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African Union High-Level Panel on Emerging Technologies (APET)

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4TH EDITION

Synopsis

Developed by the African Union High-Level Panel on Emerging Technologies (APET) and supported by its secretariat, the 2023 APET blogs series presents an array of innovative solutions for critical issues across Africa. This series emphasises the strategic use of emerging technologies in key sectors such as healthcare, education, agriculture, and environmental management.

Highlighting efforts in manufacturing vaccines, utilising solar energy, and embracing digital technologies, these blogs demonstrate APET's commitment to leveraging technology for sustainable development, inclusive growth, and enhancing socio-economic growth in African nations.

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About APET

The Heads of State and Government directed the NEPAD Agency in 2016 to establish a system for obtaining expert contributions on the matters of technology development and acquisition and deployment for economic development.

To this end, the AU established a ten-member African Union High-Level Panel on Emerging Technologies (APET) composed of eminent experts to advise the Union, its various organs, and Member States on how Africa should harness innovation and emerging technologies for socio-economic development.

The APET in its advisory Think Tank role to Member States, provides an opportunity for the continent to leverage on current and emerging innovations and technologies that have high potential to transform Africa's science base into a competitive advantage.

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Strengthening Africa's Capacity In Manufacturing Vaccines And Medicines

The prevalence of infectious diseases are particularly elevated in Africa because of environmental factors and limited health infrastructure such as health facilities and services. Diseases such as tuberculosis, malaria, and other illnesses have spread rapidly. According to reports, thousands of children under the age of five die each year as a result of diseases such as malaria. For example, the Ebola outbreak in West Africa between 2014 and 2016 resulted in over 11,000 fatalities.[1] Recently, the COVID-19 pandemic resulted in over 12.38 million cases of infection and approximately 257 thousand deaths between February 2020 and October 2022 across the African continent.[2] Thus, the continent that did not initiate COVID-19 and effectively used limited resources to keep deaths and infections below global averages may suffer severely from the pandemic's socio-economic repercussions due to difficulties surrounding vaccine access (see figure 1).[3]
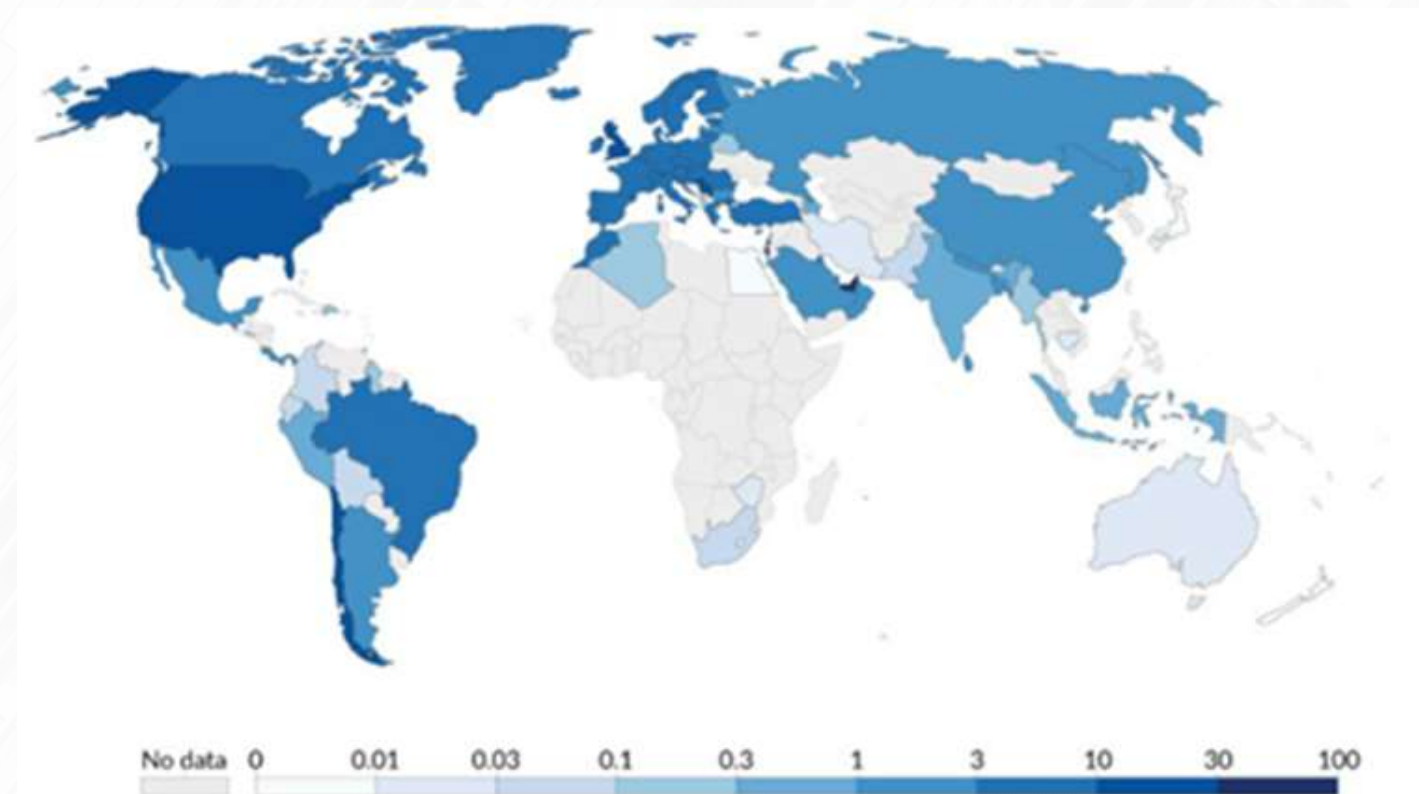
Figure 1: Africa's Lack of Access to COVID-19 Vaccines

Blog #1 Published on Feb 15, 2023

Remarkedly, African countries are significantly relying on the importation of diagnostics, medications, vaccines, personal protective equipment, and other medical supplies to manage these diseases. For example, Africa is importing almost 99% of vaccinations for diseases, and over 95% of medications, despite consuming approximately 25% of the world's vaccine production[4]. This is demonstrating the need to have its manufacturing capacity and infrastructure for vaccines and medicines to address access to medication and enhance cost-effectiveness for the continent's citizenry.

Africa's reliance on other countries for medicines and vaccines and its poor vaccine manufacturing capabilities contribute significantly to the continent's inadequacy in addressing these prevalent diseases and pandemics. However, simply expanding the importation of COVID-19 vaccinations to African countries cannot be considered a long-term solution. Rather African countries should develop their capability to manufacture and distribute medicines and vaccines.

For Africa to enhance its capacity to address emerging pandemics and diseases, countries have recognised their need to expand their capacity to manufacture vaccines and medicines. To this end, in April 2021, the African Union (AU) through the African Centre for Disease Control and Prevention (Africa CDC) developed the Partnerships for African Vaccine Manufacturing (PAVM) Framework for Action. This framework is instituting mechanisms to improve Africa's current vaccine manufacturing environment and implement programmes to unlock Africa's potential to scale up the development and manufacturing of vaccines over the next two decades.[6]

The African Union Commission and Africa Centres for Disease Control and Prevention (Africa CDC) have called on governments, multilateral organizations, philanthropies, the private sector, and civil society organizations to support the full implementation of Africa's New Public Health Order to drive global health security. The Public Health Order is aimed at protecting Africa's health and economic security as it seeks to accomplish the goals of the AU's Agenda 2063 to accomplish universal health by 2030. Therefore, enhancing local production of vaccinations, diagnostics, and treatments can enhance the continent's health systems, and enhance the capability to respond to pandemics and other health crises. In this way, Africa will be able to manufacture at least 60% of vaccines domestically by 2040, enhancing its self-reliance while it meets its vaccination needs.[7]

In 2007, the AU adopted the Pharmaceutical Manufacturing Plan for Africa (PMPA) to hasten and expand local pharmaceutical production.[8] As a result, Ethiopia, South Africa, Senegal, Nigeria, Morocco, Tunisia, and Algeria have since started vaccine production and manufacturing. However, because of the continent's unpredictable supply chains and the limited local scientific skills capacity, the vaccines and medicines production remain low. Consequently, locally produced vaccines and medicines are largely augmented by imports. Other limiting factors include inadequate investments by African governments in vaccine manufacturing, and ineffective regulatory capacity for vaccine research, development, and production. There is also limited support that is frustrating efforts of vaccine production in Africa by global vaccine stakeholders that have resulted in uncertainties towards meeting the demands of Africa-made vaccines.[9]

The African Union High-Level Panel on Emerging Technologies (APET) recommends African countries to enhance their capabilities to manufacture vaccines and medicines. This can be accomplished by adopting several mitigation strategies to enhance vaccine and medicine production in Africa. For example, APET is inspiring African countries to strengthen their training capacity education policies to encourage pharmaceutical research and development.

Such efforts can encourage skills capacity strengthening and entrepreneurship. Furthermore, the panel encourages African countries to improve and harmonise their regulatory systems to enhance the quality assurance of local manufacturers in order to match international standards when manufacturing medical consumables, materials, medicines, and vaccines.

African countries should also collaboratively coordinate their national and regional policies and initiatives to promote local production. Such efforts can assist economies of all sizes to create synergies, share the workload and avoid wasteful duplication. As such, the African market integration and trade facilitation can exploit regional economic integration platforms such as the Economic Community of West African States, the Common Market for Eastern and Southern Africa, and the African Continental Free Trade Agreement. Consequently, more integration can result in sustainable manufacturing of products in high demand in the region and expand access to new markets.

APET emphasizes that it is important for African countries to augment their political, policy, and regulatory support for vaccine manufacturing in Africa. Fundamentally, African leaders need to increase their investment commitments and policy implementation to enhance local vaccine manufacturing efforts. This can significantly improve the regionalisation and integration of vaccine markets across the continent. Access to finance and investments in local vaccine manufacturing can enhance vaccine production infrastructure and skills through collaborative partnerships and joint ventures.

APET notes that African countries can also draw lessons and replicate past successes in producing and distributing vaccines and medicines in Africa. For example, in 2010, African leaders expanded efforts to eradicate Group A Meningitis epidemic in Africa through the Meningitis Vaccine Project (MVP). This global collaboration involved public health experts, World Health Organization, Non-Governmental Organisations, and commercial firms to produce the "MenAfriVac". The "MenAfriVac" was a cost-effective vaccination that was utilised to conduct large immunisation campaigns that significantly reduced meningitis. This also facilitated technology transfer, regulatory approval, and testing to enhance the local production of vaccines and medicines.[10]

Since Africa only manufactures approximately 0.1% of the global supply of vaccines, APET opines that there is a market failure that requires urgent attention. This can be accomplished by creating superior vaccine supply resilience for Africa through domestic production.[11] Hence the continent should create this potential multi-million industry almost from scratch through the support of African governments and manufacturers. For example, the continent has managed to produce more than 11 billion doses of the COVID-19 vaccine. However, due to vaccine hoarding and export restrictions coupled with the lack of regional vaccine supply across the continent, Africans continued to lose their lives due to the delays in access to doses. Regrettably, if this is left unchecked, it can lead to more catastrophic health insecurities.[12] If the vaccine production limitation in Africa were to be meaningfully expanded, Africa could enhance her pandemic preparedness, create a greater vaccine supply resilience for African nations for a comprehensive range of vaccine-preventable diseases, and practically create a sustainable multi-billion-dollar industry.

APET observes the various vaccine manufacturing initiatives that are currently underway as approximately 30 vaccine manufacturing activities were started across the continent. These initiatives were based on the African Union's aspirations to develop, produce, and supply more than 60% of the vaccine doses required on the continent by 2040.[13] However, without careful planning and coordination, the threat could be that even with significant capital investment, these initiatives will not survive in the long term. Such shortcomings could have substantive negative impacts on existing vaccine markets.

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Hence, APET advises African countries to formulate and implement a comprehensive approach to finance the fixed overhead costs, enhance capacity strengthening of relevant skilled labour, intensify quality assurance and control, and strengthen the reliability of vaccine production. Consequently, this can make the vaccine costs competitive and sustainable. For example, the 11 vaccines that the WHO has recommended for every country can cost an equivalent of approximately US$1,300 in the United States of America. However, the same vaccines can cost as low as US$28 for Gavi-eligible countries, which includes several African countries.[14] Notably, when Gavi was first founded, it had five suppliers, which were predominately based in Europe and North America. However, this has since increased to 18 manufacturers with only seven that are in European and North America.

COVID-19 has highlighted the need for a new approach as this Gavi model has exhibited some supply reach limitations. The new approach should involve the expansion of vaccine manufacturing across Africa to boost the regional and global supply of routine vaccines.[15] This process can create a sustainable supply resilience for future pandemic vaccines as Africa is the world's largest purchaser of vaccines. African countries can support regional manufacturing in Africa. Part of this approach can involve industrial engagements and participation, provide analysis of existing markets, coordinate the vaccine markets to avoid over-crowding markets, and enhance proper regulatory benchmarking.[16]

Expanding the vaccine manufacturing efforts in Africa represents an enormous opportunity to enhance health security across Africa. This can potentially protect African citizens from a wide range of infectious diseases and further establish African vaccine manufacturers as important global suppliers. APET realises that expanding vaccine production in Africa is a challenging endeavour that requires the coexistence of various components. Most importantly, the developing sector requires extensive coordination amongst a wide range of stakeholders, including pan-African leadership groups, regional economic governments, national governments, private-sector players, and global health actors. This can significantly bolster the sustainability and effectiveness of vaccine and medicine manufacturing in Africa.

Link: https://www.nepad.org/blog/strengthening-africas-capacity-manufacturing-vaccines-and-medicines

Utilising Solar Energy To Generate Clean Drinking Water In South Sudan

African lives, livelihoods, and development are partly dependent on the provision of clean water as aspired by the African Union Agenda 2063 Goal Number 7. Africa is thriving for environmental sustainability and climate-resilient socio-economic development and growth. As a result, prioritising affordable, safe, and clean drinking water for African citizens is essential.[1] Furthermore, the United Nations Sustainable Development Goal (UN-SDG) Number 6 promotes equitable access to clean and safe drinking water as a foundation of health and development for the global community.[2] The continent has abundant water sources such as lakes, rivers, and groundwater. However, some of these sources and the distribution of water to various communities tend to be contaminated, thereby posing a threat to local communities. There is a need, therefore, to treat the water in a safe and cost-effective manner for the benefit of communities.

According to the UN, the African population has expanded from 800 million to approximately 1.2 billion people between 2000 and 2020. Of the 1.2 billion people, approximately 500 million people have access to basic sanitation facilities, and only 290 million have access to clean drinking water. Furthermore, approximately 418 million people do not have access to the most basic level of drinking water services, and approximately 779 million do not have access to basic sanitation. The latter includes about 208 million who are still defecating in the open and about 839 million people that do not have access to basic hygiene services.[3]

Furthermore, within African countries, there still exist substantial disparities between the rich and poor, in urban and rural areas, and across sub-national regions. For example, in some urban areas, half of the population has limited access to basic hygiene services. Two out of five people have limited access to securely managed drinking water, sanitation, or both. In contrast, the rural areas are observing three out of four people with limited access to safe sanitation, and four out of five people have limited access to regulated drinking water. Additionally, seven out of ten people have limited access to basic hygiene services. Similarly, data from 35 sub-Saharan African countries (covering 84% of Africa's population) demonstrates considerable differences between the poorest and richest fifths in both rural and urban settings. Over 60% of urban residents in the richest quintile utilise pipe-borne water, and 90% use improved water sources. The poorest 40% of rural families have no pipe-borne water, and less than half use improved water sources (see figure 1 on the next page).[4]
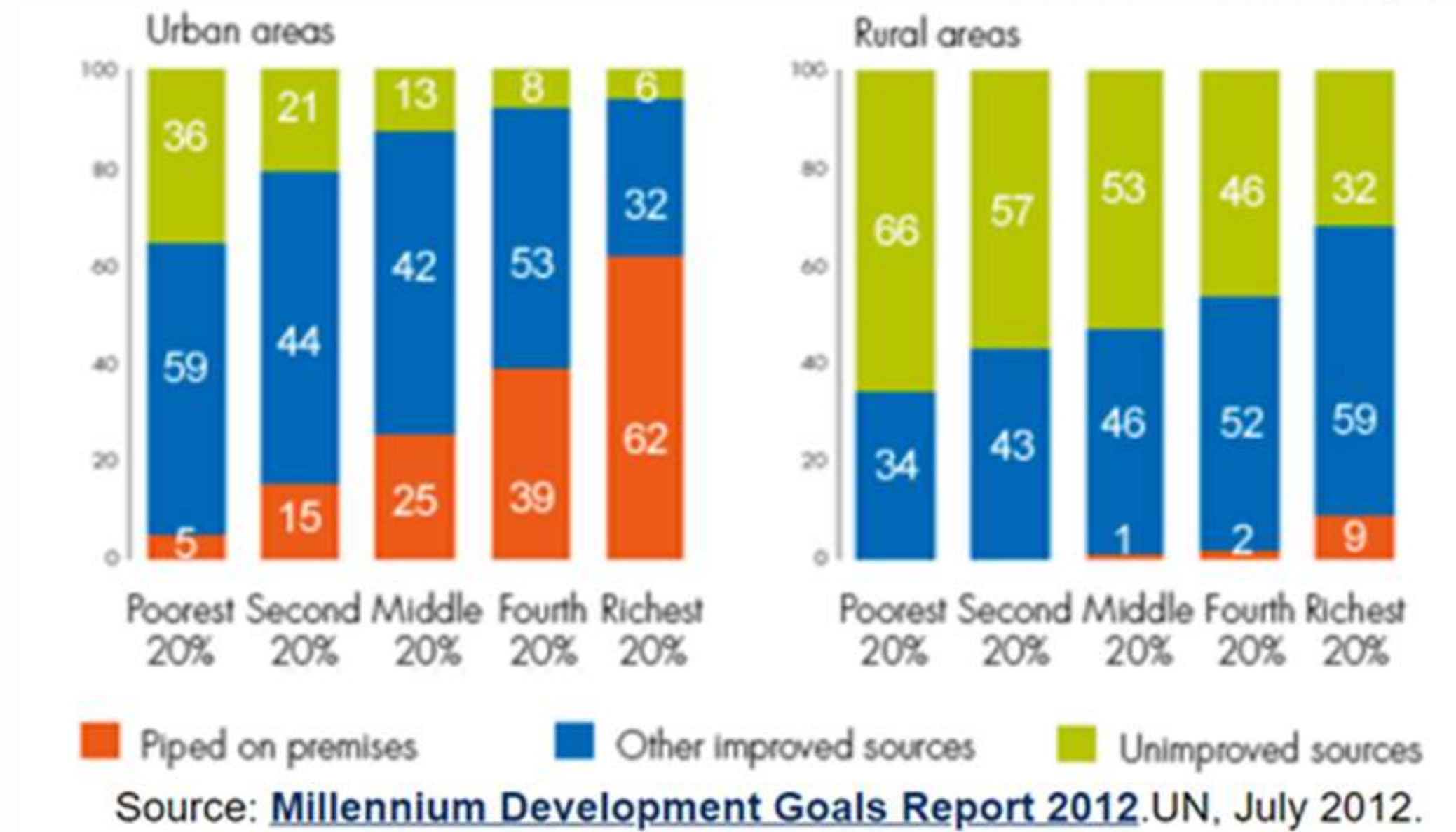
Figure 1: Drinking water coverage by wealth quintiles, urban and rural residence, sub-Saharan Africa, based on population-weight averages from 35 countries (percentage)

South Sudan is one of the African countries that is facing shortages of safe and clean drinking water. This is because the country lacks adequate water treatment, management, and distribution infrastructure. There are also a few water sources, and these are frequently serving as flashpoints for disputes over short supply. Notably, only 10% of the population of South Sudan has access to well-managed basic sanitation services. As a result, water-borne diseases such as cholera, diarrhoea, typhoid, amebiasis, hepatitis, gastroenteritis, giardiasis, campylobacteriosis, scabies, and worm infections are causing sicknesses and death, especially among children.[5]

The recurring civil wars in South Sudan have also halted institutional growth, particularly in water management and distribution. This is resulting in ineffective water management systems and institutions. Furthermore, the planning, monitoring, and management of water systems are also negatively impacted by the limitations on human and financial resources. Local water security challenges are a result of these governance problems and the prevalence of poverty.

Blog #2 Published on Feb 22, 2023

In addition, surface and groundwater quality issues have been exacerbated by oil exploitation in the central floodplains of Jonglei, Lakes, and the Upper Nile, leading to leaks and spills and contamination of surface water. Groundwater has become more salinized and exhibiting higher concentrations of heavy metals due to the seepage from oil fields. Most importantly, the lack of electricity to pump water to rural areas is also a significant obstacle for these communities.

Notably, South Sudan's plentiful water supplies are largely contaminated and of low quality. As such, a total of 3,936 m3 of yearly renewable water resources are available per person. The entire amount of freshwater makes up to 4.23% of South Sudan's total resource endowment. This is considerably less than the benchmarked 25% water stress and significantly less than the average of 5.7% in sub-Saharan Africa. Furthermore, extreme flooding and water shortages during the dry seasons are also due to the uneven distribution of water resources across the country. There are also significant inter-seasonal variabilities in South Sudan that are substantively dependent on surface water supplies sourced from neighbouring countries.

South Sudan has the potential to provide clean water because of the abundance of fertile land and over 3,000 hours of sunshine per year. As a result, some villages are implementing solar-powered water pumps. These climate-smart solutions are assisting residents who have limited access to water. Solar energy enables some communities to access environmentally friendly clean water and easily manage solar-powered water systems with clean water being delivered to places where the national electricity grid cannot reach.[6] The employment of solar water pumps is gradually replacing the conventional pump systems that are using environmentally unfriendly diesel engines.

The government is also in a campaign of installing solar-powered water systems to benefit rural communities. For example, the Yambio project is providing access to clean water for health centres, schools, and homes, especially during dry periods. This is significantly benefiting Yambio's communities because the solar water systems are bringing clean water sources closer to home. This also involves providing schools with clean water for provide sanitation purposes.[7]

Additionally, the Akuach Water Yard project is another example in South Sudan that is supplying clean water to about 15,000 people. This project has a large water tank, a deep borehole, and a generator that utilises solar energy to make up the water yard. At first, the water yard was utilised to operate on diesel generators to draw water from the borehole. However, due to the rising prices of diesel fuel, it became expensive to operate generator-based water systems. The surrounding communities had limited resources to finance such operations of the borehole. But the solar-based water system is enabling these communities to generate clean water from groundwater systems.[8]

Figure 2: A picture of the Akuach water yard [9]

Evidently, the continent has ample and reliable solar energy to provide reliable energy to local communities. The African Union High-Level Panel on Emerging Technologies (APET) thereby encourages African countries to adopt easy-to-use technologies such as solar-based water management systems. Furthermore, APET recommends that solar energy be complemented by other green energy sources such as hydro power to ensure a consistent power supply for energy-stressed African countries.

APET is cognizant of the fact that water solar systems are expensive to install and operationalise. As a result, solar-powered technologies become expensive for most Africans. To address this challenge, the Panel encourages African countries to employ innovative financing schemes such as fee-for-service arrangements. This can help Africans install sufficient solar panels to power multiple water schemes in a timely and effectively manner. African governments should also remove trade barriers such as high import duties that can lead to affordable solar technologies.

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In conclusion, it is recommended that African countries invest in climate-resilient green technologies such as solar water pumps. This approach will have substantive positive effects on socio-economic growth to strengthen job creation and reduce poverty. African governments should, therefore, actively invest in solar water technology development to create infrastructure systems that safeguard residents in a safe and cost-effective manner.

Link: https://www.nepad.org/blog/utilising-solar-energy-generate-clean-drinking-water-south-sudan

Reducing Child Mortality In Africa Using Solar-Based Healthcare Technologies

African countries are progressively improving the quantity and quality of the healthcare available to their citizenry. This is in alignment with the African Union's Agenda 2063 which envisions a prosperous Africa based on inclusive and sustainable economic development and growth. Africa's health care has significantly improved as life expectancy has increased from 50.9 years to 53.8 years between 2012 and 2015. This was the most notable increase of any region in the world.[1]

Notably, Africa's healthcare system has managed to reduce child mortality rates. For example, in 2020, for children under the age of one, about 47 children for every 1,000 live births died, and this was down from 183 for 1,000 live births in 1955.[2] This is attributable to the progressively expanded efficiency of local healthcare facilities, advances in nutrition, and increased access to clean drinking water.

Despite the progress that has been made within the African healthcare sector, several challenges still exist. This is because the healthcare system of countries remains underfunded, resulting in significant service delivery challenges such as limited facilities and equipment, a limited skilled workforce due to brain drain, and low availability of electricity to undertake critical medical procedures. Additionally, in spite of the progressive successes that have been observed in the effort to reduce child mortality, the problem persists. For example, countries such as Somalia, the Central African Republic, and Chad are registering child mortality rates of 90.81, and 68 per 1,000 births, respectively (see figure 1). These rates are much higher than countries such as Tunisia, Seychelles, and Mauritius which have observed 11, 9, and 9 children per 1000 births mortality rates, respectively.
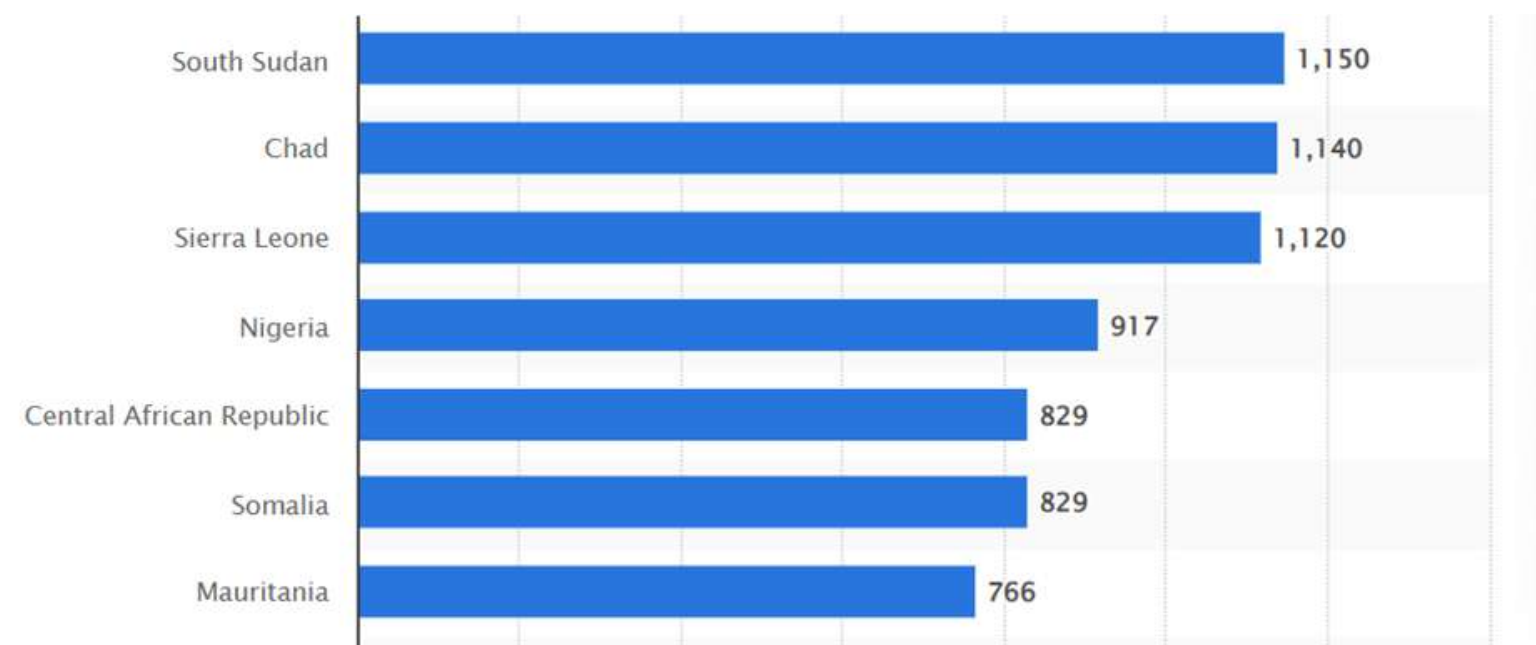
Figure 1: African countries with the highest maternal mortality rate in 2017(deaths per 100,000 live births) [3]

Blog #3 Published on Feb 22, 2023

Recent reports have estimated mortality rates that are higher in Africa for children under the age of five, with most deaths occurring in rural areas. However, more than half of these fatalities are easily preventable and treatable including malaria, childbirth complications, diarrhoea, pneumonia, and preterm births.[4] Some African countries are progressively improving maternal nutrition to ensure foetal and child nutrition, enhancing immunisation to children against diseases, providing clean drinking water, promoting breastfeeding, and providing proper healthcare.

Interventions such as investing in efficient clinics, medical experts, health information, infrastructure, and cutting-edge equipment, among other things, can significantly improve morbidity challenges and further bolster the strategic and operational mechanisms for children's healthcare. This is especially vital in rural communities where electricity provides power to essential medical equipment such as incubators for pre-term newborn babies. This includes facilities such as operating rooms and delivery rooms to enable efficient and safe newborn baby deliveries. Furthermore, electricity can also provide power to refrigerators for medicines and vaccines.[5]

Hospitals are among the biggest commercial consumers of electricity in Africa, utilising the energy to ensure water supply, temperature control, lighting, and ventilation to a wide variety of clinical equipment. Regrettably, a majority of African hospitals and clinics have limited access to reliable electricity. Consequently, this may result in the spoilage of medications and reduced capacity to undertake essential diagnostics and provide power to medical equipment. Even the absence of basic lighting and communication can make treatments and emergency procedures more difficult. Therefore, the adoption of green energy technology in healthcare can potentially enhance healthcare service delivery.

In some African countries, electricity interruptions occur up to 50% of the time. As a result, hospitals and clinics are substantively relying on diesel generators to access electricity. These generators are not environmentally friendly, unreliable, and expensive to operate. Additionally, the backup generators are unable to stop abrupt blackouts that might harm delicate medical equipment, halt medical procedures, and risk the lives of patients.[6] Therefore, African countries should seek alternative sources of electricity to supplement the grid of power.

The African Union High-Level Panel on Emerging Technologies (APET) recommends that African Union Member States adopt renewable energy such as solar power, wind energy, hydro energy, tidal energy, geothermal energy, and biomass energy to provide energy for essential healthcare activities. African countries are encouraged to exploit the vast potential of renewable energy, particularly solar energy. This can significantly improve healthcare delivery and further prevent healthcare challenges such as child mortality rates in African clinics and hospitals.[7] African countries can leverage the installation costs of solar systems that are progressively becoming affordable and cost-effective. For example, the cost of solar panels has decreased by approximately 80% in the past decade.[8]
Fundamentally, where unreliable power is still a challenge, particularly in distant rural locations, solar energy is offering medical facilities with efficient, affordable, dependable, and independent sources of electricity. This is potentially enhancing and expanding healthcare access and delivery. Furthermore, in an APET report, "Micro-Grids - Empowering Communities and Enabling Transformation in Africa", APET recommends that African countries adopt cost-effective, dependable, and autonomous sources of electricity.[9] Consequently, these renewable energy sources can be connected through microgrids to substantially expand and enhance healthcare access and delivery, especially in rural areas.[10]

Blog #3 Published on Feb 22, 2023

Some progress is being observed in the increasing usage of solar power to provide reliable healthcare and reduce child mortality in Africa. For example, the collaboration between St. Luke Hospital in Wolisso, Ethiopia, and Enel Green Power (EGP) has successfully utilised solar energy to provide power to hospitals and clinics. As such, EGP is installing and implementing a cutting-edge solar hybrid system in St. Luke Hospital.[11] This solar system, consisting of a photovoltaic plant and batteries, produces up to 320 kWh of electricity. This system can also control energy flows in real-time to ensure a steady supply of power. This system has enabled the hospital to provide more effective healthcare to approximately 4000 deliveries annually.[12]

Furthermore, Sierra Leone, Liberia, Uganda, Tanzania, Kenya, Zimbabwe, and Ethiopia have collaborated with the "We Care Solar Works" to bring solar power to remote, off-grid, and under-resourced medical facilities to ensure that women deliver their babies safely.[13] For instance, since 2010, over 2,600 healthcare facilities are benefitting from the We Care Solar project, and about 10,000 health workers have participated in the solar training programmes. As such, Solar Suitcases have been placed in clinics in 27 countries to serve more than a million mothers and their newborn babies.[14] As a result, more than 1 million babies have been delivered in healthcare facilities that are using Solar Suitcases (see figure 2).[15]

Figure 2: We Care Solar Suitcase [16]

Blog #3 Published on Feb 22, 2023

Renewable energy innovation has substantively improved obstetric care in remote communities across Zimbabwe. As such, the system has successfully supported over 180,000 deliveries per year since its introduction.[17] For example, the Kamabarami Health Clinic, in Zimbabwe, is providing healthcare to pregnant mothers, children, and HIV-positive people in need of anti-retroviral therapy (ART).[18] This facility is conducting consultations in the morning and outpatient visits until 4 pm. However, the facility is also handling emergencies even at night. This becomes difficult to undertake since the facility lacks electricity and clinicians scruffle in near darkness to deliver lifesaving healthcare to patients. As a result, the clinic relied on candles to conduct medical services which were scary during complications. For instance, healthcare workers have difficulties administering Nevirapine to newborn babies to reduce the likelihood of maternal HIV transmission. Therefore, We Care Solar's Solar Suitcase is providing an easy-to-use solar electric system to provide healthcare facilities with highly efficient medical lighting and power for mobile communication and small medical devices.[19]

The Suitcases were originally designed to support emergency obstetric healthcare delivery but can also be utilised in other humanitarian settings. For example, the water-and-dust-tight yellow case can be used as a cabinet to mount to the wall and connected to the solar panels secured on the roof. This system includes rechargeable LED lights, USB ports, a foetal doppler, and an infrared thermometer.[20]

The practical and portable source of clean, steady electricity is ensuring night-time deliveries and emergencies. With the foetal doppler, healthcare workers can listen to the foetal heart rate easily, and detect foetal abnormalities in the baby, especially when there is birth asphyxia. Consequently, the clinic has enhanced productivity and substantially decreased maternal mortality rates since the introduction of solar power. The Solar Suitcases are now operational across 759 healthcare centres in Zimbabwe to support more than 180,000 deliveries, annually.[21]

Additionally, the installation of a solar-powered medical oxygen system at a central Somalia hospital has also proven effective in saving lives. For example, the innovative solar oxygen system was installed at Hanaano Hospital, in the central town of Dhusamareb in 2021. As a result, 171 patients received oxygen at the hospital from the solar-powered system from February to October 2022. Of these 171 patients, 163 patients accounting for 95.3% of the patients, fully recovered and were discharged from the hospital. [22]

In Somalia, approximately 15,000 to 20,000 deaths occur among children under the age of five years because of pneumonia. Regrettably, pneumonia has become the deadliest disease among children under the age of five in Somalia and healthcare authorities had limited access to interventions that could reduce deaths from childhood pneumonia.[23] In addition, it had become challenging for children under one year and children who are born six months to have adequate access to oxygen. However, the advent of innovative solar oxygen systems is enabling access, even when there are shortages of electricity. This is also helping manage children who were born prematurely in clinics and hospitals to maintain high oxygen saturation levels of patients.

An initiative to install bio-medical equipment that utilises solar energy at Hanaano Hospital was developed during the peak of COVID-19 in 2020 since many patients were dying due to respiratory difficulties. As such, hospitals were barely managing the high intake of patients with a cost of a cylinder of oxygen increased to between US$400 to US$600. This is in contrast to pre-pandemic period where only 20% of hospitals and clinics in Somalia had access to the limited supply of oxygen. Currently, Somalia requires up to 3,000 and 4000 m3 of oxygen per day.[24]

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In conclusion, APET notes that solar systems are critical for effective and efficient health care delivery. These include providing electricity to hospitals for interventions such as refrigeration to store vaccines and drugs at low temperatures, without interruptions. Furthermore, solar systems improve the quality of antenatal care services, vaccination rates, emergency capabilities, and primary healthcare services. This is because these solar-powered facilities can now afford to provide high-quality, reliable, and African countries are thereby encouraged to harness solar technology through investments in infrastructure and human capital development towards effective health service delivery and reduced child mortality.

Link: https://nepad.org/blog/reducing-child-mortality-africa-using-solar-based-healthcare-technologies

Expanding Clean Water Solutions To Address Waterborne Diseases

Access to clean water is a basic human need and right for all African people. Since people cannot survive without water, the African Union Agenda 2063 and the United Nations Sustainable Development Goals (UN-SDGs) have emphasised access to water as a critical component of socio-economic development. Water is a prerequisite for improving the quality of life and ensuring universal access to sanitation. Additionally, clean water is an essential component of food, energy, health, industrial development, liveable cities, biodiversity, and ecosystems.[1]

About 2.1 billion people across the world do not have access to clean and safe drinking water. Additionally, some of the scarce water sources are also hazardous and cause over 3.4 million deaths, annually. Millions of women and children spend three to six hours fetching water from long distances and sometimes, contaminated sources, daily. As such, it takes an average of 3.7 miles to walk for clean water, which is time that could be spent working, taking care of family members, or going to school. Patients with illnesses linked to a lack of access to clean water occupy 50% of all hospital beds worldwide at any given moment.[2] In particular, the African continent has approximately 208 million people engaging in open defecation. Additionally, over 418 million people still lack access to even the most basic level of drinking water service. Most importantly, approximately 779 million people need access to basic sanitation services and 839 million people lack access to basic hygiene services.[3] Notwithstanding efforts and initiatives to extend and sustain water, sanitation, and hygiene (WASH) systems and services, Africa as a whole and Sub-Saharan Africa in particular have experienced a variety of health issues leading to death (see figure 1).[4]
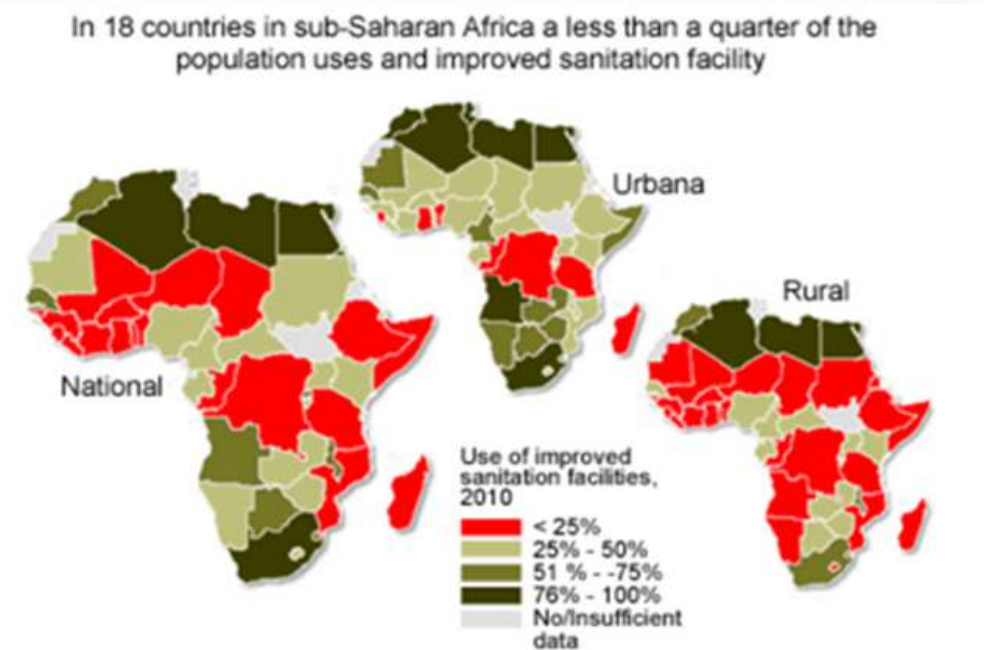
Figure 1: A glimpse of Africa's Drinking Water and Sanitation

Blog #4 Published on Feb 27, 2023

The under-performance of the water sector in Africa has resulted in the advent of waterborne diseases such as cholera. Cholera is an acute diarrhoeal infection caused by the ingestion of food or water contaminated with the bacterium Vibrio cholerae.[5] In many African countries, cholera continues to be a major source of illness and death despite having been mostly eradicated from industrialised countries through efficient wastewater treatment over a century ago. A crucial first step to lessening the cholera burden in Africa is increasing worldwide access to water, sanitation, and hygiene (WASH).[6] Reports are estimating that there are approximately 1.3 million to 4.0 million cases of cholera each year. These cases of cholera are resulting in 21 000 to 143 000 deaths annually, and 54% of these deaths are reported in Africa.[7]

Malawi has recently observed a surge in cholera cases since 2022. Remarkedly, Malawi had almost entirely eradicated cholera and there were only two cases that were reported in 2021. However, in the last 11 months, over 950 Malawians have died and approximately 29,000 cases of cholera were reported during the same period.[8] The surge of cholera in Malawi was attributable to Tropical Storm Ana and Cyclone Gombe. This is because these storms destroyed existing latrines and hand-washing facilities in 2021. There was also the emergence of informal mining settlements that emerged along Lake Malawi. Unfortunately, the informal settlers are utilising the lake for washing and sanitation.

To address these challenges, the Malawi Red Cross Society is implementing and administering Oral Rehydration Therapy at local and community levels lifesaving treatments. Furthermore, volunteers are ensuring that water supplies are safe and that sanitation facilities are working. Volunteers are undertaking door-to-door campaigns and raising awareness to prevent the disease from spreading.[9] Since there is currently a rainy season underway, citizens are encouraged to take the necessary precautions to protect themselves and their families. In addition, groundwater and shallow wells are commonly utilised in rural regions, and this is a common residential water source in Malawi. However, to make this water safe for drinking, the currently utilised water treatment techniques include boiling, solar disinfection, chlorination, and filtration.[10] Even though these techniques have proven to be inexpensive, easy to use, and cost-effective, they still fail to completely eradicate the contamination. Therefore, after such treatments, the water remains unclean and unsafe to drink. Hence, alternative, and much more effective methodologies and technologies to treat such water should be sought.

The African Union High-Level Panel on Emerging Technology (APET) recognises that adopting and implementing emerging technologies for water treatment and effective sanitation can help eradicate waterborne diseases such as cholera in Africa. APET advises that widespread access to clean water and effective sanitation can eradicate waterborne diseases such as cholera. Therefore, to ensure the use of safe water, basic sanitation, and good hygiene practices in cholera hotspots, WASH solutions should be integrated with emerging technologies to enhance safe drinking water. This is because the identification of new and uncommon contaminants and the adoption of new water quality standards can help African countries manage sanitation challenges; these can largely influence the development and application of water treatment technology.

APET recommends the integration of emerging water treatment technologies such as nanotechnology and membrane technology into existing water treatment methods. For example, the application of membrane filtration technology can promote efficient water purification systems to prevent the spread of microbes that are causing waterborne diseases. Membrane technology can remove microorganisms in a gainful manner. Furthermore, if African governments could invest in the installation and energy operating costs, these technologies can be cost-effective.

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Blog #4 Published on Feb 27, 2023

Notably, the operational costs to provide electricity to operate the membrane systems, are substantial impediments to membrane technology. Therefore, consideration of renewable energy systems to power these treatment systems can reduce the cost significantly.[11] Additionally, membrane technologies can be coupled with nanotechnology to enhance removal and water permeation performances.

Nanotechnology has also proven to substantially reduce membrane fouling that is due to the accumulation of contaminants on the surfaces of the membranes, thereby, making them lose performance capacities. Further to this, nanotechnology can effectively deactivate microorganisms and remove micro-pollutants from water, even at low concentrations. For example, these nanoparticles can be incorporated into existing adsorbents and membrane filters to improve water treatment procedures.[12] This makes the current adsorbents and membranes even more effective to remove pollutants from water bodies.

For example, South Africa has demonstrated the deactivation of laboratory-cultured bacteria by percolation through a thick paper sheet containing silver (Ag) and copper (Cu) nanoparticles (NP). These paper filters containing AgNPs or CuNPs successfully treated contaminated streams in Limpopo, South Africa to remove coliform and E. coli bacteria.[13] Furthermore, the Nanotechnology Innovation Centre under the Department of Science and Innovation (DSI/Mintek), Water Research Commission and the Medical Research Council, in partnership with South African universities such as the University of Johannesburg and the University of South Africa are currently undertaking ongoing research initiatives in the nanotechnology field. As such, Mintek has been progressively developing the critical mass in nanoscience and nanotechnology to enhance water treatment and purification.[14]

APET notes that there are some concerns about releasing nanoparticles and nanomaterials into the environment without a comprehensive understanding of pathways, reactions, and the eventual fate of such nanoparticles. These concerns include the toxicity of bulk material, such as solid silver, but do not help predict the toxicity of such nanoparticles of that same material. There are concerns that the nanoparticles will linger and accumulate in the environment, and effectively bioaccumulating in the food chain and creating unanticipated effects on human health. However, researchers are currently addressing these challenges by ensuring the non-leaching of these nanoparticles, thereby, preventing secondary contamination.

Conventional water and wastewater treatment employs a variety of physical-chemical and biological processes to generate clean drinking water and decontaminate wastewater. The substances that can be removed from drinking water include monovalent ions such as sodium and chlorine ions using reverse osmosis membranes. They can also remove water hardness such as calcium and magnesium using ion exchange, chemical softening and nanofiltration. Organic contaminants that cause taste and odour challenges are removed by activated carbon and catalytic oxidation such as ozone, ultraviolet irradiation, and chlorination. The colloids causing turbidity can be removed by chemical coagulation and ultrafiltration. The pathogenic viruses, bacteria and protozoa are traditionally removed by disinfection and membrane processes. Even though these processes function on the micro-levels and nano-levels, they are normally not considered nanotechnology since the materials and equipment that are used are produced conventionally.

The current examples of nanotechnology and nanomaterials in water treatment include nanostructured membranes, nano filters such as carbon nanotube filters, electrospun nanofibrous membranes capable of treating microbes from water, and nanoscale photocatalysts that utilise sunlight to degrade pollutants. Furthermore, the nanoscale photocatalysts promote photocatalytic degradation of toxic chemicals that pose severe environmental pollution.

Blog #4 Published on Feb 27, 2023

Some researchers have demonstrated the utilisation of nanoscale sorbents to target near complete removal of highly toxic compounds such as heavy metal species. On the other hand, nano biocides such as Cu-HT can be utilised as an alternative disinfectant to chlorine in a water purification system. Notably, Cu-HT possesses strong disinfection activities against Escherichia coli, phage Q β, Salmonella, and Staphylococcus aureus.

South Africa and Mozambique are also adopting other kinds of water treatment technologies such as the CabECO technology to treat water in Ressano Garcia, Incomati River in Mozambique, and one in South Africa at Waterval and Klip River.[15] This water treatment technology utilises electrochemical oxidation to generate strong oxidants such as ozone without the addition of any extra chemicals. In such cases, when low voltage is harnessed between the two diamond-coated electrodes, the water molecules are split into ozone and reactive hydroxyl (OH·) radicals. These hydroxyl radicals will speedily and efficiently destroy micro-organisms and organic contaminants. Daily, the two units are generating approximately 10 m3 of water and this can sufficiently supply 300 people. This is demonstrating promise and can be scaled up to provide clean water.

In conclusion, APET advises African Union Member States to scale up and adopt these water treatment technologies, although some of these ideas and technologies are still in the laboratory and pilot stages. Therefore, African governments are encouraged to provide resources to enable these technologies to be adopted and commercialised. African researchers and innovators are also encouraged to create easy-to-operate, agile, and cost-effective water treatment systems that may be deployed by local communities. These can then be utilised in rural areas that are most susceptible to cholera infections to improve the healthcare and social well-being of Africans.

Link: https://nepad.org/blog/expanding-clean-water-solutions-address-waterborne-diseases
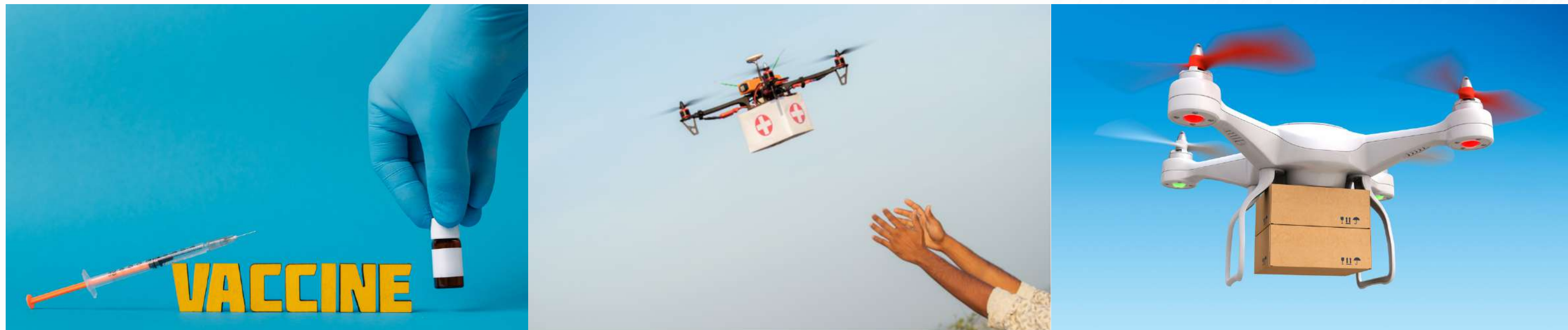
Blog #5 Published on Mar 6, 2023

Effective Delivery Of Vaccines In Africa Using Drone Technology

Africa is progressively embracing, adopting, and implementing the Fourth Industrial Revolution (4IR) to effect socio-economic development and transformation. As a result, this advancement is changing Africa's economic outlook in agriculture, healthcare, and education, among other sectors. Particularly, innovation advancements such as artificial intelligence, blockchain, drone technology, robotics, biotechnology, and quantum computing, are among the technologies that are changing the economic outlook. On the other hand, the African Union's Agenda 2063 is encouraging its Member States to embrace and exploit these technologies for the economic development of the continent. These 4IR technologies are presenting an opportunity for African countries to develop their national development plans inclusively and equitably.

The usage of drone technology, also referred to as unmanned aerial vehicles (UAVs), is gaining attention and traction in Africa. Africans are employing UAVs for commercial and humanitarian purposes.[1] Besides being used as a complex military technology, drones are also utilised for industrial activities and entertainment tools to capture spectacular videos and footage of natural landscapes, sporting events, and urban landscapes. Furthermore, drones are being used to create better and more efficient processes such as surveillance to enable insurance companies to inspect damaged assets faster and more efficiently. In agriculture, drones are utilised to enable farmers to manage their farming activities more efficiently and collect essential crop data in real time. Furthermore, drones are effectively delivering and transporting commodities and other logistics from urban to remote areas. This is especially important in several African countries because of their feeble road and rail infrastructure.

For the past decade, Africa has been struggling with an outbreak of pandemics such as Ebola, Cholera and recently COVID-19. The deployment of vaccines in hard-to-reach areas and towns has been one of the issues impeding the continent's fight against these pandemics.[2] The Logistics Performance Index (LPI) Database of the World Bank has reported that the logistics for distribution and transportation in Africa have limited capacity and performance. Africa's poor transportation and logistics are derailing the distribution of medicines and vaccines, making this rather dangerous, especially due to their short shelf-life spans.[3] Thus, African countries are challenged with addressing the logistical conundrum that can help address the timely delivery of vaccines. For example, a mass vaccination campaign's effectiveness depends on overcoming logistical obstacles and addressing vaccine reluctance. However, this becomes challenging if there are logistical challenges to transporting vaccines and medicines to the nearest vaccination centres.[4]

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Drones' technology is providing the logistical and delivery solutions that can potentially enable African countries to distribute essential supplies to disadvantaged communities, remove access restrictions, and facilitate the quicker delivery of life-saving medications and vaccines. African countries are progressively delivering medicines and vaccines using drones. For example, the Ghana government and Zipline deployed the COVID-19 vaccine to hard-to-reach areas within Ghana.[5] To facilitate the delivery, Ghana's Zipline branch has four distribution centres that are serving as a drone airport and a medical supply warehouse. Currently, these distribution centres are hosting a fleet of 30 fixed-wing drones. Operationally, drone aircraft are autonomously flying to their destination to drop off the vaccines and other medications via parachutes. The drones can deliver the vaccines as far as destinations that are 22,500 km away from the distribution centre. So far, the Zipline has distributed over 1 million vaccine doses in Ghana in over 50 thousand deliveries. Drone technology, therefore, enhances the supply chain for vaccines and circumvents the limited logistical and delivery infrastructure.[6]

Figure 1: Zipline air base in Omenako, Ghana

The Democratic Republic of Congo (DRC) has also adopted drones to deliver essential vaccines such as the yellow fever vaccine.[7] The DRC Ministry of Health, working on the Expanded Programme on Immunization (EPI)) undertook nearly a one-month vaccination campaign against yellow fever between October and November 2021. As such, the provincial government of Equateur province partnered with the Village Reach programme to deliver vaccines to hard-to-reach and remote villages using existing drone delivery networks. This was undertaken to meet the province's goal of immunising approximately 90% of the population. Prior to the use of drones to deliver vaccines, the immunisation rate was at 78%. However, it has since increased to about 95% after the introduction of drones, thereby exceeding the intended targets. [8]

Figure 2: Yellow fever vaccination campaign in Equateur province, DRC

According to the African Union High-Level Panel on Emerging Technologies (APET) report, titled, "Drones on The Horizon: Transforming Africa's Agriculture", drone technology can enable African countries to flourish and leapfrog the coverage and impact of the technology on the continent within various development sub-sectors. Fundamentally, UAVs are altering the established transport system and enabling much quicker airborne delivery in cases where road transportation is problematic for the delivery of small packages in remote communities.[9] To this end, APET recommends that African countries should increase knowledge and experience sharing as well as capacity-strengthening efforts to upscale the harnessing of drone technology across the continent. APET observes that there is a plethora of possible advantages to utilising drones for delivery.

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This includes fostering rapid transportation, providing more efficient supply chains, and enabling the delivery of emergency medical supplies. This, the Panel opines, will support infrastructure, regulatory strengthening, research and development, and stakeholder engagements.

In conclusion, APET asserts that drone technology can enable a more targeted and efficient delivery, enhancing anticipatory action, rapid life-saving work, and monitoring capacities to inform immediate and future responses. Drone technology is also strengthening impact assessment and the communication of vital information. It is, however, important that African countries invest in drone development and deployment. Furthermore, to support commercialisation, African countries should update relevant policy frameworks in order to create an enabling environment for drone technology development and adoption. Such efforts will positively impact the support and delivery of healthcare services such as medicines and immunisation programmes.

Link: https://www.nepad.org/blog/effective-delivery-of-vaccines-africa-using-drone-technology

Fostering An Inclusive And Technology Responsive Education For Youth Living With Disabilities In Africa

The African Union (AU) Agenda 2063 considers Africa's adolescents and youth as a critical population segment for improving Africa's socio-economic solutions. The AU recognises the immense potential of this demographic dividend in driving Africa's socio-economic solutions and has made it a priority to empower young people in Africa to take charge of their future. Africa's youth are increasingly creating innovations for social change and economic reform towards addressing a variety of daily and local challenges.

Fundamentally, AU's Agenda 2063 on Leveraging the Power of Africa's Youth, aspires to harness the power of Africa's youth demographic dividend by investing in their education, technology and innovation skills, and entrepreneurship. These young people are creating start-up companies and social enterprises to address some of Africa's most critical issues, which can support African countries to leverage emerging technologies, creativity, and innovation to create solutions that address development challenges such as unemployment, poverty, and healthcare needs. The AU recognises that empowering Africa's youth requires a multifaceted approach. This entails nurturing an enabling environment that fosters innovation, providing quality education and training, and creating opportunities for employment and entrepreneurship. To accomplish this, the AU is encouraging African governments and other stakeholders to create policies and programmes that support initiatives of Africa's youth. These support include funding for start-up companies and micro-enterprises, mentorship and coaching, and programmes that equip young people with the necessary skills to thrive in the 21st-century economy. The initiatives also include promoting the involvement of young people in decision-making processes at all levels such as policy development, governance, and leadership positions.

Africa's greatest natural resource is the innovative minds of its talented young people. By 2030, young Africans are expected to constitute 42% of the world's youth and account for 75% of those under age 35 in Africa.[1] However, unfortunately, when it comes to innovation and the adoption of emerging technologies, youth living with disabilities are the most vulnerable in Africa. Remarkably, not all youths on the continent have equal access to the opportunities that these technologies present. The youth living with disabilities are facing significant challenges in accessing platforms, resources, and support to realise their full potential and become value-adding global citizens. The African youth living with disabilities in Africa are most vulnerable because they live in environments lacking the necessary infrastructure, policies, and resources to fully participate in the digital economy. Therefore, African countries must reflect and recognise their capacity to innovate and develop local-based technological solutions.[2]

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APET realises that youth living with disabilities in Africa are some of the most vulnerable in terms of innovation and adoption of emerging technologies. Estimations are indicating that between 10% - 20% of the African population has a form of disability.[3] On the other hand, many African countries are guaranteeing the right to basic education. However, this right is barely being observed by people living with disabilities.[4] For example, Africa contributes about 80% of the world's total 140 million out-of-school children, the majority of whom are girls and children living with disabilities (See figure 1).

Figure 1: Disability statistics in Africa

One of the biggest challenges that youth living with disabilities face is limited access to quality education. Many schools in Africa are not designed to accommodate the needs of students living with disabilities, and their teachers are often ill-equipped to provide them with the necessary support. This lack of access to education limits their ability to acquire the skills and knowledge needed to participate fully in the digital economy. Additionally, youth living with disabilities face significant barriers to accessing technology. Most of the technologies currently available are not designed to accommodate their needs, for example the blind, thereby making it difficult for them to use these useful tools.

Furthermore, many of the youth living with disabilities are residing in areas that lack reliable internet connectivity and electricity, thereby, limiting their ability to access online platforms and tools. As a result, the lack of resources and support also limits the youth living with disability in becoming entrepreneurs and innovators.

Moreover, many youths living with disabilities are unable to access funding, mentorship, and training programmes that are essential to starting and growing a business. Consequently, they are often unable to take advantage of emerging opportunities in the digital economy.

APET realises that the opportunities for people with disabilities to engage effectively in the creation and dissemination of innovation and emerging technologies are directly and negatively impacted by an exclusion from the knowledge-acquisition process. Youth living with disabilities are usually treated as study subjects rather than being considered and perceived as equal thinkers and information carriers in their own right. As a result, they are unable to participate equally as African citizens.

In order to realise their full potential and become value-adding global citizens, youth living with disabilities require access to quality education, accessible technology, and the necessary resources and support to become entrepreneurs and innovators. APET recommends that African governments and other stakeholders prioritise investing in the development and advancement of youth living with disabilities and ensure that their rights are fully integrated into the development of policies and programmes. In addition, the government and private sector must exert more effort to ensure that they possess the intellectual and technical skills that empower and enable them to not only be employable, but also to create jobs and drive economic growth. By doing so, we can create a more inclusive and prosperous Africa for all.

The AU High-Level Panel on Emerging Technologies (APET) encourages African governments and other stakeholders to prioritise investments in the development of youths living with disabilities. The panel recommends that this investment focuses on creating inclusive education systems, developing accessible technology, and providing the necessary resources and support to enable youth living with disabilities to become entrepreneurs and innovators. Furthermore, African governments need to ensure that disability rights are fully integrated into their policies and programmes. They should include youth living with disabilities and their organisations in consultative processes to ensure that their needs and priorities are adequately addressed.

APET further encourages African countries to expand inclusive knowledge-sharing platforms and schools, enhance healthcare service delivery, and reduce bullying cases targeted at people living with disabilities. This can be accomplished by assisting and safeguarding youth living with disabilities among all stakeholders involved in their well-being. This includes adequately training parents and teachers' capacity to enhance inclusive education.

In an APET roundtable discussion held on the margins of the African Union Summit of 2023, which focused on youth's participation and involvement in digital transformation for Africa, APET acknowledged the digital divide that exists between youth living with disabilities and able-bodied youth in Africa. As such, APET emphasised the need for African countries to accomplish the AU's Agenda 2063's aspirations of equal opportunities for all Africans, including youths living with disabilities. Thus, it was recommended that African countries provide competent educators who can exhibit compassion, empathy, and dedication to youth living with disabilities.

APET further recommended that universities and colleges that are training teachers should provide curriculum that delivers long-term solutions to guarantee that all students can equally access quality education. These training programmes in teacher training universities and colleges should ensure that all teachers have the skills necessary to teach all youth, irrespective of their challenges, especially in science, technology, and innovation.

Blog #6 Published on Mar 15, 2023

That said, ensuring that all students have equal access to quality education is a fundamental challenge faced by education systems globally, but more especially in Africa. APET, however, asserts that while teacher quality is a key determinant of student success, not all teachers are adequately equipped to address the diverse learning needs of their students. Teacher training universities and colleges are significantly providing teachers with the skills and knowledge needed to overcome these challenges. Quality teacher training programmes are essential to ensuring that students have equal access to quality education that effectively impacts student achievement and addresses the diverse needs of their students to provide a positive learning environment that promotes success for all.

APET, therefore, advises that teacher training universities and colleges should develop curricula that prioritise the development of skills that enable teachers to meet the needs of diverse learners. This includes the ability to identify and address the learning challenges faced by students, particularly those who are traditionally underserved, such as students from low-income families, students living with disabilities, and students from diverse cultural backgrounds.

Since the world has been globalised, science, technology, and innovation are increasingly enhancing Africa's socio-economic growth and development. Therefore, students should have access to quality education in these fields. However, reports are demonstrating that students from traditionally under-served communities often lack access to high-quality science, technology, engineering, and mathematics (STEM) education, which can limit their opportunities for future success.[5] Thus, teacher training programmes should recognise the importance of collaboration and community partnerships in achieving these goals. This includes partnerships with local schools and community organisations, as well as collaborations with other universities and colleges to share best practices and resources.

APET encourages African governments to augment their investment in education, particularly in science, technology, and innovation programmes. This will ensure that youth living with disabilities have access to the resources they need to obtain and develop the skills necessary to succeed in the 21st century. African governments should work with private organisations and international partners to leverage additional funding for education. African governments should also prioritise the development of specialised skills and infrastructure for science, technology, and innovation programmes to support youth living with disabilities. This infrastructure should include accessible classrooms, laboratories, and computer rooms, as well as assistive technologies and software that enable youth with disabilities to fully participate in learning activities.

Finally, APET recommends that African governments strengthen their policy frameworks to support youth living with disabilities in accessing quality education. This includes the development of inclusive education policies that ensure that all youth, including those living with disabilities, have equal access to education. African governments should also work to enforce anti-discrimination laws to protect the rights of youth living with disabilities. APET realises that investing in education can ensure an inclusive and prosperous future for all. African leaders are, therefore, challenged to act decisively and commit to investing in education to support the development of a skilled and competitive workforce that includes all members of society, regardless of their abilities. This will contribute towards achieving the African Union's Agenda 2063..........the Africa We Want!

Link: https://www.nepad.org/blog/fostering-inclusive-and-technology-responsive-education-youth-living-disabilities-africa

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Utilising 3D Printing Technology To Strengthen Orthopaedic Care In Africa

Healthcare systems in Africa are confronted with challenges which include traumatic injuries that are predominantly attributed to musculoskeletal diseases, also referred to as orthopaedic trauma. This condition is becoming more common in low-income and middle-income countries, including African countries. This condition is acknowledged globally as a primary cause of death, disability, chronic pain, and escalating healthcare expenses.[1] Traumatic injuries can result from various incidents, including road accidents, falls, workplace accidents, and violence.

In recent years, traumatic injuries in Africa have risen significantly, with road accidents being a major contributor primarily because Africa has the highest mortality rates resulting from road accidents compared to any other region (see figure 1)[2]. The poor state of road infrastructure and the lack of strict traffic laws and enforcement in many African countries has resulted in an increase in road accidents. [3] These accidents often lead to severe injuries, including fractures, spinal cord injuries, and traumatic brain injuries. Unfortunately, many of these injuries are preventable, but due to various factors such as lack of education, poverty, and inadequate health infrastructure, the injuries persist.
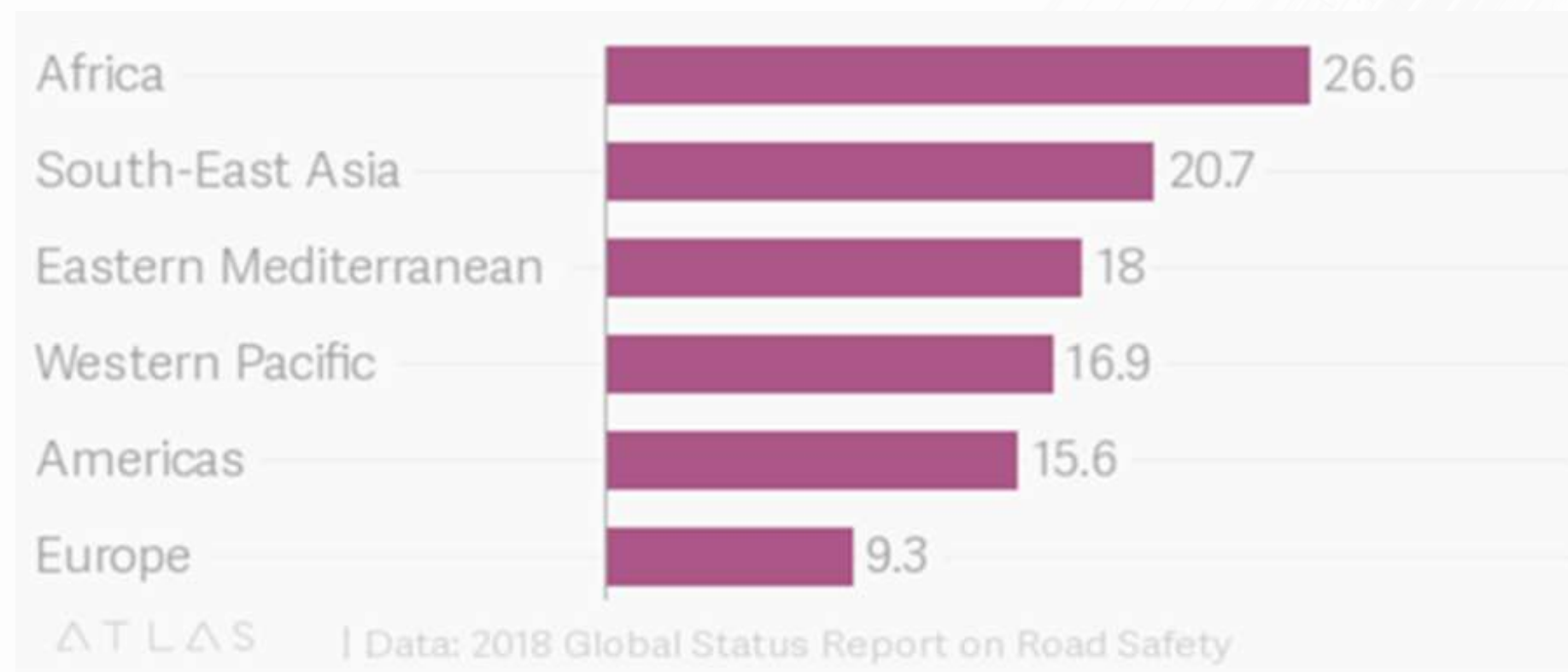

Figure 1: Number of road traffic deaths per 100 000 (2018)

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Musculoskeletal diseases, such as arthritis, osteoporosis, and fractures are also on the rise in African countries, where the lack of adequate medical care often results in delayed treatment, leading to more severe outcomes, chronic pain, and disability. Moreover, the lack of access to advanced medical equipment, such as X-ray machines and MRI scanners, presents a significant challenge in diagnosing and treating these diseases effectively.[4]

The economic impact of orthopaedic trauma and musculoskeletal diseases in Africa is substantial. For example, the costs associated with treating these conditions are often high, and the lack of insurance coverage and social protection schemes exacerbates the financial burden on individuals and families. Additionally, the long-term consequences of these injuries, such as disability and chronic pain, can limit individuals' ability to work and contribute to their communities, leading to a loss of productivity and income.

Muscle, bone, joint and nearby connective tissue dysfunction results in temporary and sometimes, permanent limitations, and reduces function and mobility. These are attributable to approximately 150 different diseases and conditions in the form of musculoskeletal impairments. Musculoskeletal conditions are frequently defined by pain which is frequently persistent as well as restrictions in mobility and dexterity.[5] Such cases make it harder for people to work and engage in social activities and may sometimes result in disabilities. The main cause of musculoskeletal diseases on the continent is road accidents.

The primary inadequacy of Africa's trauma healthcare system includes pre-hospital delays in bone fracture repair, challenges in fixing broken bones and tissues using metal screws, pins, rods, or plates to hold the bone in position, and delays in treatment. This is principally caused by delays in the deployment of medical equipment to treat trauma injuries.[6] Early treatment of orthopaedic trauma can significantly reduce recovery time and further save the patient from temporary or permanent disability by avoiding further injury.

To enhance orthopaedic trauma care in Africa, the African Union High-Level Panel on Emerging Technologies (APET) is calling upon African countries' health sector to adopt 3D printing technology in treating orthopaedic trauma cases. 3D printing, sometimes referred to as additive manufacturing, is a process of making customised three-dimensional solid objects from a digital file.[7] Additive processes are used to create 3D-printed objects, where layers of material are added until the object is fully formed. These layers can be viewed as cross-sections of the object, produced sequentially.

3D printing technology is frequently employed in the medical field to produce customised medical tools such as haemostats, tweezers, clamps, Tibial Plateau elevators, AK Fracture Reducer, Bacastow, and retractors, which are commonly used in treating orthopaedic trauma injuries.[8] One of the significant benefits of 3D printing is the ease with which precise design modifications can be made based on surgeon feedback. These enhance the surgeon's understanding of the patient's anatomical features, including normal and traumatised bones and soft tissues, making preoperative planning more precise. The use of 3D printing technology is particularly useful for addressing supply chain issues and fulfilling the increasing demand for quickly produced medical tools.[9]

APET recognises that the use of 3D printing technology can provide millions of African people with access to corrective surgery and treatment for accident-related medical conditions, thereby changing their lives for the better. However, APET emphasises that for 3D printing to be successful in Africa, there should be a variation of infrastructure and manpower across units.

Blog #7 Published on Mar 22, 2023

The installation of industrial-grade machines, dedicated software, and the employment of trained personnel can enhance the capacity and reliability of 3D fracture treatment. The establishment of interdisciplinary 3D printing departments, with sound financial and management structures, can improve sustainability.

APET encourages African countries' health sector to deploy 3D printing technology in treating orthopaedic trauma cases as an innovative step towards improving healthcare delivery. This technology can provide faster and more affordable access to customised prosthetic limbs, implants, and orthotics. Additionally, the adoption of 3D technology can yield surgical guides that enhance precision, minimise complications, and reduce recovery time.

It is recommended that African governments should collaborate with private sector stakeholders to invest in 3D printing technology and establish specialised centres to train medical personnel and promote research and development. It is equally imperative that regulatory bodies develop quality assurance and certification standards to ensure the safety and efficacy of the products produced. Deploying 3D printing technology in the health sector can significantly contribute to achieving universal healthcare coverage while also addressing the shortage of healthcare professionals, particularly in rural areas. Furthermore, APET recommends that policymakers in Africa should prioritise the prevention and treatment of orthopaedic trauma injuries to mitigate the possibility of the working-class population experiencing long-term effects that could impede economic progress and hinder development efforts.

Finally, APET recommends that African countries align their 3D printing technology efforts and advances in healthcare with the aspirations of the African Union's Agenda 2063, Science, Technology, and Innovation Strategy for Africa (STISA)-2024, and United Nations' Sustainable Development Goals (SDGs).[10] This could involve establishing specialised centres for training medical personnel and promoting research and development, investing in 3D printing technology, developing quality assurance and certification standards, and creation of interdisciplinary 3D printing departments and businesses with sound financial and management structures. The deployment of 3D printing technology can address supply chain issues, improve surgical precision, reduce the risk of complications, shorten recovery time, and increase access to customised prosthetic limbs, implants, and orthotics. Prioritising the prevention and treatment of orthopaedic trauma injuries can result in a healthy workforce, thereby, positively impacting the economy and contributing to Africa's socio-economic development and growth.

Link: https://www.nepad.org/blog/utilising-3d-printing-technology-strengthen-orthopaedic-care-africa

Leaving No Child Behind: Improving School Feeding Programmes To Enhance Primary School Education Enrolment In Africa

Education is an essential human right that is protected and promoted by several key African Union frameworks on the continent. These frameworks include the African Charter on Human and Peoples' Rights, which establishes the right to education as a fundamental human right. Additionally, the African Charter on the Rights and Welfare of the Child (1990) provides a broader and more comprehensive right to education for children than the African Charter on Human and Peoples' Rights. Furthermore, the Protocol to the African Charter on Human and Peoples' Rights on the Rights of Women in Africa (2003) is another crucial framework that seeks to eliminate discrimination against women and safeguard their right to education as outlined in international declarations and conventions. Additionally, the African Youth Charter (2006) is the first legal framework in Africa that supports national policies, programmes, and initiatives aimed at promoting youth development.[1]

Since the adoption of the African Charter on Human and Peoples' Rights (ACHPR) by the African Union in 1981, and its implementation in 1986, there has been a significant increase in primary education enrolment rates in Africa. For example, the gross enrolment ratio in primary education in sub-Saharan Africa expanded from 58% in 2000 to 79% in 2019. This increase is attributable to the efforts made by African governments to implement and provide free and compulsory primary education for all children. Furthermore, the adult literacy rate in sub-Saharan Africa increased from 60% in 2000 to 65% in 2018.[2]

Since the adoption of the ACHPR, several African governments have demonstrated their commitment to education by increasing their budgets for the education sector. For example, in Ghana, government spending on education expanded from 1.7% of the GDP in 1990 to 4.9% in 2017,while Uganda has increased its spending from 2.5% of the GDP in 2000 to 4.5% in 2017. Additionally, the ACHPR has provided African countries with legal mechanisms to promote the right to education on the continent. For instance, in the case of SERAP v. Nigeria, the African Commission on Human and Peoples' Rights found that Nigeria violated the right to education under the ACHPR by failing to provide adequate funding for public education. This decision has since had a significant impact on the Nigerian government's education policy and funding decisions.[3] On the other hand, the African Charter on the Rights and Welfare of the Child (ACRWC), was adopted as a legal instrument to promote and protect the rights and welfare of children in Africa. Its implementation has had a significant impact on children's lives in Africa, with several countries using it to guide their policies and practices relating to children. For example, the ACRWC has increased the awareness of children's rights and the need to protect them. Consequently, the ACRWC's adoption has enhanced the number of African countries to enact legislation to protect children's rights. In 2002, only 11 out of 53 African countries had a comprehensive child protection law, but by 2013, this had expanded to 44 African countries. This represents a significant improvement in protecting children from abuse, neglect, exploitation, and violence.[4]

Additionally, the ACRWC is playing a pivotal role in safeguarding children against child labour, and child marriage, while also promoting access to education. This is evidenced by the growing number of African countries that have developed policies and programmes to address these challenges. Notably, there has been a significant reduction in the percentage of children aged 5-14 years involved in child labour in Africa, from 32% in 2000 to 19% in 2020.[5] Nevertheless, despite the progress made in expanding enrolment rates, there are still disparities and inefficiencies in this crucial area. Despite improvements in enrolment rates, attendance and completion rates have remained relatively low. Several factors contribute to this limited progress, including health and nutrition issues, concerns about protection, limited financial resources for families and African governments, and the need for many children to work to support themselves and their families, even if they are enrolled in school.

Childhood malnutrition caused by hunger is one major factor that has a long-lasting and cyclical effect on learning. It can result in lower productivity and limited employment opportunities in adulthood. Undernutrition can also have serious consequences for academic performance and learning, leading to poor learning outcomes. Poverty exacerbates this challenge of food and nutrition insecurity among children, as many families struggle to provide their children with the necessary nutrition to enable them to succeed in school. Consequently, students from impoverished backgrounds may find it difficult to break the cycle of poverty due to limited earning potential.[6] In addition, hunger tends to have negative emotional and social impact, thereby, leading to low ability to learn and retain knowledge, as well as feelings of embarrassment and difficulty interacting with classmates.[7]

The African Union High-Level Panel on Emerging Technologies (APET) acknowledges the importance of food and nutrition security among children. APET, therefore, calls on African governments to enhance their school feeding programmes, which has potential to yield significant benefits such as improved education outcomes and reduced food insecurity among children. To achieve this, African countries can develop a comprehensive policy framework that outlines the goals, objectives, and strategies of the school feeding programmes at the national level. This framework should also identify the target beneficiaries, funding sources, and monitoring and evaluation mechanisms.

APET Further encourages African governments to mobilise resources from multiple sources, including national budgets, donor support, and private-sector partnerships to fund school feeding programmes. Investing in these programmes can yield significant long-term benefits, including improved health, nutrition, and education outcomes. Additionally, African countries should promote community involvement, as the ownership it generates is critical to the success of school feeding programmes. This entails engaging parents, community leaders, and civil society organisations in the planning, implementation, and monitoring of the programmes. By doing so, the community is empowered to take ownership of the initiative and ensure its sustainability. Therefore, to ensure the programme's sustainability, African governments should invest in local food production and processing to ensure a stable supply of nutritious food as part of the supply chain of the school feeding programme. This also includes prioritising the development of local markets to promote food security and economic growth. This can be supported by establishing a robust monitoring and evaluation system to track the progress and impact of the school feeding programmes. The system should measure the programme's effectiveness in improving education outcomes, reducing malnutrition, and increasing school attendance.[8]

APET notes that the main goal of the School Nutrition Programme in African countries is to enhance students' learning capacity by addressing short-term hunger, promoting regular attendance, and addressing micronutrient deficiencies.

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Several African countries have implemented this programme with notable success, such as South Africa, where nine million children receive free meals, Cape Verde, which benefits five hundred thousand children, and Ghana, which has one million and five hundred thousand students benefiting from the initiative. Emerging technologies can significantly improve the effectiveness of school feeding programmes in African countries. APET observes that African countries can leverage emerging technologies to enhance their school feeding programmes by using mobile and digital systems, developing e-learning tools, promoting precision agriculture, and utilising blockchain technology. African countries can utilise mobile technologies for monitoring and evaluation, specifically by using smartphones and tablets, to collect data on the programme's implementation and impact. This can help to monitor food distribution, identify bottlenecks, and track programme performance.[9]

Some African countries are already leveraging on emerging technologies for food and nutritional security and school feeding programmes. For example, the government of Rwanda has implemented a mobile-based system called Rapid SMS to collect data on food distribution and monitor the impact of its social protection programmes. The system is used by community health workers to track food deliveries and ensure that they reach their intended recipients. Similarly, the government of Malawi has used mobile phones to collect data on the implementation and impact of its fertiliser subsidy programme, with farmers receiving text messages to report on the availability of fertilisers and the impact on their yields.[10]

The Kenyan government, on the other hand, has utilised mobile technologies to monitor the distribution of cash transfers to vulnerable households. Beneficiaries receive their cash transfers through mobile money, and the government uses data from mobile money transactions to track the program's performance. In addition, the government of Nigeria has used mobile technologies to monitor the distribution of food aid to internally displaced persons (IDPs). Beneficiaries receive food vouchers on their mobile phones, which they can redeem at designated distribution centres. The government uses data from these transactions to track the distribution of food aid. Ghana has also used mobile technologies to monitor the implementation of its National Health Insurance Scheme (NHIS),with beneficiaries receiving their health insurance cards on their mobile phones, and the government using data from these transactions to track the programme's performance. [11]

African countries have the opportunity to improve the efficiency and transparency of school feeding programmes by implementing digital technologies. African countries are encouraged to deploy mobile money platforms and other digital payment systems to facilitate cash transfers and improve financial management. A good example is Kenya, which has already made great strides in mobile money adoption through its popular mobile money platform M-Pesa. The platform can be used to facilitate cash transfers to schools and vendors participating in school feeding programmes. Similarly, Nigeria has a large population and a growing mobile money ecosystem. The government could leverage digital payment platforms such as Paga or Interswitch to improve financial management and transparency in school feeding programmes.[12]

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Figure 1: M-Pesa – Kenya's mobile money platform

Ghana has already implemented a digital payment system for its National School Feeding Programme, which is aimed at improving the nutritional status of school children. The system uses mobile money and electronic vouchers to facilitate payments to vendors. Additionally, Uganda is also making progress in mobile money adoption. The government could leverage platforms such as MTN Mobile Money or Airtel Money to improve the efficiency and transparency of school feeding programmes. Tanzania has a well-established mobile money ecosystem, with platforms such as Tigo Pesa and Vodacom M-Pesa. These platforms could be used to facilitate cash transfers to schools and vendors participating in school feeding programmes.[13]

Figure 2: The digitisation of Ghana's National School Feeding Programme

African countries can also develop e-learning tools such as educational games and digital learning materials to enhance children's active learning capacity. African countries can also collaborate with technology companies and education stakeholders to develop e-learning tools that can align with the national curriculum. Furthermore, African countries should promote precision agriculture technologies, such as drones and sensors to increase food production capabilities and improve food nutritional quality.[14] These technologies can also support local farmers and promote sustainable agriculture practices. Additionally, African countries can utilise blockchain technology for supply chain management. Blockchain technology can enhance the transparency and efficiency of the supply chain for school feeding programmes. Fundamentally, African countries can utilise blockchain-enabled technologies to track food distribution, reduce waste, and improve accountability. Leveraging emerging technology for agriculture will ensure supply of food stuffs for school feeding programmes.

APET further recommends that African countries should effectively utilise emerging technologies to achieve sustainable school feeding programmes and promote proper nutrition for academic support. This includes increasing funding for technology-based school feeding programmes. African governments should increase their funding for technology-based school feeding programmes, including the development of mobile applications and online platforms that enable efficient management and monitoring of school feeding programmes. To accomplish this, African countries can leverage public-private partnerships to improve school feeding programmes and promote proper nutrition in schools. Private sector organisations can provide technical expertise and financial resources for technology-based solutions while the government provides the necessary regulatory framework and oversight.[15]

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African countries should also explore innovative solutions for food delivery, such as using drones to transport food to remote and hard-to-reach areas. This can significantly improve the distribution of food to schools, especially in areas where transportation is a challenge. Furthermore, African countries can promote digital literacy so to effectively utilise technology for school feeding programmes and nutrition. Therefore, it is essential to promote digital literacy among teachers, students, and other relevant stakeholders. This can be achieved through training programmes and workshops that equip individuals with the necessary digital skills to manage and monitor technology-based school feeding programmes.[16]

Finally, APET encourages African countries to integrate nutrition education into the school curriculum to promote healthy eating habits and raise awareness on the importance of proper nutrition. This can be achieved through interactive learning materials, including videos and mobile applications, that promote healthy eating habits and provide information on the nutritional value of different foods.

Link: https://nepad.org/blog/leaving-no-child-behind-improving-school-feeding-programmes-enhance-primary-school-education

Employing Emerging Technologies To Reduce The Impact Of Cyclones: The Case Of Mozambique And Malawi

The impact of climate change is posing a significant threat to Africa's ability to achieve the goals outlined in the African Union (AU) Agenda 2063.[1] The continent is experiencing a rise in temperature, heat waves, flooding, cyclones, droughts, and sea-level rise resulting in fatalities, displacement, and property damage. Unfortunately, despite having relatively low greenhouse gas emissions, Africa remains the most vulnerable continent to the effects of climate change. The Henley & Partners index assesses the effects of climate change on local communities and countries' abilities to adapt. The index reveals that the continent's average climate resilience score is 27, which is significantly lower compared to the rest of the world (see figure 1).
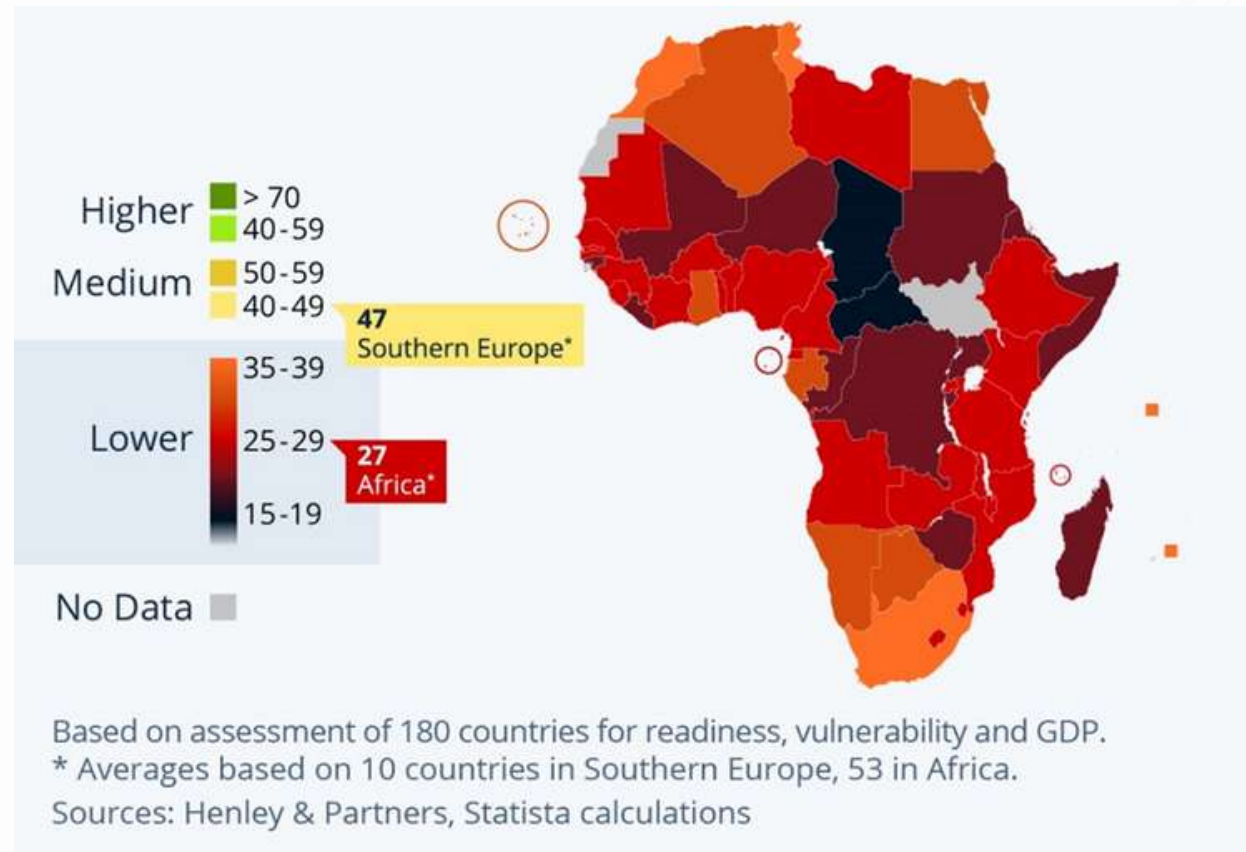
Figure 1: Index scores for climate resilience of African countries in 2022

The systemic risks posed by climate change to Africa's economies, infrastructure investments, water and food systems, public health, agriculture, and livelihoods could reverse the modest socio-economic development gains that the continent has made, leading to deeper poverty.

Agriculture and employment are key components of Africa's GDP, and the continent is heavily reliant on rain-fed agriculture. Furthermore, seven of the ten countries that are most vulnerable to climate change are in Africa, thereby exacerbating the

continent's vulnerability. Worth noting is that African countries such as Mozambique and Malawi have been ranked to be in first and third positions, respectively, on the climate change vulnerability index. As such, since 2000 Malawi and Mozambique have experienced the negative effects of climate change, including persistent droughts, floods, cyclones, landslides, heat waves, and unpredictable changes in weather patterns. Particularly, the frequent tropical cyclones are significantly threatening the lives and properties in Mozambique and Malawi.[2]

A case in point is Cyclone Anna, which hit Mozambique in January 2019, thereby, causing severe flooding and landslides, leading to the displacement of over 130,000 people and the deaths of at least 66 people. Just two months later, Cyclone Idai struck Mozambique, Malawi, and Zimbabwe, leading to over 1,300 fatalities and with significant damage to infrastructure. This was one of the most severe natural disasters ever recorded in Southern Africa, and it caused severe food insecurity in the region. In December 2019, Cyclone Gombe hit Mozambique, leading to the death of at least 13 people and the displacement of over 17,000 people. The most recent cyclone, Cyclone Freddy, hit Mozambique in February 2021, causing severe flooding, and leading to the death of at least six people.[3]

These cyclones have had a profound financial impact on the agricultural sector, among others, which is critical for the economic development of both Mozambique and Malawi. The recent cyclones have caused widespread crop damage, resulting in reduced yields and increased food insecurity. For example, in Malawi, Cyclone Idai caused an estimated US$97 million in damage to agriculture, while Cyclone Gombe caused an estimated US$17 million in damage. In Mozambique, Cyclone Idai caused an estimated US$773 million in damage to infrastructure and agriculture, and Cyclone Gombe caused an estimated US$54 million in damage.[4]

These cyclones have also posed a significant threat to the socioeconomic development of these countries. In addition to the financial impact on agriculture, cyclones have caused damage to critical infrastructure such as roads, bridges, and buildings, thereby hindering economic growth and development. Cyclones have also led to displacement, increased vulnerability to disease outbreaks, and disruption of education and healthcare services.[5]

Climate change has been linked to the recent cyclones in Mozambique and Malawi. As the Earth's climate continues to warm, sea surface temperatures are also rising. This increase in temperature provides more energy for cyclones to form and intensify. For example, Cyclone Idai formed in the warm waters of the Mozambique Channel, which had surface temperatures well above average at the time. Furthermore, climate change is causing changes in atmospheric circulation patterns, which can affect the formation and trajectory of cyclones. In the case of Cyclone Idai, scientists believe that the changes in the jet stream, a fast-moving band of air in the upper atmosphere, caused the storm to stall over Mozambique, resulting in heavy rainfall and flooding.[6]

Sea level rise, which is also linked to climate change, can exacerbate the impact of cyclones by increasing the risk of storm surges and coastal flooding. Storm surges and coastal flooding can cause significant damage to coastal communities, as observed in Mozambique during Cyclone Idai. Additionally, climate change is causing an increase in the frequency and intensity of extreme weather events, such as cyclones, droughts, and floods. This means that even if the overall number of cyclones does not increase, the ones that do occur are likely to be more severe. This has been observed in the case of Cyclone Idai, which was one of the strongest cyclones ever recorded in the region.[7]

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Insufficient knowledge and awareness regarding the occurrence of cyclones have been identified as contributing factors that exacerbate casualties and property destruction in Mozambique and Malawi. An essential aspect of mitigating disaster risks is providing early warning. This can help reduce the financial and physical impact of hazardous incidents, such as natural disasters and prevent loss of life. Therefore, effective early warning systems should implemented to actively engage with communities and individuals vulnerable to various hazards, raise public awareness of the dangers, efficiently disseminate messages and alerts, sustain a consistent state of preparedness, and facilitate prompt action to be successful.[8] To meet these challenges, the African Union High-Level Panel on Emerging Technologies (APET) calls on African countries such as Mozambique and Malawi to leverage smart and advanced technologies to provide dependable early warning indicators to mitigate the threats of tropical cyclones. The ongoing digital transformation in African countries presents opportunities to enhance the management of disaster and climate risks. These emerging technologies include the usage of drones, blockchain and short message services (SMS).

APET realises that integrating a combination of communication tools, remote sensing, and databases oriented towards spatial and temporal aspects is crucial to developing systems that can alert people about impending cyclones. These new and innovative technologies are indispensable in conceptualising such systems. Some policymakers have argued that if people had been evacuated from hot spot areas promptly, some of these fatalities could have been avoided.[9] For instance, drones can speed up the search and rescue process by efficiently covering a large area. Drones can provide rescuers with valuable information about the best course of action during search and rescue operations. Additionally, drones are equipped with sensors that can detect heat, vibration, binary signals, and noise, making them highly effective in locating survivors buried beneath debris. These advantages make drones an essential tool for disaster response, as they can also take aerial pictures to help assess the situation on the ground.

The high mobile phone ownership rate in Malawi and Mozambique creates an opportunity to use technology to mitigate the effects of cyclones. One promising solution is the use of SMS messaging to warn people of the impending danger of cyclone-related storms. This method has the potential to reach many people quickly and effectively.[10]

It is, however, essential to note that without a well-designed alert system in place, even the most advanced technology may not be effective in saving lives during a disaster. Unfortunately, Malawi and Mozambique do not lack an SMS-based weather information and disaster alert system in place. Such a system would be crucial in alerting individuals to the danger and providing them with the necessary information to move away from disaster-prone areas.[11]

APET recognizes the potential of an SMS-based alert system to reach a broad section of the population with critical information quickly. For example, the system could provide information on the timing and expected impact of a cyclone, advice on what to do and where to go, and emergency contact numbers. By providing individuals with the right information, they can make informed decisions and take appropriate action to protect themselves and their families.[12]

The use of blockchain technology to predict and respond to cyclones is a relatively new concept, but it has already shown significant promise in several countries around the world. For example, in Bangladesh, a blockchain-based system called TARA (Transparent And Reliable Aid) was used to distribute aid to victims of a cyclone in 2019. The system used blockchain technology to track the distribution of aid and ensure that it reached those in need quickly and efficiently. This approach resulted in significant cost savings and helped to prevent fraud and corruption.[13]

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Similarly, in the Philippines, a blockchain-based system called AID Chain was used to distribute aid to victims of Typhoon Haiyan in 2013. The system allowed donors to track their contributions and ensure that they reached the intended recipients. The use of blockchain technology in this context helped to improve transparency, accountability, and trust among stakeholders.[14]

Blockchain technology has not only enhanced aid distribution but has also proven to be beneficial in improving rescue operations and disaster response. For example, in the aftermath of Hurricane Maria in Puerto Rico, a blockchain-based system called BitGive was used to track rescue operations and ensure that resources were deployed efficiently. As such, APET notes that the use of blockchain technology has demonstrated significant potential in disaster response and relief efforts in several countries around the world. The Panel notes that by improving transparency, accountability, and trust, blockchain technology can help to ensure that aid and resources reach those in need quickly and efficiently, ultimately saving lives and reducing the financial impact of natural disasters such as cyclones.[15]

Notably, African nations are progressively recognising the importance of embracing emerging technological opportunities to drive economic growth and development. However, APET notes that to take full advantage of these opportunities and encourage African governments to provide a regulatory environment that can support innovation and a supportive policy environment. For example, in 2016, Rwanda became the first country in the world to use drones to deliver medical supplies to remote areas. This innovative approach to healthcare delivery was made possible by a regulatory environment that allowed for the testing and deployment of new technologies. Additionally, the Rwandan government has implemented policies to promote the growth of the technology industry, such as tax breaks for startup companies and investments in technology infrastructure.[16]

Figure 2: Medical supplies delivered near Kabgayi Hospital in central Rwanda.

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Furthermore, Kenya has emerged as a leader in mobile money technology, with the successful launch of M-Pesa in 2007. However, the success of M-Pesa was only possible because of a regulatory environment that allowed for the testing and deployment of new payment technologies. The Kenyan government has also implemented policies to support the growth of the tech industry, such as the establishment of technology hubs and investments in broadband infrastructure.[17]

Therefore, APET realises that for African nations must have a regulatory environment that fosters innovation and a supportive policy environment to seize new technological opportunities. Thus, African governments should embrace technological innovation and create a supportive environment for the technology industry to benefit the economic benefits of the digital age, drive job creation, and improve the livelihoods of their citizens. APET identifies that the emergence of new technologies presents opportunities to improve disaster risk management and reduce the impact of cyclones on the continent. However, to leverage these opportunities, it is essential that African governments prioritise expanding internet access to remote and disaster-prone areas, as it will enable individuals to receive timely warnings and information during a crisis. Furthermore, African policymakers should encourage the use of connected devices such as smartphones and sensors to improve disaster risk management by providing real-time data on weather conditions and help to monitor the impacts of cyclones. Thus, APET encourages African governments to invest in cloud computing and artificial intelligence technologies to improve risk analysis and enable faster and more accurate responses during disasters. By doing so, African countries can improve disaster risk management and reduce the impact of cyclones on the continent by leveraging emerging technologies.

Link: https://nepad.org/blog/employing-emerging-technologies-reduce-impact-of-cyclones-case-of-mozambique-and-malawi

Strengthening Africa's Intellectual Property Capacity To Enhance Innovation And Commercialisation

The global economy is increasingly being driven by knowledge, innovation, and technology, with IPR protections playing a critical role in fostering inventions.[1] Africa has witnessed the transformative impact of Science, Technology, and Innovation (STI) within the e-commerce space, with mobile payment systems like M-PESA redefining the way business is conducted.[2] Additionally, the use of drones to transport medical supplies and vaccines to remote areas is has brought innovative solutions to address health challenges that have beset African countries for decades.[3] Research and development in the fields of renewable energy, biotechnology, and artificial intelligence are also seen as key drivers of economic growth and development.[4] The benefits of these innovations cannot be fully realised without the protection and recognition provided by Intellectual Property Rights (IPR).

IPR provides protection and recognition to innovators and creators, giving them exclusive rights to control and value their inventions. This recognition and safeguard incentivise innovators to continue to create and thereby encourage more innovation in a range of fields. Fostering a robust environment that supports the creation, protection, administration, and enforcement of IPR can catapult African countries into the forefront of the global economy. In addition, the private sector can thrive, thereby enhancing competition and promoting innovation.

A Nigerian scientist, Dr Samuel Achilefu, for example, developed a pair of high-tech goggles that can help surgeons identify cancerous tissues during surgery (see Figure 1). His work was recognised with a prestigious award for African innovators, the Africa Prize for Engineering Innovation, which gives him exclusive rights to his invention.[5]

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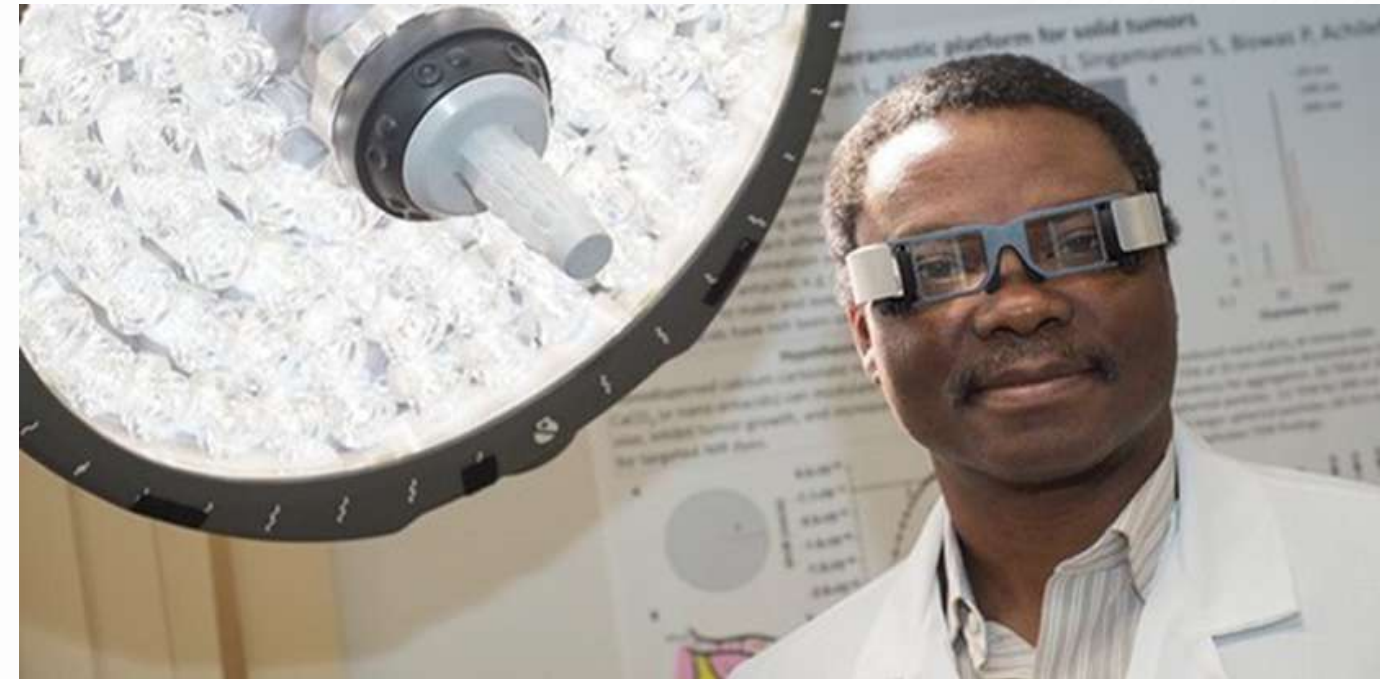
Figure 1: Dr Samuel Achilefu wearing the cancer goggles for surgery

Another example is seen in South Africa, where a company called Lumkani developed a low-cost fire detection system that uses heat detection instead of smoke detection to prevent loss of life and property in informal settlements (see Figure 2). The company was able to secure patents for its innovation, which provided them with exclusive rights to the technology.[6]

Figure 2: Lumkani's fire detection system

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Scientific and technological research, development, and innovation (RDI) are critical enablers of Africa's social and economic transformation, and IPR plays a crucial role in obtaining value from these innovations. The recognition and protection of IPR create a conducive environment for innovation and enhance the private sector's competitiveness in promoting sustainable economic growth and development in Africa.[7]

The African Union recognises the importance of IPR protection in promoting innovation and development on the continent. The Continental Strategy on Geographical Indications (2017) is one of the IPR instruments developed by the African Union (AU) to promote long-term rural development and food security.[8] This is accomplished by recognising geographic indications as a tool for enhancing the value of products from specific regions. For example, Ethiopia's famous coffee is protected by a GI that ensures the unique taste and quality of the product, while also providing a source of income for local farmers.

The African Model Legislation for the Protection of the Rights of Local Communities and Breeders and Regulations of Access to Biological Resources (2000) is another important IPR instrument that aims to protect Africa's common biological diversity and the livelihood systems that depend on it.[9] The legislation provides a framework for regulating access to and benefit-sharing from genetic resources, such as traditional medicine and agricultural products. For instance, the traditional use of Rooibos tea by indigenous communities in South Africa is protected under this legislation, which ensures that the benefits derived from its commercialisation are shared with the local communities.[10] By creating these IPR instruments, the African Union is taking proactive steps to promote innovation and development on the continent while protecting the rights and indigenous knowledge of its citizens.[11]

Leveraging Intellectual Property Rights protections is a powerful way for Africans to create, sell, and secure income from their cutting-edge goods and services. For example, African countries can use patents to protect their innovative technology and pharmaceutical products, trademarks to differentiate and promote their brands, and copyrights to safeguard their creative works such as music, artwork, and films. By registering and enforcing these IPRs, African businesses can gain a competitive advantage in both domestic and international markets, thereby attracting investment and generating income. A Nigerian company, SecureID, for instance, has built a successful business by innovating and patenting smart card technology for identity and payment applications.[12] Similarly, a Kenyan-based technology firm, BRCK, has leveraged its patented technology for portable internet connectivity devices to secure partnerships with global companies such as Microsoft and IBM.[13]

Furthermore, African countries can also use geographical indications (GIs) to promote and protect unique products that are associated with specific regions or areas, such as Rwandan coffee or South African rooibos tea. This not only adds value to the products but also helps to preserve local tradition and culture. Therefore, by effectively utilising IPRs, African countries and businesses can promote innovation, secure economic benefits, and improve their negotiating position in global markets.

Intellectual property rights are also crucial for converting knowledge into commercial assets. With IPR protection, businesses and innovators can invest in innovation without fear of losing their investment or having their ideas stolen. This security encourages investment and drives economic growth. One example of this is the pharmaceutical industry, which invests heavily in research and development to discover new drugs. The industry relies on patents to protect its investment and secure its exclusive rights to produce and sell drugs, allowing them to recoup investment and earn profits.

Despite the importance of the IPR, Africa is still lagging behind in the number of patents filed on the continent (see Figure 3 below). Shockingly, in 2020, Africa only accounted for 0.5% of the patent application, while Asia had an overwhelming 66.6%, North America 19%, and Europe 10.9%.[14]
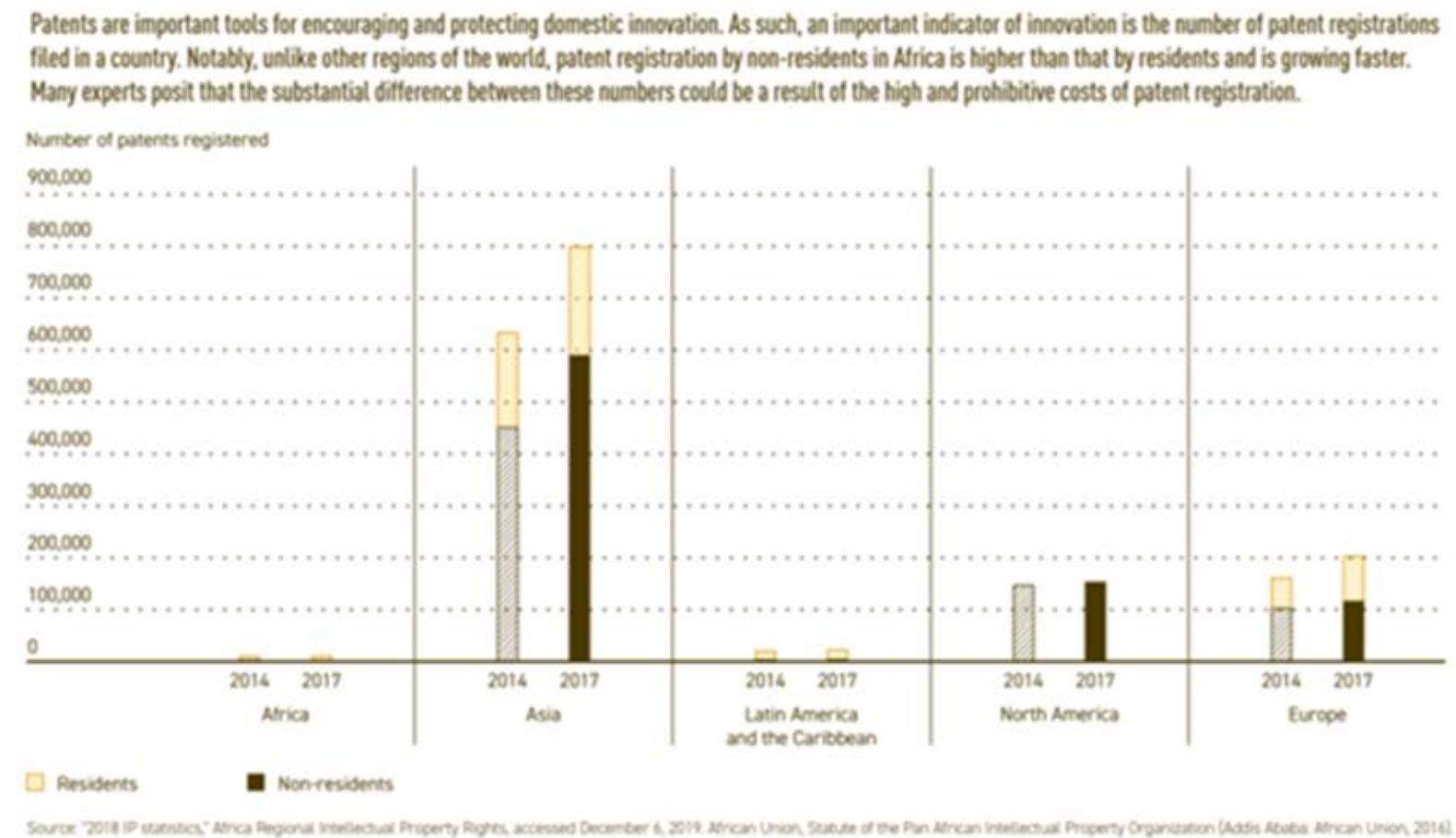
Figure 3: Number of registered patents by region

This significant disparity between Africa and other regions can be attributed to several factors, including a lack of awareness about the importance of IPR, weak legal frameworks for IPR protection, and limited financial resources for research and development.[15]

There are, however, some encouraging examples of African countries taking steps to increase their patent applications and protect their intellectual property. For instance, South Africa has established a national IP policy, which seeks to enhance the country's innovation ecosystem and increase the number of patent filings. Similarly, Kenya has developed a national IP strategy that aims to increase awareness of IPR and improve IP protection and enforcement. These efforts are essential for Africa to become a more significant player in the global economy and to drive its social and economic transformation through innovation.

According to the African Union High-Level Panel on Emerging Technologies (APET), the absence of a comprehensive national policy on intellectual property is a significant challenge to Africa's innovation and its impact on development. This hinders progress in other areas of other evolving initiatives. APET also notes that the low number of domestic applications for various intellectual property rights reflects limited local innovation. The lack of awareness of relevant rights or inadequate financial resources to pay for patent registration fees could sometimes impede domestic applications for various intellectual property rights.

Additionally, poor record-keeping procedures and inadequate technical infrastructure at intellectual property registries are among the other factors that could impact the growth of intellectual property rights on the continent. Improving the IPR regime in African countries is, therefore, critical in bolstering and fostering innovation and promoting economic growth.

APET emphasises that improving the IPR regime in African countries is critical to fostering innovation and promoting economic growth. One of the key strategies proposed by the Panel is to encourage public-private partnerships. These partnerships can create an environment that fosters collaboration between innovators and private sector players to develop new technologies and bring them to market. For instance, African governments can partner with the private sector to provide funding, technical assistance, and other resources to help entrepreneurs develop their innovations. This collaboration can also extend to financial institutions, as governments can work with banks to offer loans to business owners who pledge intellectual property as security. By doing this, innovators can access the funding they need to bring their ideas to market and grow their businesses.

In addition, the Panel encourages African policymakers to facilitate closer collaboration between universities and entrepreneurs. African governments can strengthen the incentives provided to universities and research institutions to launch new businesses, reward employees, and simplify university IP ownership policies. Additionally, policymakers can make it easier for academics and researchers with an entrepreneurial spirit to establish spin-off companies. Such collaboration will enable academic research to be translated into practical applications, thus fostering economic growth and development. By providing such incentives, governments can encourage the development and commercialisation of innovative products and services. This, in turn, can lead to job creation, increased competitiveness, and ultimately contribute to the growth of the economy.

The Panel is committed to promoting innovation and entrepreneurship across Africa and encourages African governments to provide incentives to innovators and companies to generate Intellectual Property (IP). Furthermore, improving record-keeping procedures and investing in technical infrastructure at intellectual property registries is also critical to improving the IPR regime in Africa. This will ensure that innovators have access to the resources they need to protect their intellectual property and that investors have a reliable and transparent system for investing in new technologies.

The panel urges African countries to speed up the processes in obtaining IP patents and provide a tax break for new patents. This will encourage inventors and companies to obtain patents quickly, thereby safeguarding their innovations and facilitating their commercialisation. A tax break for new patents will further incentivise innovators and companies to develop and commercialise innovative products and services, thereby contributing to economic growth and development. This is because APET believes that providing incentives for innovators and companies to generate Intellectual Property, developing better IP regulation guidelines, encouraging collaboration between universities and entrepreneurship, and speeding up IP patent processes are crucial steps in promoting innovation and entrepreneurship across Africa.

Moreover, to create global models, procedures, and best practices for IP valuation, African countries should develop better IP laws, and regulatory guidelines in line with international standards. Governments can collaborate with one another or with international organisations such as the World Intellectual Property Organization (WIPO) to achieve this. The establishment of such guidelines will provide a clearer legal framework for IP management, which will help to promote

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innovation and entrepreneurship across the continent.

In conclusion, APET notes that IPR can effectively promote socio-economic development through innovation. This will, however, require collaboration between policymakers, researchers, and industry stakeholders to create a legal framework that supports and protects innovative ideas and products. Furthermore, it is essential to build capacity and raise awareness among entrepreneurs, researchers, and policymakers about the importance of IPR. This includes training programs and workshops on IP management and licensing, as well as promoting IP education and literacy in schools and universities. APET affirms that by enhancing IPR on the African continent, countries can unlock the potential for innovation, creativity, jobs and economic growth.

Link: https://www.nepad.org/blog/strengthening-africas-intellectual-property-capacity-enhance-innovation-and-commercialisation

Safeguarding Africa's Water Resources By Leveraging Smart Water Meters Technology

Water is essential for human survival, and access to clean and safe drinking water is a fundamental human right. Unfortunately, Africa is facing a shortage of clean drinking water, which is only becoming more severe with time. Water scarcity is a growing problem that refers to the lack of access to sufficient water resources.[1] The United Nations has reported that water affects more than 2 billion people globally, and the number is expected to increase in the coming years. In Africa, the water scarcity issue is particularly severe, with up to 230 million Africans predicted to face water scarcity by 2025. Additionally, up to 460 million people are expected to reside in water-stressed areas, as the continent's population increases, and climate change continues to deplete the continent's finite resources. The impact of water scarcity can be devastating, affecting agriculture, health, and other essential aspects of life.

The African Union Agenda 2063 recognises the importance of water sustainability as the top priority for the continent's socio-economic development and growth.[2] The AU's agenda emphasises the equitable and sustainable use, and management of water resources for socioeconomic growth, regional collaboration, and a better living environment.[3] The goal is to develop solutions that ensure that clean and safe drinking water is available to all Africans. The African Union's recognition of water as a means of attaining a better and habitable environment is critical to solving the water scarcity problem. The equitable and sustainable use and management of water resources are essential for ensuring that everyone has access to safe and clean drinking water. It is also vital for sustainable socio-economic development and regional cooperation.

There are two forms of water scarcity being experienced in Africa, physical and economic scarcity. Physical water scarcity is caused by climate change and includes phenomena like droughts and changes in weather patterns. Conversely, economic water scarcity arises due to institutional inadequacies such as insufficient planning, investment, and infrastructure.[4] Of these two forms, economic water scarcity is the more pressing concern as it is largely due to a lack of empathy. This type of water scarcity occurs when a population does not have the financial means to access sufficient water supplies. Poverty poses a significant barrier to access to water in Africa.

In most African countries, clean and safe water is delivered through piped water sources. This method of water delivery is preferred because it requires less time and physical effort to collect water, allowing individuals to be more productive in other areas of life. Additionally, piped water sources result in lower healthcare costs as

individuals are less likely to get sick and incur medical expenses. Access to piped water sources can also lead to better health outcomes, which can, in turn, improve school attendance rates, especially for children who are particularly vulnerable to water-related diseases. Ultimately, the availability of piped water sources can have long-term positive effects on the lives of individuals and communities, particularly in areas with limited resources.

Despite the crucial role piped water plays in ensuring access to clean and safe water, over two-thirds of the African population lacks such access. The main reason behind this is the lack of adequate infrastructure with only 56% of urban residents in Africa having access to clean piped water. Outdated and insufficient water infrastructure leads to wastage of water, which limits its availability to communities, especially in areas where water shortage is common.[5] Most of the water wastage in urban areas is due to leakages from water pipes, geysers, and unregulated outdoor watering. The main challenge in water distribution is addressing these leakages, which result in low water pressure, erratic and insufficient water supply, as well as poor water service for customers.[6] Furthermore, leaks can lead to an increase in water bills and damage to housing infrastructure, besides contributing to the erratic water supply.

The African Union High-Level Panel on Emerging Technologies (APET) urges African countries to adopt smart water meters as part of their efforts to accelerate the adoption of emerging technologies. Smart water metres are devices that monitor and transmit water usage data from customers to suppliers, thereby improving water management and billing accuracy. Equipped with an electronic computing unit (ECU), these meters enable easier communication between customers and suppliers.

Smart water metres, enabled by the Internet of Things (IoT), provide users with the ability to monitor and track their water usage accurately and pay accordingly. This technology helps to reduce overall water distribution network losses by allowing utilities to monitor and control water demand more effectively. By managing demand, utility companies can use available water supplies more efficiently and predict when their supplies will run low, thereby allowing appropriate planning. This approach helps to ensure that everyone has access to sufficient and safe drinking water. Additionally, IoT smart meters can detect water wastage by identifying any damage to water pipes or lines. By using sensors to detect water leaks, these smart meters help water utility companies to minimise wastage quickly and remotely by stopping the flow.

APET posits that one of the key advantages of smart water meter technology is its ability to detect leakages in water pipes promptly. By identifying and addressing leaks early, water contamination can be prevented, thereby ensuring that the water supplied remains safe for consumption. For instance, in the town of Shinyalu in Kenya, the implementation of smart water meters helped identify and repair leakages, thereby safeguarding the water quality and making it more readily available for the local community.

Smart water meters allow consumers to pay for the exact amount of water they use. These meters have also played a crucial role in reducing non-revenue water losses, which occur when water is lost before it reaches the consumers due to theft, leaks, or inaccurate billing. By accurately measuring water consumption and facilitating fair billing, utilities can collect sufficient revenue to invest in infrastructure upgrades. In Kenya, the Nairobi City Water & Sewerage Company (NCWSC) and Nakuru Water and Sanitation Services Company (NAWASSCO) have embraced smart water meters, resulting in improved billing, revenue collection, and reduced water waste from leaks.[7]

Figure 1: NCWSC meter reading service

Smart water meter technology has also significantly improved the efficiency of water utility companies in providing reliable water supply to consumers. By monitoring water usage and detecting leaks in real-time, utility companies can optimise their water distribution networks, reduce water wastage, and ensure a more reliable water supply. For example, the City of Cape Town in South Africa successfully implemented smart water metering systems during a severe drought, which helped conserve water by alerting consumers to their water usage patterns and encouraging responsible water consumption. As a result, the city was able to reduce its water consumption and avoid running out of water entirely.

APET observes that smart water meter technology is revolutionising water management across the African continent. By detecting leakages, preventing water contamination, improving revenue collection, and enhancing water supply, these innovative devices are transforming the way water is distributed and consumed. Case studies from Kenya and South Africa demonstrate the benefits of smart water meters, including improved billing accuracy, increased revenue, conservation efforts, and greater water sustainability. APET opines that as African countries continue to adopt and expand smart water metering systems, there will be improved water management, enhanced access to clean water, and a more sustainable future for African communities.

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In conclusion, the adoption of smart water meters in water management is a significant step towards improving access to clean water, especially for low-income households. This technology has the potential to help utilities reduce non-revenue water losses and improve billing and revenue collection. It also enables real-time water demand monitoring across the supply area, supporting preventive planning and water conservation efforts. As more African countries and utilities adopt this technology, it is expected that the challenges of water scarcity and management will be better addressed, leading to improved access to clean and safe water for everyone.

Link: https://www.nepad.org/blog/safeguarding-africas-water-resources-leveraging-smart-water-meters-technology

Combating School-Related Gender-Based Violence In Africa Using Digital Technologies

The African Union (AU) Agenda 2063 is a blueprint for the continent's development that prioritises gender equality. Among the AU Agenda 2063's seven aspirations, Aspiration 6 and Goal 17 are particularly focused on achieving complete gender equality to foster people-driven development in Africa. To this end, AU Agenda 2063 lists two major priority areas of empowerment of women and girls, which are ending gender-based violence (GBV) and discrimination against women and girls.[1] This is because GBV is a grave concern in Africa, disproportionately affecting women and girls. To this end, the AU is committed to ending GBV by raising awareness of its harmful effects, providing support to survivors, enacting laws that protect women and girls, and holding the perpetrators of GBV accountable. Furthermore, the AU is committed to eliminating discrimination by facilitating equal access to education, healthcare, and employment for women and girls, promoting their involvement in decision-making processes, and changing social norms that perpetuate discrimination against women and girls.[2]

Despite advances in decision-making and interventions, however, African women and girls still face the persistent challenges of GBV and discrimination. One of the most common forms of GBV is School-Related Gender-Based Violence (SRGBV). SRGBV encompasses sexual, physical, and/or psychological assaults or threats that take place in or near schools and are motivated by gender stereotypes and norms that are upheld by unequal power dynamics[3]. Despite schools being recognised as sites of personal development, learning, and empowerment, these places of learning tend to perpetuate forms of violence and prejudice, particularly with a bias against girls. SRGBV is a fundamental violation of human rights, especially those of young women and children, and acts as a significant barrier to achieving gender parity, inclusive education, and participation in learning.[4]

Alarming statistics reveal that between 46% and 78% of adolescent girls in African schools have experienced some form of SRGBV.[5] Unfortunately, SRGBV has very serious negative effects on female students' life, such as grief or depression, low self-esteem, early and unwanted pregnancies, and sexually transmitted infections such as HIV/AIDS. Consequently, many female students turn to avoid schools, perform below their ability in their studies, or drop out entirely due to this violence which invariably influences the educational achievements of female students negatively.

Despite its prevalence and significant health implications, SRGBV remains under-reported as a societal challenge. Numerous factors contribute to this under-reporting, such as shame and stigma, financial obstacles, the idea that offenders would always get away with the offence or crime, a lack of awareness or access to existing interventions and

resources, cultural beliefs, the risk of losing children, and concern about getting the offender in trouble with the law. These are all obstacles to reporting or seeking help from formal interventions. Furthermore, many girls and young women also regard violence as routine or not serious enough to disclose, there is also fear of retaliation. Lastly, victims encounter prejudice and stereotypes when seeking help from legal and law enforcement settings.

Recognising the urgency in addressing the under-reporting and negative health consequences of SRGBV, the African Union High-Level Panel on Emerging Technologies (APET) identifies several essential solutions aimed at reducing SRGBV and increasing girls' educational outcomes. These interventions include, but not limited to the following: promotion of awareness campaigns and educational programmes that can enhance the understanding of SRGBV, its consequences, and available support services. Such initiatives can be implemented through school curricula, community workshops, and media campaigns to empower individuals to recognise and report incidents of violence. African countries can also enhance existing support systems for survivors of SRGBV by providing safe spaces, counselling services, and helplines. Furthermore, governments should advocate for comprehensive legal frameworks that specifically address SRGBV and ensure the protection of survivors. This includes establishing clear guidelines for reporting, investigation, and prosecution, as well as protection measures for survivors and witnesses.

Furthermore, there is a need to engage local communities, religious leaders, and traditional authorities in addressing SRGBV. By promoting community dialogue and challenging harmful cultural beliefs and norms, it becomes possible to create an environment that supports survivors and condemns violence. Additionally, the Ministries of Education should provide comprehensive training for teachers, school administrators, and law enforcement personnel on recognising and responding to SRGBV cases sensitively and effectively. This includes addressing biases, prejudices, and stereotypes that may hinder the reporting and support process. This can be accomplished by conducting comprehensive research and data collection on SRGBV to better understand the prevalence, causes, and consequences of such violence. This information can inform evidence-based interventions and policies. This can be undertaken by fostering partnerships between government agencies, civil society organisations, schools, and community groups to coordinate efforts and share resources in combating SRGBV.

Collaboration can also help amplify the impact of interventions and ensure a holistic approach. APET realises that these African-centred solutions can effectively address the under-reporting of SRGBV, dismantle barriers to reporting and seeking help, and create safer environments for women and girls in schools and communities.

Considering the alarming statistics on SRGBV, APET urges African countries to leverage digital technologies to promote women's voices and enhance intervention. The panel notes that digital technologies are offering various opportunities to address the under-reporting of SRGBV within African countries and create safer environments for young women and girls. For example, mobile applications provide a safe and confidential platform for reporting SRGBV incidents. These applications are also offering information on available support services, helplines, and legal resources. For instance, in South Africa, the "SafeNcitement" application allows students to report incidents of violence anonymously and provides access to counselling services.

While specific statistics on the impact of mobile apps in addressing SRGBV in African countries may vary, these technologies have the potential to improve reporting rates and connect survivors with available support services. An example is the "Speak Up" application in Kenya, which reported an increase in the number of reported cases of sexual violence following its launch. This indicates that such technologies can encourage reporting and access to services.
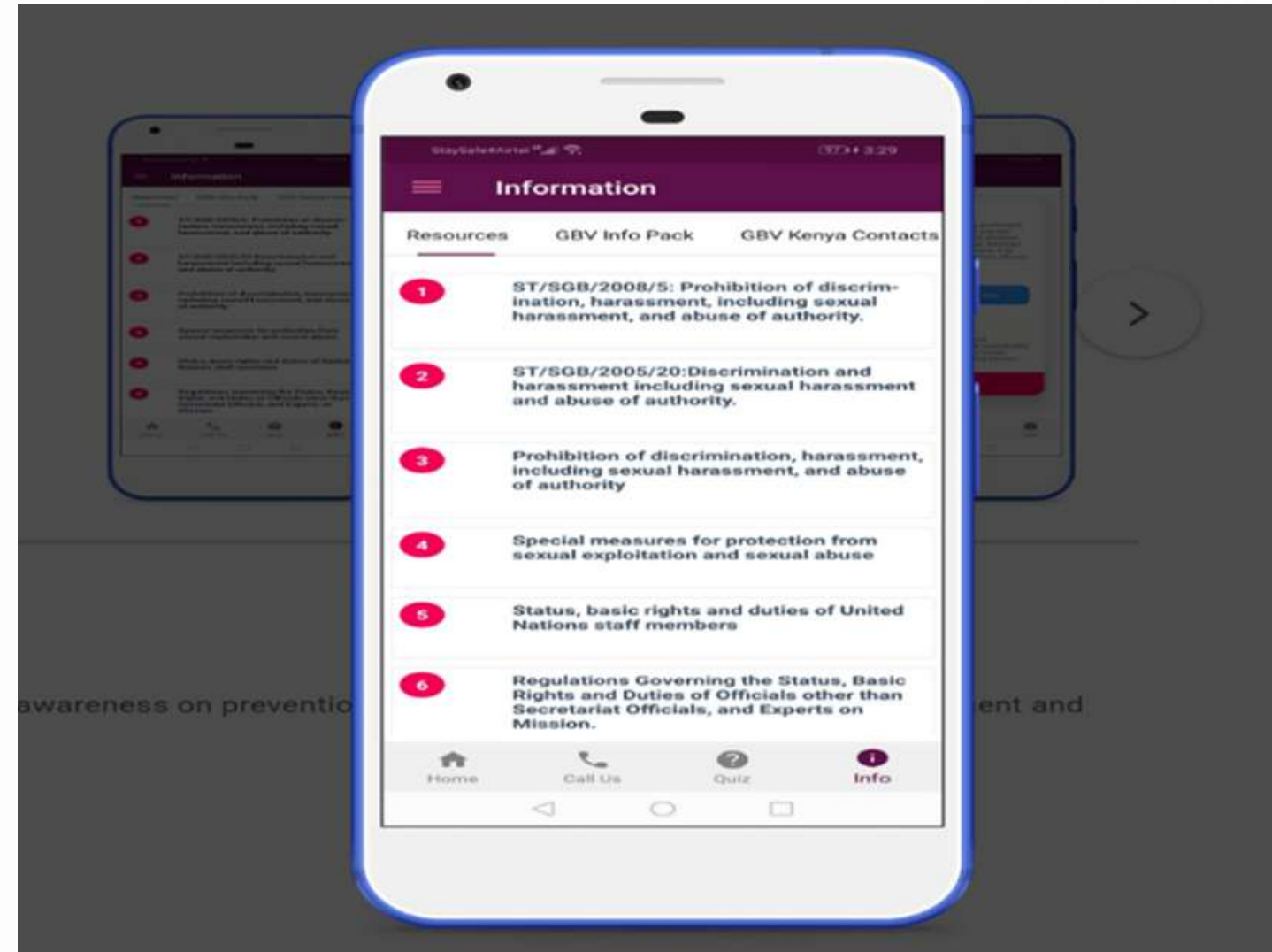
Figure 1: Kenya's Speak Up application [6]

APET recommends the development of web-based platforms to facilitate the reporting of SRGBV incidents, ensuring anonymity and providing information on available support services. These platforms can also generate data for analysis to inform evidence-based interventions. For example, the "Break the Silence" platform in Nigeria allows individuals to report cases of sexual violence and access support services, resulting in increased reporting rates. Another successful example is the "U-Report" platform in Uganda, which recorded over 120,000 reports of violence against children within a year of its launch, demonstrating the potential of technology in capturing and addressing such incidents.

The Geographic Information Systems (GIS) and data visualisation tools can be used to map SRGBV incidents, and further identify hotspots and trends. This can help governments and policymakers inform targeted interventions and resource allocation. For instance, mapping SRGBV incidents in schools and communities can assist in identifying areas that require additional support and interventions. The implementation of GIS and data visualisation technologies can provide valuable insights into the spatial distribution and patterns of SRGBV incidents. For example, in South Africa, the "Violence Against Women and Girls (VAWG) Heat Map" project utilised GIS technology to map incidents of violence, leading to improved coordination and response efforts in affected areas.

AI-powered chatbots and virtual assistants can also be employed to provide immediate and confidential support to survivors of SRGBV. These technologies can deliver information, guidance, and resources, ensuring accessibility and availability of support services, particularly in remote or underserved areas. Although specific statistics on the impact of chatbots and virtual assistants in addressing SRGBV in African countries may be limited, these technologies have demonstrated their potential in providing real-time support and information to survivors. For instance, the "Kakuma Virtual Assistant" deployed in a refugee camp in Kenya provided refugees, including survivors of violence, with information on available services and support.

APET observes that the impact and effectiveness of these technologies in addressing SRGBV in African countries may vary. However, these technologies have the potential to enhance reporting, support services, and data collection, ultimately contributing to the dismantling of barriers, creating safer environments, and empowering women and girls in schools and communities. For instance, the Nokaneng app in Lesotho has enabled pupils to view, read, or hear information about various forms of GBV, its effects, services offered in Lesotho, and laws protecting women and girls from violence. The virtual safe zone allows users to share their stories, offer support to other users, and connect with qualified counsellors for help[7].

Figure 2: Lesotho's Nokaneng application [8]

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In Nigeria the UNUSB application allows SRGBV victims to report cases more efficiently and effectively. The platform functions as a mobile and web application that links organisations working in the field with victims and survivors of sexual and gender-based violence in Nigeria. The app provides various forms of assistance, including counselling and legal support. To ensure timely support, the app utilises the user's location to recommend agencies close to the victim.[9] Apart from these digital technologies, African countries have also seen the proliferation of panic buttons and bracelets, which have similarly been developed to enable users to alert others when they are in unsafe situations.

It is, however, important to acknowledge that while digital technologies offer significant benefits, they also come with risks. Hence APET strongly condemns the use of digital technology for cyberbullying, cyber violence, and online harassment. The African continent has witnessed a surge in these incidents with the rapid expansion of the internet. The panel urges African countries to take decisive action by establishing comprehensive cybersecurity measures and implementing policy and regulatory frameworks that effectively combat online harassment.

In conclusion, APET encourages African countries to develop and implement policies that prioritise bridging the digital divide by promoting affordable internet access, improving digital literacy programmes, and ensuring equitable access to information and communication technology (ICT) resources. Implementing comprehensive strategies, such as integrating digital platforms into SRGBV prevention programmes, establishing online reporting mechanisms, and leveraging social media for awareness campaigns, can amplify efforts to address SRGBV and engage wider audiences. By addressing the digital divide and harnessing the potential of digital technologies, African policy and decision-makers can enhance the response to SRGBV and create safer school environments for girls and young women and improve their learning outcomes.

Link: https://www.nepad.org/blog/combating-school-related-gender-based-violence-africa-using-digital-technologies

Unlocking Africa's Potential Through Enhancing The Continent's Industrialisation Sector

The African Union Agenda 2063 recognises the significant role of a robust manufacturing sector in driving socio-economic growth and development in Africa. The emphasis on industrialisation has gained further momentum with the establishment of the African Continental Free Trade Area (AfCFTA), which aims to establish a unified market for goods and services across the continent, thereby, unlocking manufacturing potential and accelerating industrialisation to promote and fostering sustainable growth and employment opportunities in Africa.[1] Modern industries are enhancing both human and physical capital. They provide relatively well-paying jobs, particularly for undereducated but skilled individuals who may not have had access to formal employment in the public sector. Employment in the private sector leads to increased household income, and subsequently, driving domestic demand. Moreover, the growth of industries generates extensive backward and forward linkages, creating numerous opportunities for suppliers, distributors, retailers, and business services, thereby fostering a dynamic economic ecosystem.

Agenda 2063 recognises industrialisation as a crucial driver for achieving sustainable development, competitiveness, recovery, resilience, and inclusive prosperity in Africa.[2] It seeks to transform Africa's economies from primarily relying on the export of raw materials to value-added production, manufacturing and services. Therefore, by developing a robust industrial sector, the African Union aims to support Member States to create jobs, enhance productivity, increase incomes, and reduce poverty across the continent. Industrialisation would enable African countries to move up the value chain and capture a larger share of the economic benefits associated with processing their natural resources. By processing raw materials within the African continent, higher value-added products can be generated, leading to increased export revenues, and reduced vulnerability to commodity price fluctuations.[3]

Furthermore, industrialisation can promote economic diversification, which is crucial for reducing dependence on a narrow range of commodities and building resilience to external shocks. By developing diverse industries, African countries can foster innovation, build local capacity, and create opportunities for entrepreneurship and small and medium-sized enterprises (SMEs). Unfortunately, Africa's manufacturing sector lags significantly behind other regions worldwide, with the lowest output per capita, highlighting a substantial gap in industrial development.

Africa's contribution to global manufacturing stands at a mere 1.9%, placing it at the bottom of the global value chain. This disparity is evident in the trade imbalance, where manufactured goods constitute a substantial portion of imports, accounting for 62% of total imports.[4] In contrast, manufactured products make up only 18.5% of overall exports between 2018 and 2020. The disparity in manufacturing output and trade imbalances highlights the urgent need for Africa to prioritise industrialisation and enhance its manufacturing capabilities to create a more balanced and sustainable economic landscape.

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The low level of industrialisation in Africa can be attributed to various factors, including unfavourable policies such as state-led import substitution, structural adjustment and investment climate reforms implemented by many African countries in the late 1980s and early 1990s.[5] These policies hindered the growth of the manufacturing sector and industrial development. Additionally, political instability and conflicts prevalent in several African countries have also discouraged investors from committing their resources to the continent, further impeding industrialisation efforts. African countries have also faced criticism for its overreliance on exporting raw materials and importing consumer goods and services, stifling the growth of the manufacturing sector and industries.

This dependency on raw materials has prevented the development of value-added products and hindered the establishment of a robust manufacturing base in African countries. Examples of specific countries affected by these challenges include Nigeria, which heavily relies on oil exports, and the Democratic Republic of Congo, where conflicts have hampered economic progress and industrialisation efforts.[6] Addressing these issues is crucial for promoting industrialisation and enabling sustainable economic growth across the continent.

The low level of industrialisation in Africa is evident in the continent's import-export dynamics. As of 2022, Africa's total imports reached a value of US$25 billion, surpassing the exported value of US$24 billion highlighting a trade imbalance where Africa leans towards being a net importer rather than an exporter. This disparity underscores the continent's heavy reliance on imported goods and services. One contributing factor is the preference among many Africans for products manufactured outside the continent, to be of higher quality compared to locally produced African goods. This preference for imported products further exacerbates the trade imbalance and underscores the urgent need for Africa to strengthen its industrial base, enhance domestic manufacturing capabilities, and promote the consumption of goods made in Africa to reduce dependence on imports and achieve a more balanced trade landscape.[7]

The African Union High-Level Panel on Emerging Technologies (APET) urges African countries to embrace a bold agenda driven by private sector investments in industrial transformation to unlock their full potential. APET recognises that by prioritising domestic manufacturing and embarking on a process of industrialisation centred around commodities, Africa can effectively support inclusive economic transformation while leveraging its resources and capitalising on global shifts in production structures. Therefore, to fully utilise Africa's prospects for industrialisation, it is crucial to establish strong forward and backward linkages within domestic, regional, and global value chains. Additionally, adding value to both soft and hard commodities as well as domestic products should be emphasised to enhance Africa's industrial capabilities and competitiveness in the global market. By adopting these strategies, African countries can seize the opportunities presented by industrialisation, foster economic growth, and promote sustainable development across the continent.

A viable approach for accelerating industrialisation in Africa through the adoption of Import Substitution Industrialisation (ISI). ISI is an economic policy that aims to reduce imported goods, and eventually replace them with domestically produced alternatives, fostering self-sufficiency in the manufacturing sector and stimulating domestic production.[8] APET asserts that ISI can safeguard and nurture newly established domestic industries, thereby, enabling them to thrive and effectively compete with imported goods. By leveraging Africa's natural resources and talents, and expanding employment opportunities, ISI has the potential to bolster the development of the continent's secondary and tertiary sectors, contributing to economic growth.

By embracing ISI and addressing these key factors, African countries can foster industrial development, strengthen their economies, and promote self-reliance in manufacturing.[9] To successfully implement Import Substitution Industrialisation (ISI) in Africa and enable local African products to compete effectively with

products from other continents, APET emphasises the critical role of harnessing new and emerging technologies in local manufacturing. Emerging technologies offer significant advantages, particularly in automating various time-consuming operations, making technology a valuable asset for businesses and industrialisation.

In the manufacturing sector, technology plays a vital role in ensuring quality and precision throughout the production process. By automating manufacturing processes, technologies address concerns of quality, allowing local products to match the standards of foreign products. This not only enhances the competitiveness of local industries but also promotes self-sufficiency and reduces dependence on imported goods.[10] By leveraging new and emerging technologies in manufacturing, Africa can enhance productivity, improve product quality, and establish a strong presence in both domestic and international markets, leading to sustainable industrial development and economic growth. Examples of such technological advancements can include the use of robotics, artificial intelligence, the Internet of Things (IoT), and data analytics to optimise production processes, enhance efficiency, and drive innovation within the manufacturing sector in Africa.

Several African countries have implemented Import Substitution Industrialisation (ISI) strategies to boost their local manufacturing sectors. These initiatives are encouraging citizens to prioritise the purchase of locally produced goods and services, thereby supporting domestic industries, and stimulating economic growth. [11] For example, in Malawi, the "Buy Malawi Strategy" was implemented to promote the consumption of locally made products. This strategy encourages citizens, businesses, and government entities to prioritise Malawian goods and services, fostering domestic manufacturing and job creation. On the other hand, in South Africa, the "Proudly South African" campaign is promoting the purchase of South African-made products, effectively boosting local industries, creates employment opportunities, and enhancing the competitiveness of domestic goods in the market.

Figure 1: Visuals from the Proudly South African campaign

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In Kenya, the "Buy Kenya to Build Kenya Strategy" encourages consumers to prioritise Kenyan-made products and services.[12] This strategy supports local industries, increases job opportunities, and fosters economic development within the country. Similarly, in Nigeria, the "Buy Naija and Promote Naira Campaign" urges Nigerians to buy locally produced goods and support Nigerian businesses. The initiative is boosting the manufacturing sector, reducing dependence on imports, and strengthening the Nigerian currency.[13]APET recognises that these strategies not only encourage citizens to buy local products but also incentivise the manufacturing industries to adopt new technologies and processes to ensure their products can compete with foreign counterparts.

By promoting the consumption of locally made goods, these initiatives create a market demand that drives investment in the local manufacturing sector, fosters innovation, and improves the quality and competitiveness of domestic products. As such, APET highlights the importance of a mindset change among African citizens to embrace and support local products.[14] By initiating awareness campaigns and promoting the benefits of buying locally manufactured goods, governments can encourage a shift in consumer preferences and behaviours, leading to increased support for domestic industries and further stimulating industrialisation.

In conclusion, African countries have a crucial opportunity to attract capital and foster higher value-added, export-oriented manufacturing sectors, which are essential for industrialisation and economic growth. African countries must create a conducive environment for intra-African trade, facilitate the growth of domestic industries, and build strong and resilient economies. African countries should actively promote policies and strategies that support the consumption of African-made products, investment in domestic industries, and the overall development of a robust manufacturing sector. To capitalise on this opportunity, it is recommended that African nations prioritise the domestication of the African Continental Free Trade Area (AfCFTA) agreement. This would enable Africa to strengthen its industrial base, reduce dependence on imports, and promote the growth of indigenous African industries. By doing so, African countries can unlock their full potential, drive sustainable industrialisation, and foster economic prosperity for their people.

Link: https://www.nepad.org/blog/unlocking-africas-potential-through-enhancing-continents-industrialisation-sector

Transforming Inter-African Trade Through Cryptocurrencies: A Future Possibility?

The impact of COVID-19 pandemic and the ongoing conflict between Russia and Ukraine have had a significant impact on trade and value chains in Africa. The pandemic, for instance, disrupted global supply chains, leading to shortages of goods and rising prices. This has had a direct negative effect on trade in Africa, as many countries rely on imports for essential goods. The war between Russia and Ukraine has resulted in a sharp increase in the prices of energy and food, which are two of Africa's most important imports. Additionally, the decline in tourism, a significant source of income for many African countries, further compounded the economic challenges. This has put a strain on the budgets of many African countries and has further complicated their capacity to import the goods they need.

Beyond the economic ramifications, the disruption of trade and value chains has also had a social impact. For example, the increase in food prices has made it increasingly challenging for people to afford proper nourishment, resulting in a rise in hunger and malnutrition. Moreover, the disruption of trade has also led to job losses, which has made it more difficult for people to support themselves and their families. As a result, this has hurt economic growth and poverty reduction efforts on the continent. The war has also disrupted trade in other commodities, such as wheat and fertiliser, which play a crucial role in African agriculture. Similarly, climate change is also hurting trade and value chains in Africa. Droughts and cyclones are becoming more frequent and severe, which is disrupting agricultural production and making it more difficult for farmers to get their goods to market.

The African Union's (AU) development blueprint, known as Agenda 2063, emphasizes the significance of trade as a vital sector for the full realisation of Africa's potential for human and socio-economic development. It underscores the need to develop, enhance, and sustain trade to address various challenges, including inequality, the standard of living, and the adverse impacts of events such as the COVID-19 pandemic, natural disasters, and conflicts. Recognising the role of intra-African commerce in poverty reduction, the AU acknowledges the regrettable disparity in trade volumes between African countries compared to other continents such as Europe and Asia. Consequently, concerted efforts are required to strengthen trade within Africa and bridge this gap.

Trade plays a pivotal role in benefiting the low-income group who are mainly involved in the informal sector by reducing the price of essential goods they consume and increasing the price of the products they sell. For example, if a farmer can sell their crops to a neighbouring country for a higher price, they will be able to earn more money and improve their standard of living. Likewise, when affordable goods become accessible to a person in the low-income bracket, they can allocate their remaining funds to other important needs like education and healthcare.

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In order to enhance inter-country trade on the continent, the AU established the African Continental Free Trade Area (AfCFTA) to remove trade barriers and accelerate the free movement of goods and services on the continent. The AfCFTA is envisaged and help increase the amount of trade between African states.[1] However, it is important to acknowledge that trade alone cannot serve as a magic bullet as it is only one part of the solution. Other factors, such as education, healthcare, and infrastructure, play equally vital roles in poverty reduction. Despite this, the AfCFTA has the potential to make a significant difference in the lives of millions of people in Africa. By removing trade barriers and increasing trade, the AfCFTA can help to reduce the price of goods and services, create new jobs, and boost economic growth. These developments will directly benefit many citizens, while also indirectly creating a more prosperous environment for countries.

A few challenges have stalled the effective performance of the AfCFTA. Thus despite the launch of the AfCFTA in 2021, the main challenges to achieving trade integration across the African continent are the potential loss of tariff revenue and an uneven distribution of costs and benefits. Additionally, the lack of effective cross-border customs and duties, and banking systems presents a significant obstacle to the implementation of the AfCFTA, hindering the smooth payment of goods between trading countries. Small and medium-sized enterprises (SMEs) face particular difficulties as most cross-border transactions are conducted in foreign currencies. This leads to high transaction costs, lengthy processing times, and an increased risk of fraud associated with such transactions. Consequently, businesses, especially resource-constrained SMEs, struggle to operate and trade efficiently due to these difficulties.

The absence of formal financial services such as banking and credit severely further limits access to financial resources and hampers business expansion. As a result, the lack of banking services impedes the full participation of the unbanked population in economic activities, thereby, leading to slower growth in trade and commerce. Currently, African businesses are using banking systems such as Visa, Society for Worldwide Interbank Financial Telecommunication (SWIFT), Faster Payments Service (FPS), and PayPal. However, these banking systems are a challenge in Africa because of their high fees. As such, traditional banking systems often charge high fees for international payments. This can be a significant barrier for businesses in Africa, which often have limited financial resources. Furthermore, these banking systems exhibit slow processing times. This is because international payments processed through traditional banking systems can take several days to clear. This can be a problem for businesses that need to make quick payments to suppliers or customers. Most importantly, traditional banking systems are not always accessible to businesses in Africa. This is due to several factors, such as limited internet access and a lack of financial infrastructure. The volatility of cryptocurrencies poses a risk to African economies due to significant price fluctuations. Besides, the lack of effective regulatory frameworks for cryptocurrencies in many African nations raises concerns about money laundering and consumer protection.

Traditional banking systems can be vulnerable to security risks, such as fraud and cyberattacks. This is a particular concern for businesses in Africa, which may not have the resources to invest in robust security measures. As a result of these challenges, businesses in Africa are looking for alternative means to conduct business and undertake business transactions. Due to the above difficulties APET calls on African governments to create an enabling environment for trade by seeking alternative means to conduct business and undertake business transactions in simpler and faster means.

The African Union High-Level Panel on Emerging Technologies (APET) calls on governments, businesses and individual businesses to explore the utilisation of appropriate alternative blockchain-based payment systems such as mobile money, cryptocurrencies, and peer-to-peer payment systems to facilitate cross-border trade for context-specific needs of countries. Mobile money, for instance, enables users to send and receive money using their mobile phones.

This payment method has gained popularity in Africa due to its convenience, affordability, and accessibility. On the other hand, cryptocurrency is a digital or virtual currency that uses cryptography for security. It operates in a decentralised manner, free from government or financial institution control. However, cryptocurrency is still in its early stages of development, but it has the potential to revolutionise the way that businesses and individuals in Africa make payments. Peer-to-peer (P2P) payment systems also allow users to send and receive money directly to each other, without the need for a third party. This can be a more convenient and affordable way to make payments, especially for small businesses and individuals.

APET encourages African countries to explore, where appropriate, the adoption of cryptocurrency, a digital or virtual currency that relies on cryptography technology for enhanced security. The panel draws attention to come distinct advantages of cryptocurrency. Firstly, its transactions are highly secure due to the implementation of cryptographic protocols. Secondly, transactions are processed much faster compared to traditional bank transfers. Moreover, the fees associated with cryptocurrency transactions are currently lower, enhancing affordability. Moreover, cryptocurrency is accessible to anyone with a mobile device and internet access, regardless of their geographical location or financial status.

Further, the transparency of the blockchain allows anyone to view all cryptocurrency transactions, fostering transparency and accountability. This cryptographic technology ensures that transactions are verified and recorded in a highly secure manner, making it extremely difficult to counterfeit or duplicate digital currency. An essential characteristic of cryptocurrency is its peer-to-peer nature, which means it operates without the need for banks or other financial institutions to facilitate transactions. Instead, users directly verify and record transactions on a decentralised ledger known as the blockchain. This distributed public ledger maintains a transparent and immutable record of all cryptocurrency transactions.

Additionally, the decentralised nature of cryptocurrency sets it apart from traditional currencies as it is not subject to government or financial institution control. This attribute appeals to those who prefer making payments without intermediaries. Cryptocurrency can be used for various purposes, including online and in-store purchases, international remittances, and even as an investment option due to its potential for high returns, albeit with high volatility.

The panel points out that several African countries are actively incorporating cryptocurrencies into their systems. Nigeria, for instance, stands as a frontrunner in cryptocurrency adoption on the continent. While the Nigerian government has yet to regulate or ban cryptocurrencies, it has fostered a regulatory sandbox environment that allows businesses to experiment with digital currencies without fear of government interference. Similarly, Kenya, as seen in figure 1 above, has displayed a positive stance towards cryptocurrencies, establishing a task force to examine their potential benefits and risks. This task force is expected to provide recommendations for cryptocurrency regulation in Kenya. For example, the company BitPesa has raised over US$10 million in cryptocurrency to invest in African businesses. In South Africa, a highly developed country with a robust financial sector, the government has taken a cautious approach. While the South African Reserve Bank has warned consumers about the risks associated with cryptocurrencies, it has also recognised its potential in promoting financial inclusion.
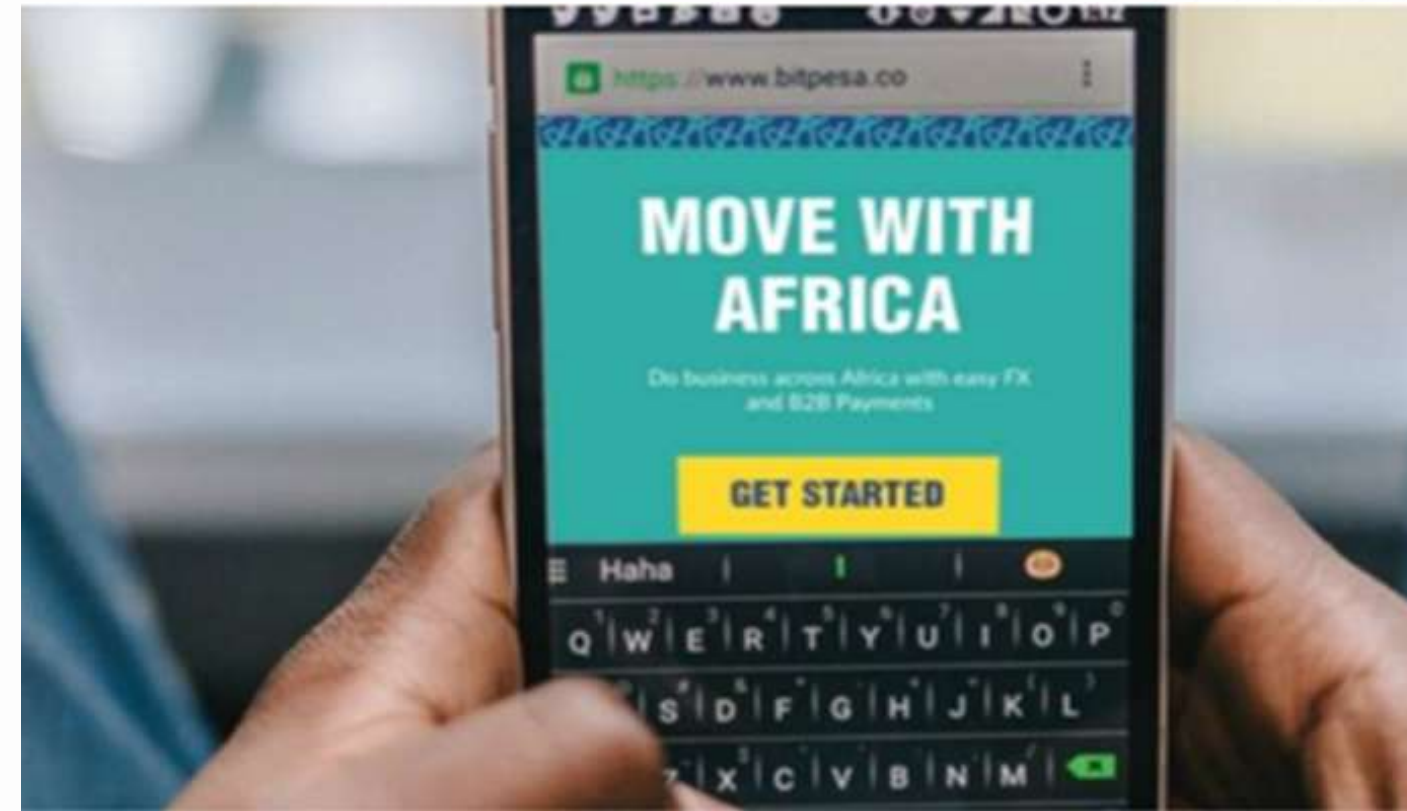
Figure 1: BitPesa platform[2]

Cryptocurrencies can be used to send remittances more quickly and cheaply than traditional methods, such as wire transfers. This can be a major benefit for African families who rely on remittances from relatives living abroad. APET highlights that the decentralised nature of cryptocurrencies, independent of traditional banking institutions, offers a faster and more cost-effective alternative for remittances and international transactions. Further to this, APET acknowledges that cryptocurrencies can reduce transaction costs in cross-border trade within Africa. Traditional payment methods involving numerous intermediaries often lead to high costs and lengthy processing delays. By eliminating middlemen, cryptocurrencies enable fast and secure transactions. Additionally, cryptocurrencies are built on blockchains, which provide secure and transparent transaction recording. APET opines that the increasing accessibility of the internet and mobile technology access in Africa makes cryptocurrencies a more appealing and practical option for transactions across the continent.

The High-Level Panel, however, draws attention to the challenges associated with cryptocurrency. One significant challenge is its high volatility, resulting in rapid price fluctuations. The panel notes that fraudulent activities, such as scams and theft, have been reported in the cryptocurrency space. Also, regulatory frameworks for cryptocurrency are still being developed in many countries, posing potential risks for users. Moreover, the energy-intensive process of cryptocurrency mining raises concerns about its environmental impact.

The panel notes that despite the challenges enumerate above, cryptocurrency has the potential to revolutionise the payment landscape by offering enhanced security, efficiency, and global accessibility, thereby enhancing trade in Africa. APET, therefore, urges all relevant stakeholders to weigh the importance of the benefits and challenges of cryptocurrency such as volatility, fraud risks, regulatory environments, and environmental implications before engaging in its usage. Hence the panel advises African countries to exercise responsible use of cryptocurrencies, where appropriate.

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APET notes that cryptocurrencies can play a role in financing cross-border trade and therefore urges African governments to explore this option as countries work towards the implementation of the AfCFTA. This can be done by using cryptocurrency as collateral for loans or by using cryptocurrency-based platforms to facilitate trade. For example, Flextrade has developed a platform allowing businesses to trade goods and services using cryptocurrency. Alternatively, cryptocurrencies can also be used to invest in African businesses and projects. This can help to boost economic development by providing businesses with access to capital and by helping to create jobs.

However, for cryptocurrencies to be used successfully in the AfCFTA, African countries need to create successful regulatory frameworks for them. This means that governments need to carefully consider the potential risks and benefits of cryptocurrencies before regulating them. They also need to ensure that regulatory frameworks are clear and consistent across different countries. In addition to creating regulatory frameworks, African countries also need to investigate ways to use cryptocurrency technology to increase financial inclusion and lower transaction costs. This could involve developing mobile payment apps that use cryptocurrency or providing financial literacy training to people who are new to cryptocurrency. By taking these steps, African countries can create a successful cryptocurrency regime that will hasten the AfCFTA and boost economic development in Africa.

In conclusion, the panel asserts fundamentally, African countries can use cryptocurrency technology to increase financial inclusion and lower transaction costs. For instance, African countries can utilise mobile payment applications that use cryptocurrency to make it easier for people in rural areas or with limited access to traditional financial services to send and receive money. Also, financial literacy training can help people understand the risks and benefits of cryptocurrency and how to use it safely and securely. These blockchain-based platforms can be used to record and track transactions securely and transparently. APET opines that by using cryptocurrency technology in these ways, African countries can help to create a more inclusive and efficient financial system for enhancing the implementation of the AfCFTA that will benefit all citizens.

Link: https://www.nepad.org/blog/transforming-inter-african-trade-through-cryptocurrencies-future-possibility

Blog #15 Published on Jul 11, 2023

Leveraging Smart Technologies To Enhance Access To Reproductive Health Care Services In Africa

Approximately 20% of births in the world occur in Africa.[1] Unfortunately, nearly half of all maternal deaths related to pregnancy or childbirth occur in Africa. These disturbing statistics can be attributed to a number of factors including inadequate reproductive healthcare services, which impact 32% of women of reproductive age.[2] Access to comprehensive reproductive healthcare services in African countries is important as it empowers women and couples to make informed decisions regarding family planning, ensuring safe childbirth, and the birth of healthy children. Furthermore, it plays a vital role in promoting sexually healthy lifestyles and preventing sexually transmitted diseases.[3] To realise a vision of Africa where development is people-driven and people-centred, Agenda 2063 includes a plan that emphasises the need of investing in women and young people including improving reproductive health.[4] The African Union's (AU) Agenda 2063 serves as a comprehensive roadmap for Africa's development in the next five decades, with a particular focus on investing in women and young people and addressing sexual reproductive health concerns.

Complementing this initiative is the Addis Ababa Declaration on Population and Development in Africa Beyond 2014, a policy document endorsed by African leaders in 2014. It reaffirms the commitment of African countries to promoting sexual and reproductive health and rights while urging increased investment in these areas. Additionally, the Maputo Protocol, a human rights treaty adopted by African countries in 2003, stands as a significant milestone. It guarantees the sexual and reproductive health and rights of women and girls, aiming to eradicate all forms of discrimination against women.[5]

Furthermore, the AU Roadmap on Harnessing the Demographic Dividend Through Investments in Youth, endorsed by the AU in 2017, lays out a strategic approach for investing in young people to maximise their potential and capitalise on the demographic dividend.[6] These policies collectively underscore the criticality of investing in women and young people, and provide a comprehensive framework for action. By directing resources and efforts towards these groups, African countries can achieve their development goals and foster a brighter future for all.[7]

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Blog #15 Published on Jul 11, 2023

Africa's progress in sexual and reproductive health and rights has been significant. These advances can be attributed to various factors, such as improved access to contraception, education, and healthcare services. However, there are still challenges that need to be addressed. Africa currently grapples with the highest adolescent fertility rate worldwide and continues to combat the pervasive issue of child marriage in many countries.[8] There exists a decline in access to reproductive health services in Africa can be attributed to harmful cultural beliefs and practices, gender inequality, stigma, and a lack of information. Practices like female genital mutilation (FGM) pose significant risks to women's health, including infections and childbirth complications.

Gender inequality limits women's access to education and healthcare, thereby hindering their ability to obtain necessary reproductive health services. The stigma surrounding reproductive health issues discourages women from seeking testing and treatment.[9] Additionally, the lack of accurate information about sexual and reproductive health contributes to uninformed decision-making. These factors collectively contribute to the declining of women accessing reproductive health services, thereby underscoring the need for countries to continue addressing these issues for the betterment of women and girls in Africa. Nevertheless, the progress achieved thus far is noteworthy. With sustained investment and dedicated effort, Africa has the potential for even greater advancements in sexual and reproductive health and rights. By promoting education, advocacy, and policy changes, African countries can improve reproductive health outcomes and create a healthier future for all.[10]

The African Union High-Level Panel on Emerging Technologies (APET) encourages African countries to leverage emerging technologies to enhance the delivery of reproductive healthcare services on the continent. Smart technologies can be used to improve access to reproductive healthcare services by providing remote healthcare services, tracking, and monitoring health data, delivering educational materials, and promoting advocacy and policy change. APET opines that smart technologies can provide remote healthcare services to people in rural areas and those who cannot easily access healthcare facilities. For example, this can be accomplished through telehealth, which allows patients to consult with doctors and other healthcare providers over the Internet.

Telehealth has the potential to transform reproductive healthcare in Africa, making it more accessible and affordable. Through telehealth, various aspects of reproductive healthcare can be improved. For instance, remote consultations enable individuals in rural areas or with limited access to healthcare to connect with doctors and healthcare providers. Virtual education can provide essential information about sexual and reproductive health to those who lack traditional educational opportunities. Telehealth can also aid in monitoring and treating individuals with reproductive health conditions, ensuring regular check-ups and management of chronic conditions.[11] Telehealth presents numerous opportunities to enhance reproductive healthcare in Africa. It can reach underserved rural populations, reduce healthcare costs, and improve the quality of care by connecting patients with specialised experts.[12]

Already, telehealth initiatives like M-TIBA in Kenya, Imara Health in South Africa, and LifeMD in Nigeria, are utilising telehealth technologies to provide reproductive healthcare services.[13] M-TIBA connects patients in rural areas with doctors and healthcare providers using mobile phones.[14] Imara Health uses video conferencing to connect HIV-positive women with healthcare providers. LifeMD combines video conferencing, phone calls, and messaging to provide reproductive healthcare services to women trying to conceive.[15] Based on these examples, APET asserts that as telehealth continues to evolve, African innovators should pursue more innovative approaches that will further enhance the health and well-being of women and girls throughout the continent.

Figure 1: South Africa's Imara Telemed platform[16]

APET also recognises the potential of smart technologies in tracking and monitoring health data, particularly in the context of reproductive health in Africa. Smart technologies, such as mobile apps and wearable devices, can be utilised to track menstrual cycles, provide contraception reminders, and connect individuals with healthcare providers. This data can identify individuals at risk of reproductive health problems such as unintended pregnancies or sexually transmitted infections (STIs) and enable timely interventions. Additionally, wearable devices can monitor various health indicators such as heart rate, sleep patterns, and activity levels, helping to identify risks associated with conditions such as pre-eclampsia or gestational diabetes.

Remote patient monitoring (RPM) using technology, such as mobile apps and wearable devices, allows for the tracking and monitoring of patients' health data from a distance. RPM can identify individuals at risk of reproductive health issues like preterm birth or postpartum depression, facilitating appropriate care and support.[17] These smart technology approaches have the potential to improve health outcomes, particularly in regions with limited access to regular healthcare. They can also contribute to cost reduction by aiding in the identification and treatment of at-risk individuals, resulting in savings for individuals and healthcare systems. Moreover, smart technologies can enhance healthcare accessibility by overcoming geographical barriers, particularly benefiting women and girls who often face obstacles in accessing healthcare.

Ultimately, smart technologies can improve the quality of care by providing comprehensive patient data to healthcare providers, enabling informed decision-making and personalised healthcare. As such, APET appreciates that smart technologies have the potential to revolutionise reproductive health in Africa. By making it easier to track and monitor health data, these technologies can help to identify people who are at risk of developing health problems and to provide

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them with the care they need. This can lead to improved health outcomes, reduced costs, and increased access to healthcare for women and girls across the continent.[18]

Smart technologies also offer opportunities to deliver educational materials about reproductive health in Africa. Mobile apps serve as convenient platforms to provide information on contraception, sexually transmitted infections (STIs), and other reproductive health topics. They can also offer resources for individuals seeking assistance. Websites, accessible through any device with an internet connection, can deliver educational materials, particularly benefiting people in rural areas. These platforms can provide interactive tools such as quizzes and calculators. Additionally, online platforms such as social media and forums serve as channels to connect individuals, share information, and offer access to educational materials that may not be readily available otherwise.[19]

Implementing smart technologies to deliver educational materials about reproductive health in Africa yields several impacts and opportunities. Firstly, it improves access to information, reaching individuals in remote or underserved areas. Secondly, it increases awareness by making reproductive health information more accessible and engaging. Thirdly, it empowers individuals to make informed decisions about their reproductive health by providing the necessary knowledge. Lastly, it reduces the stigma associated with reproductive health topics by offering a safe and anonymous space for learning.[20]

However, to fully leverage the benefits of using smart technologies for delivering educational materials on reproductive health in Africa, several challenges need to be addressed. The digital divide remains a significant hurdle as not everyone has internet access or smartphones. Lack of awareness about the advantages of using smart technologies poses another challenge, hindering their adoption. Cultural barriers can also impede access to educational materials as some societies may be uncomfortable discussing reproductive health openly. Despite these challenges, maximising the potential of smart technologies in addressing these issues can greatly contribute to improving the reproductive health of women and girls throughout the continent.[21]

Smart technologies are currently employed to deliver educational materials about reproductive health in Africa. For example, in Kenya, Amref Health Africa utilises mobile apps to provide reproductive health educational materials to women and girls. The app covers contraception, STIs, and other relevant topics while offering resources for those seeking assistance. Additionally, Marie Stopes International in South Africa employs a website to deliver educational materials on reproductive health.[22] The website covers contraception, STIs, and other reproductive health subjects while providing resources for those in need. In Nigeria, the Women's Health and Education Programme (WHEP) uses social media platforms such as Facebook and Twitter to deliver educational materials on reproductive health. By connecting with individuals through these platforms, WHEP shares vital information about reproductive health.

Smart technologies also have the potential to drive meaningful impact in promoting advocacy and policy change for reproductive health in Africa. Social media campaigns, such as the #NotJustANumber campaign in Nigeria, leverage platforms such as Facebook, Twitter, and Instagram to raise awareness about reproductive health issues and mobilise individuals for policy change. Mobile applications such as MyDawain Kenya provides information and resources, empowering users to advocate for reproductive health rights and engage in campaigns. Online platforms such as "SheDecides" create spaces for collective action, connecting individuals across Africa to share stories and support initiatives promoting reproductive health and rights.[23]

Figure 2: Kenya's MyDawa mobile application[24]

African countries can also harness the power of artificial intelligence (AI) to analyse health data and identify individuals at risk of developing health issues, leading to improved early detection and treatment.[25] Additionally, blockchain technology can establish a secure and transparent system for storing and sharing health data, enhancing the quality of care while safeguarding patient privacy. Although the utilisation of smart technologies in reproductive health is in its nascent stages, there is tremendous potential for these innovations to enhance healthcare access and improve health outcomes. As these technologies advance, they will increasingly serve as powerful tools in advancing reproductive health in Africa.[26]

In conclusion, APET recognises that challenges, such as the digital divide, limited internet access and low digital literacy in Africa should be addressed to maximise the impact of smart technologies. The panel calls for bridging this gap through promoting digital literacy programmes, expanding internet infrastructure, and making smart technologies more accessible. Furthermore, urges sensitivity to linguistic and cultural differences and tailoring information and resources in local languages. APET furthers urges governments to establish supportive policy and regulatory frameworks that protect digital rights and privacy and encourage the use of smart technologies in reproductive health advocacy.

Link: https://www.nepad.org/blog/leveraging-smart-technologies-enhance-access-reproductive-health-care-services-africa

Fertile Ground For Digitalisation: Adopting Digital Technologies To Improve Farming And Food Security In Africa

Agriculture plays a vital role in the economies of many African countries. It contributes approximately 37% of the continent's gross domestic product (GDP) and accounts for nearly 60% of its export revenue.[1] Moreover, agriculture serves as the primary source of employment for over 76% of the labour force, encompassing a significant portion of the continent's 987 million inhabitants residing in rural areas. After recognising the significance of agriculture, the African Union's Agenda 2063 outlines its first aspiration as: "A prosperous Africa based on inclusive growth and sustainable development" thereby emphasizing the continent's need to invest in modern agriculture to enhance productivity.

To support this objective, the Comprehensive African Agricultural Development Programme (CAADP), a continental framework operating within Agenda 2063, was developed to eradicate hunger, reduce poverty, and foster economic growth through agriculture-led development. This framework encourages African countries to allocate a minimum of 10% of their national budgets to agriculture and rural development. By committing to this allocation and leveraging the CAADP framework, countries are expected to achieve annual agricultural growth rates of at least 6% and expand their investments in the agricultural sector.[2] These initiatives, therefore, seek to drive sustainable development, improve food security, and uplift the livelihoods of individuals across the African continent.

Agriculture in Africa has made remarkable strides in recent years, experiencing an average annual growth rate of 13% between 2015 and 2020.[3] However, agricultural productivity in Africa remains low compared to other parts of the world. If food production remains stagnant, then Africa is projected to spend approximately US$ 150 billion on food imports by 2030. Several factors contribute to low agricultural productivity in Africa, including the limited adoption of improved agricultural technologies like high-quality seeds, fertilisers, and mechanisation services. Climate change, poor infrastructure, and limited access to markets further compound the challenges.[4]

African countries can address the challenges of low agricultural productivity by investing in agricultural research and development to develop new crop varieties that are resistant to pests and diseases, as well as more efficient irrigation systems. Furthermore, African countries should improve access to credit and markets to enable farmers to purchase input and sell their produce at a fair price. Strengthening agricultural institutions is equally vital to enhance the coordination of agricultural policies and programmes across the continent.[5] CAADP emphasises the importance of agricultural input in revolutionising the agriculture sector in Africa.

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Both organic and inorganic fertilisers are important input in improving crop yields, particularly when soils are depleted due to repeated cropping without proper soil amelioration. Additionally, high-yielding seeds are a strategic input for agriculture, with a significant impact on crop yield and return on investment.[6] Improved seeds can yield 4-6 metric tonnes per hectare, compared to less than 1 metric tonne per hectare from conventional, unimproved seeds. To increase agricultural productivity, it is important that farmers transition from using traditional approaches to science and technology-based farming practices, which involve using fertilisers, better seeds, and modern agronomic techniques.

The timely delivery and access to essential farm input in Africa, however, present significant challenges that contribute to low food productivity on the continent. The availability of input distribution at the right time is crucial for enabling early planting in favourable weather conditions.[7] thereby, ensuring the accumulation of necessary thermal time for optimal growth and development of crops in ecological settings. However, the fragmented and underdeveloped nature of the input market in Africa hinders timely access to this input. Factors such as market development, technical limitations, and inadequate infrastructure further exacerbate the problem.[8] As a result, many farmers are unable to obtain the necessary input on time, thereby negatively impacting their crop production and overall agricultural productivity. Addressing these challenges and improving the efficiency of input delivery systems are essential steps towards enhancing food production in Africa.

In Africa, some obstacles related to market development impede the timely delivery of farm input, including insufficient human resources, limited access to financing, inadequate market information and the absence of an efficient regulatory framework for agricultural input and supplies. On the technical side, it is crucial to address the lack of basic technical understanding among African farmers, especially regarding fertiliser application, as this knowledge is vital for the timely planting of crops. Moreover, infrastructural constraints such as poor road networks, particularly in rural areas, pose challenges in reaching these locations. To tackle the challenges surrounding low agricultural yield in Africa, the African Union High-Level Panel on Emerging Technologies (APET) urges African governments to embrace emerging digital technologies. These technologies encompass a wide range of solutions, from text message-based farming guidance to interactive voice response systems. Mobile applications that connect farmers to multimedia advisory information, agricultural input and consumers are also part of this digital revolution.

APET further explores the use of satellite and drone systems to guide agricultural practices, such as determining optimal crop selection and input utilisation. Moreover, digital technologies streamline logistical aspects, such as using drones for seed delivery. APET opines that digitalisation can transform the barriers to timely access to farm input into opportunities, enhancing adaptation, productivity, and resilience for farmers in Africa.

Digitisation has revolutionised the process of ordering and payment for fertilisers, benefitting farmers in remote areas with limited access to traditional financial services. For example, through mobile money payment systems, farmers can easily pay for their input, ensuring timely access. Additionally, digital platforms on mobile phones provide farmers with crucial information on suitable fertilisers for their crops, addressing a previous challenge. African policy makers can also utilise electronic vouchers (e-vouchers), to enable prompt access to input for farmers. Once the e-voucher is successfully redeemed, automatic payments are made to agro-dealers. Mobile technology is utilised in the e-voucher platform for voucher activation and redemption , streamlining the process for efficient input distribution.[9]

A prime example of successful implementation is the Zambian government's Farmer Input Support Programme (FISP), which has been e-vouchers since 2012. This programme has significantly improved small-scale farmers' access to agricultural input. In 2019 alone, The FISP reached over 1.2 million farmers and contributed to a 10-15% increase in agricultural output.

Another notable platform is the M-Kulima platform in Tanzania, which has revolutionised access to agricultural input and information for smallholder farmers, in Figure 1 below. Linked to the M-Pesa mobile money system, M-Kulima enables farmers to purchase input and services through their mobile phones. This platform has been instrumental in increasing access to input and providing valuable agricultural guidance.[10]

Figure 1: Vodacom's M-Kulima app digitising farming in Tanzania [11]

The use of e-vouchers for farm input in African countries has significantly increased access to these crucial resources. E-vouchers simplify the process by allowing farmers to redeem them at various outlets, including agro-dealers, input suppliers, and government agencies. This approach has not only enhanced the efficiency of input distribution systems but also eliminated the need for farmers to travel to government offices for input collection. Additionally, e-vouchers enable tracking and monitoring, ensuring input reach the intended beneficiaries and increasing transparency in input distribution.[12]

Recognising the empowering impact of e-vouchers, APET acknowledges that they provide farmers with access to input, enabling them to improve their yields and overall agricultural productivity. Furthermore, e-vouchers are by providing small-scale farmers with the means to increase their incomes through enhanced agricultural production. Therefore, by ensuring farmers' access to necessary input, e-vouchers contribute to improved food security and the availability of sufficient food resources.[13]

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The implementation of e-vouchers for farm input offers a transformative approach to agricultural development in Africa. These digital solutions increase access, efficiency, and transparency in input distribution systems, leading to enhanced agricultural productivity, reduced poverty, and improved food security. This approach holds great promise for advancing sustainable agricultural practices and fostering economic growth across the continent.To effectively adopt digital tools to improve food security, African countries need to invest in the development of digital infrastructure, including reliable internet connectivity, mobile networks and technology hubs in rural areas. These measures will guarantee that farmers and stakeholders have access to the necessary digital tools and platforms. Furthermore, African countries would implement training programmes to enhance digital literacy and skills among farmers, extension workers, and agricultural stakeholders.[14] This will empower them to effectively utilise digital tools and technologies in agriculture.

Furthermore, countries should establish robust data collection systems to gather relevant agricultural data, including weather patterns, soil quality, and market information. This data can be analysed using cutting-edge data processing methods to provide insights for decision-making and resource management. To this end APET recommends that African innovators develop user-friendly mobile and web applications that provide farmers with access to information on farm input and market information. These applications can offer real-time market prices, weather forecasts, and pests and disease alerts. Furthermore, African countries should facilitate the adoption of digital payment systems, allowing farmers to make secure and efficient transactions. This would reduce the reliance on cash-based transactions, improve transparency and facilitate access to credit and insurance services.[15]

Digital technologies can further promote the seamless connection and integration of digital tools in the agricultural supply chain, connecting farmers, input suppliers, agro-dealers, and retailers. To drive digital innovation in agriculture, African countries should also foster collaboration between governments, private sector companies, and technology providers. This collaboration can involve co-developing and implementing digital solutions, sharing resources and expertise, and supporting innovation hubs. Moreover, it is important for African countries to develop supportive policies and regulatory frameworks that encourage investment and innovation in digital agriculture. These policies should address areas such as data privacy and protection, intellectual property rights, and fair competition in the digital farming sector.

The panel further recommends the establishment of platforms for farmer engagement and feedback, allowing them to provide input on the design and implementation of digital tools. This would ensure that the technologies developed are user-centric and effectively address the needs and challenges faced by farmers. Regular monitoring and evaluation of the impact of digital tools should be conducted regularly to identify areas for improvement, measure progress, and make informed decisions for further implementation.[16]

In conclusion, APET asserts that by embracing the suggested policies and strategies, African countries can harness the power of digital farming technologies to revolutionise their agricultural sector. These initiatives will enable improved distribution and access to essential farm input, facilitate efficient resource management through data-driven decision-making, and ultimately bolster food security across the continent. By investing in digital infrastructure, promoting capacity building, and fostering public-private partnerships, African countries can leverage technology to overcome current challenges and pave the way for a more sustainable and productive agricultural future.

Link: https://www.nepad.org/blog/fertile-ground-digitalisation-adopting-digital-technologies-improve-farming-and-food-security

Inclusive Pathways: Enhancing Participation Of Farmers With Disability In Agriculture

Agriculture is critical for sustainable development and poverty reduction, and agricultural growth can be a powerful means of achieving inclusive growth. In spite of the disproportionately lower share of investment in the sector from African governments and donors over the last decade, growth is still being recorded and the continent's agriculture still holds much promise and potential. Agricultural productivity and rural employment can offer increased income to the poor and provide food security and income diversification to vulnerable communities. Given that agriculture dominates the rural economy in most African countries, increased productivity in the sector will remain a key driver and a critical component of inclusive growth.

In Africa, agriculture holds paramount importance in combating food insecurity, enhancing sustainable resource management and environmental preservation, and the pursuit of sustainable development. For example, agriculture features prominently in Sub-Saharan African economies, with approximately 50% of the labour force dedicated to this sector. In addition, agriculture contributes a minimum of 20% of the region's Gross Domestic Product (GDP).[1]

Family farming, commonly known as smallholder farming, is the predominant method of farming in African countries, primarily driven by the labour of family members. Approximately 80% of smallholder farmers, totalling around 33 million, operate on less than 2 hectares of land per farmer.[2] Interestingly, despite their limited land size, smallholder farmers are responsible for the majority of food production in Africa, contributing up to 80% of the continent's total food output. These farmers possess a deep understanding of the dynamics associated with cultivating crops in a changing environment. They contribute significantly to maintaining independent and diverse agricultural systems and offering a variety of food products. Additionally, their output is vital for household food security, as it increases income for a significant portion of the rural population, enabling households to purchase additional food from the market to supplement their production and meet their dietary needs.[3]

Digital agriculture solutions are transforming how farmers interact with stakeholders in the agricultural value chain to ensure better and more equitable access to crop buyers, farming tools and equipment, and information. Yet, many farmers are still being excluded from the benefits that digital agriculture solutions can offer including female and elderly farmers, those with disabilities and farmers with low literacy levels.

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Blog #17 Published on Jul 21, 2023

The panel identified three types of barriers faced by persons with disabilities to their inclusion in farming activities. These barriers are classified into systemic, attitudinal and environmental:

Systemic barriers are procedures, policies and practices that do not take farmers with disabilities into account and therefore exclude them from effective and equitable participation in value chain activities. Broadly, these barriers include the lack of consideration of disability inclusion in agricultural activities by agribusinesses but also government (e.g. through agricultural extension programmes), and the design of policies that exclude farmers with disabilities.

Attitudinal barriers are behaviours, perceptions or actions from communities or organisations that discriminate against farmers with disabilities. Specifically, we learned that in commercial relationships, lack of disability awareness creates several challenges for persons with disabilities. Their peers and communities do not know how to communicate with them and are not disability aware, making it difficult for farmers with disabilities to bargain and sell their products. Time and again, there is wide discrimination and stigma towards persons with disabilities as many people think that agriculture is not right for them, and there are still widely spread prejudices including the idea that farmers with disabilities produce lower quality products.

Finally, environmental barriers are characteristics of infrastructure (physical or digital) and tools that prevent persons with disabilities to participate in agricultural activities. Examples include the lack of accessible physical infrastructure for training, transporting, storing, and marketing agricultural products, and of adapted tools for sowing, harvesting, or performing other farming activities. Environmental barriers also include barriers to the digital inclusion of farmers with disabilities. Farmers living with disabilities not only face the aforementioned difficulties but also endure stigma and discrimination. Limited access to financial services further hinders their ability to purchase necessary inputs, while the absence of assistive technologies, such as prosthetic limbs, compounds the challenges they encounter.[4]

In addition to these difficulties, the voices and opinions of farmers living with disabilities are frequently disregarded when it comes to agricultural and food security matters. Furthermore, agricultural extension services often lack disability-friendly provisions.[5] The low participation and in some cases exclusion of persons living with disabilities from the agricultural workforce has substantial economic consequences, with the ILO estimating that African countries experience GDP losses of 3-7% due to this exclusion.[6]

These systemic barriers perpetuate inequality and hinder the full participation and potential of farmers living with disabilities in the agricultural sector. Therefore, concerted efforts should be made to address these challenges, promote inclusivity, and ensure that support systems, financial services, assistive technologies, and agricultural extension services are accessible and responsive to the needs of all farmers, regardless of their disabilities.[7]

Digital agriculture solutions offer smallholder farmers the opportunity to overcome some of the existing pain points they face, such as low productivity, stagnating incomes and financial exclusion. Applications of digital solutions in agriculture range from information dissemination in advisory services to farm monitoring using smart farming tools and predictive analytics.

The African Union High-Level Panel on Emerging Technologies (APET) advocates enhancing the participation of farmers with disabilities in the agricultural sector by leveraging digital agriculture. Digital agriculture entails the integration of digital technology in livestock and crop management, as well as other activities related to food production and maintenance. This encompasses various applications that utilise data generated in this field, enhancing the entire supply chain from seeds to farm animals to the end customer.[8]

APET firmly believes that digital agriculture solutions can enhance the connection between farmers with disabilities and agricultural value chain partners, ensuring improved and equal access to crop buyers, farming tools and equipment, and valuable information.[9] Moreover, digital agriculture can improve access to farming tools and equipment. Online platforms, for instance, can enable farmers living with disabilities to sell their crops, find buyers for their produce, and access information about farming practices.

Significant progress is already being made in several African countries with regard to utilizing digital agriculture to empower farmers living with disabilities. For example, in Kenya, the government has launched a programme called the Digital Agriculture for Inclusive Development (DAID) programme to provide training and support to empower farmers living with disabilities to utilise digital agriculture technologies to improve their productivity. Similarly, the Ghanaian government has partnered with the World Bank to develop the Ghana Agricultural Productivity Enhancement Project (GAPEP). This project is using digital agriculture technologies to enhance yields and incomes for farmers with disabilities.[10]

One exemplary organisation in Kenya is Kijiji Vision, which is dedicated to empowering visually impaired farmers. Through their mobile app called "Kijiji Vision Ag," farmers with visual impairments gain access to crucial information on crop production, pests and diseases, and market prices. Kijiji Vision Ag serves as a valuable resource for visually impaired farmers, enhancing their agricultural productivity and contributing to inclusive development. It is available in English and Kiswahili, can be freely downloaded, regularly updated, and supported by a team of agricultural experts to address farmers' queries.[11]

Remarkably, the app's voice-to-text feature makes information accessible to visually impaired users, showcasing how digital technology can empower individuals within the agricultural sector. Having been downloaded by over 1,000 Kenyan farmers, Kijiji Vision Ag has received a commendation for its accessibility and the quality of information it provides.

Farm Radio International (FRI) utilizes radio to enhance agricultural productivity for farmers in developing countries. In Ghana, FRI has introduced "Radio Farma," a programme tailored for farmers with hearing impairments, broadcasting in sign language with closed captions. The programme is broadcasted in English, Twi, and sign language across various radio stations in Ghana. This ensures the accessibility of information and features interviews with deaf or hard-of-hearing farmers, facilitating the exchange of experiences and insights. Supported by a team of agricultural experts with hearing impairments, Radio Farma contributes to improved agricultural productivity and inclusivity in Ghana.[12] Radio Farma has garnered commendations for its accessibility and informative content, showcasing the power of radio in empowering individuals with disabilities and fostering inclusive development. Figure 1 below shows a hard-of-hearing woman farmer accessing information on agriculture through radio.

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Figure 1: Smallholder farmer engaging with the Farm Radio programme [13]

TechnoServe, an international organisation combating poverty through economic development, utilizes agricultural drones in Nigeria to assist farmers with mobility impairments in crop monitoring. By collecting data on crop size, health, and yield potential, drones enable informed decisions on crop management. The benefits for farmers with mobility impairments include remote crop monitoring, eliminating the need for extensive travel or physical exertion. The use of drones expedites data collection, surpassing traditional methods, saving time, and money, and aiding in effective decision-making. TechnoServe's efforts have resulted in training over 100 farmers, supplying 20 drones, and collecting 10,000 data points, showcasing how digital agriculture empowers individuals with disabilities.

Success stories like aquaponic farming in South Africa highlight the potential of innovative and scalable methods to enable smallholder farmers, including those with disabilities, to contribute to agriculture and address food security challenges. Additionally, digital technology platforms such as Mezzanine's Connected Farmer and DigiFarm play crucial roles in overcoming farming obstacles and connecting farmers with necessary services and products.

In view of the importance that APET attributes to digital technologies in agriculture, the panel urges governments and relevant stakeholders in the public and private sectors to collaborate and provide practical assistive technology solutions that can effectively address productivity limitations and thus, enhance their well-being. These assistive devices include specialised wheelchairs, designed for agricultural settings, which provide stability, visibility, and access to machinery. Other assistive tools such as adaptive hoes, shovels, cutlasses, and rakes offer improved grip and usability.

Augmentative and alternative communication (AAC) devices, such as speech-generating devices and text-to-speech software, aid communication. Additionally, information and communication technologies (ICT) such as mobile phones, laptops, and tablets assist in accessing farming information and connecting with other farmers. APET asserts that these assistive tools demonstrate the potential of innovation and technology to empower farmers living with disabilities and enhance their participation in farming. The panel urges governments to invest in such digital solutions to promote inclusive development in Africa.[14]

To assist farmers living with disabilities in African countries, APET provides several policy recommendations to be implemented. The panel encourages African countries to invest in assistive technology, such as specialised wheelchairs, adaptive tools, and Augmentative and Alternative Communication (AAC) devices, which can significantly enhance their farming capabilities. The panel further encourages countries to promote inclusive agricultural practices, such as providing accessible training, and education opportunities, and creating infrastructure that accommodates individuals with disabilities.[15]

The panel asserts that more needs to be done to understand disability inclusion in agriculture and identify ways in which digital solutions can empower farmers with disabilities. To leverage the potential of digital agriculture as a driver of disability inclusion of farmers with disabilities, APET emphasises the need to address the barriers to their digital inclusion. For example, literacy and digital skills remain critical barriers to the inclusion of persons with disabilities, including farmers. Providing affordable mobile offerings and digital skills training are just two examples of how digital agriculture providers, operators and other stakeholders can support the digital inclusion of farmers with disabilities.

Raising awareness about the importance of inclusivity in the agricultural sector through public campaigns and educational initiatives can foster a supportive environment. To this end the panel recommends that governments and the private sector take measures such as providing training and education, ensuring access to markets, and offering financial support that can further empower farmers with disabilities. By adopting these policies, African countries can foster an environment that enables the success and food security of farmers with disabilities.[16] APET also encourages African countries to support and invest in digital agriculture solutions, including access to mobile phones, laptops, and tablets, which can facilitate market connections and access to vital information for farmers with disabilities.

Recognising the positive impact of digital technologies on agricultural productivity and revenue, the panel further encourages creators and suppliers of digital agriculture solutions to collaborate with farmers living with disabilities, to enhance their success and meaningful participation in Africa's agricultural sector, thereby contributing to long-term food security. By embracing disability inclusion as part of their core strategies, African governments, policy and decision-makers and relevant stakeholders can play a fundamental role in the inclusion of farmers with disabilities.

Link: https://www.nepad.org/blog/inclusive-pathways-enhancing-participation-of-farmers-disability-agriculture

Empowering Africa's Future: Curbing Child Labour In Africa Using Blockchain Technology


Child labour, human trafficking, and modern slavery are grave global issues, with the latter being most prevalent in developing countries. Rather unfortunately, Africa bears the highest burden, with an astounding number of child labourers. An estimated 72.1 million children are engaged in child labour, with 31.5 million children involved in hazardous work.[1] This does not only hamper children's physical and mental development, but also robs them of their childhood, potential, and dignity. Moreover, it obstructs their access to education and poses various dangers to their mental, physical, social, and moral well-being.[2]

According to the African Charter on the Rights and Welfare of the Child, a child is defined as an individual below the age of 18.[3] Child labour in Africa is primarily driven by factors such as poverty, natural disasters, chronic emergencies, famine, conflict, corruption, and the demand for low-cost and submissive labour. The most severe forms of child labour encompass slavery, child trafficking, coerced child prostitution, illicit practices such as drug peddling, and hazardous labour involving the use of perilous machinery.

In Africa, a staggering 85% of all child labour cases amounting to 61.4 million children are found in the agricultural sector. This industry subjects child labourers to tasks such as cattle herding, both commercial and subsistence farming. These are often perilous due to the demanding nature of the work and the challenging working conditions. The remaining African children involved in child labour are distributed across other industries, with 8.1 million (11%) working in the services industry, while 2.7 million (4%) employed in other industries.

A significant number of child labourers receive no remuneration at all, with many children being involved in labour within their family farms or businesses, rather than being employed by external entities. The impact of child labour on children varies depending on the economic sector they are employed in. These innocent children may endure long-term health issues including malnutrition, chemical exposure, abuse, injuries, fatigue, and psychological trauma.[4]

The African Union (AU) has made a resolute commitment to eliminate child labour and combat human trafficking and exploitation through the adoption of various frameworks. Among these crucial frameworks is the African Union Ten-Year Action Plan on Eradication of Child Labour, Forced Labour, Human Trafficking and Modern Slavery in Africa (2020-2030). This blueprint Action Plan serves as an immediate empowering guide, enlisting AU institutions, Member States, Regional Economic Communities (RECs), and other stakeholders to mobilise efforts and accelerate progress towards achieving the AU Agenda 2063 and target 8.7 of the Sustainable Development Goals, SDGs. The goal is to completely abolish forced labour, human trafficking, and modern slavery, with child labour being halted by 2025.
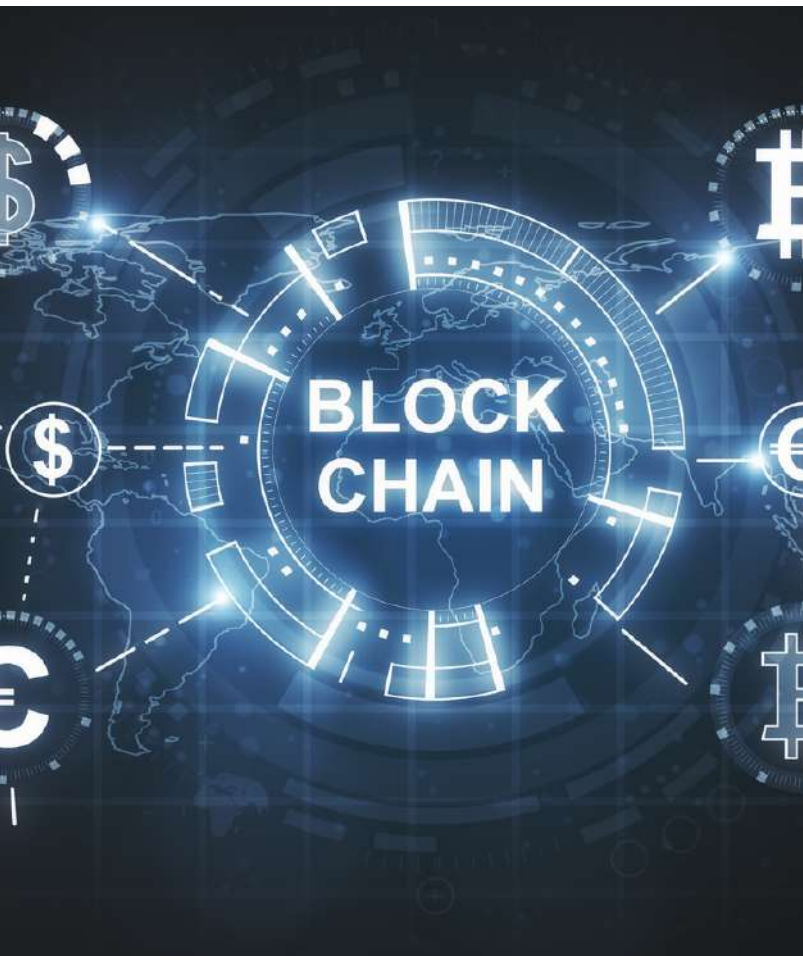
Focused on initiatives with a high potential for swift impact, the Action Plan delineates essential implementation responsibilities at the national, regional, and continental levels. Through these concerted efforts, the AU seeks to protect vulnerable populations and ensure a future free from exploitative practices on the African continent.[5] However, despite the African Union Ten-Year Action Plan, child labour and trafficking in Africa have increased since 2016. According to the International Labour Organization (ILO), Africa has 72.1 million child labourers, constituting one-fifth of the global total. Factors like poverty, conflict, and climate change contribute to this rise. One of the contributing factors to this concerning trend is the incomplete implementation of the Action Plan, resulting in gaps in enforcement and impact. Addressing this issue requires stronger implementation, increased political will, and resources. Tackling root causes such as poverty, conflict, and climate change is critical. With 31.5 million children in hazardous work and 1.2 million victims of trafficking, this alarming trend should be addressed urgently through collaborative efforts to and ensure a brighter future for Africa's children.

The AU High-Level Panel on Emerging Technologies recognises the immense potential of blockchain technology in achieving the goals of the African Union Ten-Year Action Plan on Eradication of Child Labour, Forced Labour, Human Trafficking, and Modern Slavery in Africa (2020-2030). The panel asserts that by harnessing blockchain, significant strides can be made in eradicating and preventing child labour in Africa.

One of the key strengths of blockchain is its decentralised nature, ensuring that transactions are carried out without any data tampering, thereby, ensuring security, permanence, transparency, and audibility through recording in an immutable ledger.[6] This makes it particularly well-suited for tracking and tracing the physical supply chain. By utilising blockchain, companies, financiers, and customers can precisely identify a material's origin and trace its journey through the various stages of processing, from raw materials to finished products. This level of transparency empowers stakeholders to detect any potential involvement of child labour in the production of goods. Furthermore, the unchangeable identity of the information uploaded to the blockchain allows for comprehensive evaluation at each stage of production.

Conventional survey and national accounting methods fall short in tracking the origins of finished products and their components. To achieve the desired level of transparency, statistics should not only be collected in the consumption market but also throughout the entire supply chain. Blockchain offers a viable solution for this complex task. With blockchain, it becomes feasible to detect child labour at each link in the global supply chain, requiring specific data on child employment within sectors and the interdependence of sectors across nations.[7]

The AU High-Level Panel on Emerging Technologies (APET) strongly urges African countries to invest in collecting more timely and better disaggregated national data through blockchain. This data-driven approach will enhance the analysis of trafficking for forced labour and provide a clearer understanding of the extent and characteristics of child labour in global supply chains. For example, blockchain technology offers a powerful solution in combatting child labour in the cocoa industry. Farmers can use blockchain to record the age and working hours of their workers, while cocoa traders can track the movement of cocoa beans from farm to chocolate factory. Chocolate manufacturers can then verify that the cocoa beans they use were produced without the involvement of child labour. This ensures that cocoa products are ethically sourced, giving consumers peace of mind when purchasing chocolate.

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In another notable example, prominent companies such as Ford Motor Company, LG Chem, and Huayou Cobalt have joined forces to implement blockchain technology in the cobalt mining and marketing process in the Democratic Republic of the Congo (DRC). This innovative blockchain-based platform enables monitoring and assessment of every stage of production, from mining in remote Southern Congo, home to most of the world's cobalt reserves, to Asian smelters, refineries, and the global trading market.

The platform securely records essential details such as the mine's name, date and time of mining, quantity, and miner's identity, along with information about the smelter's processing. Being immutable, this data ensures that Ford, LG Chem, and Huayou Cobalt can trace cobalt throughout the supply chain, guaranteeing ethical practices and avoiding child labour or other unethical activities. By providing transparency, traceability, and reducing fraud risks, the blockchain has the potential to revolutionise cobalt mining and marketing, fostering ethical and responsible practices within the industry.

In conclusion, blockchain emerges as a potent tool for eradicating child labour and safeguarding human rights. Through transparent production process for goods and services, it empowers consumers to make informed choices and discourages businesses from resorting to unethical practices such as child labour. Moreover, blockchain's ability to track goods throughout the supply chain enables the identification of specific farms or factories employing child labour, facilitating protective measures and preventing exploitation. While still a relatively new technology, blockchain holds the potential to revolutionise the tracking and tracing of goods and services, ultimately contributing to the elimination of child labour and the protection of human rights.

Link: https://www.nepad.org/blog/empowering-africas-future-curbing-child-labour-africa-using-blockchain-technology

Leveraging Machine Learning To Control Foot And Mouth Disease In Cattle Farming In Africa

Occurrences of foot and mouth disease (FMD) outbreaks in African countries have been significantly harmful to the cattle industry for the past decade. A prediction of FMD outbreaks based on relevant risk factors with a high prediction accuracy is, therefore, important for authorities to develop a plan for preventing the outbreaks. Machine Learning such as data-driven tools are widely accepted for their prediction abilities, but an application of these techniques to FMD outbreak prediction is very limited.

The livestock industry has played a crucial role in reducing poverty, and ensuring food security, thereby making it a significant contributor to the African Union's (AU) Agenda 2063 goals. To achieve economic growth and eradicate poverty, the Framework places increased priority on the livestock industry. Aspiration 1 of Agenda 2063 envisions a prosperous Africa through inclusive growth and sustainable development, with goal number 5 emphasising modern agriculture to boost productivity and production.[1] This goal recognises the importance of the livestock industry to the African economy and the need to develop it sustainably.

Cattle hold immense significance in Africa, with the continent having an estimated 370 million heads of cattle in 2020. Beef plays a crucial role as a daily source of food and nourishment, while also providing essential cash income, nitrogen-rich manure for soil replenishment, draught power, milk, and meat.[2] Additionally, cattle farming offers employment opportunities for many individuals on the continent and is symbolic of wealth and success in numerous tribes. However, cattle farming in Africa faces various challenges that impede production. Climate stress, nutritional deficiencies, illnesses, limited access to land and water, insufficient market channels, ineffective rangeland management, and inadequate feed supplies all contribute to these difficulties. Consequently, cattle are exposed to various stresses that negatively impact fertility, growth rate, and mortality, ultimately affecting the output of cattle farming on the continent.[3]

Foot and mouth disease (FMD) is an important economic transboundary animal disease caused by a virus of the genus Apthovirus from the Picornaviridae family.[4] FMD is a highly contagious viral illness affecting cloven-hoofed animals such as cattle, pigs, sheep, and goats. It is characterised by fever, mouth, and foot blisters, leading to lameness. FMD spreads rapidly through contact with infected animals, fluids, or contaminated surfaces.

FMD is responsible for significant losses in production and productivity to cattle farmers, as well as resulting in trade embargoes and substantial overarching economic losses for the broader cattle industry. Globally, the disease is a cause of

major concern as it is an important transboundary disease found in several regions of the world including Africa. Hence, among the diseases that significantly affect cattle in the African region, transboundary foot-and-mouth disease (FMD), stands out as a highly contagious threat.

Although there is no cure, treatments can relieve symptoms and prevent transmission. Therefore, controlling FMD necessitates biosecurity, vaccination, early detection, and reporting. These preventive measures are critical due to the disease's devastating impact on livestock populations and economies. FMD presents significant economic and social challenges, leading to the culling of infected animals. However, it does not pose a threat to human health.

The disease poses significant restrictions on production and market access, acting as a major barrier to the cattle industry and severely affecting the livelihoods and resilience of rural communities that rely on cattle.[5] The disease results in substantial income losses due to reduced milk yield, stunted growth in affected animals, and loss of livestock markets and trade disruptions.[6] Therefore, addressing the impact of foot and mouth disease is crucial in ensuring the sustainability of the cattle industry and the well-being of the communities dependent on it.

There is much interest in the use of prediction models for infectious diseases, as prediction models for livestock disease outbreaks based on classical statistical and mathematical techniques have been widely demonstrated. To this end, the African Union High-Level Panel on Emerging Technologies (APET) recommends the utilisation of machine learning (ML) technologies to predict and control the spread of FMD. Machine learning is a branch of artificial intelligence (AI) and computer science which focuses on the use of data and algorithms to imitate the way that humans learn, gradually improving its accuracy. Machine learning is an important component of the growing field of data science. Through the use of statistical methods, algorithms are trained to make classifications or predictions, and to uncover key insights in data mining projects. These insights subsequently drive decision making within applications and businesses, ideally impacting key growth metrics.

APET acknowledges that ML is still a relatively new technology globally, particularly in Africa. However, the panel recognises its potential and the progress to be made in its development. APET opines that ML can be harnessed to combat FMD across Africa, including in the areas of biosecurity, vaccination, early detection, and reporting. In 2019, for example, the African Union Inter-African Bureau for Animal Resources (AU-IBAR) implemented a machine learning-based system to monitor biosecurity measures in Kenyan livestock facilities.[7] By leveraging data from sensors and cameras, the system can identify and report potential biosecurity risks, such as animal movement and the presence of contaminated materials.

The AU-IBAR, in collaboration with the University of Edinburgh in Scotland, has developed the FMD Weather Index, a predictive project used in Africa to assess the risks of FMD outbreaks. To facilitate reporting the AU-IBAR developed a machine learning-based system in 2019 to automate the reporting of FMD cases. This system utilises animal health records and weather data, the system identifies FMD cases and automatically reports them to relevant authorities, expediting responses to FMD outbreaks.[8]

By analysing weather data, including temperature, humidity, and rainfall, the system identifies areas at high risk of experiencing FMD outbreaks and generates a risk score for each region.[9] This information aids in prioritising vaccination campaigns and implementing biosecurity measures. Currently in use in Ethiopia,

Kenya, and South Africa, the FMD Weather Index has proven to be effective in predicting and reducing FMD incidence. The system utilises machine learning algorithms trained on historical FMD outbreaks and weather data, with potential to expand to other African countries in the future.[10]

In 2018, Ethiopia partnered with the World Bank to launch a project that used machine learning to enhance vaccination coverage against FMD. The project targeted the needs of Ethiopia's livestock sector, which significantly contributes to the country's economy. By combining animal health records and weather data, the project identifies areas prone to FMD outbreaks, facilitating prioritised vaccination efforts and increased coverage. Through the project's efforts, vaccination coverage was increased, leading to a reduction in the incidence of FMD in Ethiopia.

Furthermore, in Kenya, a project led by the African Institute of Technology (AIT) in collaboration with the Kenya Agricultural and Livestock Research Organization (KALRO) developed a new FMD vaccine in 2021. By employing machine learning techniques, the project aims to identify the most effective vaccine strains and optimise the vaccine manufacturing process. Using machine learning, the project, aims to identify effective vaccine strains and optimise the manufacturing process by analysing animal health records and weather data.[11] The team seeks to detect patterns to determine the most potent FMD vaccine strains and enhance production quality while reducing costs. Though in its early stages, the project has the potential to revolutionise FMD vaccine development, potentially preventing outbreaks and safeguarding African livestock populations.

To enhance the early detection of FMD, Kenya implemented the FMD Early Warning System (FEWS) in 2017, which actively detects FMD outbreaks in livestock populations. FEWS analyses data from animal health records and weather reports, including vaccination status, herd health, and weather conditions, to identify potential FMD outbreak patterns and issue timely alerts. The system's effectiveness in early detection enables swift action, curbing the disease's spread and reducing economic losses.[12]

FEWS is also under development for implementation in other African countries. This promising tool holds the potential to protect livestock populations and prevent FMD outbreaks across Africa. Developed through a collaborative project between KALRO and the Food and Agriculture Organisation (FAO) of the United Nations, FEWS relies on machine-learning algorithms trained on historical FMD outbreak data and is slated to be fully operational by 2023.

Another example is the FMD Early Detection System (FEMS), designed by the University of Pretoria, which serves as a machine learning-based tool to detect FMD outbreaks in South African dairy farms. It leverages sensor readings and animal health records to identify early indicators of an FMD outbreak, such as temperature, humidity, animal movement, and health status. Analysing this data with machine learning algorithms, FEMS identifies patterns signalling an FMD outbreak and generates timely alerts to prevent disease spread. The system's effectiveness in early detection has proven to be cost-effective and can save lives and safeguard livestock populations.[13]

Currently operational in South African dairy farms, FEMS is being developed for implementation in other African countries as well, making it a valuable tool for preventing FMD outbreaks and protecting livestock populations in Africa. Collaboratively developed with the South African Dairy Development Corporation (SDDC), the system is based on historical FMD outbreak data and is expected to be fully operational by 2023. In 2021, the FAO launched a machine learning-based

system featuring a chatbot to assist farmers in reporting FMD cases. Simplifying the reporting process, the system enhances early detection of FMD outbreaks and facilitates prompt action. These innovative approaches demonstrate how machine learning is contributing to effective FMD control measures in Africa.
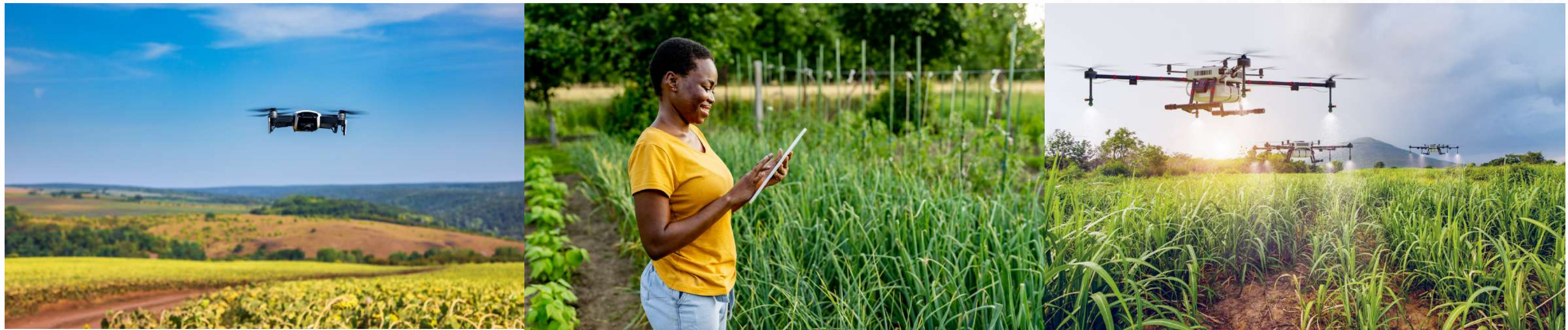
Policy recommendations for supporting FMD control using machine learning technologies encompass several key areas. Firstly, utilising ML to develop systems for monitoring biosecurity measures in livestock facilities can help identify and report potential risks, such as animal movement and contaminated materials.[14] Secondly, employing ML to predict FMD outbreaks based on weather and animal health data can aid in targeting vaccination efforts and biosecurity measures in high-risk areas. Thirdly, implementing ML-based systems for early detection of FMD outbreaks can expedite responses, preventing further disease spread.

APET urges that integrating ML in reporting processes can streamline FMD case identification and reporting to relevant authorities, enhancing response times. Therefore, to maximise the impact of ML in FMD control, the panel encourages African countries to invest in research and development for new tools, provide training on ML usage to government officials and livestock farmers, and foster a supportive regulatory environment for its implementation.[15]

In conclusion, the panel asserts that the adoption of machine learning technologies in FMD control represents a pivotal step towards eradicating the disease and protecting livestock populations in Africa. Embracing these policy recommendations will empower African countries to leverage ML for predicting and preventing FMD outbreaks effectively.

The panel concludes further that the implementation of machine learning-based techniques can bolster early detection of FMD indicators, enabling proactive measures to mitigate potential epidemics or pandemics. By harnessing the potential of machine learning, African countries can forge a path towards a healthier and more resilient livestock industry, ensuring the well-being of both animals and communities.

Link: https://www.nepad.org/blog/leveraging-machine-learning-control-foot-and-mouth-disease-cattle-farming-africa

Precision Agriculture In Action: Utilising Drone Technology For Enhanced Soil Mapping In African Agriculture

Agriculture holds significant importance in African economies, with smallholder farmers constituting over 60% of the population in Africa and contributing approximately 23% of the region's gross domestic product (GDP).[1] The African Union's Agenda 2063 identifies agriculture as a crucial sector to achieve top priorities, including poverty and hunger eradication. Despite continuous growth in Africa's agricultural output, land tenure systems, labour practices and soil inputs remain largely unchanged.[2]
Healthy soil is the foundation of the food chain and a fundamental building block for agriculture. All food-producing plants rely on nutrient-rich soil for nourishment, directly impacting the nutritional value and quantity of crops that sustain human and animal populations. With essential nutrients, water, and oxygen, healthy soils provide a stable foundation for food-producing plants to grow and prosper. Soil also acts as a protective buffer, safeguarding delicate plant roots from sudden temperature changes and ensuring continued productivity.

In Africa, the prosperity of agriculture hinges on the presence of fertile soil capable of producing healthy crops. The quality and health of soil play pivotal roles in the growth of both crops and livestock farming.[3] Regrettably, the continuous decline in soil quality significantly threatens Africa's agricultural productivity. Approximately 65% of agricultural land in Africa suffers from soil degradation, primarily caused by erosion-induced losses of topsoil and vital nutrients. Despite the continent's vast land availability, less than half of it is currently used for agriculture, and only 16% of arable land boasts excellent quality. The rising demand for food due to a growing population has spurred increased land use and deforestation, further exacerbating soil degradation. Factors such as overgrazing and inadequate fertilisation practices also contribute to this decline in soil health.

Farmers rely on understanding the characteristics and composition of their soil to make informed decisions about crop selection, as different crops thrive in specific soil types. Soil mapping plays a pivotal role in providing crucial insights into soil composition for farmers.[4] This process involves systematically observing and documenting the

various types of soil and their distribution within a given region. The benefits of soil mapping are manifold, as it helps farmers select the most suitable crops, apply appropriate fertilisers, and plan irrigation schedules. Additionally, soil mapping facilitates the formulation of effective soil conservation and restoration plans. As a result, soil data becomes a vital component of long-term soil management. Both the soil profile and its spatial distribution are integral elements that promote sustainable agricultural practices.

Traditionally, the task of soil mapping falls upon skilled soil surveyors who possess relevant expertise, invest substantial time in the field, conduct periodic auguring, and ultimately create a field soil map which is later digitised and printed.[5] However, this approach is marked by high costs and time requirements, particularly burdensome for small-scale farmers who constitute the predominant farming demography across Africa. Addressing this challenge, the African Union High-Level Panel on Emerging Technologies (APET) advocates that African farmers should adopt drones as an alternative method in soil mapping. Drones, integral to precision agriculture, are commonly known as unmanned aerial vehicles (UAV) and unmanned aerial systems (UAS).

In their report titled "Drones on the Horizon: Transforming Africa's Agriculture", APET asserts that UAVs offer a transformative leap beyond conventional soil survey techniques, providing swift and precise data to expedite decision-making. UAVs facilitate rapid deployment, enabling data collection near end-users, while delivering a more comprehensive and precise dataset compared to traditional camera-based methods.[6] Moreover, the data from these surveys can potentially fuel research into leveraging cost-effective UAVs for enhanced flood modelling simulations, thereby, negating the necessity for expensive and intricate human aircraft solutions.

Furthermore, drones have the potential to significantly enhance agricultural productivity by providing invaluable information and insights beyond farmers' traditional reach. As previously mentioned, drones excel in tasks such as soil mapping, pest and disease monitoring, and precision agriculture applications. Equipped with this data, APET emphasises that farmers can make more informed decisions about planting, watering, and harvesting timelines, ultimately leading to increased yields. Additionally, drones streamline labour-intensive activities such as scouting for pests, applying fertilisers, pesticides, and harvesting, thereby enabling farmers to allocate their efforts toward marketing and refining land management practices.[7] Moreover, drones contribute to sustainable agriculture by optimising the use of pesticides and fertilisers through precise applications, minimising their environmental impact, and promoting human health. Particularly, the integration of drones into farming practices holds the promise of job creation, income augmentation, and economic growth across Africa, with the drone industry projected to generate millions of jobs in the region. Simultaneously, increased yields and reduced costs bolster farmers' financial well-being.

In Africa, there are illustrative instances that showcase the transformative impact drones are currently exerting on agriculture. These examples highlight drones' pivotal role in propelling progress in areas such as soil mapping, crop monitoring, and livestock management. For example, in Nigeria, Aerobotics employs drones equipped with light spectrometers to map and analyse soil, aiding farmers in optimising crop yields by assessing nutrient levels and moisture content. Meanwhile, Kenya's Precision Hawk employs drones with thermal cameras to detect pests and diseases in crops, facilitating timely interventions. In South Africa, Aeryon Labs uses drones to monitor livestock health and location. Numerous startups such as Drone Deploy and Air ware are also making strides in soil analysis and crop protection. These drone applications enhance agricultural productivity by providing data-driven insights for informed decision-making. By reducing labour

requirements and promoting precision agriculture, drones contribute to increased crop yields and sustainable practices, fostering economic growth and environmental stewardship.[8]

APET urges African countries to establish and implement national UAV regulatory frameworks. Ensuring the secure and conscientious utilisation of drones in African agriculture necessitates the establishment and enforcement of national UAV regulatory frameworks. Safeguarding both individuals and the environment is paramount, as drones, if misused, can pose threats such as collisions and environmental harm.[9] Through these frameworks, regulations can be put in place to mitigate potential risks associated with drone usage. Furthermore, these frameworks act as an enabler of equitable access to the advantages of drone technology for all farmers, erasing barriers related to size or location. By creating a level playing field, these regulations facilitate widespread adoption, thereby enhancing agricultural productivity across the continent.

Facilitating innovation is another crucial role of these frameworks, as they should adapt to the rapidly evolving drone industry. Flexibility within these regulations supports the ongoing development of novel drone technologies, thereby positioning Africa at the forefront of this transformative revolution.[10] Additionally, the frameworks provide clarity and certainty for drone operators, outlining precise guidelines and expectations to minimise accidents and risks. Beyond technical specifications, these frameworks foster public confidence in drone utilisation. By demonstrating governmental commitment to the responsible and secure application of drone technology, public trust is strengthened, ensuring community comfort, and encouraging the widespread acceptance of drones in various regions.[11]

In conclusion, APET notes that establishing and implementing national UAV regulatory frameworks are indispensable for the responsible and secure integration of drones into African agriculture. These frameworks champion accessibility, innovation, and safety, ensuring that the benefits of drone technology are harnessed for the betterment of all farmers while nurturing a culture of responsibility and progress.

Link: https://www.nepad.org/blog/precision-agriculture-action-utilising-drone-technology-enhanced-soil-mapping-african

A New Dawn: Embracing Ethical Adoption And Adaptation Of Artificial Intelligence (AI) In Africa

The onset of the 4th Industrial Revolution (4IR) is releasing a wave of technological advancements poised to reshape the trajectory of African progress. At the forefront of this transformative era is artificial intelligence (AI), a catalyst with the capacity to revolutionise multiple sectors and drive inclusive expansion. AI has seamlessly integrated into numerous aspects of daily life, spanning commerce, education, health, public services, communications, governance, agriculture, and manufacturing, highlighting its pervasive impact. Furthermore, the transformative potential of AI is poised to reshape business operations, spur innovation, and uplift millions of lives across the African continent, aligning with the collective aspirations of the African Union's Agenda 2063. By catalysing swift economic progress, expanding healthcare and education access, and promoting sustainable agriculture, AI emerges as a pivotal tool in addressing the continent's critical issues.[1]

Africa's journey towards embracing AI is marked by gradual advancements. In 2021, the Centre for Intellectual Property and Information Technology Law (CIPIT) at Kenya's Strathmore Law School pinpointed a total of 213 AI applications tailored for or originated within the continent, spanning 33 diverse industries. Particularly, these applications predominantly found utility in domains such as corporate services,[2] health, agriculture, business intelligence, and education. Among the prevalent applications, data analytics, chatbots, and decision support systems emerged as the most frequent implementations.[3]

AI technology is finding practical application in South Africa's healthcare domain for rapid HIV testing. In Uganda, AI is harnessed to analyse prospective road network adjustments aimed at eliminating congestion points, strategically reallocating a limited pool of traffic enforcers, and offering optimal routing guidance to individuals and emergency vehicles. Demonstrating another facet, the World Wildlife Fund for Nature (WWF) is advocating for the integration of AI-equipped drones in Kenya. This fusion of AI and drone technology led to the apprehension of over a dosen wildlife poachers in Maasai Mara within a span of nine months.[4]

Despite its promising potential, AI presents significant challenges for African governments, authorities, and organisations, particularly in the realm of ethics. AI-driven technologies can amplify the effectiveness of hacking, digital surveillance, monitoring, and malicious software[5]. This raises concerns about authoritarian regimes exploiting AI for their agendas, for instance targeting political rivals, and perpetuating biases.[6] A major concern is the absence of a comprehensive AI strategy in Africa to guide ethical AI use. This missing guideline has created a
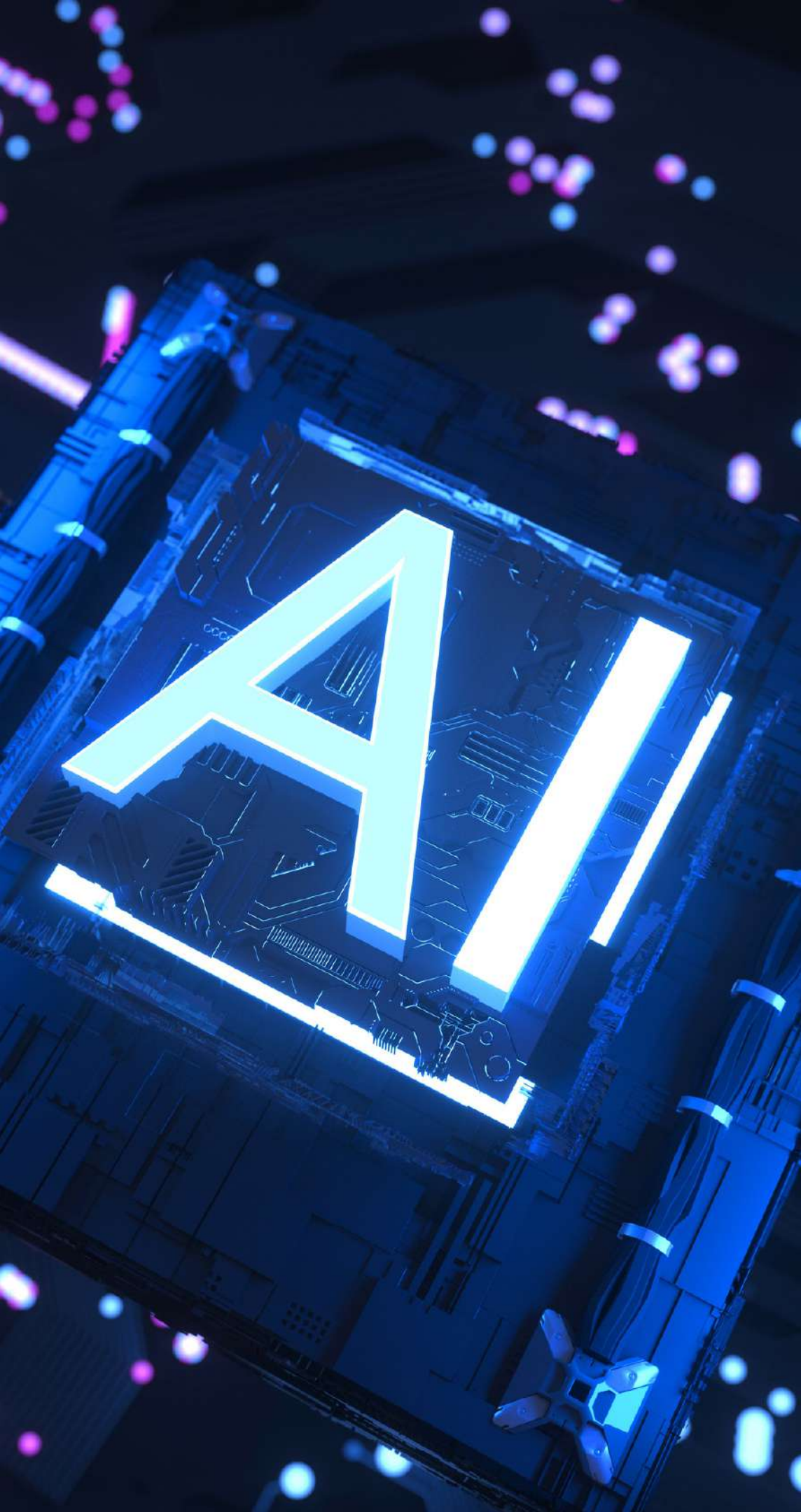
significant gap in establishing standards across the continent. Additionally, most of the funding and research in AI applications originate from external sources, often diverting priorities away from African experts who are well-versed in local norms.strategy in Africa to guide ethical AI use. This missing guideline has created a significant gap in establishing standards across the continent. Additionally, most of the funding and research in AI applications originate from external sources, often diverting priorities away from African experts who are well-versed in local norms.

In collaboration with AI experts from across African Union (AU) Member States, the African Union High-Level Panel on Emerging Technologies (APET) is formulating an African Union – Artificial Intelligence Continental Strategy for Africa. To this end, APET has convened multiple consultative meetings with AI experts since 2021 to shape this continental strategy. In this strategy, APET underscores the importance of establishing ethical and legal frameworks to harness AI's potential while mitigating risks and emphasising responsible data use.

In addition to various other considerations, the AU-AI Continental Strategy encompasses promoting ethical AI practices, establishing consistent legal principles, and embracing pertinent treaties and guidelines. To achieve this, AU Member States are encouraged to establish regulatory bodies overseeing AI creation and usage, implement codes of ethics for AI stakeholders, and collaborate to create a pan-African AI legislative framework. Harmonising AI legislation, defining guiding principles, and facilitating practical implementation are pivotal steps toward a unified and effective approach to AI development and utilisation in Africa. This framework anticipates potential AI risks, facilitates the development of proactive safeguards, and establishes a robust strategy for fostering sustainable AI solutions across the continent.

APET recognises that both formal and non-formal education has an important role to play in democratising technology and cultivating AI ethics in African countries. APET advocates for the incorporation of African ethical principles through education. To this end it is imperative to integrate a more comprehensive and structured AI ethics into educational curricula. This would contribute to enlightening future AI practitioners and stakeholders about AI's impacts and risks. African values and context-based thinking could underpin an ethical framework for AI across the continent and facilitate its adoption and advancement. The ethical underpinning of AI should primarily draw from African values, prioritising the needs of marginalised communities.

African AI researchers and innovators have a crucial role to play in shaping ethical AI practices on the continent. One significant contribution is the development of tailored ethical AI frameworks that consider Africa's distinct challenges and strengths, encompassing its youthful population, diverse cultures, and resource constraints. By researching the societal impact of AI, these reports can identify both positive and negative outcomes, enabling the formulation of strategies to mitigate potential risks. Advocacy efforts led by these experts drive the establishment of ethical AI policies at national and continental levels, thereby, safeguarding the interests of all Africans.[7] Furthermore, African AI researchers and innovators are actively building capacity in ethical AI by educating academics, policymakers, and the public. They participate in international AI conferences, thereby facilitating knowledge exchange and networking with global peers. Their research publications spotlight ethical concerns, enhancing awareness and knowledge in this domain. The creation of educational resources empowers Africans to engage in the development of ethical AI frameworks and policy shaping.

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A case in point is Dr Claudia Aranda, whose impactful contributions extend to co-founding the African AI Ethics Alliance, a collective of African AI researchers and innovators dedicated to advancing ethical AI practices across the continent. This alliance has not only raised awareness of AI's ethical dimensions in Africa but has also established a set of context-specific ethical AI principles. These principles guide AI development and utilisation among African governments, businesses, and civil society organisations.[8] Similarly, Dr Ahmed Elgammal co-founded the Responsible AI Initiative, an instrumental programme propelling ethical AI in Egypt. This initiative equips Egyptian enterprises with tools and resources to foster ethical AI systems and imparts ethical AI training to numerous Egyptian professionals. Additionally, Dr Noopur Raval's endeavours of co-founding the AI for Social Good Africa Initiative are making waves. This initiative employs AI to tackle pressing societal issues in Africa, generating AI-powered solutions to enhance education, healthcare, and agriculture. It also conducts training sessions for African AI experts in leveraging AI for societal betterment.[9]

Remarkably, the collaborative endeavours of these African AI visionaries amplify AI's positive influence throughout Africa in addressing pressing challenges, and carving out innovative pathways, thus solidifying the potential for Africa's leadership in the ethical development and application of AI.[10] In the realm of education, AI's personalised learning, automated grading, and targeted feedback mechanisms are transforming educational experiences for many people in Africa.[11] Within healthcare, AI contributes to disease diagnosis, offers medical insights, and fuels research, significantly elevating healthcare standards. Agricultural practices have witnessed a leap forward as AI optimises crop yields, forecasts weather patterns, and effectively identifies pests and diseases. Financial domains benefit from AI's prowess, facilitating credit scoring, fraud detection, and providing invaluable investment guidance. Government services are also experiencing a notable overhaul through AI-enabled e-government provisions, anti-corruption measures, and well-informed policymaking, and bolstering governance.

In conclusion, APET recognises that these initiatives discussed above underscore the commitment of African AI researchers and innovators in advancing ethical AI principles throughout the continent. Their collective efforts not only ensure a positive influence of AI on Africa's progress but also has the potential of moving the continent forward as a pioneering force in ethical AI practices. Consequently, embracing responsible and ethical AI adoption positions Africa to harness the benefits of 4IR effectively. By cultivating an ethical AI foundation, the continent is better prepared to maximise AI's numerous advantages for growth.

Link: https://www.nepad.org/blog/new-dawn-embracing-ethical-adoption-and-adaptation-of-artificial-intelligence-ai-africa

Harnessing Digital Innovations To Revolutionise Justice Systems In Africa

Ensuring access to justice for all African citizens has long been recognised as a crucial element within democracy, effective government, and inclusive development. From the establishment of states to the constitutional establishment of democratic principles, and from safeguarding human rights to regulating economic interactions, legal systems play a pivotal role in shaping societal advancement. The importance of justice has gained renewed attention in the African Union's (AU) Agenda 2063, particularly in the 3rd aspiration which envisions an "Africa of Good Governance, Democracy, Respect for Human Rights, Justice, and the Rule of Law".[1] This aspiration underscores the integral connection between access to justice, enhanced socio-economic opportunities, gender equality, and individual financial stability – all essential for equitable and sustainable development and progress.[2]

The law governs every aspect of an individual's life, spanning health, employment, education, housing, and business. However, widespread barriers to economic involvement arise due to discrimination and unequal access to these domains, particularly impacting marginalised groups. Nonetheless, the functionality and legitimacy of these sectors are intertwined with legal structures. When individuals have access to justice, they can confront these inequalities and engage in legal procedures that foster inclusive development.[3] As such, access to justice encompasses a broad spectrum of issues, spanning fair treatment of litigants, the fairness of outcomes, the efficiency of case handling, and the system's responsiveness to users.

On a broader scale, "access to justice" signifies the impartiality through which individuals of diverse backgrounds can avail themselves of the legal process.[4] Yet, over a billion individuals, notably in sub-Saharan Africa (SSA), lack crucial access to justice, which is essential for safeguarding fundamental rights and combating exploitation to promote overall welfare.[5] The justice gap persists due to the inaccessibility of relevant technologies, chronic poverty and marginalisation, disproportionately affecting the most vulnerable who struggle to uphold rights such as education and clean water access and seek aid against gender-based violence, thereby exacerbating their impoverishment. Pervasive obstacles include extended court case delays, high costs, corruption, intricate legal processes, inadequate legal representation, and concerns about judicial equity, all of which have hindered access to justice.

The African Union High-Level Panel on Emerging Technologies (APET) envisions that the incorporation and integration of emerging technologies, such as machine learning (ML), blockchain and artificial intelligence (AI), can yield a favourable outcome by expediting the dispensation of justice across the continent. These innovative technologies are reshaping the landscape of legal administration and practice, offering avenues for heightened efficiency, transparency, and inclusivity. To achieve this goal, APET emphasises that African governments should allocate resources to emerging technologies while ensuring robust privacy

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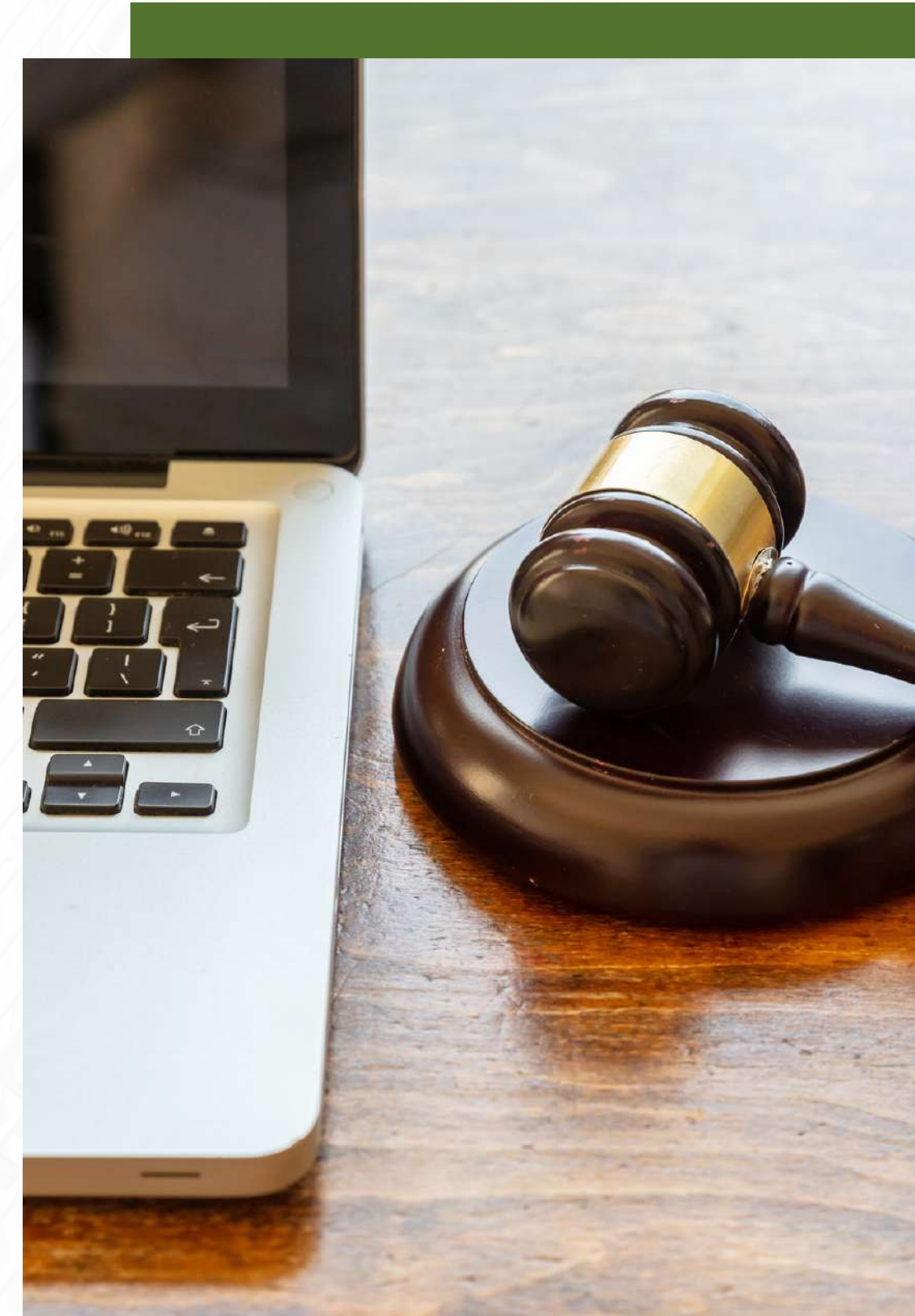
measures to protect the personal data of case participants. Enhancing the internet and technological infrastructure is vital, alongside facilitating access to these resources for marginalised populations, such as reducing internet costs for underserved communities. This approach optimally harnesses emerging technologies, bridges the potential digital divide arising from their integration in court proceedings, and advances equitable access to justice. Moreover, comprehensive training for court personnel in operating digital equipment within courtrooms is imperative.

Illustratively, within the legal realm, machine learning (ML) and artificial intelligence (AI) are assuming escalating significance. These technologies prove indispensable for legal research, adeptly dissecting extensive volumes of data to discern patterns and predict results. AI-driven document assessments expedite the discovery phase of litigation, rapidly identifying pertinent documents and highlighting areas of concern. Such advancements enhance precision and work quality by reducing manual review duration and mitigating human errors. For example, prominent AI legal tools encompass Paralegal AI and Legal Robot.
In addition to AI tools, APET advocates for the use of blockchain technology by AU Member States to enhance security and transparency within legal systems, thereby fostering trust. By providing a secure and transparent digital framework for data storage and sharing, blockchain technology can transform the management of legal contracts and documents. Essential records, such as property deeds or wills, can be securely stored and validated through blockchain technology, thereby, establishing an immutable record that can be easily accessible and verifiable. This innovation could streamline the process of establishing ownership and resolving legal matters related to such documents.

Furthermore, the integration of virtual reality and online dispute resolution platforms can significantly enhance the efficiency of legal representation and promote equitable justice systems across the continent. Virtual reality applications can simulate courtroom environments, enabling legal professionals and judges to engage in simulated trials and refine their expertise within authentic contexts. These applications also utilise algorithms and automated decision-making procedures to aid in conflict resolution, thereby reducing the reliance on traditional litigation for dispute settlement. In real-world scenarios, African countries have actively adopted these technologies to expedite and achieve justice. A notable instance occurred in 2015 when a British national, Chris Harris, was convicted of child abuse without necessitating the children's presence in the United Kingdom, where he was located. Through a video link from Kenya, the children provided testimony crucial testimony that contributed to Mr. Harris' conviction.[6] This international video link ensured that even young victims, some as young as 9 years old, could provide testimony in a safe and comfortable environment, thereby, avoiding confrontation with Harris in court.[7]

Within the Gauteng division of the High Court of South Africa, the integration of a digital case management system named "case lines" has facilitated electronic pleading submissions, improved document accessibility, and elevated overall case administration and management. Beyond countries like Ghana, Egypt, Rwanda, and Kenya, numerous African countries have also implemented computerised case management systems like "case lines".[8] In summary, APET advocates for the comprehensive adoption and integration of digital technology within African courts. The panel asserts that when thoughtfully developed and effectively implemented, digital tools can offer courts the potential to optimise internal processes, elevate user interactions, and democratise justice accessibility. Leveraging cloud and other technological resources, courts can refine internal workflows, broaden the reach and availability of justice, and enhance the transparency and accountability of court proceedings.

Link: https://www.nepad.org/blog/harnessing-digital-innovations-revolutionise-justice-systems-africa

Empowering Women's Political Participation Through The Adoption Of Gender-Responsive Innovative Technologies

Aspiration 6 of the African Union's Agenda 2063 envisions a future in Africa driven by its people, harnessing the potential of its citizens, with a special emphasis on its women and youth. Acknowledging the pivotal role that women play in advancing comprehensive development, Article 3 of the Protocol on Amendments of the African Union's Constitutive Act mandates the AU to guarantee the active involvement of women in decision-making, particularly in politics, economics, and socio-culture.[1] Additional frameworks within the AU that champion women's rights encompass Gender Equality and Women's Empowerment (GEWE), as well as the AU's African Charter on Human and Peoples' Rights on the Rights of Women in Africa. These initiatives collectively aim to ensure the full integration of women into Africa's development agenda.

In numerous African countries, politics wields a significant influence over and shapes the decision-making process that impacts people's lives. Furthermore, it determines the distribution of resources, thus shaping a country's developmental trajectory. The foundation of human rights is intertwined with politics, which also establishes the boundaries for morality and ethics. Without political structures, individuals would lack a solid framework and understanding of their rights as integral members of a nation or community, potentially leading to violations of human rights. People can acquaint themselves with their rights within the political and social sphere through legal documents and political agreements that outline these fundamental rights.[2]

Consequently, achieving the goals of AU-2063 requires the equitable participation of women in political and leadership roles. The complete and active involvement of women in legislative bodies, alongside men, is not solely an objective, but also a pivotal element for the establishment and sustenance of democratic systems. Women's equal representation, leadership, and perspectives in parliaments, for example, play a vital role in ensuring heightened responsiveness to the concerns of citizens.

Throughout history, women have faced limited opportunities for political engagement and participation. The aim of most African governments to achieve a 50% representation of females in politics across all tiers of government remains a considerable challenge, as stipulated by the 2008 Protocol on Gender and Development, which has been ratified by most African countries. Presently, women comprise merely 24% of the 12,113 parliamentarians on the continent, with 25% representation in lower houses and 20% in upper houses of parliaments.[3]

What are the issues? Numerous factors hinder women's entry into the political space. Often, women encounter unfavourable or even antagonistic political landscapes. Specifically concerning participation in politics and governance, some women suffer from various forms of harassment and abuse, which tend to be overlooked and underrepresented in dialogues. Within Africa, political parties

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contribute to a lack of political determination due to their exclusive focus on winning elections and solidifying their authority and tend to involve exclusion of women's participation. These factors shake women's confidence in their ability and available opportunities to partake in political processes.

The African Union High-Level Panel on Emerging Technologies (APET) suggests that technological progress across the African continent presents an opportunity to attain equitable representation of women in political roles. Within the political realm, access to information holds immense significance. For example, the expansion of the internet and social media has granted women greater access to information, enabling them to remain informed about laws, candidates, and subjects directly impacting them. As such, digital platforms provide women with spaces to educate themselves, form informed viewpoints, and actively participate in political discussions.

Furthermore, APET encourages African women to leverage the prevalence of social media platforms to advance their political agendas. Social media has emerged as a potent tool for women to share their narratives, articulate their ideas, and amplify awareness of their challenges. Unrestricted by physical boundaries, women can orchestrate campaigns, initiate virtual communities, and deliberate on policy matters. Particularly, artificial intelligence (AI) introduces insights that can foster formulating more effective policies and strategies. Additionally by utilising data, women can craft evidence-based policies that address the specific obstacles faced by them and other marginalised groups. This data becomes a resource for female politicians to identify trends, gauge public sentiment, and make informed decisions.

Numerous instances demonstrate how social media and AI are being harnessed to empower women in the realm of politics in Africa. For instance, in Kenya, Mzalendo employs social media to establish connections between women and elected officials, fostering accountability. The platform serves as a space for women to voice their concerns and ideas, while also offering effective social media engagement training.[4] In Nigeria, SheVotes employs AI to sift through social media data and identify potential voters, leading to targeted voter education campaigns.[5] Additionally, in South Africa, Code for Africa is in the process of developing an AI-driven tool aimed at assisting women in tracking the progress of gender equality legislation. This tool scans parliamentary records to flag instances of discrimination against women, thereby, fostering transparency.[6] These examples underscore how social media and AI are instrumental in equipping women with political influence across Africa.

The technologies discussed above possess the potential to level the playing field and amplify women's voices within the political process.[7] Further exemplifying the empowerment of women in African countries and enterprises through social media and AI, Rwanda's Ministry of Gender and Family Promotion employs these platforms to raise awareness of women's rights and advocate for gender equality. In South Africa, the Women's Legal Centre utilises AI to monitor the advancement of gender equality cases within the legal system, enabling trends to be identified and reforms championed. Meanwhile, in Kenya, SheCodes Africa employs social media to impart coding skills to women to enhance their opportunities to take up leadership roles.

The above illustrations highlight how women in Africa are capitalising on emerging technologies for political advancement. While these tools can offer empowerment, it is important to acknowledge the potential risks, such as online security and harassment. Taking this into account, continued investment in these

technologies, coupled with safeguard measures by government and private sector alike, can pave the way for meaningful change and amplified women's voices within the political arena. APET asserts that while technology presents opportunities for enhancing women's participation in leadership positions, it is also accompanied by challenges or potential risks. Awareness of these potential drawbacks is crucial, thereby emphasising the importance of responsible and gender sensitive use of emerging and innovative technologies to enhance women's political participation.

Link: https://www.nepad.org/blog/empowering-womens-political-participation-through-adoption-of-gender-responsive-innovative

AI-Enhanced Fire-Fighting: Protecting Tanzania's Forests Through The Adoption Of Emerging Technologies

The African continent boasts a rich tapestry of diverse forest ecosystems, bestowing numerous benefits upon its inhabitants. Africa is, notably, home to the world's second-largest rainforest, the Congo Basin, which encompasses 17% of the world's forests and 31% of the wooded areas found in the Sahel and other regions.[1] These landscapes serve as vital sources of various essential products and services, including sustenance, energy resources, shelter, and freshwater. Furthermore, they offer crucial protection against various threats and serve as habitat for a wide array of species. Frameworks such as the African Union's Agenda 2063 and the African Convention on the Conservation of Nature and Natural Resources provide guidance towards the preservation and safeguarding of these invaluable forest ecosystems.[2]

Regrettably, the foremost environmental challenge faced by the African continent revolves around the relentless depletion of its forest ecosystems, commonly referred to as deforestation. The gravity of this issue is underpinned by the forests' substantial economic and ecological value and the unmistakable adverse effects deforestation imposes on both human populations and wildlife.[3] The repercussions include the alarming loss of biodiversity, the release of greenhouse gases into the atmosphere, disturbances in water cycles, heightened soil erosion rates, and the profound disruption of livelihoods.[4]

Deforestation rates are particularly higher in tropical African Union (AU) Member States experiencing population growth and widespread poverty, and Tanzania is no exception to this trend. The United Nations has reported that approximately 37.7% or about 33 million hectares of Tanzania's land area is covered by forests, with woodlands accounting for approximately 90% of this forested land. Additional types of forests in Tanzania encompass coastal woodlands, mangroves, and acacia forests. [5]

Disturbingly, Tanzania is grappling with a severe crisis of forest loss. Over the two decades spanning from 1990 to 2010, the country experienced an average annual loss of slightly over 4 hundred thousand hectares, which is the equivalent to 0.97% of its forest area. The cumulative loss during this period amounted to a staggering 19.4%, encompassing roughly 8 million hectares of forest cover. Recent assessments paint an even bleaker picture, indicating that Tanzania has already lost 38% of its forested regions. Should the current trajectory persist, Tanzania's entire forested area could be depleted within the next 50 to 80 years.[6]

The depletion of the forest cover in Tanzania has had a profound and adverse impact on its rich biodiversity. A considerable number of indigenous plant and animal species are unique to Tanzania, yet their survival is gravely threatened due to the habitat destruction caused by deforestation. Historically, Tanzania's forestry sector has been a vital source of employment

and income, but these opportunities have dwindled in tandem with the reduction in forested areas. Additionally, the diminishing tree population has played a role in exacerbating climate change, resulting in various detrimental economic consequences, including reduced agricultural yields, heightened health-related risks and infrastructure degradation.[7]

Deforestation in Tanzania primarily stems from several key factors such as the requirement of land for the expansion of agriculture, logging, timber extraction, mining activities and infrastructure development. Additionally, the situation has been exacerbated by an increase in wildfires, a trend observed worldwide, including in Tanzania. Over the period from 2001 to 2022, Tanzania experienced a loss of approximately 3.01 million hectares due to various factors, with wildfires contributing to the loss of 8.81 thousand hectares of tree cover.[8] Furthermore, the surge in wildfires within Tanzania can be attributed to a range of causes, such as the quest for improved pasture quality, the control of parasites, facilitation of wildlife hunting, honey collection, charcoal production, mining activities, pit sawing, grazing practices, farm expansion, arson, with wildfires often attributed to human activities such as pedestrian movements or internal migration.[9]

The AU High-Level Panel on Emerging Technologies (APET) is advocating for AU Member States, including Tanzania, to embrace artificial intelligence (AI) such as satellite imagery and surveillance of forest canopies, machine learning, spatial modeling software and an artificial neural network architecture to map the links between past forest loss and drivers as a means of safeguarding their ecosystems. AI can substantively aid the preservation of African forests through the provision of advanced tools and technologies for their monitoring, administration, and protection. AI is a field of science and engineering that focuses on creating intelligent machines, particularly intelligent computer programmes[10]. APET argues that AI can play a significant role in protecting forests from wildfires by offering early detection, continuous monitoring, and effective management solutions.[11]

The utilisation of aerial and satellite imagery analysis through remote sensing technology allows for the rapid identification of potential wildfire outbreaks by detecting indicators such as smoke, heat, or abnormal patterns within forested regions. Employing image analysis for early detection can also help in identifying fires at their inception. AI systems are capable of scanning images and videos captured by cameras situated in various locations to discern signs such as smoke or flames. Furthermore, they can harness data from Internet of Things (IoT) sensors placed in forested areas, including temperature, humidity, and wind speed, to identify any unusual conditions that may signify the onset of a fire. Part of the problem is a lack of adequate forest monitoring, and the challenge of "obtaining accurate and consistent spatial data on deforestation". Even with the use of satellite imagery and surveillance of forest canopies, 'filtering large amounts of data can be slow, labour intensive, and expensive".

AI's application in enhancing wildfire detection, monitoring, and management across African nations introduces innovative solutions. Hharnessing AI serves as a promising innovation for enhancing the accuracy of forest monitoring, with the potential to be adapted to other AU Member States through adequate government support, robust policy frameworks, and international cooperation. In Tanzania, the Tanzania Forest Service (TFS) utilizes AI to construct a predictive model for wildfire risk by considering factors such as weather, topography, and vegetation, effectively identifying high-risk areas.[12] This insightful data informs resource allocation and the establishment of early warning systems. Additionally, TFS employs satellite imagery analysis to develop this predictive model, aiding in resource allocation and early warning system implementation. Complementing this effort, TFS has installed a network of cameras in its parks, equipped with AI
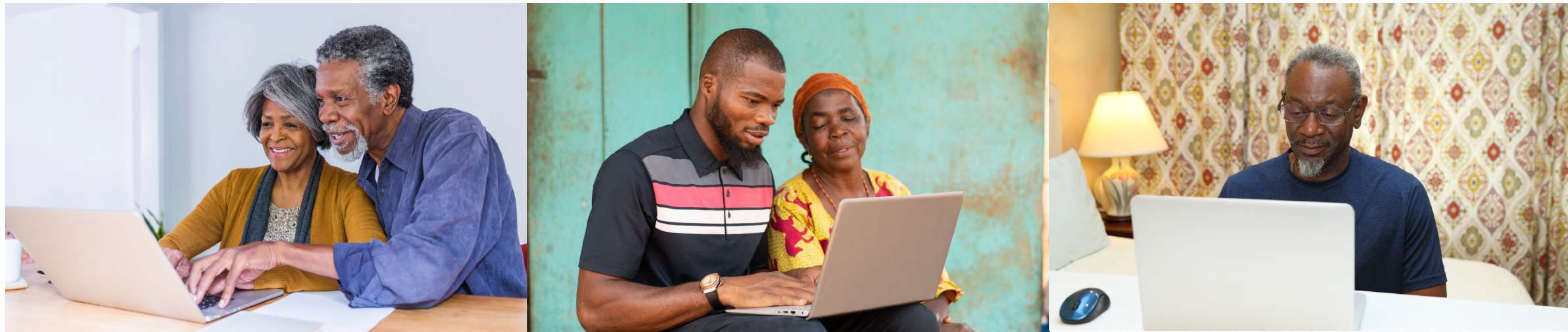
software, capable of automatically detecting wildfire indicators such as smoke, and transmitting immediate alerts to firefighters.[13] Collaborating with Conservation International, TFS utilizes an AI-powered system for real-time wildfire movement tracking via satellite imagery. This information enhances coordination among firefighters, ensuring the protection of both wildlife and communities.

In South Africa, on the other hand, the South African National Parks (SANParks) employs AI for early wildfire detection. A network of AI-equipped cameras is strategically deployed across SANParks' territories. These cameras autonomously detect smoke and other wildfire indicators in promptly alerting firefighting teams.[14] In Kenya, the Kenya Wildlife Service (KWS) partners with Conservation International to employ AI in monitoring wildfire propagation. The collaboration has yielded an AI-driven system that analyses satellite imagery in real-time to track wildfire movements. This information enhances the coordination of firefighting efforts while safeguarding wildlife and communities.[15]

APET asserts that integrating AI ethically and responsibly is of utmost importance in addressing deforestation in Tanzania and other AU Member States. Key ethical and responsible principles for the implementation of AI in wildfire management for example, could encompass designing AI-powered firefighting robots with a strong focus on minimising environmental impact. Additionally, governments and relevant stakeholders have a responsibility in ensuring that AI-driven early warning systems are accessible to all communities, irrespective of their socio-economic status. APET, therefore, urges African governments to develop AI-powered resource allocation systems that uphold the principles of equity, fairness, and non-discrimination. APET, posits, therefore, that by embracing AI with a commitment to ethical and responsible practices, AU Member States can strengthen their capacity to combat the escalating deforestation, wildfire threats, protect communities and preserve the environment for future generations.

Link: https://www.nepad.org/blog/ai-enhanced-fire-fighting-protecting-tanzanias-forests-through-adoption-of-emerging

Blog #25 Published on Sep 28, 2023

Never Too Late To Learn: Adopting Innovation And Emerging Technologies To Improve Adult Literacy In Africa

The fourth objective of the African Union's (AU) Agenda 2063 aims to ensure the well-being of African citizens, through promoting health and access to nutritious food. African countries, however, face significant challenges in accomplishing food security due to factors such as a growing population, urbanisation, and limited agricultural and food production capacity.[1] The number of people experiencing moderate to severe food insecurity on the African continent has increased from 512 million in 2014 to 794.7 million in 2021, affecting approximately 60% of the continent's population. Regrettably, Africa's current agricultural production trajectory does not align with the food security and nutrition targets outlined in the AU Agenda 2063.[2]

The agricultural sector stands as a cornerstone of African economies, serving as a multifaceted generator of income through foreign trade, employment opportunities, and vital sustenance. This underscores its immense potential to contribute significantly to crucial continental objectives, including poverty alleviation, hunger eradication, the promotion of intra-African trade and investment, acceleration of industrialisation and economic diversification, and sustainable resource and environmental management. [3] A pivotal catalyst for propelling economies forward, therefore, lies in the substantial growth of agricultural productivity, underpinned by technological advancements and strategic investments. These collective factors kindle optimism for a noteworthy upsurge in agricultural output across the African continent, particularly in the 21st century.

Despite the enormous potential of Africa as a breadbasket, the agricultural sector of the continent is faced with constraints that hinder its progress and the welfare of its populations. These barriers are multifaceted and often intertwined, contributing to a complex web of issues, which include low productivity, characterised by meagre yields attributed to outdated farming methods, especially weeding and harvesting, restricted access to contemporary agricultural technologies, and underutilisation of fertilisers and improved seeds.[4] African countries are confronted with alarming levels of food loss, with wastage rates reaching up to 50% during both pre-harvest and post-harvest stages.[5] This issue is exacerbated by the continent's underdeveloped infrastructure, labour shortages, a scarcity of skilled farmworkers, and the unpredictable tropical climate.

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Additionally, the adverse impacts of climate change, including droughts and floods, inadequate infrastructure encompassing road and storage facilities, and irrigation systems, shortage of agricultural financing, constrained market access, post-harvest losses, and the persistence of pests and diseases further compound the challenges. Drones are used for information gathering and to automate input application, similarly, to map based VRT. However, their use is often subject to strict regulations due to concerns about excessive input application, pesticide drift and aviation hazards.

The African Union High-Level Panel on Emerging Technologies (APET) notes that the quest for a promising and transformative frontier in African agriculture could be enhanced by the adoption and integration of robotics in agriculture through modern farming practices such as mechanisation. Robotics-based mechanisation holds significant promise, especially in the realm of harvesting, a critical component of Africa's economy and its pursuit of food security.[6]

As a policy imperative, APET recommends that AU Member States expedite the adoption of modern agricultural practices and techniques. This should include the integration of robotics into weeding and harvesting processes, to advance the continent's quest for food security. For instance, many farms across the continent continue to rely on traditional manual weeding and harvesting methods. Manual weeding and harvesting entail the labour-intensive process of manually removing leaves and branches from plants, sometimes employing cutting tools, and carefully plucking fruit from the plants by hand. The introduction of robotic systems in the crop fields enables highly repeatable systematic actions, such as selective mechanical weeding (which reduces the proliferation of superweeds) and health monitoring of crop and soil. Thus, by embracing modern farming techniques, such as robotic harvesting, African farmers can revolutionise these practices and significantly contribute to enhancing food security in the region.[7] By embracing robotics-based mechanisation, African countries have the potential of addressing critical issues of poor harvesting practices and food wastage, bolster agricultural efficiency, and ultimately contribute to ensuring a sustainable and abundant food supply for its growing population.

APET observes that the adoption of robotics technology and especially robotics-based mechanisation in African agriculture further offers a promising solution to mitigate challenges associated with, severe rainfall, drought, microbial contamination, and physical damage that contribute to a staggering 1.3 billion tonnes of food wastage globally. This is because robots are equipped with advanced sensors and algorithms that can accurately assess crop ripeness, execute precision harvesting, and navigate challenging weather conditions. This not only reduces food losses but also enhances overall crop yields, thereby improving food security and livelihoods for farmers.[8]

Several AU Member States are leading the way in adopting agricultural robotics to modernise their farming practices. Kenya, a pioneer in this field, boasts of numerous startups dedicated to developing and deploying harvesting robots for various crops, including tomatoes, strawberries, and avocados.[9] Farmdroid, for instance, has engineered a robotic tomato harvester with a daily capacity of up to 20 tonnes.[10] In Nigeria, there is a growing interest in agricultural robotics, with large-scale farms utilising harvesting robots to boost productivity. AgroPro, for example, has introduced a robotic maize harvester capable of handling up to 10 hectares of maize daily.[11]

Ethiopia, with its vast agricultural sector and expanding population, is witnessing a rising demand for harvesting robots to combat labour shortages and enhance efficiency. Blue River Technology's robotic tomato harvester can collect 20 tonnes of tomatoes daily while minimising fruit damage.[12] On the other hand, South

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Africa, a developed nation with a well-established agricultural industry, is harnessing harvesting robots to optimise efficiency and curtail post-harvest losses. Trimble's robotic strawberry harvester, for instance, can gather up to 10 tonnes of strawberries each day.[13] Further to this, Morocco, known for its sizable agricultural sector, is also embracing agricultural robotics to enhance efficiency and reduce post-harvest losses. For example, Naio Technologies has devised a robotic strawberry harvester capable of collecting up to 10 tonnes of strawberries daily, further illustrating the continent's commitment to revolutionising its agricultural landscape through the adoption of technologies.[14]

Furthermore, some pioneering innovators in Africa are making significant strides in the development of robotic and mechanical systems designed to revolutionise the harvesting of diverse root crops. Cassava, a particularly challenging crop to harvest manually due to its labour-intensive nature, is a prime example. Manual cassava harvesting has posed a substantial hurdle in the path to commercialising this vital crop, as it entails arduous labour, often resulting in stress, physical discomfort, and time efficiency. In order to address this challenge, the Kwame Nkrumah University of Science and Technology (KNUST), in Ghana, has introduced the TEK mechanical harvester.[15] This groundbreaking technology has the remarkable capability to harvest one cassava plant in just one second, a stark contrast to the laborious 5 to 10 min required for manual harvesting, with the potential to significantly streamline the cassava harvesting process across the continent.

To encourage the adoption of crop harvesting robots in African agriculture, APET urges African policy and decision makers to facilitate financial support for farmers seeking to acquire harvesting robots through avenues such as government grants, loans, and subsidies. Additionally, AU Member States are encouraged to invest in research and development to enhance the affordability and accessibility of these robots for African farmers, through public-private partnerships and collaboration. Such collaborations could include sensitisation and awareness creation, demystifying of technologies especially robots, comprehensive training and capacity strengthening and technical guidance for farmers on how to effectively utilise harvesting robots. Finally, APET recommends that AU Member States, especially policymakers develop supportive and enabling regulations aimed at reducing bureaucratic burdens, and providing tax incentives to farmers who invest in this technology. To this end, tailoring policies to specific crops or regions, such as avocados, cassava, and fruits, with targeted financial aid for robot adoption, could prove beneficial. Most importantly, provision of financial assistance and technical support to research and development organisations working on robotics for adoption and adaptation in African could be instrumental in overcoming barriers and reaping the technology's rewards.

In conclusion, APET proposes to AU Member States the development of small, low-cost autonomous crop machines for small- and medium-scale farms as part of the solution to the lack of agricultural labour in low- and middle-income African countries, with potential benefits especially for rural youth. Unfortunately, there are inadequate feasibility analyses for African countries. Nevertheless, the available literature indicates that the adoption of autonomous robots in these countries has the following potential benefits: reduced human labour requirement, where labour is scarce; lower costs and reduced economies of scale, ensuring accessibility of technologies to smaller farms using conventional mechanisation; and ability to use technologies in irregularly shaped fields in a cost-effective manner, avoiding the reshaping of rural landscapes into large rectangular fields, where traditional mechanisation is most efficient, a process that disrupts communities.

Link: https://www.nepad.org/blog/never-too-late-learn-adopting-innovation-and-emerging-technologies-improve-adult-literacy

Transforming African Agriculture Through Adoption Of Robotics Technology

The fourth objective of the African Union's (AU) Agenda 2063 aims to ensure the well-being of African citizens, through promoting health and access to nutritious food. African countries, however, face significant challenges in accomplishing food security due to factors such as a growing population, urbanisation, and limited agricultural and food production capacity.[1] The number of people experiencing moderate to severe food insecurity on the African continent has increased from 512 million in 2014 to 794.7 million in 2021, affecting approximately 60% of the continent's population. Regrettably, Africa's current agricultural production trajectory does not align with the food security and nutrition targets outlined in the AU Agenda 2063.[2]

The agricultural sector stands as a cornerstone of African economies, serving as a multifaceted generator of income through foreign trade, employment opportunities, and vital sustenance. This underscores its immense potential to contribute significantly to crucial continental objectives, including poverty alleviation, hunger eradication, the promotion of intra-African trade and investment, acceleration of industrialisation and economic diversification, and sustainable resource and environmental management.[3] A pivotal catalyst for propelling economies forward, therefore, lies in the substantial growth of agricultural productivity, underpinned by technological advancements and strategic investments. These collective factors kindle optimism for a noteworthy upsurge in agricultural output across the African continent, particularly in the 21st century.

Despite the enormous potential of Africa as a breadbasket, the agricultural sector of the continent is faced with constraints that hinder its progress and the welfare of its populations. These barriers are multifaceted and often intertwined, contributing to a complex web of issues, which include low productivity, characterised by meagre yields attributed to outdated farming methods, especially weeding and harvesting, restricted access to contemporary agricultural technologies, and underutilisation of fertilisers and improved seeds.[4] African countries are confronted with alarming levels of food loss, with wastage rates reaching up to 50% during both pre-harvest and post-harvest stages.[5] This issue is exacerbated by the continent's underdeveloped infrastructure, labour shortages, a scarcity of skilled farmworkers, and the unpredictable tropical climate.

Additionally, the adverse impacts of climate change, including droughts and floods, inadequate infrastructure encompassing road and storage facilities, and irrigation systems, shortage of agricultural financing, constrained market access, post-harvest losses, and the persistence of pests and diseases further compound the challenges. Drones are used

for information gathering and to automate input application, similarly, to map based VRT. However, their use is often subject to strict regulations due to concerns about excessive input application, pesticide drift and aviation hazards.

The African Union High-Level Panel on Emerging Technologies (APET) notes that the quest for a promising and transformative frontier in African agriculture could be enhanced by the adoption and integration of robotics in agriculture through modern farming practices such as mechanisation. Robotics-based mechanisation holds significant promise, especially in the realm of harvesting, a critical component of Africa's economy and its pursuit of food security.[6]

As a policy imperative, APET recommends that AU Member States expedite the adoption of modern agricultural practices and techniques. This should include the integration of robotics into weeding and harvesting processes, to advance the continent's quest for food security. For instance, many farms across the continent continue to rely on traditional manual weeding and harvesting methods. Manual weeding and harvesting entail the labour-intensive process of manually removing leaves and branches from plants, sometimes employing cutting tools, and carefully plucking fruit from the plants by hand. The introduction of robotic systems in the crop fields enables highly repeatable systematic actions, such as selective mechanical weeding (which reduces the proliferation of superweeds) and health monitoring of crop and soil. Thus, by embracing modern farming techniques, such as robotic harvesting, African farmers can revolutionise these practices and significantly contribute to enhancing food security in the region.[7] By embracing robotics-based mechanisation, African countries have the potential of addressing critical issues of poor harvesting practices and food wastage, bolster agricultural efficiency, and ultimately contribute to ensuring a sustainable and abundant food supply for its growing population.

APET observes that the adoption of robotics technology and especially robotics-based mechanisation in African agriculture further offers a promising solution to mitigate challenges associated with, severe rainfall, drought, microbial contamination, and physical damage that contribute to a staggering 1.3 billion tonnes of food wastage globally. This is because robots are equipped with advanced sensors and algorithms that can accurately assess crop ripeness, execute precision harvesting, and navigate challenging weather conditions. This not only reduces food losses but also enhances overall crop yields, thereby improving food security and livelihoods for farmers.[8]

Several AU Member States are leading the way in adopting agricultural robotics to modernise their farming practices. Kenya, a pioneer in this field, boasts of numerous startups dedicated to developing and deploying harvesting robots for various crops, including tomatoes, strawberries, and avocados.[9] Farmdroid, for instance, has engineered a robotic tomato harvester with a daily capacity of up to 20 tonnes.[10] In Nigeria, there is a growing interest in agricultural robotics, with large-scale farms utilising harvesting robots to boost productivity. AgroPro, for example, has introduced a robotic maize harvester capable of handling up to 10 hectares of maize daily.[11]

Ethiopia, with its vast agricultural sector and expanding population, is witnessing a rising demand for harvesting robots to combat labour shortages and enhance efficiency. Blue River Technology's robotic tomato harvester can collect 20 tonnes of tomatoes daily while minimising fruit damage.[12] On the other hand, South Africa, a developed nation with a well-established agricultural industry, is harnessing harvesting robots to optimise efficiency and curtail post-harvest losses.

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Trimble's robotic strawberry harvester, for instance, can gather up to 10 tonnes of strawberries each day.[13] Further to this, Morocco, known for its sizable agricultural sector, is also embracing agricultural robotics to enhance efficiency and reduce post-harvest losses. For example, Naio Technologies has devised a robotic strawberry harvester capable of collecting up to 10 tonnes of strawberries daily, further illustrating the continent's commitment to revolutionising its agricultural landscape through the adoption of technologies.[14]

Furthermore, some pioneering innovators in Africa are making significant strides in the development of robotic and mechanical systems designed to revolutionise the harvesting of diverse root crops. Cassava, a particularly challenging crop to harvest manually due to its labour-intensive nature, is a prime example. Manual cassava harvesting has posed a substantial hurdle in the path to commercialising this vital crop, as it entails arduous labour, often resulting in stress, physical discomfort, and time efficiency. In order to address this challenge, the Kwame Nkrumah University of Science and Technology (KNUST), in Ghana, has introduced the TEK mechanical harvester.[15] This groundbreaking technology has the remarkable capability to harvest one cassava plant in just one second, a stark contrast to the laborious 5 to 10 min required for manual harvesting, with the potential to significantly streamline the cassava harvesting process across the continent.

To encourage the adoption of crop harvesting robots in African agriculture, APET urges African policy and decision-makers to facilitate financial support for farmers seeking to acquire harvesting robots through avenues such as government grants, loans, and subsidies. Additionally, AU Member States are encouraged to invest in research and development to enhance the affordability and accessibility of these robots for African farmers, through public-private partnerships and collaboration. Such collaborations could include sensitisation and awareness creation, demystifying of technologies especially robots, comprehensive training and capacity strengthening and technical guidance for farmers on how to effectively utilise harvesting robots.

Finally, APET recommends that AU Member States, especially policymakers develop supportive and enabling regulations aimed at reducing bureaucratic burdens, and providing tax incentives to farmers who invest in this technology. To this end, tailoring policies to specific crops or regions, such as avocados, cassava, and fruits, with targeted financial aid for robot adoption, could prove beneficial. Most importantly, provision of financial assistance and technical support to research and development organisations working on robotics for adoption and adaptation in African could be instrumental in overcoming barriers and reaping the technology's rewards.

In conclusion, APET proposes to AU Member States the development of small, low-cost autonomous crop machines for small- and medium-scale farms as part of the solution to the lack of agricultural labour in low- and middle-income African countries, with potential benefits especially for rural youth. Unfortunately, there are inadequate feasibility analyses for African countries. Nevertheless, the available literature indicates that the adoption of autonomous robots in these countries has the following potential benefits: reduced human labour requirement, where labour is scarce; lower costs and reduced economies of scale, ensuring accessibility of technologies to smaller farms using conventional mechanisation; and ability to use technologies in irregularly shaped fields in a cost-effective manner, avoiding the reshaping of rural landscapes into large rectangular fields, where traditional mechanisation is most efficient, a process that disrupts communities.

Link: https://www.nepad.org/blog/transforming-african-agriculture-through-adoption-of-robotics-technology

Empowering Fair And Inclusive Elections: How AI Is Shaping The Future Of Democracy In Africa

The African Union (AU) has a comprehensive mandate that encompasses the establishment, maintenance, and advancement of democracy within its Member States. Since 2000, the AU has continuously expanded its mission to promote democracy on the continent, introducing innovative measures to combat unconstitutional regime changes and foster the growth of democratic institutions.[1] Particularly, the AU's development roadmap, known as the AU's Agenda 2063, emphasises the pivotal role of democracy as a fundamental prerequisite for sustainable human development across the continent. This commitment is further evident in frameworks such as the African Charter on Democracy, Elections and Governance, which actively stimulates Africa's economic growth and development by advocating for citizen participation and enhanced cooperation and integration among AU Member States.[2]

Elections stand as one of the pillars of a well-functioning democracy, playing a pivotal role in shaping a nation's political landscape and determining its destiny. Beyond the mere act of casting votes, elections are integral to the core principles of democracy, exerting a profound influence on the effectiveness and integrity of a society. Furthermore, elections empower citizens, foster accountability, and promote transparency, thus impacting a country's overall development and governance. Their significance extends far beyond the ballot box, encompassing broader ideals of democratic governance, the rule of law, social inclusivity, economic progress, and the safeguarding of human rights. In essence, active participation in elections serves as a catalyst to combat marginalisation, prejudice, and inequality, while concurrently upholding essential human rights such as freedom of expression, access to education, and the right to peaceful assembly and association.[3]

Furthermore, elections serve as the cornerstone for selecting and appointing leaders within democratic societies. In representative democracies, transparent and equitable elections are indispensable to the functioning of democratic governance. These electoral processes empower the populace to exercise authority in choosing leaders and representatives while simultaneously holding them accountable for their actions.[4] Flawed or absent electoral systems can lead to political authoritarianism and the dominance of individual rule in Africa. Unfortunately, the mechanisms governing elections and the principles and procedures that underpin them on the continent frequently deviate from established standards, resulting in practices such as lawlessness, violence, and election nullifications within African democratic societies. Conversely, when elections are conducted fairly and freely, they contribute to the promotion of peace and stability, attracting investments that, if properly managed, can facilitate economic growth.[5]

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The continent faces two paramount challenges that often result in elections being deemed neither free nor unfair: these are the lack of voter engagement and low voter turnout. Voter engagement and turnout hold immense significance as elections serve as the cornerstone of decision-making in contemporary democracies. When turnout remains low, the votes cast represent only a small fraction of the entire population. The factors contributing to this issue are multifaceted.[6] Notably, voter apathy is a concern, where citizens feel disconnected from the political process and doubt the impact of their vote. This disillusionment can deter them from engaging and participating in elections. Furthermore, specific demographic groups, such as young people, minorities, and those with lower incomes, often exhibit lower voter turnout rates. Legislative measures that restrict voting rights, such as voter identification requirements, voter roll purges, and felony of disenfranchisement, can discourage eligible voters from exercising their right to vote.[7]

Fundamentally, high levels of political polarisation can lead to divisive and unproductive campaigning, disenchanting voters and fostering a sense of disillusionment. Additionally, voter suppression tactics further exacerbate the challenges, impeding the free and fair conduct of elections. Therefore, addressing these multifaceted issues is essential for promoting genuine democracy and ensuring that elections truly reflect the will of the people.

The African Union High Level Panel on Emerging Technologies (APET) has recognised the potential significance of artificial intelligence (AI) in the facilitation of free and fair elections across Africa. AI refers to the capability of digital computers or computer-controlled robots to perform tasks typically associated with intelligent beings.[8] APET highlights that AI can revolutionise the way governments engage with voters and enhance voter participation in democratic elections. Particularly, AI's capabilities, including personalised outreach, predictive analysis of voter behaviour, real-time information dissemination, social media sentiment monitoring, targeted voter registration efforts, and the combatting of voter suppression, collectively contribute to a more robust and inclusive electoral process. As technology continues to advance, AI is poised to assume an even greater role in shaping the future of democracy, ensuring that every eligible voter can actively participate and have their voice heard.

In the African landscape, numerous pioneering startup companies are harnessing the power of AI to advance and enrich voter engagement, showcasing the multifaceted applications of AI within the electoral domain. For instance, iVerify, based in Nigeria, employs AI as a formidable tool in the battle against election-related misinformation and critical issue inaccuracies, ensuring voters' access to trustworthy information.[9]

Moreover, the Voter Turnout Project, a non-profit organisation also based in Nigeria,[10] leverages AI to pinpoint unregistered voters and establish meaningful connections with them, simplifying the voter registration process.[11] To facilitate accessible information dissemination through mobile applications, Election Buddy in Kenya offers a mobile app that equips voters with vital election-related details, such as polling locations and candidate profiles.[12] In contrast, Ghana's Politburo introduced a mobile app designed for voter registration and monitoring of registration status, streamlining the electoral procedure.[13]

In South Africa, Vote Compass operates a website that empowers voters to scrutinise candidates' stances on pivotal issues, promoting well-informed decision-making.[14] Additionally, Ghana's Voter Registration Drive utilises AI to discern and target prospective voters, tailoring messages to potentially encourage voter registration.[15] In Nigeria, Vote Compass enriches personalised voter education by employing AI to facilitate voters' understanding of candidates and issues,

aligning voters with candidates who share their convictions.[16] Additionally, mobile money platforms such as M-PESA play a crucial role in simplifying voter registration processes. In Kenya, M-PESA collaborates with the electoral commission, making it possible for citizens to register as voters and cover election-related costs conveniently via their mobile phones.[17]

APET emphasises the significance of AI-powered predictive analytics, aiding campaigns in pinpointing probable voters and refining resource allocation for mobilisation endeavours. Furthermore, chatbots and virtual assistants interact with voters, delivering essential details on registration, polling sites, and elections, thereby simplifying the entire process.[18] AI's capacity to monitor social media platforms for real-time public opinion assessment equips campaigns with the agility to tailor strategies based on sentiment analysis. Moreover, AI automates vital election administration functions, encompassing tasks like voter registration and ballot tallying, elevating efficiency, and precision in the process.[19]

APET underscores that these initiatives emphasise AI's transformative potential within the electoral arena, reinforcing the dedication to enhancing the accessibility, inclusivity, and efficiency of elections. Nigeria's remarkable use of AI to combat misinformation during recent elections exemplifies the positive impact of AI on voter participation. As AI technology advances, APET foresees the emergence of increasingly inventive solutions aimed at revitalising voter engagement and reinforcing the pillars of democracy. By harnessing AI's capabilities, AI-related innovations aspire to make elections more accessible, inclusive, and efficient, ensuring that the voices of all citizens resound. As AI technology progresses further, APET anticipates a continual stream of innovative solutions designed to foster voter participation and fortify the democratic processes.[20]

Finally, APET recommends that African governments, policymakers, and implementers boost voter participation through AI by investing in research and development to support innovative solutions. Furthermore, through establishing a regulatory framework to ensure fair and transparent AI use, forging partnerships with the private sector and civil society for AI-powered solutions and educating the public about AI's role in elections to build trust. The specific AI-powered solutions that should be considered include voter registration systems that streamline the registration process, voter education tools that provide personalised information, voter mobilisation campaigns targeting potential voters, and tools to detect and combat misinformation. It cannot be overemphasized that AI holds significant potential to enhance voter engagement, thereby making elections more accessible and inclusive, ultimately ensuring that all citizens' voices are heard in the democratic process.

Link: https://www.nepad.org/blog/empowering-fair-and-inclusive-elections-how-ai-shaping-future-of-democracy-africa

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