Digital as a Key Enabler for Climate Action

The Sub-Saharan Africa Perspective

Introduction

As an addition to our global study "The Road to Sustainability: Digital Technologies as a Key Enabler for Climate Action," this regional chapter further explores how digital technologies can be leveraged to meet the challenges across the three pillars of climate action (Mitigation, Adaptation & Resilience, Setting Foundations). As one out of six regional deep dives, this chapter is intended to adapt global recommendations to the local context and distinct regional dynamics within **Sub-Saharan Africa (SSA).**

Sub-Saharan Africa is a diverse region with a wide range of countries, politics, infrastructure, and perspectives. Alongside the regional outlook, we have chosen to focus on three specific countries: **South Africa, Kenya, and Nigeria.**

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Climate Action in SSA – the current state

As the coming years will have the greatest influence on future climate stability, there is little time left to deploy and implement climate protection actions. One key component, though not sufficient on its own, is the reduction of greenhouse gases (GHG) (mitigation) to meet the Paris Agreement commitments to **limit overall global warming to 1.5 °C.**

The SSA region was responsible for **2.48 Gt CO2eq in 2022 or 4.6% of total global GHG emissions.**[1] South Africa is by far the highest emitter of greenhouse gases in the region (535 Mt CO2eq), followed by Nigeria (408 Mt CO2eq), while Kenya emitted 118 Mt CO2eq in 2022. Together, these three countries account for **43% of the emissions at the regional level and 60% of the region's GDP.**[2]

Despite contributing less than 5% of global emissions,[3] Sub-Saharan Africa faces severe climate change impacts, including rising temperatures, droughts, flooding, and rising sea levels,[4] significantly affecting the agricultural and energy sectors (which contribute 22% and 4.5% of SSA's 2022 GDP, respectively).[5] The annual cost of addressing climate-related damage in SSA is estimated at USD 10 billion,[6] disproportionately affecting the region's most vulnerable populations.

In response, SSA countries have established ambitious climate goals to enhance climate resilience, expand access to renewable energy, and reduce greenhouse gas emissions, aligning with key policies such as the African Union Agenda 2063, the United Nations Sustainable Development Goals (SDGs), the Paris Agreement, and the African Union Climate Change and Resilient Development Strategy and Action Plan, which further supports these commitments.[7] **Many African countries have started to take action in the form of bills to address climate change concerns** such as the Kenya Climate Act (2013), which sets a target to reduce greenhouse gas emissions 30% by 2030 compared to 2013 levels or the Nigeria Climate Change Act (2021), the first stand-alone comprehensive climate change legislation in West Africa. Nigeria recently updated its conditional emission target to 47% by 2030 compared to 2021 levels.[8]

In South Africa, the National Assembly passed the Climate Change Bill in October 2023, a bill that **introduces a 'carbon budget' concept, limiting greenhouse gas emissions by entities.**[9] Parallel to these legislative actions, South Africa is progressing in its Just Energy Transition (JET), thus far securing USD 9.3 billion from local and international investors to partner with the nation to achieve energy security, economic growth, and to tackle poverty, inequality, and unemployment, while achieving its climate change targets.

The African Leaders Nairobi Declaration on Climate Change, issued at the inaugural Africa Climate Summit in Nairobi in September 2023, emphasizes the urgent need for global emissions reduction, and Africa's vulnerability to climate change.[10] It calls for global action to align emissions with the Paris Agreement goals, **including fulfilling the $100 billion annual climate finance foreign-made commitment, and urges the operationalization of the COP27-agreed Loss & Damage fund** and also seeks measurable Global Goal on Adaptation (GGA) indicators and targets.

In Sub-Saharan Africa, the energy mix is dominated by biomass, hydropower, and fossil fuels, with non-hydro renewables comprising only 1%.[11] **In fact, it is estimated that fossil fuels provide as much as 80% of SSA's energy,[12]** while hydropower accounts for 17% of the energy mix, despite it being threatened by drought.[13] However, a shift is being made towards cleaner energy in South Africa, Nigeria, and particularly Kenya, where the share of renewable energy already reaches 92%.[14] The African Summit's declaration aims **to expand the region's renewable capacity from 56 GW to 300 GW by 2030,** signaling a strong commitment to clean energy development.[15]

Climate KPIs

Measure	Unit
Climate Indicators	
Expected rise in average surface temperatures in a business-as-usual scenario	2-4 °C by 2100
Expected rise in average surface temperatures if all NDCs are achieved	2-3 °C by 2100
Activity Indicators	
Absolute emissions per year (CO_2e)	1.5 Gt
GHG per capita (CO_2e)	1.1 t
Projected emissions in 2050 if all NDCs are achieved ($MtCO_2e$)	1.7 to 2.2 $GtCO_2e$
Renewables in energy mix (%)	13%
CO_2 captured in carbon capture schemes (CCS) (tCO_2e)	n/a (CCS are in development stages)
Average yearly economic damage due to extreme weather (USD)	USD 10 billion (approximately 1% of GDP)

There are enormous opportunities for SSA to mobilize carbon credits. An initiative to boost Africa's carbon credit production 19-fold by 2030 drew hundreds of millions of dollars in pledges at the African Climate Summit in September 2023.[16] Investors from the United Arab Emirates (UAE) committed to buying $450 million of carbon credits from the Africa Carbon Markets Initiative (ACMI), which was launched at Egypt's COP27 summit last year. The ACMI has set ambitious targets, aiming to produce 300 million carbon credits annually by 2030 and 1.5 billion credits annually by 2050. This initiative is expected to unlock 6 billion in revenue and support 30 million jobs by 2030 while also contributing to climate change mitigation efforts.[17] South Africa in particular is also witnessing growth in voluntary carbon markets, with the Johannesburg Stock Exchange launching a carbon trading platform.[18]

Case Study

NeedEnergy, based in Zimbabwe, is a company that focuses on enabling access to clean energy through innovative use of artificial intelligence (AI). This startup is dedicated to addressing energy access challenges in Zimbabwe, and potentially other regions of Africa, by leveraging technology to enhance the efficiency and accessibility of renewable energy solutions. By employing AI, NeedEnergy can optimize energy distribution and management, making clean energy more attainable for communities, especially those in off-grid and underserved areas. Its approach not only contributes to reducing the carbon footprint but also plays a crucial role in improving the quality of life of people who have limited access to reliable energy sources

The burning issues

Three paramount issues have been pinpointed which, when addressed collectively, hold the key to propelling sustainable progress and equitability in the SSA region.

1. Food Insecurity & Water Scarcity

One in three people in SSA does not have regular access to food to meet their dietary requirements, with 30% of children under the age of 5 suffering from chronic malnutrition. Climate change is worsening this crisis, with a 30% increase in the total number of floods since 1970. Conversely, the total number of droughts in the region has increased by 50%, often making regions more susceptible to crop losses from pests and diseases. For example, the East Africa armyworm outbreak during the 2016-2017 drought caused an estimated crop loss of USD 1.3 bn.[19] Digital technologies like soil sensors and drone surveys are enabling farmers to optimize water usage and boost crop yields, tackling both food insecurity and water scarcity. Estimates suggest that water use could drop by at least 20% with no impact on yields.[20]

2. Disease Outbreaks

A temperature shift in SSA is altering disease risk hotspots, including malaria moving to higher elevations and latitudes. Dengue, chikungunya, and arbovirus hotspots are also expanding. Water-borne diseases like cholera and typhoid are increasing, with a severe cholera outbreak reported in Malawi, Mozambique, and Zambia, in addition to outbreaks in Ethiopia, Kenya, and Somalia due to extreme climate events.[21] Mobile apps and SMS alerts are revolutionizing disease outbreak response by enabling real-time reporting, contact tracing, and dissemination of critical information to communities. For instance, Go.Data is a software tool developed by the World Health Organization (WHO) and partners for use in disease outbreak response. Initially launched in 2019, Go.Data was deployed during the Ebola outbreak in the Democratic Republic of the Congo and Uganda. The system was instrumental in making the Ebola outbreak response more efficient and effective compared to traditional paper-based systems and its use saw a significant increase during the COVID-19 pandemic. By early 2022, Go.Data had been used in projects across 65 countries and territories worldwide.

3. Conflict and Displacement

Approximately 24 million people in this region were displaced by extreme weather events in 2020, and this number is projected to double by 2050.[22] A recent example includes the flooding in 2022 in Nigeria, which killed 600 people and displaced around 1.4 million.[23] Evidence from the International Crisis Group reveals that in 2018, 14 of the 20 deadliest conflicts were tied to climate change factors like drought, food scarcity, and encroaching water levels on habitable land.[24] Alert systems like the Flood Forecasting Initiative launched by the Google AI research center in Accra, Ghana, can help residents stay safe and give governments time to prepare by predicting when and where river floods will occur in 23 countries in Africa.[25] In conflict zones across Africa, digital platforms are also expected to play an increasing role in connecting displaced communities and facilitating humanitarian aid distribution.

Digital Transformation and Innovation

Because smartphone and internet penetration rates are still very low in the region (49% and 35%, respectively, in 2021),[26] improving the digital infrastructure in SSA has enormous potential. This is especially true in central regions of Africa, where the internet penetration rate is as low as 12% (versus 72.3% in South Africa). Sub-Saharan African countries are currently investing massively in 4G networks in order to improve the 4G connectivity rate, which was 25% as of 2022. Cloud computing is also gaining ground, with Amazon to invest USD 2.45 billion in South Africa by 2029. Nevertheless, adoption of advanced analytics and digital reality tech is still nascent. Digital literacy rates are low, with only 36.5% digital literacy in SSA,[27] and gender disparities persist, hindering economic growth. Increasing digital literacy is crucial, as a 10% boost is expected to raise SSA's GDP by USD 130 billion.

Recognizing the potential of digital technologies to enable climate action, it is estimated that today's digital technologies, if well optimized and applied widely, could reduce up to 20% of total global emissions.[28] This positive impact results from the ability to better **connect and communicate,** enabling better **monitoring and tracking,** providing software that can **analyze, optimize, and predict,** and offering support through **augmentation and autonomation.** To fully harness the benefits of digital transformation for climate resilience in SSA, there is a pressing need to invest in basic digital infrastructure such as improved internet connectivity in urban areas and deployment of internet coverage in remote villages where said coverage is still inexistent. In addition, it is crucial to increase digital literacy and leverage digital platforms to educate and raise awareness among the local population about climate change issues.

Case Study

In partnership with the Cape Town Science Center, Google has launched an initiative to empower the next generation of tech innovators in Sub-Saharan Africa, expanding the CS First program in Kenya, Nigeria, and South Africa. The program aims to empower over 10,000 students through coding workshops run by local non-profit organizations. The initiative addresses the increasing need for digital skills in the region, where around 230 million jobs are expected to require such skills by 2030. Google's CS First program has already helped over 160,000 young students learn coding in the past three years.

Climate Forward Government

Governments can effectively handle risks and challenges in environmental action by **setting goals** and **creating a flexible framework to achieve them.** As a first step, comprehending regional barriers and complexities is key so that policymakers can tailor their strategies to effectively address them, enabling the acceleration of digital tech-driven climate action.

Barriers to Digital Climate Solutions

Globally, two main overarching barriers to harnessing the potential of digital technologies for climate action have been identified: insufficient innovation and insufficient engagement.[29] SSA presents unique challenges due to its distinctive characteristics, resulting in specific barriers to overcome. These hurdles typically emerge from four key factors:

1. Lack of Digital Infrastructure
Sub-Saharan Africa suffers from substantial underinvestment in infrastructure, leading to restricted internet access and limited access to energy grids, clean transportation options and insufficient water treatment.[30] According to an estimation provided by the African Development Bank, the annual infrastructure funding gap amounts to $68-108 billion.[31] This lack of infrastructure, especially with regards to limited internet coverage and access to the energy grid, impedes the deployment of digital tools aimed at fighting climate change effectively.

2. Governance Issues
Problems related to governance may affect the development and implementation of digital climate solutions by further enabling inefficient climate choices and decision-making, such as favoring suppliers and constructors that give little importance to environmental issues.[32] In addition, it can also prevent governments from advancing a regulatory framework that advances climate friendly policies through incentives, grants, or other tax incentives.

3. Financial and Resource Constraints
Many countries in Sub-Saharan Africa face significant financial and resource constraints. This includes a lack of financial resources, natural resources, and human resources. These constraints limit governments' ability to invest in and implement digital climate solutions effectively. Without adequate resources, developing and deploying technology-based solutions to address climate change is very challenging.[33]

4. Limited Public Outreach and Awareness
Public outreach and awareness campaigns are essential for engaging communities in climate change initiatives. Sub-Saharan Africa is still in the early stages of developing comprehensive public outreach efforts. Many initiatives are led by NGOs and the private sector, indicating a gap in government-led efforts to educate the public about climate change and the role of digital technologies in addressing it.

Policy Goals

In order to successfully leverage digital technology for climate action, policy development in SSA should focus on four key goals. First, policymakers could **promote the development, education, and awareness around digital skills in the region.**[35] Second, public leaders could **facilitate access not only to affordable and renewable electricity sources but also to an affordable internet connection,** which is a prerequisite to effective use of digital technology.[36] Third, **governments could play an active role in driving and facilitating fruitful collaboration among and between businesses, civil society organizations, and international institutions** in order to accelerate the adoption of digital technologies for climate change. Ultimately, as exemplified by the call made during the last African Climate Summit in September 2023, and given the financial resource limitations, it is imperative that the international community, including donor countries, actively fulfill its existing funding commitments for the development and deployment of digital technologies in SSA countries.[37]

Case Study

The UN Climate Change Virtual School for Youths in Africa[34] was developed by African youths for African youths. Through knowledge management, advocacy training, video conferencing, and documentaries, it provides young people with the background and skills they need to enact low-carbon development. Combining the powerful tools of new media, the Internet, and webcasting, this dynamic and interactive platform makes learning about scientific concepts easy to understand and fun.

Digital Tech Policy

In presenting the potential policy measures for achieving these goals, the Digital Sprinters Framework by Google offers a structured approach. This framework defines four primary categories:

Infrastructure, People, Market Environment, and Tech Innovation. Each category addresses specific policy aspects that can facilitate sustainable and inclusive economic growth while harnessing the power of digital transformation.

All the listed recommendations are intended to promote achieving the aforementioned objectives and at the same time to reduce the barriers that currently exist.

Infrastructure

- **Incentivize private communication companies that provide internet access**. This is a key measure in a region where governments are still busy caring for even more basic needs. In designing their incentivization programs, governments have a clear interest to ensure rural areas are not left behind to prevent any increases in inequality between urban and rural households and businesses. Finally, policymakers might explore ways to reduce red tape and regulations to facilitate entry in this market.

- Simplify planning procedures and **invest in data collection tools and monitoring capabilities in new infrastructure projects.**

- **Develop and deploy digital early warning systems** to forecast extreme weather events, such as floods, droughts, and storms.

- **Encourage innovative companies involved in clean water treatment,** distribution, and sewage treatment by granting tax breaks, subsidies, no-interest loans or other supporting mechanisms to accelerate their development.

People

- **Improve digital literacy rates through education on emerging technologies,** starting with courses in mandatory school curriculum. In addition, the workforce in some sectors such as agriculture, could benefit greatly from upskilling or reskilling training around utilization of digital tools like real-time weather forecasts.[38]

- **Leverage digital communications and platforms to increase awareness around climate change and its impact with tailored and region-specific campaigns.** In this region, climate change is indeed often viewed by the wider public as an environmental issue that has no direct impact on an individual level.[39]

- **Seek and facilitate partnerships** with international organizations, tech companies, and governments to access funding, expertise, and technology transfer.

Case Study

Case Study

CityTaps is a company committed to bringing running water to every urban home, primarily in Kenya, Niger, Burkina Faso, Tanzania, Zambia, and Namibia. As a former GSMA Innovation Fund portfolio company, it has developed CTSuite, a water utility subscriber management solution that combines a smart, prepaid water meter (CTMeter) with an integrated software management system (CTCloud) to process PAYG payments through mobile money.

Case Study

The Digital Transformation with Africa (DTA) initiative, announced by President Biden, aims to expand digital access and literacy across Africa. With an investment of over $350 million and additional financing of over $450 million, it aligns with the African Union's Digital Transformation Strategy and U.S. Strategy Toward Sub-Saharan Africa.[40] The DTA focuses on three core pillars: expanding internet access and digital technologies, fostering digital skills and entrepreneurship, particularly for youth and women, and strengthening digital policies and regulations. This whole-of-government effort involves various U.S. agencies working to build a resilient African digital ecosystem, supporting economic recovery and U.S. diplomatic and commercial interests.

Market environment

- **Provide funding and incentives for SMEs active in the climate tech industry** and create an environment that promotes innovation by refraining from favoring or discouraging specific technologies to avoid distortion of competition.[41]

- **Encourage private financial markets, such as private equity, venture capital and hedge funds to invest in infrastructure in the region** and finance the adoption of alternative, 'greener' technologies through tax incentives or zero import tax and free trade zones for alternative energy sources.[42]

Tech Innovation

- **Prioritize and expedite the implementation of digital plans,** such as Nigeria's National Digital Economy Policy, South Africa's National Digital and Future Skills Strategy, and Kenya's National Digital Master Plan, to connect citizens and develop local digital skills. This will bridge the digital divide and support the growth of the digital economy.[43]

- **Support digital innovation ecosystems by encouraging initiatives like Digital Africa,** which foster digital innovation on the continent. Governments, private sector entities, and development agencies could consider collaborating to provide financial support, incubators, and tech clusters to nurture digital startups in Africa that will in turn drive entrepreneurship and innovation.[44]

- **Endorse and implement the African Union's Digital Transformation Strategy,[45]** with a particular focus on the Data Policy Framework. This framework envisions harnessing the transformative potential of data for the benefit of African countries. Policymakers have a clear interest to strengthen national data systems, foster innovation, and facilitate cross-border data flows, ultimately contributing to the realization of the African single digital market.

- **Encourage innovation hubs and incubators,** while offering incentives for climate tech related collaborations through funding mechanisms, tax incentives or other rewards.[46]

Industry perspectives

Having identified what to do, and how to do it, the next question is where to start. Based on current emission levels and the expertise of interview partners, a special focus on implementing digital technologies leveraging climate action should be placed on the following two key industries: **Energy and Agriculture.**

Industry	Recommendation[47]	Specific action	Priority
Energy	Generation of renewable energy/ minerals	Assist with the enforcement of regulation by promoting the deployment of sensors and IoT devices at mining sites to collect real-time data on environmental conditions and equipment performance	High
Agriculture	Sustainable farming techniques	Encourage and subsidize the deployment of weather and soil monitoring systems to optimize crop yield and plantation and harvest timings	Medium
	Digital literacy	Improve farmers' digital knowledge through training programs, workshops, and demonstration projects to educate and share best practices about efficient irrigation systems	Medium

Technology and Agriculture

Headquartered in Rwanda, **Africa Agriculture Watch**[48] is a web-based platform linked to a technical model that employs cutting-edge machine learning techniques and remotely sensed data to predict agricultural yields and production levels of several crops across Africa. Agripredict, on the other hand, is a Zimbabwean company using machine learning to offer information to all farmers on weather, connection to agri-service providers, and crop disease diagnosis.

Conclusion

The high prevalence of food insecurity, water scarcity, and disease outbreaks in Sub-Saharan Africa makes the region particularly vulnerable to climate change. Therefore, more than anywhere else in the world, **fighting climate change in this region is of paramount importance to sustaining the health and wellbeing of local populations.**

With lagging rates of digital literacy in international comparison, governments should consider focusing on two key measures. **First, policymakers need to create the necessary infrastructure, starting with internet connectivity,** which is a prerequisite for the deployment of many digital technologies aimed at fighting climate change. **Second, policymakers should explore ways to make major efforts to educate local populations about environmental issues,** elevate their digital literacy, and raise awareness of how digital tools can actually prove useful in fighting climate change.

By focusing their policy efforts in the two most important industries within the region, energy and agriculture, governments can help Sub-Saharan Africa move faster and more efficiently towards a healthier and more sustainable future.

References

1. EDGAR - Emissions Database for Global Atmospheric Research. (2023). GHG emissions of all world countries. Retrieved from
2. African Development Bank. (2022). African Economic Outlook 2022. African Development Bank.
3. Africa: share in global CO2 emissions | Statista
4. Intergovernmental Panel on Climate Change. (2021). Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press.
5. African Development Bank. (2022). African Economic Outlook 2022. African Development Bank.
6. United Nations Economic Commission for Africa. (2022). Africa's Climate Economy Outlook. Addis Ababa, Ethiopia.
7. African Union. (2022). African Union Climate Change and Resilient Development Strategy and Action Plan. Retrieved under
8. UNDP. (2023). Nigeria Climate promise. Retrieved from
9. Polity. (2023). COP28: South Africa's Climate Change Regime and Just Energy Transition "Stocktake." Retrieved from
10. African Union. (2023). The African Leaders Nairobi Declaration on Climate Change and Call to Action. Retrieved from
11. International Energy Agency. (2022). Africa Energy Outlook 2022.
12. World Bank. (2022). Access to electricity, rural (% of rural population).
13. United Nations Economic Commission for Africa. (2022). Africa's Climate Economy Outlook. Addis Ababa, Ethiopia
14. CleanTechnica. (2022). Renewables Provided 92.3% of Kenya's Electricity Generation in 2020. Retrieved from
15. African Union. (2023). The African Leaders Nairobi Declaration on Climate Change and Call to Action. Retrieved from
16. Reuters. (2023). Hundreds of millions of dollars pledged for African carbon credits at climate summit. Retrieved from
17. Africa Carbon Markets Initiatives (ACMI). (2023). Africa Carbon Markets Initiative Launched to Dramatically Expand Africa's participation in Voluntary Carbon Market. Retrieved from
18. Polity. (2023). COP28: South Africa's Climate Change Regime and Just Energy Transition "Stocktake." Retrieved from
19. IMF Data
20. The Nature Conservancy. (2017). Precision Agriculture: Potential and Limits. Retrieved from
21. https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(20)30178-9/fulltext & the World Health Organization 2023
22. Internal Displacement Monitoring Centre (IDMC). (2021). Global Report on Internal Displacement
23. Reuters. (2022). Nigeria's flooding spreads to the Delta, upending lives and livelihoods. Retrieved from
24. International Crisis Group. (2018). Climate Change and Conflict: The Need for Preventive Action
25. Google Africa blog. (2023). 6 Ways Google Is Working with AI in Africa. Retrieved from
26. GSMA
27. Do4africa
28. World Economic Forum
29. The World Bank. (2023). Digital Development for Climate Action in Africa.
30. International Telecommunication Union. (2023). World Information Technology and Communications Indicators Report 2023.
31. African Development Bank. (2018). African Economic Outlook 2018. Retrieved from
32. Transparency International. (2023). Corruption Perception Index 2023.
33. Africa Agriculture Watch
34. United Nations
35. International Telecommunication Union. (2023). World Information Technology and Communications Indicators Report 2023.
36. World Bank. (2023). Digital Development for Climate Action in Africa.
37. African Union. (2023). The African Leaders Nairobi Declaration on Climate Change and Call to Action. Retrieved from
38. International Telecommunication Union. (2023). World Information Technology and Communications Indicators Report 2023.
39. United Nations Framework Convention on Climate Change. (2023). Africa Climate Change Information Portal.
40. The White House. (2022). Fact Sheet: New Initiative on Digital Transformation with Africa (DTA). Retrieved from
41. African Development Bank. (2022). African Economic Outlook 2022. African Development Bank.
42. World Bank. (2023). Digital Development for Climate Action in Africa.
43. International Trade Centre. (2023). Digital Economy Strategies in Africa: A Comparative Analysis.
44. African Union. (2023). Digital Transformation Strategy for Africa.
45. African Union
46. United Nations Environment Programme. (2023). Africa: Climate Change and Sustainability
47. For the full industries policy recommendations please review the global study "The Road to Sustainability: Digital Technologies as a Key Enabler for Climate Action"
48. Africa Agriculture Watch

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