APRI
AFRICA POLICY RESEARCH INSTITUTE

GREEN TECHNOLOGY AND YOUTH EMPLOYMENT POTENTIAL IN AFRICA:

In partnership with

mastercard foundation

A continental scoping report

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Acronyms and abbreviations

AAAP	African Adaptation Acceleration Programme
AF	Adaptation Fund
AfDB	African Development Bank
AU	African Union
AUC	African Union Commission
BRICS	Brazil, Russia, India, China, South Africa
CCRD	Climate Change and Resilient development (strategy)
COP17	Conference of Parties
COVID -19	Coronavirus disease
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GRAP	Green Recovery Action Plan
ICTs	Information and Communication Technologies
IKI	Internationale Klimaschutz Initiative
ILO	International Labour Organisation
IPCC	Intergovernmental Panel on Climate Change
LULUCF	Land use, Land use change and Forestry
MENA	Middle East and North Africa
MSME	Micro, Small and Medium-sized enterprises
NDC	Nationally determined contributions
R&D	Research and development
REDD+	Reducing emissions from deforestation and forest degradation plus additional forest-related activities
SNV	Stichting Nederlandse Ontwikkelingsorganisatie
STI	Science, Technology and Innovation
TNAs	Technology Needs Assessments
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollars

Executive Summary

Green technology is a broad concept that is inconsistently applied within policies and programmes. Often conflated with climate technologies, green technologies in fact respond to all three of the triple planetary crises of climate change, biodiversity loss and pollution. It is important to keep the emphasis on all three areas: Each presents opportunities for youth employment and empowerment.

When considering the economic sectoral focus in the published literature on green technology and Africa, as well as certain country-level green technology policies, Energy receives the most focus, followed by Agriculture. Energy is elevated because of the role of fossil fuels in driving emissions and the associated global push to transition from these. In Africa, extending energy access is also a critical development need. Agriculture's importance relates to its central position in rural development and food security and the fact that so many Africans are involved in Agriculture both as a commercial activity and informally, for subsistence purposes.

The green technology programme overview indicates that some progress has been made in linking these sectors together at a spatial level, together with Water and Environment, but more can be done to drive an integrated sectoral and spatial approach to green technology development. A Scopus search also clearly identifies the gap in published research on green technology in Africa in terms of employment and entrepreneurship impacts and potential. And while there are a number of research and development programmes on technology and innovation, including green technology, at African universities and think tanks, more can be done to substantively link these to implementation.

The scoping report finds that while there is a level of integration of green technology into certain African youth employment policies (e.g. in Ghana, Kenya, Senegal and Uganda) as well as some youth employment programmes, the corollary does not apply. That is, the main green technology programmes in Africa considered in this review - the Global Environmental Facility (GEF), Green Climate Fund (GCF), Adaptation Fund (AF) and Internationale Klimaschutz Initiative (IKI) - do not include youth employment in their design. Similarly, the Technology Needs Assessments (TNA) methodology does not explicitly provide for youth inclusion.

The situation is different when it comes to incubators and innovation clusters for entrepreneurs in Africa. Here, there are several green technology start-ups, including many with links to Information and Communication Technologies (ICTs). ICTs and green technology have strong interplays. One opportunity for further creating youth employment in green technology could be through the use of ICTs. ICTs' numerous applications in green technology include bridging data gaps for diagnosis, monitoring and evaluation, creating online platforms for marketing and live-time transacting, etc. One example: the African Development Bank (AfDB) has a specific programme on climate-smart

agriculture where digital applications are a key element. Connectivity and youth skills in data sciences need to be strengthened to realise this potential.

The Climate Change and Resilient Development Strategy (CCRD) is one of the main green technology policies of the African Union (AU). Its priority activities include indigenous people and indigenous knowledge. Here, indigenous knowledge is explicitly linked to Climate Services' development and agriculture. However, despite its ability to provide culturally and contextually appropriate technology and unlock innovation, indigenous knowledge is not part of youth employment policies or programmes scoped in this assignment. Nor do indigenous green technologies emerge as a focus area in the green technology programmes or incubators (except the Innovation Hub and Council for Scientific and Industrial Research's work with traditional healers, both in South Africa). This is also a gap and opportunity. The update due to the current AU Science, Technology and Innovation (STI) policy, expiring in 2024, presents a good chance for improved policy integration of these issues, which are critical for Africa's future.

Another opportunity identified in this scoping report is for the procurement of locally manufactured green technology inputs and services – linked to existing major green technology programmes – in a manner that improves African firms' capabilities. Manufacturing currently receives little green technology policy or programmatic focus, but the manufacturing of green technologies and local green technology services could support sustainable employment growth linked to clear demand drivers, creating opportunities for Africa's youth. The GEF, GCF, AF and IKI programmes in Africa, and country TNAs, provide valuable data sources on technology needs and programmatic and funding focus. A more detailed mapping exercise not only of green technology inputs into these programmes but of national and regional capabilities to meet these now and in the future could unlock significant opportunities for local firms and employment creation.

Several high-level trends and characteristics emerge from this scoping report, signalling opportunities for improved policy coherence and programmatic design for youth employment and entrepreneurship in green technology in Africa. Country or regional-level studies could result in a more precise gap and opportunity identification including potential links between green technology and youth employment in ICTs, indigenous knowledge and the manufacturing of local inputs for major funded green technology programmes on the continent.

Source: AdobeStock

1. Introduction

1.1 Overview and context

The intertwined Climate, Biodiversity and Development crises require considerable change and innovation to achieve an inclusive and sustainable global economy. Green technology has a critical role to play in responding to this. As the infrastructure and development gap is significant in Africa, green technology can provide resilient, climate-smart[1] interventions. For example, **hundreds of millions** of Africa's smallholder farmers are highly dependent on rainfed agriculture[2]. Climate- and nature-smart water, energy and agricultural technologies could enhance production, build resilience and help to improve food security, while supporting ecosystem-services. However, while the global green technology market has enormous financial value and, together with other frontier technologies, is expected to **reach USD2,1 trillion** in 2030[3], most green technology development happens outside of Africa[4]. Sub-Saharan Africa, together with Latin America and the Caribbean, is the least ready to exploit these technologies[5].

The global growth in green technology – if harnessed – could offer opportunities for job creation and entrepreneurial activities in Africa. As young people will bear the brunt of the Climate and Biodiversity crises and have the highest unemployment rate in Africa, their agency and capabilities can be mobilised to provide green technology solutions. Green technology adoption can also create much-needed jobs through the emergence of new firms and industries that develop and trade these technologies. For this to happen, firms require not only the skills and know-how, as well as access to capital necessary to develop and sell green technologies, but an enabling regulatory, policy and infrastructural environment[6].

To better understand the potential for youth employment in green technology in Africa, this scoping report examines the current landscape of existing green technology policies and programmes, including their focus on youth employment and entrepreneurship.

1.2 Purpose of report

The scoping report seeks to describe the current characteristics and focus of green technology policy and programmes in Africa in general and the inclusion therein, or not, of youth. The findings identify gaps and opportunities for better-aligned and more impactful programmes in green technology, such that they benefit youth.

1.3 Research approach

The scoping report is based on a review of secondary literature through desk-based research which included some policy content and coherence checking. Such is the breadth of the topic under consideration that a detailed analysis of any specific aspect was not possible, though the synthesis of literature does provide a useful set of insights that point to potential areas of focus and action.

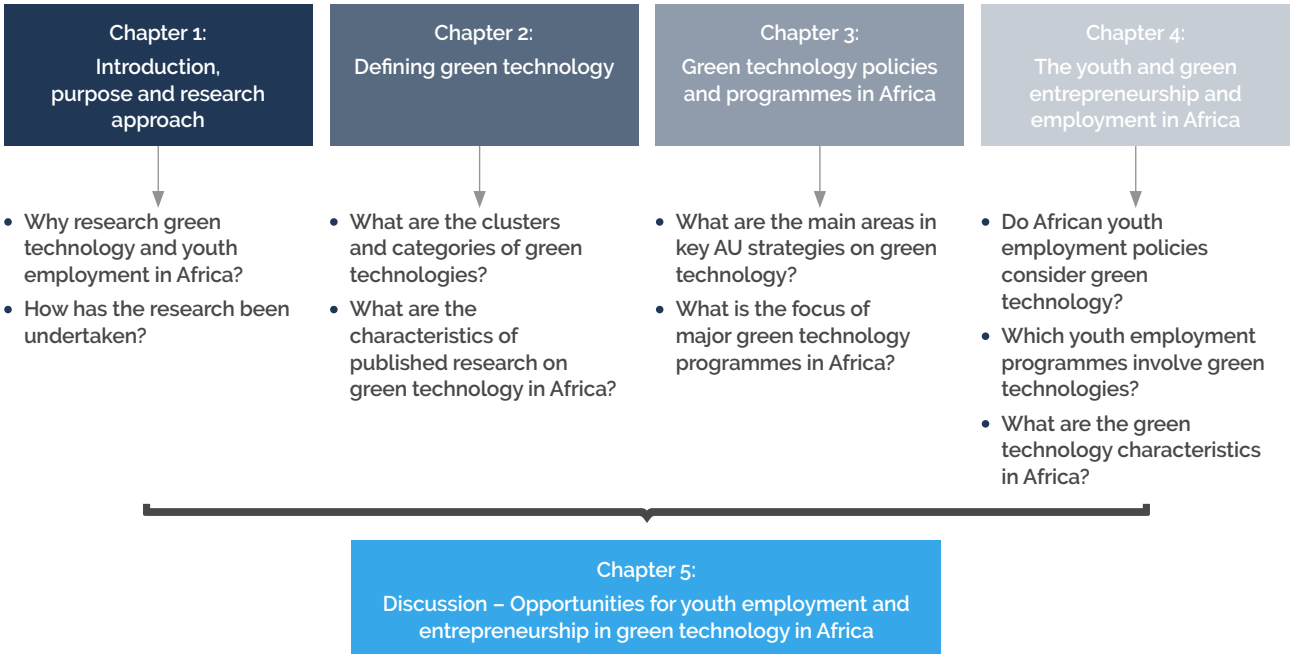
In order to focus the findings, where available, data has been considered for a subset of countries: Ghana, Kenya, Senegal, Nigeria, Rwanda, Uganda and Ethiopia. This provides more granular insights.

The following approach was taken for the scoping review:

- A Scopus[7] search was conducted to review literature published on green technology and Africa. This scoping review identifies the main economic sectors, geographic focus of research and keywords occurring in published research.
- The African Union website was searched for the most applicable policies and strategies on green technology at the continental level[8].
- The Climate Laws Project of the Grantham Research Institute[9] was utilised to identify and download into Excel all the green technology policies and strategies related to climate change for the country subset. This was supplemented by a search of the website of the Convention on Biological Diversity to identify national Biodiversity Strategies and Action Plans for the subset of countries[10].
- Two recent African Development Bank programmes on green technology were identified through an online search including a search of the AfDB website.
- The Technology Needs Assessments of the subset of countries were downloaded from the United Nations Framework on Climate Change Convention website[11] to provide an overview of these countries' specific green technology gaps.
- African green technology programmes and projects were downloaded from the databases of the Internationale Klimaschutz Initiative of the German Federal government[12], the Global Environmental Facility[13], Green Climate Fund[14] and Adaptation Fund[15]. Once exported to Excel, the data were categorised into 'focal areas' and sectors based on the classifications provided in the dataset. Projects in the subset of countries were considered in more detail.
- The International Labour Organisation's website[16] and reports were used to identify youth employment research as it relates to green technology.
- All of this was augmented by a grey literature search using Google Chrome for reports on green technology, youth employment and Africa.

Given the nature of the research approach and the project's extensive conceptual and geographical scope, the findings point to patterns observable from the data rather than definitive conclusions. The research remit did not extend to a strategic assessment of the green technology policy and programmatic environment. Nonetheless, the discussion section – Section 5 – proposes gaps and opportunities to unlock further youth employment in green technology in Africa.

Figure 1
Report Structure and Flow



Note: Author's Construct, 2023.

Source: AdobeStock

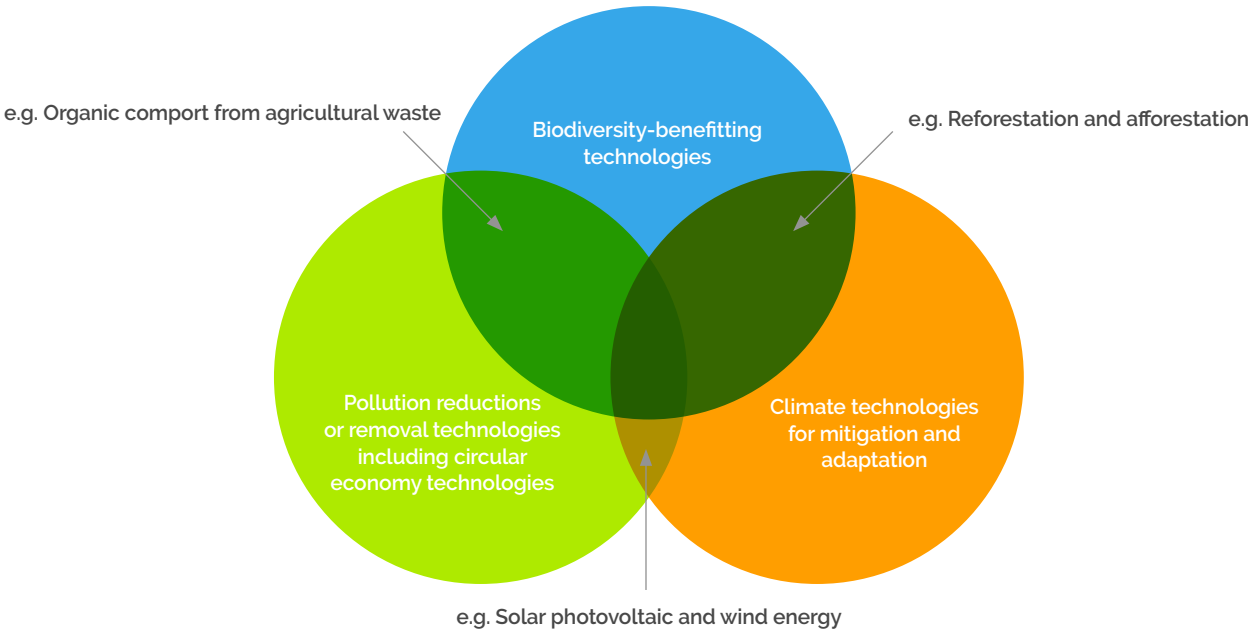
2. Defining green technology

2.1 Introduction to the concept

No single and universally shared definition exists for the concept of green technology[17]. In general, green technologies seek to reduce the environmental impacts of consumption and production, through means such as more efficient resource use. Green technologies also reduce negative externalities on resources and the environment in product design production, distribution and use[18]. While green technology is often conflated with climate technology, it responds to all three of the environmental planetary crises of climate change, biodiversity loss and pollution[19]. For the purposes of this scoping report, an expansive definition of green technology has been used. That is, green technology is taken to mean any method or product that addresses climate change and/or biodiversity loss and/or pollution.

Climate adaptation and mitigation technologies are major current areas of global green technology investment and development, with mitigation receiving the lion's share. **Annexure A** provides an overview of major investment trends in these climate technologies, with examples of African firms.

Figure 2
Clusters of Green Technologies



Note. Author's Construct, 2023. Constructed to reflect the triple planetary crisis and select green technologies.

Green technologies that address pollution involve various methods and products in industrial processes where they drive efficiencies and improvements. This leads to both reduced resource use of water, energy and other material inputs, and reduced waste outputs[20]. Here, the circular economy concept finds application. Circular economy technologies eliminate waste, circulate products and materials and regenerate nature[21].

Biodiversity-benefiting technologies respond to the third planetary crisis – biodiversity loss – and can be understood in relation to Target 20 of the Kunming-Montreal Global Biodiversity Framework, adopted in late 2022. That is, to 'strengthen capacity-building and development, access to and transfer of technology, and promote the development of and access to innovation and technical and scientific cooperation, … *for the conservation and sustainable use of biodiversity* …'.[22]

Figure 2 indicates these major clusters of green technologies and shows that, in practice, there is significant overlap between them.

As indicated in **Figure 3** below, green technologies can also be categorised according to whether they are used for 'monitoring and assessment', 'prevention', 'control' or 'remediation and restoration'.

Figure 3
Categories of Green Technology

Monitoring and assessment	Prevention technologies	Control technologies	Remediation and restoration
Measure and track the environment and impacts of production processes upon it	Reduce or totally avoid the production of environmentally harmful substances. Can involve new products or processes	Render hazardous substances harmless	Improve ecosystems through supporting ecological processes to improve biodiversity

Note. Author's Construct, 2023. Figure adapted from UN.ESCAP. (2012). *Low carbon green growth roadmap for Asia and the Pacific: turning resource constraints and the climate crisis into economic growth opportunities.* Fact sheet: green growth.[23]

Conceptually these can be linked to the three clusters of green technology indicated in **Figure 2** in the following way:

- Climate mitigation technologies typically fall into the category of 'prevention' or 'control' technologies'. Examples include renewable energy, zero-emission mobility and accelerating the efficient use of materials and energy.

- Climate adaptation technologies include the use of drought-resistant crops, sustainable agriculture approaches, early warning systems, sea walls, water access and efficiency systems, amongst other technologies. These typically cut across the categories of 'monitoring and assessment', and 'remediation and restoration'.

- Biodiversity-benefitting technologies include technologies for 'remediation and restoration', as in the case of rewilding and regeneration, including through sustainable agriculture, mangrove planting, etc.

- Technologies to address pollution fall into the categories of 'prevention' and 'control' technologies, such as reduction in or reuse of waste products.

Monitoring and assessment technologies are a cross-cutting category that relates to all of the areas. This category indicates the critical role of data in green technology design, deployment and impact.

A further point of definition needs to be made about the concept of technology. 'Technology' includes many approaches, or methods, covering systems, know-how, goods and services, equipment, **as well as managerial and organisational procedures**.[24] This broad definition means that the concept denotes more than a physical piece of equipment or infrastructure: It also refers to how things are done. This is an important point. While the use of 'green technology' is often reported and understood in relation to (Western) formal **knowledge- and capital-intensive approaches to, for example, climate mitigation**,[25] in Africa's context, the potential also exists for indigenous knowledge to provide green technology solutions. Indigenous knowledge practices are based on an understanding of what works for the landscape within resource constraints and cultural contexts. Indigenous knowledge can be a source of innovation for green technology.

2.2 Green technology research in Africa

As green technology is a broad concept, a scoping review was conducted on Scopus to understand the focus of published research on green technology in Africa. Undertaken on 21 June 2023, the terms 'green technology' and 'Africa' were searched together on Scopus across titles, abstracts and keywords. The search yielded only 79 papers across all categories of papers – such as those appearing in social, natural, engineering and managerial journals.

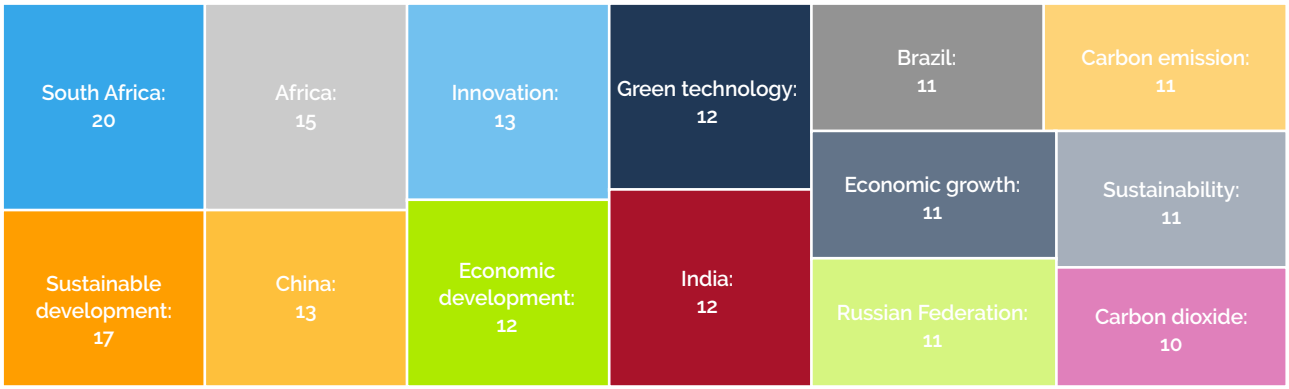
In addition to the Scopus-provided keywords function, the Scopus entries on the published documents were also exported to Excel. Drawing on titles and abstracts, the research papers were organised in terms of the geographic focus of the research and main economic sectors.[26]

Findings

Keywords

Keywords appearing ten or more times are shown in **Figure 4**. Many articles focus on the BRICS grouping (i.e. Brazil, Russia, India, China and South Africa). 'Sustainable development' is a major research theme, together with 'innovation' and 'economic development'.

Figure 4
Keywords Appearing most Frequently in the Scoping Review



Note. Author's Construct, 2023. Adapted from SCOPUS by Elsevier (**https://www.elsevier.com/solutions/scopus**). The search was conducted in July 2023.

'Youth' does not appear among the top keywords. Neither do 'employment', 'jobs' or 'entrepreneurship'. In fact, 'youth' only appears twice in the title, keywords and abstract search. The two papers in which 'youth' appears are:

- Otieno B., Ochieng A (2018)[27]: a study of existing and potential green jobs and identified green qualifications and skills necessary in the wastewater treatment sector in selected local governments across the northern provinces of South Africa.

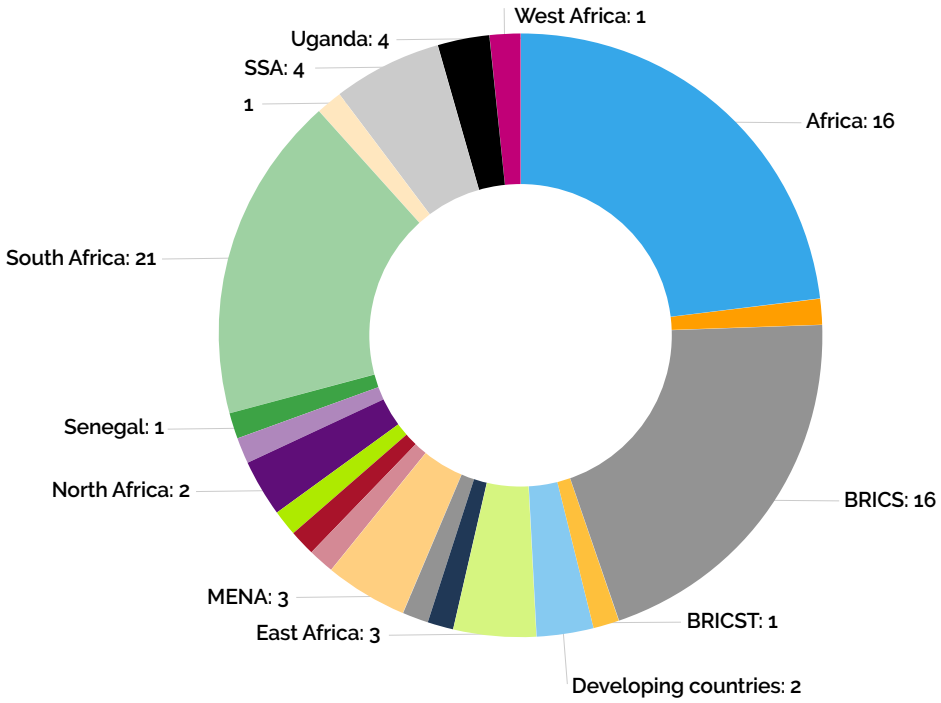
- Habib H., (2021)[28]: the role of remittances in alleviating the real GDP oscillations induced by the meteorological variability in the North African countries between 1980 and 2016.

Geographic focus

As the subject of 21 published research documents, South Africa received the most geographic focus of any country or region across the 79 papers. This was followed by Africa (with 16 documents) and then BRICS (with 14 documents). As it is the only African member country of BRICS, South Africa is also the main African focus among the BRICS documents.

Sub-Saharan Africa was the focus of 4 papers, the Middle East and North Africa (MENA) and East Africa each of 3, North Africa (without the Middle East) of 2 and West Africa, of 1. Other than the many South African-focused research documents, there were only a few instances in which the geographic focus was only one country: Nigeria is the geographic focus of 3 documents[29], together with other countries in 2 of these. Uganda is the focus of 2 published research documents[30], and Senegal[31] and Ghana[32] each of 1. These geographic focus findings are shown below in **Figure 5**.

Figure 5
Geographic Focus of SCOPUS Published Research on Green Technology and Africa

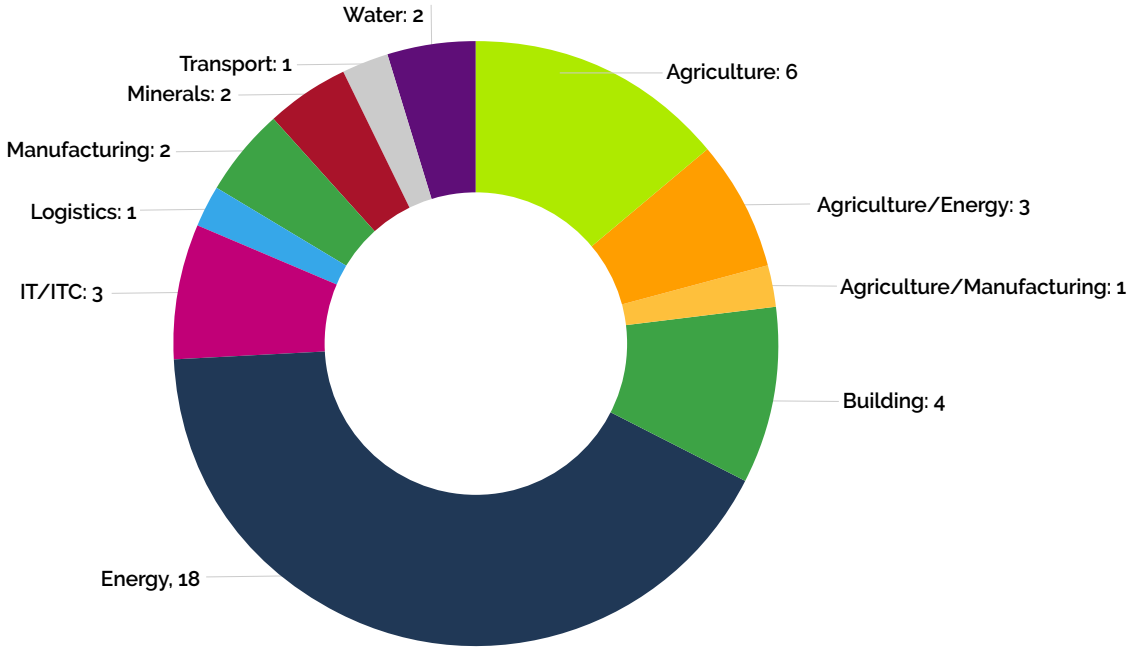


*Note. Author's Construct, 2023. Adapted from SCOPUS by Elsevier (***https://www.elsevier.com/solutions/scopus***). The search was conducted in July 2023.*

Sectoral focus

Of the 43 papers which took a sectoral approach, Energy is the focus of 18, Agriculture of 6, with Agriculture and Energy (where the sectors were considered together) a further 3 and Agriculture and Manufacturing (in the case of leather processing), of 1. Buildings are the focus of 4, covering Airports, African universities, North African Medinas and an analytical taxonomy of challenges facing green buildings. Information Technology/ Information and Communications Technology is the focus of 3 documents. Manufacturing, Water and Minerals, are each the focus of 2 published documents and Logistics and Transport, each of only 1 paper.

Figure 6
Economic Sectoral Focus of Published Research



*Note. Author's Construct, 2023. Adapted from SCOPUS by Elsevier (***https://www.elsevier.com/solutions/scopus***). The search was conducted in July 2023.*

Summary of key points:

- 'Green technology' is a broad concept and is used in various ways. Climate, Biodiversity and Pollution are the three major crises to which green technology responds. These technologies cut across these three areas and encompass not just products and infrastructures, but methods and approaches too, including indigenous methods.
- Most published research on green technology and Africa focuses on energy then agriculture; South Africa is the geography most covered. Other than South Africa there is little published on green technology and Africa at the country-level.
- Sustainability and sustainable development, economic development, economic growth, innovation and green technology, and carbon dioxide and emissions are the keywords most associated with green technology in Africa.
- Youth entrepreneurship and employment are notably absent from published research on green technology in Africa.

3. Green technology policies and programmes in Africa

3.1 Introduction

This section considers the green technology policies and strategies of the AU and of the selected subset of countries. A selection of major green technology programmes in Africa is also described. The AfDB is an important continental Development Finance Institute; two of its recent green technology programmes are considered. Also included in the programme overview are three United Nations (UN) finance programmes active in green technology deployment, and the German Federation governments' IKI programme, which provides considerable finance for green technology roll-out in Africa. Furthermore, the Technology Needs Assessments of the subset of countries provide an in-depth country-based indication of technologies identified for climate mitigation and adaptation. All of these programmes are considered in 3.3, below.

3.2 African Union policies and strategies

At a continent-wide level, African Union policies, plans and strategies provide the overarching context for continental priorities. Goal 7 of the African Union Commission (AUC) Agenda 2063, 'environmentally sustainable and climate resilient economies and communities'[33], is the most relevant to green technology. It sets the scene for the different strategies and plans. This goal identifies water security and renewable energy as areas of focus together with sustainable natural resource management and biodiversity conservation, sustainable consumption and production patterns, and climate resilience and natural disaster preparedness and prevention. It accordingly covers all three environmental crises that frame global green technology responses.

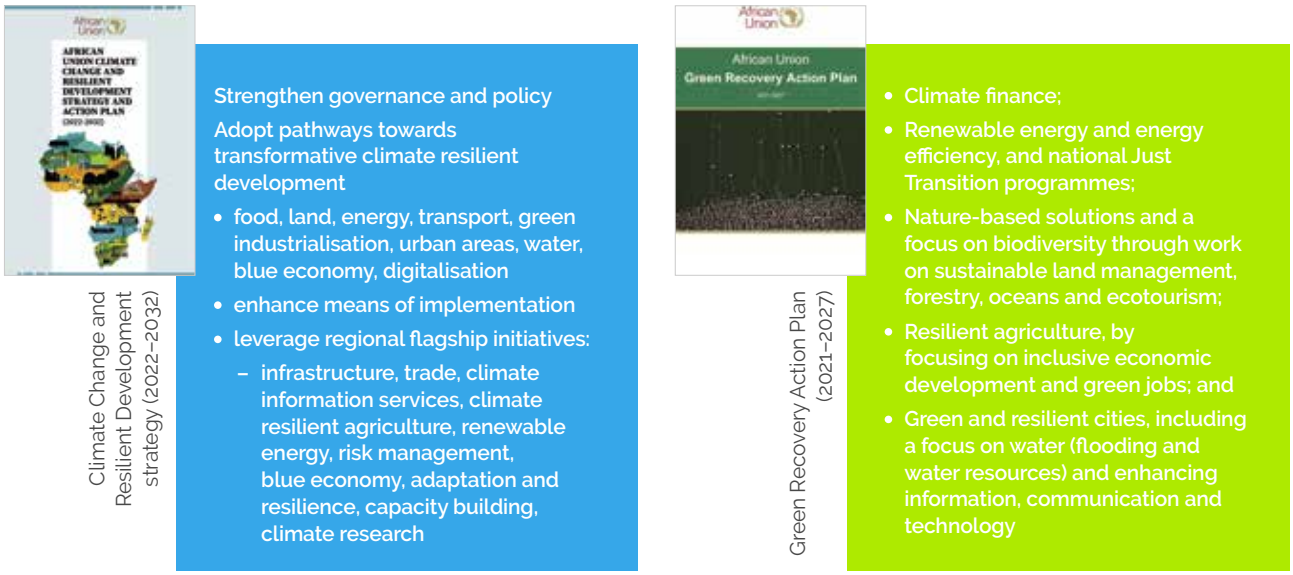
Around the world, green technology is also a focus area in many science, technology and innovation (STI) policies. In Africa, the STI policy of the AU, 'AU's 2014 **Science, Technology and Innovation Strategy for Africa, 2024**'[34] locates technology development within the broader goals for society. These goals both explicitly and implicitly identify sectoral transformation and cover a broad set of sectors: agriculture; health (including traditional medicine with its link to indigenous knowledge); communication (including transport infrastructure, mobility and ICTs); environmental protection; biodiversity; water; maritime; space; urban hydrology; hydraulics; urban waste management and the exploitation of minerals, forests, aquatics, and the marine environment; and management of water resources. This expansive approach does not explicitly identify climate in its framing of sectoral focus areas, while waste management and biodiversity are both clearly included.

Neither does the STI strategy emphasise the role of youth. It does, however, underscore the need for innovation and entrepreneurship to achieve a knowledge economy and sustainable socio-economic development across Africa. This is necessary 'to improve public services (including entrepreneurial innovation), for the creation of new economic sectors, wider employment

opportunities in the formal economy and commercialisation of technologies with regional relevance and global potential' (ibid, p31).

The **2022 Climate Change and Resilient Development (CCRD) Strategy and Action Plan (2022 – 2032)**[35] and the **Green Recovery Action Plan (GRAP) (2021 – 2027) of 2021**[36] of the AU are the main green technology strategies at the continental level. Both highlight specific sectors and substantively include Youth and Jobs. Agriculture is a sectoral priority in both, as is Renewable Energy and an Urban or City focus. Digitalisation is a focus area in the CCRD and ICTs in the GRAP. In terms of the three planetary crises, Climate and Biodiversity both feature, prominently, though Pollution receives less focus.

Figure 7
Focus Areas of the CCRD and GRAP



Note. Author's Construct, 2023. Adapted by author from these documents available at : "African Union Climate Change and Resilient Development Strategy and Action Plan (2022-2032)" *by African Union, 2022. African Union. (***https://au.int/en/documents/20220628/african-union-climate-change-and-resilient-development-strategy-and-action-plan***) &* "Green Recovery Action Plan" *by African Union, 2021. African Union. (***https://au.int/sites/default/files/documents/40790-doc-AU_Green_Recovery_Action_Plan_ENGLISH1.pdf***).*

The CCRD makes detailed references to youth in Strategic Intervention Axis 3 – 'Enhancing the Means of Implementation towards Climate-Resilient, Low-Emission Development, Including through Climate Finance' – which calls for the inclusive participation of marginalised and vulnerable groups, especially women and youth. Similarly, the situation analysis in the GRAP notes that a Covid recovery must be inclusive and ensure that marginalised groups (including women and youth) are actively involved and part of the recovery, in particular that 'young people will play a key role in all areas of COVID-19 recovery, and must be considered, championed, and included' (p 6).

Indigenous approaches receive a specific focus in the CCRD, where it is proposed that indigenous and scientific knowledge be combined to provide climate services. Indigenous approaches to farming and indigenous peoples' rights are also highlighted. This recognition goes beyond a simple acknowledgement that indigenous people are custodians of land and need recognition, to signal that indigenous knowledge can be a source of innovation for climate solutions.

While not considered here, several other AU sectoral or spatially-based strategies and initiatives also have a bearing on green technology. Energy, forests, agriculture and ecosystems are a major focus of these; agriculture, in particular. These include the:

- Africa Adaptation Initiative: **https://africaadaptationinitiative.org/**
- Africa Renewable Energy Initiative: **http://www.arei.org**
- Africa Blue Economy Strategy: **https://www.au-ibar.org/sites/default/files/2020-10/sd_20200313_africa_blue_economy_strategy_en.pdf**
- African Union Sustainable Forest Management Framework: **https://afforum.org/publication/the-sustainable-forest-management-framework-for-africa-2020-2030/**
- Pan-African Action Agenda on Ecosystem Restoration for Increased Resilience: **https://www.fao.org/3/ni543en/ni543en.pdf**
- Comprehensive Africa Agriculture Development Programme: **https://au.int/sites/default/files/documents/41425-doc-31250-doc-the_caadp_results_framework_2015-2025_english_edited_1-1.pdf**
- Adaptation of African Agriculture Initiative: **https://www.aaainitiative.org/en/initiative**
- African Forest Landscape Restoration Initiative: **https://afr100.org/**
- The Great Green Wall for the Sahara and Sahel: **https://www.unccd.int/our-work/ggwi**
- African Nationally Determined Contributions Hub: **https://africandchub.org/**

3.3 National green technology policies in Africa

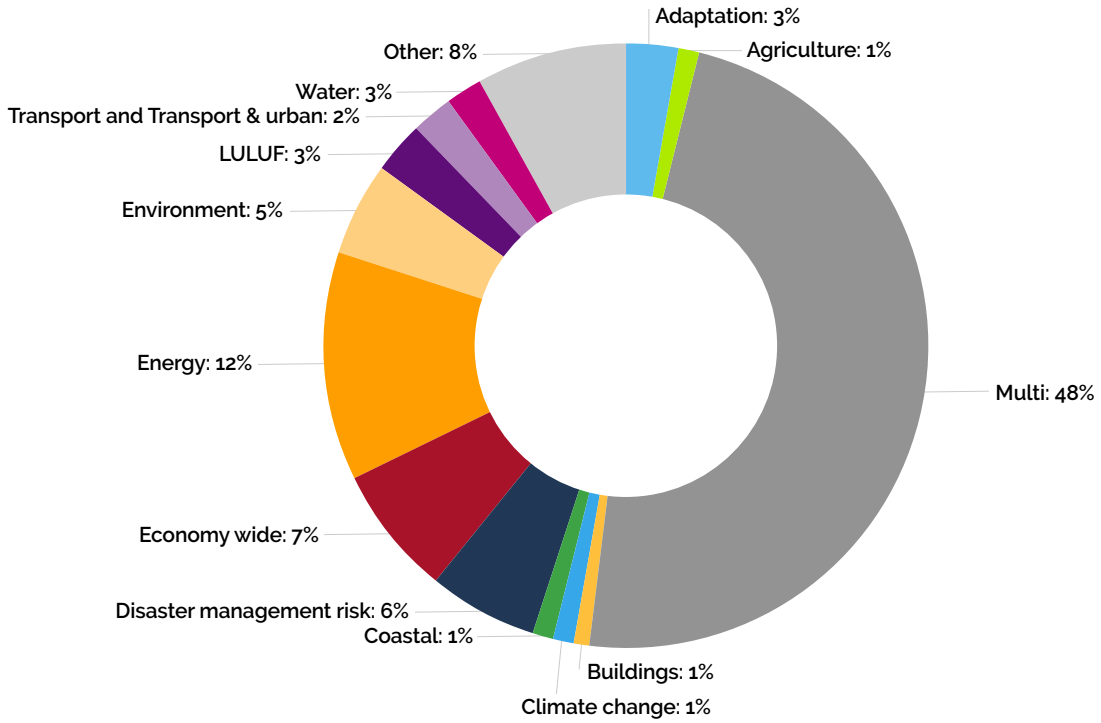
No African country has a standalone green technology policy. Instead, countries have climate change strategies, renewable energy strategies or policies, and reference green technologies in their national development agendas, visions or plans. Green technology is also included in disaster management acts and plans. Given the increasing incidence of climate-related disasters and the negative impacts on food security, these disaster management plans are a major recent policy focus. Furthermore, at the sectoral level, specific pieces of legislation and policy identify green technologies required to address a particular need, such as renewable energy technologies. **Table 1**, indicates the policies (not the legislation, strategies or frameworks) for the country subset.

Table 1
Green Technology Policy Focus, Country Subset

Policy areas targeting green technology					
	Climate change	**Disaster risk management**	**Environmental**	**Energy**	**Forestry**
Ethiopia	✗	✓	✓	✓	✗
Ghana	✓	✗	✗	✓	✗
Nigeria	✓	✓	✓	✓ Renewable Energy and Energy Efficiency policy; Gas policy and Biofuels policy	✓
Senegal	✗	✗	✗	Three Decrees on Renewable Energy	✗
Uganda	✓	✓	✓	✓ Renewable Energy policy	✗
Rwanda	✗	✓	✗	✓	✗
Kenya	(Climate Finance policy)	✓	✓	✗	

Note. Author's Construct, 2023. Adapted from The Climate Law Project database by Grantham Research Institute and Sabin Center at Columbia Law School. 2023. Grantham Research Institute (**https://climate-laws.org/**). Download conducted on 12 May 2023.

Figure 8
Sectoral Focus of Climate Change Policies, Strategies, etc., in Country Subset



Note. Author's Construct, 2023. Constructed based on Climate Law Project database. Download conducted on 12 May 2023.

A broader perspective, which includes all the climate related legislation, policies, edicts, frameworks, action plans and strategies of Ethiopia, Ghana, Kenya, Nigeria, Rwanda, Senegal and Uganda, as drawn from the **Climate Laws project** of the Grantham Research Institute[37] (and provided in full in **Annexure B)** is indicated in **Figure 8**.

Much of the country-level focus – such as policies and plans for national development, economic development, and climate change – is multisectoral and cross-cutting. The Energy sector stands out, receiving a considerable share of its own strategic focus.

While not captured in the Climate Law database, all the countries in the subset also have National Biodiversity Strategies and Action Plans. This is according to a search of country report listings on the Convention on Biological Diversity website[38]. In terms of pollution, 50 out of 54 African countries have some level of waste policy, strategy or legislation in place. Of the subset of countries, Rwanda and Uganda have adopted circular principles into their cross-cutting development or green economy policies and legislation[39].

3.4 Green technology programmes

The AfDB has recently launched two major cross-cutting programmes on green technology in Africa. The Alliance for Green Infrastructure in Africa[40], launched with the AU at COP17 in 2021, aims to scale and accelerate financing for green infrastructure projects. A second programme, the African Adaptation Acceleration Alliance Programme (AAAP) has a subprogramme on climate-smart digital technologies for agriculture in addition to its infrastructure and innovative finance components. It also has a dedicated subprogramme on youth employment.

- The *Alliance for Green Infrastructure in Africa*'s project development funds focus on the sectors Energy, Transport, Water and Sanitation, Health, Broadband Infrastructure, and Urban and Rural Infrastructure. The Alliance seeks to raise USD500 million of early-stage project preparation and development capital to lead to USD10 billion in investment opportunities for the private sector. It plans to establish green eligibility criteria and project rating guidelines for infrastructure projects. The Alliance seeks to address the gap in Africa's infrastructure financing, estimated at over USD108 billion a year, and to ensure that the infrastructure is climate resilient and climate-smart. It does not have a focus on Biodiversity or Pollution.

- *The African Adaptation Acceleration Programme* aims to mobilise USD25 billion over five years to accelerate and scale climate adaptation action across the continent[41]. The AAAP has four subprogrammes detailed in **Table 2**. The youth subprogramme includes mainstreaming adaptation jobs into multilateral development banks' operations and projects (where, presumably to date, this focus has been absent). Furthermore, three youth employment projects are identified, two of which are in Nigeria: the first on digital and creative enterprises, aiming to create 165,600 direct climate adaptation-aligned jobs[42] (See Table 2); the other a Nigeria-based agro-industrial processing zone which targets the adoption of climate-smart agricultural practices and aims to create at least 150,000 direct and indirect jobs. The third youth employment project is located in Sudan. It focuses on youth enterprise development and capacity building. The clear focus here is on climate-change-related technologies. While Pollution is not a focal area, Waste is included in some elements. It is not clear how Biodiversity is considered, and whether the climate smart methods for agriculture will also be positive for biodiversity outcomes.

As in the case of the AU's GRAP and CCRD, part of the focus of the AAAP on green technology is on cities, with the 'city adaptation accelerator'. ICTs are also included in programme design, as part of climate-smart agricultural services.

Table 2:
Subprogrammes of the African Adaptation Acceleration Programme

	Climate Smart Digital Technologies for Agriculture and Food Security	African Infrastructure Resilience Accelerator	Empowering Youth through Jobs and Entrepreneurship	Innovative Financial Initiatives for Africa
Goal	To scale up access to climate-smart digital technologies and associated data-driven agricultural and financial services for at least 30 million farmers in Africa, supporting food security in 26 African countries and reducing malnutrition for at least 10 million people.	To scale up investment for climate-resilient urban and rural infrastructure in key sectors such as Water, Transport, Energy and Waste Management, thus helping the continent close the infrastructure gap and ensuring the infrastructure services are resilient to the growing shocks of climate change.	To support one million youths with entrepreneurship skills and job creation. This pillar aims to create millions of new jobs in climate adaptation, half of which will be for women.	To build the capacity of African countries to drive adaptation at a much greater scale by planning differently and accessing the key sources of adaptation finance.
Specific elements	• Thought leadership on climate-smart digital technologies in agriculture • Supporting the design, mainstreaming and adoption of climate-smart digital technologies into agriculture projects and programmes • Enhancing the capacity of relevant persons and institutions to implement projects with climate-smart digital technologies • Monitoring, evaluating, and learning from the implementation of climate-smart digital solutions	• Public-Private Infrastructure Resilience Accelerator • National infrastructure risk and resilience programmes • Nature-Based Solutions Investment Innovation Program • Capacity building through a Climate Resilient Infrastructure Masterclass • Climate-Resilient Water Services • A City Adaptation Accelerator	• Strengthening environments that support youth-led climate adaptation entrepreneurship and youth participation in adaptation policies • Scaling up youth innovations for climate action • Building youth capacity for employability and unlocking access to finance • Mainstreaming 'adaptation jobs' into multilateral development banks' operations and projects	• In addition to capacity building, this programme will support the design of innovative public and private financial instruments, ranging from resilience bonds and debt-for-resilience swaps to aggregation mechanisms for adaptation investment assets and monetisation of adaptation benefits.

	Climate Smart Digital Technologies for Agriculture and Food Security	African Infrastructure Resilience Accelerator	Empowering Youth through Jobs and Entrepreneurship	Innovative Financial Initiatives for Africa
Existing leverage and examples	As of June 2022, this pillar had influenced and leveraged multilateral development bank projects to benefit 4.7 million direct beneficiaries. In addition, the pillar is working on other investment projects estimated at USD1 billion. • The **Program to Build Resilience for Food and Nutritional Security in the Horn of Africa** is designed to expand access to climate services to more than 1.3 million farmers and pastoralists, and access to digital advisory services to more than 750,000 farmers. The project aims to increase agricultural (crops and livestock) productivity by 30%. • The **Program for Integrated Development and Adaptation to Climate Change in the Zambezi Basin** will lead to 400,000 farmers in adopting climate-smart agriculture techniques and a 30% increase in the adoption of digital climate advisory services. • The **Ethiopia Food Security Resilience Project** is designed to support 2.4 million farmers in adopting resilience-enhancing technologies and practices.	For example: • The **Freetown WASH and Aquatic Environment Revamping Program** aims to benefit an estimated 1.4 million people by providing climate-resilient and safe water service delivery. • The support of the AAAP Upstream Financing Facility conducted vulnerability stress tests and climate hazards identification for the **Banjul Port 4th Expansion Project**, leading to the design of 20 adaptation options. • The Upstream Financing Facility, supported the development of the **National Infrastructure Risk and Resilience Program in Ghana,** proposes 35 adaptation options for funders and investors to invest in Ghana's future.	• Funded entrepreneurs across the continent to scale their adaptation businesses as part of the **African Youth Adaptation Solutions Challenge (YouthADAPT Challenge)**. • The AAAP Upstream Financing Facility is supporting the mainstreaming of adaptation jobs for youth in the **Digital and Creative Enterprise Program in Nigeria**; the Upstream Facility has helped identify opportunities to create climate adaptation-aligned jobs within the project, aiming at creating 165,600 direct jobs and 1,674,000 indirect jobs created over five years. • The **Youth Enterprise Development and Capacity Building Project** aims to enhance employability and job creation for women and men aged 18–35 in South Sudan, creating at least 1,600 jobs and training at least 900 youth. • The **Nigeria Special Agro-Industrial Processing Zones Program** expects to accelerate the adoption of climate-smart agricultural practices to create at least 150,000 direct and indirect jobs.	• The **Technical Assistance Program to Access and Leverage Climate Adaptation Finance** is helping countries build capacity for adaptation finance planning and decision-making; to support the accreditation of new and existing African Direct Access Entities; and to develop and submit a portfolio of adaptation projects and programs to international climate funds. The programme is currently supporting 14 countries. • The **Financial Tools Instruments and Mechanisms** offers technical assistance for structuring blended finance and capital markets solutions such as green bonds and private debt and equity funds or adopting an adaptation taxonomy for traditional green lines of credit. Currently, GCA is supporting the upcoming Sustainable Sovereign Bond of the Government of Côte d'Ivoire and the Invesco Climate Adaptation Action Fund. • The **African Green Financing Facilities Fund** is designed to help create and capitalise national green banks and national climate change funds in African countries.

Note. Author's Construct, 2023.

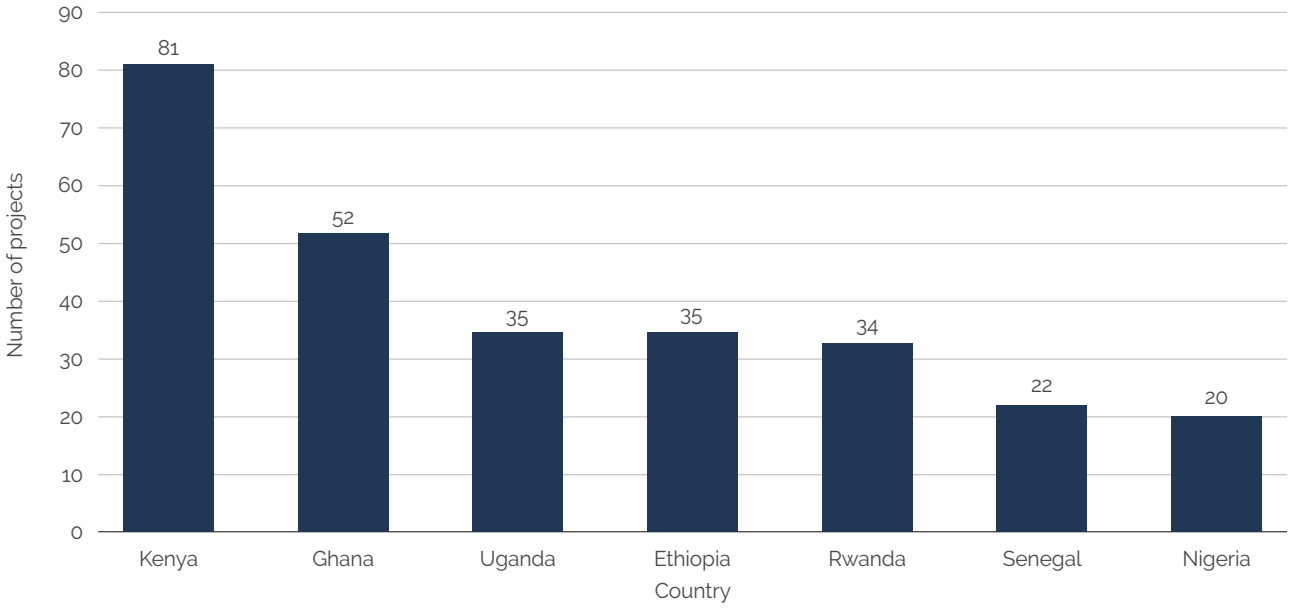
The German Federal Government's International Climate Initiative (IKI)

Between 2008-2021, IKI approved more than 950 climate and biodiversity projects in over 150 countries worldwide, with a total funding volume of EUR5 billion[43]. IKI supports projects that implement National Determined Contributions (NDCs). It also supports its partner countries in achieving the biodiversity goals of the Convention on Biological Diversity. Most projects include multiple countries across the continent and the world (e.g. 35 are bilateral, 253 are transnational and 318 are world-wide). A review of IKI's Africa projects[44] for the subset of countries reveals that:

- 'reducing emissions from deforestation and forest degradation (REDD+)' is the main focus. Energy projects, financial mobilisation/investment by the private sector, ecosystem-based adaptation, and adaptation strategies are also major themes. While 'recycling economy/waste/waste water/resources' is an IKI project topic, few of the projects in the country subset fall under the category of pollution;

- Kenya is included in 81 IKI projects – the most of the subset. Nigeria has the least IKI projects, with 20.

Figure 9
IKI projects in African Country Subset



Note. Author's Construct, 2023. Constructed based on downloaded project data from IKI website. Download conducted on 31 July 2023.

According to their project descriptions, the IKI Africa projects have a limited focus on employment, including youth employment:

- Only one project refers explicitly to young people as target beneficiaries: the Kenyan project 'Adaptation to climate change through Silvopastoral systems in the North Rift'.

- The projects 'Integrating Electric 2 & 3-Wheelers into Existing Urban Transport Systems in Developing Countries' in Ethiopia, Kenya and Uganda, and 'Electric Cargo Bikes Made in Ghana

– Contributing to the Transformation of Ghana's Transportation' both have the creation of green jobs as part of their objectives.

- A further project, 'Financing and Capacity Building for Micro and Small Climate-Smart Enterprises: Filling the Gap of the Missing Middle', provides finance for small and micro climate-smart enterprises in Ghana, South Africa, and Uganda.

The Global Environment Facility, the Green Climate Fund, and the Adaptation Fund

The Global Environmental Facility, the Green Climate Fund and the Adaptation Fund are three of the main UN funding facilities that support a multitude of green technology programmes in Africa. Their focus areas differ, as indicated in **Table 3.** GEF is designed to respond to all three planetary crises, while the GCF and AF have a climate change focus.

Table 3
Sectors/Focal Areas of the GEF, GCF and AF

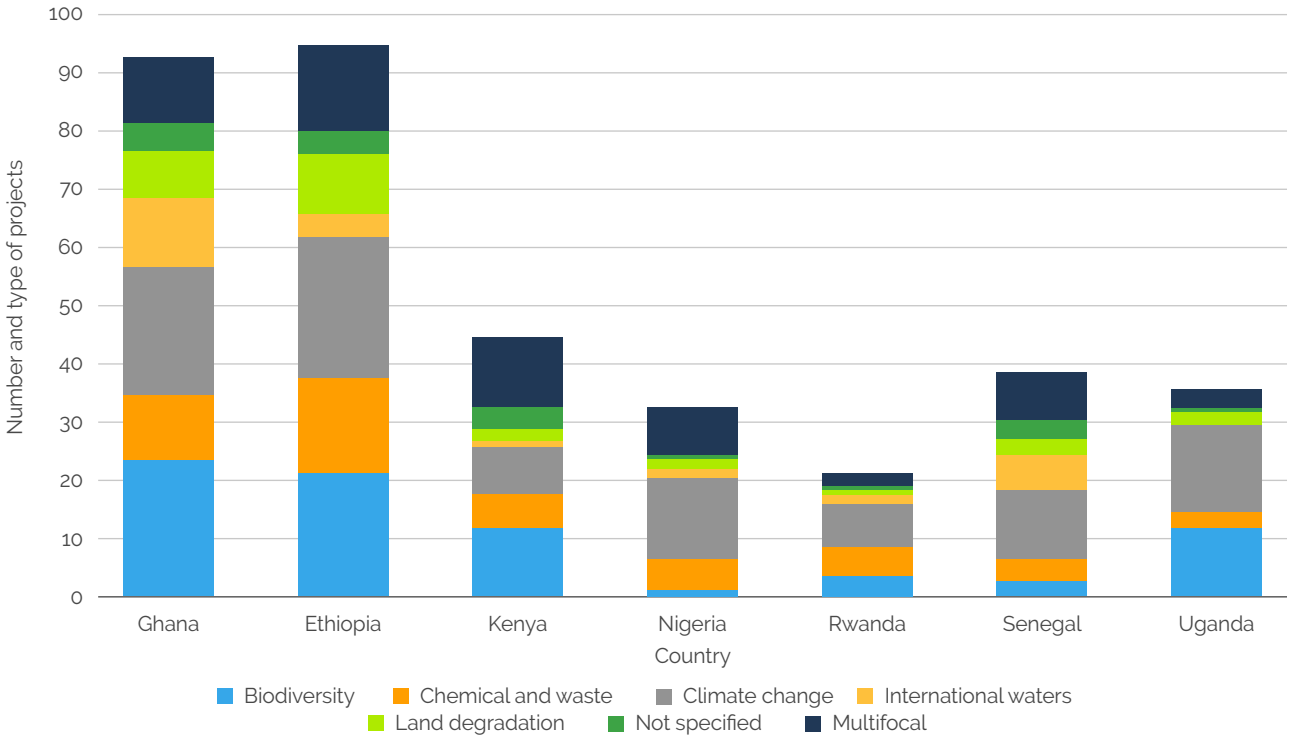
GEF	GCF	AF
Biodiversity Chemicals and Waste Climate Change International Waters Land Degradation Multi-Focal Area Ozone Depleting Substances POPs	Climate Adaptation Climate Mitigation Cross-cutting Sectors: health, food, and water security; livelihoods of people and communities; energy generation and access; transport; infrastructure and built environment; ecosystems and ecosystem services; buildings, cities, industry and appliances; forests and land use.	**Agriculture** Coastal Zone Management Disaster Risk Reduction Disaster Risk Reduction and Early Warning Systems Ecosystem-based Adaptation Food Security Forests Multisector Projects Rural Development Urban Development Water Management

Note. Author's Construct, 2023. Adapted from "Projects database of the Global Environment Facility", 2023. Available at (**https://www.thegef.org/projects-operations/database**); "Projects" by Green Climate Fund. 2023. (**https://www.greenclimate.fund/#**).[45]

GEF is Africa's largest funder of green technology programmes, with many projects funded over the past four decades[46]. The GEF is a financial mechanism for five conventions: Convention on Biological Diversity, United Nations Framework Convention on Climate Change, Stockholm Convention on Persistent Organic Pollutants, UN Convention to Combat Desertification, and Minamata Convention on Mercury.[47]

Of all African GEF projects, most (103) have Climate Change as their focus, followed by Biodiversity (80). There are 49 Chemicals and Waste projects, which indicates that GEF does fund projects in Africa which deploy green technology to address pollution. International Waters and Land degradation each account for the fewest projects, with 26 each. GEF funds many multi-country projects. Among the subset of African countries chosen for deeper analysis, the most GEF projects have been in Ghana (with 92) and Ethiopia (with 94); the fewest were in Rwanda, (21). The high counts are a result of the multi-country focus of most of the projects.

Figure 10
GEF Projects by Country and Focal Area, including Regional Projects



Note. Author's Construct, 2023. Figure derived from GEF database.

GEF does not have an overarching focus on youth. However, its Small Grants Programme has launched a dedicated Innovation Programme on Youth and Climate Change to enable young people to qualify for green jobs, start green enterprises and lead local and national climate actions.

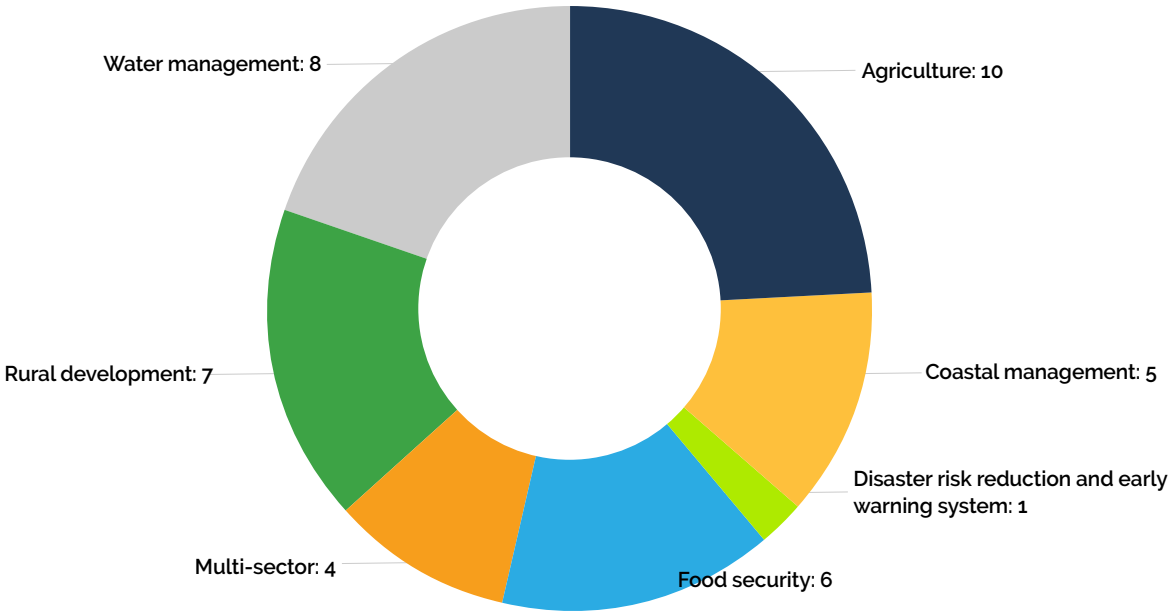
In June 2023, a new biodiversity framework fund was announced by the GEF[48] and it is expected to be launched in August 2023 at the GEF Assembly. This will increase funding for biodiversity projects.

The **Adaptation Fund** was established in 2010 to finance concrete adaptation projects and programmes in developing countries that are parties to the Kyoto Protocol and particularly vulnerable to climate change›s adverse effects[49]. The 41 African projects of the Adaptation Fund are widely spread across Africa[50]. Tanzania has the most projects of any country with 5. Uganda, South Africa, Senegal, Côte d'Ivoire, Djibouti, and Egypt each have 2. A further 28 African countries have one Adaptation Fund project.

Agriculture is the leading sectoral focus of AF projects in Africa; Water (management) and Rural Development are other major focus areas. **Figure 11** shows the sectoral coverage of the AF projects in Africa.

As with the GEF, youth employment is not a priority focus of the AF. In fact, a 2022 AF report on lessons learned recommends further inclusion and support for youth participation[51]. The Adaptation Fund's Climate Innovation Accelerator does, however, provide small grants to support developing countries to foster innovation in adaptation. Recipients include governments, non-governmental organisations, community groups, young innovators, etc.

Figure 11
Sectoral Focus of the Adaptation Fund's 41 African Projects



Note. Author's Construct, 2023. Figure derived from the Adaptation Fund project database.

The **Green Climate Fund** was established under the Cancún Agreements in 2010 as a financing vehicle for developing countries serving the Financial Mechanism of the UNFCCC and the Paris Agreement. As of the end of July 2023, it had 92 approved projects in Africa[52], 79 of which were under implementation. Of these, 18 were multi-country projects. Mitigation has been the largest focus to date, with the highest number of projects. Cross-cutting projects have attracted the most funding.

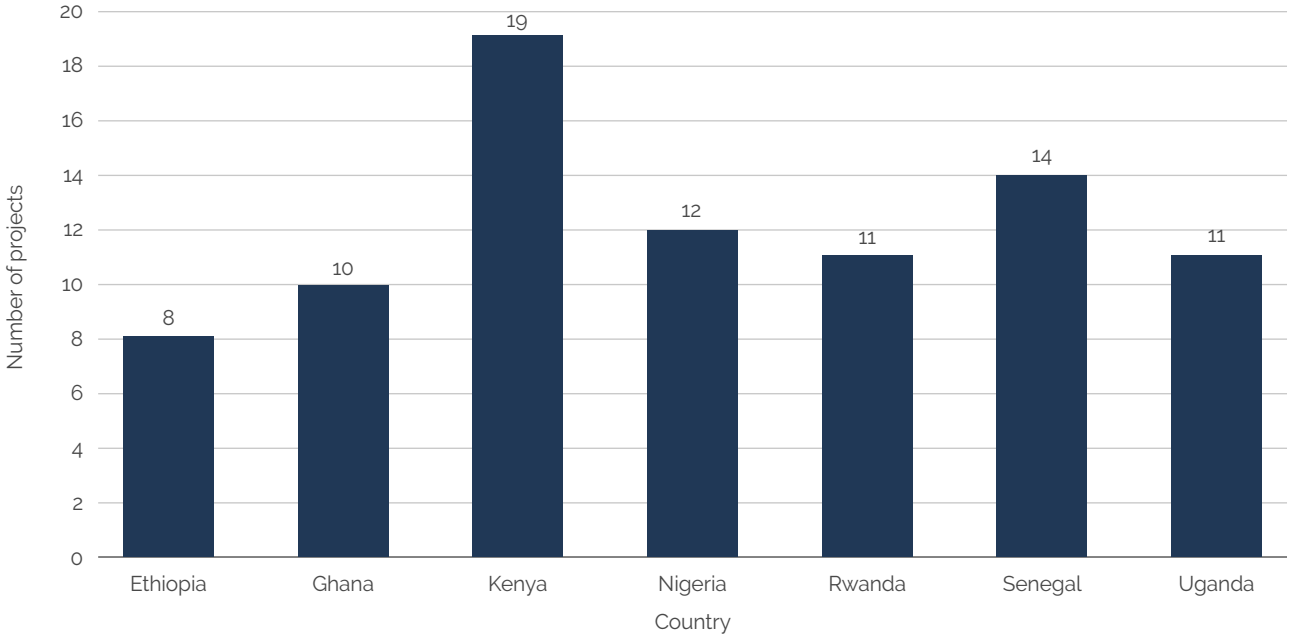
Regarding the country subset analysis[53], as in the case of IKI projects, Kenya has the most coverage in GCF projects, at 19. Ethiopia is the geographic focus of the fewest GCF projects, at 8. Most GCF projects in the subset of selected countries relate to setting up a finance facility or instruments (e.g. a guarantee) – with a number targeted at Agriculture. At the sectoral level, where the project's design is not around finance, Energy, with 5 projects, then Agriculture, with 4, are the lead sectors. Water and Disaster Risk Management also feature as focus areas.

Examples of individual country-specific GCF projects within the country subset include:

- *Senegal*: integrated urban flood management; climate resilience of food insecure smallholder farmers; solar rural electrification;
- *Uganda*: building resilient communities, wetland ecosystems and associated catchments;
- *Ethiopia*: building gender-responsive resilience to drought, resilient landscapes and livelihoods;
- *Rwanda*: strengthening the climate resilience of rural communities; transforming the Eastern province through adaptation;

- *Kenya*: ecosystem-based adaptation to end drought emergencies; community resilience and water security;
- *Ghana*: financing climate resilience agricultural practices (for women); Shea Landscape Emissions Reduction project.

Figure 12
Green Climate Fund Project Selection in Africa: Country Subset



Note. Author's Construct, 2023. Figure derived from the GCF online database.

While Nigeria is not the focus of a country-specific project, it is included in many multi-country projects, such as two energy access programmes; a resilient agricultural fund; and several climate funds, green banks and innovative and inclusive finance programmes.

Technology Needs Assessments

The Technology Mechanism of the UNFCCC's Climate Technology Centre and Network provides international support for technology development and transfer to support the implementation of countries' Nationally Determined Contributions. The Technology Needs Assessments provide specific and detailed technology recommendations at the country and sector level. These assessments are country-driven and involve local stakeholder engagements. They are funded by the Global Environment Facility.

Table 4 summarises, by sector, the TNAs for Kenya, Uganda, Rwanda, Ghana, and Senegal. There is no TNA for Nigeria. Ethiopia's TNA is currently underway (in 2023). Most of these countries' technology needs are in Agriculture, Energy and Water. Forestry and other Land Uses and Waste receive some focus, too.

While certain identified technologies are physical or 'hard' infrastructures like grain storage, rainwater infrastructures, solar dryers, solar rooftop systems and biodigesters, others are 'softer' technologies, such as ways of organising local use rights and ownership, as in the case of community irrigation systems, community-based extension models, water-user associations and farmer-managed natural regeneration for forest landscape restoration. In addition, certain green technologies, such as terraces and agroforestry for agriculture, involve particular methods and techniques rather than physical equipment or community use and benefit models. This indicates the multiple dimensions of green technology needs and applications in Africa.

Source: AdobeStock

Table 4
TNAs: Kenya, Uganda, Rwanda, Ghana, and Senegal

Agriculture	Water	Other	Energy
Kenya • Drought-resistant sorghum • Drip irrigation • Hay preservation **Rwanda** • Seed and grain storage • Agroforestry • Radical terraces • Drip irrigation • Rainwater harvesting **Uganda** • Responsive agricultural extension • Community irrigation systems • Crop breeding for climate change adaptation **Ghana** • Community-based extension model • Water-user associations • Integrated soil nutrient management • Ecological pest management • Integrated climate monitoring and early warning system **Senegal** • Bank of improved seeds • Bio-charcoal • Constitution and fodder conservation reserves; agroforestry alley cropping	**Kenya** • Roof rainwater-harvesting • Surface run-off harvesting • Solar-powered desalination **Uganda** • Deep well extraction • Rainwater harvesting • Surface runoff harvesting **Ghana** • Rainwater collection from ground surfaces • Post-construction support for community-managed water systems • Improving the resilience of protected wells to flooding • Demarcation and protection of buffer zones for water bodies • Integrated climate monitoring and early warning system **Senegal** • Technique for drip irrigation • Reuse of treated wastewater • Capture of rainwater per tank • GEOSFM Model for simulation of flow over the watershed	**Kenya** Waste management sector • Methane capture from bio-digesters • Waste-paper recycling **Uganda** LULUCF & Forestry • Promotion of Farmer Managed Natural Regeneration (FMNR) for forest landscape restoration • Integrated pest management in forest plantations through promoting mixed-species plantations • Promoting forest-based enterprises, e.g. beekeeping/apiaries, butterfly farming, fruit-tree production, ecotourism	**Rwanda** • Small hydro • Kivu Methane Combined Cycle Gas Turbine with Carbon Capture and Storage • Geothermal energy • Plug-in hybrid vehicles • Large solar photovoltaic systems **Uganda** • Solar rooftop systems • Efficient institutional cook stoves • Bio-latrines for institutions (using biogas technology) **Senegal** Energy (renewable energies, energy efficiency in buildings and industries) • Biomass direct combustion • Solar photovoltaics • Onshore wind • Portable solar lamps • Solar water heaters • Solar dryers • Low-consumption lamps (Compact Fluorescent Lamp) • Automated power factor improvement **Kenya** • Solar home systems • Solar dryers

Note. Author's Construct, 2023. Table adapted and summarised from UN TT:CLEAR (2023) Technology Needs Assessment. Retrieved from **https://unfccc.int/ttclear/tna/reports.html** on 20 April, 2023.

3.5 Green technology R&D programmes

Major Research and Development (R&D) programmes in green technology in Africa include the Africa Higher Education Centers of Excellence[54], a World Bank initiative in collaboration with governments of participating countries to support higher education institutions specialising in STEM (science, technology, engineering and mathematics), agriculture, health, environment and social science/applied science and education. While the focus is not green technology per se, in practice linkages with green technology are strong. For example, the Regional Centre for Energy and Environmental Sustainability is an African Centre of Excellence committed – through their renewable energy laboratories – to providing quality teaching, learning and research to advance the development of future leaders in the disciplines of energy and environment.

The first phase was launched in 2014, with 22 Centers of Excellence in nine West and Central African countries and the second phase was launched in East and Southern Africa with 24 centres. Based on the initial successes, the ACE Impact Project was launched in 2019 to further strengthen post-graduate training and applied research in existing fields and support new fields essential for Africa's economic growth. Under ACE Impact, 53 ACEs specialise in the broad thematic areas of STEM, agriculture, health, environment and social/applied science and education.

Other examples of research partnerships on technology in Africa that incorporate a focus on green technology include:

- ***African Centre for Technology Studies***[55]***:*** This think tank focuses on harnessing applications of science, technology and innovation policies for sustainable development in Africa. Their work has influenced patent (i.e. industrial property) legislation and policy (Kenya); environmental impact assessment standards (Eastern and Southern Africa); bio-energy and biofuels policy (Kenya, Eastern Africa, West Africa); agricultural policy, bio-diplomacy, biotechnology and biosafety (Africa-wide); and climate change adaptation and mitigation (Africa-wide).

- ***Open African Innovation Research***[56]***:*** (Open A.I.R) is a unique collaborative network of researchers spread across 22 African countries plus Canada, with the primary goal of uncovering new insights into the balance between control over, and access to, knowledge, thus solving a problem at the heart of intellectual property and innovation policy. Launched in 2011, Open A.I.R. is a pan-African network of nearly 60 experts and comprises multiple academic disciplines, national and international government organisations, civil society advocates and private sector leaders. Open A.I.R has a long-standing interest in innovation practices by African maker communities.

- ***African Institute of Indigenous Knowledge Systems***[57]***:*** This new institute promotes indigenous knowledge systems research and scholarship on a continental level. It forms a partnership of 19 higher education and autonomous research institutions with a common interest in advancing African indigenous knowledge. It is a virtual institute based on a hub and nodes model, with the University of KwaZulu-Natal in South Africa serving as the hub for the institute. Nodes are located in anglophone, francophone and lusophone countries and, in addition to South Africa and Rwanda, they include research institutes and universities in Tanzania, Côte d'Ivoire, Namibia, Zimbabwe, Uganda, Senegal, Zambia, Kenya and Mozambique.

- ***IST-Africa***[58]***:*** Supported by the European Commission and African Union Commission and co-funded under Horizon 2020, IST-Africa is a strategic collaboration between IIMC (Ireland) and

ministries and national councils responsible for innovation, science and technology adoption, policy, and research in 18 African Countries. IST-Africa facilitates and supports:

- strategic engagement with Africa focused on international research, innovation and policy cooperation;
- knowledge sharing, capacity building and skills transfer between IST-Africa Partner Countries
- collaborative open innovation, ICT-enabled entrepreneurship (including social entrepreneurship) and global development;
- the Africa - EU Strategic Partnership (ICT-enabled research and innovation supporting sustainable development).

A number of other initiatives including pan-African networks for pan-African technology and innovation are highlighted in **Annexure H**.

Summary of key points:

At a policy level:

- There are no standalone green technology policies in Africa at the continental or national level. Rather, green technologies are usually considered within climate and development policies and/or STI policies. They are also considered at the sectoral level.
- The AU's CCRD and GRAP are the two strategies with the strongest links to green technology and youth employment. They cover a range of sectors and areas. They also highlight the role of youth. The CCRD states the need to integrate indigenous knowledge solutions within Climate Services and Agriculture, in particular.
- Country-level green technology policies, etc. within the country subset tend to be cross-sectoral. Energy receives the most focus as a standalone sector. Disaster Risk Management is an important emerging area, also receiving policy focus across the countries. Climate Change strategies exist at the cross-cutting level, but there is less clear emphasis on Biodiversity and Pollution.

At a programmatic level:

- The AfDB's recent green technology focus is on infrastructure sectors and adaptation finance. Its recently announced African Adaptation Acceleration Alliance also targets climate-smart digital technologies for agriculture. Of the funders considered, it makes the strongest programmatic link to youth employment with three projects – two in Nigeria and one in Sudan. Biodiversity and Pollution are not a focus, although certain subprogrammes contain waste. The scale of the ambition – to support 1 million youth with entrepreneurship skills and job creation – is notable.

- UN finance facilities and Germany's IKI programme are major funders of green technology programmes in Africa. They have differing focuses:

  - None of the UN's main green finance mechanisms – the GEF, AF and GCF –have youth employment as a primary focus. 'Youth', 'employment', and 'entrepreneurship' are seldom mentioned in project summaries. Neither is this focus of the IKI projects in Africa.
  - IKI has a strong sectoral focus on REDD+ and Energy, while most GEF projects focus on Climate Change and Biodiversity, with fewer on Waste. The GCF has a broad focus on Climate Change, covering mitigation, adaptation, and cross-cutting projects. Pollution is not a major focus. The AF concentrates most on Agriculture, Water and Rural Development. Kenya has received significant IKI and GCF support – the most by far of the subset of countries considered.
  - None of the UN programmes focuses on Manufacturing ('industry') as a discrete sector, although the AfDB's AAAP does have an agro-processing subprogramme.

- Country technology needs assessments clearly describe recommended technologies for climate mitigation and adaptation. For Ghana, Kenya, Rwanda, Senegal and Uganda, the main sectors are Agriculture, Water and Energy, with a few additional needs in Waste and other land uses, such as Forestry. Furthermore, green technologies include 'hard' physical and 'soft' technologies, such as organising community participation or farming methods.

- A number of pan-African R&D programmes exist on technology and innovation, including green technology. It is neither clear, however, how extensively this R&D translates into funded technology commercialisation, application, and uptake, nor to what extent employment potential and entrepreneurship are included.

4. Youth and green entrepreneurship and employment in Africa

4.1 Introduction

Young people in Africa are over-represented among the unemployed. Youth employment also has gendered characteristics: For example, while women dominate employment in medium, small, and micro enterprises (MSMEs) in SADC countries, they seldom own or control productive assets such as land[59].

When employed, 95% of youth work in the informal economy. Informal work can be labour-intensive and low-skilled and is situated within communities in both urban and rural environments. At a sectoral level, most informal employment is in Services, dominated by informal trading. More than 90% of agricultural employment is also estimated to be informal[60].

While young people continue to struggle with access to services and skills, including connectivity and digital literacy, they are more likely to become entrepreneurs than older people[61]. Young entrepreneurs innovate with what they have. In waste, businesses exist based on young people creating value from eggshells, organic waste, recycling and repurposing building materials, amongst other materials[62]. Informal businesses can also plug gaps in service provision – like access to energy, water, housing, public security, telecoms, food and waste management. Youth-led (between the ages of 18 and 35) medium, small and micro enterprises (MSMEs) provide different technology or solutions to meet underserved needs and can be adopters of radical innovations, including green technologies. Community-based businesses can engage social networks to develop more inclusive pathways to sustainability[63].

4.2 African Union and global policies and approaches

The AU has developed the African Youth Charter, the Youth Decade Plan of Action (which ended in 2018) and the Malabo Decision on Youth Empowerment[64]. These programmes form part of the AU Agenda 2063. In 2019, the 'One Million by 2021 Initiative' aimed to create 1 million new opportunities for Young Africans in education, employment, entrepreneurship and engagement across the continent and in the diaspora[65]. A critique of these youth policies, strategies and plans includes that they are not adequately integrated into other policies, there is weak coordination between different stakeholders, and data on youth are also lacking[66]. It also not clear to what extent they align with youth aspirations[67].

Research into the status of green jobs for African youth indicates that there is inadequate data and information on green jobs for young people in Africa. Furthermore, in practice not all green employment is decent[68].

Challenges to green jobs for the youth in Africa

- The evidence base for green jobs is inadequate. Systems are needed for collecting and analysing empirical data on green jobs for youth. The data challenges include a lack of data on informal employment; what constitutes a green job and how to link this to current employment surveys; and the regularity, extent, and depth of such surveys.
- Information on impacts, delivery and outcomes lacks depth.
- Not all green employment is decent and high quality.
- It is not clear if green jobs programmes have significantly improved employment outcomes in Africa.
- Youth do not have unique characteristics – other than their age - that set them apart in the job market from other people seeking employment.
- Young people's perceptions of green jobs do not appear to differ much from these concerning other jobs.
- Not all green jobs are knowledge-intensive as many green jobs held by youth are in the informal economy. More education, training and professionalisation of green jobs is needed to create employment mobility and progression for young people.
- Young women, particularly in rural areas, struggle more than men to find green jobs.
- Unsustainable activities continue to offer employment opportunities, e.g. in fossil fuel exploration and extraction.

Note. Author's Construct, 2023. The text box was adapted from Mwaura, G and Glove, D. (2021). Green jobs for young people in Africa: work in progress. Evidence Synthesis paper series. INCLUDE knowledge platform. Available at **https://includeplatform.net/wp-content/uploads/2021/08/ESP-Mwaura-and-Glover.pdf** .

At the international level, and responding to the concept of the just transition (to a greener global economy), the Food and Agriculture Organisation (FAO) has developed a youth plan[69] which links youth employment to the just transition. It integrates entrepreneurship and technology, including strengthening rural youth capacities for using innovative approaches and technologies in food and agriculture, and promotes rural services for youth and agricultural entrepreneurs. This youth plan is a deliberate attempt to address the particular circumstances of youth rather than subsume them into more general employment plans for agriculture.

Agriculture is also identified as a sector with a large potential for green jobs by the Challenge Fund for Youth Employment[70], a seven-year programme funded by the Netherlands Ministry of Foreign Affairs and managed by the Palladium Group, Randstad and VSO. So too, are Energy, Construction, Tourism and Environmental Services. The geographical focus of the Challenge Fund is Egypt, Jordan, Kenya, Nigeria, Sudan, Uganda, Tunisia, Ethiopia, Senegal, Morocco, and Burkina Faso.

Annexure C captures some of the sectoral characteristics and opportunities for youth jobs in Africa in the shifting landscape of green technology adoption.

4.3 National youth policies

As with green technology, many African countries include youth employment in cross-cutting rather than standalone policies. Improved policy coherence is particularly required between employment and youth policies, as well as agricultural and rural development policies[71].

Recent policy briefs, produced by the International Labour Organisation in partnership with The Mastercard Foundation[72], examine the youth employment policies of Ethiopia, Ghana, Kenya, Nigeria, Rwanda, Senegal, and Uganda. A finding with particular relevance to green technology is the increasing emphasis in these countries' policies on employment in green and digital sectors, which require high levels of skills. This is viewed as a positive trend. The research also shows that much of the focus on youth employment remains in more traditional sectors such as agriculture, construction, and infrastructure development. While 'traditional', each of these sectors nonetheless has the potential for green technology adoption to improve efficiencies, climate-smart methods, and resilience, as in the case of circular economy approaches.

Specific findings relevant to the country subset in terms of green technology and youth employment include that:

- ICT and green skills are a focus of Uganda's National Development Plan III and Ghana's National Medium-Term Development Policy Framework;
- Within Kenya, Nigeria, Rwanda, Senegal and Uganda, the focus on agriculture and rural development includes some interventions, including linking agricultural technologies and ICTs, climate-smart agricultural practices and investing in agro-processing (the manufacturing side of agriculture). Other measures include supporting green entrepreneurship in sectors and activities such as Renewable Energy, Waste Management and Recycling.

Table 5
Policy Areas Targeting Young People – Ethiopia, Ghana, Kenya, Nigeria, Rwanda, Senegal, Uganda

	National Development Strategy	National Employment Policy	TVET & Skills	Agriculture	Digital	Green	Migration
Ethiopia	✓	✓	✓	✗	✓	✗	✗
Ghana	✓	✓	✗	✗	✗	✓	✗
Kenya	✓	✓	✗	✓	✓	✓	✗
Nigeria	✓	✓	✓	✓	✓	✗	✓
Rwanda	✓	✓	✓	✓	✓	✗	✓
Senegal	✓	✓	✓	✓	✓	✓	✗
Uganda	✓	✓	✓	✓	✗	✓	✗

Note. Author's Construct, 2023. Table adapted from Youth Country Briefs: Cross Country review by International Labour Organization. 2023. International Labour Organization.(**https://www.ilo.org/employment/Whatwedo/Publications/WCMS_886467/lang--en/index.htm**).

To support entrepreneurial capabilities, several African countries are **introducing specific policies and legislation modelled on Tunisia's Start-up Act of 2018**[73]. Senegal is implementing their Start-up Act of 2020, while Nigeria, Kenya and Egypt are busy drafting their own policies to support entrepreneurs, including youth entrepreneurs.

4.4 Green technology and youth programmes in Africa

The International Labour Organisation (ILO), Stichting Nederlandse Ontwikkelingsorganisatie (SNV), Challenge Fund for Youth Employment (CFYE) and Hivos are some of the major institutions that support programmes that seek to directly address youth unemployment using green technology. Certain of these programmes are listed and described in **Table 6.** Renewable Energy, Construction and Agriculture received the most sectoral prominence in these examples. **Annexure D** provides more detail on the highlighted programmes.

Source: AdobeStock

Table 6
Select Youth Employment Programmes involving Green Technology

Countries	Sectors	Programme Name and Design
Tanzania, Mozambique and Rwanda	• Agriculture • Renewable Energy • Water and Sanitation businesses	**SNV's Opportunities for Youth Employment programme** links three key components to support rural market systems: i) skills and capacity development, ii) matching youth with market opportunities for employment and enterprise development, and iii) promoting value chains within growth sectors.
Zambia	• Construction	**The Green Jobs programme promotes** sustainable enterprises in an expanding market for green housing through i) shaping attitudes, practices and behaviour towards the advantages of green buildings and their related job creation potential, ii) policy-level engagement which supports government and parastatal institutions to undertake a regulatory reform process to promote green building practices among private and public housing developers and support a Green Building Association, and iii) capacity building of private sector associations and service providers, aimed at improving MSME access.
Southern Africa	• Cross-cutting	**The Hivos Green Entrepreneurship programme** trained local business support trainers. It also developed business support structures and investment in frontrunner SMEs through HIVOS' impact investment facility to accelerate the growth of exceptional SMEs.
Tanzania	• Construction • Waste Management • Organic Agriculture • Renewable Energy • Sustainable Tourism and other sectors	**ILO's long-standing Start-and-Improve-Your-Business programme** has produced sector-specific adaptations of its business development training materials like green construction and waste management.
Kenya, Tanzania, and Uganda	• Renewable Energy	**The ILO's Youth Entrepreneurship Facility** promotes green business and youth and green entrepreneurship training through multiple partners and initiatives. For example, the Lighting up Kenya Programme, with UNIDO support, has established renewable energy centres managed by the local communities.
Kenya	• Construction	**Habitat for Humanity in Kenya** aims to green the construction sector in Kenya and beyond. In Kenya, it has partnered with three local green technology companies – Gjenge Makers, MycoTile and The Toolkit iSkills. Habitat works with local TVET institutions and the industry to establish certification standards for general and green skills in the construction industry.

Countries	Sectors	Programme Name and Design
Uganda	• Renewable Energy	**African Clean Energy Uganda** was established in 2016 as part of the Dutch social enterprise African Clean Energy. ACE is a certified B-Corp and will catalyse the growth of the Thermal Energy sector in Uganda by strengthening the rural distribution of the ACE clean cooking systems.
Benin and Nigeria	• Agriculture	**The Youth Employment in Agri-business and Sustainable Agriculture Project** aims to link rural youth (18–35 years) with access to agricultural resources, technical and practical skills, credit facilities and other services needed to establish agribusiness enterprises and maximise their ability to benefit from existing agrifood systems.
South Africa	• Environmental Services • Public employment programmes	The Government's **Working for Water** project implemented large-scale public works programmes and an ecological restoration programme with a job focus especially for youth. With over 300 projects across South Africa, it has cleared more than a million hectares of invasive plants.
Morocco	• Fisheries, • Agro-processing	**Green Jobs for young people in rural areas (GIZ)** offered training courses for ecologically sustainable careers, provided technical advisory services, and financed micro and small enterprises and young entrepreneurs in businesses such as fishing, wood processing, and other natural product-processing.
Egypt	• Renewable Energy • Environmental Conservation • Waste Management and Recycling • Organic Farming • Agro-processing • Eco-tourism	**Decent Jobs for Egypt's Young People** has been funded by the Government of Canada and implemented by the ILO alongside the government of Egypt. The project funded skills-development toolkits, training, conferences and knowledge-sharing events, decent jobs assessment studies, and national and regional initiatives addressing youth labour market demand and supply challenges.
Burkina Faso, Ghana, Mauritius, Rwanda, Senegal, South Africa, Sierra Leone, and Zimbabwe	• Agriculture and Food • Energy • Waste	**The Green Jobs for Youth – Food and Agriculture Organisation** project aims to provide green jobs across Agri-food and other rural economic sectors through value chain identification and community involvement. Local actors, youth entrepreneurship and impact investors are partners in scaling successful agri-businesses. Training is offered to young people in business development.
Multi-country	• Renewable Energy • Water Management • Climate-smart Agriculture • Waste Management	**Youth and Women Green Entrepreneurship in Africa.** The United Nations University coordinates a consortium of partners to set up a framework that brings together actors and stakeholders in Africa's green innovation and entrepreneurship ecosystem. The aim is to identify and ideate solutions and organise and support innovations, innovators and entrepreneurs focusing on women and youth. A community of practice around the topic of green innovation and entrepreneurship in Africa, a Pan African Green Entrepreneurship Policy, and a knowledge hub will be established to analyse the interactions among stakeholders in the innovation and entrepreneurship ecosystem and provide policy and recommendations for improvement.

Note. Author's Construct, 2023. Table constructed based on data from the following sources: FAO, 2019.; UNU; ILO, 2022; Challenge Fund for Youth Employment/Include, 2022; ILO, 2019, ILO, 2021.

4.5 Youth entrepreneurship, start-ups, and clusters for green technology

At the continental level, the African Plan of Action for Youth Empowerment identifies five key priority areas. One is on youth employment and entrepreneurship. Building on this, a more recent AU policy brief, 'Promoting Youth Entrepreneurship in Africa'[74], proposes six interventions:

1. Engaging youth directly in entrepreneurship-related policy-making
2. Integrating relevant education with entrepreneurship to facilitate entrepreneurship skills development
3. Supporting and enhancing an enabling entrepreneurial ecosystem
4. Employing and supporting smart and effective financing for start-ups, particularly for social enterprises addressing a specific gap, niche or problem
5. Leveraging and strengthening partnerships and collaboration with the private sector and other stakeholders
6. Promoting gender-responsive programming

While a number of the youth programmes highlighted in **Table 6** support skills, financing and the entrepreneurship ecosystem, there is also an emerging tech hub scene in Africa responding to the opportunities that green technology brings. Support to youth entrepreneurs can involve support for start-ups through clustering and incubators. In terms of clustering, there are many kinds, such as science and technology parks and innovation hubs. Green industrial parks exist in certain countries, like the **Atlantis Special Economic Zone in South Africa** and **Hawassa Industrial Park in Ethiopia**. Hawassa Industrial Park represents a flagship project on the continent, with a supply of hydropower energy and the installation of the Zero Liquid Discharge industrial-effluent treatment plant. **The Innovation Hub**, another good example from South Africa, has several bio-based entrepreneurs. While governments and donors run some of these clustering initiatives, others are real estate models, where small firms buy-in or cluster themselves together, sharing certain facilities and services.

Examples of African technology hubs, their location, partners and the select start-ups they host are provided in **Table 7.** The examples provided cover a range of green technology sectors, such as Renewable Energy, Agriculture, Waste, Water and Transport/Mobility.

Table 7
Examples of Incubators and Accelerators in Africa with Green Incubatees or Programmes

Incubator Name	Partners	Examples of Start-ups	Location
Impact Hub[75]	Local and international partners, such as Climate Launchpad	Solar Freeze (Renewable Energy), Ecozen Solutions (Agriculture)	Various locations
East Africa Accelerator[76]	IKEA Foundation and Acumen	Taimba (Agriculture), HydroIQ (Water Management)	Nairobi, Kenya
MEST Seed, MEST Express and MEST Accelerator[77]	MEST and The Mastercard Foundation	AgroCenta (Agriculture), Trotro Tractor (Transportation/ Agriculture)	Accra, Ghana
Katapult Africa Accelerator[78]	Katapult, Tony Blair Institute (TBI) for Global Change, Norrsken, and Smart Africa	Agritech and Foodtech Kudoti (Waste Management), SunCulture (Renewable Energy)	Africa-wide, Mauritius accelerator hub and Rwanda
Africa ClimAccelerator[79]	35 preparation and implementation partners	Pura Organic Agro Tech (Agriculture), HydroNeo (Water Management)	Multiple countries
The Climate Innovation Center South Africa[80]	The Climate Innovation Center South Africa provides incubation services to small and medium enterprises that focus on creating innovative solutions to climate change challenges.	TMI Dynamatics (modelling and simulation)	South Africa
The GIZ Accelerator Program for Climate Change Innovations[81]	The accelerator supports early-stage companies in Benin, Cameroon and Niger that deliver digital solutions to combat climate change.		Benin, Cameroon, Niger
The African Youth Climate Hub[82]	A Moroccan-based incubator for entrepreneurs from around the continent that gives answers to climate-related concerns.		Morocco

Note. Author's Construct, 2023. Author's compilation based on various website sources. See **endnotes 75 to 82**.

While green sectors present growth, employment and enterprise potential, young people in Africa are often interested in other areas, including ICTs. Young people's aspirations should be an important consideration in programme design and ICTs and green technology can be linked together. African firms using ICTs to provide green technology do this in a number of ways, e.g. through the provision of datasets to enhance business efficiencies, connect consumers with markets previously isolated or underrepresented, or access information hard to access. Examples include **Data Prophet** (efficient manufacturing), **Abalobi** (sustainable fisheries), **Aerobotics** (precision crops), **Where is my transport** (live data on public transport, including informal transport), **FarmDrive** (finance for smallholder farmers), **Sophie Bot** (health chatbot) and **SyeComp** (digital farmer services).

Government and donor entities may be mandated to support the green technology ecosystem. These agencies and programmes support linkages between firms, export opportunities, finance and skills access, and policy reform. They play a critical part in this ecosystem's development. Examples are provided in **Annexure G**.

Summary of key points:

- African Youth face significant un- and underemployment and, when they do work, the work is often informal. Their work often occurs in the service and agricultural sectors in both rural and urban areas. With increasing urbanisation overall, however, urban, or city-based youth employment strategies, including green technology, are an important focus. C40 is one of several organisations working with cities to advance green technology adoption.
- Research undertaken into green jobs for youth poses several questions about the nature, impact and attractiveness of these jobs. Far better data is required to better design programmes that work.
- Of the select country subset, youth employment is already considered in many cross-cutting and sectoral policies, although more coherence is required. While many countries are considering the potential of green technology for youth employment, including concerning green skills, entrepreneurship, climate-smart agriculture and its linkages to ICTs, others do not.
- Agriculture remains the main sectoral focus of employment policies, including for youth. Green technology in agriculture includes climate-smart agricultural practices. Some of these have already been identified in Technology Needs Assessments.
- Entrepreneurship is increasingly the focus of specific country legislation, such as Senegal's Start-up Act. Entrepreneurship is also a focus in many donor-funded programmes on youth employment in Africa, where enterprises and individuals are supported to gain skills to start or grow businesses. Global youth employment and entrepreneurship programmes tend to focus on Agriculture, Construction, Energy, Waste and Water. Construction industry/building projects receive greater youth employment programmatic focus than this sector receives in overall green technology policies and programmes.
- Many innovation hubs exist in Africa that target technology start-ups, and most have some green technology focus. Government and donor agencies often support this green technology entrepreneurship environment through specific innovation programmes on green technology.

5. Discussion: opportunities for youth employment and entrepreneurship in green technology in Africa

This scoping report indicates a number of patterns in green technology policy, programmes, and youth employment in Africa. It also points to several gaps and opportunities for improved policy and programmatic coherence, focus and impact.

1. The potential for green technologies to respond to the Climate Crisis, Biodiversity Loss and Pollution

Green technology is a broad concept which should not be limited to climate technologies. There are also many opportunities to address Biodiversity Loss and Pollution through green technologies, and to exploit the associated employment potential. A further important conceptual point is that technology does not simply denote hard equipment or infrastructure. It can also refer to methods and approaches. This is essential for the integration of indigenous knowledge into green technologies in Africa.

The Scopus search also clearly identifies a gap in published research on green technology in Africa in terms of employment and entrepreneurship impacts and potential.

2. State of green technologies and links to manufacturing potential

Green technology policies and programmes in Africa appear to have a limited focus on firms and firms' capabilities. However, as indicated by UNCTAD, 'if developing countries are to capture the economic gains associated with new technologies, their firms must have the required capabilities. This includes not just scientific or technical skill, but also the necessary policies, regulations, and infrastructure' (UNCTAD[83], 2023, p: xvii).

To generate employment for youth and others in society, a far more deliberate focus is needed on developing green technology industries in Africa. For this reason, the lack of a manufacturing focus is a strategic gap within existing green technology policies and programmes. Given the scale of the UN programmes considered in this report, there is also a clear opportunity for African firms to localise and develop certain of the green technologies that are required as inputs – for example, rainwater tanks, cabling for solar PV installations, and/or the services that go with these. These UN and other programmes that support green technology and employment in Africa should help build this manufacturing base, which will spur sustainable employment.

The Technology Needs Assessments (TNAs) provide a detailed and nuanced view of the specific green technologies – hard and soft – required at a country level. These TNAs form a very useful basis for aggregating the various technology inputs required across countries for a coordinated

approach to manufacturing. In time, the African Continental Free Trade Area can also play a role in supporting intra African trade of these products.

There is also an opportunity (requiring more investigation) to strengthen linkages between R&D programmes on green technology at universities and firm development.

3. Sectors and multisectoral potential at the landscape level

The main focus of published green technology documents, policies and programmes (and, by implication, funding) is the Climate Crisis. There is some integration of Biodiversity considerations, but less on Pollution. While Waste receives less coverage in published research, TNAs and the GEF programmes in Africa, it is nonetheless already the focus of much entrepreneurial innovation: Waste can become organic compost, a source of protein, a construction material and more. Construction, as a sector, features strongly in youth employment programmes but not in the GEF, GCF and AF green programmes or the policy environment. Construction has strong linkages to Manufacturing, Waste, Entrepreneurship and the Urban Environment. It, too, requires further policy integration from a green technology perspective. Making these linkages clearer could improve impact and integration.

Energy is the major sectoral focus of green technology research, policies, and programmes in Africa. Agriculture also receives considerable focus. While a number of the green technology programmes address Energy Access, Water, Food Security and Rural Development together, more focus could be given to the Water-Energy-Food-Environment nexus at a programme level and in relation to youth employment. Such an approach could address multiple development challenges within a landscape, through an integrated planning approach. From a green technology perspective this is interesting, as it requires that different technologies – both hard and soft – be identified to simultaneously address complex multi-faceted green and development needs. Indigenous knowledge plays an important role here in ensuring that technologies are appropriate.

4. Indigenous knowledge and ICTs

Indigenous knowledge is increasingly recognised as a source of both inspiration and of appropriate technologies to address Climate Change, Biodiversity Loss and Pollution[84]. As indigenous knowledge is place-based, relational and dynamic[85], it provides for systemic connections of culture, heritage and climate change[86]. Indigenous knowledge has been recognised as having the potential to '(re) position the continent as a serious and equitable stakeholder in the new knowledge economy and dynamics of the 4IR[87]'. The AU's Climate Change and Resilient Development (CCRD) strategy identifies specific areas – notably in agriculture – where the focus needs to be in terms of the integration and use of indigenous knowledge. There is an opportunity to align policy between green technology and indigenous knowledge in national policies on the African continent, particularly STI policies. South Africa's Indigenous Knowledge Systems Act of 2019 is a forerunner as it provides several mechanisms, amongst others, to document and register indigenous knowledge. South Africa has also made some progress in setting up the legal, regulatory, and institutional framework for its protection and development. (**Annexure G** contains a case study on South Africa's indigenous knowledge development and links to green technology).

While indigenous knowledge offers several approaches to farming, soil enhancement, pest control, plant beneficiation and early warning systems (among other technologies), there appear to be

relatively few existing green technology programmes or technology hubs that invest in green technology applications based on indigenous knowledge. This is a gap.

ICTs also emerge as a theme in the green technology research – in the published research identified on Scopus, the GRAP and CCRD, within a subprogramme of the AAAP and in a number of the youth employment programmes, as well as in the tech and innovation hubs on the continent.

ICTs play multiple roles within green technology development and uptake. These include diagnosing, monitoring, measuring, sharing, informing, communicating, and transacting. Mobile phones, sensors, satellites, and Artificial Intelligence (AI) are increasingly used for effective green technology development. At the same time, a lack of data affects planning, management and monitoring. It also affects finance flows where baselines are needed to set targets. Specific datasets that must be strengthened and supported across countries for green technology include weather station data, agriculture, species, population, and economic data[88]. Data on green jobs in Africa for youth have also been identified as a major obstacle to understanding performance and progress in job creation programmes[89].

As young people have a strong affinity with ICTs, there is an opportunity to involve youth to assist with building datasets in their communities and to develop applications for the data's use. For this reason it is critical that investments are made to improve connectivity and digital skills for youth. Programmes must also be designed to address the gendered nature of youth employment, unemployment and underemployment.

Source: AdobeStock

6. Conclusion

A deliberately inclusive and integrated approach is required for job-creating green technology development in Africa. This should seek to decarbonise and dematerialise economies in a just manner over time, reflecting nuances in country contexts, while substantially improving employment and entrepreneurial opportunities for the young African population. The approach should be holistic in accommodating multiple sectors, but also through the adoption of a socio-ecological design that places local people and their knowledge at the centre of technology choice, development, and use. Integration of indigenous knowledge into technology programmes has been signalled in policies, but the research shows it is somewhat limited in practice.

This scoping report has indicated (at a high-level) some of the trends in green technology policies and programmes on the continent. It also points to several opportunities for improved policy coherence and programmatic focus to drive youth employment and entrepreneurship. Targeted research and mapping, at a country and/or regional level, would allow for more detailed findings to advance coherence and impact.

Working on a green technology industry strategy at a country and, perhaps, regional level, and aligning this to respond to the immediate procurement opportunities presented by the major green technology programmes of the UN, IKI and AfDB, among others, could create a market for youth businesses. It could also create youth employment within growing local green technology manufacturing firms (be they youth-owned or not).

A final point and recommendation: As the current AU STI policy for 2014-2024 will soon need to be updated, there is an opportunity to push for a focus on green technology as it relates to youth employment. This should specify the many leverage points to scale green technology R&D, open up opportunities for local green technology development, including for example, through linkages with ICTs, indigenous knowledge and manufacturing, as well as improved overall policy and programmatic coordination and integration.

Annexures

Annexure A:
Climate technology investment sectors, subsectors, trends, and examples of African firms

Sector	Subsectors	Global Investments	Notable Global Trends	Examples of African firms
Energy	• Renewable energy generation • Nuclear energy[90] • Grid management • Waste heat capture, conversion, and storage • Alternative fuels	Increased 2.7 times between 2020 and 2021; USD29.65bn in 2022; the largest equity investment of USD47m to British Volt.	Focus on low GHG extraction and maintenance, lithium-ion batteries for electric vehicles.	Sun King (providing solar energy solutions across Africa and Asia); Bboxx (providing clean energy access to off-grid communities); Zola (providing solar home systems and energy-efficient appliances); M-KOPA (providing pay-as-you-go solar solutions in Africa); d. light (providing solar products for households and small businesses); Koko Network (providing liquid ethanol cooking fuel); Powerstove (providing smokeless biomass stoves); Nuru (solar mini-grids)
Farming and food production	• Alternative foods and low GHG proteins • Vertical and urban farming (including aquaponics) • Agricultural biotech/ genomics and natural solutions • Precision agriculture and robotics • Earth and marine protection • Land use management • Value chain GHG reduction • Low GHG fertilisers and pesticides	Record high investment in 2021; USD8.26bn funding gap in 2022; makes up 20.2% of global climate tech start-ups and scaleups.	Innovation in farming and food production, use of data for efficient use of farmland, and GHG reduction in value chains.	Gro Intelligence (providing data analytics for agriculture); Aerobotics (providing aerial imagery and analytics for precision farming); **Komaza (reviving degraded land and creating sustainable forestry-based businesses in Africa)**

Sector	Subsectors	Global Investments	Notable Global Trends	Examples of African firms
Circular economy	• Platforms which enable sharing, leasing, reusing, and refurbishing existing materials and products • Recycling in an environmentally feasible way • Reverse logistics for environmental sustenance • Emerging enabling technologies to reduce waste	Steady growth from 2017 to peak of USD15.26bn in 2021; declined in 2022.	The role of platform technologies in facilitating behavioural change, and examples such as ride-hailing companies like Bolt and e-commerce company Depop.	**Good Nature Agro (providing sustainable and organic fertilizers to farmers in Zambia);** Coliba (providing plastic waste recycling services in West Africa)
Mobility	• Low GHG air transport • Low GHG shipping • Micro-mobility (small, lightweight vehicles which cover short distances) • EVs & High-Efficiency vehicles • Efficient transport systems • Batteries and fuel cells	Investment is 7.7x higher than in 2017, but significant job cuts are seen in 2022.	Growth in micro-mobility, and zero-emission buses, vans, and taxis. The role of bicycles and buses as dominant forms of future transport within cities.	**MAX.ng** (providing motorcycle ride-hailing services in Nigeria); Zembo (providing electric motorcycles and charging infrastructure); MellowCabs (providing electric mini-cabs and urban delivery vehicles
Built Environment	• Low GHG construction • New low-GHG materials, including waste materials	USD3.63bn investment in 2022; compound annual growth rate of 33% since 2017	The low number of firms. Need for more incentives for climate tech innovation in this sector.	**Sanergy (providing sanitation solutions and waste-to-energy services in Africa)**
Carbon accounting and climate risk	• Emissions data, monitoring, management, and reporting • Climate risk management • Climate and earth data generation • Low satellites and sensors		This area of focus skyrocketed in 2022, reaching USD3.91bn. Climate accounting and risk are central to environmental, social and governance (ESG). Companies must understand their impacts before creating a strategy to reduce emissions. The information provided could have an extensive indirect impact on the environment.	**Greenhouse** (various consulting services, including carbon accounting); **Dataprophet (efficiencies** – machine learning, AI for lean manufacturing)

Sector	Subsectors	Global Investments	Notable Global Trends	Examples of African firms
GHG removal	• Carbon capture, usage, and storage (includes concrete which sequesters GHG) • Geo-engineering-based direct air capture and storage • Enhanced weathering • Biomass uptake of CO2 (excluding afforestation and land management) • Biochar and bio-oil		Experienced a 717% increase in investment in 2022. There are only 210 start-ups and scaleups in this space. Carbon removals have not yet worked at scale.	

Source: Adapted from **Tech Nation: Climate Tech Report 2022**. Certain African examples are provided by the Author.

Annexure B:
Climate Laws for Ethiopia, Ghana, Kenya, Nigeria, Rwanda, Senegal, Uganda

ETHIOPIA			
Document Type and focus	**Sectors**	**Document title**	**Summary**
Policy (Adaptation)	Agriculture Energy Environment Health Industry LULUCF[91] Urban Waste Water	Environment Policy of Ethiopia	The policy aims to 'improve and enhance Ethiopians' health and quality of life and promote sustainable social and economic development through the sound management and use of natural, human-made and cultural resources and the environment as a whole…' This is done through several sectoral policies as well as some cross-sectoral policies.
Plan (Adaptation)	Agriculture Buildings Economy-wide Energy Industry LULUCF Tourism Transport Water	The Growth and Transformation Plan TP) II	The GDP II replaces the initial GDP to cover the period 2015-2020. It sets some targets for energy generation from renewables and biofuels. The plan focuses on improving macroeconomic indicators, sectoral economic development plans (e.g. agriculture and rural transformation, manufacturing, mining, tourism), infrastructure (transport, digital and water supply), human and technology capacity building, good governance and cross-cutting issues. New feasible agricultural varieties that are resilient to climate change and positively contribute to climate-resilient green economy development to enhance agricultural production and productivity will also be identified and disseminated. Other important GTP II goals are protecting forests and re-afforestation; expanding electricity generation from renewable energy sources; and leap-frogging to energy-efficient technologies in transport, industry and construction.
Programme (Adaptation and Disaster risk management)	Agriculture Buildings Environment Health Transport Waste Water	Ethiopian Programme of Adaptation to Climate Change (EPACC)	The EPACC calls for the mainstreaming of climate change into decision-making at a national level and emphasises planning and implementation monitoring. It identifies 20 climate change risks, mainly in the following areas: health risks (human and animal); agriculture production decline; land degradation; water shortages; biodiversity; waste; displacement; distributive justice.
Resolution (Adaptation; Disaster Risk Management)		Disaster Prevention and Preparedness Commission Establishment Proclamation	The proclamation establishes a federal commission to oversee the management of national human-made and natural disasters. Climate change is not mentioned specifically.
Policy and Strategy (Adaptation; Disaster Risk Management)		National Policy and Strategy on Disaster Risk Management	The National Policy and Strategy on Disaster Risk Management aims to reduce disaster risks and potential damage caused by a disaster through a comprehensive and coordinated Disaster Risk Management System in the context of sustainable development.

ETHIOPIA			
Document Type and focus	**Sectors**	**Document title**	**Summary**
Roadmap (Adaptation; Disaster Risk Management)	Adaptation	National Adaptation Plan Implementation Roadmap	This roadmap aims to identify key enabling activities instrumental to achieving the country's NAP, their timelines, and key milestones to note during implementation in collaboration with key actors responsible for their delivery.
Strategy (Adaptation; Mitigation)	Buildings Economy-wide Energy Industry LULUCF Transport	Climate-Resilient Green Economy (CRGE) Strategy	The Climate-Resilient Green Economy (CRGE)'s vision is to achieve middle-income status by 2025 in a climate-resilient green economy, outlining four pillars: i) Agriculture: Improving crop and livestock production practices for higher food security and farmer income while reducing emissions; ii) Deforestation: Reducing emissions by protecting and re-establishing forests for their economic and ecosystem services including as carbon stocks; iii) Power: expanding electricity generation from renewable energy for domestic and regional markets; iv) Transport, industrial sectors and buildings: leapfrogging to modern and energy-efficient technologies.
Plan (Adaptation; Mitigation)	Economy-wide Energy LULUCF	10-year development plan (2020/21-2029/30)	This plan sets the government's development vision over the decade 2020-2030. It is based on ten pillars. Pillar six is to build a climate-resilient, green economy.
Strategy (Adaptation; Mitigation)	Transport Urban	Climate Resilient Transport Sector Strategy	This document seeks to modernise the country's transport sector and encourage multi-modality in particular.
Strategy (Adaptation; Mitigation)	Energy Water	Climate Resilience Strategy: Water and Energy	This document sets the government's strategy to provide the country with sustainable water and energy supplies.
Resolution (Disaster Risk Management)		Proclamation to provide for the establishment of the Disaster Prevention and Preparedness Fund and its administration.	The proclamation establishes a disaster management fund, to maintain a readily available cash reserve to combat disasters, and to assist the implementation of Employment Generation Schemes (EGS) that would support the achievement of National Food Security.
Regulation (Disaster Risk Management)		National Disaster Risk Management Commission Establishment Council of Ministers Regulation No. 363/2015	This regulation establishes the National Disaster Risk Management Commission as an autonomous Federal Government office and defines its functions and powers.
Resolution (Mitigation)	Economy-wide Industry LULUCF Transport	Proclamation creating the Ministry of Environment and Forestry	The proclamation creates the 'Ministry of Environment and Forestry' and amends the designation 'Ministry of Urban Development and Construction' and 'Ministry of Water and Energy'. It considers that to expand farmland and increase forest coverage it is necessary to separate the Forestry from the Ministry of Agriculture.
Resolution (Mitigation)	Energy	The Electricity Proclamation (No. 86-1997)	The proclamation established the Ethiopian Electricity Agency (EEA) as an autonomous federal government organ (later changed to Ethiopian Energy Agency). The Agency's mandate is to regulate the operation of the Energy sector on technical and economic issues – from standards, efficiency and reliability to tariffs.

ETHIOPIA			
Document Type and focus	**Sectors**	**Document title**	**Summary**
Policy (Mitigation)	Agriculture Energy Industry Transport	Ethiopia Energy Policy	The Policy aims to increase the availability of reliable and affordable energy supplies and ensure their use rationally and sustainably to support national development goals, mostly by increasing energy supply to meet needs by developing and utilising hydro-electric power, natural gas and oil exploration, and providing alternative energy sources for households, industry, agriculture, transport and other sectors. It names coal as the main alternative to the popular biomass.
Resolution (Mitigation)	Energy	Proclamation No. 810/2013 on energy	The proclamation allows the Council of Ministers to establish the Ethiopian Energy Authority. The Authority will be the key governmental actor in issuing and renewing licenses, supervising operations, reviewing national grid tariffs, formulating energy efficiency and conservation strategies, and promoting energy efficiency and conservation.
Law (Mitigation)	Energy Transport	Rural Electrification Fund Establishment Proclamation (No. 317 of 2003)	This Proclamation establishes the Rural Electrification Fund to provide loans and technical services for Rural Electrification Projects carried out by private operators, cooperatives and local communities and, more specifically, for those projects operating on renewable energy sources and to encourage the utilisation of electricity for production and social welfare purposes in rural areas.

GHANA			
Document Type and focus	**Sectors**	**Document title**	**Summary**
Policy (Adaptation; Mitigation)	Economy-wide Energy Environment Industry Social development Transport Waste	National Climate Change Policy (NCCP)	The National Climate Change Policy (NCCP) outlines the vision and objectives concerning effective adaptation, social development, and mitigation. It argues that the new development path will reduce emissions against the BAU baseline through energy waste reduction, better infrastructure, and improved public transport. The NCCP's emphasis is on climate-resilient development pathways and low-carbon growth. It proposes integrating traditional knowledge with current and emerging knowledge to tackle climate change. It also proposes the establishment of a dedicated climate change research centre. It outlines five priority areas to improve food security, increase infrastructure and communities' resilience, improve environmental management practices and ecosystems for greater biodiversity, and improve economic growth. These are i) agriculture and food security; ii) disaster preparedness and response; iii) natural resource management; iv) equitable social development; v) energy, industrial and infrastructural development.

GHANA			
Document Type and focus	**Sectors**	**Document title**	**Summary**
Strategy Adaptation; Disaster Risk Management	Agriculture Health LULUCF Transport Water	National Climate Change Adaptation Strategy	The National Climate Change Adaptation Strategy (NCCAS) was released by a joint venture between UNEP/ UNDP supported by the Danish Ministry of Foreign Affairs. The document outlines strategies to increase climate resilience, decrease population vulnerability, deepen awareness, draw from funding opportunities, and facilitate mainstreaming disaster risk reduction to national development frameworks. It proposes to build capacity in the area of infrastructure and knowledge to deal with climate change impacts, and to reduce vulnerability in key sectors, ecosystems, districts and regions of the country.
Law Mitigation	Buildings Energy Social development	Renewable Energy Act	The Act's objective is to provide for the development, management, and utilisation of renewable energy sources to produce heat and power efficiently and sustainably.
Policy Mitigation	Buildings Energy Transport Urban	The National Energy Policy	The vision for the Energy sector is to develop an 'Energy Economy' that will ensure a secure and reliable supply of high-quality energy services for all (both urban and rural) homes, businesses, industries, and the transport sector while significantly contributing to the country's export earnings. The Energy Policy proposes to achieve these objectives through various measures such as fiscal incentives, private participation, institutional reform and capacity building.
Plan Mitigation	Agriculture Buildings Energy Industry Transport	Strategic National Energy Plan 2006-2020	The plan reviews the energy supply structure for Ghana and sets out the energy needs to meet development objectives. Volume one of the plan covered the demand from residential; commercial services sectors; agriculture; fisheries; industry, and transport sectors. Volume two covers the supply side: electricity, petroleum, wood fuels and renewables.
Law Mitigation	Energy Transport	Energy Commission Act	The Act established a National Energy Commission to regulate, manage, develop and utilise energy resources (including hydropower, solar biomass, wind, geothermal and hydrocarbon), and control granting of licences for transactions and operations related to electricity and natural gas.
Act Adaptation		National Disaster Management Organisation Act, 1996 (No. 517)	This Act establishes the National Disaster Management Organisation and defines its functions and powers.
Act Adaptation; Disaster Risk Management	Agriculture Water	Ghana Meteorological Agency Act, 2004 (Act 682)	This Act establishes the Ghana Meteorological Agency as a corporate body, defines its functions and powers, and provides for the administration of the Agency various other matters regarding the Agency.

GHANA			
Document Type and focus	**Sectors**	**Document title**	**Summary**
Plan Mitigation	Energy	Ghana Renewable Energy Master Plan	This plan aims to achieve the following by 2030: i) Increase the proportion of renewable energy in the national energy generation mix from 42.5 MW in 2015 to 1363.63 MW (with grid-connected systems totalling 1094.63 MW), ii) reduce the dependence on biomass as main fuel for thermal energy applications, iii) provide renewable energy-based decentralised electrification options in 1,000 off-grid communities, and iv) promote local content and local participation in the renewable energy industry.
Framework Adaptation; Disaster Risk Management; Mitigation	Economy-wide	Medium-Term Development Policy Framework 2022-2025	This document sets the government's development vision as follows: 'create an optimistic, self-confident and prosperous nation, through the creative exploitation of our human and natural resources, and operating within a democratic, open and fair society in which mutual trust and economic opportunities exist for all'. To realise this vision, the document defines the following priorities: economic growth; digitisation; science, technology and innovation; urbanisation and infrastructural deficits; youth unemployment; public health; emergency preparedness; the fight against pandemics; and climate change.
Strategy Adaptation; Mitigation	Agriculture Energy Waste Water	Ghana Beyond Aid Charter Strategy	Ghana's Beyond Aid Charter intends to break away from 'business as usual' and achieve a WISER (Wealthy, Inclusive, Sustainable, Empowered and Resilient) Ghana by 2028. To meet the vision of a Sustainable Ghana, the charter strategy sets targets for access to potable water, sanitation facilities, electricity and clean fuel and cooking technology. The strategy envisions a move towards renewable energy, ending single-use plastics by 2023, and recycling-intensive waste management. The strategy also outlines objectives and programmes to modernise the Agriculture sector.
Plan Adaptation; Disaster Risk Management; Mitigation	Economy-wide Social development	Long-term National Development Plan of Ghana (2018-2057)	This document was prepared by the National Development Planning Commission (NDPC) and sets the country's long-term development strategy. It contains several climate-related clauses, including agricultural practices, coastal and marine areas management and protecting the natural environment, notably wetlands.
Plan Disaster Risk Management; Mitigation	Buildings Energy Industry Transport Waste Water	Ghana Infrastructure Plan 2018-2047 (Volumes One and Two)	The National Development Planning Commission prepared this plan. The extensive, wide-ranging document seeks to provide the country with a reliable and robust national energy infrastructure that stimulates economic growth, poverty alleviation and general well-being, per the Long-term National Development Plan (LTNDP) objectives. The plan notably aims to develop the production and use of energy from renewable and nuclear sources. It also aims to accommodate the use of electric vehicles and rail.

GHANA			
Document Type and focus	**Sectors**	**Document title**	**Summary**
Programme Disaster Risk Management	Economy-wide Energy Social development	Coordinated Programme of Economic and Social Development Policies (2017-2024)	This document, presented by Ghana's President to Parliament, guided the preparation of the medium-term national development policy framework. It sets new development directions, notably focusing on low-carbon growth, social protection, agricultural practices, infrastructure, institutional reform and Measurement, Reporting and Verification.
Agenda Adaptation	Agriculture Transport	Ghana Shared Growth And Development Agenda (GSGDA) II - - Volume I: Policy Framework; Volume II: Costing Framework	This USD24m programme highlights the importance of addressing climate change impacts within development strategies through: ensuring and sustaining macroeconomic stability; enhanced competitiveness of Ghana's private sector; accelerated agricultural modernisation and natural resource management; oil and gas development; infrastructure and human settlements development; human development, employment and productivity; transparent and accountable governance.

KENYA			
Document Type and Focus	**Sectors**	**Document title**	**Summary**
Policy Adaptation; Disaster Risk Management	Transport	National Environment Policy 2013	The Policy aims to provide a framework for an integrated approach to sustainable management of Kenya's environment and natural resources.
Policy Adaptation; Disaster Risk Management		National Policy for Disaster Management	The policy recognises that climate change has contributed significantly to Kenya's increasing vulnerability to disasters in the last two decades and seriously affects communities' lives and livelihoods. The policy, therefore, aims to institutionalise mechanisms to address these disasters and associated vulnerabilities, stressing the central role of climate change in any sustainable and integrated National Strategy for Disaster Management.
Regulation Mitigation	Energy Transport Waste Water	Energy Act 2006	Encompassing several energy-related laws, the Act has a very broad scope covering all forms of energy, from fossil fuels to renewables. The Act mandates the government to promote the development and use of renewable energy, including biodiesel, bioethanol, biomass, solar, wind, hydropower, biogas, charcoal, fuel-wood, tidal, wave and municipal waste.
Law Adaptation; Disaster Risk Management; Mitigation	Buildings Social development Transport	Climate Change Act, 2016	This Act provides a framework for promoting climate-resilient, low-carbon economic development.

KENYA			
Document Type and Focus	**Sectors**	**Document title**	**Summary**
Action Plan Adaptation; Disaster Risk Management; Mitigation	Agriculture Energy Environment Health LULUCF Tourism Transport Urban Waste Water	National Climate Change Action Plan (NCCAP) 2018-2022: Volume I	This plan aims to strengthen the country's path towards sustainable, climate-resilient development while achieving low carbon climate resilient development. It builds on the previous Action Plan spanning the period 2013-2017. The NCCAP consists of three documents: an Adaptation Technical Analysis Report (volume II) and a Mitigation Technical Analysis Report (volume III). The Plan seeks in particular to: i) reduce risks to communities and infrastructure resulting from climate-related disasters such as droughts and floods; ii) Increase food and nutrition security through enhanced productivity and resilience of the agricultural sector in as low- carbon manner as possible; iii) enhance resilience of the Blue Economy and water sector by ensuring access to and efficient use of water for agriculture, manufacturing, domestic, wildlife and other uses; iv) increase forest cover to 10% of total land area; v) rehabilitate degraded lands, including rangelands; vi) increase resilience of the wildlife and tourism sector; vii) mainstream climate change adaptation into the health sector; viii) increase the resilience of human settlements, including improved solid waste management in urban areas; ix) improve energy and resource efficiency in the manufacturing sector, and climate-proof energy and transport infrastructure; x) encourage electricity supply based on renewable energy; xi) encourage the transition to clean cooking; xii) develop sustainable transport systems.
Law Adaptation; Disaster Risk Management	Water	National Drought Management Authority Act (No. 4 of 2016)	This law establishes the National Drought Management Authority.
Act: Adaptation; Mitigation	LULUCF	Environment and Land Court Act (Cap. 12A)	This law establishes Kenya's Environment and Land Court, which has jurisdiction over all matters related to environmental planning and protection, climate issues, land use planning, title, tenure, boundaries, rates, rents, valuations, mining, minerals and other natural resources, compulsory acquisition of land, land administration and management, public, private and community land and contracts, choices in action or other instruments granting any enforceable interests in land, and any other dispute relating to environment and land.
Strategy Adaptation; Mitigation	Environment	National Wildlife Strategy 2030	Kenya's National Wildlife Strategy 2030 is based on four pillars: Resilient Ecosystems; Engagement by all Kenyans; Evidence-based Decision Making; Sustainability, and Governance. It recognises that climate change places Kenya's wildlife at risk and that ecosystem conservation and management can contribute to greater climate resilience by serving as a form of adaptation. It specifically calls for creating a National Wildlife Adaptation Strategy to determine complementarities between wildlife conservation and climate change adaptation.

KENYA			
Document Type and Focus	**Sectors**	**Document title**	**Summary**
Plan Adaptation; Disaster Risk Management	Water	National Disaster Response Plan	Kenya's National Disaster Response Plan outlines the high-level principles and assumptions that go into the government's planning for disaster response, as well as the concrete procedures, roles and responsibilities of disaster responders. The plan identifies droughts, floods, landslides, tsunamis, fires and other hazards as particular risks facing Kenya, and disaggregates risks by province. The plan identifies climate change as an important factor in disaster risk for Kenya.
Strategy Adaptation; Mitigation	Agriculture Buildings Water	Kenya Climate Smart Agriculture Strategy 2017-2026	The broad objective of the Kenya Climate Smart Agriculture Strategy 2017-2026 (KCSAS) is to adapt to climate change, build the resilience of agricultural systems, and minimise emissions for enhanced food and nutritional security and improved livelihoods. The specific objectives of the KCSAS are to i) enhance the adaptive capacity and resilience of farmers, pastoralists and fisher-folk to the adverse impacts of climate change; ii) develop mechanisms that minimise greenhouse gas emissions from agricultural production systems; iii) create an enabling regulatory and institutional framework; and iv) address cross-cutting issues that adversely impact climate-smart agriculture. Four broad strategic areas have been identified for KCSAS: i) adaptation and building resilience by addressing vulnerability to changes in rainfall and temperature, extreme weather events, and unsustainable land/water management and utilisation; ii) mitigation of greenhouse gas emissions from key and minor sources in the agriculture sector; iii) establishment of an enabling policy, the legal, and institutional framework for effective implementation of climate-smart agriculture; iv) minimising the effects of underlying cross-cutting issues, such as human resource capacity and finance, which would potentially constrain the realisation of climate-smart agriculture objectives.
Policy Adaptation; Disaster Risk Management; Mitigation	Agriculture Energy Health LULUCF Tourism Transport Water	National Policy on Climate Finance	This policy accomplishes several goals. First, it describes the current legal and policy framework for climate financing. Second, it outlines the role climate financing could play in Kenya's most important economic sectors (Agriculture, Forestry, Energy, Transport, Trade, Tourism, Manufacturing, Water and Sanitation, Disaster Risk Management, and Research and Innovation). Third, it describes the policy interventions the Kenyan government intends to make.
Framework Adaptation; Disaster Risk Management	Buildings	A Climate Risk Management Framework for Kenya	The Climate Risk Management Framework for Kenya outlines how the government intends to harmonise its climate change and disaster risk policies. According to the framework, ten priority areas overlap between climate change and disaster risk policies, which can be areas for government intervention.

KENYA			
Document Type and Focus	**Sectors**	**Document title**	**Summary**
Plan Adaptation	Adaptation	National Adaptation Plan 2015-2030	This document identifies Kenya's vulnerabilities to the effect of climate change, adaptation actions and implementation strategies.
Vision Adaptation; Disaster Risk Management; Mitigation	Economy-wide	Kenya Vision 2030	Kenya Vision 2030 is a long-term development blueprint that is evolving over time.
Law Mitigation; Loss And Damage	LULUCF	Forest Conservation and Management Act 2016	This Act aims at conserving Kenya's forests and managing them sustainably. This includes fighting deforestation and increasing carbon sequestration.
Regulation Mitigation	Energy Industry	Environmental Management and Coordination (Air Quality) Regulations	The Environmental Management and Coordination (Air Quality) Regulations set emissions standards for air pollution, including greenhouse gas emissions.
Policy Adaptation; Mitigation	Finance	Central Bank of Kenya – Guidance on Climate-Related Risk Management	The Central Bank of Kenya issued this guidance in October 2021. The guidance recognises that climate change poses a substantial risk but can pose an opportunity for the financial sector. It requires banks to: embed the consideration of the financial risks from climate change in their governance arrangements; incorporate the financial risks from climate change into their existing financial risk management practice; and develop an approach to disclose the financial risks from climate change.
Strategy Adaptation	Agriculture Buildings	National Climate Change Response Strategy	The National Climate Change Response Strategy outlines its objectives thus: to enhance the understanding of the global climate change regime, negotiation process and develop priorities for Kenya; to assess the evidence and impacts of climate change in Kenya; to recommend adaptation and mitigation measures; to develop assessment and capacity building frameworks; to recommend research and technological needs; to develop a conducive and enabling policy, legal and institutional framework; to provide a concrete action plan combined with a resource mobilisation plan. Actions mentioned in the strategy include: promoting orphan crops; agricultural produce post-harvest processing, storage and value-added; breeding of animals from various agroecological zones that adapt well to climatic variances and providing special livestock insurance within adaptation; establishing a national climate awareness campaign, and incorporating climate change in school curricula within information and awareness building; developing technology through CDM or other options; accelerating south-south partnerships in technology.

KENYA			
Document Type and Focus	**Sectors**	**Document title**	**Summary**
Rules Adaptation; Mitigation	Agriculture Environment LULUCF Water	Agriculture (Farm Forestry) Rules 2009	The Agriculture Farm Forestry Rules of 2009, designed by the Minister for Agriculture after consultations with the Central Agricultural Board, require farmers to establish and maintain farm forestry on at least 10 % of their agricultural lands. The underlying objectives behind these efforts to regulate the destruction of vegetation for agricultural expansion are i) combat climate change, ii) conserve water, soil and biodiversity, and iii) protect riverbanks.
Regulation Mitigation	Energy Transport Waste Water	The Energy (Solar Water Heating) Regulations, 2012	Encompassing several energy-related laws, the regulations cover all forms of energy, from fossil fuels to renewables. The Act mandates the government to promote the development and use of renewable energy, including biodiesel, bioethanol, biomass, solar, wind, hydropower, biogas, charcoal, fuel-wood, tidal, wave and municipal waste.
Action plan Adaptation; Disaster Risk Management; Mitigation	Agriculture Energy Environment Health LULUCF Tourism Transport Urban Waste Water	National Climate Change Action Plan (NCCAP) 2018-2022: Volumes I and 2.	This plan aims to strengthen the country's path towards sustainable, climate-resilient development while achieving low carbon climate resilient development. The Plan seeks to: i) reduce risks to communities and infrastructure resulting from climate-related disasters such as droughts and floods; ii) increase food and nutrition security through enhanced productivity and resilience of the agricultural sector in as low-carbon manner as possible; iii) enhance resilience of the Blue Economy and water sector by ensuring access to and efficient use of water for agriculture, manufacturing, domestic, wildlife etc.; iv) increase forest cover to 10% of total land area; v) rehabilitate degraded lands, including rangelands; vi) increase resilience of the wildlife and tourism sector; vii) mainstream climate change adaptation into the health sector; viii) increase the resilience of human settlements, including through improved solid waste management in urban areas; ix) improve energy and resource efficiency in the manufacturing sector; x) climate-proof energy and transport infrastructure, encourage electricity supply based on renewable energy, encourage the transition to clean cooking, and develop sustainable transport systems.

KENYA			
Document Type and Focus	**Sectors**	**Document title**	**Summary**
Act Disaster Risk Management; Mitigation	Environment	The Environmental Management and Coordination (Amendment) Act, 2015	This law provides for environmental protection in Kenya. Article 49 promotes the use of renewable energy and the planting of trees. Article 57 grants the relevant ministry the possibility to allow fiscal incentives under the form of tax rebates for private entities 'that invest in plants, equipment and machinery for pollution control, recycling of wastes, water harvesting and conservation, prevention of floods and for using other energy resources as substitutes for hydrocarbons'. Article 50 sets the legal framework to ensure the conservation of biological diversity. It charges the relevant agency to 'measure the value of unexploited natural resources in terms of watershed protection, influences on climate, cultural and aesthetic value, as well as actual and potential genetic value thereof'.

NIGERIA			
Responses	**Sectors**	**Document Title**	**Summary**
Policy Adaptation; Mitigation	Energy LULUCF Transport	National Policy on Climate Change and Climate Change Policy Response and Strategy	The National Policy on Climate Change is a strategic response to climate change that aims to foster a low-carbon, high-growth economic development path and build a climate-resilient society by attaining set targets. The plan explicitly identifies climate change as one of the major threats to economic development goals and food security. The plan includes concrete targets in climate change adaptation, afforestation, and energy supply to meet these challenges. Nigeria's president approved the current version of the policy on June 2, 2021, and covers the period 2021-2030.
Vision Adaptation	Energy LULUCF Water	Nigeria Vision 2020	Vision 2020 aims to reduce the impact of climate change on development processes and the environment. It would i) strengthen environmental governance; ii) promote environmental education; iii) optimise economic benefits from sustainable environmental management.
Policy Mitigation	Industry	Nigerian Biofuel Policy and Incentives	The policy aims to help develop the biofuel industry to gradually reduce the dependence on imported gasoline and reduce GHG emissions while promoting economic development. Concrete measures include the introduction of a biofuel blend (10% ethanol) and various measures aimed at stimulating market demand for biofuels and promoting their production (e.g. tax exemptions). The policy includes the establishment of a Biofuel Energy Commission and Biofuel Research Agency and a target that by 2020, 100% of biofuels consumed in the country will come from domestic production.

NIGERIA			
Responses	**Sectors**	**Document Title**	**Summary**
Law Mitigation	Energy	Regulations on feed-in-tariff for renewable energy sourced electricity in Nigeria 2015	The NIGERIA_FIT_regulation 2015 specifies that a total of 1,000 MW by 2018 and 2,000 MW by 2020 should be generated through renewables such as biomass, small hydropower, wind and solar and be connected to the grid. Power distribution companies should source at least 50% of their total supply from renewables. A distinction is made between small and large generation plants: Electricity procured from small plants (1 MW to 30 MW) can automatically be integrated as renewable energy; for large plants (>30MW), a competitive procurement process needs to be initiated.
Plan Adaptation	Energy LULUCF	Economic Recovery and Growth Plan (2017-2020)	The Economic Recovery and Growth Plan aims to foster sustainable economic development in Nigeria from 2017 to 2020. It is a transversal strategic document that edicts detailed measures, notably in climate change adaptation, renewable energy production and use, energy efficiency, land degradation, and desertification.
Regulation Mitigation	Energy	The Flare Gas (prevention of waste and pollution) Regulations 2018	The flare gas regulations establish a legal framework to pursue the Federal Government's objectives for reducing GHG emissions by flaring and venting natural gas.
Policy Mitigation	Energy	National Gas Policy 2017	The National gas policy aims at setting goals and implementing an institutional framework for the gas sector. The document notably insists on encouraging the use of Liquefied Petroleum Gas (LPG) to combat climate change, reduce deforestation and improve community health. The policy is meant to be reviewed and updated periodically.
Policy Mitigation	Energy	National Renewable Energy and Energy Efficiency Policy (NREEEP)	This document defines the government's position on strengthening the country's renewable energy and energy efficiency.
Policy Adaptation Disaster Risk Management; Mitigation	Environment	National policy on the environment	This document aims to ensure the country's sustainable use of natural resources. It notably seeks to enable sustainable, low-carbon development and protect the country from natural disasters.
Programme Mitigation	Finance	Nigeria's green bonds programme	The issuance of Nigerian green bonds aims at providing finance to projects contributing positively to the environment and climate change.
Action plan Adaptation Disaster Risk Management; Mitigation	Social development	National Action Plan on Gender and Climate Change for Nigeria	This document focuses on effective strategies for integrating gender into the implementation of national climate change initiatives.

NIGERIA			
Responses	**Sectors**	**Document Title**	**Summary**
Plan Adaptation; Disaster Risk Management; Mitigation	Buildings Energy Transport	National Integrated Infrastructure Master Plan	This document is Nigeria's blueprint for infrastructure development. It notably seeks to make the country's infrastructures resilient to the adverse impacts of climate change, enable a low-carbon transport sector development and prepare the country for natural disasters.
Plan Adaptation; Disaster Risk Management; Mitigation	Economy-wide Social development	Medium-Term National Development Plan 2021 - 2025	This plan succeeds the Economic Recovery and Growth Plan (2017-2020) to implement the government's 2050 agenda over the period 2021-2025. It focuses on economic growth and development, infrastructure, public administration, human capital, and social and regional development. It notably seeks to increase awareness of climate issues, boost the production and use of renewable energy sources, and generally create the conditions for making the economy sustainable.
Action plan Mitigation	Agriculture Buildings Energy Industry Transport Waste	Nigeria's National Action Plan to reduce short-lived climate pollutants	This document outlines the country's strategy to reduce the emission of short-lived climate pollutants (SLCPs), mostly black carbon and methane, from various socioeconomic sectors. It sets 22 measures to lower SLCPs emissions while improving local air quality.
Policy Mitigation	LULUCF	National Forest Policy 2020	This document sets the country's forest policy and replaces the National Forest Policy 2006. It seeks to improve the sustainable management of the resource and increase total forest cover.
Framework Adaptation	Adaptation	National Adaptation Plan Framework	This document lays out the country's framework for guiding adaptation actions. The framework's main goals include i) building appropriate capacity for adaptation action, ii) defining adaptation options at the various levels of governance, iii) creating an enabling environment for effective adaptation, and iv) designing a coherent approach to fund mobilisation for effective climate change adaptation.
Act Adaptation; Mitigation	Economy-wide Finance Public Sector	Nigeria's Climate Change Act	President Buhari signed The Climate Change Bill into law in November 2021 to provide Nigeria with a legal framework for achieving its climate goals, long-term social and economic sustainability, and resilience. Following the President's commitment made at COP26 in Glasgow of achieving net zero by 2060, the Act enacts an overarching objective of achieving net zero emissions between 2050 and 2070.

NIGERIA			
Responses	**Sectors**	**Document Title**	**Summary**
Regulation Adaptation; Mitigation	Agriculture Environment LULUCF Social development	National Environmental (Desertification Control and Drought Mitigation) Regulations 13/2011	These regulations aim to: provide an effective and pragmatic regulatory framework for the sustainable use of all areas already affected by desertification and the protection of vulnerable lands; sensitise the public to the causes and dangers associated with desertification and the attendant land degradation; encourage the sustainable use of fuelwood through the use of more efficient and energy saving devices with a view to encouraging their wider use and adoption at all levels; promote the use of alternative sources of energy, including the use of wind, solar, briquettes, coal, gas etc; encourage reforestation and reseeding attain the 25% national forest cover as prescribed by the United Nations Food and Agricultural Organisation (FAO) with a view to being self-sufficient in wood and other forest resources, including the enhancement of ecological integrity and the abatement of the impacts of climate change; ensure sustainable agricultural- and range-management practices, by improving animal husbandry and management of water resources in desertification-prone areas with a view to achieving sustainable livelihood, poverty reduction and wealth creation; support poor farming communities through the introduction of modern, affordable production technologies; promote international cooperation; sustain and expand forests and tree cover generally.
Plan Mitigation	Energy Industry Transport	Information about the Nigeria Energy Transition Plan	In August 2022, the Nigerian government launched a new Energy Transition Plan, which seeks to use a data-driven approach to generate new funding and investment opportunities for the energy transition in Nigeria. This is in line with Nigeria's goal of achieving Carbon Neutrality by 2060. The plan sets out emissions-reduction pathways and investment needs to reduce emissions in energy, transport, oil and gas, cooking, and industry.
Plan Mitigation	Energy	Bouncing Back: Nigeria Economic Sustainability Plan	This document aims at i) stimulating the economy by preventing business collapse and ensuring liquidity; ii) retaining or creating jobs using labour-intensive methods in key areas like agriculture, facility maintenance, housing and direct labour interventions; iii) undertaking growth-enhancing and job-creating infrastructural investments in roads, bridges, solar power, and communications technologies; iv) promoting manufacturing and local production at all levels and advocating the use of Made in Nigeria goods and services, as a way of creating job opportunities, achieving self-sufficiency in critical sectors of the economy and curbing unnecessary demand for foreign exchange which might put pressure on the exchange rate; and v) extending protection to the very poor and other vulnerable groups – including women and persons living with disabilities – through pro-poor spending.

RWANDA			
Document Type and Response	**Sectors**	**Title**	**Summary**
Law Adaptation; Mitigation	Energy	Law No. 16 of 22 May 2012, determining the Organisation, Functioning and Mission of the National Fund for Environment (FONERWA)	This Law determines the organisation, functioning and mission of the National Fund for Environment in Rwanda (FONERWA). The fund will be the primary instrument to channel, distribute and monitor international and national climate finance. FONERWA has four finance windows: conservation and sustainable management of natural resources; R&D and technology transfer; streamlining climate change issues into policies and programmes; and Environmental Impact Assessment (EIA) monitoring & enforcement.
Strategy Adaptation; Mitigation; Loss And Damage	Energy LULUCF Transport Urban Water	Green Growth and Climate Resilience - National Strategy on Climate Change and Low Carbon Development	The Strategy seeks to meet development goals while reducing the country's vulnerability through mitigation and adaptation. The key mitigation strategies are: promoting geothermal power generation, with an estimated potential of 700 MW – enough to meet all of Rwanda's demand if implemented by 2020; integrated soil fertility management, which would cut the use of inorganic fertilisers, improve soil structure and the water retention capacity of soil; and high-density walkable cities, fighting anticipated trends of energy-intensive urban sprawl on hilly terrain. Key adaptation elements are irrigation infrastructure, which will reduce uncertainty regarding rainfall variation; a robust road network to mitigate food loss during transport to markets and to ensure access during extreme weather events; establishing a centre for climate knowledge for development; and developing agroforestry.
Law Mitigation	Agriculture	Ministerial Order No. 003/16.01 of 15 July 2010 Preventing Activities that Pollute the Atmosphere	This Ministerial Order regulates activities that give rise to chemical pollutants. It specifies emission standards for CO2 and other pollutants (such as NOx, SOx, PM10, Lead and Ozone). It prohibits open burning of any substance, except for fires used for recreational and ceremonial purposes, fires purposely set for agricultural control of disease and pests, and open-air kitchen fires for cooking meals.
Law Disaster Risk Management	Environment Water	Organic Law 4/2005 determining the modalities of protection, conservation and promotion of the environment in Rwanda	This law affects The National Policy on Environment, which sets out how to protect, conserve and promote the environment. It defines citizens' and states' responsibilities and principles for using natural resources, such as air and water, protecting biodiversity, etc. It orders an environmental impact assessment. The law provides for establishing a National Fund for Environment (FONERWA).

RWANDA			
Document Type and Response	**Sectors**	**Title**	**Summary**
Vision **Mitigation**	Energy Environment LULUCF Transport Water	Rwanda Vision 2020	Vision 2020 was a framework for Rwanda's development, presenting the key priorities and providing Rwandans with a guiding tool for the future. It sought to transform Rwanda into a middle-income country by the year 2020. The framework included the rehabilitation and development of infrastructure as a crucial aspect in lowering business costs. It calls for: i) a modern land law providing security of tenure and freedom of exchange; ii) the development of alternative lower costs of transport to the sea; and iii) an increase of energy production and diversification into alternative energy sources. Rwanda has considerable hydroelectric potential and large deposits of renewable methane gas in Lake Kivu, estimated at 60bn m3. In rural areas, direct solar or photovoltaic energy can be used, whilst up to 1/3 of 155m tons of peat deposit is currently exploitable. Rwanda projected that by 2020, at least 35% of the population would be connected to electricity.
Law **Adaptation**		Law no 63/2013 determines the mission, organisation and functioning of the Rwanda Environment Management Authority.	Law no 63/2013 determines the mission, organisation and functioning of the Rwanda Environment Management Authority (REMA). The Authority shall have legal personality, administrative and financial autonomy and shall be governed by laws governing public institutions. This Law repeals Law no 16/2006 of 03-Apr-06, which determined the organisation, functioning and responsibilities of the Rwanda Environment Management Authority. Art 3.4 of the present law missions REMA to implement measures to prevent climate change and cope with its impacts.
Policy **Disaster Risk Management**	Disaster Risk Management	The National Disaster Management Policy	This policy establishes the guiding principles for disaster risk management (DRM) in Rwanda by presenting the institutional structures, roles, responsibilities, authorities and key processes to increase the resilience of vulnerable groups to disasters. This document amends and replaces the 2009 National Disaster Management Policy. The natural hazards in Rwanda identified by the policy are floods, landslides and mudflows, volcanic activity, drought, food security, earthquakes, fires and epidemics. The main objectives are i) to strengthen the legal and institutional framework for the management of disasters, ii) to promote disaster awareness, and iii) to ensure that institutions and DRM activities are coordinated and focused on fostering partnerships between the government and other stakeholders at all levels (international, regional, sub-regional Eastern African, national and sub-national bodies).
Plan **Disaster Risk Management**	Disaster Risk Management	National Disaster Risk Management Plan	The National Disaster Risk Management Plan is the guiding document for addressing disaster risk management in Rwanda. The document pursues the disaster management mission and goals laid down by the National Disaster Management Policy 2012.

RWANDA			
Document Type and Response	**Sectors**	**Title**	**Summary**
Law **Adaptation;** **Mitigation**	Economy-wide	Law N°48/2018 on the environment	This Law determines modalities for protecting, conserving and promoting the environment against climate change. The law establishes i) the conservation and the protection of the natural environment (soil, water resources, biodiversity, atmosphere, etc.); ii) obligations to the state, decentralised entities and local communities concerning the protection and promotion of the environment; and iii) powers of inspection and criminal investigation in environmental matters.
Strategy **Adaptation**	Agriculture LULUCF Urban	7 Years Government Programme: National Strategy for Transformation (NST1) 2017 –2024	The 7-year strategy, adopted in 2017, sets out the Government of Rwanda's plans for achieving its 2020 and 2050 Vision for economic development. Climate Change is highlighted as a priority cross-cutting area in the strategy. The strategy aims to inform sectoral and district level strategies, enabling Rwanda to achieve its development goals. The strategy focuses on strengthening cross-sectoral cooperation to address climate change, focusing on agriculture, urbanisation, infrastructure and land use management. The strategy also identifies that Rwanda's oil and gas reserves have yet to be fully exploited as an opportunity.

SENEGAL			
Document Type and Response	**Sector**	**Title**	**Summary**
Decree Mitigation	Buildings Energy	Ministerial Decree No. 9317 establishes the organisation and functioning of the National Greenhouse Gas Reduction Programme through energy efficiency in the building sector and related regulation.	Decree No. 9317 establishes the National Greenhouse Gas Reduction Programme through energy efficiency in the building sector. The programme's overall objective is to develop energy-efficient practices in the buildings and construction sector. The programme aims, in particular, at: increasing the number of energy-efficient building construction projects using innovative building materials and practices; developing standards for energy-efficient construction; and increasing the number of construction professionals integrating the energy-efficient building standards in their project design and construction process.
Decree Mitigation	Energy	Decree No. 2013-684 on the establishment, organization and functioning of the National Agency for Renewable Energies	The Decree establishes the National Agency for Renewable Energies (ANER) under the technical supervision of the Minister for Energy. ANER's mission is to promote renewable energy, including bioenergy.

SENEGAL			
Document Type and Response	**Sector**	**Title**	**Summary**
Decree Mitigation	Energy	Decree 1577 Regulating the Inter-ministerial Committee on Renewable Energy	Decree 1577 creates and regulates the functioning of the Inter-ministerial Committee on Renewable Energy, bringing together the Ministry of Energy and the Ministry of Renewable Energies. Operating under the supervision of the two ministries, the Committee aims to ensure the coordination of actions and programmes on renewables, improving efficiency in the sector.
Law Mitigation	Agriculture Energy LULUCF Transport	Law 2010-22 Regulating the Biofuels Industry	The Law aims to develop the biofuels sector, establishing norms and conditions for producing and exploiting biofuels in the national territory and for international cooperation. More broadly, the law aims to contribute to environmental protection and increase the value of forest and agricultural resources. Overall, the law expects to increase access to energy, promoting economic growth and social welfare. The law covers all components of the biofuels sector, from production to processing, storage to transport and distribution. It grants biofuels the fiscal benefits established under the Great Agricultural Offensive for Food and Abundance Programme.
Law Mitigation	Energy	Renewable Energy Law (No. 2010-21)	This law regulates the renewable Energy sector by outlining goals, laying the foundation for a feed-in-tariff scheme, and providing tax incentives for development. Specifically, the law establishes the legal framework for sustainable renewable energy development. Goals outlined in this legislation include: reducing dependence on fossil fuels, diversifying the energy mix, reducing GHG emissions and facilitating domestic energy production. The law directs the Ministry of Renewable Energies to establish and regulate incentive schemes for renewable development, including: i) a tax exemption for purchasing equipment required for renewable generation intended for domestic consumption; and ii) a tax relief scheme for renewable energy technology research. The Law also requires electricity network operators to connect renewable generation facilities to the grid.
Decree Mitigation	Energy	Decree No. 2008-38 on the powers of the Minister of Biofuels, Renewable Energies, and Scientific Research	The Decree defines the powers of the Minister of Biofuels, Renewable Energies and Scientific Research related to preparing and implementing policy on exploration and exploitation of alternative energy sources and promoting scientific research. In particular, the Minister is responsible for drawing up development plans and programs to support clean energy sources and to significantly reduce the use of fossil fuels, ensure the adequacy of specific up-to-date technology choices for solar, hydro and wind energy sources, and, to this end, promote the basic and applied research in conjunction with national development policies.

SENEGAL			
Document Type and Response	**Sector**	**Title**	**Summary**
Strategy Mitigation	Energy Transport	National Bioenergy Strategy and National Strategy on the Development of Renewable Energies 2016-2020	The National Bioenergy Strategy aims to contribute to national energy security through the production of bioenergy for transport as well as power generation.
Decree Mitigation	Buildings Energy Environment Transport	Ministerial Decree 1220 establishing the National Climate Change Committee (amended by the Decree 2011-1689)	The Decree formalises the creation of the National Climate Change Committee (NCCC) with jurisdiction over all domains related to the activities related of the UNFCCC and its legal instruments, such as: i) technological transfer, ii) energy efficiency, iii) promotion of renewable energy, iv) carbon emissions reduction, v) capacity building for biodiversity preservation, vi) management of marine resources, and vii) pollution management.
Law Adaptation	Buildings Environment Health LULUCF Urban Waste	Environment Code (Law 2001-01)	The Code recognises the environment as a national and international patrimony, establishing that all citizens have the right to live in a healthy environment but are also responsible for its protection. Thus, environmental conservation must be integrated into national policies addressing socio-economic development and cultural issues. The key instruments for environmental protection outlined in the Code address biodiversity, desertification, forest management, air pollution, urban planning and hazardous waste disposal.
Decree Adaptation	Water	Decree no. 2013-316 on Rainwater Management and Climate Change Adaptation Project	Decree no. 2013-316 declares the Rainwater Management and Climate Change Adaptation Project (PROGEP) of public interest, applying Art.3 and articles following law no. 76/1967 on expropriation due to public interest and other property operations of public interest. PROGEP is a project financially backed by the World Bank to reduce the vulnerability of populations to flooding and improve their general living conditions.
Decree Mitigation		Decree No. 2011-1689 establishing the National Committee on Climate Change	This decree establishes a National Committee on Climate Change (COMNACC) under the authority of the Ministry of the Environment. The COMNACC is made up of representatives of state, local and associative structures, and is a body for coordination, consultation, training, awareness raising, management and monitoring of the various activities identified in the implementation of the United Nations Framework Convention on Climate Change and its additional legal instruments.

SENEGAL			
Document Type and Response	**Sector**	**Title**	**Summary**
Order Adaptation; Mitigation		Ministerial Order No. 9.048 on the Steering Committee of the Program 'Towards a Local Development Less Emitter of Greenhouse Gases and More Resistant to Climate Change (TACC Senegal)'	This decree creates a Steering Committee for the Project 'Integration of Adaptation to Climate Change in Sustainable Development in Senegal (TACC Senegal)'. It defines the structure and functions of the Committee.
Order Adaptation		Ministerial Order No. 8807 MEPNBRLA-DEEC on the Steering Committee of the Project 'Adaptation to Climate Change-Response to Coastal Change and its Human Dimensions in West Africa	This document establishes, composes and operates the Steering Committee of the Adaptation to Climate Change-Response to Coastal Change and Human Dimensions Project in West Africa within the Integrated Coastal Management (ACCC) framework.
Decree Adaptation		Ministerial Decree No. 9.719 on the institutional framework of the Project for the Development of Resilience to Recurrent Food Insecurity in the Sahel	This decree creates a Project Management Unit (PMU) within the Ministry of Agriculture and Rural Equipment. This PMU is responsible for implementing the Food Insecurity Resilience Development Project. This applies to the Sahel in the regions of Fatick, Matam, Saint-Louis, Tambacounda and Ziguinchor (DRIARS Senegal). The project aims to contribute to reducing food insecurity and developing the resilience of vulnerable populations in Senegal by targeting five vulnerable regions of the country subjected to climate variability and hazards per the objectives of the National Plan for Agricultural Investment (PNIA).
Order Adaptation; Disaster Risk Management	LULUCF	Ministerial Order No. 6579 establishing the Technical Committee for disaster risk declaration	This Ministerial Order creates the Technical Committee of Verification, responsible for reporting and verifying natural calamities affecting rural areas and causing disaster losses to farms, livestock, forestry and fishing. It establishes the composition and functions of the Technical Committee.
Decree Adaptation	Buildings Urban Water	Decree No. 2013-163 (Flood Zones)	This decree defines the attributions of the Minister Restructuring and Development of Flood Zones. The Minister should prepare and implement the policy the Head of State defines in restructuring and urban development, flooding areas, and resettlement by promoting social housing.
Plan Adaptation; Disaster Risk Management	Economy-wide	Senegal Emergent Plan 2014-2023	This plan aims at enabling Senegal to emerge in terms of economic development. The document identifies the adverse impacts of climate change and the need to boost resilience.

SENEGAL			
Document Type and Response	**Sector**	**Title**	**Summary**
Decree Mitigation	Energy	Inter-ministerial decree n ° 010 158	This document exempts from value-added tax (VAT) a list of 22 materials used in producing renewable energy from solar, wind and biogas sources.
Decree Adaptation; Mitigation	Coastal zones Economy-wide LULUCF Water	Decree No. 2014-880 relating to the powers of the Minister of the Environment and Sustainable Development	Outlines the responsibilities of the Minister of the Environment and Sustainable Development, including protecting the environment of Senegal against pollution of any kind and ensuring that polluting activities do not impact the living conditions of the Senegalese people. Further directs the Minister to: protect waterways; preserve fauna and flora; protect coasts, estuaries and marine life from erosion; protect endangered species; fight desertification and promote soil rejuvenation policies; develop environmental education; promote the forest economy via sustainable use, ensuring the implementation of reforestation policy; participate in the implementation of water conservation policy; manage a climate change monitoring mechanism and track climate change trends.

UGANDA			
Document type and response	**Sector**	**Title**	**Summary**
Policy Adaptation; Loss And Damage	Agriculture Buildings Energy Environment LULUCF Tourism Transport Water	National Climate Change Policy	The policy notes that the knowledge of climate change and its impacts remains low in Uganda. Therefore, it seeks in the short-term to raise awareness of climate change, targeting sectorial weaknesses (to be determined by different governmental agencies and ministries), while providing in the long-term information for a wide variety of stakeholders. The policy calls for adopting and implementing a Transport Policy emphasising reducing GHG emissions from this sector, especially by promoting less carbon-intensive fuels. It also stresses the importance of the implementation of the 2007 Renewable Energy Policy and other measures that promote the use and the production of renewables. The adoption of climate change strategies that address the impact of climate change and promote sustainable activities in the sectors of agriculture and livestock, fishery production, water management, forestry, wetland, biodiversity and ecosystem services and tourism are identified as important needs to develop Uganda's approach to adaptation to climate change.

UGANDA			
Document type and response	**Sector**	**Title**	**Summary**
Policy Adaptation; Disaster Risk Management		National Policy for Disaster Preparedness and Management	Serves as the framework policy for disaster and risk management and preparedness in Uganda, including disasters caused by climate change; details the mechanisms and structures aimed at effectively managing disasters, including vulnerability assessments, mitigation, preparedness, and response and recovery, and in particular site-climate variability, climate change, and environmental degradation among the increasing vulnerabilities Uganda faces and needs to prepare for.
Policy Mitigation	Energy Industry Urban Waste Water	The Renewable Energy Policy for Uganda	The Renewable Energy Policy follows the National Energy Policy 2002 commitment to develop the use of renewable energy resources in Uganda. The Government's overarching policy vision for renewable energy is to make modern renewable energy a substantial part of national energy consumption, where modern renewable energy is understood to mean renewable energy resources that are transformed into modern energy services like electricity. The ultimate goal of the Renewable Energy Policy is to increase the use of modern renewable energy from the current 4% to 61% of the total energy consumption by 2017.
Policy Adaptation; Mitigation; Loss And Damage	Economy-wide Environment LULUCF	National Environment Management Policy (NEMP)	The NEMP recognises that Uganda faces several environmental issues, including: soil degradation, deforestation, loss of biodiversity, increasing pollution and environmentally related diseases. These problems are compounded by poverty, low environmental awareness and low levels of technology. The NEMP aims to address these issues by establishing a more comprehensive and integrated approach to environmental issues. The NEMP, therefore, creates a National Environment Management Authority, a legal framework for climate issues, and an effective monitoring and evaluation system to track the effects of different policies on the environment, population and economy. It also attempts to promote a new sustainable conservation culture and to harmonise local and national policy efforts on environmental issues.
Act: Adaptation; Mitigation		Uganda National Meteorological Authority Act, 2012	This Act establishes the Uganda National Meteorological Authority as a corporate body and provides concerning its administration, internal organisations, functions and powers, etc. The Authority shall, among other things, establish and maintain systems for the rapid exchange of meteorological and related information and establish networks of stations for taking, recording and transmitting meteorological observations as well as hydrological and other geophysical observations related to meteorology. Among the Authority's functions, it should interpret, review and recommend appropriate changes in climate policies, as well as international instruments.

UGANDA			
Document type and response	**Sector**	**Title**	**Summary**
Policy: Mitigation	Economy-wide Energy	The Renewable Energy Policy for Uganda	This Policy sets out the Ugandan government's vision, strategic goals, principles, objectives and targets for promoting and implementing renewable energy investments in the country. The Policy Framework provides a basis for the planning, implementation and monitoring of renewable energy programmes, as well as projects that respond to the needs and priorities of the population at various levels of the economy. It is based on the need to address energy challenges by implementing the Energy Policy in general and the Power Sector Reform in particular. It also aims to respond to threats posed by increasing energy prices, environmental degradation and climate change, as well as Government's commitment to poverty and gender-responsive energy actions. Furthermore, implementing the Renewable Energy Policy will result in the disposition of Uganda's commitments at the Bonn Conference on Renewable Energy in 2004.
Act: Adaptation; Mitigation	Environment	The National Environment Act	This document repeals, replaces and reforms Uganda's environmental management law. It aims to provide a legal framework for environmental issues, including climate change measures to i) address the impacts of climate change on ecosystems, e.g. by improving the resilience of ecosystems, promoting low carbon development and reducing emissions from deforestation and forest degradation, and promoting the sustainable management of forests and conservation of forest carbon stock; ii) advise institutions, firms, sectors or individuals on strategies to address the impacts of climate change, including those related to the use of natural resources; iii) take measures and issue guidelines to address the impacts of climate change, including measures for mitigating and adapting to the effects of climate change; and iv) liaise with other lead agencies to put in place strategies and action plans to address climate change and its effects.
Vision Adaptation; Mitigation	Economy-wide	Uganda's Vision 2040	This document lays out the country's overall vision for 2040. One of the stated aspirations is to generate the conditions for developing a green economy. It notably seeks to enhance the share of renewable sources in the energy mix. It further calls for local governments and all economic sectors to plan their adaptation to the adverse effects of climate change.
Plan: Adaptation; Disaster Risk Management; Mitigation; Loss And Damage	Economy-wide	Third national development plan (NDPIII) 2020/21 - 2024/25	This document lays out the country's development vision for 2020-2025. Chapter 9 states that natural resource and climate change management are critical to the reduction of disaster losses, achievement of increased household incomes and improvement of the quality of life of the population

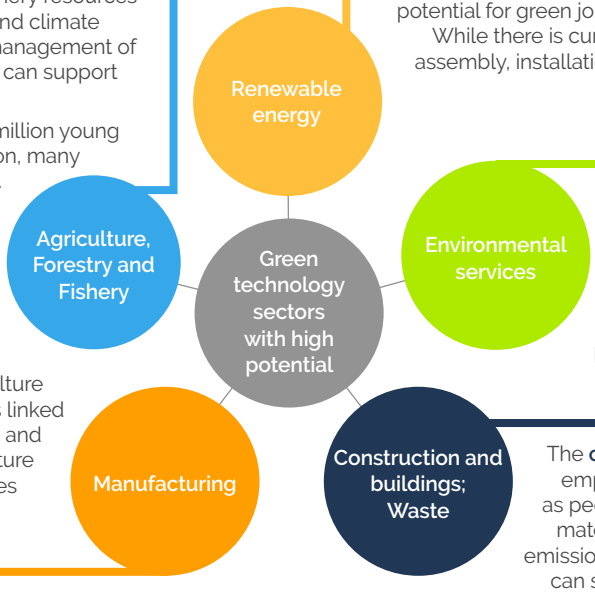
UGANDA			
Document type and response	**Sector**	**Title**	**Summary**
Act: Adaptation; Mitigation	Economy-wide	National Climate Change Act 2021	The Climate Change Act governs Uganda's national response to climate change. One of the stated purposes of the Act is to give effect to the UN Framework Convention on Climate Change, the Kyoto Protocol, and the Paris Agreement. Section 4 gives these agreements the force of law in Uganda. The Act mandates the creation of a Framework Strategy on Climate Change, a National Climate Action Plan and District Climate Action Plans. It also contains several provisions establishing a transparency framework and Measurement, Reporting and Verification system.
Framework Adaptation; Mitigation; Loss And Damage	Economy-wide LULUCF Social development	National Budget Framework Paper FY 2020/21 - FY 2024/25	This budget law aims to provide relief aid in response to disasters, including climate-induced floods and landslides. The budget framework paper also sets targets for forest cover, integration of the climate change issue into development plans, and changes in direct and indirect GHG emissions.
Strategy: Adaptation; Disaster Risk Management; Mitigation	Economy-wide	The Uganda Green Growth Development Strategy 2017/18 - 2030/31	This strategy aims to enable the green economy goal developed in the country's Vision 2040. The strategy's stated objectives are as follows: i) enhance Uganda's economic growth while creating new opportunities for decent employment; ii) support a low-emissions economic growth pathway integrating resource use efficiency, climate resilience, disaster risk reduction and optimal use of natural capital; iii) undertake socially inclusive growth that improves food and nutritional security; and iv) establish an institutional, governance financing framework to operationalise an optimal green growth development strategy.
Strategy: Adaptation; Disaster Risk Management; Mitigation	Economy-wide	Information on the Uganda Green Growth Development Strategy	This strategy aims to enable the green economy goal developed in the country's Vision 2040. The strategy's stated objectives are as follows: i) enhance Uganda's economic growth while creating new opportunities for decent employment; ii) support a low-emissions economic growth pathway integrating resource use efficiency, climate resilience, disaster risk reduction and optimal use of natural capital; iii) undertake socially inclusive growth that improves food and nutritional security; and iv) establish an institutional, governance financing framework to operationalise an optimal green growth development strategy.

Annexure C:
Characteristics of sectors and youth employment potential in Africa

Forestry is not a big contributor to Sub-Saharan Africa's GDP overall, but is important for certain countries, like Liberia, Sierra Leone and Zambia. Furthermore, many people rely on forests for energy, food, medicine and shelter. In Africa, deforestation accounts for almost 90% of carbon dioxide emissions due to changes in land use. Sustainable forest management can create local jobs tied to natural resource management and new funding streams to protect these biodiversity and carbon sinks.

Fisheries support the food security of millions of people and provide 5 million jobs. Fishery resources are under pressure from overfishing and climate change. A shift towards sustainable management of fish resources and green aquaculture can support jobs in these green industries.

Agriculture employed more than 23 million young people in2015 and despite urbanisation, many young people will still need rural jobs. Food security will be increasingly challenged by climate change. Agriculture is a major emitter, user of water and degrader of lands. Many different technologies exist for more sustainable agriculture, from high-tech precision farming, to agro-forestry and regenerative agriculture practices. Adoption of these practices linked to market development opportunities and climate finance could improve the nature of work in agriculture and opportunities for young people.



Renewable energy is critical in the transition to a green economy. In Sub-Sahara Africa, renewable energy is still a relatively small sector. Renewable energy can assist with meeting electricity needs in Africa.

Technological advancements in solar, wind and bio-energy follow each in rapid succession and provide great potential for green job creation on the African continent. While there is currently little manufactured in Africa, assembly, installation and maintenance present many immediate opportunities for jobs.

Environmental services refer to work done to maintain and improve the natural services provided by nature. For example, removing alien vegetation releases water, introducing appropriate plants can reduce erosion, improve soil health, reduce heat spots, etc.

The **construction** sector is a large-scale employer in Africa and is likely to grow as people move into cities. While certain materials and practices produce heavy emissions, new materials and, approaches can support greatly reduced emissions, water and waste impacts. Local materials, including waste inputs, are an important potential source of building materials. In terms of municipal solid wastes, while waste-pickers already contribute enormously to recycling, a myriad of opportunities exist around waste sorting, diversion and new product creation.

Africa's **manufacturing** sector is nascent. Currently, there is relatively little published on green manufacturing or sustainable manufacturing in Africa. Six sectors have a pronounced contribution to GHG emissions: cement, coal-to-liquids technologies, petroleum refining, iron and steel, and ammonia productions and emissions that come from South Africa, Egypt, Algeria and Nigeria. Much of the manufacturing in Africa has been based on activities developed around equipment and other inputs into resource-based sectors. While current industrial processes are dirty, certain products are essential for industrialisation. These include plastics, chemical products, cement, aluminium, steel and polyesters. Technologies that reduce the resource footprints of these technologies, or replace these products with greener alternatives, already receive considerable attention around the world. Other manufacturing sectors of importance in Africa include agro-processing (given that agriculture is the dominant sector across the continent), clothing and textiles and automotives.

Source: Fund for Youth Employment, 2022. . Adapted and added to by Author

Annexure D:
Youth employment programmes in green technology

Countries, programme name and partners	Sectors	Programme name and design
Tanzania, Mozambique and Rwanda	• Agriculture • Renewable Energy • Water and Sanitation businesses	**SNV's Opportunities for Youth Employment (OYE) programme** The programme has adopted a comprehensive approach by bringing a market development perspective. The programme intends to improve the livelihoods of 27,050 rural, out-of-school young people between 18-24 years. The model of 'push, match, and pull', links three key components in an approach to support rural market systems: i) skills and capacity development, ii) matching youth with market opportunities for employment and enterprise development, and ii) promoting value chain within growth sectors with real potential for employment creation, for example by promoting youth inclusive out-grower schemes or by creating self-employment in rural retail chains.
Zambia Green Jobs programme	• Construction sector	Decent work for youth in sustainable housing construction in Zambia helped to create jobs among youth by promoting sustainable enterprises in an expanding market for green housing. Supporting actors along the entire construction value chain were included, including forest growers, processors, manufacturers and retailers of local building materials, as well as buyers of green housing. The model of intervention consisted of three components: i) shaping attitudes, practices and behaviour towards the advantages of green buildings and their related job creation potential; ii) policy level engagement which supports government and parastatal institutions to undertake a regulatory reform process to promote green building practices among private and public housing developers and support a Green Building Association; and iii) capacity building of private sector associations and service providers, aimed at improving MSME access to industry-specific financial services as well as on functional and technical-vocational skills training. Overall, 4,300 jobs were created, almost 75% of which were for youth. Replication potential: project design highly relevant for country context and target group; systemic approach based on analysis of determinants and enablers of market creation; well-established Theory of Change explaining complex project design; strong partnership with national government; good working relations with UN partners; supportive, engaged donor government; strong communication strategy; developing employment projection models for replication in other sectors such as agriculture.
Southern Africa The HIVOS Green Entrepreneurship programme	• Crosscutting	The programme for Southern Africa (2018 – 2020) has a budget of EUR2.7 million and trained local business support trainers, and developed business support structures and investment in frontrunner SMEs through HIVOS' impact investment facility to accelerate the growth of exceptional SMEs. HIVOS' Green Entrepreneurship programme adopts a systemic approach that includes close collaboration with government agencies, local incubators, universities, business support organisations, financial institutions and investors. The aim is to co-create a support network that can develop socially and environmentally conscious entrepreneurial start-ups into sustainable, investment-worthy businesses with long-term impact.

Countries, programme name and partners	Sectors	Programme name and design
Tanzania E.g. ILO's long-standing Start-and-Improve-Your-Business (SIYB) programme	• Construction • Waste Management • Organic Agriculture • Renewable Energy • Sustainable Tourism and other sectors.	Sector-specific adaptations of ILO's training materials for business development were produced and used, for example, in green construction and waste management.
Kenya, Tanzania, and Uganda The ILO's Youth Entrepreneurship Facility (YEF): promoting green business and youth entrepreneurship. Through a partnership between the Africa Commission, the Youth Employment Network (YEN), and the International Labour Organization (ILO) and funded by DANIDA.	• Renewable Energy	The programme was implemented from 2010 to 2014. YEF included green entrepreneurship training, with about 1,000 youth entrepreneurs reached. YEF has successfully adapted an existing ILO training tool to focus exclusively on green entrepreneurship among youth. It achieved large-scale outreach and sustainable institutional impact. Examples are: i) the Junior Achievement Kenya, through which green business concepts and entrepreneurship have been introduced among 25,504 students in secondary school students and 787 in universities; ii) the Enablis Entrepreneurial Network and Chase Bank business plan competitions with a Green and Ecological Business category – in total, 5,967 participants received business planning and green entrepreneurship training across major towns in Kenya.; iii) the Lighting up Kenya Programme that, with UNIDO support, established renewable energy centres managed by the local communities; and iv) the Kenya Women Finance Trust YEF, which trained 30 women Renewable Energy Ambassadors (REAs) in support of the Trust's loan portfolio. In 2014, 500 women entrepreneurs were trained.
Kenya **Habitat for Humanity in Kenya**	• Construction sector	Habitat for Humanity aims to green the construction sector in Kenya and beyond. With expertise from its Terwilliger Center for Innovation in Shelter, Habitat for Humanity is partnering with three local companies – Gjenge Makers, MycoTile and The Toolkit iSkills – to support and link at least 908 youths. Gjenge's paving blocks and MycoTile's insulation provide alternative, more affordable solutions to realise green construction. The Toolkit iSkills model matches and certifies skilled labour in the Renewable Energy sector. Habitat works with local TVET institutions and the industry to establish certification standards for general and green skills in the construction industry. They also assist with changing negative perceptions associated with green materials. Changing building codes to include alternative building materials and providing incentives for green construction is key to stimulating a green transition.

Countries, programme name and partners	Sectors	Programme name and design
Uganda African Clean Energy (ACE) Uganda was established in 2016 as part of the Dutch social enterprise African Clean Energy. ACE is a certified B-Corp.	• Renewable Energy	A project funded by CFYE will catalyse the growth of the Thermal Energy sector in Uganda by strengthening the rural distribution of ACE clean cooking systems while creating 440 jobs for youth and women through investing in digital skills and basic digital literacy. Greening the Energy sector does require technical and maintenance skills, but these can all be taught on the job and with online modules.
Benin and Nigeria **Youth Employment in Agri-business and Sustainable Agriculture (YEASA) project.**	• Agriculture	The YEASA project aims to link rural youth (18–35 years) with access to agricultural resources, technical and practical skills, credit facilities and other services needed to establish agribusiness enterprises and maximise their ability to benefit from existing agrifood systems. The project aimed to empower one thousand young rural adults in the Republic of Benin (Parakou and Cotonou) and Nigeria (Oyo and Ekiti) for a period of three years (2019-2022) to establish agribusinesses and gain employable skills along the value chains of maize, cassava, plantain, cowpea and soybean, and machine fabrication. The International Fund for Agricultural Development (IFAD) sponsors YEASA, and three institutions implement the project, with AfeBabalola University Ado-Ekiti (ABUAD) as the grant recipient, and the International Institute of Tropical Agriculture (IITA) and the AfricaRice Center as sub-recipients. IITA will leverage Incubation Centres across Oyo State, including the IITA-Oyo State Agribusiness Park Center, Awe, to endow 200 young rural adults in Nigeria and the Republic of Benin.
South Africa Working for Water	• Environmental Services • Public Employment programme	Established in 1995, this government-implemented, large-scale public works programme is an ecological restoration initiative with a job focus, especially for youth. It has been sustained for over 20 years, spawning several other programmes with a natural resource focus (such as wetland restoration). With more than 300 projects across South Africa, it has cleared more than a million hectares of invasive plants, and created employment for approximately 20,000 people per annum. It has a total budget of R3.3 billion (or USD 240 million) over its lifespan (PAGE, 2016). Many job opportunities have been created, but many workers have remained insecure due to the temporary nature of the work. That said, the income has created employment buffers.
Morocco Green Jobs for young people in rural areas: GIZ is providing financial support to the Ministry of Agriculture, Marine fisheries, Rural Development, Waters and forests.	• Fisheries • Agro-processing	This project sought to 'improve the employment situation of young people in rural areas and create up to 2,000 jobs between 2018 and 2022. The programme targeted rural youth, offered training courses for ecologically sustainable careers, provided technical advisory services, and financed micro and small enterprises and young entrepreneurs in businesses such as fishing, wood processing and other natural products. The programme also supported the creation of a network for green employment, which aims to allow youth in rural areas to obtain professional advice on implementing their business ideas. Finally, the programme supported 1,000 youth business start-ups to increase their incomes by collaborating with the national education and training centre (GIZ, 2020). Of the 2,000 jobs the programme expected to create, one-third targeted women.

Countries, programme name and partners	Sectors	Programme name and design
Egypt Decent Jobs for Egypt's Young People. Funded by the Government of Canada and implemented by the ILO alongside the government of Egypt.	• Renewable Energy Environmental Conservation • Waste Management and Recycling • Organic Farming • Agro-processing • Eco-tourism.	The project has facilitated youth employment opportunities, with a particular emphasis on green jobs. The investment comprised CAN $15 million, an in-kind contribution of $5 million from the government of Egypt, and a further $2 million as grants from the private sector. These investments have funded skills-development toolkits, training, conferences and knowledge-sharing events, decent jobs assessment studies, and national and regional initiatives addressing youth labour market demand and supply challenges. The project has also worked with numerous partners in developing, implementing and institutionalising demonstration initiatives. Between 2011 and 2020, the programme supported 216,000 young people, of whom 40% were women. Demonstration projects included 60 households constructing biogas plants in their homes in Port Said. Since 2018, a further 160 biogas plants have been supported for construction.
Burkina Faso, Ghana, Mauritius, Rwanda, Senegal, South Africa, Sierra Leone and Zimbabwe. Green Jobs for Youth. Food and Agriculture Organisation.	• Agriculture • Food • Energy • Waste.	Aims to provide green jobs across agri-food and other rural economic sectors through value chain identification and community involvement. Local actors, youth entrepreneurship and impact investors are all partners in scaling successful agribusinesses. Training is offered to young people in business development. Rural and urban youth will be able to develop skills and work in Green Agriculture, Energy and Waste Management sectors and transferable soft skills such as teamwork, communication, business development, information technology and financial literacy. Partners are the Korea International Cooperation Agency, Massachusetts Institute of Technology, Partnership for Action on Green Economy, Korea Trade–Investment Promotion Agency, International Labour Organization, local government and public organisations, youth groups, universities, civil-society groups, producer organisations, the private sector, and multi stakeholder platforms.
Youth and Women Green Entrepreneurship in Africa UNU coordinates a consortium of partners, including the Pan African University Institute for Water and Energy Sciences (incl. Climate Change – PAUWES), AfriLabs, VC4A and the United Nations Framework Convention on Climate Change Secretariat (UNFCCC). The project is funded by IDRC (International Development Research Centre)	• Renewable Energy • Water Management • Smart Agriculture • Waste Management	The project aims to set up a framework that brings together actors and stakeholders of the green innovation and entrepreneurship ecosystem in Africa to identify and ideate solutions and organise and support innovations, innovators and entrepreneurs with a focus on women and youth. The framework builds on the result of the analysis, assessment and classification of African start-ups, innovations and promising market segments and the mapping of actors and stakeholders and structure of the Green Innovation and Entrepreneurship Ecosystem in five green sectors, namely Renewable Energy, Water Management, Smart Agriculture, Climate Actions and Waste Management. Furthermore, it consists of a virtual environment with appropriate courses to strengthen the entrepreneurial and hard skills of youths and women in the selected green sectors, and a blueprint and technical implementation of a reference virtual incubator and accelerator at the Pan African level with appropriate services such as mentoring, networking, infrastructure and resources, seed funding, etc. To stimulate a community of practice around the topic of green innovation and entrepreneurship in Africa, a Pan African Green Entrepreneurship Policy and Knowledge Hub will be established to analyse the interactions among stakeholders of the innovation and entrepreneurship ecosystem and provide policy and recommendations for improvement.

Annexure E:
GEF Africa-wide projects, accessed 5 April 2023

Title	Focal Areas	Type	Agencies	GEF Grant in USD	Cofinancing in USD	Status
African Climate Risk Insurance Facility-De-risking Adaptation to Climate Change in Africa	Climate Change	Full-size Project	African Development Bank	8,940,768	25,000,000	Concept Approved
Support to Preparation of the Fourth National Biosafety Reports to the Cartagena Protocol on Biosafety - AFRICA REGION	Biodiversity	Enabling Activity	United Nations Environment Programme	1,287,000	1,246,750	Project Approved
Transformational Change in Sustainable Forest Management in Transboundary Landscapes of the Congo Basin		Full-size Project	United Nations Environment Programme	8,192,366	49,935,044	Project Approved
AFLDC-2 Scaling-up Investment and Technology Transfer to Facilitate Capacity Strengthening and Technical Assistance for the Implementation of Stockholm and Minamata Conventions in African LDCs	Chemicals and Waste	Full-size Project	African Development Bank	21,300,000	237,143,479	Project Approved
Knowledge exchange and institutional partnerships to reduce environmental health risks from exposure to harmful chemicals and waste	Chemicals and Waste	Full-size Project	The World Bank	4,311,926	10,850,000	Project Approved
Regional Partnership for African Fisheries Policy Reform (RAFIP)	International Waters	Medium-size Project	The World Bank	2,000,000	12,000,000	Project Approved
Investing in Renewable Energy Project Preparation under the Fund for Energy Inclusion (FEI)	Climate Change	Full-size Project	African Development Bank	10,000,000	610,000,000	Project Approved

Title	Focal Areas	Type	Agencies	GEF Grant in USD	Cofinancing in USD	Status
Reducing environmental Health Impacts of Harmful Pollutants in the African Region	Chemicals and Waste	Medium-size Project	The World Bank	2,000,000	2,000,000	Project Approved
AfDB-PPP Public-Private Partnership Program	Climate Change	PFD	African Development Bank	20,000,000	240,000,000	Concept Proposed
Pilot African Climate Technology Finance Center and Network	Climate Change	Full-size Project	African Development Bank	14,340,000	89,000,000	Project Approved
SPWA-BD: Scaling Up the Impacts of Goods Practices in Linking Poverty Alleviation and Biodiversity Conservation	Biodiversity	Medium-size Project	The World Bank	900	1,140,000	Completed
Strategic Partnership for a Sustainable Fisheries Investment Fund in the Large Marine Ecosystems of Sub-Saharan Africa (Tranche 1, Installment 2)	International Waters	Full-size Project	The World Bank	5,600,000	0	Project Approved
SIP: Institutional Support to New Partnership for Africa's Development (NEPAD) and Regional Economic Communities (RECs) for Sustainable Land Management (SLM) Scale-up in Sub-Saharan Africa (SSA)	Land Degradation	Full-size Project	United Nations Environment Programme	3,735,809	6,014,550	Project Approved
Regional Dialogue and Twinning to Improve Transboundary Water Resources Governance in Africa	International Waters	Medium-size Project	United Nations Development Programme	1,000,000	1,915,000	Completed
Development of Sub-Regional Environmental Action Plans of the New Partnership for Africa's Development (NEPAD)		Medium-size Project	United Nations Environment Programme, The World Bank, United Nations Development Programme	1,000,000	135	Completed

Title	Focal Areas	Type	Agencies	GEF Grant in USD	Cofinancing in USD	Status
SP-SFIF: Strategic Partnership for a Sustainable Fisheries Investment Fund in the Large Marine Ecosystems of Sub-Saharan Africa (Tranche 1, Installment 1)	International Waters	PFD	The World Bank	73,26	0	Cancelled
Protection of the North West Sahara Aquifer System (NWSAS) and Related Humid Zones and Ecosystems	International Waters	Medium-size Project	United Nations Environment Programme	600	816	Completed
Finalization of the Action Plan on the Environment Component of the New Partnership for Africa's Development		Medium-size Project	United Nations Environment Programme	300	100	Completed

Annexure F:
Green technology support agencies, examples from UNECA

Select examples across Africa include[92]:

- GreenCape, in South Africa, provides a range of services such as an industrial symbiosis programme, training/capacity development (e.g. in support of municipalities' adoption of small-scale embedded generation), project management for a new Special Economic Zone, drought business support, and a range of market intelligence reports.

- SOLTRAIN is the Southern African Solar Thermal Training and Demonstration Initiative. This regional programme aims to support Botswana, Lesotho, Mozambique, Namibia, South Africa and Zimbabwe to use solar thermal energy to replace fossil fuel. It works with local partners to improve access to solar thermal solutions.

- The Seychelles' Conservation and Climate Adaptation Trust (SeyCCAT) provides grants, and the Development Bank of Seychelles (DBS) provides loans from finance from the country's Blue Bond.

- Tanzania Urbanisation Laboratory is a community of urban specialists from government, civil society, development partners, academic organisations, think tanks and the private sector who convene to identify problems, risks and opportunities facing cities in Tanzania.

- OceanHub Africa seeks to accelerate innovative impact-driven start-ups in Africa to protect the oceans.

- SEED: Founded in 2002 at the World Summit on Sustainable Development, SEED works directly to support enterprises and entrepreneurs and provides a comprehensive support package for business and capacity-building, networking, and profiling at the national and international levels.

- The Innovation Hub is an innovation agency of the Gauteng Province of South Africa that supports economic development and competitiveness through fostering innovation and entrepreneurship. Several business incubators provide support across prioritised sectors and industries.

- UNDP's accelerator labs are located in several SADC countries. The Accelerator Labs model a new capability to make breakthroughs on the future of development: inequality, decarbonisation, the 4th industrial revolution and new forms of governance.

- Switch African Green is a UN Environment Programme initiative to address responsible consumption and production in Africa. The programme focuses on four sectors: agriculture, manufacturing, integrated waste management and tourism.

- AfriLabs is a network organisation supporting Innovation Centres across African countries since 2011. It was founded as a community around Africa's rapidly emerging technology hubs.

Annexure G:
Case Study- South Africa's IK development and links to green technology

The Protection, Promotion, Development and Management of Indigenous Knowledge Act, 2019, creates the legal, regulatory, policy and strategy framework for IK&TK in South Africa. Stemming from this, the Indigenous Knowledge Registration System is an initiative of the Department of Science and Innovation that documents over 20,000 claims of indigenous knowledge in various provinces. It was developed by the Council for Scientific and Industrial Research Next Generation Institute using a living lab approach. It features a portal that serves as the entry point to IK information, a secure digital repository system, and an official database containing a list of traditional medicines and their uses, side effects and directions for use.

The country's Technology Innovation Agency and Industrial Development Corporation has also established an IK-based bio-innovation programme. It seeks to create a commercialisation platform to allow individuals who intend to use IK for commercialisation purposes to apply in the manner prescribed in the regulations for a licence authorising the use of indigenous knowledge.

Furthermore, North-West University's Indigenous Knowledge Systems Centre is a leader in research in IK&TK.

Regarding new green technology, IK and the Health sector, the CSIR has a programme with certain Traditional Health Practitioners to explore, develop and commercialise standardised and safe traditional medicines. The products include:

- UmphethaTM, an iced tea used to treat internal ulcers, blood cleansing and immune boosting
- Moshumasekgwa, a tea that treats high blood pressure, diabetes and urinary problems
- Lenong, a tissue oil to treat wounds and arthritis
- KgopaTM, a petroleum jelly to treat sores, skin problems and stomach aches
- PrijapTM, a herbal liquid with anti-viral and anti-inflammatory properties that strengthens the immune system and increases energy levels and appetite
- Areka Ya MakgomaTM, a herbal sachet that facilitates the healing process of opportunistic infections and improves appetite

Source: CSIR, DST.

Annexure H:
Further Stakeholder lists

1. ***African Technology Policy Studies Network (ATPS)*** is a trans-disciplinary network of researchers, policymakers, private sector actors and civil society that promotes STI's generation, dissemination, use and mastery for African development, environmental sustainability and global inclusion. In collaboration with like-minded institutions, ATPS provides platforms for collaborative and innovative policy research to support African governments and STI institutions/stakeholders in building necessary knowledge conditions and infrastructures, policies and incentives, and capabilities for STI knowledge generation, brokerage, circulation and socialisation. This ensures effective valorisation and commercialisation of scientific and indigenous knowledge into new technologies and innovations for sustainable development on the continent.

2. ***African Research and Impact network*** is an impact platform that brings together a network of scholars and policymakers across Africa. Modelled as a network, ARIN seeks to flexibly leverage talented African scholars' capabilities. ARIN's core focus is to engage in peer learning and sharing good transformative research and impact practices. Areas of focus include natural resource management, climate change, agriculture, forestry, energy, water and cities to leverage knowledge and experiences in promoting research excellence and impact pathways (**https://www.arin-africa.org/**).

3. ***The ASKIA service*** (Access to Scientific and Socio-economic Information in Africa: ASKIA http://askia.uneca.org/) was developed by the United Nations Economic Commission for Africa. It provides access to scientific and socio-economic information for the African community (including scientists, researchers, academics, students, economists, and policy-makers) via an interactive online portal. The African Knowledge Base (AKB), a flagship project of the African Union, is a unique open online resource providing one-stop access to African premier academic, research and government organisations' current publications. It consists of full-texts, abstracts and bibliographic information (http://akb.africa-union.org/auc/).

4. The **Youth Think Tank** (is a research group of young people from The Mastercard Foundation's networks. In partnership with Restless Development, it trains and mentors young people to conduct research, collect evidence and document youth needs, challenges and aspirations. A new cohort researches their communities each year and makes recommendations based on their findings. Research is focused on key issues that affect youth. The YTT was launched in 2012, and since then, it has grown to 28 researchers from seven countries across the continent.

African Centres of Excellence

List includes:

Country	University	Centre	Website	Thematic Area
Benin	University of Abomey – Calavi	ACE: Mathematical Sciences, Computer Science and Applications	**https://ceasma-benin.org/**	STEM
	University of Abomey – Calavi	Water and Sanitation	**https://c2ea.ine-uac.net/**	STEM
	University of Abomey – Calavi	College of Engineering, Energy, Infrastructure, Environment	**https://coe-epac.com/fr/**	STEM
Burkina Faso	Institut International d'Ingénierie de l'Eau et de l'Environnement	CEA for Training and Research in Water Sciences and Technologies	https://www.2**ie-edu.org/fr/centre-d-excellence-de-la-banque-mondiale/cea-impact-2ie**	STEM
	Institut International d'Ingénierie de l'Eau et de l'Environnement	College of Engineering for Training and Research in Science and Technology of Energy and Infrastructure Engineering in West Africa and the Center	https://www.2**ie-edu.org/fr/centre-d-excellence-de-la-banque-mondiale/cea-impact-2ie**	STEM
	Université de Ouaga I	Center for Training, Research and Expertise in Medicines Sciences	**https://www.cforem-univ-ouaga.org/**	Health
	Université Nazi Boni	CEA and Biotechnological Innovation for the Elimination of Trans-Mission Diseases Vectorielle	**https://cea-itech.u-naziboni.bf/cea/**	Health
	Université de Ouaga I	Center for Studies, Training and Research in Social Risk Management	**https://ceforgris-ujkz.org/**	Education
Côte d'Ivoire	INP-HB	CEA: Mines et Environnement Minier		STEM
	INP-HB	CEA: Valorization Of Waste In Products With High Added Value		STEM
	Université Félix Houphouët-Boigny	CEA: Climate Change, Biodiversity and Sustainable Agriculture		Agriculture
	ENSEA	CEA: Statistics and Quantitative Economics		Education
Djibouti		Emerging centre: logistics and transport		STEM
	UD School of Engineers			STEM
Gambia		Emerging Center: Science, Technology and Engineering for Entrepreneurship		STEM

Country	University	Centre	Website	Thematic Area
Ghana	Kwame Nkrumah University of Science and Technology	Regional Water and Environmental Sanitation Center Kumasi	**https://rwesck.org/**	STEM
	University of Energy and Natural Resources	Regional Center for Energy and Environmental Sustainability	**https://www.rcees.uenr.edu.gh/**	STEM
	University for Development Studies	West African Center for Water, Irrigation and Sustainable Agriculture	**https://wacwisa.uds.edu.gh/**	Agriculture
	University of Cape Coast	Africa Center of Excellence in Coastal Resilience	**https://acecor.ucc.edu.gh/**	Agriculture
	Kwame Nkrumah University of Science and Technology	Regional Transport Training and Research Center	**https://treck.knust.edu.gh/**	STEM
	Kwame Nkrumah University of Science and Technology	College of Engineering, CoE_ KNUST	**https://keep.knust.edu.gh/%c2%a0**	STEM
	University of Ghana	West African Center For Cell Biology of Infectious and Non-Communicable Diseases	**https://www.waccbip.org/**	Health
	University of Ghana	West Africa Center for Crop Improvement	**https://wacci.ug.edu.gh/**	Agriculture
	University of Ghana	West Africa Genetic Medicine Center	**https://wagmc.org/**	Health
Guinea	Gamal Abdel Nasser University of Conakry	African Center of Excellence for the Prevention and Control of Communicable Diseases	**http://makettest.africahealthconsulting.com/**	Health
	Higher Institute of Mines and Geology of Boké	Emerging Center, Mines and Societies CoE_Guinée		STEM
Niger	Abdou Moumouni University	Regional Center of Excellence on Pastoral Productions: Meat, Milk, Leather and Skin	**http://www.cerppniger.ne/**	Agriculture
	Abdou Moumouni University	Teaching & Learning Math and Science for Sub-Saharan Africa	**http://www.cea-ms4ssa.org/**	STEM
		Emerging Center: Environment mining		STEM
Senegal	Gaston Berger University	African Center of Excellence in Mathematics and ICT	**https://www.ceamitic.sn/en/**	STEM
	Cheikh Anta Diop University	The African Center of Excellence for Mother and Child Health	**http://ceasamef.sn/**	Health
	Cheikh Anta Diop University	CEA: Agir African Centre of Excellence Environment Health, Societies	**https://cea-agir.ucad.sn/**	Health
	Cheikh Anta Diop University	CEA: Agriculture for Food and Nutrition Security	**https://ceaagrisan.sn/**	Agriculture
Togo	University of Lome	Regional Center of Excellence for Electricity Control		STEM
	University of Lome	Regional Center of Excellence in Avian Sciences	**https://www.cersa-togo.org/**	Agriculture
	University of Lome	Regional Center of Excellence for Sustainable Cities in Africa	**https://www.cervida-togo.org/**	Education

Other multilateral/major country-funded initiatives

World Bank

The World Bank has the Innovation Policy Platform and a Gender Innovation Lab. It finances the large XL Africa Program designed to support later-stage technology start-ups ready for scale.

African Development Bank

At the regional level, the African Development Bank set up an STI Forum in 2018 and is about to invest in the Boost Africa Program with the European Investment Bank to accelerate the growth and development of start-ups in Africa.

African Union-EU High-level Policy Dialogue

The African Union-EU High-Level Policy Dialogue on STI was set up in 2010 by the Second Africa-EU Summit. It functioned as a platform for regular exchanges on research and increasingly innovative policy.

European Commission

The European Commission has recently launched an Africa-Europe-innovation Partnership for networking of both continents' tech hubs and technology transfer organisations and a Policy Support Facility for supporting the design, coordination and implementation of national innovation strategies.

Agence Française de Développement and the Kingdom of the Netherlands

The French AFD launched the Digital Africa initiative in December 2019. (**https://digital-africa.co/en/about/**)

The Kingdom of the Netherlands launched Orange Corners to support entrepreneurs in 2017.

UK government

The Research and Innovation Systems for Africa Fund is a multi-country project, running between 2021 and 2024, funded by the UK through the Foreign, Commonwealth and Development Office, to support research and innovation systems strengthening in Africa.

The Africa Technology and Innovation Partnerships programme objective is to accelerate the growth of technological innovation in Nigeria, South Africa, Kenya, Ghana, Rwanda and Tanzania, between 2020 and 2024, leading to inclusive and sustainable growth and contributing to the delivery of the sustainable development goals. It is also funded by the Foreign, Commonwealth and Development Office

Continental indigenous knowledge programmes

These provide platforms, training, advocacy and coordination, and integration of indigenous knowledge into other agricultural knowledge systems:

- The African Union's African Network of Centers of Excellence in Indigenous Knowledge Systems: a platform for research, training and dissemination of indigenous knowledge systems across the continent
- The African Network for Agriculture, Agroforestry and Natural Resources Education, promoting the integration of traditional and modern knowledge systems in agriculture
- The Indigenous Peoples of Africa Coordinating Committee, promoting and protecting the rights of indigenous peoples, preserving their cultural heritage, and promoting the use of the indigenous knowledge in development
- The African Institute for Indigenous Knowledge Systems, offering training programmes to students, researchers and development practitioners

Endnotes

1 Retrieved from **https://www.afdb.org/en/news-and-events/press-releases/cop27-african-and-global-partners-launch-multi-billion-alliance-green-infrastructure-56403**

2 IPCC. (2022). Fact Sheet – Africa: Climate change impacts and risks. Retrieved from: **https://www.ipcc.ch/report/ar6/wg2/downloads/outreach/IPCC_AR6_WGII_FactSheet_Africa.pdf**

3 **https://www.statista.com/statistics/1319996/green-technology-and-sustainability-market-size-worldwide/**

4 Omoruyi, O. 2023. $2.8bn for climate change start-ups in Africa in 5 years, but will funding get better? Retrieved from **https://technext24.com/2023/06/27/2-8bn-for-climate-change-tech-africa/** (Accessed 10 July 2023).

5 **https://www.esi-africa.com/renewable-energy/sub-saharan-africa-among-least-ready-to-harness-green-tech-opportunities/**

6 Ibid

7 Scopus, launched in 2004, is Elsevier's abstract and citation database. It covers nearly 36,377 titles from approximately 11,678 publishers, of which 34,346 are peer-reviewed journals in top-level subject fields: life sciences, social sciences, physical sciences and health sciences.

8 Undertaken on April 10, 2023.

9 Available here: **https://climate-laws.org/**. Policies for the subset of countries were downloaded on 12 May and organised according to the existing categories for reporting.

10 Search performed on 10 August 2023, at **cbd.int**

11 Downloaded and summarised from **https://unfccc.int/ttclear/tna/reports.html** April 20 2023. **https://unfccc.int/ttclear/tna/reports.html**

12 Retrieved from **https://www.international-climate-initiative.com/projekte-suchen/#/** on 30 July 2023.

13 Project data downloaded from GEF's website (**https://www.thegef.org/projects-operations/database**) on 5 July 2023 for Ghana, Ethiopia, Kenya, Uganda, Senegal, Rwanda and Uganda provides an indication of trends. This relates to all GEF projects, less cancelled projects, from 1991 to 2023. It includes country-specific projects as well as regional and global projects in which the countries participate.

14 Project data was downloaded from GCF online database accessed through **https://www.greenclimate.fund/projects**

15 Project data downloaded 4 July 2023 from **https://www.adaptation-fund.org/projects-programmes/project-information/projects-table-view/** for Ghana, Ethiopia, Kenya, Uganda, Senegal, Rwanda and Uganda. The Adaptation Fund's categories were used to categorise projects by sector.

16 Retrieved from here: **https://www.ilo.org/global/topics/youth-employment/lang--en/index.htm and here: https://www.ilo.org/global/topics/green-jobs/lang--en/index.htm**

17 Gubanova, Clasen and Theuvsen. (2015). Definitions, classifications and data banks of green technology start-ups. Conference paper. Universität Göttingen und Hochschule. Retrieved from **https://www.gil-net.de/Publikationen/27_61.pdf**.

18 Dong, X.; Fu, W.; Yang, Y.; Liu, C.; Xue, G. (2022). Study on the Evaluation of Green Technology Innovation Efficiency and Its Influencing Factors in the Central Plains City Cluster of China. Sustainability 2022, 14, 11012. Retrieved from **https://doi.org/10.3390/su141711012**

19 Andersen. (2020). The triple planetary crisis: Forging a new relationship between people and the earth. (Press Release). UNEP. Retrieved from **https://www.unep.org/news-and-stories/speech/triple-planetary-crisis-forging-new-relationship-between-people-and-earth?gclid=CjwKCAjwzo2mBhAUEiwAf7wjkqOdIIkwfuhuuRl5-RLcAOgaGjl0a-m-saFNDDQ3-hIfAB9P9LVZxRoCHMoQAvD_BwE**

20 El-Haggar, S. (2007). Chapter 2 - Cleaner Production, in *Sustainable Industrial Design and Waste Management*, Academic Press, 2007.

21 Ellen MacArthur Foundation. (2023). *What is a circular economy*? (Webpage). Retrieved from: https://ellenmacarthur **foundation.org/topics/circular-economy-introduction/overview?gad=1&gclid=CjwKCAjw2K6lBhBXEiwA5RjtCQpn** F9BabSHIRHQf6Knbkg8blOtjfwiREHvk6kLl4BmeHLxYzVAm0hoC3f0QAvD_BwE

22 Convention on Biological Diversity. (2022). *COP15: Final text of Kunming-Montreal Global Biodiversity Framework*. Retrieved from **https://www.cbd.int/article/cop1** 5-final-text-kunming-montreal-gbf-221222

23 UN.ESCAP. (2012). Low carbon green growth roadmap for Asia and the Pacific: turning resource constraints and the climate crisis into economic growth opportunities. United Nations. Retrieved from: **https://sustainabledevelopment.un.org/index.php?page=view&type=400&nr=694&menu=1515**

24 UN.ESCAP. (2012). *Low carbon green growth roadmap for Asia and the Pacific: turning resource constraints and the climate crisis into economic growth opportunities*. United Nations. Retrieved from: **https://sustainabledevelopment.un.org/index.php?page=view&type=400&nr=694&menu=1515**

25 WIPO. (2022). *Green Technology Book 2022: Solutions for Climate Change Adaptation*. Retrieved from **https://www.wipo.int/en/green-technology-book/?utm_source=google&utm_medium=cpc&utm_campaign=Search%3A+Green+Technology+Book+2022+%28EN%29&utm_term=green+technology&utm_content=search+ads&gclid=CjwKCAjw0N6hBhAUEiwAXab-TffmAHuyLAETjGjZRRlZcmD8Dti8vymdxUv2WKJXDQ65j96_tRwsKBoC3TIQAvD_BwE**

26 Documents that did not specify an economic sector were categorised as n.s. (not specified).

27 Otieno B., Ochieng A (2018). Green economy in the wastewater treatment sector: Jobs, awareness, barriers, and opportunities in selected local governments in South Africa, 2018. *Journal of Energy in Southern Africa*

28 Habib H (2021). Climate change, macroeconomic sensitivity and the response of remittances to the North African countries: a panel VAR analysis. *Research Square*.

29 Ndichu J.; Blohmke J.; Kemp R.; Adeoti J.; Obayelu A.E. (2015) The adoption of energy efficiency measures by firms in Africa: Case studies of cassava processing in Nigeria and maize milling in Kenya. *Innovation and Development.* Vol 5, No.2; Ouédraogo M.; Peng D.; Chen X.; Hashmi S.H.; Sall M.I. (2021). Dynamic effect of oil resources on environmental quality: Testing the environmental kuznets curve hypothesis for selected African countries. *Sustainability (Switzerland).* Vol 13, No. 7

30 Ariwa E.; Katono I.W. (2011) Corporate sustainability of green technology and assessment of the environment and challenges faced by regulatory authorities in Uganda: A case of the electricity regulatory authority (ERA).*Journal of Internet Banking and Commerce.* Vol 16, No.2 ; Munu N.; Banadda N.; Kiggundu N.; Zziwa A.; Kabenge I.; Seay J.; Kambugu R.; Wanyama J.; Schmidt A. (2021).Transforming corn stover to useful transport fuel blends in resource-limited settings. *Energy Reports. Vol 7.*

31 Ulsrud K.; Muchunku C.; Palit D.; Kirubi G.(2018). *Solar energy, mini-grids and sustainable electricity access: Practical experiences, lessons and solutions from Senegal*. Book.

32 Ayetor G.K.; Quansah D.A.; Adjei E.A. (2020). Towards zero vehicle emissions in Africa: A case study of Ghana. *Energy policy*. Vol 143.

33 African Union. (undated). Goals and Priority Areas of Agenda 20163. (webpage). Retrieved from **https://au.int/agenda2063/goals**

34 African Union. (undated). *Science, Technology and Innovation Strategy for Africa 2024*. Retrieved from: **https://au.int/sites/default/files/newsevents/workingdocuments/33178-wd-stisa-english_-_final.pdf**

35 African Union. (2022). *African Union Climate Change and Resilient Development Strategy and Action Plan (2022-2032)*. Retrieved from: **https://au.int/en/documents/20220628/african-union-climate-change-and-resilient-development-strategy-and-action-plan**

36 African Union. (2021). *Green Recovery Action Plan*. Retrieved from **https://au.int/en/documents/20210715/african-union-green-recovery-action-plan-2021-2027**

37 Downloaded from https://climate-laws.org/ on 12 May 2023 and sorted to identify all the relevant entries for the subset of countries. The sectoral classification provided by the Climate Laws project has been used to identify focus areas.

38 Search performed on 10 August 2023, at **cbd.int**

39 Attafuah-Wadee, K and Tilkanen, J. 2020. Policy approaches for accelerating the circular economy in Africa. Circular Economy Earth. (website). Retrieved from: **https://circulareconomy.earth/publications/accelerating-the-circular-economy-transition-in-africa-policy-challenges-and-opportunities**

40 AfDB. (2023). COP27: African and global partners launch multi-billion alliance for green infrastructure. (Press release). Retrieved from **https://www.afdb.org/en/news-and-events/press-releases/cop27-african-and-global-partners-launch-multi-billion-alliance-green-infrastructure-56403**

41 AfDB. (2022). The African Adaptation Acceleration Programme. Retrieved from: https://www.afdb.org/en/topics-and-sectors/initiatives-partnerships/africa-adaptation-acceleration-program.

42 It is not clear to the author what is meant by an adaptation-aligned job.

43 IKI. (undated) About the IKI. (webpage). Retrieved from **https://www.international-climate-initiative.com/ueber-die-iki/**

44 Undertaken on 31 Jul 2023, based on the number of entries filtered by each country in the 'list' tab. These were organised according to topic using IKI's own characterisation of topics.

45 For more background on the GEF see **https://www.thegef.org/who-we-are/organization**; the GCF see **https://www.greenclimate.fund/themes-result-areas** and the AF see **https://www.adaptation-fund.org/projects-programmes/project-sectors/**

46 Project data downloaded from GEF's website (**https://www.thegef.org/projects-operations/database**) on 5 July 2023 for Ghana, Ethiopia, Kenya, Uganda, Senegal, Rwanda and Uganda provides an indication of trends. This relates to all GEF projects, less cancelled projects, from 1991 to 2023. It includes country-specific projects as well as regional and global projects in which the countries participate.

47 **https://www.thegef.org/partners/conventions**

48 Global Environmental Fund. 2023. *On the heels of biodiversity deal, GEF presents record work program and prepares to host new fund.* **https://www.thegef.org/newsroom/news/heels-biodiversity-deal-gef-presents-record-work-program-and-prepares-host-new-fun**

49 For more background on the Adaptation Fund see **https://www.adaptation-fund.org/about/governance/**

50 Downloaded 4 July 2023 from **https://www.adaptation-fund.org/projects-programmes/project-information/projects-table-view/**. The Adaptation Fund's categories were used to categorise projects by sector.

51 Adaptation Fund (2022). Youth Engagement in Climate Change Adaptation: Lessons from the Adaptation Fund Portfolio of Projects and Programmes. Retrieved from **https://www.adaptation-fund.org/wp-content/uploads/2022/07/Youth-Report-07.11.22.pdf**

52 Green Climate Fund (2023). GCF Spotlight. (online factsheet). Retrieved from **https://gcfrod.blob.core.windows.net/public/odl/pdf/africa.pdf**

53 Project data was downloaded on from GCF online database accessed through **https://www.greenclimate.fund/projects**

54 See https://ace.aau.org/ for more information

55 See https://www.acts-net.org/ for more information

56 See https://openair.africa/ for more information

57 See https://aiiks.org/ for more information

58 See http://www.ist-africa.org/home/ for more information

59 ECA. (2023*). Opportunities for micro-small and medium-sized enterprises in the green and blue economies: case of the Southern African Development Community*. Retrieved from **https://uneca.org/opportunities-for-micro-small-and-medium-sized-enterprises-within-the-green-and-blue-economies**

60 Ibid

61 Global Entrepreneurship Monitor. (undated) Youth are more entrepreneurial than adults: GEM report on youth entrepreneurship. (press release). Retrieved from **https://www.gemconsortium.org/news/Youth%20are%20more%20entrepreneurial%20than%20adults**:%20GEM%20report%20on%20youth%20entrepreneurship

62 **Africa.com**. (2019). *10 Young Afripreneurs Creating Solutions By Recycling and Upcycling*. Retrieved from **https://www.africa.com/10-young-afripreneurs-creating-solutions-recycling-upcycling-waste/**

63 TIPS. (2019). *Green economy and inclusivity*. Retrieved from: **https://www.tips.org.za/images/TIPS_for_PAGE_Green_economy_and_inclusivity.pdf**

64 African Union. (undated) *Youth Development* (webpage). Retrieved from **https://au.int/en/youth-development**

65 African Union (undated). 1 million by 2021 (webpage). Retrieved from https://1**millionby2021.au.int/**

66 Gyimah-Brempong, K and Kimenyi, Mwangi S. (2016). *Youth policy and the future of African development.* Africa Growth Initiative by Brookings. Retrieved from **https://www.brookings.edu/wp-content/uploads/2016/06/04_youth_policy_african_development_kimenyi.pdf**

67 Gradiner, D and Goudhuys, M. (undated). *Youth Aspirations and the Future of Work*. International Labour Organisation Working papers. Retrieved **fromhttps://www.ilo.org/static/english/intserv/working-papers/wp008/index.html**

68 Mwaura, G and Glove, D.(2021). *Green jobs for young people in Africa: work in progress*. Evidence Synthesis paper series. INCLUDE knowledge platform. **https://includeplatform.net/wp-content/uploads/2021/08/ESP-Mwaura-and-Glover.pdf**

69 FAO. (2022). *Rural Youth Action Plan*. Rome. **https://doi.org/10.4060/cc0583en** '**Rural Youth Action Plan**'.

70 For more information: **https://fundforyouthemployment.nl/**

71 David, Schwebel and others, 'Policies for Youth Employment in Sub-Saharan Africa', in Valerie Mueller, and James Thurlow (eds), *Youth and Jobs in Rural Africa: Beyond Stylized Facts* (Oxford, 2019; online edn, Oxford Academic, 19 Dec. 2019), **https://doi.org/10.1093/oso/9780198848059.003.0003**, accessed 30 July 2023.**https://academic.oup.com/book/37379/chapter/331368712**

72 **https://www.ilo.org/emppolicy/events/WCMS_883552/lang--en/index.htm**

73 Africarena. (2023). The state of tech in Africa 2023. Retrieved from **https://www.africarena.com/_files/ugd/0da073_08aec517db784543b2802cd80330a491.pdf**

74 African Union. 2020. 'Promoting Youth Entrepreneurship in Africa'. Published by GIZ. Available at: **https://au.int/sites/default/files/documents/39541-doc-promoting_youth_entrepreneurship_in_africa_-_en.pdf** [Accessed 11 July 2023]

75 **https://impacthub.net/**

76 **https://www.acumen.org/programs/east-africa-accelerator/**

77 **https://meltwater.org/mac/**

78 **https://katapult.vc/africa/**

79 https://africaclimaccelerator.org/

80 **https://www.theinnovationhub.com/business-incubators/climate-innovation-centre-south-africa-6**

81 **https://vc4a.com/blog/2022/02/25/introducing-the-giz-accelerator-program-for-climate-change-innovations/**

82 **https://youthclimatehub.org/**

83 United Nations. (2023). Technology and Innovation report 2023: Opening green window. Technological opportunities for a low-carbon world. Report. Retrieved from **https://unctad.org/system/files/official-document/tir2023_en.pdf**

84 United Nations Environment Programme. (2022). Tapping into Indigenous Knowledge to protect nature. (webpage). Retrieved from **https://www.unep.org/news-and-stories/story/tapping-indigenous-knowledge-protect-nature**

85 Orlove, B., Dawson, N., Sherpa, P., Adelekan, I., Alangui, W., Carmona, R., Coen, D., Nelson, M., Reyes-Garcia, V., Rubis, J., Sanago, G., Wilson, A..(2022) ICSM CHC White Paper I: Intangible Cultural Heritage, Diverse Knowledge Systems and Climate Change. Contribution of Knowledge Systems Group I to the International Co-Sponsored Meeting on Culture, Heritage and Climate Change. Charenton-le-Pont & Paris, France: ICOMOS & ICSM CHC, 2022

86 Simpson, N.P., Orr, S.A., Sabour, S., Clarke, J., Ishizawa, M., Feener, M., Ballard, C., Mascarenhas, P.V., Pinho, P., Bosson, J.B., Morrison, T., Zvobogo, L. (2022) ICSM CHC White Paper II: Impacts, vulnerability, and understanding risks of climate change for culture and heritage: Contribution of Impacts Group II to the International CoSponsored Meeting on Culture, Heritage and Climate Change. Charenton-le-Pont & Paris, France: ICOMOS & ICSM CHC, 2022

87 Oguamanam, C. (2023). A Critical Examination of the African Legal Framework for Indigenous Knowledge. Journal of African Law, 67(1), 1-21. doi:10.1017/S0021855323000049 9

88 Trisos, C.H., I.O.Adelekan, E.Totin, A.Ayanlade, J.Efitre, A.Gemeda, K.Kalaba, C.Lennard, C.Masao, Y.Mgaya, G. Ngaruiya, D. Olago, N.P. Simpson, and S. Zakieldeen, (2022). Africa. In: *Climate Change 2022: Impacts, Adaptation and Vulnerability.* Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O.Pörtner, D.C.Roberts, M.Tignor, E.S.Poloczanska, K.Mintenbeck, A.Alegría, M.Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 1285–1455, doi:10.1017/9781009325844.011.

89 Mwaura, G and Glove, D. (2021). Green jobs for young people in Africa: work in progress. Evidence Synthesis paper series. INCLUDE knowledge platform. **https://includeplatform.net/wp-content/uploads/2021/08/ESP-Mwaura-and-Glover.pdf**

90 Many would question nuclear energy's inclusion here. It has been retained based on the original source of the data.

91 Land use, Land use change, and Forestry

92 ECA. (2023*). Opportunities for Micro-small and medium-sized enterprises in the green and blue economies: case of the Southern African Development Community*. Retrieved from **https://uneca.org/opportunities-for-micro-small-and-medium-sized-enterprises-within-the-green-and-blue-economies**.

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The Mastercard Foundation is a registered Canadian charity and one of the largest foundations in the world. It works with visionary organisations to advance education and financial inclusion to enable young people in Africa and Indigenous youth in Canada to access dignified and fulfilling work. Established in 2006 through the generosity of Mastercard when it became a public company, the Foundation is an independent organisation separate from the company, with offices in Toronto, Kigali, Accra, Nairobi, Kampala, Lagos, Dakar, and Addis Ababa. Its policies, operations, and program decisions are determined by the Foundation's Board of Directors and leadership.

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