

**Innovative communities: leveraging technology and innovation to build sustainable and resilient societies**

**Input from the Economic Commission for Africa**

**New Technologies and Innovation**

**The African Biomedical Engineering Consortium as an Innovation Community for improved Healthcare Outcomes**

The recent Ebola outbreak (2014-2016) in the Mano River region of West Africa and the failure to eliminate communicable diseases, such as Cholera, underscored the fragility and weakness of Africa's health system. Poor health is often a causative factor in leaving people behind. It thus follows that improving health outcomes for all is central to achieving the SDGs and realizing the aspirations of Agenda 2063. Health technologies, especially medical devices, are needed to empower health workers to provide lifesaving healthcare services.

Over the last six years, ECA has developed a comprehensive and integrated approach to building skills and competencies needed by countries to install, operate, maintain, upgrade as well as design medical devices needed to meet current and future healthcare challenge. The initiative has integrated training of undergraduate and post graduated biomedical engineers, promoted innovation through competitions and awards and encouraged entrepreneurship through showcasing and mentorship. To ensure sustainability, ECA inspired the formation of the African Biomedical Engineering Consortium (ABEC) which is promoting exchange and training of lecturers and post-graduates, overseeing the international design school programme and building an online open source platform to facilitate design of medical devices that meet both international standards and Africa's operating conditions.

**Outcomes:** There are now about 19 universities and 6 support industrial and medical research institutes and 2 external knowledge partners; an estimated 1,174 students were enrolled in BME ungraduated programs; one medical device has been approved and entered into service in Malawi cutting down infant mortality; a team in Uganda has won global and continental awards for their design of a medical device that improves the safety of patients and a team of graduates set up their own designing and service firm.

**Senior Expert Dialogue as a Community for Policy Innovation and Integration**

Since 2014, ECA has organized four Senior Experts Dialogue (SED) on Science, Technology, and Innovation and the African Transformation Agenda. The objective of the SED is to provide a forum for knowledge sharing, peer learning and for consensus building on how best to deploy science, technology, and innovation to achieve the African transformation agenda, Agenda 2030 on Sustainable Development and the African Union's 2063 Agenda. SED also serves as a catalyst in member States for the building or strengthening of a constituency for science, technology, and innovation and its recognition as an important driver of economic growth.

It is with this in view that ECA decided to rotate the hosting of the SED among member States and select and timely multi and interdisciplinary themes that bring different communities of experts, policy makers, civil society organizations and private sector actors. Each theme is selected in consultation with the host country, African Union Commission and the New Partnership for Africa's Development (NEPAD). The previous themes of SED brought together a range of stakeholders. For instance, the following were the themes of past SEDs:

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1. *Science, Technology and Innovation and the Africa Transformation Agenda: Making New Technologies Work for Africa's Transformation* (2014):
2. *"Innovation hubs, clusters and parks and the African Structural Transformation Agenda"* (2015)
3. *"Cities as Innovation Hubs"* (2016) and
4. *"Higher Education, Science, Technology and Innovation and the African integration and development agenda"* held in 2017 hosted by Senegal.

These themes brought together town planners and managers, academics, and policy makers from education, trade, diplomacy, information technology and industry to generate policy recommendations and actions to achieve sustainable development

**Evidence-based ICT and STI policy making for Development in Africa**

ECA has undertaken a number of analytical policy research activities that have mapped trends in research and development (R&D) intensity/expenditures, the state of African R&D infrastructures, and the STI governance arrangements on the continent and their ability to drive STI growth in the continent. These have helped inform governments on measures they need to put in place to in order to develop the necessary human resources needed to drive innovation, entrepreneurship and competitiveness of African firms and their products (goods and services).

This has helped support the development of STI and ICT policies in Africa that have shaped the national strategies. In particular, the rapid growth of the ICT, its uptake and its impact on productivity, inclusiveness and sustainable growth is partly attributed to the favourable policy environment. ECA has been one of the major players in promoting ICT policy development in Africa. These include the ICT policy/strategy in member countries, covering e-government, e-commerce, e-education, e-health in countries such as Burundi, Ethiopia, Ghana, Guinea, Mauritius, Rwanda, Senegal, Seychelles and South Sudan.

**Promoting Financial Inclusion Through FinTech in Africa**

Financial inclusion is necessary to ensure that economic growth is inclusive and sustained. New and emerging technologies such as financial technology (FinTech) may help countries to extend financial services to currently excluded communities, especially youths and women. In this encouraging the growth of FinTech firms can drive inclusive growth and innovation. Currently, there about 301 Fintech startups in Africa that offer a range of technological solutions in areas such as payment, lending, retail banking, asset management, fraud protection and regulatory compliance. This community of innovative startups, alongside reconfiguring incumbents, are reformulating service design and delivery through technological developments and advancements in software, user experience and data mining.

**Improved access to broadband Internet in support of Africa's transformation**

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Broadband Internet has been categorized as one of the world's most important platform technologies, able to dramatically impact social structures and entire economies.<sup>1</sup> Broadband and information and communications technologies (ICTs) can also be mechanisms for social and digital inclusion for all, especially for disadvantaged and remote populations.

ECA has undertaken several analytic research policy papers that highlight how different policy mixes and business models may affect broadband deployment as well as the potential economic, social and environmental benefits for increased broadband deployment.

**Regional Initiatives in ICT: SWISS**

As the continental Chair of the World Summit on Information Society (WSIS), ECA has facilitated the monitoring and evaluation of countries' progress on the implementation of the action lines of the WSIS and in mapping the WSIS action line against the SDGs targets and the targets of Agenda 2063. By so doing ECA has built consensus among African countries on the best ways of harnessing the potential of ICTs in the implementation of the SDG targets, emphasizing the best ways of using ICTs:

- (i) Controlling marine pollution; fostering cross-border communication; rapid adaptation of preventive measures in planning and managing the effects of climate change and other natural disasters (SDGs 13 and 14);
- (ii) Conserving, restoring and using in sustainable manners the terrestrial ecosystems (SDG 15);
- (iii) Supporting successful agricultural industry, empowering farmers by engaging them in policymaking, market development and trade; enhancing the education system and lifelong learning opportunities (SDGs 2 and 4).
- (iv) Facilitating management of water systems; by improving transparency and stakeholders' engagement (SDG 6).

**Building a Regional STI Policy Monitoring Mechanism**

ECA has provided technical and substantive supports to the AUC on the development of the continental Science, Technology and Innovation Strategy for Africa 2024 (STISA 2024). However, several good policies are thought to be poorly implemented and monitored. As such, very few lessons can be learnt due to poor monitoring.

In support of this strategy, ECA and NEPAD agency has been building the capacity of 35 member states to assess and measure research and development (R&D) as well as innovation activities. The joint team is also helping science granting councils on the continental to learn and use modern tools in assessing needs, funding and fund monitoring.

**Outcomes:** As a result, some of the countries such as Kenya and Uganda have acquired the necessary expertise and are serving as trainers while countries such as Egypt, South Africa and

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<sup>1</sup> Silja Baller, Soumitra Dutta, and Bruno Lanvin, eds., *The Global Information Technology Report 2016: Innovating in the Digital Economy* (Davos Switzerland, World Economic Forum, 2016), available at: [http://www3.weforum.org/docs/GITR2016/WEF\\_GITR\\_Full\\_Report.pdf](http://www3.weforum.org/docs/GITR2016/WEF_GITR_Full_Report.pdf).

**2018 ECOSOC Integration Segment, 1-3 May 2018**

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Tunisia have been instrumental. In the process a community of experts capable of undertaking STI assessments, reporting and policy advice has been created.

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**Green Economy and Natural Resources**

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Fostering inclusive green economy as a tool in achieving sustainable structural transformation and sustainable development in Africa

The unfolding structural transformation in Africa seeks to achieve sustained, inclusive and job creating growth built on diversified and resilient economies. Inclusive green economy approach promoted by the Economic Commission for Africa (ECA) provides countries with the tool to pursue development trajectories that entail a balanced integration of the economic, social, and environmental dimensions of development. Member States have opportunities to enhance multiple and interlinked dimensions and elements of resilience. These elements include economic diversification, socially inclusive societies, a diverse and productive natural capital base, climate-proof economies and energy efficiency and security. These are crucial in reducing vulnerability and constitute key drivers of adaptive capacity and can enable societies and economies to bounce back from shocks. Several African countries have designed frameworks that are providing strategic direction and insights in this regard. Ethiopia's Climate-Resilient Green Economy (CRGE) Strategy and Rwanda's Green Growth and Climate Resilience National Strategy for Climate Change and Low-Carbon Development are examples.

The transition to an inclusive green economy, however, demands deliberate efforts and investments to establish an enabling environment including institutional arrangements for diverse actors to work together to plan and craft coherent policies and strategies based on holistic and integrated thinking. This calls for tools for effective integrated assessment. Additionally, strengthened capacity is needed in innovation and green technologies development and application to drive the green economy. Below are highlighted ECA's interventions and approaches in fostering an inclusive green economy with a focus on its bearing in enhancing integration and resilience.

**Greening industrialisation:** Structural transformation in Africa's economies remains the highest priority, and industrialization is the top strategy for achieving it in practice. ECA has been advocating the greening of Africa's industrialisation as an approach to ensuring resilient and sustainable structural transformation and development in Africa. For instance, ECA dedicated the 2016 edition of its flagship publication – Economic Report on Africa – to the theme “Greening Africa's industrialization.” The report notes that greening industrialisation ensures that the structural transformation process avoids stranded assets. It will enable the region to cope with its rapid urbanization given that about half of Africa's population is set to be living in urban areas by 2035. Greening industrialisation reduces resource inputs and increases efficiency in the production process; cuts back on harmful waste emissions; and strengthens infrastructure to reduce environmental impacts including pollution and extreme weather events. Greening industrialisation also maintains or improves the natural resource base, including providing associated environmental goods and services which are crucial in underpinning of adaptive capacity.

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One of the central strands in greening Africa's industrialization is investment in resilient and sustainable energy infrastructure. As such, ECA's work promotes policy options for the expansion of clean and modern energy which countries can achieve by tapping into Africa's vast renewable energy resources. Boosting the region's renewable energy will not only propel industrialisation but also help resolve Africa's overall energy deficit. It will also diversify economic opportunities, crucial to resilience building. To this end African countries are seizing the opportunities offered by new innovations and technologies. For example, Kenya has been leading other countries in the region with investment in green geothermal energy technologies. In Nigeria, projections are that by 2020, growth in renewable energy generation will be achieved through additional capacity in solar (387 MW), wind (412 MW), small hydro (675 MW) and biomass (526 MW). Ethiopia is an excellent example of a country that combines integrated policies that link greening, infrastructure, industrialization and climate resilience.

***Greening agricultural value chains:*** Diversified and robust socioeconomic sectors and ecosystem assets are necessary for Africa's resilience. Although agriculture is often recognized as a critical sector in driving Africa's transformation due to its contribution to economic growth, employment, value-addition, and productivity, shortcomings faced by the sector have impeded it from realizing its full potential. For instance, due to its low productivity at merely 20 per cent of crop yields potential in Sub-Saharan Africa, the continent is lagging behind in its effort to achieve food security.

Mainstreaming and adoption of inclusive green economy principles in the agriculture sector could offer vast opportunities for Africa to achieve structural transformation, and enhance resilience, food security, quality growth, job creation, poverty eradication, and productivity while reducing environmental risks, ecological scarcities and imbalances. ECA commissioned the study on "Fostering sustainable transformation of agriculture in Africa through inclusive green economy: The case of livestock value chain in Southern Africa". The study highlights that a robust and strong agriculture sector could be achieved through inclusive green economy by assisting countries in the development, rejuvenation, and upgrading, enhancing climate resilience and overall sustainable transformation of the sector.

Individually, southern African countries are making strides towards institutionalising the green economy into their national policy frameworks. Currently, Mozambique, South Africa and Zambia have green economy frameworks with a greater number of African countries working towards achieving one, at varying stages of progress. As such, southern African countries making strides towards institutionalising the green economy into their regulatory policy frameworks, need support in development or completion of relevant and supportive policies, as well as support to institute programs that enhance productivity through human capital development, fostering market participation, and promoting preservation of the environment. Hence, institutional set-up and regulation frameworks need to factor-in the development of

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value-chains that encompass comprehensive coverage of actors from the downstream to the upstream of the value chains. In addition, investment in research and development (R&D) in the agriculture sector is critically needed more than ever.

***Methodologies and tools to support inclusive green economy:*** An inclusive green economy (IGE) strategy needs a holistic planning, implementation, monitoring, and evaluation framework to ensure its effectiveness in accelerating structural transformation in Africa. Critical therefore are both data and tools for the continent to be able to design effective strategies and track its contribution to Sustainable Development Goals (SDGs), other development goals, commitments and sectoral targets. Economic Commission for Africa (ECA) continuously supports member states to consistently incorporate systematic tools and methodologies in every step of policy cycle.

The study on “Integrated assessment methodologies and tools for inclusive green economy analysis in Africa” for example, is aimed at assisting member States in the identification of appropriate methodologies and tools to be applied in policy cycle that could comprehensively assess the adequacy of the inclusion of inclusive green economy principles in each policy subject to the types and timeframe of each respective policy. The study identifies a wide range of methodologies and tools such as feasibility studies, impact analysis, and strategic environmental assessment that could be applied using varying tools of green economy indicators, system of environmental economic accounting, and cost-benefit analysis, respectively. There are two main challenges for the continent to fully capitalise on the use of available methodologies and tools for inclusive green economy assessment. First is data availability and reliability. Second is the lack of capacity of policymakers. These shortcomings require political will and concrete action from member states to invest more in technology-assisted data collection and management that fully adheres to statistical data collection principles.

***Fostering enabling measures for an inclusive green economy transition:*** ECA undertook a study on “Enabling measures for inclusive green economy in Africa” that highlights the key enablers that can foster an inclusive green economy and facilitate structural transformation in Africa. These enablers include institutions and technology development and transfer.

Institutions play an important role in coordinating and implementing development strategies at national, regional and subregional levels. National level institutional setups should be robust to deal with emerging challenges and for effective translation of strategies into transformative actions supporting sustainable development. It is therefore crucial to strengthen existing institutional and policy frameworks rather than replacing and rebuilding functional and effective institutions. A well-rounded institution framework would have policy priorities including reforming the incentives framework, promoting sustainable infrastructure

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development, and facilitating investments including in human capital and natural resources management.

Technology development and transfer to foster sustainable development in developing countries remains a priority. Strong and sustained economic growth requires technological progress, innovation and technology indigenization. The challenges to technology development and transfer include weak support for research and innovation, financial, legal and institutional barriers. Research and development funding is below 1 per cent of GDP in all African countries, despite massive foreign direct investments averaging over US\$60 billion annually particularly in the natural resources sector.

African countries therefore need to accelerate the setting up and implementation of appropriate measures to address challenges and harness opportunities for promoting green technology development and transfer. Investment in human capital is critical to spur innovation, research and development that would enhance the multiplier effects of technology and innovation in development across the region. However, investment in science, innovation and technology infrastructure requires adequate financial resources to unlock opportunities and strengthen competitiveness of African economy. While international partners can provide catalytic finance for sustainable infrastructure investments required to build resilient economies in Africa, domestic resource mobilization will be critical. Nevertheless, this requires the realignment of public finance with development plans and better mapping of domestic resources.

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**Climate policy**

**2018 Integration Segment of the Economic and Social Council (ECOSOC)**

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At the regional level ECA is supporting Member States with integrative approaches and tools that capitalize on the risks and challenges posed by climate change and variability to develop solutions for enhanced resilience, particularly in the areas of infrastructure development, energy, food security, disaster preparedness, and entrepreneurship for vulnerable groups.

**Promoting Entrepreneurship in Innovation in Climate Information Services for Enhanced Resilience**

As a forum tailored to facilitate science-policy dialogue, the Climate Change and Development in Africa Conference (CCDA) – a flagship event of the Climate for Development in Africa<sup>2</sup> (ClimDev-Africa) – provides a marketplace for innovative solutions that integrate climate change into development processes through entrepreneurship among youth and gender groups. This is achieved through a dedicated day – the Climate Information Services (CIS) Day. CIS Day focuses on promoting the importance climate information services in Africa's development agenda, human wellbeing and economic prosperity with the ultimate goal of increasing policy uptake of CIS. The CIS Day showcases and shares good practices for the development of climate information services on the continent – e.g. to promote climate-smart agriculture, early weather warning systems, advanced planning of planting seasons, among others. A key feature of the Day is the *Solutions Forum*, which serves as a marketplace of ideas and opportunity for civil society, experts, academia, the private sector and other stakeholders to contribute their solutions to long standing challenges of climate change in Africa.

**Enhancing the Climate Resilience of Africa's Infrastructure – The Africa Climate Resilient Investment Facility (AFRI-RES)**

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<sup>2</sup> ClimDev-Africa is a joint programme of the African Union Commission (AUC), the United Nations Economic Commission for Africa (ECA) and the African Development Bank (AfDB), mandated at the highest level by African Heads of State and Government to enable better planning and a preemptive response climate change and build a solid foundation for Africa's response to climate change impacts.

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In the post-2015 era, Africa's development aspirations are framed by the UN 2030 Agenda for Sustainable Development aimed at leaving no one behind and the continent's wider development blueprint - Agenda 2063: The Africa We Want - a peaceful, prosperous and integrated Africa. Transforming African economies to attain these development objectives requires widespread access to modern and sustainable infrastructure and infrastructure services in ecosystems, energy, transport, water, sanitation, urban and information and communications technology.

However, climate variability and change is causing significant stress on a range of economic sectors and commodities, including energy, food production and water management that threaten the overall economic development and wellbeing of human and ecosystems in Africa. Intra-seasonal and longer timescale variations of rainfall, temperature trends and climate extremes, together with the growing demand for food and energy, put additional pressures on production systems and natural resources. Closing the huge infrastructure gap in Africa requires investments of the order of USD 100 billion a year. It becomes essential to ensure that these investments are made in such a way that the infrastructure will perform in both today and tomorrow's uncertain climate.

The African Climate Resilient Investment Facility (AFRI-RES) - an initiative of the Economic Commission for Africa, the World Bank, the African Union Commission and the African Development Bank, with initial funding support from the Nordic Development Fund - is an Africa-based networked centre of technical competence and excellence with the overall objective to strengthen the capacity of African institutions (including national governments, river basin organizations, Regional Economic Communities, power pools, among others) as well as the private sector (project developers and financiers) to plan, design, and implement infrastructure investments that are resilient to climate variability and change in selected sectors. In particular, AFRI-RES provides (i) project-level technical assistance to ensure integration of climate resilient in infrastructure project design, financing and implementation; (ii) outreach, dissemination and training to encourage behavioral change and develop human and institutional capacity for climate-resilient infrastructure development; (iii) guidelines, standards and good practice notes for climate resilient infrastructure investment across different sectors and stages of decision-making; and (iv) a climate knowledge and portal for ready access to climate data, tools and climate information services of relevance for climate resilient investment planning and design in Africa. As such AFRI-RES impacts on, and will be impacted by frontier developments in the areas of open systems, cloud computing and data sharing and intellectual property rights.

**Numerical Weather Prediction Systems for Enhanced Resilience**

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The need for access to timely and quality climate and weather information and services is essential for climate resilient development planning and disaster risk reduction. In the absence of adequate meteorological infrastructure, as is the case with most African countries, accessible and customizable numerical weather prediction systems based on open source tools becomes essential. The African Climate Policy Centre (ACPC) of the ECA is deploying a cloud-based high resolution 1km operational numerical weather prediction and early warning system to enable African SIDS manage weather and climate-related risks. The system which is based on open-source tools provides a cost-effective and comprehensive solution to operational weather forecasting compared to most existing license-based systems where high annual subscription fees renders them unsustainable. Cloud based computing and open source software and tools have emerged as frontier technologies opening new opportunities and changing the approach to community of practice driven systems rather than corporate centralized ones. Cloud computing (despite its key constraint of the regular need for access to the internet) and open source systems are disruptive innovations in service provision and empowerment of communities of practice across borders, with open source systems pushing the frontiers of intellectual property and collective design of new solutions to environmental, economic and social challenges.

**Crop suitability mapping to capitalize on emerging opportunities for agricultural production and trade under climate change in Africa**

Agriculture, crop production and hence food security is being seriously impacted by adverse impacts of climate change in Africa as demonstrated by recent droughts and famine in the Horn of Africa Region. Erratic shortages in food supply triggered by climate variability and climate change impacts on agricultural production systems have often generated escalations in food prices exacerbating livelihood insecurity in Africa.

Crop suitability mapping for existing land areas and soil conditions presents an unique and transformational opportunity to capitalize on emerging opportunities for agricultural production and trade under climate change in Africa. Following climate-induced shifts in agro ecosystems and matching areas of high production to those of low production using suitability mapping of different crop species, could create the mechanism for de-risking agricultural investments and transactions. This has the potentials to generate new opportunities for agricultural trade and expanding the internal markets for agricultural commodity at different spatial and temporal scales. Trade could therefore provide the crucial pull factor required in transforming African agriculture from the realms of subsistence, into a business that generates wealth.

**Africa Climate Resource Platform Partnership and Information Service**

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Africa is at serious risk of not attaining its development goals if climate change is not integrated into development planning at all levels and scales. The Paris Agreement ushers in a paradigm shift to climate-integrated development planning. However, the lack of access to quality, timely and fit-for-purpose climate data and information services must be addressed if climate change is to be effectively mainstreamed in the planning of sustainable and resilient development in Africa.

Over the last several decades, climate data of varying quality have been collected at different scales and using various media by various private and public institutions such as national meteorological and hydrological services, as well as by different data purveyors at the global level. These data are located at different repositories with varying metadata and access and use rights. Thus, it has become increasingly urgent to have a coordinated approach and framework for making these data widely available for development planning.

The Partnership and Climate Resource Platform and Information Service for Africa aims to provide an open architecture one-stop go-to place for quality and timely climate data, climate information services, open-source climate-related modeling tools and online advisory services, learning and capacity development resources and helpdesk for stakeholders, as well as an online convening and community forum for regional climate research and user groups. In particular, the resource will serve as a platform and framework for climate data standards and protocols for data sharing within the complexities intellectual property, public and commercial data interplays.

The Africa Climate Resource Platform Partnership and Information Service provides an opportunity to influence and promote new frontiers arising from the combined power of cloud computing (despite its key constraint of the regular need for access to the internet) and open source systems as disruptive innovations in service provision and empowerment of communities of practice across borders, with open source systems pushing the frontiers of intellectual property and collective design of new solutions to environmental, economic and social challenges.