United Nations
Economic Commission for Africa

DRAFT REPORT OF THE

Expert Group Meeting

On

"Governing science, technology and innovation to achieve the targets of the Sustainable Development Goals and the aspirations of the African Union's Agenda 2063"

Date: **2 and 3 August 2017**

Venue: **Conference Room 6, United Nations Conference Centre, Addis Ababa, Ethiopia**

United Nations
Economic Commission for Africa

I. Background

The United Nations Economic Commission for Africa (ECA) organized the Expert Group Meeting on "*Governing science, technology and innovation (STI) to achieve the targets of the Sustainable Development Goals (SDGs) and the aspirations of the African Union's Agenda 2063" from* 2-3 August 2017 in Addis Ababa Ethiopia. The main aim was to assess some of the emerging national STI governance structures and arrangements in Africa, their influence on the productivity and efficiency of the STI sector, and the ability of STI to contribute towards meeting both national and internationally agreed development goals.

It was recalled that the United Nations adopted the 2030 Agenda for Sustainable Development and the African Union adopted "Agenda 2063: The Africa We Want" in 2015. Agenda 2030 includes 17 Sustainable Development Goals (SGDs) and 169 targets while Agenda 2063 comprises seven (7) Aspirations, 20 Goals, 39 Priority Areas, 256 Targets and 248 Indicators. In both cases, the implementation of those agendas is critically dependent on science, technology and innovation. This was clearly demonstrated in the Addis Ababa Action Agenda of the Third International Conference on Financing for Development in which 16 initiatives relating to STI (5 relating to scientific research, 5 relating to industry and innovation, and 6 relating to specific development outcome) were highlighted.

Many of the Sustainable Development Goals specifically focus on science, technology and innovation. Goal 9 (Industry/Innovation), for example, calls on countries to "[e]nhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending". Other SDGs that have a similar focus on building STI include Goal 3 (Health), Goal 4 (Education), and Goal 17 (Partnership).

The 2030 Agenda for Sustainable Development calls on Governments, international organizations, the business sector and other non-State actors and individuals to strengthen developing countries' scientific, technological and innovative capacities to move towards more sustainable patterns of consumption and production. The Sustainable Development Goals (SDGs) will also benefit from the Technology Facilitation Mechanism and other similar arrangements, which were created recently for the purposes of promoting and harnessing science, technology and innovation to achieve the Goals.

Agenda 2063: The Africa We Want sets even more ambitious targets than those of the SDGs. Suffused with references to science, technology and innovation, Agenda 2063 aspires to eventuate in "a prosperous Africa based on inclusive and sustainable development" - an Africa that is well educated and skilled and is underpinned by science, technology and innovation. One of the targets is to uplift the quality of life measures in African countries to be among the best global performers by 2063. This will be attained through "strategies of inclusive growth, job creation, increasing agricultural production; investments in science, technology, research and innovation". Agenda 2063 summarizes the commitment of African countries to "catalyse education and skills revolution and actively promote science, technology, research and innovation, to build knowledge, human capital, capabilities and skills to drive innovations and for the African century". It is against this

DRAFT

understanding that the EGM was organized to take an in-depth assessment of the SDGs and the goals of Agenda 2063 on one hand, and of the emerging STI governance structures and their ability to enable STI to meet the set targets.

II. Objectives of the EGM

The main objectives of the objectives of the Expert Group Meeting were to:

- Deepen and broaden our understanding of the science, technology and innovation governance structures and policymaking institutions in Africa, and their influence on the productivity of the STI sector insofar as productivity is critical for the achievement of the Sustainable Development Goals.
- Explore how a better understanding of the science, technology and innovation governance and policymaking structures can enhance the sector's deployment more efficiently to achieve the targets of the Sustainable Development Goals and the aspirations of Agenda 2063.
- Contribute to the creation of a database and mapping of science, technology and innovation governance and policymaking structures on the continent that could serve as a useful resource for peer learning and experience sharing among the continent's science, technology and innovation policymakers, researchers and other stakeholders.
- Make recommendations for consideration and possible adoption by African policymakers at national, regional and continental levels on how best to enhance the efficiency of African science, technology and innovation governance structures and policymaking institutions to contribute to the achievement of the Sustainable Development Goals and Agenda 2063.

III. Setting the scene: science, technology and innovation and the Agendas

A. STI in AU Agenda 2063 – The Africa We Want

To ensure that all participants had a similar appreciation and knowledge of one of the key subject matters of the meeting, a close look at Agenda 2063 was provided by the African Union Commission. It was noted that Agenda 2063 has seven aspirations:

Aspiration 1: A prosperous Africa based on inclusive growth and sustainable development.

Aspiration 2: An integrated continent; politically united and based on the ideals of Pan-Africanism and the vision of Africa's Renaissance.

Aspiration 3: An Africa of good governance, democracy, respect for human rights, justice and the rule of law.

Aspiration 4: A peaceful and secure Africa

Aspiration 5: An Africa with a strong cultural identity, common heritage, shared values and ethics.

DRAFT

Aspiration 6: An Africa, whose development is people-driven, relying on the potential of African people, especially its women and youth, and caring for children.

Aspiration 7: Africa as a strong, united, resilient and influential global player and partner.

Science, technology and innovation fall squarely in Aspiration 1, Goal 2: *Well Educated Citizens and Skills Revolution underpinned by Science, Technology and Innovation*. However, STI is expected to contribute towards an "*STI driven Manufacturing / Industrialization and Value Addition" (target of Goal 4 – Transformed Economies)* and *the targets of Goal 5 (Agricultural Productivity), Goal 7 (Environmental Sustainability) and Goal 10 (World Class Infrastructure)* that focus on information and communication technologies.

It was emphasized that STI will be key in achieving the goals of Agenda 2063; and the Science, Technology and Innovation Strategy for Africa 2024 (STISA-2024) is the continental blueprint for guiding STI initiatives. Among its four pillars, one focuses on building an "overall enabling environment for STI" at the national, regional and continental level. The main goal of this pillar is to bring about the development of a "functioning national innovation system" in each African country. To achieve this goal, STISA 2024 includes mechanisms and arrangements that encourage all national and regional innovation stakeholders (e.g. public, private, education and research-including scientific, engineering, and medical academies, societal and funding sectors) to interact, collaborate and compete.

In particular, Africa seeks to build a science culture, institutional arrangements for funding, recognizing and rewarding innovation. In this regard, governance arrangements for intellectual property rights and for monitoring and evaluation have been highlighted in STISA 2024. It is hoped that such measures will improve transparency and accountability; coordination and communication; and trust among all stakeholders, in turn improve the application of STI to development challenges. In this regard, governance of STI becomes indispensable to empowering STI to achieve the goals set in Agenda 2063.

B. STI and Agenda 2030 on Sustainable Development

The role of STI in achieving the SDGs has been a subject of great focus. It was noted that the SDGs impose varying degrees of responsibility to countries at different levels of development. It was noted that poverty and hunger among the top priorities for African countries. Poverty and hunger are more or less already overcome by most developed and advanced countries

It was also noted that the contribution of STI towards the achievement of the 17 SDGs differ widely. The direct contribution of STI to, for instance, Energy, Health and Food Security, is very high while the direct contribution of STI to the SDGs on Gender Equality; Peace, Justice and Strong Institution; and Reducing Inequalities is likely to be low. It was underscored that countries may have to determine areas where STI application may have a greater impact, whereas areas that other tools (e.g. legal and administrative arrangements) may have a greater chance of success than STI. While the contribution of STI to attainment of all the SDGs is conceivable, resources limitations may require countries to undertake a better assessment of the SDGs to which STI may make the most contribution.

DRAFT

Emphasis was also placed on the role of the private sector in development, use and/or deployment of STI. In some areas such as energy, infrastructure, health and education, private sector interests and benefits are high. In these sectors, industry is likely to invest more resources to generate the necessary technologies and solutions needed to achieve the SDGs. In other areas such as Gender, Inequalities and Poverty, direct business benefits or profits for the private sector are low. The public sector may have to take a leading role, and in some areas, create incentives to attract private sector investment in innovations of national interest and to meet the SDGs.

It was highlighted that African countries have limited technological and industrial capabilities. In this regard, countries may have to choose areas where STI capabilities can be sufficiently built to meet the SDGs and areas where international collaborations and cooperation may have to play a greater role to achieve the goals. Even where countries made such choices, a further focus may have to be made in terms of whereabouts in the innovation value chain they may wish to place greater emphasis. For instance, most of the R&D expenditure in Africa goes to health and agriculture although the countries wish to industrialize – creating a mismatch between R&D funding and ambitions to develop the manufacturing sector and add value to raw materials. More importantly, most of the R&D is performed by universities and public research centres that have limited or no linkages to industry.

Accordingly, the governance of STI was seen as critical in coordinating the efforts and maintaining the interests of the different stakeholders needed to meet the SDGs. This may have to take into consideration the level of industrial, technological and scientific development of the country, the social and environmental challenges as well as the opportunities that the SDGs present. For instance, a number of SDGs seek to help African countries and least developed countries (LDCs) to build their scientific, technological and industrial capacity to produce medicines and improve agricultural productivity (as will be discussed later).

C. Governing STI-Does it matter for the achievement of the SDGs?

This session focussed on the subject governance in terms of definition and the research and policy questions. First, *"*what is the relationship between the STI governance structures and policy-making institutions, the productivity of the STI sector and national efforts to achieve the SDGs? and second, "is a country much abler to leverage STI to achieve the SDGs if the STI sector is better governed and STI policy making institutions are more efficient?"

It was argued that several factors are driving countries to assess how STI is governed. Some of these factors include the need to enhance national competitiveness in an increasingly globalized world; the increased pace of knowledge production and diffusion; increased role of the private and non-governmental sectors in research including privately owned research universities public good; and the implications of regional and international mandates such as intellectual property rights, environmental agreements and Agenda 2063 and SDGs. Improving governance of STI is seen as key in enhancing the efficiency and productivity of the STI sector which in turn would improve the capacity of the country to innovate and compete. Currently, African countries rank poorly on all the major indices such as the Global Innovation Index, Global Competitiveness Report, the Global Technology Index, Human Development Index and the World Ranking of Universities, among others.

Governance was highlighted as a core explanatory factor of STI performance as it shapes processes and behaviours that affect ways in which powers are exercised, especially in resource allocation, openness, participation, and accountability. A high degree of compartmentalization and poor coordination of the key stakeholders of the STI sector could constrain and limited the performance and contribution of STI to development objectives. Similarly, poor linkages between national objectives and resources allocation may lead to a dysfunctional innovation system.

To overcome some of these challenges, a number of African countries are elevating STI policy making and governance to the highest level of national governance to overcome fragmentation and duplication of efforts. Some of key players such as those in education, research and development institutions are located in different arms of government and most of the firms and organizations that are involved in knowledge generation and use, and innovation activities have stronger links with different government department rather than STI. This creates a major coordination challenge for the agency responsible for STI (e.g. the Ministry or council).

It was observed that different strategies seem to emerge to improve governance. For instance, countries such as Nigeria have a national council for STI, chaired by the President and composed of Ministers and advisors from key sectors of the economy. In this case, the planning, execution, coordination, monitoring and evaluation takes place at the national level. It was noted that this model of governance improves coordination and minimizes compartmentalization. However, decision making may take longer and may result in delays.

The second common model of governance is at cabinet level where a full-fledged ministry of science and technology is in place. The main advantage is that STI has a voice in cabinet and, to the extent that decision making is taken across sectors and the key support institutions are in place, a good level of coordination can be attained. South Africa is a good example of such a governance system. However, STI will be competing for attention at the national level.

The third and perhaps common model of governance of STI in Africa is where STI is part of the ministry responsible for other areas such as education, environment, ICT, youth, industry, sports etc. Fears were expressed that this governance arrangement often gives less attention to STI and may even be drowned by other activities at the ministerial level. For all purposes, STI is a directorate within the parent ministry. Such a governance arrangement makes coordination and coherence challenging. Senegal was a case in point.

However, countries may have to adopt STI governance arrangements that fit their overall national governance system. For instance, it may not be feasible, wise and efficient for countries with small populations (e.g. Seychelles with less than 100,000 inhabitants) to create independent ministries of STI. On the other hand, countries that are large (e.g. Ethiopia, Egypt, Nigeria and South Africa) may need not only a ministry but also several agencies to provide support in policy making, funding and monitoring.

Countries may also use different tools to ensure fair resource allocation, promote accountability and enhance performance. Among others, national funding, innovation and technology commercialization agencies are emerging in Africa. For instance, Kenya's nation innovation fund, Tanzania's Commission for Science and Technology, and South Africa' National Science Foundation manage nation research funds that are granted on a competitive basis in areas of national interest. In this case, interested stakeholders from all sectors are free to apply for funds

DRAFT

individually and/or collaboratively. This approach seems to improve coherence, coordination and accountability.

IV. Governance of STI and its impact on innovations at firm and institutional level

A. STI governance to enhance firm-level innovations

Africa's quest to emerge as a continent with high growth and to attain sustained development can be achieved through innovations at the firm level. All firms operate within countries and their ability to innovate is largely dependent on the governance structure of the respective countries. Nonetheless, the governance structures of the firms that operate in countries within the continent matters. The research seeks to achieve two important objectives: 1) provide an overview of the STI governance structure and innovation of firms that operate within the continent, and 2) explore the relationship between STI governance structure and innovation of firms in selected African countries.

Data for achieving these two objectives were extracted from the World Bank's World Governance Indicators (WGI) and the Enterprise Survey. With respect to STI governance structure, it was observed that although Africa has not performed as impressively as other continents, there have been slight improvement in some specific governance indicators (such as control of corruption and rule of law) from the period 2005 to 2015. These improvements should serve as a motivation for the continent to work towards all other components of governance. In the same vein, it was found that some progress has been made with regards to firms' product innovation, but process innovation, and spending on research and development (R&D) are still strikingly low. Given the implication of these factors for sustained growth, improving STI governance is needed to help firms in Africa to compete globally.

As far as the relationship between STI governance structure and innovation is concerned, the results showed some variations across countries. In some of the countries, improvement of STI governance structure is found to have a consistent positive association with firms' innovation. However, in other countries, the results do not depict consistent pattern possibly due to the existence of some intervening factors that mediate the relationship between the two variables. It was further observed that a positive association between measures of institutional framework that affects innovation (general business environment, access to permits for firm operations, access to credit and investors' protection) and firms' spending on Research & Development exist. Narrowing the analysis to specific case studies of Nigeria and South Africa, it was observed that both countries have instituted polices to promote innovation among firms. Although there some differences in the approach, there are evidence of government funding of firms' spending on R&D.

From these results, the research concluded that consideration of country specific characteristics may be very instrumental in policy designs aimed at improving governance structures as a mean to stimulate innovation of firms in Africa. Blanket policy prescriptions on governance structure for all African countries may not achieve the intended objective of high innovation required for productivity, growth and development.

DRAFT

B. Governance of health R&D and innovation- the case of ANDI

There are several initiatives in Africa – at national and regional levels- that seek to enhance health R&D and innovation to meet healthcare challenges with a specific focus on R&D and manufacturing of pharmaceutical products. Africa has a growing number of institutions and firms with a health research, development and production track record. The number of manufacturers that could meet Good Manufacturing Practices and other international standards remains high while only a few exist.

It was noted that major governance challenges include poor coordination of existing R&D and manufacturing capacity to solve local health problems; limited collaboration between R&D institutions and the emerging pharmaceutical industry and among R&D institutions and firms; and over reliance on imported active pharmaceutical ingredients and devices; limited or lack of finance; and complex and cumbersome regulatory regimes that seem to favour imports to local production of imported pharmaceutical products.

Mobilizing African institutions

To address some of the challenges, the African Network for Drug and Diagnostics Innovations (ANDI) was established to mobilize national institutions and firms in the health sector. So far, a comprehensive mapping health innovation was undertaken and an extensive scrutiny of R&D institutions and firms was completed. Through open and competitive calls, African-based health R&D and innovation centres for the public and private sector were selected based on availability of infrastructure and equipment, quality of staff working, track record and productivity of the institution as measured by publications in peer reviewed journals, patents or products discovered or developed and availability and access to good communication tools as well as financial sustainability of the institution.

The first round resulted in only 38 centres meeting the above conditions of which 32 were R&D institutions and 6 pharmaceutical firms and were designated ANDI Centre of Excellence (CoE). These CoEs cover a wide range of institutions involved in the entire health innovation value chain – such as research and training, product development, clinical trials and manufacturing of drugs, vaccines and medical devices. It demonstrates that capacity exists if these centres are carefully mobilized, incentivized and supported.

Governance issues still remain

Coordination and policy inconsistencies remain a major challenge. While governments have stated goals to promote local manufacturing of health products, support of R&D, start-ups and innovations at firm level is missing. The few health products do not make to the market due to limited or lack of support in financing, entrepreneurship, contractual negotiation, management, technology acquisition and intellectual property protection. This is particularly important as many Africa markets for pharmaceutical products are too small and they need coordination among the key sectors- health, industry, investment and science and technology.

C. Other initiatives discussed

Experiences of two key initiatives from the private sector were shared and discussed. These included IBM Research in Kenya which is working closely with the government to improve the

efficiency of trading across borders by deploying block chain technologies. Block chain technologies are enabling all the key players in the export of products to be on the same platform. Players can see the actions of one another and anticipating others' actions to improve the processing time and reduce waiting time at major ports of entry and exit of merchandize. Here, the main challenge is putting in place the technology friendly environment.

The second initiative is the Square Kilometre Array largely hosted by South Africa. This is perhaps Africa's largest and most expensive research infrastructure that promises to improve our understanding of the universe, advance engineering and computing research and drive information technology. For instance, each radio dish will be transmitting data at a speed of 160 Gigabits per second. While most of the dishes will be concentrate in South Africa, an additional 9 countries will also host the radio dishes that will be sending data to the central computing centre in South Africa and the United Kingdom.

This will require all the participating African countries to provide dedicated communication lines capable of handling such large volumes of data. For instance, Ghana has become the first partner country of the African Very Large Baseline Interferometer (VLBI) Network (AVN) of the nine African partner countries (Botswana, Ghana, Kenya, Madagascar, Mauritius, Mozambique, Namibia, South Africa, and Zambia). Team of scientists from Ghana and South Africa successfully converted and upgraded communications antenna into a radio telescope at the Ghana Intelsat Satellite Earth Station at Kutunse.

The impact of SKA on the continent will largely depend on how government and participating institutions learn and diffuse the knowledge to the wide community and the extent to which SKA will stimulate interest in science, technology, engineering and mathematics subjects, especially astronomy and engineering, among the youths and firms. The lessons from handling and processing such large volumes of data could go a long way in preparing Africa for the anticipated data revolution.

Key Lessons:

- It was noted that governance of STI plays a critical role in enabling firm-level innovation. Key issues include intellectual property, infrastructure, standards and financial support as well as good governance.
- Africa has a rapidly growing R&D base but faces a challenge in translating R&D outputs into marketable products. Improved coordination and policy coherence can help the continent mobilize and effectively use its public and private institutions and firms to deliver viable products.
- Countries wishing to work closely with the private sector and major research projects may wish to put in place technology-friendly environment, identify and recognize clearly the key benefits of such endeavours, and appreciate or participate in the governance of the projects.

IV National experiences STI Governance in Africa

Several countries shared their national STI governance systems.

DRAFT

A Algeria

The Algerian governance of STI is very elaborate and well established. The current Algerian scientific research Act was adopted in December 2015 and provides complementary tools and mechanisms to promote synergizes and to bridge the gaps between the research institutions and the socio-economic sectors. In terms of governance, the National Scientific Research and Technological Development Council (CNRST), under the supervision of the Prime-Minister, is charged with the responsibility of setting major national policy directions and orientation for scientific research and technological development. CNRST determines the priorities of national research programmes and coordinates their implementation. However, CNRST meets very rarely.

To address this challenge, the National Research Governance is managed by the Directorate General for Scientific Research and Technology Development (DGSRTD). The DGSRTD, established in 2008, is responsible for coordination of national research efforts and has its own budget specifically to support multi-sectoral R&D. The DGSRTD also ensures coordination of scientific research activities across sectors through the Intersectoral Committee (ISC), Permanent Sectorial Committees (PSCs), five (05) Thematic Research Agencies (TRAs), the National Agency for the Commercialization of Research and Technology Development (NAVRTD) and Thematic Research. The ISC is composed of experts from several Ministries while PSCs are ministerial bodies of development, coordination and sectorial evaluation of research activities. The NAVRTD funds innovation and technology transfer, including intellectual property issues and Industry-Academia research and development activities support.

Today, Algeria has 60,000 professors and associate professors; and 4,500 researchers that work in 25 research centres, 1430 research laboratories and 94 universities and training institutions. Algerian publications have grown from 500 in 2000 to more than 5000 in 2016, with 75% of them in chemistry, engineering, physics and materials science. However, research commercialization remains weak.

The location of the DGRSDT is under the authority of the Ministry of Higher Education and Scientific Research. Its multi-sectoral focus is often a source of confusion and reflects inconsistencies in the formulation and execution of national STI policies. The coordination and oversight role of the CNRST, chaired by the Prime-Minister, has not worked as it has met only once over the years. Similarly, various layers of governance have made the system heavy and complex.

B. South Africa

The governance of STI in South Africa is led by the Department of Science and Technology (DST), headed by the Minister. DST is mandated to boost socio-economic development through research and innovation by providing leadership, creating an enabling environment and mobilizing resources of the innovation. DST has five programmes, a budget of about $575 million and works closely with 8 entities. The six that are key in shaping the behaviour and coordination of STI actors include:

1) Nation Advisory Council on Innovation (NACI) advises the minister and the government on policy aspects of STI;

DRAFT

2) Technology Innovation Agency (TIA) is responsible for promoting research and technology commercialization through funding, linkages, competitions and mentoring;
3) National Research Foundation supports research funding across sectors on a competitive basis;
4) Academy of Science of South Africa promotes common and independent scientific thinking and recognize excellence in STI;
5) National Intellectual Property Management Office (NIPMO) facilitates protection and commercialization of publicly funded research outputs;
6) Human Sciences Research Council (HSRC) undertakes research and surveys on performance of the innovation system and promotion

These agencies play a critical role in the coordination of STI and in achieving policy coherence. They also enable the DST to work across sectors. Unlike most ministries of science and technology, DST has only two major R&D agencies – the Council for Scientific and Industrial Research (CSIR) and South African National Space Agency (formerly part of CSIR as Satellite Application Centre). As such, most of the scientific, technological and innovation activities that DST supports is located within or affiliated to other Departments of Government. In addition, some of the institutions have achieved a level of excellence and reputation to attract their own support and deliver on their mandates. For example, CSIR was founded in 1945 while the NRF is about 18 years old.

C Kenya:

It was noted that Kenya's draft national STI policy and strategy provides a framework for harmonized and coordinated approach to create a robust knowledge-based economy and is in its final stages of development. It seeks to create an effective innovation system is required to harness the potential offered by modern science and technology to address social and economic advantage.

The Kenyan STI Governance Framework is anchored on three distinct agencies: 1) National Commission for Science, Technology and Innovation (NACOSTI) which serves the regulatory and advisory role to the Ministry of Education, Science and Technology on matters of STI governance. 2) Kenya National Innovation Agency (KENIA) which is responsible for technology commercialization and innovation and 3) National Research Fund (NRF) that is charged with resource mobilization for research and innovation. The three agencies fall within the Ministry responsible for science but receive their funding directly for government. For instance, NRF is supposed to manage funds equivalent to 2% of the GDP of Kenya from the government and other stakeholders (e.g. firms, foundations, donors etc) that will support competitive basis.

D Senegal:

The STI sector of Senegal is part of the Ministry of Education and is highly integrated in higher education and research. As such, the STI policies are largely sectoral in nature. A key aspect is that most of the STI goals seems to be viewed through the education lens. This is highlighted by some of the key decisions such as focusing education on STEM, vocational training, improving access to higher education and use of ICT to develop the higher education.

Under the current arrangement, the Ministry of Higher Education and Research is responsible for the planning and implementation of the STI priorities and its governance through the directorate of research. Despite a wide consultation and involvement of various actors in defining the national

DRAFT

strategic goals (e.g. those in the Senegal Emerging Plan of 2014), the ability to work across sectors remain challenging. Since then, efforts are focusing on establishing a National Research and Innovation Council designed as an autonomous council with its own budget as well as on putting in place the necessary legislation and organs for STI coordination and evaluation.

E. Namibia

Through the Ministry of Higher Education, Training and Innovation (MHETI), Namibia adopted the National Research, Science and Technology Policy (NRSTP) of 1999, Research, Science and Technology Act of 2004 (Act no. 23 of 2004), the Research, Science and Technology (RST) Regulations of 2011 and the Industrial Policy of 2012. Others include information and communication technologies, biotechnology and a range of implicit or indirect policy instruments for STI including those covering agriculture, health, environment and natural resources, mining, fisheries, and tourism.

In terms of governance, the key public institutions are the MHETI and the National Commission on Research, Science and Technology (NCRST). The National Programme on Science, Technology and Innovation (NPSTI) is spearheaded by the NCRST and sectoral lead institutions and is designed to be implemented through networks of centres of excellence and partnerships of institutions. The proposed reforms of 2017-2030 seeks to establish a Parliamentary Standing Committee on STI and a Cabinet Committee on STI, chaired by the President and/or Prime Minister, for effective and efficient governance of STI.

Key Lessons:

1. Countries at different level of development are likely to adopt different ways of governance that reflect their national realities – skills, funding, institutional base, industrial development and reputation of different organizations.
2. Irrespective of the level of development of the country, the elevation of STI to a higher level seems to be key – be it located in the Head of State or Government or as an independent ministry.
3. The existence of autonomous or semi-autonomous institutions that provide guidance, manage competitive grants or R&D funding, set priorities and continuously take research to inform policy making and policy makers seems to help overcome compartmentalization and improve coordination of the STI sector.
4. Countries may wish to pay special attention to overly cumbersome and complex governance arrangements that could reduce efficiency and slow decision making.

V. Selected United Nations initiatives for improved STI governance in Africa.

A. GOSPIN as Tool for Improving STI Governance

GO-SPIN is a methodological tool to map national science, technology and innovation (STI) landscapes and analyze STI policies and their implementation. It is an open-access platform that offers innovative databases with powerful graphic and analytical tools for the use of decision-

makers, parliamentarians, universities, knowledge brokers, companies, specialists and the general public, with a complete set of diverse information on STI policies.

The strategy of the GO-SPIN programme is four-fold, namely:

Capacity building: This entails the training of STI stakeholders in design, implementation and evaluation of STI policy instruments.
Data collection: Worldwide distribution of the GO-SPIN national surveys.
Standard-setter: Serves as the standard practice for surveys on STI policies and policy instruments record in what is called the Paris Manual.
GO-SPIN platform: Creation of an online, open access platform for decision-makers, knowledge-brokers, specialists and general-public with a complete set of various information on STI policies.

How GO-SPIN works:

a. Expression of interest: Once a country has expressed interest in compiling a national inventory of its science and innovation system, UNESCO sends out a survey for the country to complete. These includes institutions which coordinate and/or perform research and innovation, innovative firms; organizational structure of the governing bodies and the way in which they interact, standard analysis of explicit STI policies, standard analysis of SETI legal frameworks; standard analysis of different types of operational policy instruments; and temporal series of various input and output indicators on research and development.

b. Visualization and dissemination of the inventory: The inventory is entered into an open access database managed by UNESCO, in order to allow broad access, international comparisons and regular updates. In parallel, the inventory is published in book form on UNESCO's portal, within UNESCO's new series of GO-SPIN Country Profiles in Science, Technology and Innovation Policy. Each inventory is updated on a regular basis by the country. It serves as a monitoring tool and can also be used to improve governance and for the purposes of training and research.

The multilingual GO-SPIN online platform will be launched in December 2017, it will have information on around 50 countries, including about 12 countries from Africa. This will probably be the most complete and detailed information platform on STI policies available. The information available for each country will include the contextual factors and all the inventories of policy instruments, legal framework, organization charts, indicators, etc. GO-SPIN Country Profiles in Science, Technology and Innovation Policy that are released so far include that of Botswana, Zimbabwe, Malawi, Rwanda, Israel, La República de Guatemala, and Lao Popular Democratic Republic.

B. Enhancing STI in Africa through the Technology Bank for LDCs

DRAFT

The 2030 Agenda for Sustainable Development (SDG 17) and the Istanbul Programme of Action (IPoA) for the LDCs have specifically called for the establishment and full operationalisation of the Technology Bank for the LDCs. Subsequently, the UN General Assembly adopted the resolution 71/251 on Establishment of Technology Bank for LDCs, on 23 December 2016. The Technology Bank is intended to help LDCs strengthen their STI capacities, foster the development of national and regional innovation ecosystems and, generate home grown research and innovation.

The Technology Bank will consist of an STI Supporting and Enabling Mechanism (STIM) and an Intellectual Property Bank (IP Bank), as operational units. In addition, the Technology Bank is expected to have a Management Support, Partnerships and Coordination Unit that will help ensure synergies and coherence across the different work streams of the Technology Bank, and further coordinate with relevant organisations of the UN system and other stakeholders. Once fully operationalised, STIM could offer fundamental training in entrepreneurship and marketing, since most technical researchers cannot be expected to innately display parallel business skills while the IP Bank will serve as a great resources of reference for researchers in academia, government, industry and other public organizations.

The Technology Bank has a multi-stakeholder governance arrangement. The Technology Bank will be guided by a Council composed of 13 independent Experts. These Experts will be appointed by the Secretary General and will serve for a period of three years and can be reappointed. As the Technology Bank was established by the General Assembly, it will report to the General Assembly.

The Bank is based on voluntary resources and uses both in-kind and financial support by Member States of the UN and other stakeholders. In light of the difficult development cooperation landscape, multilateral institution-building remains challenging in the area of sustainable development and elsewhere. It is, thus, unlikely that the Bank will start operations on the ground before the second half of 2018. In general, the Technology Bank will be a major step forward for the 33 LDCs in Africa towards enhancing STI.

C. The UN Technology Facilitation Mechanism

The Agenda 2030 on Sustainable Development launched the Technology Facilitation Mechanism. Paragraph 70 of Agenda 2030 states "We hereby launch a Technology Facilitation Mechanism which was established by the Addis Ababa Action Agenda in order to support the sustainable development goals. The Technology Facilitation Mechanism will be based on a multi-stakeholder collaboration between Member States, civil society, private sector, scientific community, United Nations entities and other stakeholders and will be composed of: a United Nations Interagency Task Team on Science, Technology and Innovation for the SDGs, a collaborative Multistakeholder Forum on Science, Technology and Innovation for the SDGs and an on-line platform."

The United Nations Interagency Task Team (IATT) on Science, Technology and Innovation is designed to promote coordination, coherence, and cooperation within the UN System on STI related matters. The IATT is composed of thirty-five members that represent the various UN agencies, funds and programmes, and it is supported by 10 representatives from the civil society, private sector and the scientific community. The IATT has mapped existing science, technology and innovation initiatives within the UN, conducted background research and developed reports in support of the TFM's activities.

DRAFT

Each year, a Multistakeholder Forum on Science, Technology and Innovation for the SDGs will be organized to "discuss STI cooperation around thematic areas for the implementation of the Sustainable Development Goals"[1]. The second Forum was held in April 2017 and focussed discussion around two thematic areas: a) Science, technology and innovation for the SDGs 1, 2, 3, 5, 9 and 14; and b) STI plans, policies and capacity building.

The on-line platform serves as a comprehensive resource on initiatives being undertaken by the various UN entities and a major information gateway. As such, it provides a complete and comprehensive mapping of existing science, technology and innovation initiatives, mechanisms and programmes within and outside of the United Nations in support of SDGs

*Outcomes of the TFM 2017 Forum***:**
The Forum called on scientists and innovators to engage with the realities of local communities, and to consider meeting some of the needs through existing low-cost technologies. It urged governments, the private sector and other partners to pay attention to scaling up smart investment to unlock the creative potential of all. The Forum also underscored the need to create flexible and participatory STI roadmaps at national and global levels. These maps will serve as an essential instrument to prioritize actions and promote cross-sectoral collaborations for the SDGs and to recognize the possible disruptive effects on societies of new technologies (e.g. nanotechnology, automation, robotics, artificial intelligence, gene editing, big data and 3D printing).

Lessons for Africa:
The TFM is good resource to improve coherence on STI initiatives of UN entities for better coordination and strengthening of synergies within the UN to better support STI capabilities building in member States. As an online platform, countries can identify initiatives that they may wish to showcase, participate in and seek partnerships with UN entities and other stakeholders. However, countries need to recognize potential costs and risks associated with participation in international STI initiatives. In particular, it could distort technology choices or steer policy emphasis to areas not of immediate concern to the countries.

As a governance tool, nothing stops member States using a similar approach to map national initiatives, their design, implementation, monitoring and their related costs and opportunities. The TFM can be seen as a tool for enhancing coordination, improving policy coherence, minimizing duplication of efforts and promoting collaboration.

Conclusion
The extent to which science, technology and innovation can serve as an effective means of implementation of the 2030 Agenda and Agenda 2063 to enable the achievement of the targets depends on how STI is governed. The efficiency and effectiveness of the governance structures and policy-making institutions – both nationally and internationally are utmost important. It was emphasized that countries in Africa will need to decide which of the Goals can science, technology and innovation make the most contribution and which relevant governance arrangements are likely

[1]

DRAFT

to facilitate the development of the necessary innovation systems to enable STI meet the identified Goals.

Although there was limited consensus on the optimal governance arrangements, given the wide differences in the level of development of countries and their development aspirations, there were a number of factors that were considered as key. These included the need to elevate STI planning and implementation – preferably a council chaired by the Head of State or Government or as an independent ministry; existence of autonomous or semi-autonomous institutions that provide guidance and R&D funding and simplification of governance arrangements that can quickly respond to the changing environment.

DRAFT

United Nations
Economic Commission for Africa

Annex 1: Background information on the EGM (Attendance and Remarks)

On behalf of the United Nations Economic Commission for Africa and its partners, Mr. Kasirim Nwuke, Chief of New Technology Innovation, Section of Special Initiatives Division, welcomed the participants for the Expert Group Meeting. He emphasized the critical role of science, technology and innovation (STI) in the recent economic and social development of the continent. STI will have to play an even greater role to achieve Africa's transformation and meet the development aspirations of its people. He indicated that the meeting on governance of science, technology and innovation could not have come at a better and critical time than now that several countries are evaluating their national STI policies.

He pointed out that Governance of STI could not be completely divorced from national or regional governance systems, and for this purpose he said there might be no single right way for governing STI – it varies widely among developed countries and among developing countries, as well as between developed and developing countries. Countries may have to choose to organize their systems to suit the national governance system, taking into consideration the political, economic and social realities. Designing optimal STI governance structure and their support policy making institutions need to respond to their existing and rapidly evolving situations.

The African Union Commission (AUC) representative, Dr. Mahama Ouedraogo, Head of Division for Science and Technology, echoed the importance of theme of the EGM in addressing the AUC Agenda 2063 and Africa's transformation. He acknowledged the effort of ECA to address the issue of STI governance in the continent and the strong partnership between ECA and AUC.

He noted that Africa governments have committed themselves to improve governance of STI in Africa through the African Science, Technology and Innovation Strategy for Africa 2024 (STISA 2024). He also highlighted the several efforts and their recommendations. In this regarded, he pointed out that a recommendation to encourage African the use of STI Advisors to the President and councils of STI chaired by the heads of State and Government are yet to be fully implemented.

Closing ceremony

In the closing remarks, UNECA acknowledged all the participants for their valuable contribution and sharing the STI governance structures of their respective countries and institutions. ECA also took the opportunity to announce the dates of the second EGM on research infrastructure to meet the goals of the 2030Agenda on Sustainable Development which will be held here in Addis Ababa, Ethiopia, in October 2017 as well as the third Senior Expert Dialogue (SED) to take place in Senegal in November 2017. ECA encouraged participants support and participate in the efforts of ECA to address the issue of STI in Africa.

DRAFT

United Nations
Economic Commission for Africa

Annex 2: Summary feedback responses

The EGM was attended by over 30 participants which included 14 African member States, two RECs (COMESA and EAC), UN agencies (UNESCO, and United Nations Office of the High Representative for LDCs, LLDCs and SIDS (UN-OHRLLS)), Private sectors (SKA and IBM), regional networks (ANDI), academia, NGOs and European Union representatives. In addition, a number of ECA divisions were also represented. A total of 25 filled and completed evaluation feedback questionnaires regarding the overall organization of the workshop and their suggestions and observations for improvement of future meetings. A summary is presented below.

Regarding quality and usefulness of the workshop presentation and discussion during the two days, participants had felt that it was the most educative in term of sharing the experience among countries and other relevant agencies about the STI governance. Accordingly, they reported that this EGM was quite useful and with good presentations and discussions in terms of exchanging experiences that will help each member States to improve its STI governance.

In terms of adequacy time allocated for discussions, most of them have agreed that the time was sufficient. However, time management was flagged as an area that ECA may have to addressed. This is understandable as the meeting starting about 15 minutes late on the first days as some participants had not completed the security procedures.

However, some have made few comments as summarized below. Among others, too many and important subjects are treated and briefly discussed, however, no common vision is encouraged mainly on development and implementation on STI. Therefore, it will be useful for future to organize a small groups to discuss a common STI governance strategy and to exploit success stories from experienced countries. Similarly, they said, there are many other institutions on the continent that need to be involved in STI governance but were not represented. For a meeting like this, they said, it would be better to bring them all together. Similarly, type of slides used by few participants were poor with bad backgrounds and small fonts and hence were not viewer friendly. Hence, presenters need to ensure their slides are readable.

Regarding the quality and usefulness of the meeting documents, participants have rated as 4.32 i.e. with higher rating. They have received information about this EGM including the concept note/Aide Memoire, program of work and participants' information kit to provide them with sufficient information before their arrival. Besides that, the PowerPoint presentation slides have also be dispatched for their references. In addition, the new NTIS's publications are also delivered to participants namely;

1. ***Unlocking the potential of Open Government in Africa: Policy, legal and technical requirements for open government implementation in Africa,***
2. ***Innovating for better health: Building biomedical devices innovation capacity in Africa,***
3. ***Review of the legal and regulatory frameworks in the information and communications technology sector in in a sub-set of African countries: what lessons can we learn?***

Regarding the overall effectiveness of the workshop organization, most of them have rated as most effective and well organized with rate of 4.24 in 1 to 5 measurement scale. They said, in general,

the presentation /discussion address the objectives as outlined and the organization was up to the mark.

Participants were also requested to **indicate the least and most valuable points** about this workshop and to put their suggestions for the future improvement as well as their general observations in their feedback to assess and strength and weakness of the event. In this respect, they have figured out a number of important points. For example, as the most valuable about this workshop includes;

- Sharing experiences, ideas and interactive discussion as well as exchange of views on the STI governance, that help them to learn from countries and similar initiatives from other organizations at the global level including those by UN. It provided opportunities for networking and sharing experience, learning from others, better identification and understanding of challenges on the continent as well as created contacts for further collaboration, exchange of documents with participants.
- The event allowed them to learn about ongoing policy implementation in countries and sub-regional area and benefited them from the lessons learned to have a better vision of STI implementation. Besides, they said, they have got interesting discussions on STI on different perspectives as well as STI governance and development of various countries from different corners of Africa. They also have appreciated the ECA for bringing Member States and different stakeholders from different departments and expertise open room to learn about STI governance as well as discussion on case studies from member states.

In general, they found the EGM as a motivating event for exchanging sectorial and country experience for practical ways of implementing STI. Specially, they said, the initiative of AUC to frame a governance system of STI in Africa is wonderful.

On the other hand, with issues of **least valuable about this workshop**, participants have pointed out some including;

Inefficient management of time – According to them, the time was not well managed and was not possible to start on time thus they felt that they were in rush. There could possibly have made more presentations of national cases that could have further improved their understanding. Others comments were related to the absence of some key actors at regional level as well as interpretation service.

Respondents have also provide a number of suggestions to ECA for improvement which are quite relevant and need attention for the future EGM as summarized below.

Among other things

- No clue was made about concrete action on the way forward and how follow up will be done for the future.
- To maintain a strict time management during presentations and discussions.
- To request presenter to submit their presentation slides before the meeting and improve the quality of slides, encourage presenters to limit their number of slides.

DRAFT

- To share and avail workshop materials to participants such as the programme at least two months before the event. To have reaction to get a programme finalized, driven by a common vision of participants.
- To have list of a short CV of presenters well in advance.
- To have basic background document e.g. comparison of existing institutional arrangement in Africa and other continents might have informed the discussion.
- To improve network between AUC and regional commissions.
- To share the document presented by different participants
- To invite more countries, international organizations as well as private institutes to share their experience that will help to put together all these key actors
- To have more practical case studies
- It will be quite informative to know what each country delegation considers to be the most useful information/lessons learnt from each other.

Finally, they provide their general observation as listed below.

- No time for plenary discussion.
- Very good effort and need to be frequent with availability of funding there is a need to this workshop promote collaboration and information sharing.
- To put STI into the agenda of the head of states at the level of AU submit.
- To include entrainment program out of the formal workshop programme (such as dinner, a group of photo that will give opportunities for participants to know each other).
- To collect useful intervention (and/or question) to summarize the interaction and debate.
- This meeting was very indispensable to know the general evolution of STI in different countries and it will help countries that are in designing and implementing STI.
- Africa needs a frame document for STI governance to be implemented at country level.
- Support the participation in such a meeting should invited at least two participants, particularly from countries with no system/policy/strategy of STI.
- More UN agencies could have been invited so that the opportunities to take part in the discussion.

As concluding evaluation, the workshop in general was a great platform to bring issue on STI governance from around Africa. This had help them to create a network and sharing of ideas and experiences for better understanding both institutional and operational challenges for countries in governing STI. According to them, as this is a good exercise, and encouraged the arrangement of similar interactions on an annual basis or alternatively at least in every two years.

DRAFT

United Nations
Economic Commission for Africa

Annex 3 DRAFT PROGRAMME OF WORK of the Expert Group Meeting

02 August 2017

8:30 – 9:00 **Registration**

9:00 – 09:30 **Opening Session**

- Introduction
- Opening remarks

9:30 – 10:30 **STI in the SDGs and the AU's Agenda 2063**
Agenda 2063: The role of Science, Technology and Innovation
Dr. Mahama Ouedraogo, Ag. Director, HRST, AUC

Science, technology and innovation in the Addis Ababa Action Agenda and Sustainable Development Goals
UNECA Presentation

Discussion
Moderator: **ECA**

10:30 – 11:00 **Tea / Coffee Break**

11:00 – 12:30 **Should the governance of STI matter for the achievement of the Sustainable Development Goals and the Aspirations of the AU's Agenda 2063?**
UNECA Presentation

Discussion

12:30 – 14:00 **Lunch Break**

14:00– 15:00 **Sectoral STI governance structures and policymaking institutions**

Governance of STI and firm-level innovation performance
Mr. Belmondo T. Voufo, Minisitry of Economy and Planning, Cameroon.

Governance of health research and innovation
Dr. Solomon Nwaka, Executive Director – ANDI, UNOPS, Ethiopia

Discussion:
Moderator: **Dr Lisho C. Mundia**, Director: Research and Innovation, Ministry of Higher Education, Training and Innovation, Namibia

15:00 – 15:30 **Tea / Coffee Break**

DRAFT

United Nations
Economic Commission for Africa

15:30 – 17:30 **Governing STI at the national level in Africa: Country experiences**

Kenya – **Prof. Jemimah Gesare Onsare**, Ag. CEO, National Research Fund, Kenya

Senegal – **Prof. Mamadou SY**, Directeur des stratégies et de la planification Recherche. Dakar, Senegal

South Africa: **Ms. Mmampei Chaba**, Chief Director, DST, South Africa

Tunisia - **Dr. Noureddine Selmi**, Deputy Minister, Ministry of Higher Education and Scientific Research, Tunis, Tunisia

Discussion
Moderator: **Prof. Ndomba**, Tanzania

DRAFT

United Nations
Economic Commission for Africa

Day two: 03 August 2017

9:00 – 10:30 **Private and public-private perspectives on STI governance**

STI Governance in a large research and innovation-focused firm in Research: IBM's experience
Dr. Komminist Weldemariam, IBM Research Africa: Nairobi, Kenya

STI governance in large projects: The case of Square Kilometer Array, South Africa
Ms. Anita Loots, Head, Office of Africa Planning SKA SA.

Discussion
Moderator: Ms. Mmampei Chaba, Chief Director, DST, South Africa

10:30 – 11:00 **Tea / Coffee Break**

11:00 – 13:00 **Emerging technology platforms**

Technology Data Bank for Least Developed Countries and Africa's development
Ms. Miniva Chibuye, OHRLSS, United Nations, New York

GOSPIN as a tool for improving STI Governance
Mr. Edwin Kumfa, UNESCO, IICBA UNESCO

Technology as a means of Implementation of the SDGs: The UN's Facilitation Mechanism
Mr. Kasirim Nwuke, NTIS, Economic Commission for Africa

Discussion
Moderator: AUC

13:00 – 14:00 **Lunch Break**

14:00 – 15:30 **Governing STI at the African sub-regional and continental levels: Examining the effectiveness of sub-regional structures.**

The case of the Common Market for Eastern and Southern Africa (COMESA)
Mr. Innocent Paradzayi Makwiramiti, Senior Private Sector Development Officer; COMESA
The case of East African Community (EAC)
Ms. Gertrude Ngabirano, Executive Secretary, East African Science & Technology Commission (EASTECO), East African Community

Discussion
Moderator: **Mr. Amadou OUANE**, Conseiller Technique, MESRS, Bamako, Mali.

15:30 – 16:00 **Tea / Coffee Break**

DRAFT

United Nations
Economic Commission for Africa

16:00-:17:30 **Policy recommendations:** Towards a comprehensive science, technology and innovation governance structure and policymaking institutions for African countries

Closing session

Closing remarks

DRAFT