

**Concept note**

**Expert Group Meeting**

**Building research infrastructure capacity in Africa  
to achieve the  
2030 Agenda for Sustainable Development**

to be held on  
4 and 5 October 2017

at the

United Nations Conference Centre, Addis Ababa

New Technologies and Innovation Section  
Special Initiatives Division  
Economic Commission for Africa

Addis Ababa

## Summary

Science, technology and innovation (STI) are identified as a means of implementing the 2030 Agenda for Sustainable Development. The degree to which STI fulfils this role in Africa depends on the ability of national institutions to undertake research that spurs scientific and technological innovations to address challenges in national and regional development. However, success in research depends in part on research infrastructures, which include the availability of and the state and condition of research facilities, tools, and services. An important complement to effective research infrastructures is the ready availability of trained and competent scholars and scientists willing to undertake research.

Research infrastructures come in many shapes and forms. Some are of an imposing size, such as the Square Kilometre Array (SKA); others are relatively small and are the size, for example, of some national laboratories. Research infrastructures also differ in terms of ownership and provision. They may be provided by the public sector, private-for-profit sector and the non-profit sector (such as universities and philanthropic institutions). They may also differ with respect to financing. A research infrastructure may be provided by the public sector but financed using private resources. Some research infrastructures, especially those that address regional and global public goods, may be provided and financed jointly by a group of countries.

In Africa, Governments are the primary providers and financiers of research infrastructures. Private provision and financing is largely absent or inadequate due to the absence of large manufacturing firms that are engaged in research and development. Evidence suggests a glaring deficit in most countries. This deficit, if not addressed expeditiously, will hinder the ability of countries of the continent to deploy STI as a means of implementation of the Sustainable Development Goals, with an adverse effect on the rate of progress to achieve the targets, in particular, and the competitiveness of their economies, in general. Cooperation among countries of the region and between the continent and the international community could help build research infrastructure capacity.

The preceding outlines the motivation of the Expert Group Meeting. The meeting and the background analytical report will explore the research infrastructure landscape in Africa and the surface issues for the attention of policymakers and researchers. More precisely, the meeting will explore the potential role of international cooperation and collaboration to attenuate the constraints of capacity, which enables African countries to undertake the research critical for spurring innovations to achieve the 2030 Agenda, in addition to realizing the aspirations of the African Union's Agenda 2063.

## I. Background

African countries, in spite of recent improvements in economic performance and related social indicators, continue to struggle with disease, poverty, and other development challenges, most of which can be solved or attenuated through science, technology and innovation. While appreciable progress has been made in the aggregate in building up the research and innovation capacity of the continent to confront these challenges, much remains to be done. Research capacity varies across countries. Based on evidence from the more technologically advanced parts of the world, it is clear that the continent can achieve a much faster rate of progress if African countries had high-quality higher education and research institutions, and correspondingly high-quality research infrastructures (including research facilities, tools and services), which are required by researchers to function effectively. Marginal improvements in the quality of higher education institutions and in the availability and quality of research infrastructures could significantly reduce the outflow of very able students and scarce scientific manpower (or encourage the return of experts).

The concept of research infrastructures is not new. In 2003, with specific reference to science and engineering, the United States National Science Board (NSB)<sup>1</sup> defined research infrastructure as “tools, services, and installations that are needed for the science and engineering (S&E) research community to function and for researchers to do their work”.<sup>2</sup> However, in recent times, the research infrastructures agenda has been primarily led by the European Union in the context of the European research area network. The European Strategy Forum for Research Infrastructures (ESFRI) defines research infrastructures as “facilities, resources, and services that are used by the research communities to conduct research and foster innovation in their fields”.<sup>3</sup>

There is not much difference between the NSB and ESFRI definitions. For both, “research infrastructure” includes major scientific equipment (or sets of instruments, instrumentation, platforms and facilities), software or knowledge-based resources, such as libraries, databases, collections, archives and scientific data, and e-infrastructures — and any other tools that are essential to achieve excellence in research and innovation. Research infrastructures may also include technical support (human or automated), the services needed to operate the infrastructures and keep them working effectively, and the special environments and installations (such as buildings and research space) essential for creating, deploying, accessing and using the research tools. Research infrastructures may be “single-sited”, “virtual” or “distributed”.

Research infrastructures thus encompass a wide range and variety of facilities, tools, resources and services whose primary purpose is to enable researchers in public and private institutions to achieve excellence in scientific research and innovation. They constitute the foundation as well as the undergird of vibrant research, technology and innovation

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<sup>1</sup> National Science Board. Science and engineering infrastructure for the 21<sup>st</sup> Century: the role of the National Science Foundation. NSB 02-190 (2003). Available at <https://www.nsf.gov/nsb/documents/2002/nsb02190/nsb02190.pdf>

<sup>2</sup> <https://www.nsf.gov/nsb/documents/2002/nsb02190/nsb02190.pdf>

<sup>3</sup> European Commission, *European Charter for Access to Research Infrastructures: Principles and Guidelines for Access and Related Services* (2016).

communities insofar as they are critical to knowledge production, acquisition, adaptation, diffusion and commercialization.

Good research infrastructures are needed by research universities not only for the purposes of research but also to train and produce globally competitive experts in all sectors, including in agriculture, health, engineering and water. The absence of African universities in the top 100 in the world despite the presence of about 26 universities in the top 1000 is largely due to limited research infrastructure, which, in turn, influences the research and teaching environment and the performance on which the rankings are based.<sup>4</sup> In particular, research infrastructures determine the quality and range of fields of training at Masters, PhD and post-doctoral levels in technologically demanding and emerging fields (for example, artificial intelligence, nanotechnology and biosciences).

In addition, research infrastructure is needed for cutting-edge research to be undertaken — the kind of research that appears in peer-reviewed articles, knowledge that is the subject of patent applications and grants, and its transformation into products and processes. Research infrastructure is also needed to drive innovation and service delivery through stronger collaboration with the private sector and support to science and technology parks, business incubators and field stations. Institutions with world-class research facilities are likely to serve as service providers to industry and the public sector. That, in turn, helps industry to inform the research and development agenda of such institutions.

Finally, soft research infrastructure,<sup>5</sup> such as fast, secure and reliable networks and information technology, enables researchers to access management, intellectual assets and other resources, and to obtain key information on sources of knowledge, market opportunities and potential partners within the nation and across national borders. In addition to IT facilities, up-to-date libraries, field testing stations, technology transfer offices, business development centres, meeting and conference facilities collectively support and enable research and development institutions to stay at the top of their game.

## **II. Cooperation and collaboration to enhance research infrastructure capacity in Africa**

As mentioned previously, research infrastructures in most African countries are inadequate and in many cases of poor quality, reflecting to a large degree low R&D investments. Very few countries have met the African Union prescribed minimum of allocating 1 per cent of GDP to R&D. It also reflects the ad hoc nature of planning for research infrastructures in many countries and the inefficiencies arising from it. Plans of research infrastructures are often fragmented and fail to take account of the future needs of the whole sector, country or region. Little effort is invested in maintaining and sustaining the research infrastructures, once acquired. This state of affairs reduces the ability of Africa's research communities to effectively undertake the research that is critical for providing solutions to many of the continent's development challenges and for meeting continentally and internationally agreed development goals.

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<sup>4</sup> <https://www.timeshighereducation.com/world-university-rankings/2017>

<sup>5</sup> This includes e-research infrastructures.

Of particular relevance here, in terms of the 2030 Agenda for Sustainable Development, is Goal 2 target 2a, which calls for: “Increase[d] investment, including through enhanced international cooperation, in rural infrastructure, agricultural research and extension services, technology development and plant and livestock gene banks in order to enhance agricultural productive capacity in developing countries, in particular least developed countries”. Additionally, Goal 17 target 6 calls for ways to “Enhance North–South, South–South and triangular regional and international cooperation on and access to science, technology and innovation and enhance knowledge sharing”. Such Goals and targets enshrined in the 2030 Agenda are based on the general understanding that, in a globalized world, no country working in isolation can mobilize the capacity required in science, technology and innovation to address all its challenges, added to which are global challenges such as health, security, conservation, environment and climate change.

African countries, led by the African Union at the continental level and regional economic communities at the regional level, with support from the Economic Commission for Africa (and other agencies and organizations within the United Nations system), have explored and continue to harness regional and international cooperation as an additional instrument to bridge their research infrastructures capacity deficit. For example, one of the main conclusions of the stakeholder conference, 2012 Network for the Coordination and Advancement of Sub-Saharan Africa-EU Science and Technology Cooperation (CAAST-Net) - Promoting African – European Research Infrastructure Partnerships (PAERIP), was that research infrastructures should be a priority focus of bi-regional Africa–European Union cooperation in science, technology and innovation. The road map for research infrastructures that was promulgated recently by South Africa<sup>6</sup> envisages participation in joint international research infrastructures. Similarly, the science, technology and innovation policies of African countries that have them assign an important mutually beneficial role to international cooperation in STI including in research infrastructures.

While not always systematic, African countries have used regional and international approaches to promote research collaboration and, by implication, to attenuate national research infrastructure gaps. The control of locusts, for example, has been one area where African countries collaborate in research and in the control and eradication of such pests. These include the International Red Locust Control Organisation for Central and Southern Africa (located in Zambia) and the Desert Locust Control Organization of Eastern Africa based in Ethiopia. The networks of the International Livestock Research Institutes (ILRI), International Institute for Tropical Agriculture (IITA), and the laboratories of the Centers for Disease Control and Prevention contribute to the effort.

### **III. Objectives of the Expert Group Meeting**

The overall objective of the Expert Group Meeting is to identify strengths and weaknesses of the research infrastructure landscape in Africa and to explore the scope for collaboration and cooperation to bridge the research infrastructure deficit as a critical success factor if STI is to fulfil its role as a means of implementing the Sustainable Development Goals. Specifically, the Expert Group Meeting will:

1. Give an overview of the research infrastructure landscape in Africa;

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<sup>6</sup> <http://www.gov.za/sites/www.gov.za/files/sa%20research%20infrastructure%20road%20mapa.pdf>

2. Enable a better understanding of the research infrastructure challenges in Africa and the magnitude of the constraint that they present to enhancing the role of STI in achieving the 2030 Agenda;
3. Explore the innovation and socioeconomic impacts of research infrastructure and their measurement in the context of Africa;
4. Identify the possibilities of regional integration in building research infrastructures capacity in African countries;
5. Explore the global dimensions of research infrastructure and the role that international cooperation can play in bridging Africa's research infrastructure deficits;
6. Provide policy recommendations for the leveraging of international cooperation and collaboration to develop Africa's research infrastructure capacity in order to achieve the 2030 Agenda.

#### **IV. Expected outcomes**

The expected results include the following:

- Research and analytical report on research infrastructure in Africa and the role of collaboration to meet the Sustainable Development Goals;
- Policy briefs and working papers;
- Input into the report of the next meeting of the ECA Conference of African Ministers of Finance, Planning and Economic Development.

#### **V. Expected impact**

The expected impacts are: an enhanced understanding on how Africa can harness collaborative arrangements to build STI capacity and research infrastructure capacity, in particular; and improved national policies on research infrastructures.

#### **VI. Partnerships**

The Expert Group Meeting will be organized in collaboration with the African Union Commission (in particular, its Department of Human Resources, Science and Technology).

#### **VII. Participation**

Participation is by invitation only. Invitations will be extended to African Ministries responsible for Science, Technology and Innovation and Ministries responsible for National Development Planning to nominate senior policy experts to attend and participate. Invitations will also be extended to heads of major African research centres, STI institutions, African Union departments, NEPAD, regional economic communities, selected academic institutions, agencies within the United Nations system that have a pertinent mandate, multilateral and bilateral development agencies; and non-governmental organizations and civil society organizations, and a selected number of experts. ECA will provide full sponsorship to about 20 experts nominated by African governments. Participants will be expected to discuss the state

and challenges of research infrastructures in their country and how collaboration and cooperation can help or is helping to attenuate deficits and gaps.

## **VIII. Documentation and language**

Documents, materials and publications relevant to the theme will be made available on the website created for the meeting. Expert papers will be made available in the language in which they are written. The working language of the meeting is English.

## **IX. Date and venue**

The Expert Group Meeting will be held on **4 and 5 October 2017** at the United Nations Conference Centre, Addis Ababa.

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