

Trends in STI governance in Africa

*Based on findings of
UNESCO Science Report
Towards 2030
(2015)*





Majority of countries now have STI policies

Three common thrusts for African ‘vision’ planning documents to 2020–2040:

- better governance ;
- more inclusive growth ;
- sustainable development.

Ties between ‘vision’ documents and STI (and related) policies

Majority of African countries now have STI policies:

- 11 out of 15 SADC countries
- half of ECOWAS countries
- All 5 members of East African Community (EAC)
- None from Economic and Monetary Community of Central Africa

Those without STI policy include 5 small island states, countries affected by conflict in past 15 years and some with fairly developed innovation systems like Senegal (as of 2015).

Table 20.3: STI planning in SADC countries

	STI policy document	Date of adoption/ period of validity
Angola	Yes	2011
Botswana	Yes	1998; 2011
Congo, Dem. Rep.	No	
Lesotho	Yes	2006–2011
Madagascar	Yes	2013
Malawi	Yes	2011–2015
Mauritius	No	
Mozambique	Yes	2003; 2006–2016
Namibia	Yes	1999
Seychelles	No	
South Africa	Yes	2010
Swaziland	(draft)	
Tanzania	Yes	1996; 2010
Zambia	Yes	1996
Zimbabwe	Yes	2002; 2012

Source: compiled by authors



STI being integrated in development policies

...for ICTs, higher education, innovation, climate change, poverty reduction, etc.

Examples :

Gabon: environment

Emerging Gabon: Strategic Plan to 2025 (2012) called for *National Climate Plan* (2013) to limit greenhouse gas emissions and forge adaptation strategy: hydropower to account for 80% of electricity mix by 2020 (20% in 2010), inefficient thermal stations to be replaced with clean ones;

Related law on sustainable development (2014) created environmental protection fund to be financed through state subsidies, local bodies, loans from public and private bodies, etc..

Cameroon: ICTs

National Policy for Development of ICTs (2007), implementation hampered by lack of financial resources (internet penetration 6.4% in 2013); despite this, two hubs: ActivSpaces and Cameroon Innovation Hub .

Rwanda: poverty reduction

Second Economic Development for Poverty Reduction Strategy 2013-2018 proposes creating Climate Change and Environment Innovation Centre; allocates 36% of expenditure to energy over 2013-2018.

Senegal: higher education

Senegal Emerging Plan to 2035 led to Priority Programme Reform and Development Plan for Higher Education and Research 2013–2017, which has created three universities; law passed in 2014 creates governing body for universities, half of members to be external to university, such as from private sector.



Obstacles to efficient STI policy implementation

- **Policies can take years to adopt**

e.g. Nigerian Biotechnology Agency created in 2001 but national biosafety management bill lingered in parliament for years until passed in 2011, was awaiting presidential consent in 2015

- **Policy directions may change with government**

e.g. In Zimbabwe, following change of government in 2013 elections, *Medium-term Strategy, 2011-2015*, replaced by *Zimbabwe Agenda for Sustainable Economic Transformation, 2013-2018*, Ministry of S&T downgraded in 2013 to Department for S&T within other ministry, research priorities changed

- **Research and innovation funds may be established without resources**

e.g. Revised *Ethiopian STI Policy (2010)* advocated creating centralized innovation fund, by mid-2015 not yet operational

e.g. Nigerian Federal Executive Council approved allocating 1% of GDP to establish National STI Fund in 2011, not operational by 2015;

- **Policy implementation not monitored, lack of accountability**

e.g. Lesotho

- **Lack of data hampers policy design, implementation and monitoring**

Only 19 countries contributed data to 2nd *African Innovation Outlook* in 2014 (6 from ECOWAS)



Governments investing in R&D: game-changing acts?

Examples

Burkina Faso:

STI Act (2013) created three funds for research and innovation, financed from national budget and subsidies: 0.2% of tax revenue, 1% of mining revenue, 1% of revenue from operating mobile phone licenses, etc.

Kenya:

STI Act (2013) contributes to *Vision 2030*, created National Research Fund, with provision for it to receive 2% of Kenya's GDP each year.

Act also created National Commission for STI to, *inter alia*:

- develop priority areas for R&D,
- co-ordinate implementation and financing of policies with other institutional bodies, including new National Innovation Agency and National Research Fund;
- foster private-sector involvement in R&D.

Namibia:

In 2013, UNESCO helped develop manual for operationalizing National Research, Science and Technology Fund: 1st and 2nd disbursements made jointly with South Africa in 2014 (57 projects for N\$ 7 million, *circa* US\$330,000).



Africa embracing sustainable development: examples

AU–NEPAD African Action Plan, 2010–2015 underscores role harmonized regional policies could play in adapting to climate change.

In 2013, ministers adopted **SADC Regional Climate Change** programme.

COMESA, EAC and SADC have been implementing joint initiative over 2010-2015 : **The African Solution to Address Climate Change**.

Bio-Innovate network in East Africa (2010) : improving crop productivity and agro-processing and building smallholder farmers' resilience to climate change.

Ethiopia has **Climate Resilient Green Economy Vision and Strategy** within its *Growth and Transformation Plan for 2011–2015*. It is developing wind power, biofuels and Great Ethiopian Renaissance Dam.

In **Gaborone Declaration for Sustainability in Africa** (2012), 10 countries commit to integrating value of natural capital into national accounting and corporate planning: Botswana, Gabon, Ghana, Kenya, Liberia, Mozambique, Namibia, Rwanda, South Africa and Tanzania.

In 2013, Botswana initiated development of **National Climate Change Strategy and Action Plan**.

National Fund for Environment and Climate Change in Rwanda (FONERWA, est. 2008), part of *National Green Growth and Climate Resilience Strategy*; pilot 'green city' launch in 2018.

Kenya developing **geothermal energy** in Rift Valley and 'Africa's largest **wind farm**' near Lake Turkana



Opportunities for (sub)regional scientific integration: centres of excellence

Growing networks of centres of excellence

- African Biosafety Network of Expertise (achieved under CPA, *see map*)
- African Biosciences Initiative (CPA)
- Bio-innovate (CPA)
- African Institutes of Mathematical Sciences (CPA)
- African Institutes of Science and Technology (Mandela)
- Centres of excellence in Medical Sciences (EAC and World Bank)
- African Centres of Excellence Project for West Africa (World Bank - NB ECOWAS and WAEMU planning similar networks)





Opportunities for (sub)regional scientific integration

Concern: lack of perennial funding for networks of centres of excellence

- Centres dependent on donor funding
- CPA failed to set up African S&T Fund
- STISA-2024 considers it 'urgent to set up' African S&T Fund but identifies no specific funding mechanism





Regional economic communities fostering scientific integration: ECOWAS

ECOWAS Science and Technology Policy (2011)

Integral part of *ECOWAS Vision 2025*, provides framework for ECOWAS members, recommends that they:

- raise GERD to 1% of GDP
- Define own research priorities rather than those of donors (lesser dependence on donor funding)
- Create national funds which would allocate funding on competitive basis (Burkina Faso has since created three such funds)
- Define harmonized regional status for researchers
- Adapt university curricula to market needs
- Develop small research and training units in strategic industrial fields, such as lasers, fibre optics, biotechnology, pharmaceuticals etc.
- Establish science and technology parks, tax incentives for private companies
- Facilitate spread of ICT infrastructure, equip labs
- Foster university-industry partnerships
- Establish national and regional databases on R&D activities, etc.



Regional economic communities fostering scientific integration: EAC and SADC

SADC Protocol on Science, Technology and Innovation (2008)

- Protocol entered into force in June 2017, once ratified by two-thirds of Member States. Broad definition that extends beyond STI. In 2011, South African DST called protocol essential first step towards regional integration, offering considerable self-financed bilateral cooperation.

SADC Protocol on Education and Training (1997)

- Set out to facilitate mobility but only South Africa, Swaziland and Zimbabwe charge same fees for foreigners as for nationals. In South Africa, 49% of researchers are transitory.

East African Community Common Market Protocol (2010)

- makes provision for market-led research; promotion of industrial research; technology transfer, acquisition, adaptation and development. States encouraged to collaborate with East African Science and Technology Commission and to establish a research and technological development fund to implement protocol.

Inter-University Council for East Africa entrusted by EAC with developing Common Higher Education Area.



Energetic efforts to boost private-sector R&D

Policies to foster innovation in private sector:

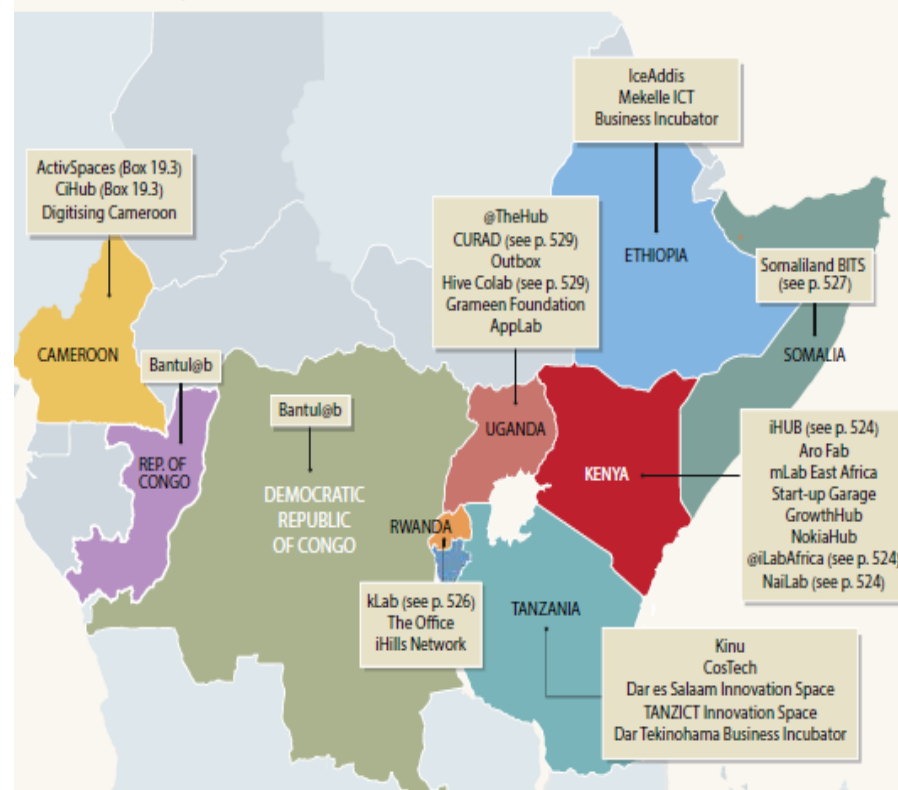
- more than 90 technology hubs (see map for examples)
- specific funding mechanisms, such as Malawi Innovation Challenge Fund
- Cybervillages and technology parks (e.g. Ghana, Kenya, Nigeria, Morocco, Tunisia)

Virtuous cycle: success of technology hubs in Africa encouraging governments to invest more in R&D, which should in turn boost private-sector R&D, e.g. iHub in Kenya.

Trade: efforts to develop infrastructure (rail, roads, ports) and multipartite trade agreements like COMESA-EAC-SADC should help to create markets for intra-African trade in value-added and manufactured products.

Much of **social innovation** reported in East and Central Africa focuses on overcoming sustainability challenges: food security, renewable energy, climate change mitigation
e.g. Hive Colab (Uganda) helping entrepreneurs innovate in climate technologies, ICTs and agribusiness.

Figure 19.4: Technology hubs in East and Central Africa, 2014





**What are the data telling
us about trends
in African science?**



Africa's place in the world: visible progress

Between 2007 and 2013, the research gap between high-income and middle-income countries narrowed, mainly due to China, which overtook the USA for the number of researchers and almost doubled its global share of research spending (from 10.2% to 19.6%).

RESEARCH EXPENDITURE

Global research expenditure grew faster (+30.5%) than the global economy (+20.1%) between 2007 and 2013.

Sub-Saharan Africa's share of research spending rose from 0.7% to 0.8%. (South Africa's share stable: 0.3%)

RESEARCHERS

The global number of researchers rose by 21% between 2007 and 2013 to 7.8 million.

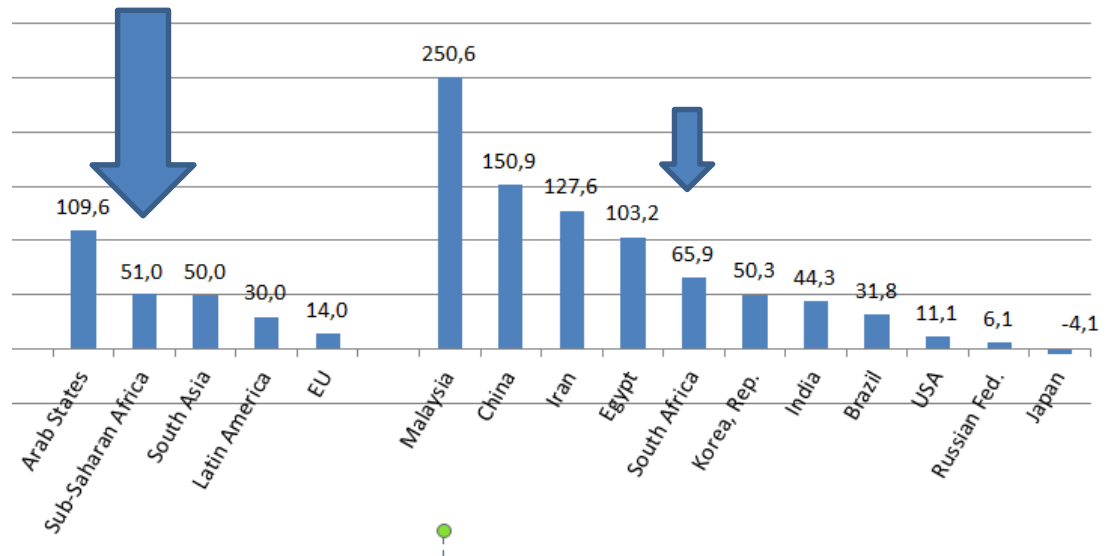
Sub-Saharan Africa's share rose from 0.9% to 1.1%: 58,800 to 82,000. (South Africa's share stable: 0.3%)

PUBLICATIONS *(see graph on the right)*

Scientific articles progressed globally by 23% between 2008 and 2014.

Sub-Saharan Africa's global share rose from 1.2% to 1.4%; it showed the second-fastest growth rate (51%) after the Arab States.

(South Africa's share: from 0.5% to 0.7%)





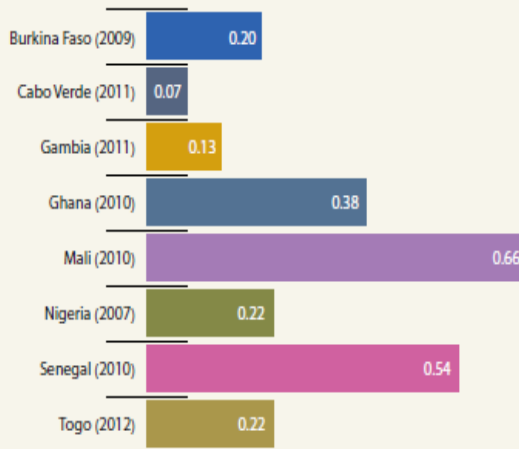
Countries have used commodities boom to boost research spending

- Some governments have raised their research effort.
- Business sector contributes most in South Africa (38%)
- Foreign sources make up large share of research spending in Burundi (40%), Burkina Faso (60%), Kenya (47%), Mozambique (78%), Togo (42%) and Uganda (57%)
- Recent data missing for many countries

Malawi 0.40%	⇒	1.06% of GDP
Egypt: 0.43%	⇒	0.68% of GDP
Ethiopia: 0.24%	⇒	0.61% of GDP
Kenya: 0.36%	⇒	0.79% of GDP
Mali: 0.25%	⇒	0.66% of GDP
Senegal: 0.37%	⇒	0.54% of GDP
Uganda: 0.36%	⇒	0.48% of GDP

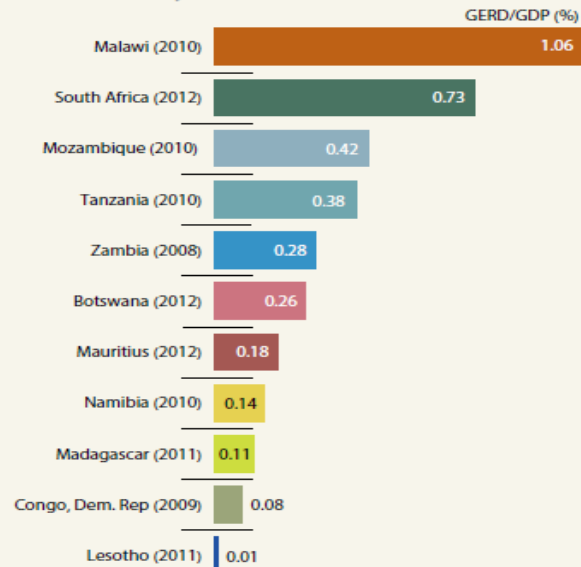
Figure 18.4: GERD/GDP ratio in West Africa, 2011 or closest year (%)

Selected countries



Source: UNESCO Institute for Statistics, January 2015

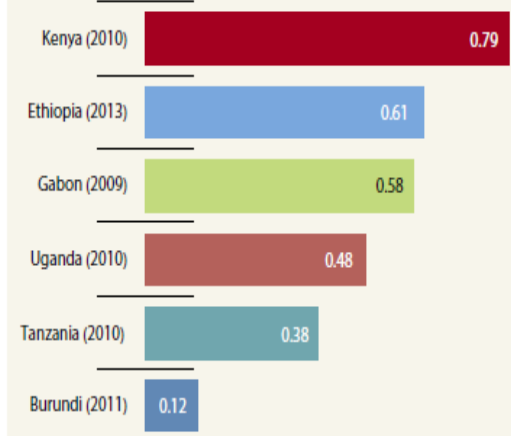
Figure 20.3: GERD/GDP ratio in Southern Africa, 2012 or closest year



Source: UNESCO Institute for Statistics, August 2015; for Malawi: UNESCO (2014a)

Figure 19.9: GERD/GDP ratio in East and Central Africa, 2013, or closest year (%)

Selected countries



Source: UNESCO Institute for Statistics

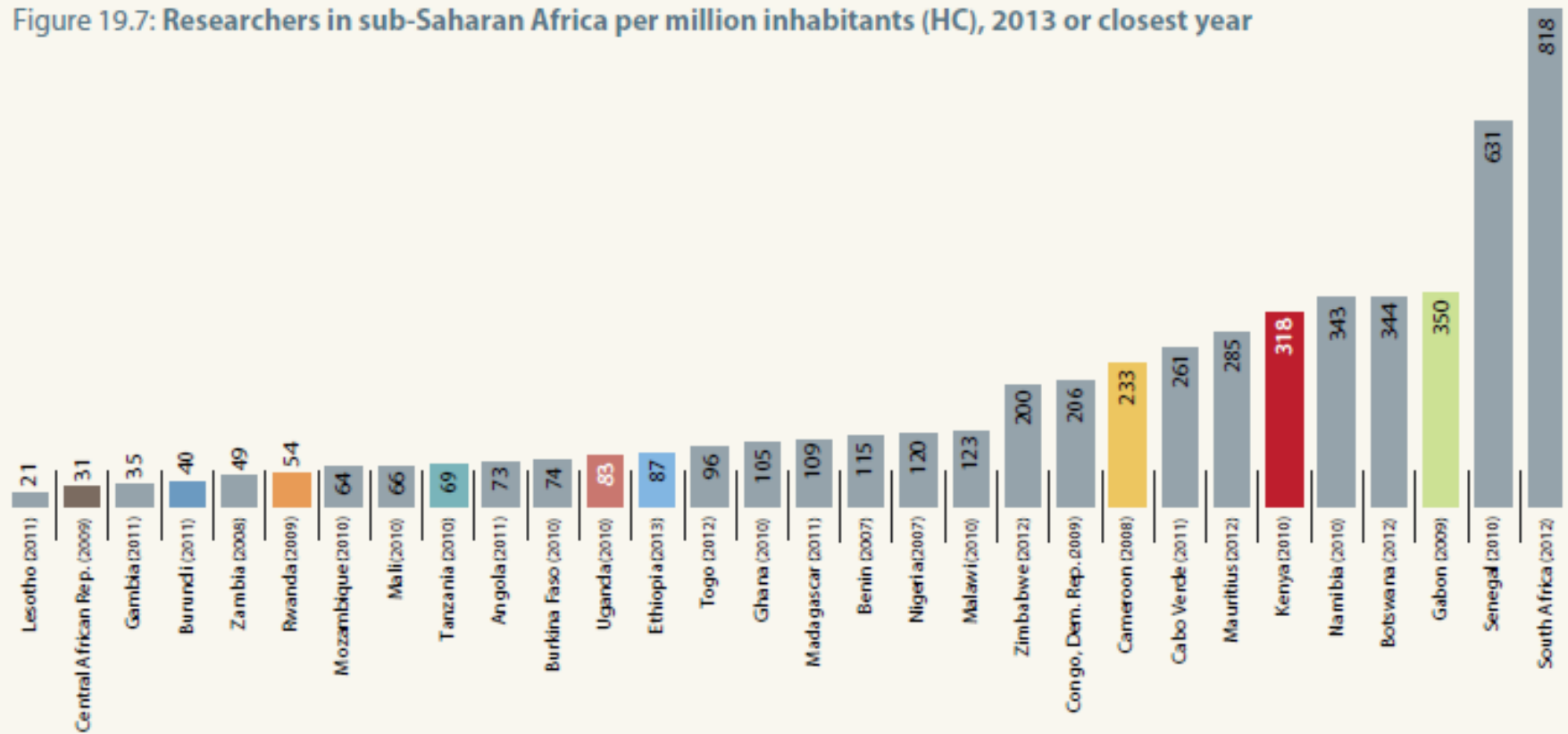


Economic diversification hampered by a skills shortage

Africa needs more scientists, engineers, technicians, agronomists, etc to achieve its development goals.

Researchers (FTE) per million inhabitants in 2013: 91 in sub-Saharan Africa, 495 in North Africa; this is up from 77 in sub-Saharan Africa and 474 in North Africa in 2007 but still well below the world average of 1 083.

Figure 19.7: Researchers in sub-Saharan Africa per million inhabitants (HC), 2013 or closest year



Source: UNESCO Institute for Statistics, April 2015



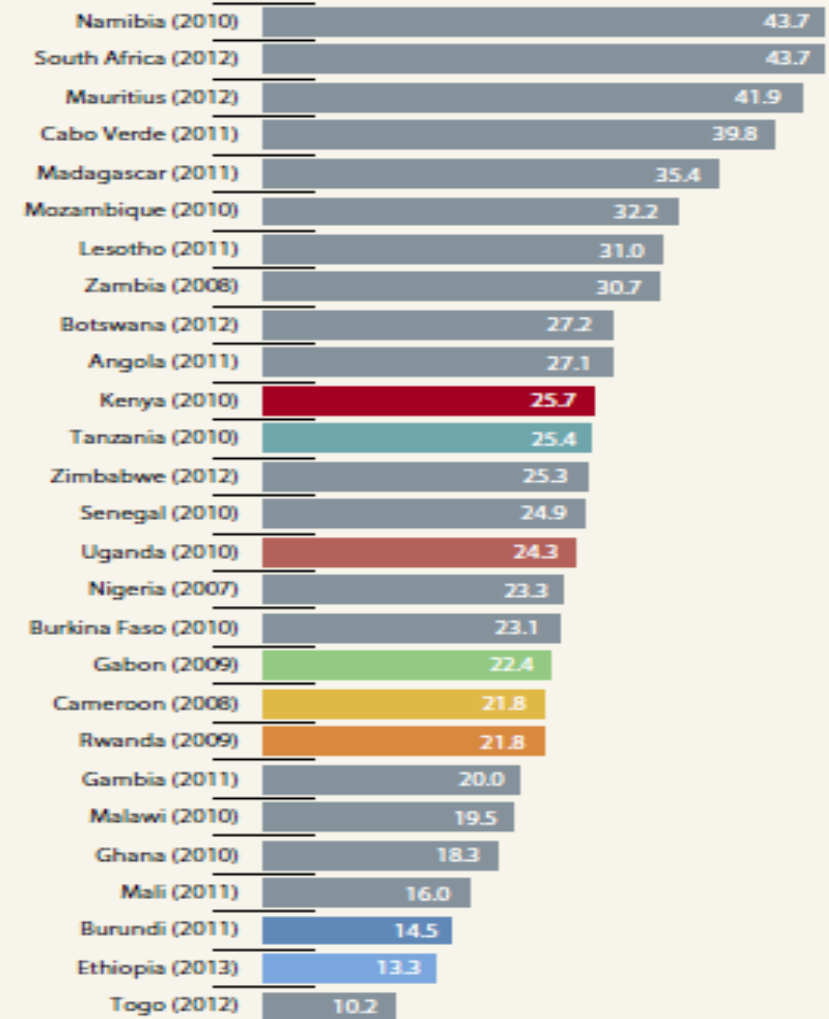
Women researchers in sub-Saharan Africa

Namibia and South Africa have almost attained gender parity (45-55%).

Regional scientific awards set up for women: 21 recipients 2009-2012, regional economic communities participating (EAC, SADC, ECOWAS, etc).

Governments have put policies in place to promote gender equality, e.g. Ethiopia's Growth and Transformation Plan 2011-2015 plans to raise share of women students at university to 40%.

Figure 19.3: Women researchers in sub-Saharan Africa, 2013 or closest year (%)



Note: Recent data are unavailable for some countries.

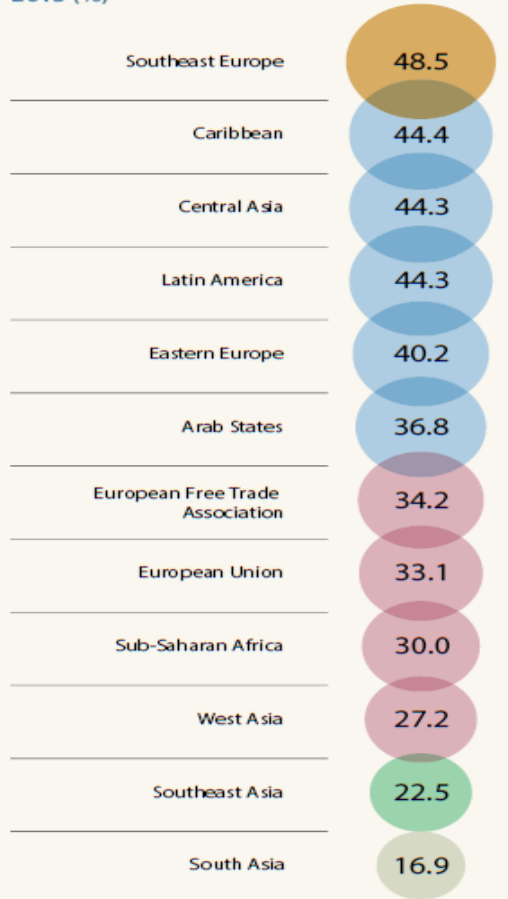
Source: UNESCO Institute for Statistics, April 2015



Three out of 10 sub-Saharan researchers are women

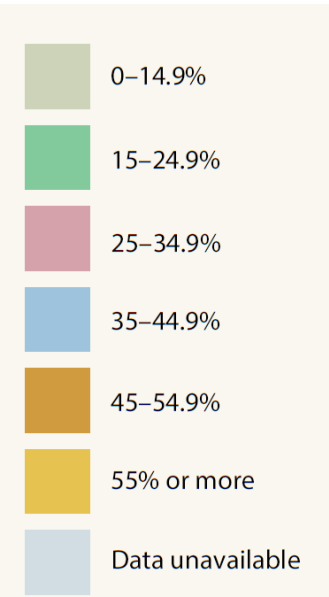
Several governments are putting policies in place to augment the number of women researchers (e.g. Ethiopia)

Regional shares of female researchers, 2013 (%)



Share of women researchers in Africa, 2013 or closest year (%)

(Europe and the Middle East are shown for comparison)





Good governance, higher scientific productivity

Most countries with 50+ publications per million pop. in **first quadrant** for governance: Botswana, Cabo Verde, (Gabon and Gambia **third quadrant**), Namibia, Mauritius, Seychelles, South Africa

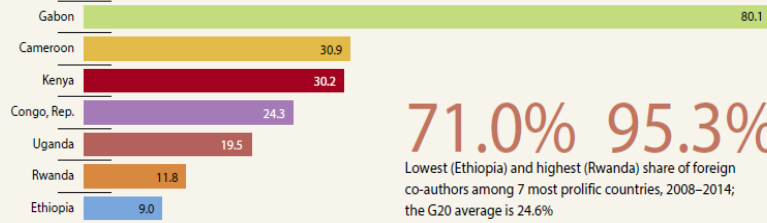
Between 2005 and 2014, sub-Saharan publications:

- up from 15 to 20 per million inhabitants (average)
- internationally coauthored articles up from 58.4% to 68.7% of total;
- average citation rate up from 0.85 to 0.97 (2012).

Central and East Africa

Gabon was the most productive in 2014

Articles per million inhabitants for the most productive countries



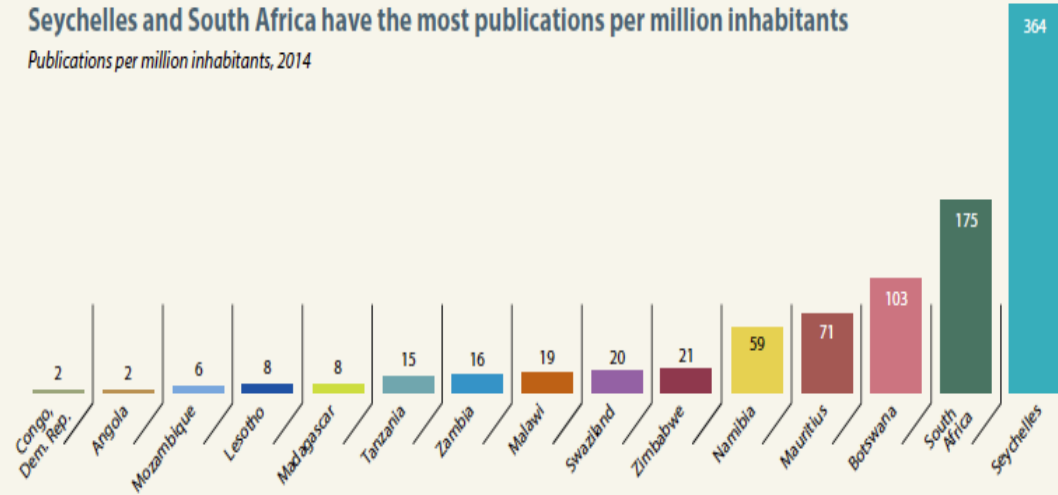
71.0% 95.3%

Lowest (Ethiopia) and highest (Rwanda) share of foreign co-authors among 7 most prolific countries, 2008–2014; the G20 average is 24.6%

Southern Africa

Seychelles and South Africa have the most publications per million inhabitants

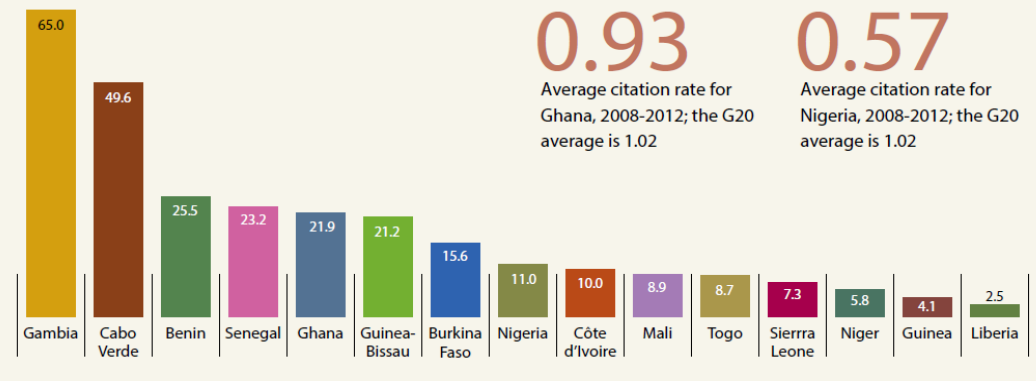
Publications per million inhabitants, 2014



West Africa

Scientists from Gambia and Cabo Verde publish most in international journals

Per million inhabitants, 2014



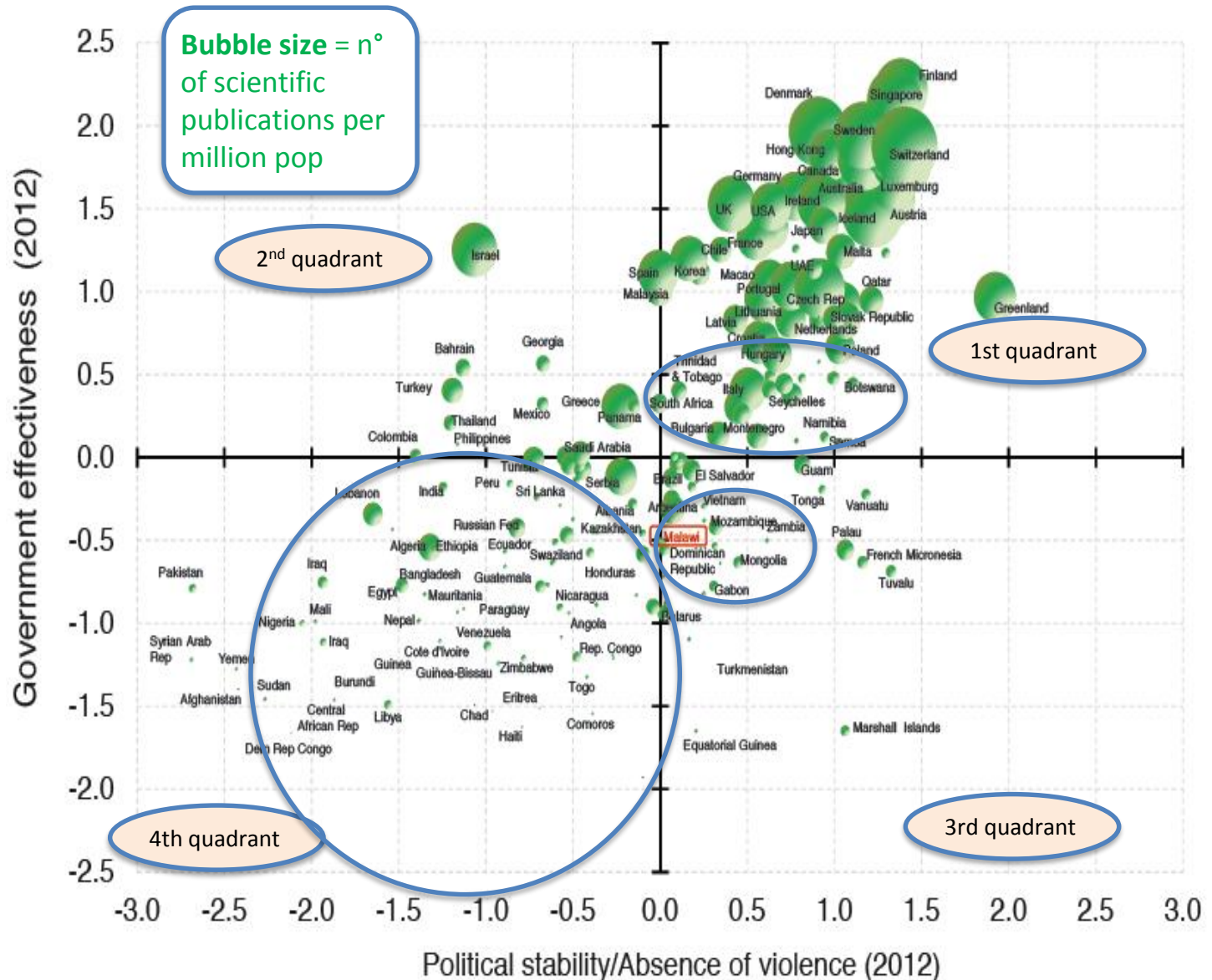
0.93

Average citation rate for Ghana, 2008–2012; the G20 average is 1.02

0.57

Average citation rate for Nigeria, 2008–2012; the G20 average is 1.02

Figure: Evolution in government effectiveness worldwide, as measured against political stability/ absence of violence, 1996–2012





Agriculture in need of greater investment

Publications: modest output in agricultural sciences, 2008-2014 (pale green on left)

Low agricultural productivity

Poor land management, leading to degraded soils, etc

Little value-addition to agricultural produce in many countries (soap, etc). Others have agro-processing industries, e.g. Ghana and Nigeria.

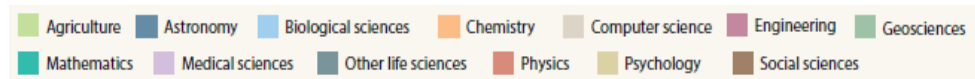
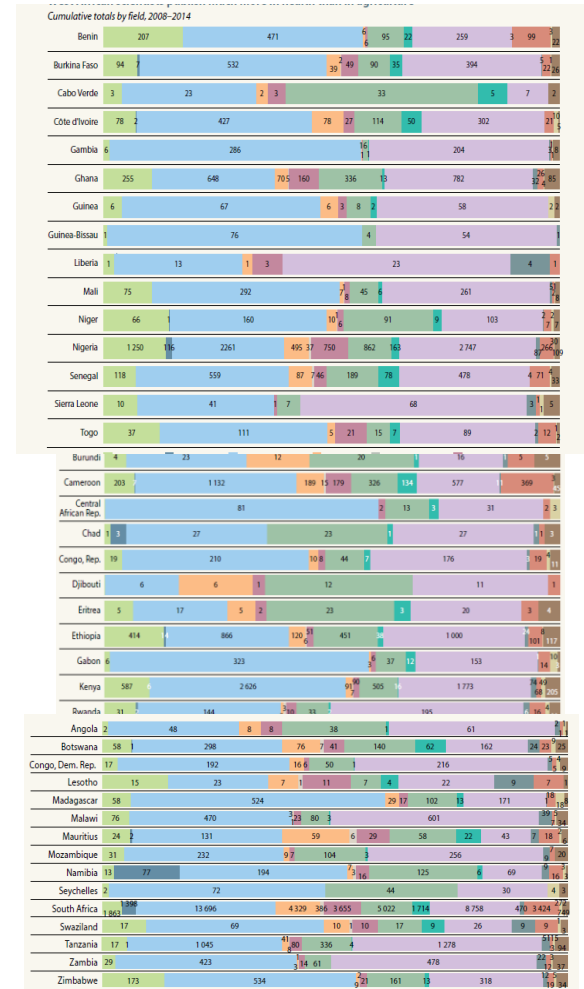
Low levels of investment: few countries devote 10% or more of GDP to agriculture, the target agreed in the *Maputo Declaration* (2003); there has been a worrying drop in government funding for agricultural R&D in the SADC.

Low university enrolment in agricultural sciences: the CPA review regretted that young African researchers were reluctant to train in such fields as agricultural science, which lacked popular appeal; it considered that 'the shortage of qualified personnel in such fields is a big challenge for the continent.'

Examples of new agricultural universities :

Lilongwe University of Agriculture and Natural Resources (Malawi, 2012)

Marondera and Monicaland State Universities (Zimbabwe, planned)



Conclusion

- Most African countries are convinced that they will need STI to foster more inclusive growth and sustainable development in the years to come. This conviction is reflected in national and subregional development plans to 2020-2030 (e.g. *Vision* documents), which also recognize need for better governance.
- Regional economic communities in Africa now recognize that scientific integration will be a means of achieving their goal of economic integration.
- Many African countries now have STI policies; several have raised financial commitment to R&D in past few years; some are striving to empower the private sector, such as through technology incubation hubs, dedicated funds and technology parks.
- Countries still need to develop mechanisms for implementing, monitoring and evaluating STI policies, including operational policy instruments (including funding mechanisms), coordination mechanisms, regular data collection and analysis and a robust legal framework.
- The recommended African Science and Technology Fund is yet to materialize, posing a problem for the perennity of networks of centres of excellence in Africa.
- Economic diversification remains hampered by a skills shortage but countries are establishing new universities.
- Africa is embracing sustainable development: examples abound of strategies and operational projects related to climate change adaptation and the development of renewable energy and 'green cities'.



Thank you

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