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Economic Commission for Africa

**2017 Africa Regional Review of Progress in the  
implementation of the outcomes of the World Summit on the  
Information Society**

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## 1. Background

The Annual World Summit Information Society (WSIS) Regional Review 2017 is the follow-up of the UN General Assembly (GA)'s *Overall Review of the Implementation of the WSIS Outcomes* (UNGA Resolution 70/125), which also an alignment of WSIS and the SDG processes. The review highlights, over a 1 years- period (from 2015 to 2016) countries' progress in implementing the major action lines of WSIS outcomes such as improving the digital divide, internet governance, cybersecurity, technology and innovation, addressing cultural, linguistic diversity. It re-iterate, the importance of, and recommend commends stronger alignment of WSIS the Agenda 2030.

The WSIS Regional Review Meeting 2017 will catalyse discussions on how ICTs could best be used to facilitate implementation of the SDGs in countries as follow-up of the UNGA Resolution A/70/1). The WSIS-SDG Matrix developed by UN WSIS Action Line Facilitator and presented at the WSIS Forum 2015 will serve as the mechanism to map, analyse and coordinate the implementation of WSIS Action Lines, and more specifically, ICTs as enablers and accelerators of the SDGs. ECA's experience in updating and adapting the WSIS-SDG matrix and to the African Union Agenda 2063 targets will be used to facilitate the discussion.

As the regional chair the review of implementation of WSIS action lines in Africa, ECA will continue to play this role focusing particularly on outreach activities, such as disseminating the review report in larger forums. For this year, the report emphasizes the need of reliable statistics to support ICT for development. It also emphasizes the need for new indicators in the WSIS action lines that are relevant to Africa's socioeconomic context. As an active member of the Partnership on Measuring Information and Communications Technology for Development mandated/or tasked to gather and disseminate data, ECA is best positioned and willing to facilitate development and applications of these indicators.

The theme of this year's regional review "Transformation towards sustainable and resilient societies" aligns with the 2018 High Level Political Forum (HLPF) on the SDGs, a UN platform in charge of the follow-up and review of the 2030 Agenda for SDGs adopted in 2015. It also aligns with the Agenda 2063 of the AUC. To foster the alignment of WSIS process and the Agenda 2030, the review report will highlight the role of ICT in accelerating the implementation of the SDGs, with particular emphasis on the following goals that will be debated by 2018 HLPF.

Goal 6: Ensure availability and sustainable management of water and sanitation for all

Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all

Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable

Goal 12: Ensure sustainable consumption and production patterns

Goal 15: sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss and

Goal 17: Strengthen the means of implementation and revitalize the global partnership for sustainable development (reviewed annually)

## 2. Setting out the scene: ICT for Transformation towards sustainable and resilient societies

The SDGs call for several bold breakthroughs by the year 2030, including Ensure availability and sustainable management of water and sanitation for all (SDG 6), universal access to modern energy services (SDG 7), sustainable cities (SDG 11), sustainable consumption and production patterns (SDG 12), Protect, restore and promote sustainable use of terrestrial ecosystems (SDG 15)

In this context, as shown in table 1 below, African economies have sustained a solid growth rate over the past two decades after the previous decades of stagnation and decline. In the last decade, many African countries have been growing faster than they have previously.

Table 1: World's ten fastest-growing economies: Annual average GDP growth, %

<u>2001-2010</u>		<u>2011-2015</u>	
<b>Angola</b>	<b>11.1</b>	China	9.5
China	10.5	India	8.2
Myanmar	10.3	<b>Ethiopia</b>	<b>8.1</b>
<b>Nigeria</b>	<b>8.9</b>	<b>Mozambique</b>	<b>7.7</b>
<b>Ethiopia</b>	<b>8.4</b>	<b>Tanzania</b>	<b>7.2</b>
Kazakhstan	8.2	Vietnam	7.2
<b>Chad</b>	<b>7.9</b>	<b>Congo</b>	<b>7.0</b>
<b>Mozambique</b>	<b>7.9</b>	<b>Ghana</b>	<b>7.0</b>
Cambodia	7.7	<b>Zambia</b>	<b>6.9</b>
<b>Rwanda</b>	<b>7.6</b>	<b>Nigeria</b>	<b>6.8</b>

Source : *The Economist*, IMF: [https://www.economist.com/blogs/dailychart/2011/01/daily\\_chart](https://www.economist.com/blogs/dailychart/2011/01/daily_chart)

Six of the world's 10 fastest growing economies in the 2000s<sup>1</sup> were in Sub-Saharan Africa: Angola at 11.1% a year, Nigeria 8.9%, Ethiopia 8.4%, Chad 7.9%, Mozambique 7.9%, and Rwanda 7.6%. Furthermore, several other countries have also recorded above or near the 7% growth needed to double their economies in ten years. Some of the factors of this growth include the implementation by African governments of better economic policies, the end of the decades long debt crisis, high commodity prices and rising discovery and exports of oil, gas, and minerals, and the beneficial impacts of new information and communication technologies (ICTs). In the post-2015 development agenda, understanding how Africa can continue to accelerate economic transformation and broaden growth in the decades gained significant importance. It has been well recognised in the last couple of years that in order to ensure that growth is sustainable and continues to improve the lives of the many, countries now need to vigorously promote economic transformation.

It is believed that 90% of new jobs are going to be in areas that either are related to digital technologies or involve the use of digital technologies. For instance, according to GSMA Report

<sup>1</sup> [https://www.economist.com/blogs/dailychart/2011/01/daily\\_chart](https://www.economist.com/blogs/dailychart/2011/01/daily_chart)

2017<sup>2</sup>, Mobile generated 7.7% of GDP in Sub-Saharan Africa and supported 3.5 million jobs in 2016. Mobile's contribution to GDP is expected to rise to \$142 billion, equivalent to 8.6% of GDP, by 2020. This will facilitate successful implementation of the SDGs, Agenda 206 and WSIS employment targets. Progress in service economy, which depends on development of ICTs, will also facilitate the realization of the structural transformation that is increasingly been embraced by many countries across Africa. Structural transformation is referred to by ECA as policy objectives aimed at producing fundamental change in the structure of the economy and its drivers of growth and development, enhancing productivity, increasing contribution of manufacturing to GDP<sup>3</sup>. It is a shift in economic activity including a rise of urbanisation and modern industrial and service economy.

As demonstrated in a recent historical analysis of structural transformation of African countries, application of ICT have significantly helped the service sectors and boost economies of many countries. The study identifies over the last four decades two general patterns of structural change across the continent. Firstly, the early reformers saw an early transition of labour out of agriculture, with manufacturing absorbing this labour in decades prior to the 1990s. Examples of these countries include Botswana, Nigeria, South Africa, Mauritius, and Egypt. Secondly, the later reformers saw a later transition out of agriculture, where labour being shed from agriculture in the 1990s and 2000s appears to have largely been absorbed in the services sector. Examples of these countries include Zambia, Tanzania, Ethiopia, Senegal, Malawi, Ghana, and Kenya<sup>4</sup>.

Furthermore, the African Center for Economic Transformation 2014 report re-affirmed that in order for the continent to sustain the recent economic growth and development on the continent, African countries need to vigorously promote economic transformation. To this end, countries need to diversify their production and exports, become more competitive on international markets, increase the productivity of all resource inputs; especially labour and they have to upgrade technologies they use in production. By doing so, countries can ensure that growth improves human well-being by providing more productive jobs and higher incomes and thus has everyone share in the new prosperity. To this effect, the Center has come up with an 'African transformation index' that consists of five indicators, namely: Diversification of production and exports; Export Competitiveness; Productivity; Technology; and Human economic well-being<sup>5</sup>.

One of the priorities in Agenda 2063 aspirations is creating well educated citizens and skills underpinned by science, technology and innovation which is linked to some of the key elements of the transformation index. It is also identified in the SDG 4 on ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all. The implementation of the associated WSIS action lines, namely, action lines C3, C4, C5, C6, e-learning, e-employment, e-agriculture, e-science, C8 and C10, which would demonstrate the role of ICTs in this regard.

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<sup>2</sup> <https://www.gsmaintelligence.com/research/?file=7bf3592e6d750144e58d9dcfac6adfab&download>

<sup>3</sup> [https://www.uneca.org/sites/default/files/uploaded-documents/Macroeconomy/africaeconomictransformation\\_en.pdf](https://www.uneca.org/sites/default/files/uploaded-documents/Macroeconomy/africaeconomictransformation_en.pdf)

<sup>4</sup> Maria Enache, Ejaz Ghani and Stephen O'Connell (2016). Structural Transformation in Africa: A Historical View. Washington, D.C.: The World Bank Group. Policy Research Working Paper 7743.

<sup>5</sup> African Center for Economic Transformation (2014). 2014 African Transformation Report: Growth with Depth. Accra: ACET.

Furthermore, while the continent is striving to industrialize, the role of new information and communication technologies (ICTs) is gaining momentum. ICTs are enablers of the structural transformation process and next generation of industrialisation i.e. industry 4.0 in addition to their central role in facilitating the implementation of the SDGs.

Since the beginning of the industrial revolution, advancements in technology have driven dramatic increases in industrial productivity. Industrialisation saw phases of growth from the steam engine powered factories in the 19<sup>th</sup> century to the electrification that led to mass production in the early 20<sup>th</sup> century and the automation of industries in the 1970s (IBA Global Employment Institute). While in the periods that followed industrial technological advancements were only incremental, today, the world is in the midst of a fourth wave of technological advancement: the rise of the new digital industrial technology known as Industry 4.0, a transformation that is powered by nine foundational technology advances – Autonomous robots; Simulation, Horizontal and vertical system integration; the Industrial Internet of Things; Cybersecurity; the Cloud; Additive manufacturing; Augmented Reality; and, Big Data and analytics<sup>6</sup>.

This is in line with the Agenda 2063 aspiration on creating transformed economies and SDG 9 on building resilient infrastructure, promoting inclusive and sustainable industrialisation and foster innovation<sup>7</sup> in which implementation of the range of WSIS action lines would enable realise this including action lines C2, C3, C5, e-government, e-business, e-environment, e-agriculture, C9 and C10.

The potential of ICTs for achieving sustainable development is therefore endless. In this regard, with the proliferation of mobile phones in the continent, there can be as many applications and tools for disseminating information and knowledge on sustainability issues including climate change.

In this regard, the WSIS High-Level Forum 2017 emphasized an implementation of WSIS targeting transformation of both the global economy and emerging, including African, economies. The WSIS High-Level Forum 2017 stressed that the WSIS Action Lines are in support of the implementation of the SDGs. It believes that ICTs continue to play a critical role in promoting, advancing and measuring the SDGs and pledged to enhance the capacities of member countries in this regard. Furthermore, it believes that ICTs are an important engine for achievement of the Sustainable Development Goals. Goals 9 and 17 are among the most relevant. Goal 9 addresses the promotion of inclusive and sustainable industrialization and fostering innovation in general and information and communications technology, in particular Goal 17 refers to science, technology development and transfer, and capacity building as means of implementation which play crucial roles in achievement of the 2030 Development Agenda. Although the SDGs, and also the Tunis Agenda make several direct and indirect references to transfer of technology, their cross-cutting relevance is not properly reflected in the SDG indicator framework. A major challenge that is facing many developing countries is the lack of appropriate technology that is required for the achievement of the SDGs.

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<sup>6</sup> The Boston Consulting Group (2015). Industry 4.0: The Future of Productivity and Growth in Manufacturing Industries. BCG: Boston.

### **3. WSIS action lines and the 2030 SDGs and Agenda 2063 targets**

The 2030 Sustainable Development Agenda adopted by the United Nations (UN) General Assembly in 2015 recognizes the key role of Internet and information networks in supporting sustainable development. ICTs are powerful tools for inclusion and poverty eradication, and it is imperative to empower everyone to make use of these tools. Hence they are key element that impact all SDGs. They should therefore be leveraged in the implementation of the SDGs and Agenda 2063. To this end, the digital divide must be overcome and that access to ICTs must be attained by all – so no one should be left behind. In Africa several initiatives showed that ICT will contribute substantially to the three dimensions of development covered by the SDGs.

The WSIS-SDG Matrix, developed by UN WSIS Action Line Facilitator and presented at the WSIS Forum 2015, will serve as the mechanism to map, analyse and coordinate the implementation of WSIS Action Lines, and more specifically, ICTs as enablers and accelerators of the SDGs. Furthermore, the United Nations Economic Commission for Africa (UNECA) has also extended the matrix to include the integration of the WSIS Action Lines with the Agenda 2063 targets as the regional priority agenda for the fifty years' period envisaged since the African Union celebrated its fiftieth anniversary of the foundation of the Organisation of African Unity (OAU) now the African Union.

To achieve the above, the international WSIS High Level Forum 2017 made the following propositions:

- Improved collaboration among stakeholders to bridge the digital divide and achieve sustainable development using ICTs.
- Building infrastructures in remote, unconnected areas is a first step towards boosting inclusive socio-economic development.
- Deployment of infrastructures should be complemented with actions such as providing local content (in the form of e-government services, for example) and strengthening digital literacy among end-users.
- Public-private partnerships in promoting development and innovation through the use of ICTs.
- Incentivising innovative thinking across all sector of the society.
- Using digital technologies to improve people's quality of life and support their personal development and autonomy.
- Exploiting the role of ICTs as a powerful tool for inclusion and for eradication of poverty.
- Leveraging new technologies such as the Internet of Things to transform societies.

However, it is recognised that there are challenges to meet these aspirations in that many countries are still dealing with high poverty rates and that deploying infrastructures in remote areas often proves to be challenging, especially when there are not enough incentives for the private sector to invest. Therefore, government actions should aim at supporting digital development in a holistic approach.



#### **4. Review of the Implementation and follow up of the WSIS action lines in Africa**

The WSIS Action Lines play a key role in supporting the implementation of the Sustainable Development Goals. The vital role of ICTs as a catalyst for development is specifically recognized in the new development framework Transforming Our World: The 2030 Agenda for Sustainable Development, which acknowledges that “the spread of information and communication technology and global interconnectedness has great potential to accelerate human progress and to develop knowledge societies, to bridge the digital divide and to develop knowledge societies, as does scientific and technological innovation across areas as diverse as medicine and energy”.

The effective implementation of the WSIS Action Lines can help accelerate the achievement of the SDGs. To that end, the WSIS-SDGs Matrix, developed by the UN Action Line Facilitators, clearly shows the linkage between each Action Line and the 17 SDGs and provides rationale for each ([www.wsis.org/sdg](http://www.wsis.org/sdg)). ICTs already empower billions of individuals around the world with wide ranging applications cutting across sectoral boundaries in agricultural productivity, health, education, transportation, industry, trade and finance, climate change and protection of our environment; as well as for the prevention and management of disasters, among many others. The section will focus on the progress made by African countries in the implementation of WSIS Outcomes in 2016-2017

##### **4.1 Action Line C1: The role of public governance authorities and all stakeholders in the promotion of ICTs for development**

The 2030 Agenda for Sustainable Development recognizes the critical role of ICTs as a catalyst for development, as follows: “*The spread of information and communication technology and global interconnectedness has great potential to accelerate human progress, to bridge the digital divide and to develop knowledge societies*”. Thus, ICTs energize and reinforce the three pillars of sustainable development: economic growth, social inclusion and environmental protection.

In doing so, Members States have committed to harnessing the potential of ICTs to achieve the 2030 Agenda for Sustainable and have made a call on all Governments, the private sector, civil society, international organizations, the technical and academic communities and all other relevant stakeholders to integrate information and communications technologies into their approaches to implementing the Goals. It is in this context that several African governments have put in place policies to integrate information and communication technologies (ICTs) in particular WSIS Action Lines into the national development plans, as enablers of Sustainable Development Goals?

As the effective participation of government and all stakeholders is vital in developing the information society, this requires an endeavor to enhance cooperation and partnerships among all parties. This action line contributes to several of the Sustainable Development Goals (SDGs), namely SDGs 1, 3, 5, 10, 16 and 17 and aims to promote the development of national e-strategies,

including the necessary human capacity building, taking into account different national circumstance.

A general overview is that in 2016, African governments have spared no effort to advance ICT Development Index, which was set for Africa at 2.48 points, just over half the world average of 4.94. ICT Development Index (IDI) 2016 which measures ICT access, usage and skills. In this regard, more than 80% of the countries have been developing and implementing national ICT policies and e-strategies since 2005. Several Governments are engaged in the review or the elaboration of a national strategy for the development of the digital economy linking them to their mid- and long-term national development plans, in relation with public, private and civil society stakeholders. As result, the Global ICT Development Index (IDI) as part of the Measuring the Information Society Report, showed that African countries achieved an improvement in their IDI value between 2015 and 2016.

**Table 2: ICT Development Index 2016 Regional Rank of Africa**

<b>RANK</b>	<b>COUNTRY</b>	<b>IDI VALUE 2016</b>	<b>2015 RANK (OUT OF 143)</b>	<b>IDI 2015 VALUE</b>
<b>73</b>	Mauritius	5.55	73	5.27
<b>87</b>	Seychelles	5.03	85	4.77
<b>88</b>	South Africa	5.03	86	4.70
<b>97</b>	Cape Verde	4.60	99	4.23
<b>108</b>	Botswana	4.17	109	3.79
<b>112</b>	Ghana	3.99	11	3.75
<b>120</b>	Namibia	3.64	121	3.20
<b>124</b>	Gabon	3.12	126	2.81
<b>129</b>	Kenya	2.99	129	2.78
<b>132</b>	Côte d'Ivoire	2.86	139	2.43
<b>133</b>	Zimbabwe	2.78	132	2.73
<b>134</b>	Lesotho	2.76	138	2.47
<b>136</b>	Swaziland	2.73	136	2.49
<b>137</b>	Nigeria	2.72	137	2.48
<b>141</b>	Senegal	2.53	140	2.41
<b>143</b>	The Gambia	2.46	141	2.40
<b>147</b>	Zambia	2.22	148	2.05
<b>148</b>	Cameroon	2.16	146	2.07
<b>149</b>	Mali	2.14	149	2.00
<b>150</b>	Rwanda	2.13	158	1.79

*Source: ITU, Measuring the Information Society Report (2016)*

Mauritius continue to maintain the lead position followed by Seychelles, South Africa, Cap-Verde and Botswana. However, Kenya achieved an improvement in its IDI score by 0.21 up from 2.78 in 2015 to 2.99 in 2016. Côte d'Ivoire achieved an improvement in its IDI value of 0.44 points between 2015 and 2016 making it the most dynamic country in Africa in terms of IDI value. It also moved up six places in the global IDI rankings. Namibia improved its IDI score from 3.20 in 2015 to 3.64 in 2016 ranking it second from Cote d'Ivoire.

For the 2017 report, as always, Mauritius remains the top ranking country in Africa with a score of 5.88 followed by Seychelles and South Africa. In Central Africa, Gabon score of 4.11 leads the subregion and ranks 6th in Africa and 114th in the world. There is a gain of 10 places for this country, because in 2016, Gabon was ranked 124th in the world. In West Africa, Côte d'Ivoire a score of 3.14 leads the subregion and ranks 131st in the world and 9th in Africa

The progress made by African countries in 2016 indicates that government are building awareness on the enabling role of ICTs in sustainable development and placing ICTs in central point of the national sustainable development agendas and policies. For instance, in the definition of their new policy some countries (Senegal, Ghana, South Africa, etc.) have fostering of cross sectoral approaches ICTs to accelerate achievement of SDGs (e-health, e-learning, e-business, e-agriculture, e-governance, etc.), given great importance to the empowerment of women by strengthening digital women's entrepreneurship and taking charge of social inclusion (disabled, women, children) and engaged all stakeholders into the national implementation.

To this end, some countries have implementing ground-breaking initiatives. Among them include:

- In October 2017, the Government of the Republic of Togo has approved its new ICT sectoral policy for the period 2018-2022. Four fundamental axes compose it: the development of national and international local infrastructures; the diffusion of ICTs in the economy and the increase of uses for the most vulnerable layers; strengthening competition across all market segments and ensuring national digital sovereignty, including cyber security and citizen protection
- Morocco now has its Digital Development Agency, a structure entirely dedicated to the implementation of the government strategy on boosting the digital economy (Maroc Digital 2016-2020). This agency will also be in charge of supervising young innovators and project leaders in the digital sector
- In the Republic of Guinea, thanks to the national ICT policy, the penetration rate of mobile telephony has thus increased from 20% in 2010 to more than 80% in 2016. The Internet penetration rate rose from 0% to 20% during the same period. The telecommunications sector is also a major contributor to the country's gross domestic product (GDP). Each year, it represents 22% of the national GDP.
- The Somalian Government has just adopted a new Telecommunications Law in October 2017. This new law will allow Somalian consumers to securely enjoy access to a wide range of mobile services such as international roaming, local interconnection, sending and

withdrawing money by mobile safely. This new legal framework will also allow the government to collect additional tax revenues through the licensing of mobile operators and the financial fees that telecom companies will have to pay to the state to operate on the national territory.

- Government of Chad plans to develop a national digital program 2017- 2021. The aim is to double the contribution of digital technology to the national economy by 2021, so that it represents between 6 and 8% of GDP. This Plan should also allow Chad to densify the quantity and quality of fiber optic coverage to achieve a bandwidth per capita of 1 Mbps
- Concerning broadband access, ECA has assisted countries in developing broadband policies and plans. Currently, support has been provided to develop national ICT policy and national ICT master plans Republic of Guinea Bissau and the Republic South.

**Box 1: E-strategies: Targeting African countries**

The African Civil Society on the Information Society (ACSIS) organization has developed the ACSIS WEB PLATFORM, which aims to provide African civil society and all partners (African governments, civil society, communities, the private sector, academia and international organizations) with a consistent information system focusing on WSIS and ICT activities relating to the African continent. The project directly addresses several SDGs, namely SDGs 1, 3, 4, 5, 8, 9, 10, 16 and 17, by promoting inclusive and sustainable ICT growth, peaceful and inclusive societies and lifelong learning opportunities for all African countries, ensuring healthy lives and equitable quality education, building resilient infrastructure and fostering innovation. The goal of the programme is to inform, train and educate Africans on issues related to Internet governance and WSIS action lines, as part of a unique platform for Africa and the African diaspora. The platform will also be progressively establishing an observatory on ICTs and the ICT profile of each African country.

*Source : WSIS Stocktaking (2017)*

Government and other stakeholders have also an important role in securing online space to accelerate the progress achieving SDGs. In this regard, in 2017, several African countries (Mauritius, Egypt, Rwanda, Niger, Senegal, Kenya, South Africa, Ivory Coast, Gahan, etc.) have put in place policies and/or good practices in capacity building to combat cybercrime. ECA's WSIS survey of Governments in 2016 indicated increased investment in ICTs for development, more widespread deployment of e-government portals, greater integration of ICTs in schools and deployment of electronic commerce applications. Integration of ICTs in other development sectors, such as agriculture and health is less advanced, but catching up with pilot projects and pilot applications being rolled out.

## **4.2 C2: Information and communication infrastructure**

Half of the world's population or nearly 3.8 billion people are connected to the Internet today and 8.4 billion connected things in 2017, setting the stage for 20.4 billion Internet of Things

(IoT) devices to be deployed by 2020, according to analyst firm Gartner<sup>7</sup>. The totality of this connectivity holds the potential to lift people out of poverty, transform the informal economy into the formal market, increase the productivity of people and the efficiency of supply chains, and in turn raise income, etc.

Africa, with more than 900 million people do not yet have access to the Internet, has thus invested in large-scale fiber optic network deployment programs., such as the project to build a fiber optic line. 4,500 km, part of NEPAD (New Partnership for Africa's Development) and linking Algeria to Nigeria via Niger. Many submarine cables now run along the African coast. Objective, to enable African countries to have access to quality telecommunications services. Backbone fibre networks are gradually spreading across most African countries and all coastal countries except Guinea Bissau & Eritrea have access to at least one submarine fibre cable and most countries have at least two.

There are over 1 million kilometres of terrestrial fibre<sup>8</sup> installed and cross-border fibre is increasing so that almost all countries will be connected to their neighbours by fibre by 2018. However, as shown the figure 1 below, there are therefore huge inequalities in access to the terrestrial infrastructure in the continent from one region to another, making some regions and a large part of the population totally absent from cyberspace and its challenges. Countries Ghana, South Africa and even Somalia on the coast, near to fiber-optic cables that provide, have faster access to a cheaper connection to internet broadband services while in Chad, Cameroon, Mali, Niger, Lesotho, Guinea-Bissau, Burkina Faso, Benin, Comoros and Togo Internet access is more expensive. Unlike Southern African countries, the terrestrial telecommunication networks of ECCAS member countries are not interconnected. In North Africa, although the region has a well-developed fiber optic cable network, there is still a problem in setting up a Maghreb regional fiber-optic network.

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<sup>7</sup> <http://www.zdnet.com/article/iot-devices-will-outnumber-the-worlds-population-this-year-for-the-first-time/>

<sup>8</sup> <http://www.africabandwidthmaps.com/>

**Figure 1: Intra-Africa Optical Fibre Network**



Source: Hamilton Research 2017, [www.africabandwidthmaps.com](http://www.africabandwidthmaps.com)

Whereas while the infrastructure has been improving and getting better in the continent in the last few years, Internet access in Africa has seen a significant increase in recent years thanks to the deployment of mobile telephony. International Internet bandwidth grew worldwide by 32% between 2015 and 2016. Africa experienced an increase of 72% during this period, the highest of all regions (ITU-ICT Facts and Figures 2017). However, connectivity compared to other regions of the world is still the lowest. The situation of is due to a delay in the development of infrastructures and access to the network which remains slow. Proportion of households with Internet access is still 18 per cent which is the lowest compared to other regions where 47.6 per cent in Arab States, 48.1 per cent in Asia and Pacific and the world average 53.6 per cent ( ITU-ICT Facts and Figures 2017). While in 2016, Internet access in the continent is growing at an average rate of over 4%, the disparities between countries remain "colossal" and range from 1 to 50. For example, In Somalia, Eritrea and Burundi, internet is accessible by less than 2% of the population, Kenya (68%), Seychelles (57.90%), South Africa (52%). According to Live Stat, Algeria, Nigeria, South Africa, Kenya, Egypt, Sudan and Uganda concentrate 80% of African Internet users.

The deployment of optical fiber is very long and expensive and will not connect all African regions. Fixed broadband subscription is still less than 1 per cent. In this connection, wireless broadband Internet access is growing faster than the fixed broadband, mainly driven by the growth

in mobile phone technologies. In some countries such as Kenya, for example, almost all Internet subscriptions are now on mobile networks. The rapid growth of mobile Internet is liberating Internet use from fixed locations and reshaping business models for mobile telecommunications including facilitating the growth of social networking, micro-blogging and others. This is why there is also a rapid growth in the use of social media and networks in the continent. Africa registered the highest growth rate of Facebook users globally in 2016. Facebook has grown its African user base to 170-million, 94% of whom use mobile to access the social network. Seven out of 10 internet users in Africa now log onto Facebook<sup>9</sup>.

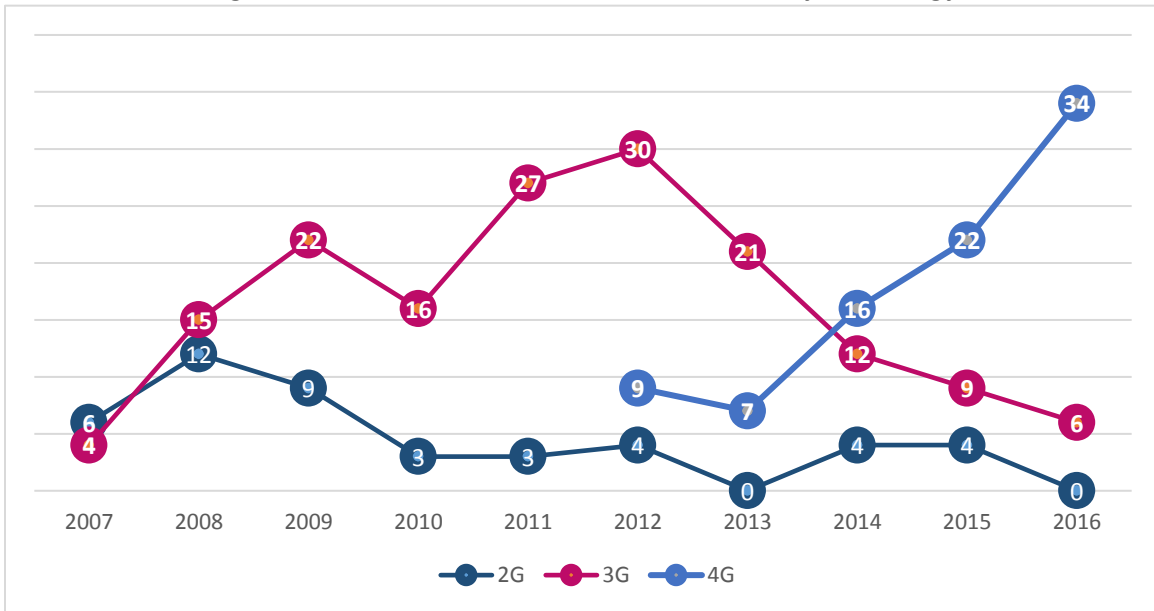
In data traffic, Africa is already recording the largest growth rates in mobile data consumption. According to the Cisco Visual Networking Index 2017<sup>10</sup>, Africa and the Middle East had the fastest growth rate in global mobile data traffic in 2016. While the world grew by 63%, the Middle East and Africa grew by 96%, more than Asia Pacific (71%), Latin America (66%) or Asia Pacific Central and Eastern Europe (64%). The trends will continue until 2021, and from this growth, Africa will have a fairly large share. The continent, and the Middle East region, will have the fastest growth of mobile data traffic in the world with an annual increase of 65%. They will be followed by Asia-Pacific at 49% and Latin America at 45%. In this regard, with the deployment of 2G, 3G and 4G LTE mobile networks, which now cover a large part of the African continent (figure 2), mobile broadband is bridging the gap and enable large size of the population to have access to the Internet. 4G connections are gaining more and more territory in Africa, supporting 26% of mobile connections in 2016. It will support 58% of mobile connections in 2021 and will also account for 79% of global mobile data traffic.

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<sup>9</sup> <https://www.forbes.com/sites/tobyshapshak/2017/04/05/facebook-has-170m-african-users-mostly-on-mobile/#31dca9a453dc>

<sup>10</sup> <https://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/mobile-white-paper-c11-520862.html>

**Figure 2: Sub-Saharan Africa network launched by technology**



Source GSM 2016

The continent has a unique domain name (.Africa) that extends across the continent. The 54 African countries are now united under a unique domain name unique to the continent. The benefits of a.africa domain name include displaying the brand and its commitment to the African continent, establishing a home for Africa-specific products and services, expanding the brand’s regional influence and acquiring valuable online real estate in a fast-growing and high-potential market<sup>11</sup>. More than 8,000 of the continent's largest brands and companies, as well as individuals, have already registered.

Therefore, in many countries, it is expected that infrastructure investment will continue to be a priority to ensure access. To this end, some countries have begun implementing ground-breaking initiatives. Among them, include:

**i) Mauritius**

Since 2016, government has committed important fund to improve internet connectivity, throughout the country. To this effect, Mauritius Telecom has reserved access to the submarine fiber cable which should be put into service in 2019. This telecom infrastructure, called IOX Cable System to provide broadband services, spanning more than 8850 kilometres, will provide design capacity of over 13 terabits-per second per fibre pair. This new submarine cable system will link Mauritius to South Africa and Reunion, and then to Rodrigues Island and India. In this regards, Mauritius leads the 2017 ranking of African countries in terms of mobile connectivity Index published by the World Association of Telecom Operators (GSMA). The GSMA mobile connectivity measures the capacity of more than 150 countries to connect their citizens to the mobile internet, and rank them according to a score ranging from 0 to 100. The ranking is based on four key factors namely infrastructure (facilities allowing access to mobile internet), prices

<sup>11</sup> <http://registry.africa/fr/>



(devices and mobile packages), the degree of predisposition of citizens who are not connected to learn the Internet. mobile internet (skills, cultural and political environment, etc.), as well as content (availability of services to meet the needs of a local population).

**Table 3: Top 10 Top 10 African Mobile Connectivity Index in 2016**

Country	Rank (out of 150)	Value 2016	Value 2015
Mauritius	76	62.7	61.0
South Africa	84	60	57.4
Tunisia	88	57.4	53.3
Morocco	95	55.1	51.8
Egypt	96	55.0	54.9
Algeria	99	52.7	48.5
Botswana	102	51.2	48.2
Namibia	103	50.2	48.6
Ghana	105	48.7	45.0
Angola	109	48.2	45.2

Source GSAM Report 2016 ( <http://www.mobileconnectivityindex.com/#year=2015>, accessed on.....)

With a score of 62.7, Mauritius ranks 76th worldwide. South Africa (84th worldwide) takes the second step of the podium in front of Tunisia (89th), Morocco, Egypt, Algeria, Botswana, Namibia and Ghana. Angola closes African Top 10. Cameroon (124th) is ahead of Rwanda (129th) and Côte d'Ivoire (130th). Guinea, Chad, the Democratic Republic of Congo and Niger are the latest on the African scale and globally, with scores between 20 and 17.2 This is due to serious lack of infrastructure as well as the high cost of the ICT service in addition to the lack of adapted content.

#### **ii) Côte D'Ivoire**

Agence Nationale (ANSUT) is the universal service agency in Côte d'Ivoire ([www.ansut.ci](http://www.ansut.ci)) in charge of bridging the digital divide across country. To finance connectivity, Ansut has an initial funding based on a national Tax of 2% of Telecommunications operators. Ansut has been able to raise additional funds (> 100 billion euros) from the market to finance its broad band's program in Côte d'Ivoire.

#### **iii) Malawi**

Using PPP to finance fiber optic networks, launch of connected schools program

#### **iv) Nigeria**

National ICT roadmap 2017-2020 with the launch in August 2017 of Smart cities program. Increase penetration rate with various solutions such as satellite. NIGCOMSAT is a national agency in charge of satellite communications. In order to improve the broadband penetration rate in the country and to support the local IT industry, the government will deploy 18,000 km of fiber optics in 2018.

#### **V) Burkina Faso**

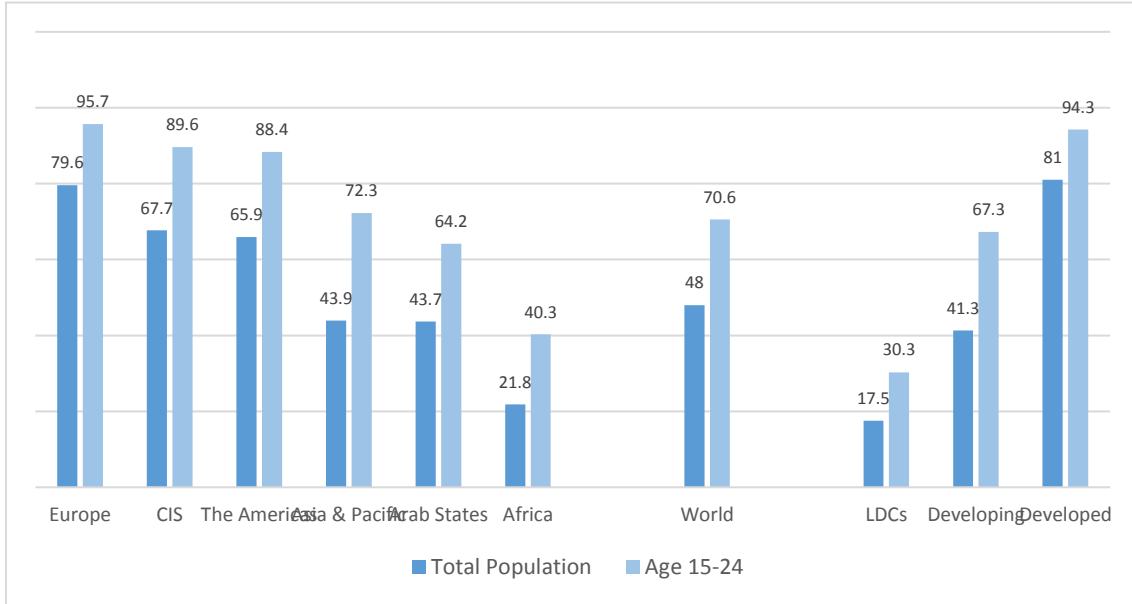
Burkina Faso is carrying out infrastructure projects to connect villages and cities, and is part of a regional broadband connectivity project for West Africa. The country is also implementing e-government initiatives that provide online services to citizens.

### **4.3 C3: Access to information and knowledge**

Internet access and penetration is very weak in Africa. It makes access to world's published information (paper & digital) difficult to scientists and researchers. Particularly, it affects negatively other users such as people living with disability, or people who are already marginalized, such as women in low-income groups and people living in rural areas. In this context this Action line C3 is crucial to fulfilling numerous established SDGs (SDGs 2, 4, 6, 8, 9, 10, 11, 12, 13, 14, 15 and 16). Access to information and knowledge is essential to ensure a successful agricultural industry, empower farmers by engaging them in policy/market processes and profitable sales, ensure sustainable educational processes and afford lifelong learning opportunities (SDGs 2 and 4). This action line contributes to ensuring the sustainable management of water; it can connect the national government with individual water users and thus increase transparency and raise awareness regarding water-related challenges (SDG 6). In order to reduce inequality, obtain transparency in markets and provide predictable trading systems for countries, access to information and knowledge is fundamental (SDGs 8 and 10). Open access to information can contribute to controlling levels of marine pollution; it allows cross-border communication and the rapid adaptation of preventive measures, favouring effective climate change-related planning and management (SDGs 13 and 14). It plays a critical role in the event of natural disasters and ensures conservation, restoration and sustainable use of terrestrial ecosystems (SDG 15).

The good development with the usage of Internet in the continent is that the proportion of youth (15-24) Internet users, African youth by far the better users compared to other regions of the world with 37.3 percent in Africa, 26.3 percent in Arab States and 25.8 percent in Asia and Pacific.

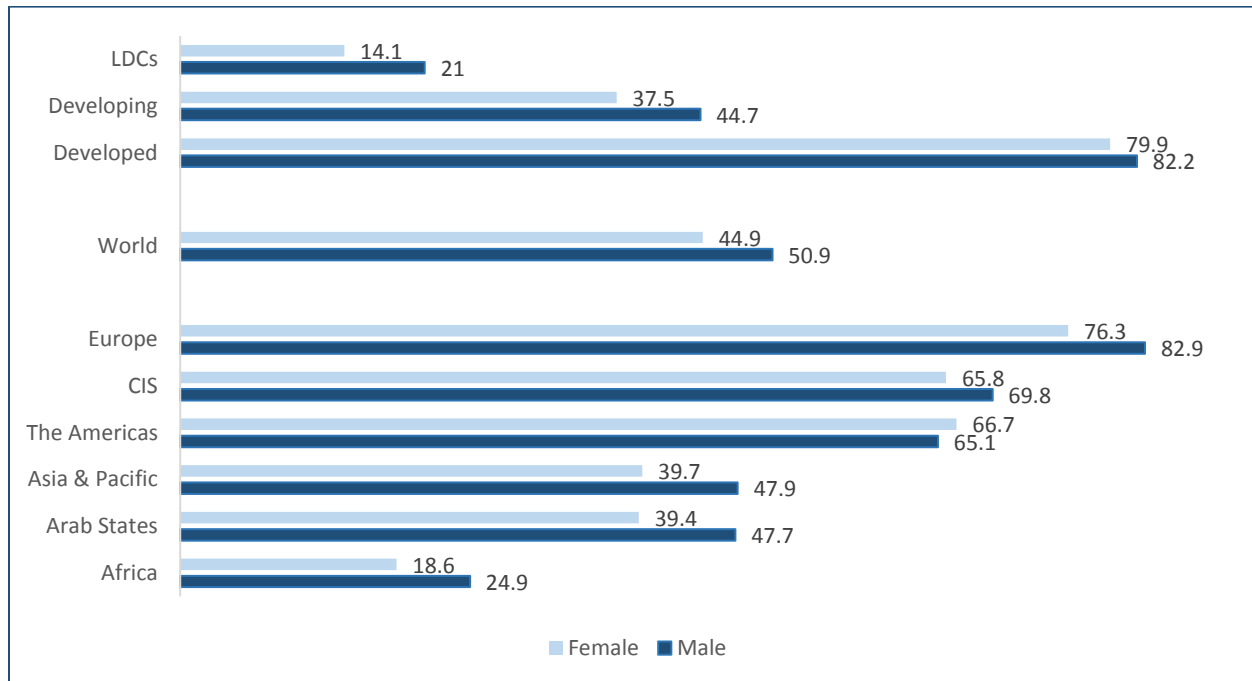
**Figure 3: Proportion of individuals using the Internet, by age, 2017**



Source: ITU. ICT Facts and Figures (2017)

The importance of gender equality and empowerment, as well as the potential role of the Internet and ICTs as determinants of sustainable development, have also been promoted in the 2030 Agenda for Sustainable Development. The importance of this equality is also clearly stated in the 2063 agenda of the African Union Commission. The importance of women's access, an important part of the workforce, to ICT in achieving the Sustainable Development Goals (SDGs) of the 2030 Agenda, is perfectly reflected in Goal 5 of the Agenda by the commitment of all States to prioritize universal access to the Internet by 2020 and to empower women by facilitating the use of ICTs. However, while the gender gap has narrowed in most regions since 2013, it has widened in Africa. According to ITU (2017), the gender gap in global Internet usage has increased from 11% in 2013 to 12% in 2016. In Africa, the proportion of women using the Internet in 2017 is 25% lower than the proportion of men using the Internet.

**Figure 4: Internet penetration rate for men and women, 2017**



**Source: ITU. ICT Facts and Figures (2017)**

Several countries (Senegal, Nigeria, South Africa, and Rwanda) have embarked on a comprehensive program to reduce the digital gender divide and create a policy environment and investments that promote digital equality by increasing women's participation in public and private institutions, particularly in decision-making bodies. And the implementation of training and digital entrepreneurship programs for girls and women.

The key in determining access and usage of ICTs is the price of service such as for voice and data. Although the pricing of voice services in many African countries has become competitive and in-line with the rest of the world, taking the differences in GDP into account as compared to global benchmarks, Africans are still paying more on a GDP basis. The ITU ICT price basket analysis shows the extent of the gap that for mobile cellular calls, Africans pay on average 24.6% of monthly GNI per capita versus 11.4% in other developing countries. On the other hand, the story of mobile penetration is far better than the Internet; overall 80 % of African residents have a mobile subscription which is more than four times the penetration of the Internet.

African countries have undertaken concrete measures to promote *access to knowledge* in cyberspace through subsidizing broadband to academic institutions and libraries. In this regard, Africa is progressively embracing free and open source software including development application and services using open sources software and the availability of content in a familiar or local language would enhance the usage and adoption of ICTs. In this regard, Educational services via a mobile device connected (mobile-learning or mobile-education) is the main lever to

make available content for learning (teacher training, learner-centred pedagogy, assessments) or to promote the access to information and knowledge.

**Box 2: Mobile ICT Telecentres**

In Algeria, the Mobile ICT Centers (Télécentres de Proximité Mobile) project aims to ensure healthy lives and equitable quality education, promote economic growth and reduce gender inequality by empowering all women and girls in the country (SDGs 3, 4, 5, 8, 10 and 16). The Mobile ICT Centers are five ICT-equipped buses intended to provide remote rural populations, especially women, with proper access to ICTs so that they can obtain training, information and new opportunities for communication and access to networking in order to improve their living conditions and level of qualification and give them more employment opportunities.

*Source : Ministère de la Formation et de l'Enseignement Professionnels, Algeria*

Some countries have already invested in a robust and resilient communication infrastructure with the construction of the National Backbone. However, given the overall low level of penetration of the Internet in Africa as indicated above, the role of public ICT access points through libraries, telecentres and cybercafés are important. In this regards, countries have launched innovative initiatives to enhance access to information and knowledge among communities particularly disadvantaged communities.

The government of Rwanda, Mauritius, etc. developed a number of community access centres which are effective anchors for broadband demand in areas where individual household connections are not yet viable .Today telecentres have evolved by being less concerned with the provision of simple access and more concerned on the provision of specific kinds of services to specific communities thus providing services and support ranging from small business support to e-government, e-health, community based multi-media training and production opportunities, etc. Studies indicate that the youth (15-35 year-olds) represent the vast majority of users of public ICT access points<sup>12</sup>. Public ICT access points in the form of telecentres have been developed as a means of providing access to computing and telecom services in rural communities.

**Box 3: Heading is missing**

In Mauritius, the Ministry of Technology, Communication and Innovation has developed the Democratizing access to ICTs through cyberaravans, computer clubs and Wi-Fi in Mauritius. No fewer than 270 computer clubs, each equipped with around three Net PCs/tablets and free Internet access, were set up across the island to democratize access. Some 1.3 million registrations, including recurrent users, have been noted. Furthermore, 369 locations in Mauritius will be equipped with Wi-Fi and 10 Mbit/s connections through fibre optics. The National Computer Board (NCB) also operates three cybercaravans equipped with broadband Internet through which training is provided to the community by registered IT Support Officers according to the specific needs of different segments. A total of 181,541 participants have undergone training in ICT awareness, 2,793 in Internet core computing certification, 62 in the Microsoft Office package and 61 in an ICT literacy programme. The programme is conducted in partnership with Microsoft, Mauritius Telecom, the Mauritius Telecom Foundation and the National Empowerment Foundation, and is consistent with SDGs 4 and 9.

*Source : WSIS Stocktaking (2017)*

<sup>12</sup> Gomez, Ricardo, Camacho, Kemly (2009). Who uses ICT at Public Access Centers? Age, education, gender and income differences in users of public access to ICT in 25 developing countries. *ICIS Conference, SIG GlobDev Workshop, Phoenix, Arizona, December 14, 2009.*

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Also, trust will lead to greater use of information and knowledge and accessibility of these resources. Users of knowledge resources should not be under surveillance. Indeed, without confidence, users will desert libraries, archives, documentation centers & online repositories. In this regard the Economic Commission for Africa through its Knowledge and Library Services Section has expanded its promotion of access to information and knowledge by using the Access to Socioeconomic Knowledge in Africa (ASKIA)<sup>14</sup> online interactive portal that features a federated search engine to probe scientific and socio-economic information from multiple sources to discover knowledge and associated information from/on Africa. ASKIA continues to unlock African knowledge through the African Virtual Library and Information Network (AVLIN) and other stakeholder communities including scientists, researchers, academics, students, economists and, policy-makers and presents such knowledge and information in 5 languages (English, French, Arabic, Spanish, & Portuguese). ECA has further extended access to its comprehensive knowledge collections of over 200,000 titles, E-resources from 139 online databases, OCLC spotlight programme – 74,000 libraries (libcat.uneca.org) by creating a union catalogue of resources from its 5 sub-regional offices and IDEP as well as the repository of its knowledge product of 60 years - 34,000 + titles and linked to various UN catalogues (repository.uneca.org). It has also launched an ECA Knowledge Hub<sup>15</sup> that brings all together and facilitates the knowledge discovery, consultation, and collaboration efforts of its constituencies on the latest social and economic development issues in Africa.

Despite progress made by African countries to promote access to information and knowledge, to policy makers and other ICT4D stakeholders are faced with several critical challenges. Among them the infrastructure is still insufficient in some remote areas, including electricity. Internet access is still too often a luxury, the price of data remaining high.

#### **4.4 C4: Capacity building**

The rationale for this action line is that every individual and every community should have the necessary knowledge and skills to fully leverage the benefits of ICTs. This action line ensures that ICTs are fully integrated in education and training at all levels, thus contributing to reduction of poverty (SDG 1). In parallel to the growing adoption of ICTs, the need for access and knowledge

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<sup>13</sup> Gomez, Ricardo, Camacho, Kemly (2009). Who uses ICT at Public Access Centers? Age, education, gender and income differences in users of public access to ICT in 25 developing countries. *ICIS Conference, SIG GlobDev Workshop, Phoenix, Arizona.*

<sup>14</sup> <http://askia.uneca.org>

<sup>15</sup> <http://knowledge.uneca.org>

is increasing, making this action line very important in the promotion of sustainable agriculture and achievement of food security (SDG 2). It is also crucial to SDGs 5 and 10 – on removing gender barriers, the promotion of equal training opportunities and reducing inequality within and among countries. Steps taken on capacity building can increase scientific knowledge and develop research and innovation capacity in order to conserve and sustainably use oceans and marine resources (SDG 14). In order to prevent violence and combat terrorism and crime, human capacity building needs to go hand in hand with institutional capacity building (SDG 16).

The rapid space of ICT and its implications for human and institutional capacity building are now a major concern for governments, the private sector and all other actors. In this regard, the majority of governments in Africa put in place and implemented the inclusive policy, legal and regulatory frameworks and promoted and facilitated accessibility of ICTs for all. They further sensitize the population through digital literacy campaign, to use the internet, facilitates the provision of low-cost user devices, and creates e-government applications and digital content that foster the use of internet.

In the education sector, policymakers widely accept that access to ICT can help individuals to compete in a global economy by creating a skilled work force and facilitating social mobility (UNESCO 2015). They emphasize that ICT in education has a multiplier effect throughout the education system, by:

- Enhancing learning and providing students with new sets of skills;
- Reaching students with poor or no access (especially those in rural and remote regions);
- Facilitating and improving the training of teachers; and
- Minimizing costs associated with the delivery of traditional instruction.

Therefore, the need for “soft” skills are echoed by the Partnership for 21<sup>st</sup> century learning<sup>16</sup>, which lists three types of skills required for the development:

- Learning Skills (i.e. Critical Thinking, Creative Thinking, Collaborating, and Communicating);
- Literacy Skills (i.e. Information Literacy, Media Literacy, and Technology Literacy); and
- Life Skills (i.e. Flexibility, Initiative, Social Skills, Productivity, and Leadership).

In this regard, several countries have reformed their education systems in recent years to integrate information and communication technologies (ICTs) for teaching and learning purposes. Governments and their partners have undertaken several initiatives to create new opportunities for knowledge sharing to develop networking and human resources. As a result, there are promising initiatives in the continent that innovatively use ICTs towards promoting e-learning and education/training. They also increase investment in ICT in education institutions to ensure that people are information-literate. However, in several countries, ICT integration in the education system remains low at all levels leading to an ineffective capacity building system with a very small percentage of children having access to digital literacy skills from an early age. Few countries have made performance in introducing ICT in Education system.

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<sup>16</sup><http://www.p21.org/about-us/our-mission>

In 2015, Rwanda developed its ICT integration in education sector master plan with the vision to harness the innovation and cost-effective power of World-Class Education technology tools. The main target is to use ICTs in order to improve the quality of education, increasing access and allowing diversity of learning methods. As results, the percentage of High Learning institutions connected to Internet is 100% since 2012. Similarly, the percentage of High Learning institutions with a network computer lab is 100% since 2012. In addition, in 2012, there was only one laptop per 17 teachers (primary education), however in 2015 a progress was register with one laptop per only 6 teachers (rather than 17). It goes without saying that more progress need to be made.

**Table 4: ICT in Education: Rwanda Case**

Key Indicators	2012	2013	2014	2015
<b>I. PRIMARY EDUCATION</b>				
Computer to teacher ratio (Number of Computer: Number of Teachers)	1:17	1:08	1:08	1:06
Computer to Pupils ratio (Number of Computer: Number of Pupils)	1:40	1:15	1:15	1:16
Percentage of schools with computer infrastructure	39%	49%	56.10%	58.80%
Total number of OLPC <sup>17</sup> laptops distributed	152,768	203,763	204,321	245,785
Percentage of schools connected to the Internet	6%	6%	8%	10.25%
Percentage of schools with a networked computer lab	1%	1%	2%	3.90%
<b>II. SECONDARY EDUCATION</b>				
Computer to teacher ratio (Number of Computer: Number of Teachers)	1:06	1:07	1:06	1:11
Computer to Students ratio (Number of Computer: Number of Students)	1:40	1:44	1:32	1:28
Percentage of schools connected to the Internet	18%	14%	16.90%	16.10%
Percentage of schools with a networked computer lab	25%	31%	31%	43%
<b>III. TERTIARY EDUCATION</b>				
Computer to admin. staff ratio (Number of Computer: Number of admin. staff )	1:02	1:01	1:02	1:02
Computer to acad. staff ratio (Number of Computer: Number of acad. staff )	1:04	1:02	1:03	1:03
Computer to student ratio (Number of Computer: Number of Students)	1:19	1:10	1:07	1:05
Percentage of High Learning institutions connected to Internet	100%	100%	100%	100%
Percentage of High Learning institutions with a network computer lab	100%	100%	100%	100%

Source: ICT Sector Profile (2015)-Rwanda

<sup>17</sup> OLPC: One Laptop per Child (year is missing)



Internet access has been improving in higher education institutions in Africa, thanks to efforts by champions in establishing National Research and Education Networks (NREN), and due to the funding from development partners such as the European Commission and the World Bank. However, the progress with the National Research and Education Network formation varies considerably, with only universities in Algeria, Egypt, Kenya, Morocco, Senegal, Tunisia, South Africa, Uganda and Zambia attaining acceptable degrees of access comparable to their peers in developing south (i.e. Asia and Latin America).

Several initiatives in building the capacity of professionals and experts including policy and decision makers have been undertaken across the continent during the period under review. Internet security training programs are aimed at professional journalists and civil society media actors from 10 West African countries. They aim to build the capacity of 500 journalists, bloggers and activists to protect the sources and data exchanged. The threats to the journalists-citizens are numerous and multiple and pass notably by the vulnerabilities in their information systems. Global e-Schools and Communities Initiative (GESCI) has launched the African Digital Schools Initiative (ASDI), in partnership with MasterCard Foundation, Ministry of Education Kenya, Ministry of Education Tanzania, and Ministry of Education Côte d'Ivoire.

**Box 4: One billion to transform the education of Malawian children**

The One billion, a not-for-profit developer and publisher of educational apps, wanted to find a way to help Malawian teachers educate children with the help of technology. One billion's ambitious goal is to transform the education of one billion marginalised children.

It has already established five *oneclass* learning centres in Malawi, with another 200 classrooms planned nationwide, providing apps in the local language, on solar powered tablets.

Source: Onebillion to transform the education of Malawian children, September 2017, Retrieved November 15, 2017 from <http://www.installation-international.com/avtechnology/onebillion-transform-education-malawian-children/>

In Mauritius, the National Computer Board (NCB) has launched the Universal ICT Education Programme in partnership with the Cyber Learning Foundation, Certiport and the Ministry of Education and Human Resources. The implementation model is also particularly interesting, whereby resources of State secondary schools that were idle after school hours, at weekends and during vacations have been put to use. More than 230 000 persons have been trained to date

In Sierra Leone, B-Gifted Foundation of Sierra Leone has launched Digital Hope (ICT for an inclusive information society), in partnership with Teach a Man to Fish, UK; National Telecom, Sierra Leone; National Youth Commission, Sierra Leone; and UN ITU TELECOM's Young Entrepreneurs and Innovators 2011 competition, and serving.

A number of project were developed, such as :

- Smart Africa scholarship fund aimed at supporting deserving students with funds to study ICT in African centres of excellence,
- Girls in ICT regional and continental forum aimed at improving digital inclusion,

- Capacity building for member States in result-based strategic planning and project identification
- Strengthening the enabling environment for a sustainable digital economy in Africa aimed at enhancing the capabilities in ICT policy and regulatory institutions.
- Etc.

Despite several initiatives, the continent is faced with key challenges for capacity building success to participate in the Internet Society. Among them include limited literacy and skills that are needed to participate in the Internet economy, lack of adequate ICT infrastructures, high taxes of ICT hardware and software. The increasingly lack of traditional or digital literacy and necessary digital skill sets among women, rural, poor, elderly, people even where physical infrastructure exists, meaning that they are not able to convert ICT resources to yield digital dividends. Among the factors include fear of using digital technologies, lack of digital capacity among those responsible for educating others (teachers, trainers, municipal officers, etc.), developing new, high-quality e-learning content is costly in terms of time and money. In addition, the low retention of human capital or scarce talents / skills in the public sector as well as the language barriers faced by diversified communities in Africa impact the development of applications and on-line content.

#### 4.5 C5: Building confidence and security in the use of ICTs

With the impressive economic growth and digitisation in the continent, there is however new risks and vulnerabilities that comes with it that could undermine progress. The main factor among these is the global rise of cybercrime. As Africa’s economy moves online, citizens, their computer systems, and the Continent’s information technology (IT) infrastructure become enticing targets for an increasingly professional cadre of cyber criminals. While it is not only the problem of Africa, the total direct cost of cybercrime globally reached in 2013 an estimated USD\$ 113 billion. In South Africa, 67% of adults reported to have experienced cybercrime in the last year, which amounted to have cost the South African economy USD\$ 242 million where it costs each cyber crime victim in South Africa USD \$ 274 per year. While 8.8 million South Africans were victims of online crime in the past year, globally, there were 602 million cybercrime victims over the last 12 months<sup>18</sup>. According to Symantec, in 2015 more than 430 million new unique pieces of malware globally have been discovered, which 36 per cent is up from the year before.

**Table 5: Top 10 Source African Countries for Attacks (2016)**

<i>COUNTRY</i>	<i>RANK</i>	<i>PERCENTAGE WITHIN AFRICA</i>	<i>INCIDENT COUNT</i>
<i>South Africa</i>	1	25%	314,880
<i>Egypt</i>	2	12%	149,685
<i>Kenya</i>	3	9%	106,265
<i>Nigeria</i>	4	7%	89,100
<i>Mauritius</i>	5	6%	73,134

<sup>18</sup> African Union Commission and Symantec (2016). Cyber Crime and Cyber Security: Trends in Africa. AUC & Symantec.

<i>Algeria</i>	6	5%	60,381
<i>Seychelles</i>	7	4%	45,661
<i>Botswana</i>	8	3%	37,880
<i>Morocco</i>	9	3%	34,464
<i>Tunisia</i>	10	3%	32,187

Source : [https://www.thehaguesecuritydelta.com/media/com\\_hsd/report/135/document/Cyber-security-trends-report-Africa-en.pdf](https://www.thehaguesecuritydelta.com/media/com_hsd/report/135/document/Cyber-security-trends-report-Africa-en.pdf).

Therefore, African policymakers began to implement effective policies and awareness initiatives to stem the rising tide of cyber threats. As result, A macro-level of region, the use of secure servers, servers using encryption technology in Internet transactions, increased significantly from 2015 to 2016 (Table 6).

**Table 6: Secure internet servers (region)**

Country	2013	2014	2015	2016
Arab World	5299	7354	8731	9592
East Asia & Pacific	252076	297681	325929	354008
Europe & Central Asia	391045	477925	558872	593033
Euro area	223453	281142	333018	337003
European Union	349125	422960	492002	509512
Latin America & Caribbean	24517	30928	35839	37097
Middle East & North Africa	8187	10321	12378	14046
North America	449574	537083	577701	570454
OECD members	1059349	1262894	1394006	1414662
Sub-Saharan Africa	6094	8340	9780	9999
World	1137052	1370323	1530602	1590393

Source: World Bank

Although policy makers and professional long recognised the importance of reliable threat information regarding cybercrime threats in the region, there is still long way for African to overcome this lack of detailed and reliable information on cybercrime.

However, the situation of cybercrime legislations show that countries are at different state of play with regard to laws enforcing cybercrimes. For instance, according to the Global Cybersecurity Index 2017 (GCI) published by ITU, Egypt and Mauritius are among the best in the world alongside 20 other countries including the United States, Switzerland, France, Canada, Australia or Japan.

**Table 7: Top three ranked countries in Africa - Global cybersecurity Index 2017**

COUNTRY	GCI Score	Legal	Technical	Organizational	Capacity Building	Cooperation
MAURITIUS	0.83	0.85	0.96	0.74	0.91	0.7
EGYPT	0.77	0.92	0.92	0.4	0.92	0.7
RWANDA	0.6	0.6	0.71	0.79	0.66	0.28
KENYA	0.57	0.75	0.73	0.36	0.41	0.6

Source Global Cybersecurity Index 2017 - [https://www.itu.int/dms\\_pub/itu-d/opb/str/D-STR-GCI.01-2017-PDF-E.pdf](https://www.itu.int/dms_pub/itu-d/opb/str/D-STR-GCI.01-2017-PDF-E.pdf)

In the mature category (77 countries), several other African countries stand out: South Africa, Algeria, Botswana, Cameroon, Ivory Coast, Ghana, Kenya, Morocco, Nigeria, Uganda, Rwanda, Senegal, Tanzania, Tunisia.

In addition, the category Initiation reveals 96 countries among which, in Africa: Angola, Benin, Burkina Faso, Burundi, Cabo Verde, Central African Republic, Chad, Congo, DRC, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Guinea, Guinea Bissau, Liberia, Lesotho, Libya, Madagascar, Malawi, Mali, Mauritania, Mozambique, Namibia, Niger, Sao Tome and Principe, Seychelles, Sierra Leone, Somalia, Sudan, South Sudan, Swaziland, Togo, Zambia and Zimbabwe.

**Box 5: Top 5 ranked countries in Africa**

- **Mauritius** is the top ranked country in the Africa region. It scores particularly high in the legal and the technical areas. The Botnet Tracking and Detection project allows Computer Emergency Response Team of Mauritius (CERT-MU) to proactively take measures to curtail threats on different networks within the country. Capacity building is another area where Mauritius does well. The government IT Security Unit has conducted 180 awareness sessions for some 2 000 civil servants in 32 government ministries and departments.
- **Egypt** ranks second with a full range of cooperation initiatives. It is a member of the UN Government Group of Experts (GGE) on cybersecurity<sup>19</sup>, has chaired the ITU Working Group for Child Online Protection<sup>20</sup>, was a founding member of AfricaCERT<sup>21</sup>, and has a number of bi-lateral and multilateral agreements on cybersecurity cooperation.
- **Rwanda**, ranked third, scores high in the organizational pillar and has a standalone cybersecurity policy addressing both the public and private sector<sup>22</sup>. It is also committed to develop a stronger cybersecurity industry to ensure a resilient cyber space.
- **Kenya**, ranked third in the region, provides a good example of cooperation through its National Kenya Computer Incident Response Team Coordination Centre (National KE- CIRT/CC)<sup>23</sup>. The CIRT coordinates at national, regional and global levels with a range of actors. Nationally this includes ISPs

<sup>19</sup> <https://www.un.org/disarmament/topics/informationsecurity/>

<sup>20</sup> <http://www.itu.int/en/council/cwg-cop/Pages/default.aspx>

<sup>21</sup> <https://www.africert.org/home/>

<sup>22</sup> [http://www.myict.gov.rw/fileadmin/Documents/National\\_Cyber\\_Security\\_Policy/Rwanda\\_Cyber\\_Security\\_Policy\\_01/](http://www.myict.gov.rw/fileadmin/Documents/National_Cyber_Security_Policy/Rwanda_Cyber_Security_Policy_01/)

<sup>23</sup> <http://www.ke-cirt.go.ke/index.php/members/>

and the financial and educational sectors; regionally it works with other CIRTs through the East African Communications Organization; and internationally it liaises with ITU, FIRST, and bi-laterally with the United States and Japan CIRTs among others.

*Source : [https://www.itu.int/dms\\_pub/itu-d/opb/str/D-STR-GCI.01-2017-PDF-E.pdf](https://www.itu.int/dms_pub/itu-d/opb/str/D-STR-GCI.01-2017-PDF-E.pdf)*

An overview of the situation in the 54 countries of Africa in terms of specific criminal law provisions on cybercrime and electronic evidence suggests, according to the AUC and Symantec study as at April 2016, shows<sup>24</sup>:

- 11 States seemed to have basic substantive and procedural law provisions in place (Botswana, Cameroon, Côte d'Ivoire, Ghana, Mauritania, Mauritius, Nigeria, Senegal, Tanzania, Uganda and Zambia) although implementing regulations may still be missing in one or the other country.
- A further 12 States seemed to have substantive and procedural law provisions partially in place (Algeria, Benin, Gambia, Kenya, Madagascar, Morocco, Mozambique, Rwanda, South Africa, Sudan, Tunisia and Zimbabwe).
- The majority of African States (30) did not have specific legal provisions on cyber crime and electronic evidence in force.
- Draft laws or amendments to existing legislation reportedly had been prepared in at least 15 States (Burkina Faso, Djibouti, Ethiopia, Guinea, Kenya, Lesotho, Mali, Morocco, Namibia, Niger, South Africa, Swaziland, Togo, Tunisia, and Zimbabwe).<sup>12</sup> In some instances, bills had been presented to national parliaments, in others the fate of draft laws is uncertain.

Some of these countries also have an authority dedicated to cybersecurity, even a CERT whose role is to respond to incidents. But many African countries are struggling to effectively combat cybercrime, due in part to a large shortage of skilled human resources, limited resources (including financial) for governments and organizations, a limited level of awareness of cyber issues -security among stakeholders, and a lack of awareness of the risks associated with the use of ICTs. In addition, the low number of cooperation mechanisms between African countries and with the rest of the world makes it extremely difficult for law enforcement authorities to identify, apprehend and try cybercriminals. Finally, there is a risk in some states that cybersecurity is misguided to limit freedom of expression in some countries.

#### **4.6 C6: Enabling environment**

This is the policy action line - This action line being a cross-cutting and fundamental tool aims to enable countries and stakeholders to benefit from the universal access to information and knowledge. It is evident that by building an enabling environment for ICTs, it will enable achievement of the SDGs through the many goals that this action line is linked. Africa is one of

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<sup>24</sup> Ibid 4

the largest continents of the world with abundant resources that are key to its economic growth. However, the continent remains to be faced with considerable development challenges. Today, there is a need to create an appropriate enabling environment, to expand ICT access among young people in particular in the rural areas and to enable them to realize their potential in the information society. Governments shall review, reorient or create a comprehensive policy framework in collaboration with all relevant stakeholders, including civil society and the private sector, for a better ICT.

The Doing Business 2017 Report<sup>25</sup> published by World Bank show that 47 African countries implemented 80 reforms between 2015 and 2016 on improving the business environment. This performance represents an increase of 14% increase compared to 2016 Report. Several countries in the region (Niger Kenya, Ivory Coast, Mauritania, Rwanda, Senegal and Togo) implemented four reforms. The best business environment in Africa is Mauritius which is ranked 49th in the world, followed by Rwanda (56th), Botswana (71) and South Africa (74). Eritrea (189th) Central African Republic (185th), Somalia (190th) and South Sudan (186th) are the lowest ranked.

**Table 8: Doing Business 2017: Top 10 countries in Africa**

1	Mauritius	49
2	Rwanda	56
3	Morocco	68
4	Botswana	71
5	South Africa	74
6	Tunisia	77
7	Kenya	92
8	Seychelles	93
9	Zambia	98
10	Lesotho	100

*Source : World Bank : Doing Business 2017*

The development of ICT such as e-Government tools has enabled Rwanda to perform well. As result, Rwanda ranks second in the world in terms of obtaining loans. It is fourth for the transfer of ownership, with the introduction of a reform that reduces to 12 days the time to make transfers, against 22 for OECD member countries.

Some African countries have made considerable efforts in implementing universal access as a key issue for the development of the continent. The universal deployment of broadband can be a powerful accelerator of development and economic growth. Technological innovations associated with the development of mobile networks, as well as, increasingly, the shift to broadband networks have already begun to transform the way in which universal access is extended to rural and remote areas. This is why several countries in Africa (Kenya, Rwanda, Uganda, Tanzania, Cape Verde, Mauritius, Ghana, South Africa, Ghana and Cameroon) have already included broadband in their definition of universal service since 2016. Most of these countries have set up multipurpose

<sup>25</sup> <http://www.doingbusiness.org/~media/WBG/DoingBusiness/Documents/Annual-Reports/English/DB17-Report.pdf>

community centers (CMPs) in villages in rural areas by involving school education and also postal services.

Regulation is a key factor for promoting financial inclusion ranging from enabling access to digital services to all through making infrastructure available to regulating prices and making it affordable and finally introducing new regulatory mechanisms for new and emerging ICT services (financial services, IoT, e-commerce, etc.). In this regard, the majority of the countries continue to put in place mechanism to open the ICT market. The African ICT market has different degrees of maturity and regulation. While fixed telephony services are characterized by strict regulation with a limited number of players, the mobile phone markets with more than two hundred operators are much more open and competitive. Several countries have three operators. Nigeria has nine licensed operators, and there are seven operators that were licensed in Tanzania. The only countries with no competition are Ethiopia and Eritrea where incumbent operators still provide cellular, Internet and fixed services.

Other enabling environment that Africa recently created is the mobile industry. The mobile industry in sub-Saharan Africa for instance has pledged to invest some multi billion over the next five years to extend coverage to rural areas and roll out mobile broadband services. Electronic transactions are becoming increasingly important for governments, businesses and consumers in most countries. E-commerce, mobile money services are developing and creating many opportunities, but still faces the major hurdle of implementing a regulatory environment. Online fraud and data breaches are creating growing concern and calling for adequate legislative and regulatory responses to grow domestic and foreign trade. Government are recognizing the importance of creating an open and level playing field for mobile money services. In 2016, 52 out of 92 countries with mobile money services had an enabling regulatory framework<sup>26</sup>. However, it is not easy to adopt a satisfactory legal and regulatory framework, given the variety and complexity of laws and regulations and the rapid evolution of technologies and markets. In this regard,

- Banks in South Africa, including the Reserve Bank, are beginning to accept the innovation of digital currencies and blockchain technology despite the differing opinions of regulators on matters such as cryptocurrencies.
- The Bank of Ghana has published a ‘Schedule for Payment of Mobile Money Interest to Customers’ outlining the dates scheduled for the transmission of the accumulated trust account interest to mobile money users.

At the regional level, there has been a continued effort by regional bodies in promoting regional consensus around policies and regulation that promote the ICT sector. For instance, to further improve the regulatory framework in the region and to address emerging issues ECOWAS, ECCAS adopted in 2016 regional ICT framework. This identifies a number of action and implementation plans in focus areas such as an enabling policy and regulatory environment; infrastructure development; affordable internet access; aiding the development of innovative services and content; and cybersecurity. In order to harmonize national legislative and regulatory

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<sup>26</sup> State of the Industry Report on Mobile Money, GSMA, 2017

frameworks Member States have started to transpose these Community provisions into their legislation in order to create unified, dynamic and competitive markets

## 4.7 C7 E-Applications

Technology adoption continues to rise in the continent with mobile device ownership growing exponentially, social media use increasing, and the Internet of Things (IoT) quickly becoming a reality. Several measures show that Africa is poised to make great gains and help fuel global growth into the future. In several areas Africa is showing progress with regards to the application of ICTs in various sectors from public service through e-government to businesses, health, education and agriculture sectors, etc. This action line also contributes to such SDGs as SDGs 9, 16 and 17. The following section provides some highlights and case examples of progresses made in the continent:

### 4.7.1 E-government

African governments have been making important steps in promoting transparency, efficiency and good Governance with e-Government solutions. However, compared to other parts of the world, Africa still lags globally with a low average on the global e-government development index (EGDI) undertaken by the UN<sup>27</sup>.

According to the UNDESA global e-government development index<sup>28</sup> for 2016, African countries are largely in the lower two tiers (i.e. lower and middle groups) of e-government application except for five countries – Mauritius ranked globally 58<sup>th</sup>, Tunisia at 72<sup>nd</sup>, South Africa at 76<sup>th</sup>, Morocco at 85<sup>th</sup>, and Seychelles at 86<sup>th</sup> out of 193 countries

**Table 9: Top 10 countries for e-government in Africa**

Country	OSI	HCI	TII	EGDI	EGDI Level	2016 Rank
Mauritius	0.7029	0.7067	0.4596	0.6231	High	58
Tunisia	0.7174	0.6397	0.3476	0.5682	High	72
South Africa	0.558	0.7253	0.3807	0.5546	High	76
Morocco	0.7391	0.4737	0.3429	0.5186	High	85
Seychelles	0.4058	0.6861	0.4624	0.5181	High	86
Cape Verde	0.4565	0.6031	0.3629	0.4742	Medium	103
Egypt	0.471	0.6048	0.3025	0.4594	Medium	108
Botswana	0.2826	0.6553	0.4215	0.4531	Medium	113
Libyan Arab Jamahiriya	0.1087	0.7588	0.4291	0.4322	Medium	118

<sup>27</sup> <http://workspace.unpan.org/sites/Internet/Documents/UNPAN97453.pdf>

<sup>28</sup> United Nations Department for Economic and Social Affairs (UNDESA) (2016). United Nations E-Government Survey 2016: E-Government in Support of Sustainable Development. New York: United Nations.



Kenya	0.558	0.5169	0.1808	0.4186	Medium	119
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Source: United Nations E-Government Survey 2016

Today, e-government has become a development indicator which is clearly contributing to development through the advancement in the delivery of basic services such as education, health, employment, finance and social welfare.

Some of the current initiatives with regard to implementing e-government in countries include the following:

- **Burkina Faso** is carrying out infrastructure projects to connect villages and cities, and is part of a regional broadband connectivity project for West Africa. The country is also implementing e-government initiatives that provide online services to citizens.
- In **Uganda**, to further address access gaps, the government has embarked on leveraging existing infrastructure like post offices to enable access to e-services, including e-government services. The traditional post offices are being upgraded with internet connectivity to enable them accommodate one-stop Centres where the citizens can access all the available e-government services.

The priorities of the 2030 Agenda are closely aligned with the Agenda 2063 adopted by the African Union.<sup>29</sup> In this document, the issue of public participation, alongside poverty reduction, is put forward as central to the continent's transformation. Agenda 2063 includes three closely interrelated and important "Aspirations" that can benefit from, and be supported by e-participation. Africa's 54 countries have a smaller presence in the Top 50 EPI (E-participation Index) performers accounting for only 6% of countries in that group.

#### 4.7.2 E-business

In relation to this action line, reference has to be made to SDGs 1, 2, 5, 8, 9 and 17. SDG 1, on ending poverty, can be achieved through e-business services, such as digital currencies and mobile payments. In this regard, along with this rapid economic growth, comes a burgeoning e-commerce industry that is expected to expand to an estimated \$75 billion USD by the year 2025<sup>30</sup>. Several countries have also made significant increases in ICT exports from 2015-2016 (Table 10 below)

<sup>29</sup> See also: [http://agenda2063.au.int/en/sites/default/files/06%20The%20Vision%20for%202063\\_.pdf](http://agenda2063.au.int/en/sites/default/files/06%20The%20Vision%20for%202063_.pdf)

<sup>30</sup> <http://www.mckinsey.com/industries/high-tech/our-insights/lions-go-digital-the-internets-tranformative-potential-in-africa>

**Table 10: ICT service exports, current US\$**

Country Name	2013	2014	2015	2016
Cape Verde	50254752	72542321	38476284	81225216
Egypt, Arab Rep.	1.29E+09	2.29E+09	1.28E+09	
Germany	1.05E+11	1.17E+11	1.08E+11	1.14E+11
Kenya	5.15E+08	6.51E+08		
Lesotho	9740735	8176881	7045552	7525850
Mauritius	8.8E+08	1.09E+09	8.57E+08	
Morocco	3.26E+09	2.76E+09	2.82E+09	3.13E+09
Sao Tome and Principe	4977659	12508550	13237254	11472566
Senegal	4.96E+08	4.84E+08		
Seychelles	2.36E+08	2.33E+08	2.38E+08	
South Africa	2.54E+09	2.59E+09	2.54E+09	2.52E+09

Source: WITS

In Africa, with nearly 80% of the adults who lack access to formal or semi-formal banking services because not only because of poverty but due to the cost of transaction, the high cost of saving management rate and the availability of the financial institutions, the adoption of mobile banking has boosted access to formal financial institutions across Africa. Mobile money is now available in most African countries. Indeed, with the explosive growth on mobile devices, the introduction of LTE (4G) systems and the development of the mobile communication networks, several telecommunication operators have adopted financial services in their field of activity. As result, in 2016 over 220 million registered mobile money accounts, the African region accounts for 52% of the 271 live mobile money services in 93 countries and 64% of all active mobile money accounts. The World Bank estimates that by 2020, mobile money could reach 2 billion currently unbanked people. For example, it has been founded by recent studies that in East Africa, where mobile money penetration is more important, the penetration of financial institution accounts remained steady at 24%, whilst mobile money account penetration increased to 35%. According to the Central Bank of Kenya, by 2006, only 185,000 of the adult Kenyans had formal bank account. But in March 2014, 26.2 million accounts had been registered on mobile money platforms and today more than 60% of the adult population are using the M-Pesa platform.

Some of the examples to demonstrate implementation of e-business in some countries in Africa include the following:

- The **Mauritius** eRegistry Project (MeRP) was launched to scale up to e-services by harnessing the latest technologies and solutions that can provide integrated workflows and options for businesses, professionals and members of the public to conduct business with the Registrar General Department over the Internet. MeRP allows for the e-submission of documents, e-payment of duties and taxes, e-registration, e-search and e-delivery of registered documents.

- An integrated web-based e-Procurement System (e-PS) destined for the public sector also in **Mauritius** is expected to improve its procurement processes, enhance transparency and stimulate competition.
- In **Uganda**, Bizcust is a mobile web-based application system for expanding the customer, market and transport accessibility base for both businessmen and farmers. Bizcust runs on all mobile devices and computers. The system helped resolve information asymmetry and farmers to have update information on commodity prices offered by different agrobusinessmen and closes a communication gap including facilitating quick and affordable transportation. This project is an example of an initiative that relates to addressing poverty, food-security and gender-equality issues (SDGs 1, 2, 5).
- Another project from **Uganda**, the Money mobile counter (M-Count) is a mobile application for automatically counting large amounts of money. The use of counterfeit money detectors is one of the methods employed to ensure safety. Under this, money is screened to check it for the watermark. This is also done manually, but entails considerable loss of time and inconvenience, and the liability of money laundering and fraud. Hence, M-Count represents a real possibility for enhancing security with regard to money, the efficiency of the people handling it, for example bank tellers and supermarket attendants, transparency in providing the actual amounts of money available, and time-saving in regard to counting large numbers of notes (SDGs 8 and 9).
- In **Zambia**, Nchitonet Dot Com Ltd establishes the e-Mentorship Programs for Local Entrepreneurs, a mentoring programme for 1,500 local entrepreneurs to help local enterprise development that will create jobs and sustainable business. Ten local industries that have business potential to improve socio-economic and environmental challenges faced by young people, women and the nation at large are targeted
- **Ethiopia** : With a strong regulation of its financial institutions, Ethiopia has introduced mobile banking ( BelCash and M-Birr) in 2012 and initiated the creation of a Financial Inclusion Council in 2014. However, Ethiopia needs to strengthen mobile and other digital infrastructure to enhance adoption of digital financial services. One example of the growing mobile-based e-services that promote digital inclusion is the Ethiopia Commodity Exchange (ECX) that provides a virtual marketplace accessible online and by phone and SMS which enhanced transparency on supply, demand, and prices and increases farmers' share of revenue. The ECX receives more than one million requests per month for market information, with 80 percent coming from rural areas.
- **UEMOA**: In UEMOA region, the average banking rate which was 35% in 2015, rose to 75% of the population in 2016 if e-finance is taken into consideration. Senegalese government, for instance, was one of the first on the continent to invest in fibre-optic infrastructure and prioritise the rollout of Internet cafés. Its e-government project has directed resources to digitizing education, public administration, finance and health-care services. This has contributed to the promotion of financial inclusion in the country. As result, in 2014, 2,5 million mobile banking users generated a volume of 18.8 million transactions for a value of 192 billion CFA francs, the mobile banking contributed to the financial inclusion estimated at 18.74%, for a broad banking rate of 26.48%. (Central Bank of West Africa).
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### 4.7.3 E-learning

E-learning is a component of the broader knowledge society ecosystem and touches on other sectors, such as e-health, e-agriculture, etc. Furthermore, emerging technologies, such as Big Data, Internet of Things, Artificial Intelligence are new platforms that can be leveraged to embrace capacity building and e-learning, and at policy level these have to be prioritized in developing the skill sets at national level to leverage these technologies. Technologies that are widely adopted like mobiles have the potential to expand digital literacy even among rural, less literate populations; therefore, digital literacy would help overcome traditional literacy challenges. In this regard, according to Statistics MRC, the Global E-Learning Market is accounted for \$165.21 billion in 2015, will be valued at US\$255 billion in 2017 and is expected to reach \$275.10 billion by 2022 growing at a CAGR of 7.5% during the forecast period. Due to the widespread access to mobile phones in the continent fuelled by Africa's entrepreneurs' boundless creativity, Africa's e-learning market has doubled from 2011 to 2016, reaching USD 513 million, according to a report by market researchers Ambient Insights. South Africa is Africa's largest e-learning market, along with Angola, Nigeria, and Tunisia. Meanwhile, Senegal, Kenya, Zambia, and Zimbabwe are posting 25 per cent annual e-learning market growth.

Some of the examples on implementing the WSIS action line on e-learning include:

- ITU launched a project on using ICTs to combat Ebola in West Africa to educate people to learn about how the health sector copes with such epidemics. The project embraced Big Data to trace core data records. This can also be used with similar approaches for agriculture, environment.
- To bridge the digital divide, Djibouti, has developed in 2013 a strategy that integrates ICTs and restructures the framework to make it feasible in the midterm to meet the need to bridge the digital divide. Djibouti Digital aims to make our country an ICT center within the region, building on the country's geo strategy and the submarine cables that go across the country.

#### **Box 6: Leap m-learning solution**

In Kenya, Amref Health Africa has developed the Leap m-learning solution. Community health workers (CHWs) are essential to fill human resources gaps in the health sector in Africa. However, training is required to empower CHWs to deliver health services to communities. Leap is a leading m-learning solution for CHWs developed four years ago through a cross-sector partnership with Amref, Accenture and the Vodafone Group. It delivers training through SMS and audio across all geographies, using basic phone technology. It has reached over 20 000 CHWs, with preliminary monitoring and evaluation (M&E) data showing strong outcomes such as a 26 per cent improvement antenatal clinic visits and a 25 per cent increase in immunization coverage. Leap has transitioned into a social enterprise and is scaling to other countries.

*Source : [http://www.wvi.org/sites/default/files/About%20Leap%20the%20mHealth%20Platform\\_Amref.pdf](http://www.wvi.org/sites/default/files/About%20Leap%20the%20mHealth%20Platform_Amref.pdf)*

The new trend in this area is that the regulatory frameworks are changing to embrace e-learning to promote both traditional and digital literacy.

#### **4.7.4 E-health**

E-health helps to achieve various SDGs, for example SDGs 1, 2 and 3 on poverty, food security and well-being of all. E-health can contribute to finally recognizing the role of women as health providers in their families and communities and to improving and extending healthcare and health information systems to remote and underserved areas (SDG 5). Health data and information systems are needed for alerting, monitoring and controlling the spread of communicable diseases, providing evidence for uptake and trends in e-health and its impact on other related socio-economic outcomes (SDG 17).

In the area of healthcare, it is possible to leverage e-health tools for better access to information and enhanced quality of care. The newest trend is e-health integration. It is achieved through the use of open source information technology and is updated with continuous feedback from clinicians and technicians in all phases of healthcare service development. (Dinevski et al., 2010).

Another important e-health trend is telemedicine with integrated web-enabled video cameras (“webcams”), an innovation that has the potential to broaden access to specialists to a much wider pool of patients (Wicks et al., 2014).

An example of an e-health initiative is the one below from Algeria:

- In Algeria, the personal medical card is based on the idea a magnetic card, or an element of the Chifa card, where electronic medical prescriptions (medical identity) are initialized. This medical card will contain personal information concerning the individual’s state of health (chronic diseases, medical prescriptions, hereditary diseases, new symptoms, allergies). Electronic registers will be created, to include all information from all different parties: doctors, pharmacists, hospitals. As soon as there is a new disease, a special programme issues an alert so it can be treated quickly. The information is established and processed in one centre, by specialists in the medical domain and scientific research. The centre will also provide all the regions with different information on economic, social, medical and scientific issues. This will help in obtaining urgent information for different treatments easily and quickly, thus ensuring healthy lives and sustainable consumption and production patterns (SDGs 3 and 12).
- In Egypt, Marwa El Nokrashy has launched the Telemedicine for Remote and Rural Areas in Egypt (TRRA) programme. Despite the forward strides that have been made in the Egyptian health ecosystem in recent years, the major challenge resides in the centralization of specialized medical services in the country’s major cities, leaving more isolated and rural communities with less than adequate medical services.

#### **4.7.5 E-employment**

E-employment aims to encourage the development of best practices for e-workers and e-employers built, at the national level, on principles of fairness and gender equality, respecting all relevant international norms. It also promotes new ways of organizing work and business with the aim of raising productivity, growth and well-being through investment in ICTs and human resources. E-employment is directly related to various SDGs, namely SDGs 4, 8, 10 and 17

It is well recognised that 90% of new jobs are going to be in areas that are either related to digital technologies or involve the use of digital technologies – achievements of targets in SDGs and Agenda 2063 related to employment would be accelerated through meeting e-employment targets.

Linked to Goal 8 of the SDGs on ‘Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all’, it is important to mention that governments provide an online job opportunity platform on vacancies available. By putting government vacancies online, governments can share information about employment opportunities in the public sector. Based on the 2016 Survey, such features are offered in 9 out of 54 countries in Africa compared to 21 out of 35 countries in the Americas; 29 out of 43 countries in total in Europe; 8 countries out of 14 in Oceania; and in 27 out of 47 in Asia that offer online information about job vacancies<sup>31</sup>.

#### **Box 7: Careerjet, South Africa**

According to the company, Careerjet uses smart agents running on a cluster of networked computers that scan the web and identify job listings on the internet. Those listings are then scanned daily and the jobs found are added to the job index. Over 58,000 websites are scanned every day.

The website itself is fairly simple to use. Users can simply head to the front page of the website and either start searching for their preferred job by industry, or via location. Some of the categories include job placements for healthcare, human resources, insurance and law enforcement

*Source : Careerjet.co.za*

#### **4.7.6 E-environment**

E-environment relates to the achievement of various SDGs, including SDGs 9, 11, 13, 14 and 15 on sustainable industrialization and innovation, the inclusivity and safety of cities, combating climate change, and the preservation of marine resources and terrestrial ecosystems.

An example of an initiative of global in nature focusing on the Africa, Asia and Pacific regions in relation to e-environment is the international Mobilizing Arab-Wide Action for Reliable Environmental Data (MAWARDED<sup>32</sup>), which is an online platform that allows users at any time and location to upload their environmental observations to a central server using smartphones. The system also provides information about environmental observations around the user’s current location. The users can upload observations through a user-friendly interface by selecting the type

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<sup>31</sup> Ibid 6.

<sup>32</sup> <https://www.itu.int/md/T13-SG05-C-0763/en>

of observation and status. The app directly identifies the location (latitude and longitude) and the time, and then sends it to the server to be stored. The user can also take a photo of the observation using the phone's camera and upload it to the server. All observations appear directly on an interactive web mapping system. Relating to global partnership, the application promotes well-being and contributes to safety of cities, sustainable use of oceans as well as the fight against desertification, etc. (SDGs 3, 11, 13, 14, 15 and 17). (ITU- 2016)

#### **4.7.7 E-agriculture**

Improving access to valuable information can help agricultural stakeholders to make informed decisions and use the resources available in the most productive and sustainable manner.

Digital solutions that can be harnessed for e-agriculture may include devices, networks, services and applications. These can range from cutting edge internet-based applications, sensing tools, artificial intelligence and data analysis technologies to others that have been around for much longer, such as radio, telephones, television, telecommunication networks, mobile phones and satellites.

Some of the examples of ICT in agriculture (e-agriculture) from the continent include the following:

##### **(1) Somalia**

The Food and Agriculture Organization of the United Nations (FAO) initiated the Somalia Water and Land Information Management (SWALIM) programme that serves Somali government institutions, non-governmental organizations (NGOs), development agencies and UN bodies engaged in assisting Somali communities whose lives and livelihoods depend directly on water and land resources. The programme aims to provide high-quality water and land information, crucial to relief, rehabilitation and development initiatives in Somalia. The use of ICTs to accelerate, improve and multiply the effects of this work has been a hallmark of the programme since the beginning and remains a key component. The project is linked with a considerable number of SDGs, fighting against poverty and hunger, ensuring healthy lives and access to water, promoting economic growth and sustainable industrialization, etc. (SDGs 1, 2, 3, 5, 6, 8, 9, 13 and 15).(ITU- WSIS 2017)

##### **(2) Sudan**

In Sudan, the Gedaref Digital City Organization (GDCO, a civil society NGO) and its partners have developed an e-agriculture project. Owing to significant variations in crop prices and lack of information, farmers sell their crops at low prices. Moreover, there is severe conflict between farmers, shepherds (nomads) and the forestry department. The e-agriculture project is a public-private partnership (PPP) for community development. It provides good opportunities to invest in telecentres for better sustainable development.

### **(3) Nigeria**

In Nigeria, the Smallholders Foundation launched the FarmBracket<sup>33</sup>: an Online open collective market for cash crop farmers project that will establish and develop an online open collective market source for farmers (specifically young farmers) in Nigeria who farm cash crops. This system enables potential buyers to easily access their profile and the quantity and quality of their produce. The system uses an SMS to web platform to inform and educate farmers with current daily markets tips. Through the SMS to web package, poor young rural farmers can update their status in terms of the quantity of goods available for sale by simply dialing a code which is provided for them on their phone. The project's goals meet SDG 2, 3, 4 and 8, promoting sustainable agriculture, lifelong learning opportunities for farmers and well-being for all. It also ties in with economic development and employment in the agricultural sector of the country.

### **(4) Kenya**

In Kenya, Anglican Development Services – Western Region (ADS-WR)<sup>34</sup> promotes farmer entrepreneurship through the value chain development approach. The main objective of the ICT in Agriculture programme is to promote fair economic development among participating chain actors especially in the tomato, onion and passion fruit value chains.

## **4.7.8 E-science**

It is believed that ICTs are an important engine for achievement of the Sustainable Development Goals. Goals 9 and 17 are among the most relevant. Goal 9 addresses the promotion of inclusive and sustainable industrialization and fostering innovation in general and information and communications technology, in particular Goal 17 refers to science, technology development and transfer, and capacity building as means of implementation which play crucial roles in achievement of the 2030 Development Agenda.

It also focuses on promoting electronic publishing, differential pricing and open access initiatives to make scientific information affordable and accessible in all countries on an equitable basis. E-science aims to encourage the use of peer-to-peer technology to share scientific knowledge and pre-prints and reprints written by scientific authors who have waived their right to payment. It also promotes the long-term systematic and efficient collection, dissemination and preservation of essential scientific digital data, for example population and meteorological data in all countries.

## **4.8 C8: Cultural diversity and identity, linguistic diversity and local content**

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<sup>33</sup> [https://www.itu.int/dms\\_pub/itu-s/opb/pol/S-POL-WSIS.REP\\_REG\\_AFR-2016-PDF-E.pdf](https://www.itu.int/dms_pub/itu-s/opb/pol/S-POL-WSIS.REP_REG_AFR-2016-PDF-E.pdf)

<sup>34</sup> <http://www.adskenya.org/>



Africa, being a multi-ethnic, multi-cultural and linguistically diverse continent, action line C8 on cultural diversity and identity, linguistic diversity and local content, is key in implementing the SDGs and AU agenda 2063 goals.

More than 50 per cent of the approximately 7,099<sup>35</sup> languages spoken in the world (around 2,000 languages are spoken in Africa and 300 in Europa) are likely to die out within a few generations, and 96 percent of these languages are spoken by a mere 4 per cent of the world's population. Africa is the second largest and second most populous continent in the world with a total population of 1.256 billion<sup>36</sup>. Six of the most widely-spoken language in the continent are English (150 millions), Kiswali (140 millions), French ( 114 millions),Arabic (200 millions), Haoussa (50 millions), and Oromo (25 millions). Action Line C8 particularly supports one of the aspirations of Agenda 2063 among the seven, which is '*Aspiration 5*' on '*An Africa with a strong cultural identity, values and ethics*'.

Africa is way behind the development of content in local language as the data on the languages used on the Internet show that languages in Africa represent less than 0.1% of the 500 languages who have a digital existence as of today. Dominant languages on the Internet include English (51.6%), Russian (66%), Japanese (5.6%), German (5.6%), Spanish (5.1%), French (4.1%), Portuguese (2.5%) and Chinese (2.0%), from March 2017<sup>37</sup>. However, African languages are becoming increasingly visible in cyberspace. This visibility is more dynamic with Google whose online translation service has contributed significantly to the linguistic diversity in Internet as well as to add a value of African local languages around the world.

Several localization projects and initiatives have been initiated across Africa that enhance linguistic diversity in the cyber-space. Such examples are highlighted below.

**Box 8: Lubuto Literacy: Use of Digital Technology to Teach Reading in Zambia**

Lubuto Library Partners (LLP) in Zambia employed digital technology to create engaging, accessible means of teaching children to read in their mother languages. LubutoLiteracy lessons are an upgrade and improvement on a pilot set of 700 mother-tongue literacy lessons (100 in each of the 7 major Zambian languages) created by LLP in 2011 with support from EIFL's Public Libraries Innovation Programme. Creation of this new and dramatically improved set of lessons was made possible by an All Children Reading grant, supported by USAID, World Vision and Australian AID. The new lessons were designed by an expert from the U. of Zambia who had also designed a new reading curriculum introduced by the Zambian government. The lessons thus extend the school curriculum to computer and mobile platforms, reaching beyond the classroom to computers and mobile devices everywhere these languages are spoken as the mother tongue: Nyanja, Bemba, Lozi, Luvale, Lunda, Tonga and Kaonde.

*Source: LubutoLiteracy, 2016. "Use of Digital Technology to Teach Reading in Zambia" Retrieved November 15, 2017 from [www.ifla.org/node/10521](http://www.ifla.org/node/10521).*

<sup>35</sup> [www.ethnologue.com/guides/how-many-languages](http://www.ethnologue.com/guides/how-many-languages)

<sup>36</sup> [www.Worldometers.info](http://www.Worldometers.info)

<sup>37</sup> [https://en.wikipedia.org/wiki/Languages\\_used\\_on\\_the\\_Internet#cite\\_note-Alternative-5](https://en.wikipedia.org/wiki/Languages_used_on_the_Internet#cite_note-Alternative-5)

**Box 9: Linguistic diversity in ICTs, Case of Kenya**

Language is a very important factor in using ICT. It is language that facilitates the interaction that occurs between people and ICT. Herbert (1992) argued that the availability of software and content in the languages most familiar with users is an essential element in their adoption and optimal use of computers and the internet.

There are various efforts that have been made to enable the use of Kiswahili in ICT. For example the growing use of Kiswahili in world media such as the voice of America Radio Deutsche Welle, BBC radio and Television, Asia radio and TV programs that comes to many homes in East Africa. In addition, Microsoft Windows and Microsoft Office in Kiswahili have been developed by Microsoft Company to enable the large population that speaks Kiswahili to use the computers. In a survey conducted by NEPAD in a number of secondary schools in Kenya, it was found that Kiswahili is used in ICT both by students and teachers although at varying degrees.

*Source: Kiswahili usage in ICT in NEPAD secondary schools in Kenya.*

African Academy of Languages (ACALAN) is also working towards developing a methodological framework for developing terminology in African languages, as well as increasing the presence of African languages in cyber space. It is starting with a prototype domain in Swahili which will then be emulated for other languages.

#### **4.9 C9: The role of the Media**

The role of the media in the development of the information society in Africa is of paramount importance as advancement in ICTs revolutionized the media sector. This action line encourages the media – print and broadcast as well as the new media- to continue to play an important role in the information society, through the development of domestic legislation that guarantees the independence and plurality of the media. It takes steps to promote respect for peace and to uphold the fundamental values of freedom, equality, solidarity, tolerance, shared responsibility and respect for nature.

Africa is in the process of embracing the convergence between traditional media and digital media, which is offering interactive services such as film, music and games and have a significant impact on the growth of the media industry on the continent.

Mobile media services is boosted by the increased availability of 4G and next generation enabled services and handsets, and the migration to digital television. For instance, streaming TV and movies to mobile phones can benefit the media industry, such as Nollywood, Nigeria's film industry, which has an average production of 200 films per month. The African cable giant, DSTV, already streams some of its programmes to smart phones almost everywhere in Africa.

Most African countries are committed to migrating to digital broadcasting in 2015 through the GE06 Agreement (Geneva 2006). There are already 7 countries ( Malawi, Mauritius, Namibia, Rwanda, Tanzania, Kenya and Senegal ) who have completed this transition and many more which are making the transition (GSMA Digital Migration Process in Kenya, 2017). 2017 is expected to be a critical year for Africa to meet the analogue switch-off deadline. The economic model adopted by the most of the African countries, offers benefits to both the publishers of television, authors, creators and producers of content, developers, suppliers of interactive services and the states. Thus consumers will now have the opportunity to access a bouquet of national channels free of charge (up to 40 channels and a scalable way), from thematic, to national and local dimension. There will be clearer images and also the availability of radio spectrum will allow expansion of internet-based technology.

Transmission network, transmission standards of broadcasting continue to evolve and by adopting a unified approach to adopting technology across Africa, countries can achieve economies of scale and convenience of connectivity.

StarTimes, a leading digital-TV operator in Africa serving nearly 10 million subscribers and covering 90 percent of the continent's population with a massive distribution network, said that it has established an enormous network system which is able to provide service to tens of millions of subscribers. With a signal distribution platform, a Direct-to-Home satellite platform, and a digital terrestrial TV, StartTimes has made its sign available throughout the African Continent.

Direct-broadcast satellite television, also known as "Direct to home" (DTH), is delivering television programming using signals relayed from space radio stations, such as digital video broadcast (DVB) satellites.

Benefits of digital migration is that it automatically opens up opportunities for African governments to provide more internet based services while providing a platform for more broadcasters and content providers to come on board.

The increase in content channels will see an increase in employment of people in the creative industry. New broadcast stations no longer have to invest in transmission equipment and so allow lower production costs and additional players to the information technology sector will also translate in an increase in revenues from taxes to African governments<sup>38</sup>.

#### **4.10 C10: The ethical dimensions of the information society**

The increasing use of ICTs including access and use of internet, social media, computers and associated applications such as e-government and social networking, have a tremendous impact on society. This action line promotes that the information society should be subject to universally held value and promote the common good and prevent abusive uses of ICTs.

In this regard,

- All stakeholders should increase their awareness of the ethical dimension of their use of ICTs. There is little research in the area among academic and research communities in the continent and awareness is particularly enhanced in some of the issues addressed through the African internet Governance Forums (AfIGF) in the last few years. All actors in the Information Society should promote the common good, protect privacy and personal data and take appropriate actions and preventive measures, as determined by law, against abusive uses of ICTs such as illegal and other acts motivated by racism, racial discrimination, xenophobia, and related intolerance, hatred, violence, all forms of child abuse, including pedophilia and child pornography, and trafficking in, and exploitation of, human beings.
- All actors should take steps to promote respect for peace and to uphold the fundamental values of freedom, equality, solidarity, tolerance, shared responsibility, and respect for nature.
- Invite relevant stakeholders, especially the academia, to continue research on ethical dimensions of ICTs.

#### **4.11 C11: Regional cooperation**

International and regional cooperation among all stakeholders is vital to the implementation of the WSIS Action Lines and needs to be strengthened with a view of promoting universal access and bridging the digital divide, among others, by providing suitable means of implementation. This section outlines major regional and international initiatives that occurred in 2016 and drove large numbers of African countries and African Union to support ICT development in Africa.

The ECCAS deployed in the implementation of the two priority programs adopted by the Conference of Chiefs State and Government of ECCAS in January 2012, namely (i) the National Regulatory Harmonization Program and (ii) the Broadband Optical Fiber Infrastructure

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<sup>38</sup> [www.pressreader.com](http://www.pressreader.com) (date accesses is missing)

Development Program, and the further finalization of the Plan. Consensual Action Plan for the Deployment of Electronic Communications Infrastructures (PACDICE-AC) containing all the cross-border fiber optic interconnection paths of the Member States.

At the end of these activities, the following intermediate results were obtained:

- Adoption by ICT Ministers of ECCAS Member States (November 2016, Brazzaville) of the Model Laws on Telecommunications / ICT and Cyber Security and the Regulatory Reference Framework for Cross-Border Interconnection of the Member States of ECOWAS ECCAS;
- Adoption of the Brazzaville Declaration, to establish in the Central African subregion an environment favorable to the attractiveness of private investors in the development of Broadband Optical Fiber Infrastructures and to guarantee the security of the end user;
- Migration of the National Internet Exchange Points of the Republic of Congo and the Republic of Gabon to Regional Exchange Points in 2016;
- Restitution and validation of the feasibility studies and the business plan of the Consensus Implementation Plan for the Deployment of Electronic Communications Infrastructures in Central Africa (PACDICE-AC).

ECOWAS Ministers in charge of Telecommunications and ICT have approved the free regional roaming regulation for ECOWAS Member countries including a clear implementation roadmap which will start at the beginning of 2018. The draft Free Roaming Regulation sets out an harmonized legal and tariff framework for roaming on public mobile communications networks I within ECOWAS member countries. It aims to reduce short-term costs and eliminate them in medium term as well as to determine the rights and obligations of roaming providers, regulators and ECOWAS member states. It also determines the minimum guarantees for consumers of roaming community services. Since March 2017, Burkina Faso, Côte d'Ivoire, Mali, la Guinea, Senegal and Togo signed the agreement to implement the free roaming.

The Economic Commission and the National Assembly of Niger have established a partnership framework to organize a Forum on Information and Communication Technologies (ICTs) in the Economic Community of West African States (ECOWAS) region. from 3-5 May, 2017, in Niamey, Niger. with the main aim of promoting and building awareness about the vast potential of ICT for development in the ECOWAS region and the importance for parliamentarians to grasp the fundamentals of these new technologies. Lawmakers learned more about how to development national ICT agendas, the application of ICTs in specific sectors, and the role of government and members of parliament in the process of implementing ICT laws in their respective countries.

In South Africa, the Association for Progressive Communications (APC) and the New Partnership for Africa's Development (NEPAD) Planning and Coordinating Agency co-organized the African School on Internet Governance (AfriSIG). AfriSIG aims to give Africans from diverse sectors and stakeholder groups the opportunity to gain knowledge and confidence to participate effectively in Internet governance (IG) processes and debates nationally, regionally and globally. It contributes to increasing the diversity, extent, qual- ity and effectiveness of African participation in IG by

creating a space that promotes multistakeholder learning and dialogue. The school responds to the challenge of inadequate participation by African and women stakeholders in the IG sphere, building knowledge across stakeholder groups and Africa's subregions by fostering dialogue on complex issues towards mainstreaming African and women's perspectives into global Internet governance.

## 5 Challenges

- Many countries in Africa are still dealing with high rates of poverty in which deploying infrastructures in remote areas often proves to be challenging for governments to rationalize limited resources. Furthermore, in many cases there are not enough incentives for the private sector to invest. Mobilizing financial resources to bridge the digital divide across the continent is still a challenge.
- As a result access to infrastructure and services are limited in many areas particularly with regard to access broadband services, which is key to accelerating growth. Broadband uptake is still low in the continent primarily due to high costs and the availability of the service is also limited. There is a lot to be done to connect the unconnected which requires more investment both through public investment, PPP and attracting foreign direct investment.
- With regard to access to information and knowledge, the challenge remains with the level of knowledge about ICTs on the one hand and on the other hand the lack of local content and language as a barrier for accessing information and knowledge online. To this end a lot is yet to be done on capacity building and skills development to meet with the requirements of the 21st century skills. Integration of ICTs into academic and pedagogical practices must also lead to a professionally trained youth in computer programming software
- The other challenge is in relation to the government's legal and regulatory environment in that in many cases Government regulations do not address local needs. Therefore, ongoing updating and contextualizing the regulatory environment to the local situation is important.
- Finally, it is important to identify and overcome different types of digital divides caused by barriers due to affordability, efficacy, skill-levels, disability and gender. Challenges in rate of adoption of new technologies especially in areas with disadvantaged communities with low digital literacy and disposable income need to be given priority attention.

## 6 Conclusions and way forward

Building strong knowledge societies depends on multiple factors, including physical infrastructure, development of applications that enable use of that infrastructure, and development of skill sets to be able to use the applications and produce digital dividends. The use of ICTs in education and E-learning is part of a broader knowledge ecosystem and touches on other sectors, such as e-health, agriculture, etc. Furthermore, the regulatory frameworks are changing to embrace e-learning to promote both traditional and digital literacy.

There is a greater understanding that it is necessary to do more than merely connect the unconnected. While connection is necessary, education and training is vital to successful

implementation of the WSIS with regard to building the human resources capital necessary for the knowledge economy that will lead to accelerated economic and social development.

Building the next generation of ICT infrastructure and reducing cost of access are key to the widespread adoption and uptake of ICTs in the continent. Improving broadband connectivity/ bandwidth especially in rural communities is a priority if the continent is to meet its agenda 2063 aspirations and the SDGs at large. The government can play an important role in providing the necessary enabling environment to facilitate competition amongst private players, to provide incentives to private sector to invest and to deploy resources in cases of market failure. The future is about integrating breakthrough technologies into everyday life including healthcare, governance, education and smart cities as it relates to meeting the SDGs.

Emergence of local access solutions such as community networks as a critical element in expanding internet access need to be revitalized through community access facilities where there is limited access. A blended approach to leapfrog into greater digital access and adoption using a combination of government initiative, private sector investment/ competition, and cutting edge technology has to be considered.



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