



# IGAD REGIONAL INFRASTRUCTURE MASTER PLAN

Final IRIMP Report – ICT Sector Report



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## Foreword by Executive Secretary of IGAD

The IGAD Regional Infrastructure Master Plan (IRIMP) is an ambitious plan, the implementation of which will accelerate the region's growth and structural transformation. The IRIMP consists of policy initiatives and infrastructure investments that will significantly strengthen the process of regional economic cooperation and integration. The IRIMP is aligned with, and furthers the aims of, the Abuja Treaty, the Constitutive Act of the African Union, Agenda 2063, and the national development plans of IGAD Members States.

This ICT Sector Report is part of four sector reports picked from the overall IRIMP Report. The other three reports are for energy, transport and transboundary water resources. The Sector Reports are intended to be used by IGAD Member States, and in particular the relevant line Ministries, Departments and Agencies responsible for sector development, and their development partners to guide future planning, investment decision-making and funding and financing arrangements.

The process of preparing IRIMP began in March 2006 when the 11th IGAD Summit of the Heads of State and Government, held in Nairobi, recognised the importance of infrastructure projects as a vehicle for the integration of the IGAD region and as a catalyst for the economic growth and development of IGAD Member States.

The following year experts from the European Union (EU), IGAD Member States, and the IGAD Secretariat met in Mombasa, Kenya to prepare the Horn of Africa Initiative (HOAI). HOAI priority areas were: (i) interconnectivity in transport (focus on transport and trade facilitation) priority road corridors linking region to seaports; (ii) energy; (iii) ICT; and (iv) water resources for food security.

Subsequently, the IGAD Secretariat organised a meeting of Member States, held in Nairobi during December 2010, at which was prepared a comprehensive roadmap for the Minimum Integration Plan which would create a Free Trade Area (FTA) in the IGAD region. The roadmap recommended the preparation of IRIMP, which was cited as crucial to achieving the FTA. The preparation of the IRIMP is very timely as the African Continental Free Area (AfCFTA) has recently been established and all IGAD Member States have signed the Agreement. AfCFTA seeks to accelerate intra-African trade and to boost Africa's trading position in the global market by strengthening Africa's common voice and unified position in global trade negotiations.

In June 2013, IGAD requested support from the African Development Bank (AfDB) to develop the IRIMP. The positive AfDB response culminated in the commencement of the preparation of the IRIMP in May 2018. Support from the AfDB for IGAD initiatives is substantial and includes the Kampala–Djibouti Corridor Studies, and the IGAD Drought Disaster Resilience and Sustainability Initiative (IDDRSI). The AfDB is also supporting a number of regional projects that are connecting the Member States including the construction of Isiolo–Moyale Highway in Kenya and the rehabilitation of Awassa–Moyale Highway in Ethiopia.





The IRIMP covers infrastructure in Transport, ICT, Energy and Transboundary Water Resources. The IGAD region is unfortunately characterised by the low stock of infrastructure, particularly in transport and energy, and the inadequate development of the ICT sector and digital economy. Coupled with the increasingly severe strain placed on water resources the region's productivity and growth, and regional integration, has fallen short of expectations. Studies have shown that inadequate infrastructure shaves off at least 2% of Africa's annual economic growth. Adequate infrastructure would lead to productivity gains by African firms of up to 40%.

The IRIMP will help facilitate regional integration by bridging the gap in national and regional policies and strategies and addressing infrastructure needs in vital areas, including in remote and pastoralist areas. The IRIMP will guide the process of implementation of priority regional infrastructure projects – constituting the basis for IGAD Member States commitment to a common infrastructure development programme, in the form of a Declaration, as well as the basis for regular review of its implementation. The IRIMP will be implemented over three phases; in the short term (2020-2024); the medium term (2025-2030); and over the long term (2031-2050).

There is an urgent need to scale up regional infrastructure development to accelerate regional integration and development. The IRIMP will help address key regional infrastructure deficits. This includes projects that will address transport and energy needs of the region in a manner that ensures accessible and affordable access by the region's population, and the sustainable development of energy and water resources with a special emphasis on renewable sources. The IRIMP will help to enhance the equitable sharing of water resources amongst competing uses. The IRIMP will also further help the region to make necessary steps to expand and deepen the access to modern, affordable, and reliable ICT technologies and services.

The IRIMP focuses on effective implementation of projects by identifying preferable and practical financing strategies, and by proposing policy and institutional frameworks that will ensure the unfettered and seamless implementation of identified projects and interventions.

**H.E. Dr. Workneh Gebeyehu**

**Executive Secretary**





## Acknowledgements

The IGAD Regional Infrastructure Master Plan (IRIMP) was prepared by a team from IPE Global and Africon Universal Consulting. Preparation was a collective effort that involved the IGAD Member States, and their respective ministries, departments, and agencies responsible for infrastructure planning, finance, and delivery. The Member States, through the Joint Steering Committee, provided valuable feedback on the IRIMP as it progressed through the preparation process and the reporting milestones.

The support and contributions of the African Development Bank team, led by Mr. Mtchera Chirwa, were invaluable in ensuring the IRIMP was firmly focused on delivering sound infrastructure investments that supported wider continental ambitions of inclusive, resilient, and sustainable growth.

IPE Global and Africon Universal Consulting are grateful to the many officials and experts that shared their time and knowledge with us in order to improve the quality of the evidence, review the findings, and to sharpen the recommendations.

The IGAD Secretariat, under the stewardship of Mr. Elsadig Abdalla (Director Economic Cooperation and Social Development) and Mr. Zacharia King'ori (Project Coordinator), ensured that the interests of the Member States were at the forefront of the analysis and prioritisation processes shaping the direction and recommendations of the IRIMP. Mr. Zacharia King'ori provided much valued day-to-day guidance on project management matters. He was a reliable sounding board on technical issues and how they can best be communicated to ensure the IRIMP can be acted on by Member States.

Throughout the IRIMP preparation process, the driving philosophy was 'plan to implement' and to build on the positive infrastructure initiatives that the IGAD Member States were already developing and implementing. The policy and project recommendations reflect this philosophy.





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## List of Acronyms

AfDB	African Development Bank
AfCFTA	African Continental Free Trade Area
AFD	Agence Française de Développement (French Development Agency)
AFESD	Arab Fund for Economic and Social Development
AU	African Union
CMI	Corridor Management Institute
CIIP	Critical Infrastructure Information Protection
CIRT	Cyber Security Response Team Centre
COMESA	Common Market for Eastern and Southern Africa
DARE	Djibouti Africa Regional Express
DDC	Djibouti Data Centre
DjIX	Djibouti Internet Exchange
EAC	East African Community
EU	European Union
FDI	Foreign Direct Investment
G2A	Gulf to Africa
GDI	Gross Domestic Income
GDP	Gross Domestic Product
GoK	Government of Kenya
GTP	Growth and Transformation Plan (Ethiopia)
IDP	Infrastructure Development Programme
IGAD	Intergovernmental Authority on Development
ISP	Internet Service Provider
IMF	International Monetary Fund
IRIMP	IGAD Regional Infrastructure Master Plan
ITU	The International Telecommunication Union
IXP	Internet Exchange Points
LAPSSET	Lamu Port-South Sudan-Ethiopia-Transport Corridor
LCDA	LAPSSET Corridor Development Authority
NEPAD	New Partnership for Africa's Development
NETIP	North Eastern Transport Improvement Project
NGO	Non-Governmental Organisation
NDP	National Development Plan
PIDA	Programme for Infrastructure Development in Africa
PAP	Priority Action Plan
PPP	Public Private Partnership
PSO	Private Sector Organisation
REC	Regional Economic Community
SADC	Southern African Development Community
SDI	Spatial Development Initiative
SDM	Single Digital Market
VoIP	Voice Over Internet Protocol
WB	World Bank





# Executive Summary



## IRIMP ICT Sector

The main goal of the IGAD Regional Infrastructure Master Plan (IRIMP) is to develop smart and integrated ICT infrastructure. The main specific objectives are to develop harmonised policy and regulatory frameworks; promote the development of ICT services and e-applications, fast track the development of physical infrastructure, create safe cyber space, build capacity of the human resources and the related institutions.

There is a clear digital divide among the IGAD member states as well as between urban and rural areas. IRIM will play a great role in bridging this digital divide. Kenya, Sudan and Uganda have developed their ICT sector. Kenya and Sudan have around thirty thousand kilometres each of optical fibre in operation while Somalia has few hundred kilometres and South Sudan has less than hundred kilometres. The cross-border connectivity is not sufficient. The table below shows the current ICT cross border connectivity.

Table ES 1. 1:IGAD Region ICT Cross-border Connectivity

Country	Number of cross borders links	Neighboring countries	Expected number of countries to be connected	% of regional connectivity
Djibouti	2	Ethiopia and Somalia	2	100%
Ethiopia	2	Djibouti and Sudan	5	40%
Kenya	1	Uganda	3	33.3%
Somalia	1	Djibouti	3	33.3%
South Sudan	0	-	4	0%
Sudan	1	Ethiopia	2	50%
Uganda	1	Kenya	2	50%

The region has a good number of submarine cables systems and landing points on the coastal countries. It will make easier for the landlocked countries to have access to more than one landing point. However, there is a need to establish more backhaul links to maximise the utilisation of the submarine cables and reduce the cost of the ICT services.

The data volume is growing very fast due to internet services, broadband connectivity, cloud computing and smart infrastructure. The voice traffic is not growing due to the usage of VoIP applications. The demand is calculated.

The main strategic objectives for ICT sector are:

- i. Enhance enabling environment and institutional arrangements towards building digital market;
- ii. Construct and expand regional ICT infrastructure links and networks;
- iii. Increase the usage of ICT services, e-applications such as financial services, e-commerce, internet services, social media, and promote infrastructure digitalisation;
- iv. Develop the IGAD Region Safe Cyber Space;
- v. Build capacity of human resources, strengthening the institutions and promote technology transfer.





There are a number of ICT projects collected. Three projects have been submitted to PIDA PAP2. There two projects which will be implemented in the short-term period which are DARE and Gulf to Africa. The implementation pal shown below:

Table ES 1. 2:ICT Sector Implementation Plan

Activity	Short Term	Medium Term	Long Term
	2020-2024	2025-2030	2031-2050
Review the enabling environment	—		
Develop cyber security policy and regulations Develop regional cooperation agreement on cyber security Establish regional cyber security response team centre (CIRT) study on the Public Key Infrastructure Protection Establishing a regional mechanism for recognition Certificate Authorities	—	—	
Establish regional ICT regulatory authority association	—		
Develop regional ICT regulations such as competition, licensing, interconnections, digital regulation and infrastructure	—		
Develop postal policy and regulatory frameworks	—		
Expand DARE and G2A submarine cables to connect all IGAD coastal countries	—		
South Sudan connected by two fibre optic cables to Uganda; Somalia connected to Ethiopia by two fibre optic cables; South Sudan connected to Ethiopia by two fibre optic cables; Kenya and Ethiopia connected by three fibre optic cables; Ethiopia and Sudan connected by fibre optic cable via Kassala and Humera; South Sudan connected to Sudan by three fibre optic cables Establish Regional IXPs South Sudan be connected to Kenya by two optical fibres Somalia be connected to Kenya by two optical fibres	—	—	



# Chapter One: Introduction to the IRIMP ICT Sector



## Chapter 1: Introduction to the IRIMP ICT Sector

### 1.1 Objectives

The objectives of the IGAD Regional Infrastructure Masterplan (IRIMP) are to:

- i. Develop a strategic framework for infrastructure development and investment in the transport, energy, ICT and water resources sectors;
- ii. Facilitate intra-regional and inter-continental trade, and the flow of goods, services, and the movement of people across borders of the region;
- iii. Support regional economic growth that is inclusive, resilient, and sustainable; and
- iv. Reduce isolation and promote regional integration and stability.

The IRIMP aims to catalyse investments in infrastructure in the IGAD region, as outlined in the Terms of Reference (TOR): “[the] infrastructure master plan will provide an opportunity for Member States, development partners, investors and other stakeholders to **pick regionally accepted and bankable infrastructure projects to fund, invest and support.**”

The IRIMP not only focuses on projects but, equally important, highlights the need to invest in building sustainable institutional capacity to improve the delivery and management of investments in the long-term. The IRIMP is also about improving the *quality of growth and investment* by ensuring climate change, social inclusion (bringing vulnerable groups, women, and youth into the development process from design to implementation) and conflict sensitive investment choices are mainstreamed in decision-making and project execution.

The focus of this report is to outline the ICT sector plans and investments that form an integral part of the IRIMP.

### 1.2 The IRIMP Strategic Framework

The key institutional and policy drivers of the IRIMP Strategic Framework are:

- The IRIMP is a key tool to *operationalise* the African Continental Free Trade Area (AfCFTA) and Vision 2063 through the Regional Economic Communities (REC) institutional arrangements;
- The IRIMP will contribute to the PIDA-PAP 2 planning process, the underlying concept of which is: “*To promote an integrated, multi-sectorial corridor approach that is employment-oriented, gender-sensitive, and climate-friendly and that connects urban/industrial hubs with rural areas*”; and critically,
- The expression of IGAD Member State priorities as expressed through *National Development Plans*.

The IRIMP maps out the provision of trans-border physical infrastructure and the implementation of related policy, regulatory and institutional strengthening (economic infrastructure) initiatives over the 2020-2050 period, with three phases of development:

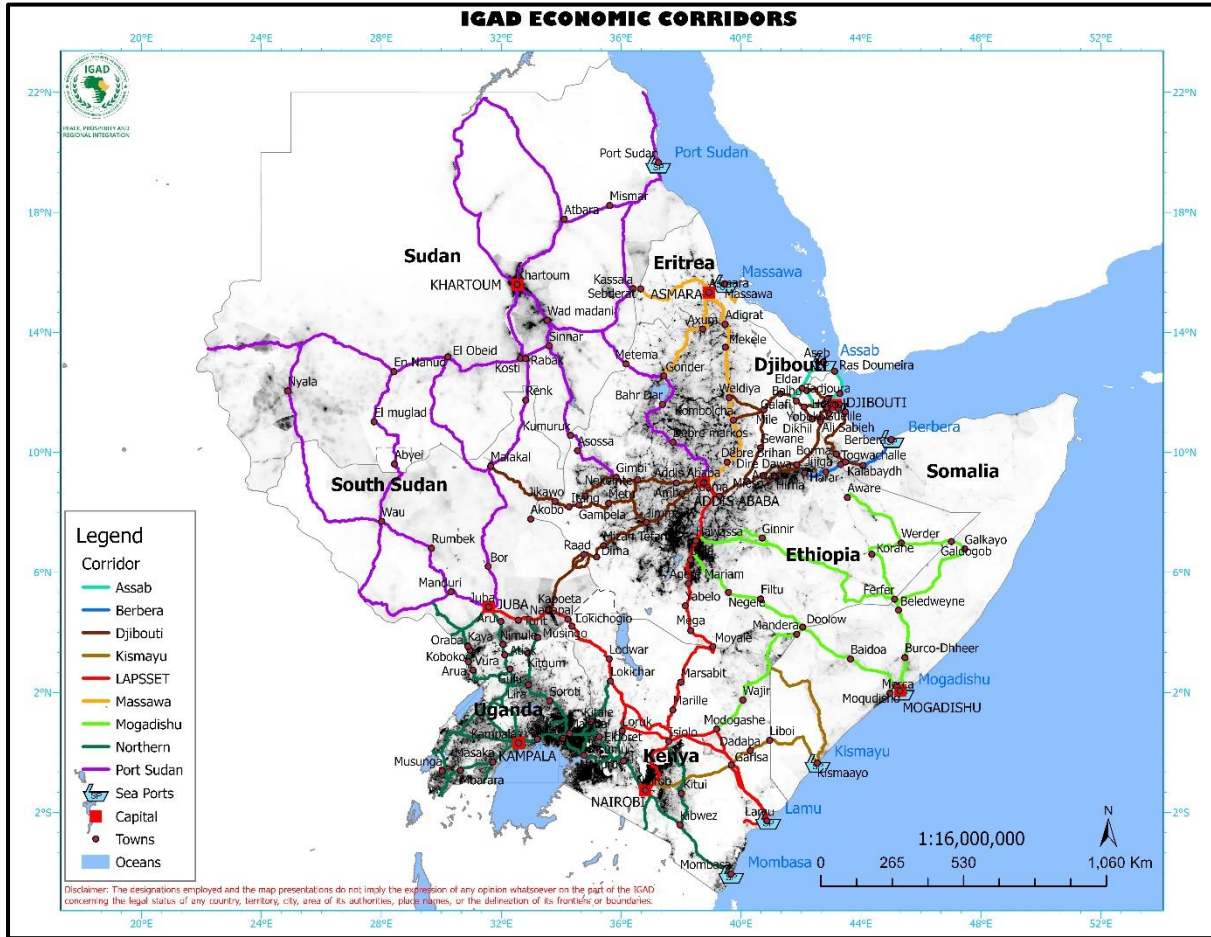




- Short term: 2020-2024
- Medium term: 2025-2030
- Long term: 2031 - 2050

The primary principle guiding the selection of trans-border infrastructure projects for the IRIMP is the degree to which a project promotes the development of the nine economic development corridors that traverse the IGAD region – Figure 1.1.

Figure 1. 1: Potential IGAD Economic Corridors



The objective of the IRIMP is to develop these potential economic development corridors to maximise job creation, are resilient to climate change, are people-driven and strengthen the role of women through gender-sensitive infrastructure development. A balanced and inclusive approach adopted, with all countries and corridors included in the Infrastructure Development Plan and Action Plan. The sector profile of the IRIMP / Infrastructure Development Programme is given in Table 1.

The contribution of the ICT sector to development of the respective economic development corridors is subject of this report. The rationale, investment priorities, financing, implementation and safeguards of the ICT sector are described in the sections that followed.







Table 1. 1: Summary of Infrastructure Development Programme Projects: Sector Portfolio Breakdown by Implementation Phase

Sector	Subsector	Short-term (2024)		Medium-term (2030)		Long-term (2050)		Total	
		Projects	Cost \$m	Projects	Cost \$m	Projects	Cost \$m	Projects	Cost \$m
Transport	Roads	23	9,312	23	13,179	7	8,224	53	30,715
	Railways	4	8,442	5	9,668	21	47,960	30	66,070
	Inland Container Depots (ICDs)	3	209	2	200	0	0	5	409
	Border Posts	11	129	2	14	2	40	15	183
	Inland Waterways	4	61	6	3,337	0	0	10	3,398
	Sea Ports	6	5,041	4	4,200	5	4,680	15	13,921
	Aviation	11	4,737	10	2,734	1	600	22	8,071
	<b>Subtotal</b>	<b>62</b>	<b>27,931</b>	<b>52</b>	<b>33,331</b>	<b>36</b>	<b>61,504</b>	<b>150</b>	<b>122,766</b>
Energy	Petroleum/Gas Pipeline	3	5,214	5	7,235	0	0	8	12,449
	Power Interconnector	6	2,342	6	675	6	2267.5	18	5,285
	<b>Subtotal</b>	<b>9</b>	<b>7,556</b>	<b>11</b>	<b>7,910</b>	<b>6</b>	<b>2267.5</b>	<b>26</b>	<b>17,734</b>
ICT	Fibre Optic Links	10	396	4	264	0	0	14	660
	Data Centre	1	173	1	70	0	0	2	243
	Internet Exchange Point (IXP)	2	7	0	0	0	0	2	7
	<b>Subtotal</b>	<b>13</b>	<b>576</b>	<b>5</b>	<b>334</b>	<b>0</b>	<b>0</b>	<b>18</b>	<b>910</b>
Transboundary Water	Multi-purpose Reservoir	4	662.65	1	2,000	0	0	5	2,663
	Water Aquifer Management	1	2.7	0	0	0	0	1	2.7
	<b>Subtotal</b>	<b>5</b>	<b>665.35</b>	<b>1</b>	<b>2,000</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>2,665</b>
<b>Grand Total</b>		<b>89</b>	<b>36,728</b>	<b>69</b>	<b>43,575</b>	<b>42</b>	<b>63,772</b>	<b>200</b>	<b>144,075</b>





### 1.3 Scope

The Sector Reports *complement* the IRIMP Strategic Framework and Infrastructure Development Plans which are centred around the core economic development corridors in the IGAD region. The sector plan and related investments have been developed in collaboration with the Member States to ensure alignment with national development plans. In parallel, the sector investments have been developed to align with the African Union PIDA PAP II process. The sector plans and risks have been “tested” through consultations with the IGAD Joint Steering Committee and consultations with civil society and private sector organisations through a series of workshops to ensure inclusion, resilience and environmental and social safeguards are fully considered and incorporated into the IRIMP.

### 1.4 Users

The Sector Reports are intended to be used by IGAD Member States, and in particular the relevant line Ministries, Departments and Agencies responsible for sector development, and their development partners to guide future planning, investment decision-making and funding and financing arrangements.



# Chapter Two: Strategic Context and Situational Analysis

## Chapter 2: Strategic Context and Situational Analysis

### 2.1 Sector Development Drivers

The ICT demand is driven by the economic and social development which results in growth of voice traffic and data volume. The growth of voice is going down due to the usage of Voice over IP applications such as Skype and IMO. The data volume growth increases due to the growth of the Internet and broadband services. The demand for bandwidth will definitely need to be increased to provide capacity for internet and broadband services as well as international and regional capacities. The data volume demand will be influenced by the development of new technologies and innovations which will make a huge transformation. The transformation will come with opportunities, challenges and implications that are not yet fully known. The expected technology development main products are the Internet of Things (IoT), cloud computing, big data analytics and artificial intelligence as shown in the figure below. When these technologies are deployed new services and products developed for the use of the people which definitely will generate more data volumes and requires more bandwidth and high speed. ICT has a great role in enhancing technology, businesses and society interaction. This development requires access to the infrastructure, software and availability of skilled persons.

The demand for bandwidth needs to be estimated and projected into the future to design the regional and national backbone network for adequate capacity. This task is particularly difficult in some countries such as Somalia and South Sudan because there is very little reliable data available that could be used in a forecasting model. With help of the regulatory authority the telecommunications operators can provide information to estimate the growth rate per year which will be used to calculate the demand and the expansion capacity of the existing network.

It is important to ensure the availability and sustainability of the services. When two or more operators build ICT infrastructure along the same route and lease capacity on each other's infrastructure as a backup redundancy has been achieved. The policy of infrastructure sharing can contribute significantly to redundancy and optimise infrastructure cost. The most effective redundancy concept on the network topology level is the creation of ring structures. In the event of a local failure in a ring structure, almost any point along the ring can continue to be served by routing traffic the other (longer) way around the ring.

### 2.2 Current projects and trends: Demand and supply analysis

The mobile telephone networks, however, are fairly extensive across the region, and well developed in Kenya, Sudan and Uganda where the market is open for competition. The networks in Djibouti and Ethiopia currently are under government monopoly. The network is fairly well developed in Somalia, driven by the private sector, but is unregulated and associated with a high-risk investment profile. Recent conflict in South Sudan is a major reason for the poor development of its mobile network. Further investment in the mobile





telephone networks of IGAD member states is required. Most exhibit below the world average for mobile penetration per hundred inhabitants. The Africa average mobile penetration rate for 2016 was 80.8 per hundred inhabitants for the year 2016; while the corresponding figure for the world was 99.7. Kenya has the same average for Africa. The rest of the IGAD member states have less than the Africa average. The region needs to expand mobile services, especially in rural and underserved areas. Expanding the mobile networks are most likely to be associated with significant positive economic development impacts. The mobile networks enable mobile money, online banking, internet, and e-payment. An example is M-PESA in Kenya, which is universally recognised as a success. Somalia wants to establish a regional hub for the mobile money.

### *Internet Exchanges*

In 2016 the ITU estimated that only some 25% of individuals in Africa use the internet, which is very low compared to the world average of 47%. The IGAD region average for the same year was even lower at around 15%. One of the main reasons for this low average is the high cost of the internet and the poor infrastructure in rural areas. Although, the IGAD region has many submarine cable landing points, the cost of the bandwidth for internet is high, especially for the landlocked countries. The cost of bandwidth per month in Kenya is \$46.79 and in Uganda is \$68.73.

IGAD member States have Internet Exchange Points (IXPs) except Somalia and South Sudan. Kenya has a regional IXP owned by the private sector. The Internet Service Providers (ISPs) are not all connected to these IXPs. Djibouti Data Centre (DDC) is the first tier 3 carrier-neutral data centre in East Africa with direct access to all major international and regional cable systems (nine) connecting Africa to Europe, Asia, middle East and Australia. DDC also operates the Djibouti Internet Exchange (DjIX) an independent, neutral and open IXP in Africa. The DjIX offers high speed, reliable, and resilient service. Both DDC and DjIX can act as catalysts in east Africa to enable new applications and services that help to drive development and social well-being in the region. The DDC is used by many international operators such as China Telecom, France Telecom, Google and Facebook. It could become a regional centre for the IGAD region. Ethiopia is also in a good location for an IGAD regional IXP. A regional IXP will keep the regional and local traffic within the region, hence reduce the cost of the internet services.

### *Broadband Connectivity*

The average fixed broadband penetration per hundred inhabitants is 0.67 in the IGAD region, which is very poor. The fixed broadband penetration rate for Africa is 0.7 while it is 11.9 for the world. IGAD member states should prioritise the development of broadband connectivity in order to create an effective enabling environment for the establishment of the digital economy and single regional digital market. Improved broadband connectivity most likely will generate enormous social and economic benefits including job creation, and growth of investment opportunities, access to online government services, improved education and training services, and improved national safety and security services.

Fortunately, the governments in IGAD region are supporting the development of software applications and their usage especially for promoting trade, financial services, and enhancing





the productivity of SMEs. IGAD member states have also established innovative centres for the youth with ICT for the development of software and other ICT applications. Some of the IGAD member states have gone further and have developed policies to promote the manufacture and assembly of ICT equipment including smart phones.

The demand for broadband connectivity will be influenced by the technology developed which will make a huge transformation. The transformation will come with opportunities, challenges and implications that are not yet fully known. The expected technology development main products are the Internet of Things (IoT), cloud computing, big data analytics and artificial intelligence. When these technologies are deployed new services and products developed for the use of the people which definitely will generate more data volumes and requires more bandwidth and high speed. ICT has a great role in enhancing technology, businesses, and society interaction.

### *Submarine Cables Systems*

The region has a good number of submarine cable landing points which provide international connectivity with enough capacity, which enhance competition and ensure affordable prices for international connectivity and contribute to the reduction of the ICT services prices at national level. Djibouti will have very soon nine submarine cables, Kenya has five submarine cables systems, Sudan four submarine systems, and Somalia has three. Djibouti has two submarine cable landing stations 5km apart for redundancy. Djibouti submarine landing points can be redundancy for the Mombasa and Port Sudan ones due to the strategic location and ample capacity, while the submarine landing points in Mombasa and Port Sudan to be redundancy for each other and for Djibouti and Somalia.

The Djibouti Africa Regional Express (DARE) project can be extended to Eritrea and Sudan while the Gulf to Africa (G2A) cable system can be expanded to Kenya and Port Sudan to enhance regional connectivity and competition which will contribute substantially to the reduction of the ICT services price and eradication of poverty. The DARE and G2A will provide complementarily and redundancy for each other as well as for other submarine cables systems.

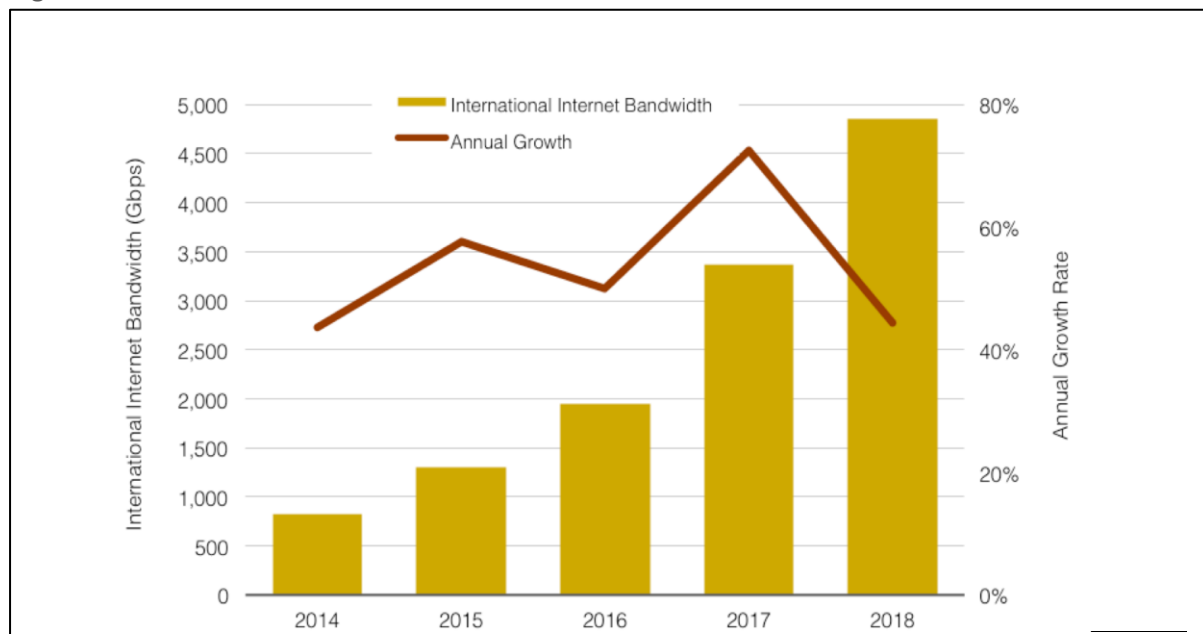
### *Demand Analysis*

The international internet bandwidth has a high rate especially in Africa. In Africa Internet bandwidth is, growing at a compound annual rate of 44 percent between 2013 and 2017 according to Tele-Geography. The Middle East was just behind Africa, rising at a 42 percent compound annual rate during the same period. The international Internet bandwidth has a rate of around 50% for Uganda for the year 2016. Kenya bandwidth growth rate is low which may not be correct. It is difficult to calculate the international Internet bandwidth for the other country in the absence of data. Estimation has been proposed for some countries taking into account the population, national backbone infrastructure, penetration rate, pricing and competition.





Figure 2. 1: International Internet Bandwidth Growth - Sub Saharan Africa



The clustering mentioned above will be used for proposing the growth rate. The growth rate for the short and medium terms planning will be high compared to the one for the long-term planning. It will be similar to the mobile growth rate which very high six or seven years ago but now is at lower growth rate.

The assumption for the international Internet growth rate is as follows:

- Cluster one includes Kenya, Sudan and Uganda. The forecasting will be 25% for the short and medium terms planning and 15% for the long-term planning.
- Cluster two includes Djibouti and Ethiopia. The forecasting will be 16% for the short-term planning, 21 for the medium-term planning and 18% for the long-term planning.
- Cluster three includes Somalia and South Sudan. The growth rate will be 12% for the short-term planning, 20 % for the medium and 16% long term planning.

The forecasting for the international Internet bandwidth is shown in the table below.

Table 2. 1: Forecast for International Internet bandwidth

Country	Short Term Plan		Mid Term Plan		Long Term Plan	
	2016 Gbps	2024 Gbps	2025 Gbps	2030 Gbps	2031 Tbps	2050 Tbps
Djibouti	47	166.0404	192.6069	599.4872	0.725379	16.83928
Ethiopia	285*	805.4726	934.3482	2908.15	3.518862	81.6884
Kenya	877.775	2877.711	3223.036	8185.084	9.412846	133.9615
Somalia	23*	56.94715	63.78081	190.4485	0.228538	3.834075
South Sudan	17*	42.09137	47.14234	140.7663	0.16892	2.833881
Sudan	560*	1835.912	2129.658	4926.029	5.664933	80.62204
Uganda	61.585	201.9012	234.2054	541.7313	0.622991	8.866265

Note\* Estimation for Ethiopia, Somalia, South Sudan and Sudan



### *Prices for ICT services*

The supply and demand for ICT services has changed over the last two decades. There is a growing demand for data and a decrease in traditional voice and short messages. The innovation of new phone handsets and lower prices has increased the penetration rate for mobile services. However, prices are still considered as one of the barriers to access in Africa. The majority of mobile phones users do not use smart phones. A considerable percentage of the users do not see the need for internet services and some lack the knowledge of how to use it. In addition, the perceived risks from cyber security, privacy, cost and quality of services deter users from using the internet via smart phones. Therefore, there is poor knowledge of internet benefits. The challenges are cost, knowledge, lack of awareness and access to smart phones.

The price of the mobile services basket ranges from \$1.47 for South Sudan to \$12.67 for Djibouti. Djibouti is the most expensive country in IGAD region and above the African average by 33.4%. The Africa average value is \$9.5/month. On average, the prices are less than the average cost for Africa, with the exception of Djibouti. This means that the mobile services in IGAD region cost is affordable to the majority of the citizen. The prices can be sustained or reduced further by increasing the access to mobile services and enhance competition.

Africa has low mobile-broadband prices in USD which is less than the world average at approximately \$8 and \$15 for the prepaid handset-based and post-paid computer-based sub-baskets respectively. Africa is high when compared with the average world for the GNI per capita percentage.

The fixed-broadband services have been on the decline since 2008 in Africa. Most African countries have fixed-broadband prices that are less than 5% of GNI per capita. However, Africa has higher prices than the world average. In the IGAD region, the member states that provide the lowest price in USD for the fixed broadband are Uganda, Sudan and Ethiopia.

The factors that affect prices are the penetration rate, network development, coverage, international and cross border connectivity, connectivity to the submarine cable systems, income of individual hard currency availability among other factors. The government taxes also contribute to the high cost of prices. Taxes can be more than 40% in some countries. Hence it is recommendable to reduce the taxes, increase the connectivity to the submarine cable systems, and increase the cross-border connectivity. The establishment of regional IXPs will also contribute to the reduction of internet prices.

### 2.3 Gap analysis/assessment

The estimation will also be used to design the necessary national and cross border optical fibre interconnectivity. Regional and international bandwidth is the bandwidth available at an international gateway be at satellite earth station, cross border optical fibre or/and submarine landing points. The total international bandwidth of a country is the sum of all international bandwidth at all the gateways in the country. The expansion and reviewing of the national backbone will generate ICT infrastructure projects. The implementation of these projects will put the region on the eve of the digital economy and maximise the utilisation of





the submarine cable available capacity. It will promote balanced economic development between urban and rural areas to eradicate poverty, create jobs and reduce the digital divide.

In fibre-optic communications, wavelength-division multiplexing (WDM) is a technology which multiplexes a number of optical carrier signals onto a single optical fibre by using different wavelengths of laser light. The technique allows bidirectional communications and multiplication of capacity over one strand of fibre. A Wavelength Division Multiplexing (WDM) system uses a multiplexer at the transmitter to join the signals together and a de-multiplexer at the receiver to split them apart. It is possible to have a device that does both simultaneously, and can function as an optical add-drop multiplexer. The expansion of existing systems using WDM is not costly.

There is a clear gap in ICT cross border connectivity in IGAD region. The table below shows the current IGAD Regional ICT cross border connectivity.

Table 2. 2:IGAD Region ICT cross border connectivity

Country	Number of cross borders links	Neighboring countries	Expected number of countries to be connected	% of regional connectivity
Djibouti	2	Ethiopia and Somalia	2	100%
Ethiopia	2	Djibouti and Sudan	5	40%
Kenya	1	Uganda	3	33.3%
Somalia	1	Djibouti	3	33.3%
South Sudan	0	-	4	0%
Sudan	1	Ethiopia	2	50%
Uganda	1	Kenya	2	50%

Most of the existing connectivity depends on one cable. It is essential to have more than one optical fibre link to ensure the sustainability, redundancy and availability of the ICT services. It is important to use the power line crossing the borders in ICT connectivity for safety and reduction of cost.

## 2.4 Intervention Priorities

The main objective is to develop ICT bankable projects with clearly demonstrated economic and financial feasibility, as well as social benefits. It is essential to develop innovative models for financing and attract more private investors. The financial resources should be directed to projects which will have greatest impact on social and economic development. The backhaul links are important to utilise the capacity of the submarine cables and enhance competition to reduce the cost of ICT services. The submarine cables can be prioritised to be used for regional and international connectivity.

It is important to review and update the enabling environment to facilitate the implementation of the ICT cross borders projects. It is important to develop regional interconnection agreement to ease the problem of cross borders connectivity. The ICT regulatory authorities have to promote the regional connectivity and encourage the telecommunications operators to do it. It is a priority to establish a regional regulatory association to fast tract the harmonisation of the ICT policy and regulatory frameworks.





Cyber security development will encourage the people to use internet services especially the financial services which will have economic benefits by keeping the money in the banks. It will provide trust and confidence to use e-applications such as e-commerce, e-learning and mobile money. It is important to establish the regional CIRT as well as CIRTs at national level.



# Chapter Three: Strategic Framework

## Chapter Three: Strategic Framework

### 3.1 Sector Vision and Strategy

The IGAD region will be characterised by sustainable, seamless, integrated and secured regional ICT networks at the end of IRIMP implementation. The implementation of IRIMP will contribute positively to affordability, reliability, resilient and bridge of the Digital Divide. The vision will contribute substantially to the achievement of the IGAD region integration objectives, 2063 Agenda and sustainable development goals. The ICT sector in the IGAD region will progressively evolve from one characterised by rapid but uneven growth, poor internet and broadband connectivity and usage, and a Digital Divide to a developed, sustainable and integrated network where the majority of the population can access and efficiently use the digital economy, making ICT an important driver in propelling IGAD into a regionally and internationally competitive economy.

The Vision for the three periods is given below:

Table 3. 1: ICT Sector Vision

Short term (2020-2024) Vision	Medium term (2025-2030) Vision	Long term (2031-2050) Vision
The policy and regulatory environment enabling the growth of and improved access to the regional ICT architecture is strengthened, agreed and implemented. Internet and broadband connectivity and usage is significantly improved	Regional ICT infrastructure and cross border links are significantly improved, as is internet and broadband usage which reaches International standards. Private sector investment significantly; all operators agree terms	The digital divide is overcome, and the digital economy is a major driver of prosperity and integration in the IGAD region, which becomes a hub of ICT and digital content innovation of Continental significance

Strategic objectives to realise the vision are as follows:

- i. Enhance enabling environment and institutional arrangements towards building digital market;
- ii. Construct and expand regional ICT infrastructure links and networks;
- iii. Increase the usage of ICT services, e-applications such as financial services, e-commerce, e-health, internet services, social media, content development and promote infrastructure digitalisation;
- iv. Develop the IGAD Region Safe Cyber Space;
- v. Build capacity of human resources, strengthening the institutions and promote technology transfer.

#### *Enhance the enabling environment and institutional arrangements*

Prevailing ICT policies and strategies in IGAD, developed some seven years ago, need updating and strengthening. Regulations on issues such as licensing, consumer protection, interconnection, spectrum, pricing and competition must be developed. Policies and strategies need to be reviewed in order to facilitate the construction and interconnection of regional trans-border ICT infrastructure, as well as to promote open access and network unbundling.







The IRIMP vision concerning enabling environment will be “*conducive, smart, dynamic and predictable policies and regulations which will stimulate investment for the sector development and encourage new entrants*”. The IRIMP proposals are for IGAD to have regional ICT institutions or committees to oversee the ICT development programmes and activities and make recommendations to the higher levels of government. The national ICT institutions will be established and strengthened to play their roles in implementing the IRIMP and other master plans and programmes.

#### *Construct and expand regional ICT cross borders infrastructure links and networks*

There are gaps in the trans-border ICT infrastructure in the IGAD region. The IRIMP envisages that the region will have a sustainable regional network with redundancy and high quality which will have a positive impact on the reduction of prices and be able to cope with the expected significant increase in regional digital traffic. This traffic will be enabled by the establishment of regional IXPs.

Furthermore, it is envisaged that the submarine cable capacities will be substantially utilised; and related benchmarks and targets reached. The existing regional infrastructure links capacities are expected to increase to 100% and the internet network bandwidth to 1000G by 2050. It will have redundancy using ring topology and using the electricity and railways optical fibre cables.

The mobile penetration per hundred inhabitants, fixed broadband per hundred inhabitants and percentage of individual using the internet are expected to increase to 80%, 10% and 40% in the medium-term (up to 2030) and 100%, 60% and 80% in the long-term (up to 2050). Worldwide the trend has been to reduce interconnection charges using regulatory authorities’ controls. Enhanced competition in the sector will reduce the user charges. IGAD region will have competitive pricing in the medium- and long-term plans. The networks and services developed will facilitate the creation and operation of the IGAD’s digital economy, reduce the cost of doing business and enhance region integration.

#### *Increase the usage of ICT services, e-applications such as financial services, e-commerce, e-health, internet services, social media and promote content development and infrastructure digitalisation*

ICT is a cross cutting sector which has positive impact on the construction and operation of other sectors. For example, the implementation of the ICT systems and applications such as intelligent transport system (ITS) on transport, energy and water will optimise the cost of both construction and operation. ITSs are those in which information, data processing, communication, and sensor technologies are applied to vehicles (including trains, aircraft and ships), infrastructure, operating and management systems, to provide benefits for transport service users.

The latest technological innovations will be embraced in the design, implementation and operations of infrastructure which will reduce the operation and management cost and increase the project life cycle. Therefore, by implementing the medium- and long-term plans, IGAD will have smart corridors and smart infrastructure which will have positive impact on the operation efficiency and increase the lifecycle of the equipment and networks which maximise the profit for the investors.

#### *Develop the IGAD Region Safe Cyber Space*

Effective cyber security is crucial for infrastructure which uses the ICT systems and applications. IGAD has a cyber security programme waiting for funding. It is expected that IGAD member states develop cyber security policies, laws, regional cooperation agreements and critical infrastructure information protection instruments as well as creation of related regional systems and institutions such as Regional Cyber Security Centre. Therefore, IGAD will be “*having secured infrastructure and cyber space with strong regional cooperation and involvement of the private sector*”.





### *Build capacity and promote technology transfer*

The capacity building for institutions and individuals is a continuous process due to the rapid technology change in ICT sector. Capacity will be built through the implementation of the programmes and projects. The skilled persons and efficient ICT regulatory authorities will contribute substantially to the development of the ICT sector, reducing the cost of construction and operation and attraction of investors as well as enhancing accountability and transparency.

Technology transfer is important for developing the ICT industry, customisation of technologies to the African environment and reducing the cost of ICT infrastructure development. It is recommended that IGAD member states universities are involved in the development of ICT industry, research and innovation. The transfer of technology will create enabling environment to attract big companies such as Microsoft, Facebook, and Google to the region. The IGAD region will have smart partnerships for technology transfer.

### Regional infrastructure Connectivity

The regional ICT interconnectivity is not sufficient. Djibouti and Ethiopia connected with two countries each. Kenya, Somalia, Sudan, and Uganda connected with one country each. South Sudan is connected by satellite and has no terrestrial optical fibre connectivity with his neighbours. Kenya has optical fibre to the borders with Ethiopia and Somalia. Kenya also has a project to connect with South Sudan. Uganda has an optical fibre to the border of South Sudan. Ethiopia is ready to connect with Somalia and then with the G2A submarine cable. Sudan also is ready to connect with South Sudan. Somalia and South Sudan cross border connectivity will enhance the regional ICT connectivity.

More trans-border ICT connectivity is required to improve network reliability, affordability, competition and maximise the utilisation of the submarine cables capacities. Therefore, the following links are proposed for the medium and long terms plans:

- Expand DARE and G2A submarine cables to connect all IGAD coastal countries;
- Sudan be connected to Ethiopia by two optical fibres;
- Establish Regional IXPs;
- South Sudan be connected by two optical fibres to Uganda;
- Somalia be connected to Ethiopia by two optical fibres;
- South and Ethiopia be connected by three optical fibres;
- Ethiopia and Sudan be connected by optical fibre via Kassala and Humra;
- South Sudan be connected to Sudan by three optical fibres.

### IGAD Region Single Digital Market (SDM) Proposal

The proposal of the SDM includes the enabling environment, infrastructure connectivity, data, services cyber security, and digital skills. Some of therecommendations stated above are included in the SDM proposal.

#### 1. Towards IGAD Region Single Digital Market (SDM) -

##### A. Priority regional digitalinterconnectivity infrastructure:

##### i. *Submarine festoon cable along coast*

- i. Extension of DARE cable system (\$80m), based on open access for all, adding missing landings points, branching units and cable extension. Would link Assab/Masawa - Djibouti - Berbera - Bossaso - Mogadishu - Kismayo - Mombasa (approx. 6,400km)

Readiness: Feasibility study largely done. Feasibility for extension to Port Sudan (for redundancy) and Kismayo landing point needed.





- ii. Extension of Gulf to Africa (G2A) submarine cable system (\$140m) from Mogadishu and Bossaso to Djibouti, Assab/Masawa, Port Sudan as well as to Kismayo and Mombasa for redundancy and enhance competition for better quality and affordability

*ii. Terrestrial links and backbone connections*

- a. Djibouti to Ethiopia (\$26m):
  - i. Samara - Galafi- Dikhil – Djibouti
  - ii. Dire Dawa - Dewelleh – Ali Sabeh – Djibouti - feasibility study done
- b. Djibouti to Somalia (\$5m):
  - i. Djibouti - Loyada – Borama (\$Xm) – no feasibility study
- c. Somalia to Kenya
  - i. Kismayo – El wak (\$Xm) – no feasibility study
  - ii. Kismayo – Liboi (\$Xm) – no feasibility study
- d. Kenya to Somalia / Ethiopia
  - i. NETIP (744 km): Isiolo – (1) Wajia - Madera – Dadaab (2) Mogadishu – Elwa (\$34m) – no feasibility study
- e. Kenya to Ethiopia
  - i. LAPSSET (1,000km): Lamu - Isiolo – Moyale (\$35m) – no feasibility study
- f. Eritrea to Ethiopia / Sudan
  - i. Bure-Assab (\$Xm) – no feasibility study
  - ii. Zalambassa-Asmara-Masawwa (\$Xm) – no feasibility study
  - iii. Kassala –Tasany- Asmara (\$Xm) – no feasibility study
- g. Somalia-Ethiopia
  - i. Mogadishu – Firfir (\$Xm) – no feasibility study
  - ii. Mogadishu – Dollo (\$Xm) – no feasibility study
  - iii. Bossaso – Goldogob (\$Xm) – no feasibility study
  - iv. Berbera-Togo Woji (\$Xm) – no feasibility study
- h. South Sudan - Sudan....
  - i. Rank –Malakal-Juba (\$Xm) – no feasibility study

\*underlined connections are considered to be more ready for deployment

- B. Policies and Regulations harmonisation: regional interconnection framework based on open access, spectrum, mobile roaming, , competition, infrastructure sharing, general data protection regulations, regulations of Internet, digital technology regulations and digital media regulations, licensing etc. (\$30m)
- C. Establishment of Regional ICT Regulatory Authorities Association

**2. Towards a single regional data market in IGAD Region** – safely and cost-effectively storing and exchanging data

- A. Data Infrastructure (carrier neutral) at landing stations and in major cities
  - i. Regional Tier 4 Data Centre (\$20m)(based in Djibouti) – feasibility study completed
  - ii. National Data Centers in Ethiopia, Somalia, South Sudan and Eritrea (\$70) – to support redundancy - no feasibility studies
  - iii. Regional data hubs / Internet Exchange Point (IXP) / Caches (\$30m) – cloud infrastructure – private data caches - content delivery networks
- B. Cyber security
  - iv. Regional cybersecurity platform (\$50m), focusing on capacity building and information-sharing – establishment of regional CERT
  - v. Regional policy, regulation, legislation and enforcement frameworks (\$20)
  - vi. Harmonisation of cyber crimes legislation and development of regional cooperation agreement on tackling cyber crime
  - vii. Development of region public key infrastructure for critical infrastructure information protection platforms and legal frameworks towards establishment of IGAD Root Authority Certification.
- C. Regulatory policy harmonisation and technical assistance (national and regional): data protection, open data, standardisation (\$30)





### 3. Towards a single digital service market in IGAD Region

- A. E-government - Sharing e-government expertise, connecting governments digitally, study tours , visits and exchanges of expertise, information and knowledge(\$20)
- B. E-commerce hubs such as onlinetrade points
- C. Digital financial services
- D. Policy and regional harmonisation and Cooperation between national postal networks
- E. Cross-border digital payment facilitation (\$30) - Interoperability, lower transaction fees, harmonisation of legislation, convene / facilitate dialogue between operators/ regulators, technical assistance on MAL/Fraud

### 4. Digital skills

#### A. Regional ICT Academy Network

The digital competence is a combination of information skills, communication skills, content creation skills, safety skills, and problem-solving skills. Centers of excellence specializing in different topics (R&D, innovation, cyber security, data and training) are proposed to offer basic and advanced skills as well as contribute substantially to knowledge transfer to the IGAD region (\$60m):

- i. Kenya - Cyber security (i.e. Cyber Security Research Institute)
- ii. Ethiopia - Advanced ICT
- iii. Somalia - Digital financial services
- iv. Djibouti - Data centre and its enabling environment
- v. Uganda- Content and its platform development
- vi. Sudan – Terrestrial and submarine cabling systems Academy
- vii. South Sudan – Wireless communications

#### B. Expansion of Research & Education Networks (RENs) (\$30m) - Sharing resources and demand aggregation; Access to open educational resources; e-learning

## 3.2 Funding requirements and financing

Opportunities for investment in the ICT sector are considerable in the IGAD region. The sector requires around \$1bn of investment in the medium-term to 2030 in order to meet the challenges and ensure that the ICT infrastructure can be a major contributor to the economic prosperity of the IGAD region and the social well-being of its citizens. It is difficult, however, to precisely identify the investment required for the long-term, from 2030 to 2050, due to the rapid change in the ICT sector and increasingly fast pace of technology innovation, though the sums are expected to be considerable.

The private sector has played a leading role in the development of the ICT sector by providing investment, knowledge and management. The types of the private sector investment are Build Own and Operate (BOO) and Build Operate and Transfer (BOT), as well as management. The internal rate of return (IRR) of nearly all ICT projects to date has been positive. The profitability of projects to date has stimulated private sector investment. Further, the sector is not capital intensive in a manner that characterises power generation and railway investments.

The opportunity (and indeed necessity) of establishing a regional ICT network in the IGAD region is clearly apparent. The network would include, Regional IXPs, a regional cyber security cooperation framework, and digital content development. Policies and regulations have to be designed and implemented in order to facilitate and directly promote ICT infrastructure cross borders connectivity. It is also important to pay attention to the capacity building, the transfer of technology and strengthening of relevant institutions. The transfer of knowledge will





reduce the cost of constructing the infrastructure and hence contribute to the affordability of the infrastructure services.

The cyber security is important where public and private partnership will be required to mobilise financial resources for it. It will provide confidence and trust to the users.

### 3.3 ESIA, Climate Resilience and safe guards

ICTs can play both positive and negative roles in environment. The positive impact is online services such as e-commerce, paperless trade, transport and travel substitution, increase in energy efficiency, a host of monitoring and management applications. The telecommunications and mobile operators now use solar energy especially in the stations outside the cities. The increase of the equipment and material life cycle will reduce the amount of e-waste. The ICT indirect impact will be by smart infrastructure by using transport intelligent system and smart grids, building and irrigations as well as in monitoring the climate and storing the information. ICT and the Internet are enabling an increasing number of products and services such as scientific journals, books, music Compact Discs (CDs), film and videos, software, to be delivered online. Email has replaced many millions of letters, written on paper, collected, sorted and delivered worldwide ICT can play a role in the reduction of transport by e-working, e-educations, tele-conferencing, video conferencing, e-commerce, and e-agriculture. In short ICT reduces the demand on transport and office space. The ICT will play a great role in disaster management and control.

### 3.4 Risks

The ICT projects have manageable risk. The private sector prefers projects with medium or low risks which can be managed. The table below shows the type of risks and their mitigation of ICT projects.

Table 3. 2: Risk and Mitigations

Potential Risk Areas	Risk Mitigation Measures
Climate Change	Assessment of climate change impacts and safeguard measures
Environmental impacts	Conducting ESIA's and development of remedial measures
Social Impacts	Conducting ESIA's and development of Resettlement Action Plans
Gender Exclusion	Providing for non-discrimination and gender inclusion
Political and Regulatory Risks and Nationalisation Risk	ICT activities have moved from government monopoly to liberalisation and competition
Currency Exchange Risk	The ICT operators always discuss the ICT services prices with the regulatory authority to optimise the cost of local currency exchange rate



# Chapter Four: Action Plan

## Chapter Four: Action Plan

### 4.1 Implementation Plan

It is essential when considering the gap analysis to take into account the ICT cross border links infrastructure sustainability, quality, reliability and availability. The usage of the ring topology in the national optical fibre backbone will ensure the achievement of the sustainability and reliability. It is also important to have redundancy for the cross-border ICT infrastructure links and it will be proper if it is on the power transmission lines. It is also important to have different towns or cities for the cross-border interconnectivity for example all the three optical fibres between Ethiopia and Sudan pass through or near Matema and Galabat. It is important for Ethiopia and Sudan to construct links via Humera-Kassala and Gambela-Damazeen. The assumption for bridging the gaps is that the short-term planning will be for the completion of the planned projects and expansion of the existing network. However, the Eritrea interconnectivity projects should be implemented in the short-term planning. Eritrea can be connected to Sudan and Ethiopia as well as to submarine cable landing points to Port Sudan or Djibouti depending on the cost.

Table 4. 1: ICT Sector Implementation Plan

Activity	Short Term	Medium Term	Long Term
	2020-2024	2025-2030	2031-2050
Review the enabling environment	—————		
Develop cyber security policy and regulations Develop regional cooperation agreement on cyber security Establish regional cyber security response team centre (CIRT) study on the Public Key Infrastructure Protection Establishing a regional mechanism for recognition Certificate Authorities	—————	—————	
Establish regional ICT regulatory authority association	—————		
Develop regional ICT regulations such as competition, licensing, interconnections, digital regulation and infrastructure	—————		
Develop postal policy and regulatory frameworks	—————		
Expand DARE and G2A submarine cables to connect all IGAD coastal countries	—————		
South Sudan connected by two fibre optic cables to Uganda; Somalia connected to Ethiopia by two fibre optic cables; South Sudan connected to Ethiopia by two fibre optic cables; Kenya and Ethiopia connected by three fibre optic cables; Ethiopia and Sudan connected by fibre optic cable via Kassala and Humra; South Sudan connected to Sudan by three fibre optic cables Establish Regional IXPs South Sudan be connected to Kenya by two optical fibres Somalia be connected to Kenya by two optical fibres	—————	—————	

#### Short Term Planning Projects

As stated above, expansion of ICT networks for data or voice is not costly, because the technology used is DWDM. Multiplex and interface equipment are required which is not







costly. Therefore, the short-term planning will include the expansion of the existing networks which don't require high investment. It will also include the projects which are currently in the pipeline.

Table 4. 2: ICT Short Term Projects

Project	Sub-Sector	Cost m\$	Country(ies)
Gulf to Africa (G2A)	Fibre Optic Cable	200	Somalia, Ethiopia
Djibouti Africa Regional Express (DARE)	Fibre Optic Cable	100	Djibouti, Somalia, Kenya
Juba-Kampala Fibre Optic Link (South Sudan Section)	Fibre Optic Cable	45	Uganda, South Sudan
Transborder Submarine Fibre Points of Presence (PoPs) and Regional Smart Hub Facility and Data centre	Fibre Optic Cable & Data centre	70	Kenya, Uganda. Ethiopia
Konza National Data Centre and Smart City Facilities	ICT Data Centre	173	Kenya
Installation of 681 km Fibre Optic Cable	Fibre Optic Cable	32	Djibouti, Ethiopia
Nadapal – Juba Fibre Optic Cable	Fibre Optic Cable	62	Kenya, South Sudan
Berbera – Togochoale Fibre Optic Cable	Fibre Optic Cable	10	Somalia, Ethiopia
Nairobi – Mogadishu Fibre Optic Link (Kenya Section) and Point of Presence (PoP)	Fibre Optic Link and Point of Presence (PoP)	34	Kenya
Garissa - Kismayo Fibre Optic Link (Kenya Section)	Fibre Optic Cable	20	Kenya, Somalia
Somalia Internet Exchange Point	IXP	4	Somalia
South Sudan Internet Exchange Point	IXP	3	South Sudan
One Area Network	Voice Traffic Exchange	0.5	Djibouti, Ethiopia, Kenya, Somalia, South Sudan, Sudan, Uganda

### Medium Term Planning Projects

Most of the ICT networks in the liberalised and competitive market is owned by the operators. The operators normally have a business or strategic plan but they keep it as confidential due to competition. The strategic plan contains the operator network expansion including new links for the next five years.

The second organisation concerned of the ICT network development is the regulatory authority or the ICT ministry where there is no regulator. The regulator plans for the network as well as the operator's business plan should be considered in identifying the projects for the medium-term planning.

The ownership of new projects and regional ring of optical fibre links by the IGAD Member States especially the ICT operators and regulators is highly essential which will ensure the implementation of these projects. The lack of these institutions means the new projects will be a wish list.

The ICT equipment has backup systems., Ring topology should be taken into consideration when planning for medium and long terms to ensure redundancy and reliability of the network. The current national networks in IGAD Member States are based to some extent on ring topology with the exception of networks in Djibouti, Somalia and South Sudan. It will





also be better to apply ring topology on the cross borders' connectivity. The proposed regional rings are:

- Ethiopia, Sudan, South Sudan, Uganda, Kenya and back to Ethiopia
- Ethiopia, Djibouti, Somalia and back to Ethiopia.
- Kenya, South Sudan, Uganda and back to Kenya,
- Djibouti, Ethiopia and Sudan including the submarine cables

Currently there are cross borders optical fibre links which can be facilitated by policy and negotiation of necessary agreements to establish rings in IGAD region such as the one for Djibouti, Ethiopia and Sudan including the submarine cable.

The other proposal is to have cross border optical fibre links redundancy by locations. The proposed cross borders links based on geographical locations are:

- Ethiopia and Sudan link currently pass through Metema and Galabat, hence the redundancy links can be via Humera-Hamdyeed-Kassala and also a second one via Gambella-Kurumk-Damazin
- Ethiopia and Djibouti current optical fibre links via Galafi. The redundancy can be via Ali Sabieh and also the usage of the Standard Gauge Railway optical fibre;
- Kenya and Uganda current links are via Malaba. The redundancy can be via Busia and Kisumu
- Ethiopia and Somalia have no cross border optical fibre but they can have more than one in terms of geographical locations;
- Uganda and South Sudan have no currently cross border optical fibre but they can have more than one in terms of geographical locations;
- South Sudan and Sudan have no currently cross border optical fibre but they can have more than one in terms of geographical locations;
- Djibouti and Somalia have one optical fibre link but they can have a second one in terms of geographical location and another one by submarine cables.
- Ethiopia and Kenya currently can be linked via Moyale but they can have a second one in terms of geographical location and another one by submarine cables (Ethiopia-Djibouti-Kenya using DARE system)

Table 4. 3:Medium Term Projects

Project	Sub-Sector	Cost m\$	Country(ies)
Nadapal – Juba Fibre Optic Cable	Fibre Optic Cable	45	South Sudan
Transborder Submarine Fibre PoPs and Regional Smart Hub Facility and Data center	Fibre Optic Cable & Data centre	70	Kenya, Uganda, Ethiopia
Berbera – Togochoale Fibre Optic Cable	Fibre Optic Cable	10	Somalia
Isiolo - Mandara Fibre Optic Cable	Fibre Optic Cable	35	Kenya, Somalia
Khartoum – Juba fibre optic cable	Fibre Optic Cable	20	South Sudan, Sudan
Transborder Submarine Fibre Points of Presence (PoPs) and Regional Smart Hub Facility and Data centre	Fibre Optic Cable	70	Kenya, South Sudan, Ethiopia
Sudan-Eritrea Fibre-optic Link	Fibre Optic Cable	10	Sudan, Eritrea





Nairobi – Mogadishu Fibre Optic Link (Somalia Section) and Point of Presence (PoP) at Mogadishu	Fibre Optic Cable	134	Somalia, Kenya
Garissa - Kismayo Fibre Optic Link (Somalia Section) and Point of Presence (PoP) in Kismayo	Fibre Optic Cable	25	Somalia, Kenya

### Long Term Planning Projects

The long-term planning projects will be based on the analysis in the previous section. Some projects from the proposed redundancy and ring topology will be classified as long-term projects depending on factors such as plan for industry and agriculture development, networks sustainability and population growth.

### 4.2 Prioritised projects and PIDA PAP2

The IRIMP will assist the development and implementation of PIDA PAP2 by creating proper enabling environment, publicity, strengthening the skills of the experts and providing bankable projects as well as facilitating the implementation of PIDA PAP2 projects. There are three ICT projects which submitted to PIDA PAP2 as shown in the table below:

Table 4. 4: ICT Projects submitted to PIDA PAP 2

Project	Sub-Sector	Cost m\$	Country(ies)
Nadapal – Juba Fibre Optic Cable	Fibre Optic Cable	45	South Sudan
Transborder Submarine Fibre PoPs and Regional Smart Hub Facility and Data center	Fibre Optic Cable & Data centre	70	Kenya, Uganda. Ethiopia
Nairobi – Mogadishu Fibre Optic Link (Isiolo – Manderla fibre optic link)	Fibre Optic Cable	35	Kenya, Somalia
Berbera – Togochoale Fibre Optic Cable	Fibre Optic Cable	10	Somalia, Ethiopia
Djibouti Africa Regional Express (DARE)	Fibre Optic Cable	100	Djibouti, Somalia, Kenya

### 4.3 Enabling Environment, Institutional arrangements and Capacity Development

The ICT sector reform started in 1990s by privatising the incumbent operator. Example Sudan privatised the incumbent operator in 1993. The new Company, named Sudan Telecommunications Company, (Sudatel) started business in the first quarter of 1994. Then the ICT sector started witnessing liberalisation and the attraction of the private sector investment and knowledge. The ICT sector in most of the African countries is partially or fully with the exception of few countries under monopoly. This development is due to the right climate of political, proper enabling environment, strategy, and planning. The ICT market in IGAD region is competitive with the exception of Djibouti and Ethiopia which they are under monopoly.

The ICT services can be used to enhance the productivity of other sectors such as transport and energy. Many ICT applications have been developed for the transport sector such as Intelligent Transport system (ITS), tracking, and automation. More applications can be developed by the youth for other sectors to enhance the product and management. Innovations centres can be established for the youth to develop and innovate technology and





applications. The software development needs enabling environment to build the capacity of the innovators and resolve their problems.

There is a United Nation organisation dealing with Standards related to ICT which is ITU. All the countries in the world participate in the process of adopted the standards.

### *Policy and Regulatory Frameworks*

Most of the countries in Africa completed the ICT sector reform process which started in 1990s. The ICT liberalised and opened for the private sector. The sector attracted the private sector investment, management and knowledge. The countries developed policies with clear and specific vision. The main issues addressed by the policy are:

- Separation of government, regulatory and operator duties.
- Establishment of independent regulatory institutions.
- Universal service and access to basic and value-added telecommunications services.
- Creation of conditions for investor friendly telecommunications environment such as transparency and clarity in the decision-making process.
- Development of local communications industry towards global competitiveness
- Fair competition.
- Preparation for convergence of technologies.
- Liberalisation and encouragement of private investment in the sector

IGAD developed regional ICT policies and strategies which are important for ensuring the regional harmonisation. The interconnection of the ICT networks is essential on both national and regional levels. The ICT operators are interconnected on national level with the ICT regulatory authorities' facilitation. On regional level the operators negotiate the interconnection agreement which paves the way for their network's integration. But governments and RECs have to develop regional policy guidelines on interconnection and infrastructure sharing to fast track the integration of the cross borders ICT networks and to maximise the utilisation by opening networks for access by existing and new entrant. Table 7-12 shows the implementation of policies and regulations in IGAD region.

Table 4. 5: ICT Policies in the IGAD Region

Country	Policy	Law	Licensing Regulation	Interconnection Regulation	Pricing Regulation	Competition Regulation
Djibouti	Yes	No	No	No	No	No
Ethiopia	Yes	Yes	No	No	Yes	No
Kenya	Yes	Yes	Yes	Yes	Yes	Yes
Somalia	Yes	Yes	No	No	No	No
South Sudan	Yes	Yes	Yes	Yes	Yes	Yes
Sudan	Yes	Yes	Yes	Yes	Yes	Yes
Uganda	Yes	Yes	Yes	Yes	Yes	Yes





## Competition

The ICT sector opened for competition. Most of the regulatory authorities established in IGAD region are independent and regulate the market in a proper way. All ICT services opened for full competition in Kenya, Somalia, South Sudan, Sudan and Uganda. Djibouti and Ethiopia are under monopoly. Ethiopia government established committees to privatise the Ethiopia Telecommunications Company (ETC). ETC will open very soon for the private sector investment. After completing the privatisation process, the ICT sector will be liberalised and opened for competition. The table below shows the competition in IGAD region.

Table 4. 6: Level of Competition in IGAD Region

Service	Djibouti	Ethiopia	Kenya	Somalia	South Sudan	Sudan	Uganda
Local Fixed Line Services	M	M	C	C	N	C	C
Domestic fixed long distance	M	M	C	C	N	C	C
International Fixed Long Distance	M	M	C	C	N	C	C
Mobile	M	M	C	C	C	C	C
Fixed Wireless Broadband	M	M	C	N	N	C	C
Leased Lines	M	M	C	N	N	C	C
International Gateways	M	M	C	N	C	C	C
Internet Services	M	M	C	C	C	C	C
M: Monopoly							
P: Partial competition (year when competition was introduced)							
C: Full competition (year when competition was introduced)							
N: N/A							

The stakeholders for any infrastructure sub sectors are policy makers, regulators, and operators. Normally the policy makers are government which they should operate any network or provide any services. Governments should focus on the policy issues and create enabling environment for new entrants and for regional connectivity. The governments may not have the adequate knowledge of operating and managing the networks. It is healthy for competition that the government should not be an operator. The ICT regulator has to make research on ICT market and competition maturity. It should not allow private monopoly or protection by opening the market for new entrant.

## Institutional Arrangements

The governments operate providers some of which have been privatised, and new companies have been established by the private sector. At present Kenya, Sudan, Uganda and Somalia have many ICT operators. The regulatory authorities have been established in Kenya, Somalia, South Sudan, Sudan and Uganda. The main objective of the regulatory authority is to regulate the ICT sector ensuring affordable, reliable and sustainable services with high quality.

Djibouti and Ethiopia ICT sectors have not been liberalised. The ICT is under monopoly. The ministries responsible for ICT are regulating the market. Ethiopia is in the process of finalising a proclamation to establish an independent regulatory authority. It will be finalised by end of 2018. The regulatory authority will report to parliament and not to any ministry to ensure





transparency and accountability and create proper enabling environment to attract investment.

### *Cyber Security*

Cyber security requires smart professionals who will be ready to be educated and trained in cyber security and related computer education. The availability of well-trained professionals on cyber security policies and strategies can set the platform to develop the cyber security institutions and structure to respond to the cyber threats and attacks and cyber-crimes. The national universities have to include the cyber security in their syllables to ensure the availability of the necessary professionals. In some countries such as Kenya training was done to judges, prosecutors and police officer. There are international organisations, such as ITU and ISO that have standards in aiding and developing capacities on cyber security. The RECs such as IGAD can develop and implement a capacity building programme on cyber security including raising the awareness of the public. The RECs such as IGAD can develop and implement a capacity building programme on cyber security including raising the awareness of the public.





## Proposal for Action

Table 4. 7: ICT Proposals for Action

Summary of Policy and Institutions options	
Development of Regional ICT and Cyber security policy and regulatory frameworks	Establish a Committee for Regulatory Authorities as well as operators and ISPs
Development of Regional cooperation agreement on cyber security	Setting up of Regional CIRT Establishing a regional mechanism for recognition Certificate Authorities
Implement the regional model in the countries with IGAD assistant	IGAD has to assist the member states to establish national CIRT
Create an enabling environment for infrastructure competition	Stimulate roll-out in underserved and rural areas
<p><b>Remove regulatory obstacles to investment and competition</b></p> <p><i>Remove limits on the number of network licenses</i> <i>Encourage the entry of alternative infrastructure providers</i> <i>Remove constraints on the backbone services market</i> <i>Improve the regulation of backbone networks</i></p> <p><b>Reduce the cost of investment</b></p> <p><i>Facilitate access to passive infrastructure.</i> <i>Promote infrastructure-sharing. And unbundling</i></p> <p><b>Reduce political and commercial risks</b></p> <p><i>Risk guarantees and political risk insurance</i> <i>Demand aggregation</i></p> <p><b>Promote effective competition in the downstream market</b></p> <p><i>Promote downstream competition through effective regulation.</i></p>	<p><b>Competitive subsidy models</b></p> <p><i>Provide operator(s) with subsidy to build and operate a network in currently underserved areas of the country. Services provided in these areas on a non-discriminatory basis.</i></p> <p><b>Shared infrastructure/consortium models</b></p> <p><i>Provide operators with incentive to cooperate in the development of backbone infrastructure in currently underserved areas of the country where infrastructure competition is not commercially viable</i></p> <p><b>Incentive-based private-sector models</b></p> <p><i>Provide operators with an incentive to build networks in currently underserved areas through reductions in USF contributions or sector levies.</i></p>

## Build capacity and promote technology transfer

The capacity building for institutions and individuals is a continuous process due to the rapid technology change in ICT sector. The capacity building will be part of the programmes and projects. The skilled persons and efficient ICT regulatory authorities will contribute substantially to the development of the ICT sector, reducing the cost of construction and operation and attraction of investors as well as enhancing accountability and transparency. IGAD will be having highly trained experts and strong institutions by medium- and long-term plans. Technology transfer is important for developing the ICT industry, customisation of technologies to the African environment and reducing the cost of ICT infrastructure development. It is expected that IGAD member States universities to be involved in the







development of ICT industry, research and innovation. The transfer of technology will create enabling environment to attract big companies such as Microsoft, Facebook, and Google to the region. The IGAD region will have smart partnerships for technology transfer.

### *Constraints and Barriers for ICT Development*

Efficient information and communications technology (ICT) services contribute to the achievement of IGAD's objectives of enhancing regional integration, sustainable growth and development. However, the ICT sector is still characterised by poor infrastructure and services associated with limited participation of the private sector in policy formulation and investment. There are challenges faces the sector development. These challenges include:

- Lack of regional policy and legislation as well as regulatory framework
- Poor business environment and no incentive
- Regulatory authority's capacity needs to be strengthened to enforce the regulations and do their job effectively and efficiently
- Non-existence of structured and complete information on the ICT sector performance at national level.
- Inadequate deployment of broadband infrastructure especially the last mile connectivity
- Low internet penetration, especially in the rural areas.
- The high cost of the ICT services
- Limited sharing of the ICT infrastructure by the operators in both passive and active infrastructure
- Insufficient uptake of ICT by SMEs and businesses;
- Poor implementation of cyber security in some Member States.





#### 4.4 Key success factors and KPIs

ICT sector has many success factors which influenced positively its development. It is a technology and innovation driven sector. It is a cross cutting sector which is applied to all social and economic development activities. It is a profitable and revenue generating sector with manageable and controlled risks. It is liberalised and opened for competition and private sectors investment and knowledge. It has attracted the private sector investment and management. There are mobile telephone companies owned by the private sector. The private sector investment and management has driven the ICT sector development in African especially mobile telephony and internet services.

ICT has many key performance indicators (KPIs) such as penetration rates per hundred inhabitants, percentage of internet users, mobile coverage percentage and gender equality. The targets for these indicators are shown in the table below.

Table 4. 8:IRIMP ICT Sector Benchmarks and Targets

	Target	2024	2030	2050
	<b>Growth - enable and foster access to and increased utilisation of ICT services and applications and bridge the digital divide</b>			
1	Mobile penetration per 100 inhabitants	60%	80%	100%
2	Mobile geographical coverage	70%	85%	100%
3	Fixed broadband penetration per 100 inhabitants	5%	10%	60%
4	Percentage of Individuals using Internet	25%	40%	80%
5	Affordability and Reduction of tariffs by	15%	25%	60%
6	The rural areas mobile coverage	65%	75%	100%
7	Percentage of household having access to Internet	15%	30%	60%
8	Gender equality among Internet Users	10%	30%	60%
9	Enabling environments ensuring accessibility ICT services and applications for persons with persons with disability	60%	70%	100%
	<b>Sustainability - Manage challenges emerging from ICT development</b>			
10	Cyber security policy and legislations	0	0	0
11	Establishment of National and Regional CIRTs by	0	0	0
12	Develop PKI regulations, infrastructure and institutions by		0	0
13	Develop Regional Cooperation framework by		0	0
14	Volume of redundant e-waste to be reduced by	30%	50%	70%
15	Reduction of Green gas emission generated by ICT sector	20%	40%	60%
	<b>Technology transfer and Innovation</b>			
16	Enabling environment conducive to technology transfer	0	0	0
17	Enabling environment conducive to Innovation	0	0	0
18	Smart partnerships of stakeholders in ICT development	0	0	0
	<b>ICT Infrastructure Interconnectivity</b>			
19	National Broadband connectivity	200G	400G	1000G





20	Cross-border ICT infrastructure connectivity	20%	40%	100%
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#### 4.5 The IRIMP Implementation Strategy

The IRIMP ICT physical infrastructure projects will be implemented by member states with the IGAD Secretariat. The IGAD Secretariat role will be facilitating the development of enabling environment, mobilisation of financial resources and coordination. The coordination is important with African Union, Development partners and financial institutions.

##### *Role of IGAD Secretariat*

The role of the IGAD Secretariat in implementing the ICT physical projects will be in issues such as marketing of the projects to private sector and IFIs, organising investor forums, proper and harmonised enabling environment, projects bankability, ensure projects included in PIDA etc.

IGAD has to update and ensure harmonisation of policies and regulations necessary for the ICT physical projects to create a proper and predictable enabling environment to attract private sector investment, technical and management knowledge. It is essential to have a regional regulatory framework which can include cross borders interconnection agreement, spectrum management and mobile roaming. It is important to establish a regional regulatory association to lead the harmonisation process.

IGAD Secretariat has also to play a great role in capacity building to ensure transfer of technology which will reduce the cost of projects development. It is also important to strengthen the ICT regulatory authorities and train their technical staff.

IGAD Secretariat can play great role in developing the cyber security systems and regional institutions such as regional CIRT. The cyber security development will pave the way for implementation of digital markets and establishment of Digital Single Market. It is important for IGAD Secretariat to ensure sustainable regional cyber security cooperation network.

IGAD Project Preparation Unit (IPPU) has to enhance the relation with the focal points in the Member States to fast track the implementation of the physical ICT projects and collect information to update the projects. IPPU has also to mobilise financial resource to implement bankable projects and also do feasibility study for those projects which are not yet ready.

##### *Role of ICT Regulatory Authorities*

The ICT regulatory authorities in IGAD region have to develop the appropriate regulations necessary for the physical ICT projects and soft programmes in close cooperation with national ICT stakeholders, IGAD, AUC and other regional and continental institutions. The regulations should be developed based on the IGAD ones to ensure harmonisation to attract investment. The regulations have to be predictable and harmonised with regional ones. They have to ensure affordable, reliable, affordable and sustainable cross borders ICT connectivity and services.





The ICT regulatory authority should work closely with telecommunications operators and private investors and collect information to make one stop shop. It has to manage competition and ensure it is not restricted and the ICT sector is opened for new entrant.

Regulatory authorities have to be involved in IGAD Secretariat ICT programme especially marketing of ICT projects and investment conferences and provide the required information as well as establish regional institutions such as regional regulatory authority association, digital single market and regional CIRT.

### *Roles of Ministries Responsible from ICT*

The Ministry responsible for ICTs, has the key responsibility for providing a vision for the ICTs sector, develop a policy framework, for investment, competition and economic growth of the industry, which both public and private sectors can use in their business. The ministry has to involve all the stakeholders and IGAD Secretariat in the development of the ICT sector policies and strategies. It is important for the ICT ministry to have a regular dialogue with the private sector.

The Ministry has to share all the information concerning ICT projects with IGAD and participate in the IGAD activities and programmes. The ICT Ministries has to involve IGAD Secretariat in the ICT projects marketing and financial resources mobilisation to ensure seamless regional connectivity as well as development of cyber security systems

### *Roles of Private Sector and Telecommunications Operators*

The private sector has to work in close cooperation with the ICT ministry and regulatory authorities. The telecommunications operators have to share their information on the physical and soft ICT projects with the regulatory authority as well as the ICT market information. The private sector and telecommunications operators have to participate in the universal services projects and work with IGAD Secretariat and provide her with the required information on the ICT projects. It is advisable for IGAD Secretariat to establish a forum for the private sector and business men and women from the region. This partnership will contribute positively to the development of the infrastructure in the region.

