SOUTHERN AFRICAN DEVELOPMENT COMMUNITY
SADC
TOWARDS A COMMON FUTURE

Regional Infrastructure Development Master Plan

Information and Communication Technologies (ICT) Sector Plan

August 2012

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Abbreviations

AFD	L'Agence Française de Développement
AfDB	African Development Bank
AIP	Administrative Incentive Pricing
AISI	African Information Society Initiative
AMS-IX	Amsterdam Internet Exchange
ARPU	Average Revenue Per User
ASN	Autonomous System Number
ATU	African Telecommunication Union
AU	African Union
BGP	Border Gateway Protocol
BPS	Bits per Second
BRICS	Brazil, Russia, India, China and
CDN	Content Distribution Network
CEC	Copperbelt Energy Corporation
CERT	Computer Emergency Response Team
CIDA	Canadian International Development Agency
CoE	Centre of Excellence
COMESA	Common Market for East and Southern Africa
CRASA	Communication and Postal Regulatory Association of Southern Africa
DBSA	Development Bank of Southern Africa
DFID	Department for International Development
DID	Direct Inward Dialling
DNS	The Domain Name System
DRC	Democratic Republic of Congo
DTT	Digital Terrestrial Television
DVB	Digital Video Broadcasting
DWDM	Dense Wave Division Multiplexing
EAC	East African Community
EAIF	Emerging Africa Infrastructure Fund
EASSy	Eastern Africa Submarine Cable System
ECCAS	The Economic Community of Central African States
ECOWAS	The Economic Community of West African States
EIA	Environmental Impact assessment
EIB	European Investment Bank
EU	European Union
FAP	Frequency Allocation Plan (for radio spectrum)
Gbps	Gigabits per second
GDP	Gross Domestic Product
Gigabit	One billion bits
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GMS	Global Monitoring System
GNI	Gross National Income
GPS	Global Positioning System
GSR	Global Symposium of Regulators
gTLD	Generic Top Level Domain
HIPSSA	Harmonisation of ICT Policies in Sub-Saharan Africa
HOS	Heads of States
IASP	International Association of Science Parks
ICA	Infrastructure Consortium for Africa
ICT	Information and Communication Technology
IDRC	International Development Research Centre

IFC	International Finance Corporation
IGAD	Intergovernmental Authority on Development
IICD	International Institute for Communication and Development
IP	Internet Protocol
IPP	Independent Power Producer
IPS	International Postal System
IRU	Indefeasible Right of Use
IS	Internet Solutions
IsDB	Islamic Development Bank
ISOC	Internet Society
ISP	Internet Service Provider
IT	Information Technology
ITU	International Telecommunication Union
IXP	Internet Exchange Point
LINX	London Internet Exchange
LION	Lower Indian Ocean Network
LTE	Long Term Evolution
Mbps	Megabits per second
MDG	Millennium Development Goal
Megabit	One million bits
MEO	Medium Earth Orbit
MoU	Memorandum of Understanding
NEPAD	New Partnership for Africa's Development
NGN	Next Generation Network
NICI	National Information and Communication Infrastructure
NICTBB	National ICT Broadband Backbone
NIXP	National Internet Exchange Point
NorAID	(Irish) Northern Aid Committee
NPCA	NEPAD Planning and Co-ordinating Agency
NRA	National Regulatory Authority
NREN	National Research and Education Network
NSC	North South Corridor
NSO	National Statistics Office
OAU	Organization of African Unity
OGP	Open Government Partnership
OSBP	One-Stop Border Post
OPGW	Overhead Power Ground Wire
OSISA	Open Society Initiative for Southern Africa
PAPU	Pan African Postal Union
PCU	Project Co-ordinating Unit
PIDA	Programme for Infrastructure Development in Africa
PIM	Project Information Memorandum
PKI	Public Key Infrastructure
POI	Point of Interconnection
POP	Point of Presence
PPDF	Project Preparation and Development Facility
PPDR	Public Protection and Disaster Relief
PPP	Public Private Partnership
PPIU	Project Preparation and Implementation Unit
PSTN	Public Switched Telephone Network
QoS	Quality of Service
PTO	Public Telecom Operator
REC	Regional Economic Community

RICTSP	Regional ICT Support Programme
RIO	Reference Interconnection Offer
RIR	Regional Internet Registry
RISDP	Regional Indicative Strategic Development Plan
RIDMP	Regional Infrastructure Development Master Plan
RIXP	Regional Internet Exchange Point
ROI	Return on Investment
ROW	Rest of the World, or Rights of Way
RTN	Road Transport Network
SABA	Southern Africa Broadcasting Association
SADC	South African Development Community
SAEx	South Atlantic Express
SAFE	Southern Africa-Far East-West Africa submarine cable
SAPOA	Southern African Postal Operators Association
SAPP	Southern African Power Pool
SAPRA	Southern African Postal Regulators Association
SARUA	Southern Africa Regional Universities Association
SATA	Southern Africa Telecommunications Association
SIDA	Swedish International Development Cooperation Agency
SLA	Service Level Agreement
SMP	Significant Market Power
SPV	Special Purpose Vehicle
SRD	Short Range Device
SRII	SADC Regional Information Infrastructure
TCM	Transport, Communications and Meteorology (Protocol)
Terabit	One thousand gigabits
TLD	Top Level Domain
TMSA	Trademark Southern Africa
TTA	Tripartite Trust Account
UNCSTD	United Nations Center for Science and Technology for Development
UNCTAD	United Nations Conference on Trade and Development
UNDESA	United Nations Department of Economic and Social Affairs
UNECA	United Nations Economic Commission for Africa
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNIDO	United Nations Industrial Development Organization
UPU	Universal Postal Union
USAID	US Agency for International Development
USF	Universal Service Fund
VoIP	Voice over Internet Protocol
VNO	Virtual Network Operator
WACS	West African Cable System
WATRA	West African Telecommunications Regulators Assembly
WiFi	Wireless Fidelity
WiMax	World interoperability for Microwave access
WIPO	World Intellectual Property Organization
WSIS	World Summit on the Information Society
WTO	World Trade Organization

Definitions

4G	4G is the latest mobile broadband cellular network technology – LTE-Advanced and WirelessMAN-Advanced are officially designated IMT-Advanced by the ITU – the new standard for 4G wireless networks.
ASN	Autonomous System Number - unique ASNs are allocated to internet operators by the regional internet registries (RIRs) for use in multi-path routing and are a key component of independent networks which BGP routing to ensure they are connected as directly as possible to as many other network operators as economically and technically feasible (see Transit and Peering).
Backbone	The trunk routes of a network used as the path for transporting traffic between different networks. Backbones can be the physical telecommunication infrastructure, or the internet circuits established over them by a particular internet operator.
Bandwidth	The size or capacity of a communications channel to transfer data, usually measured in the speed of data transfer, in bits per second (BPS), although also often stated in the frequency range assigned to the channel, measured in Hertz (Hz).
BGP	Border Gateway Protocol - the protocol standard used to ensure that there is more than one route to the internet provider network (see ASN).
BPS	Bits per Second - the number of bits passing a point every second. The transmission rate for digital information, i.e. a measure of how fast data can be sent or received. Often expressed as Mbps, for Megabits per second or Gbps (Gigabits per sequin) for fibre or broadband links.
Broadband	A high speed (multi-megabit) data connection sufficient to support multiple streaming video connections.
DID	Direct Inward Dialling - telephone numbers linked to VoIP gateways.
DNS	The Domain Name System - matches human readable/more memorable names with the IP addresses needed to route traffic. The DNS uses a tree structure, which divides the internet into a hierarchical structure of domains and sub-domains. Top-level domains (TLDs) include generic domains such as .com, .edu and .org, and country code domains - ccTLDs – such as .uk, .za, .gh or .ke. Administrators of each TLD can create as many sub-domains as they wish. An international network of DNS servers, maintains up-to-date information about which domain name goes with each IP address; changes can be made on any one server and are rapidly propagated through the network.
DTT	Digital Terrestrial Television - the new standard for television broadcasting to which most countries have committed firm time frames for migrating their TV services away from the Analogue wavebands, particularly in the 700Mhz band which will release it for broadband use, in the so-called Digital Dividend.
DWDM	Dense Wave Division Multiplexing - the current standard for data transmission over fibre optic cable.
HIPSSA	Harmonisation of ICT Policies in Sub-Saharan Africa - a joint ITU/EU/GIZ programme to support policy and regulatory reform.
International gateway	Technically, this is a facility to consolidate and share the cost of international links and termination points. In practice it is a licensing term used by many developing country governments who only allow the state owned monopoly operator to carry international traffic. In some countries, one or two additional international gateway operators have been licensed, often the mobile operators.
Internet	A global mesh of computer networks using the same communications protocol called TCP/IP. The internet's national and international backbones are high-speed fibre trunk lines owned by telecommunication companies. National Tier-1 service providers aggregate data traffic and pass it over the backbones. They work with local service providers who connect to customers via digital links or modems.
IP	Internet Protocol - the packet based data interchange standard on which the internet is based, increasingly being used for voice traffic (VoIP).
IPS	International Postal System - an international postal management system developed by the UPU, which includes track &t race and various other functions.
IRU	Indefeasible Right of Use - a common method of purchasing fibre optic infrastructure, on a long-term basis (usually 10-15 years), on a capacity (Mbps or STM-x) basis or as a wavelength or dark fibre pair. Preferred by larger operators as a once-off CAPEX item.

ISP	Internet Service Provider - a generic term for organisations providing internet services such as web site hosting and internet access. Internet Service/Access Providers purchase bandwidth from other companies that have direct links to the internet. The Internet Service/Access Providers in turn sell that bandwidth to consumers and businesses in smaller chunks. For example, an ISP may take the bandwidth of a 45Mbps connection to the internet and sell it to two thousand 256Kbps broadband users at a 10:1 contention ratio.
IXP	Internet Exchange Point - a location where many internet providers meet each other to exchange traffic. As the internet becomes more dense, IXPs also need to become more widespread to help ensure that local traffic stays local. Regional IXPs are hub locations connected to many fibre optic cables where international internet providers exchange traffic.
LTE	Long Term Evolution - LTE-Advanced and WirelessMAN-Advanced are accorded the official designation of IMT-Advanced – the new standard for 4G wireless networks.
Mbps	Megabits per second - a unit of traffic or capacity measurement.
NGN	Next Generation Network - a purely IP based network for carrying voice and data.
O3B	Other 3 Billion - a Medium Earth Orbit satellite communications system being launched shortly. It offers much lower latency than traditional GeoStationary satellite links.
OFC	Optic Fibre cable - a technology using glass fibre for the transmission of data. The signal is imposed on the fibre via pulses (modulation) of light from a laser or a light-emitting diode (LED). Because of its high bandwidth and lack of susceptibility to interference, fibre optic cable is used in high capacity, long haul or noisy applications. With advances in modulation technology, international fibre cables are now usually deployed with terabit capacities.
Open Access	When referring to Infrastructure, Open Access service delivery models ensure that all operators have equal terms of use, usually for access to fibre optic cables on a capacity (Mbps), wavelength, or dark fibre basis, often sold as 10-15year IRUs.
OPGW	Overhead Power Ground Wire - a location for fibre cabling on power lines - poles or high-tension pylons.
Peering	Peering, also known as Sender Keeps All, or Bill and Keep, is a zero compensation arrangement where network operators agree to exchange traffic at no charge. This arrangement is common where the networks have roughly the same characteristics and traffic volumes, such that net financial burden from traffic flows between them is likely to be small. The process by which a network qualifies for peering is usually privately negotiated based on network coverage, volume of traffic, and network reliability. Peering is the alternative to 'Transit' where the ISP pays to have their packets delivered to the remote network. Peering and Transit often takes place most efficiently at IXPs, but bilateral direct physical links between different network operators is also common.
PKI	Public Key Infrastructure - a set of hardware, software, people, policies, and procedures needed to create, manage, distribute, use, store, and revoke digital certificates.
PSTN	Public Switched Telephone Network - the traditional voice telephone system, based on switched (rather than packet) networking protocols.
PTO	Public Telecom Operator usually refers to the incumbent state-owned monopoly operator, although technically, the distinction between fixed line, cellular operators and ISPs is becoming increasingly blurred.
Redundancy	Connection Redundancy – an alternative route, usually on a second physical link.
RIR	Regional Internet Registry - the five organisations responsible for allocating IP addresses to network operators in their respective regions - Africa, USA, Asia Pacific, Latin America and Europe - AfriNIC, ARIN, APNIC, LACNIC and RIPE NCC.
SMP	Significant Market Power - a definition used by regulators to help ensure a level playing field in the presence of an operator which is dominant in the market and therefore able to charge uncompetitive prices (usually the incumbent previously state-owned monopoly). An SMP determination will allow the regulator to set tariffs charged and place other conditions on the operator.
Transit	Transit is an arrangement in which networks sell access to their customers, usually other networks. Transit charges are set by negotiation, and are often not disclosed publicly. Transit arrangements typically provide access to an array of networks, not limited to one country. In many cases one internet transit arrangement with a large network can provide a small, remote network with access to the Rest of the World (ROW).

WACS	West African Cable System - a submarine fibre cable linking a number of SADC and other countries on the west coast of Africa and to Europe.
WiFi	Wireless Fidelity - the most common spread spectrum data protocol used in Hotspots to share or deliver a broadband link.
WiMax	World interoperability for Microwave access - a data interchange standard developed with support from Intel, now giving way to LTE-Advanced and WirelessMAN-Advanced.
WirelessMan-Advanced	One of the two official ITU 4G mobile broadband standards.

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Executive Summary

Information and communication technologies (ICTs) have become the lifeblood of the knowledge economy or, as some have observed, the electricity of the 21st Century. In either case, affordable access to ICTs is a human right as well as a significant contributor to economic growth and social well-being. The goal of the ICT Chapter of the Master Plan is to outline the measures necessary to ensure that every Member State citizen has full access to this vital resource.

More tangibly, the vision to achieve a 'Digital SADC' by 2027, is driven by some key benefits that are expected to result from becoming a knowledge-based society:

- Well-informed rapid decision-making – efficient, transparent governance, globally competitive industries and knowledgeable public;
- Lifelong learning – instant access to knowledge and better jobs;
- Social and cultural inclusion – the end of isolation and discrimination;
- More wealth and livelihood creation options and employment opportunities;
- Efficient cross-border travel and seamless markets for goods and services;
- Increased agricultural production and more efficient produce markets;
- Accessible government, commercial and financial services, cultural heritage and indigenous knowledge; and
- A healthier, happier population.

These benefits are based on the promise of always-on affordable broadband connectivity, rich content and useful applications, with easy to use access devices and postal systems. Making sure this happens by 2027 will require rapid and concerted efforts by all. This would ideally begin at head of state level, with allocation of clear roles and responsibilities, and based on a systematic approach to eliminating bottlenecks and identifying the best methods to move forward. The framework for this can be seen as four pillars based on platforms of ICT Policy & Regulatory Harmonisation, and Confidence and Security of Networks & Services, as shown in the diagram below.

Pillars:

- Infrastructure;
- E-services & applications;
- Research, innovation & industry development; and
- Capacity building & content.

Platforms:

- Confidence and security of networks & services; and
- Policy & regulatory harmonisation

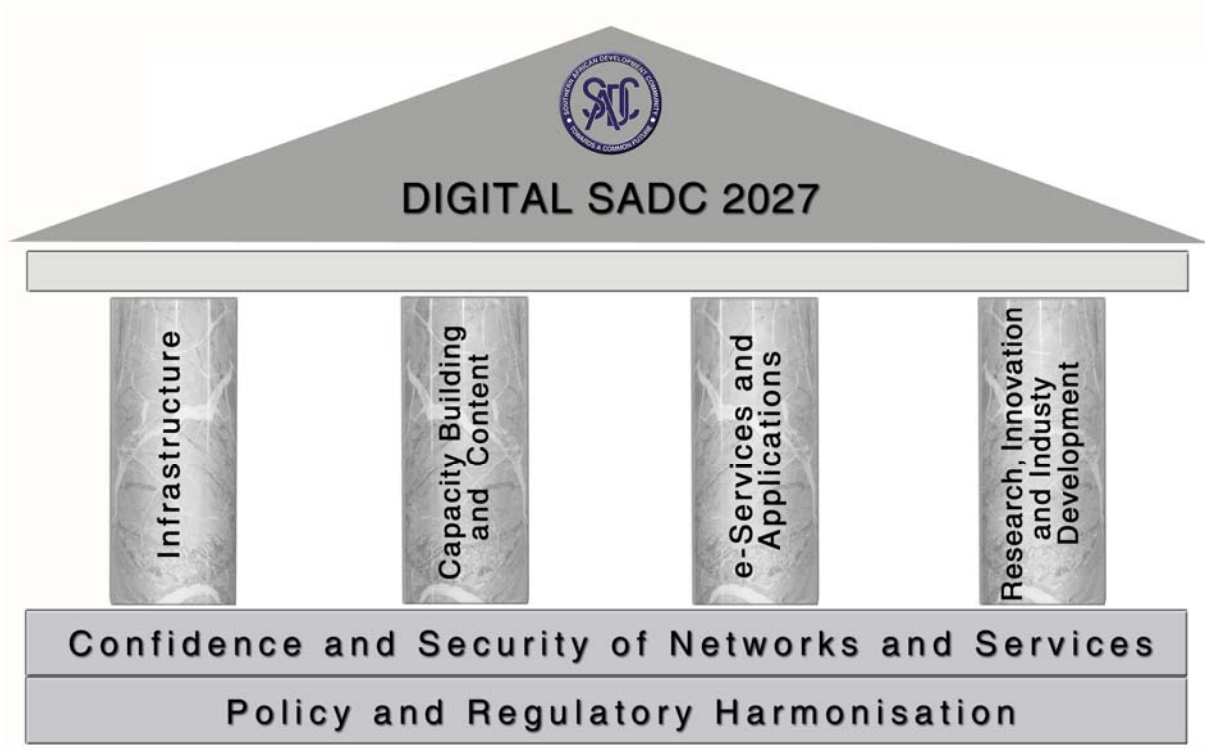

Figure 1: Digital SADC 2027

The identification and prioritisation of projects that support the platforms and pillars of this framework are the key output of this chapter.

Analysis of the current status of ICTs in the region shows that one of the main problems is that although most of the underlying infrastructure is in place, it is not efficiently used. Landlocked SADC Member States still pay more to get to the coast or to the rest of Africa than they do to get from the coast to Europe, the US or Asia. National fibre optic backbones in many SADC Member States need better management, upgrading and extension to cover more population, and affordable pricing. And due to limited development of traffic exchange points, much domestic and regional traffic is exchanged overseas, leading to poor network performance and millions of dollars in transit fees annually paid to foreign operators.

As a result, high access costs prevail across the region, severely limiting use, especially for broadband services among the general public, and this in turn constrains demand for the development of local applications and services, so that inefficient manual processes continue. When combined with sparse human capacity, low levels of research and development and immature e-commerce facilities that lack payments and physical delivery systems, this leads to a low critical mass of ICT innovators, investors, employers, skilled workers and ICT users. These issues assume even greater significance in rural populations, remote areas and disadvantaged groups, where costs and unmet demand for access to ICTs are much higher, and the opportunities to use information technology to accelerate their development is perhaps greater.

To address these issues, which affect countries all over the world, national broadband plans are being implemented to help ensure that everyone, including those in rural areas, has access to fast and affordable internet services. Policy and regulatory modernisation and harmonisation is at the heart of addressing these issues, to take into account the latest technological developments and to ensure that best practices are propagated throughout the region, creating economies of scale, opportunities for cost-sharing, and leveraging the full potential of ICTs to support regional integration.

Building the environment in which ICTs are to thrive is part of a strategic framework which has both short and long-term objectives. In the short term, the main aim is to assist Member States in sharing the cost of ensuring the key building blocks are in place – secure and affordable connectivity and access devices, useful applications and rich content, and sufficient human capacity to maximise their potential. This would lay the basis for a dynamic ICT market in which demand and supply are well balanced, allowing each Member State to meet their longer-term policy objectives to ensure that everyone, regardless of income level or geographic location, can reap the full benefits. Depending on the country, the priorities would likely include; network extension to the most remote areas, reducing access costs to levels which do not exclude even the poorest people, ensuring network reliability by implementing backup routes, and strengthening the supporting infrastructure – notably postal systems and energy supplies.

But first, the key policy bottlenecks in each Member State need to be addressed to ensure that the full ICT programme can progress as quickly and as cost effectively as possible. Using a rapid assessment methodology to yield fast results, the top policy and regulatory constraints in each country would be identified for priority short-term treatment (<12 months). This would allow some low cost quick wins to be made that would substantially improve the enabling environment within a very short time. The assessment would focus on the issues currently considered most important:

- Access to broadband radio spectrum and use of TV white space for broadband – Reduce the high cost of radio spectrum licences and ensure availability of optimal frequencies for broadband;
- Access to national fibre backbones and the fibre infrastructure of utility operators at market-based rates – increase national network coverage and multiple cross-border/international routes; and

- Open markets and technology neutral licensing for new ICT infrastructure operators – increase competition and encourage new investment in the middle and last mile to deliver more efficient services.

In parallel with the rapid assessment, the enabling policy & regulatory environment project would also initiate longer-term support for integrated national ICT policy reviews for each Member State, to assess the overall status of ICT sector reform and market liberalisation, and support national broadband strategy development. This process is already ongoing in some Member States.

With the policy & regulatory environment providing a solid base for the Digital SADC 2027 framework, the other programme activities supporting the framework are outlined below. These have been organised for coherence and efficiency as follows:

a) **Ensuring confidence and security in networks and services.** Making Member State and regional communication networks secure and reliable by establishing Computer Emergency Response Teams and standards for fibre cable laying and topologies, in order to minimise down times.

b) **Infrastructure a) Consolidation of regional telecommunications networks.** Ensuring that the region is fully interconnected nationally, regionally, inter-regionally, and globally, through reliable and affordable fibre optic links i.e. every capital city in the Region is linked to all of its neighbours via at least two routes, and to at least two different cross-continental submarine networks, that postal systems are pervasive, and an affordable satellite based connectivity solution is available for remote areas outside the near-term reach of fibre infrastructure.

c) **Infrastructure b) Strengthening the Postal sector.** Implementing Postal Code and addressing systems, extending postal branch networks and security, revitalising and improving the range of postal services, in particular developing financial services as part of the integration of physical and electronic networks.

d) **Capacity building & content**. Maximising human capacity to take advantage of ICTs by regional sharing of the costs of: a) raising awareness of ICT supported development strategies, governance innovations and business opportunities, b) developing regional certification standards for information literacy, c) establishing centres of excellence (CoEs) in ICT and Postal Services and regional repositories of online learning materials.

e) **Regional e-services and applications**. Sharing software development costs across the region, improving efficiencies in public service delivery and commerce, facilitating administration of regional flows of people, goods and services, and providing open access to public data.

f) **Research, innovation and ICT industry development.** Strengthening research institutions and SMEs working in the ICT sector, promoting national and regional institutional collaboration, innovation and the development of local ICT manufacturing industries. Minimising the negative effects of ICTs on the environment and using ICTs to mitigate the effects of climate change.

g) **Monitoring progress toward digital SADC 2027**. Ensuring the availability of up-to-date information on levels of ICT use in each Member State and, as a region, to support strategic decision-making and measure progress toward the 2027 goals.

In terms of the financing needed to support this, which is estimated at about US$436 million, it is noteworthy that the return on investment in ICT projects can be relatively high compared to the other infrastructure sectors, either in profits or efficiency gains. At the same time, the investment costs are relatively small, while their impact cuts across virtually all other sectors. As a result, once the enabling policy and regulatory environments are more uniformly in place, much of the implementation cost will be met by the private sector, or through public-private partnerships. As a result, the ICT Master Plan necessarily places initial emphasis on grant funded projects for capacity building and to ensure the enabling environment is in place to provide better access to existing infrastructure and to attract more investment in new infrastructure.

Finally, the ICT Chapter of the Regional Infrastructure Development Master Plan (RIDMP) also takes into account the ICT components of the broader ongoing infrastructure development initiatives in Africa, in particular, at the continent-wide level, with the Programme for Infrastructure Development in Africa (PIDA). At the regional level the RIDMP will also form part of the inputs to the proposed Common Market for East and Southern Africa (COMESA)-East African Community (EAC)-SADC Tripartite Inter-regional Infrastructure Master Plan, and would also be expected to take into account the initiatives taking place in the the Economic Community of Central African States (ECCAS) region to which Angola and the Democratic Republic of Congo (DRC) also belong.

1. Introduction

The Information and Communication Technologies (ICT) Chapter of the Master Plan is based on a detailed review of the current ICT infrastructure status and plans in the SADC region, and an evaluation of their adequacy to meet the needs forecast to year 2027.

The key institutions that would be involved in the RIDMP and its development would be the SADC I&S Directorate, the Communication and Postal Regulatory Association of Southern Africa (CRASA), Southern Africa Telecommunications Association (SATA), Southern African Postal Operators Association (SAPOA), the National Regulatory Authorities, ICT Ministries, related institutions – Competition Boards, Commissions and Tribunals, development partners and ideally the office of the Head of State in each Member country.

At a broader geographic level, ongoing liaison with a variety of related initiatives will need to take place to benefit from synergies and minimise overlap. These are: the Tripartite Inter-regional Infrastructure Master Plan, the COMESA TCS/PIP and PIDA, as well as the programmes of ECCAS (due to the DRC and Angola's membership in this Regional Economic Community (REC) and in particular the North-South corridor project which will link the two countries).

1.1 Sector Purpose and Objectives

ICT infrastructure comprises a wide range of electronic technologies - computing, telecommunications, internet and broadcasting – as well as related applications and resources such as digital maps and radio spectrum, and the physical infrastructure of access devices, ducts for fibre cable, masts and antennae to convey radio signals, as well as the physical and financial networks provided by banks and postal services. Together, these are recognised as enablers of social and economic development whose impact cuts across virtually all other sectors.

The objective of the ICT section of the RIDMP thus aims to ensure that these technologies are accessible and affordable for all citizens in the SADC region, and that ICTs are fully able to support the national development agendas and policies of the Member States, as well as the region as a whole. This includes accelerating regional integration, inclusion of rural and isolated populations, enhancing competitiveness, maximising economic development, attaining Millennium Development Goal (MDG) targets, eliminating supply side constraints and reducing the cost of doing business in the region. By the same token, by providing more universal access to communications and ICTs, the region will be better able to address its overarching objective of reducing poverty.

To support the universal broadband services needed, major improvements to the quality of ICT infrastructure within the region will be required, in particular with a view to making access more affordable and extending coverage into rural areas. Aside from addressing the supply-side, increasing the pervasiveness and reducing the cost of the underlying infrastructure, the ICT Sector Plan also aims to stimulate the demand side, for example, by improving production of content and e-services.

Overall, the core areas of intervention necessary to achieve these objectives are:

- Improving the ICT policy and regulatory enabling environment to make more efficient use of existing infrastructure, minimise its costs of use, and encourage investment in new infrastructure;
- Facilitating interconnection within and among SADC Member States, as well as among the Tripartite Member States, by establishing low-cost high capacity communication links using terrestrial fibre routes between neighbouring SADC Member States and adjoining regions;
- Improving the coverage, reliability and security of ICT infrastructure;

- Increasing the extent of ICT skills and human resources, investment in ICT research & development, and private sector collaboration for industry development;
- Accelerating the adoption of ICTs within government, parastatals, the private sector and the general public in order to increase service levels, efficiencies, profitability, and transparency, which will in turn attract further private investment in the sector;
- Using ICTs to help reduce the region's carbon footprint and minimise other environmental impacts by using 'smart monitoring' systems, remote sensing and crowd-sourcing; and
- Using relevant progress markers to monitor the levels of ICT-use and identify bottlenecks.

As can be seen, the majority of activities proposed for the ICT Sector Plan are *'soft'* projects, without a direct return on investment, designed to put in place the required human capacity, institutional frameworks and enabling policy environments. Once these are established, it is expected that the private sector will be keen to implement most of the *'hard'* projects. In this respect the ICT sector is somewhat different to most of the other infrastructure sectors covered by the RIDMP, in that capital costs are relatively low and the return on investment is likely to be higher. And although the extent of public financing required for the soft projects is not insignificant, there will ultimately be large indirect returns on the investment provided by the much increased efficiency and transparency levels, higher tax returns resulting from the wealth created by the 'oil' of the ICT revolution seeping more extensively into all the other commercial sectors.

1.2 Policy and Legislative Frameworks Guiding the ICT Sector

The following key policies and frameworks provide the context for the broader objectives of the RIDMP, all of which are directly or indirectly relevant to ICTs, due to the cross-cutting nature of the technology:

- SADC Trade Protocol (1996);
- SADC Protocol on Facilitation of Free Movement of Persons (2006);
- The proposed COMESA-EAC-SADC Grand Free Trade Area Framework (2010);
- The SADC Regional Indicative Strategic Development Plan (RISDP) 2005;
- The SADC Protocol on Transport, Meteorology and Communications (1996);
- The SADC Telecommunication Policy Guidelines (1998);
- SADC Declaration on ICTs by Heads of State (2001);
- The e-SADC Strategy (2010); and
- The African Union Programme for Infrastructure Development in Africa (PIDA) (2012).

The Sector Plan also builds on global and continental frameworks and initiatives such as the World Summit on the Information Society (WSIS), PIDA, the COMESA TCS/PIP, Connect Africa and the African Information Society Initiative (AISI), as well as best practices in national ICT policies and particularly broadband policies.

Building on these well established goals, policies and plans, the ICT Sector Plan is a strategic framework document to guide the implementation of regional ICT infrastructure development, forming the basis for priority setting, feasibility assessments, preparation for bankability and investment. The RIDMP will in this respect constitute the basis for SADC Member States commitment to a common ICT infrastructure development programme, in the form of a Declaration, as well as the basis for regular review of its implementation.

1.2.1 The Regional Indicative Strategic Development Plan (RISDP)

In 2003 the RISDP was adopted, providing an indicative framework to guide SADC Member States in the achievement of the SADC objectives over a 15-year period. The RISDP defined the vision, mission

and strategic objectives for a broad range of development goals, including the basis for ICT development, focusing on ICT's role in transforming SADC into an information-based economy with specific objectives and deadlines.

Aside from ICT infrastructure related areas, e-strategies revolving around development of e-services and applications were also a major component of the RISDP ICT strategy. In 2009, at its meeting in DRC, the SADC Council of Ministers directed the SADC Secretariat to conduct a mid-term review of RISDP in accordance with the directive made in 2003 that the RISDP be regularly monitored and evaluated.

1.2.2 Protocols and Other Documents and Statutes

In many respects the initiatives that were proposed in the RISDP are very similar to those outlined here in the ICT Sector Plan. In the intervening nine years since the RISDP was adopted, progress has been slow, largely because of the limited reform in the telecommunication sector, leading to high costs of access resulting in low levels of demand.

While SADC Member States have made ICTs a priority at a policy level for more than a decade, in practice, it was recognised that implementation posed several challenges. To address these, more concerted efforts were made to assist Member States to develop their national ICT policies and strategic plans based on the SADC guidelines. As part of this process SADC created an ICT development strategy called the e-SADC Strategy Framework. Developed with support from the United Nations Economic Commission for Africa (UNECA), this became the overarching strategy document, approved by the SADC Ministers responsible for Telecommunications, Postal and ICT in Luanda in May 2010.

The e-SADC framework addresses convergence issues and harmonisation of ICT infrastructure, services and indicators; promotes ICT usage for regional economic integration, enhancement of connectivity and access to ICT services. Aside from addressing policy, legislation and regulation, it also focused on crosscutting issues such as ensuring gender is taken into consideration, as well as capacity building programmes and the development of e-applications such as e-governance, e-parliament, e-commerce, e-education, e-health and e-agriculture. The strategy also establishes a methodology for data collection and analysis, and reviewing the status of e-readiness and e-strategies adopted by SADC Member States. A review of e-strategies from other selected countries and sub-regions in Africa and the rest of the world took place, as well as examination of the models recommended by international organisations.

The Luanda 2010 SADC ICT Ministers' meeting also approved the recommendations made by the Regional Alliance Task Team (RATT) for the adoption of a policy statement including the following policy objectives: transparency; cost based pricing; effective competition; regulatory certainty and predictability; regional development; and infrastructure development. The meeting also proposed regional priorities for 2011⁄2012 which included the setting up of National and Regional Internet Exchange points; harmonisation of Cyber Security Regulatory Frameworks in SADC; and a Regional project to improve interconnection among physical, electronic and financial postal networks.

Prior to this, SADC Ministers responsible for Telecommunication, Postal and ICT had decided in 2009 to adopt the joint International Telecommunication Union (ITU)/ Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)/European Commission project "Harmonisation of ICT Policies in Sub-Sahara Africa (HIPSSA)" to assist in the implementation of the necessary policy and regulatory reforms identified for the region. An assessment of Member States' national ICT policies and legislation was made and gaps in some countries were found where regional policy objectives were not yet addressed. Best practices from the region to fill these gaps were also identified.

To reflect market and technology evolution, changes were suggested to the Transport, Communications and Meteorology (TCM) Protocol, the SADC Telecommunication Policy, and the Telecommunication Model Bill. In addition a new Policy Framework on Convergence was also developed to guide Member States in addressing the challenges of convergence and to harness the potential developmental opportunities that emerge with the transformation of the sector.

A full rewrite of the SADC Telecommunication Policy is also being made to change it to a comprehensive SADC ICT Policy, instead of just amending the existing one. The necessary changes would also be incorporated into the TCM Protocol, and revisions to the Model Bill to align it with the convergence policy proposed.

These various strategies have already clearly mapped out most of the requirements to achieve Digital SADC 2027, but their implementation at the national level is still lacking in most SADC Member States. As stated in the e-SADC strategy document; "Although at the policy level, Member States had adopted ICT as a key driving element for socio-economic development (ICT Declaration of 2001), in practice, at the strategic level, implementation had not taken place. This therefore called for concerted efforts to assist member States in developing their national ICT policies and strategic plans based on the SADC guidelines".

At the same time, the ICT sector has evolved considerably since these strategies were developed (especially with regard to the 'broadband imperative[1]') and there is a need to ensure that the strategies incorporated into the RIDMP reflect the latest developments. Addressing infrastructure requirements to meet exploding broadband demand is not a uniquely Southern African problem or even a developing country problem. Globally, governments and operators are now grappling with these issues. Policy makers and regulators are having to re-evaluate their strategies, and operator networks are still in the process of migrating from a voice-centric model to a broadband capacity model. This affects the provision of ICT infrastructure and services at every level – continental, regional, national and local.

1 Goals for connectivity have now moved beyond simply 'getting connected' to the internet, to ensuring that every person has access to sufficient bandwidth to support realtime multimedia applications – at least 1Mbps.

2. Situation Analysis

2.1 Current Sector Status

2.1.1 Voice Telephony

SADC Member States have progressed relatively well over the last decade in terms of access to voice telephony. Encouraged by the early introduction of prepaid services (which now account for 80-90% of subscribers in the region), mobile uptake stood at an average of 60% of the population in 2010, with little sign of growth slowing down as yet, as shown in the charts below. The average across the SADC region is a little behind world averages, but the average obscures fairly large variations (about 5 times) between SADC Member States, with the DRC and Malawi at only around 20% penetration while Seychelles, Botswana and South Africa are over 100% (due to the use of multiple SIM cards).

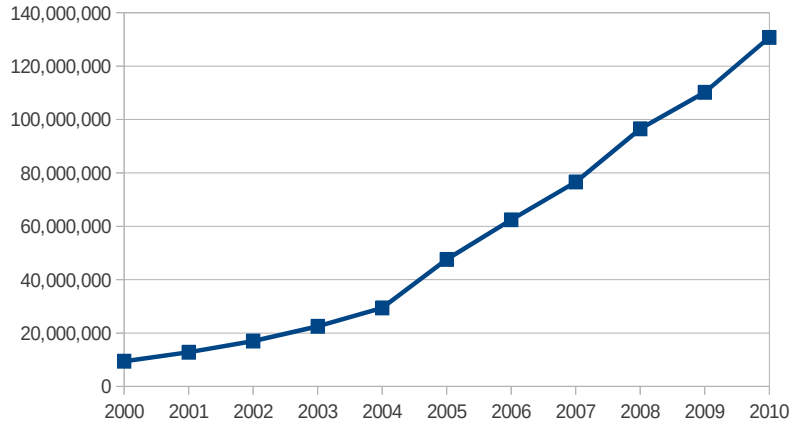

Figure 2: Growth in total mobile subscribers in the SADC region
Source: ITU (2011)

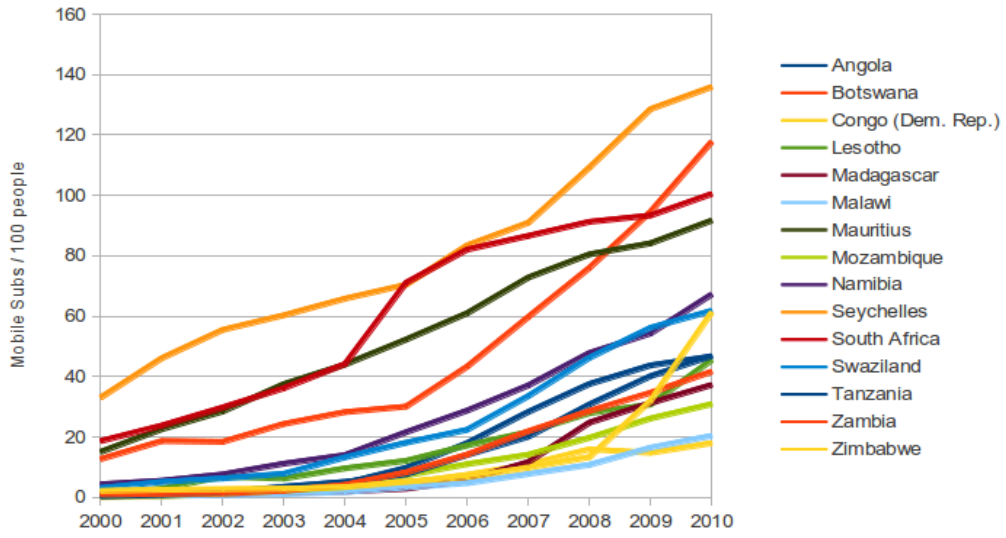

Figure 3: Trends in mobile subscriber density SADC Member States
Source: ITU (2011)

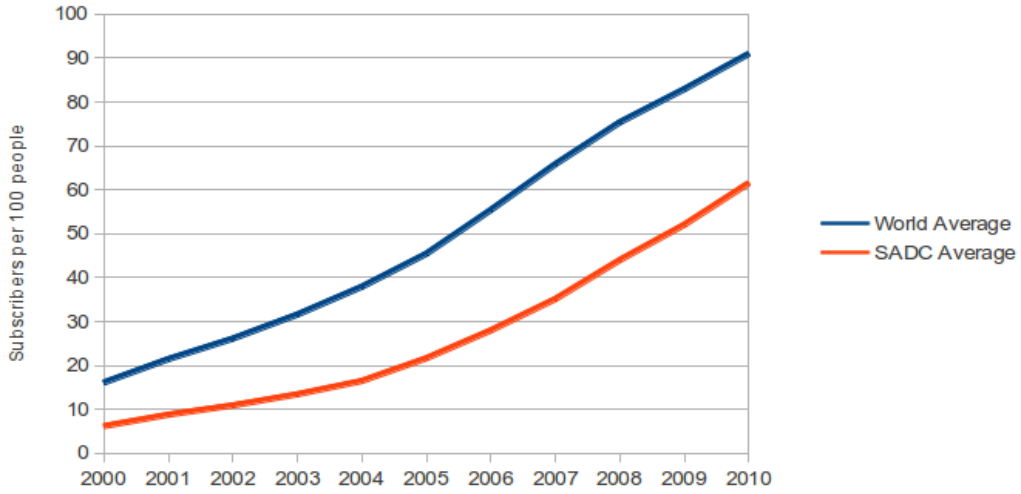

Figure 4: Average mobile penetration trends world-wide vs the SADC region
Source: ITU (2011)

S-time-distance gap analysis on the average penetration trends shown above indicates that the SADC region is a little under 4 years behind the world average, but ahead of the overall African average.

The dominance of mobile over fixed line subscribers in the SADC region shows similar trends to those taking place in Africa as a whole, and the rest of the world, with fixed lines only representing about 6% of total voice subscribers (2% if South Africa is taken out of the equation), and this actually declined marginally between 2009 and 2010 to 6.14 million lines, of which over 4 million are in South Africa.

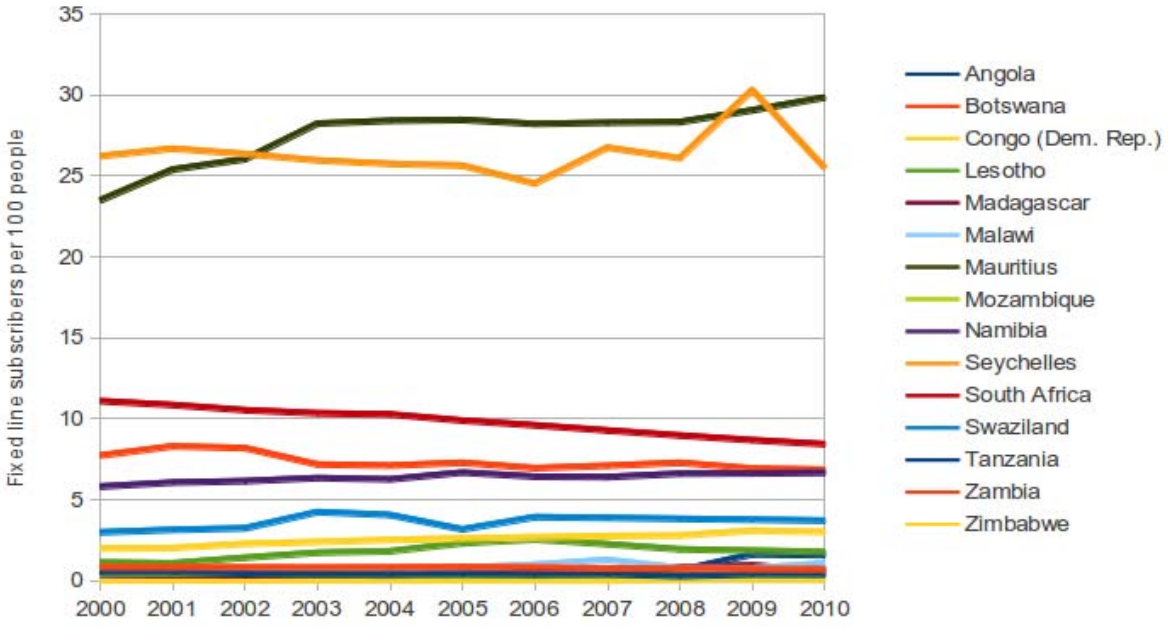

Figure 5: Trends in fixed line access in the SADC region
Source: ITU (2011)

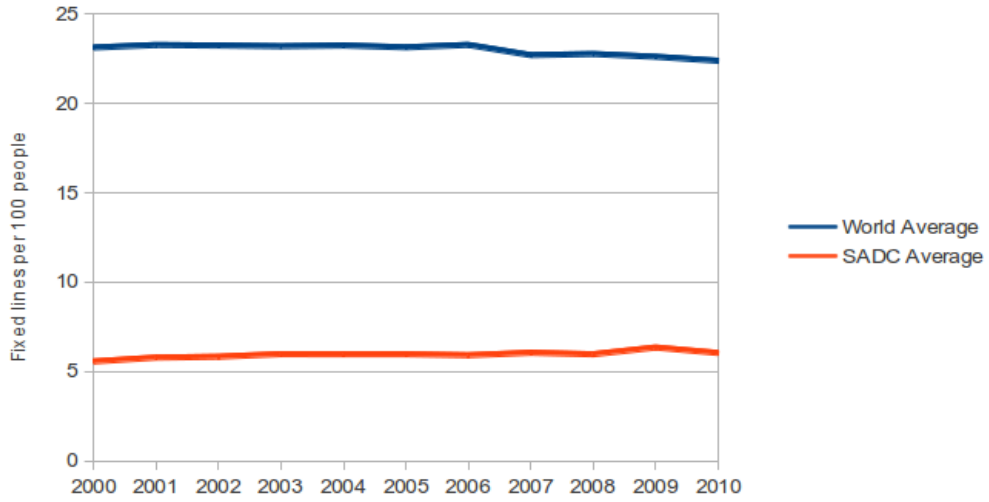

Figure 6: Average fixed line penetration trends in the SADC region
Source: ITU (2011)

Except for Swaziland, mobile markets in the SADC Member States are relatively competitive, as shown in the chart below. However where there are only two or three operators present, the extent of competition is unlikely to be sufficient to drive prices down. Even where there is significant competition, there is still suppressed demand (mainly through curtailed usage), because costs remain relatively high (compared to Asia for example). High costs often still prevail due to exogenous factors, the most notable of which are high input costs (e.g diesel-powered base stations, equipment import taxes, spectrum and licence fees), government taxes on airtime, small markets leading to low economies of scale, and high perceived levels of business risk, leading to short time horizons for achieving returns on investment.

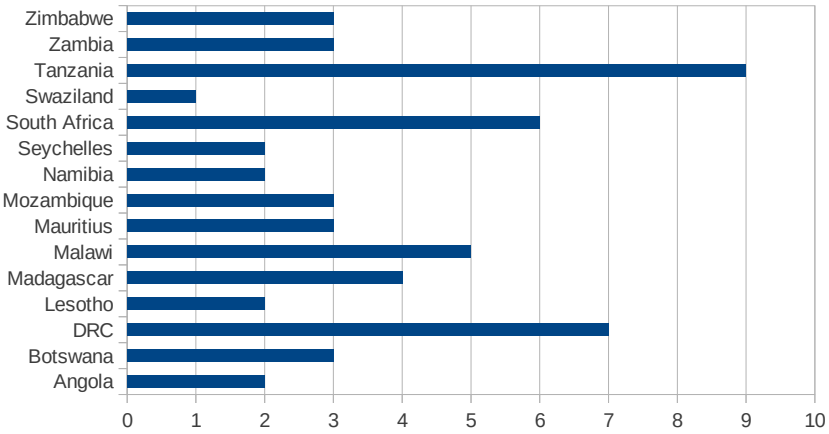

Figure 7: Number of mobile operators per country
Source: ITU (2011)

Nevertheless mobile voice and text messaging services have now become a 'mass technology' across the region, and the development focus has shifted to mobile and fixed broadband, while ensuring the remaining remote rural and other disadvantaged groups can gain access, such as through the use of Universal Service Funds.

Increasingly, convergence of technologies is being reflected in national licensing environments, as shown in the table below.

Table 1: Telecommunications Licensing Status in SADC Member States

Service and Technology Neutral Licence Status	
Angola	Awaiting Cabinet approval
Botswana	Yes
DRC	No
Lesotho	Yes
Madagascar	No
Malawi	Awaiting Cabinet approval
Mauritius	Yes
Mozambique	Awaiting Cabinet approval
Namibia	Awaiting Cabinet approval
Seychelles	No
South Africa	Yes
Swaziland	No
Tanzania	Yes
Zambia	No
Zimbabwe	No

2.1.2 Internet and Broadband Access

Growth in internet and broadband access and usage in SADC Member States (as in other developing regions) has not kept pace with voice penetration. An average of only 4% of the SADC region's population are internet users today. In the absence of regular gathering of data on internet users by national regulators in the region, the level of reliability of this estimate is not entirely clear. Up-to-date data is not easy to gather in Africa, and the distinction between 'users' and 'subscribers' is not always made, or if it is, the level of sharing of internet accounts can vary significantly. Nevertheless, other proxy indicators, such as the number of Facebook users in the country, which although quite volatile and exhibit very rapid growth in some SADC Member States in the region, indicates that the internet user figures are probably within 50% of the actual number of users.

As shown in the charts below, similar to voice penetration figures, the average across the region obscures even wider variations in internet penetration rates between Member States – ranging from 1% in the DRC, to almost 40% in Seychelles – a 40 times variation, vs only 5 times for mobile penetration. Clearly income levels are a strong factor in determining ICT uptake, but it is also apparent that suppressed demand due to other factors has a much larger role, at least until the major bottlenecks are removed. In terms of indicators of the progress of the RIDMP, one would expect to see decreases in the level of variation in ICT uptake between SADC Member States as bottlenecks are removed and coverage tends toward the universal.

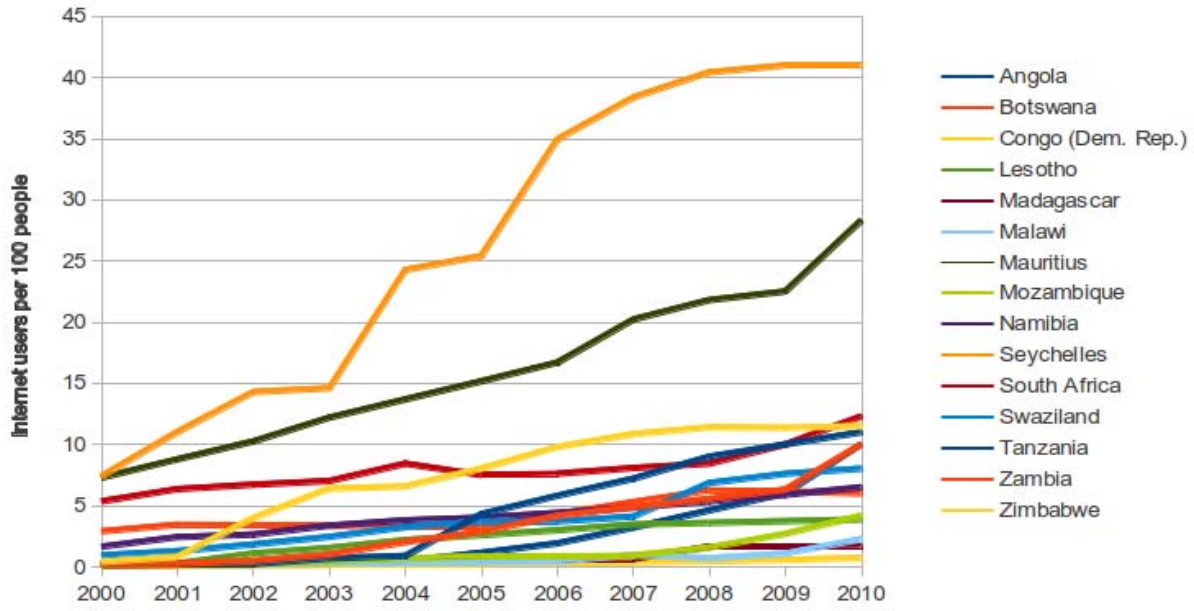

Figure 8: Trends in internet penetration in the SADC region
Source: ITU (2011)

As can be seen from the above graph, except for the smaller more economically developed island states of Mauritius and the Seychelles, the growth in internet users has been relatively flat in the region. These generally low levels of internet penetration, are partly the result of the high cost of access, combined with low income levels, and the lack of fixed line infrastructure, combined with the relatively short period that lower cost wireless internet services (mainly 3G and WiMax) have been available in major urban areas.

The graph below charts the average growth in internet penetration world-wide and in the SADC region, and shows that the region is falling behind compared to the rest of the world (although it is ahead of the average for Africa as a whole). The S-time-distance gap is also much greater than for mobile telephony, with the SADC region being almost 10 years behind the world average.

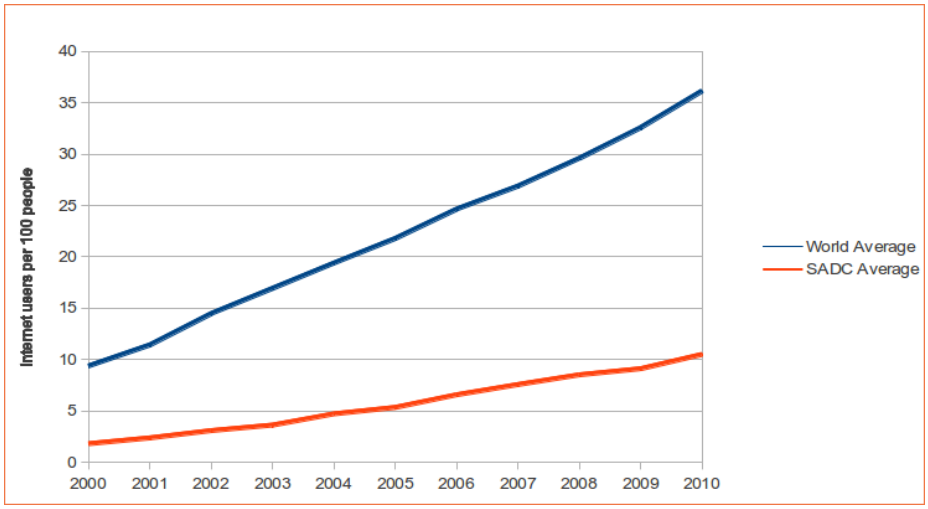

Figure 9: Average internet penetration trends in the SADC region
Source: ITU (2011)

Over the last few years operators have begun to deploy wireless/mobile internet services in major population centres[2] in all of the SADC Member States, and with the recent arrival of more submarine cables in the sub-continent, along with fibre to the landlocked countries, mobile internet access levels are currently rapidly increasing, and the trend lines above for the SADC region are likely to tick sharply upward over the next few of years.

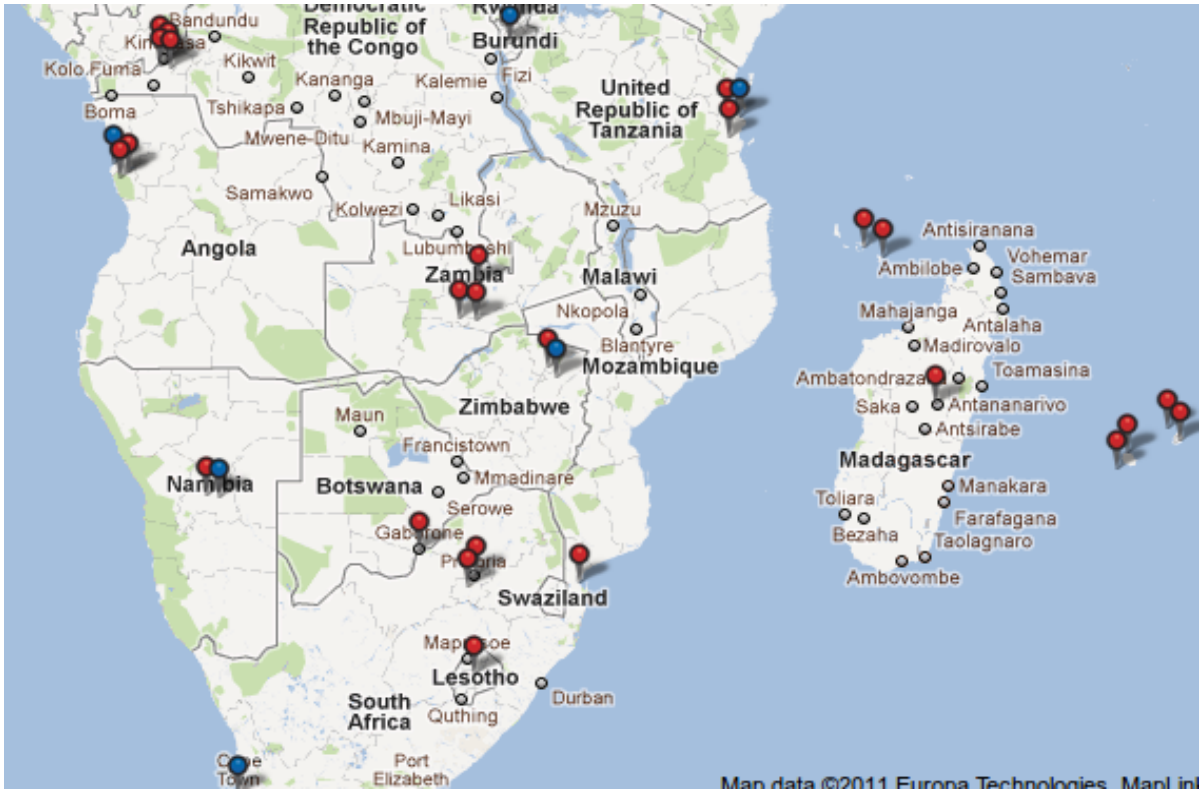

Figure 10: WiMax deployments in Southern Africa
Source: Wimaxmaps.org (2011)

Of particular relevance is the extent of broadband penetration in the region. While the ITU has not made recent statistics on mobile broadband publicly available, the chart below shows the fixed broadband trends in the region. The wide variations in fixed broadband subscriber penetration are largely a reflection of the availability of fixed lines in the country. The subsequent chart, showing the relative uptake of fixed and mobile broadband world-wide and in developing countries since 2007, is likely to be reflected in the SADC region as well. The rapidity of this change and the extent of broadband penetration over the short term will largely depend on the effectiveness of the implementation of the RIDMP.

2 Nationally, the fixed and mobile infrastructure that is in place today was initially dimensioned for voice services and will not be able to fully handle the demands for broadband without substantial and costly upgrades, mainly involving interconnecting base stations with fibre backhaul links.

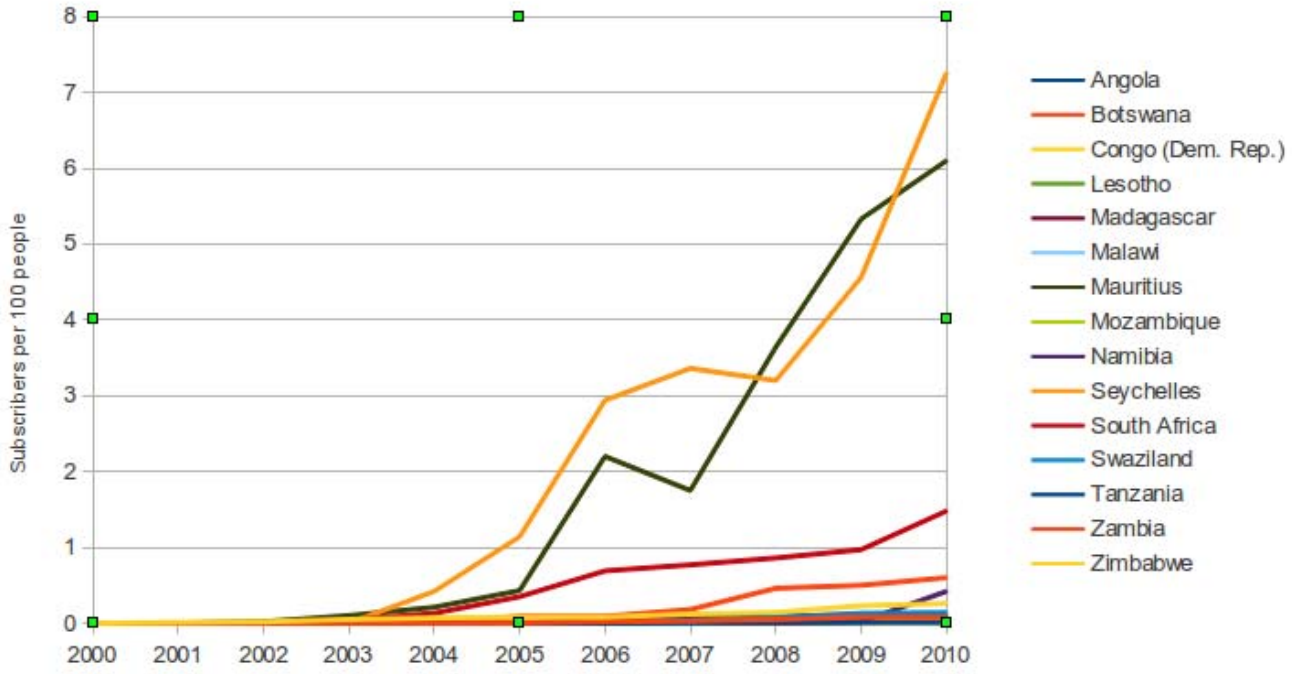

Figure 11: Trends in fixed broadband penetration in the SADC region
Source: ITU (2011)

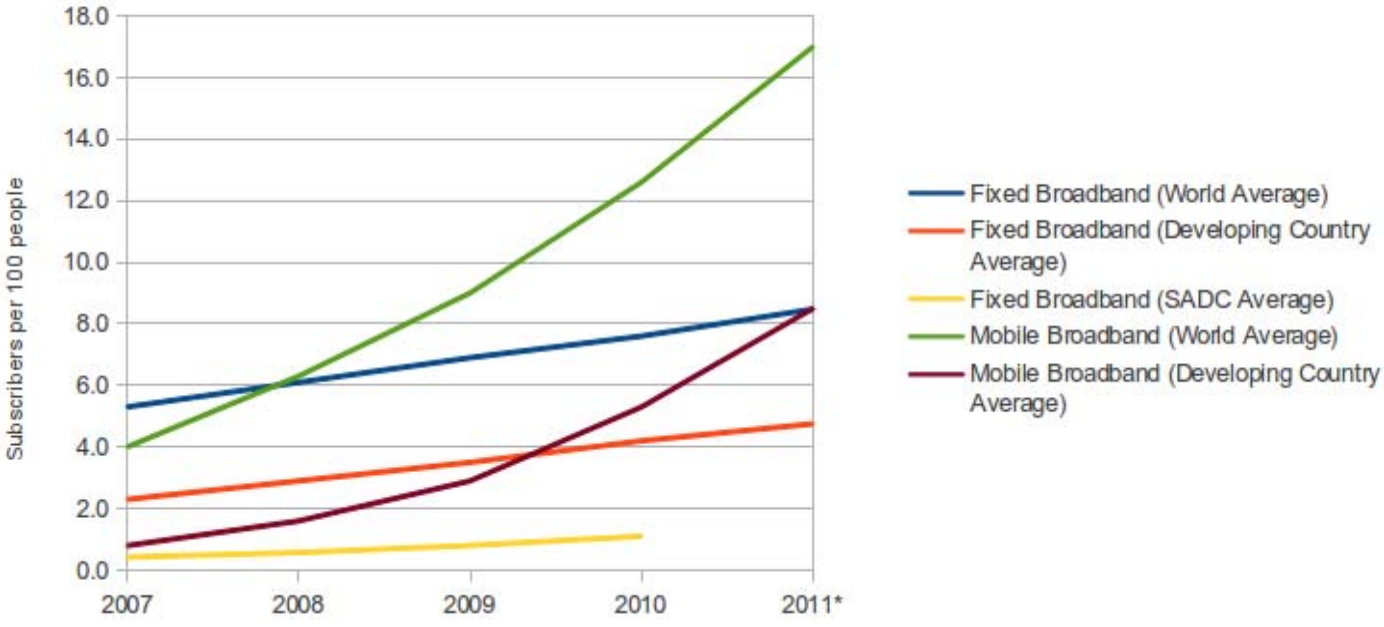

Figure 12: Trends in fixed and mobile broadband worldwide
Source: ITU (2011)

Table 2: Broadband penetration levels in SADC Member States

Country	Fixed + Mobile penetration % of population
Angola	5.7
Botswana	6.9
DRC	0.0
Lesotho	N/A
Madagascar	N/A
Malawi	N/A
Mauritius	28.4
Mozambique	1.6
Namibia	7.9
Seychelles	12.0
South Africa	18.1
Swaziland	0.1
Tanzania	2.1
Zambia	0.1
Zimbabwe	1.0

Source: SADC e-Commerce Study 2012

2.1.3 Optic Fibre Infrastructure

High-bandwidth fibre optic backbone networks are a particularly important element in the ICT ecosystem and often a major contributor to the cost of internet access, especially broadband access. National backbone networks connect towns and cities within countries and often across borders, to neighbouring countries, as well as providing the links to the international submarine cable networks that carry traffic between continents. By the same token, for landlocked countries, their international links are provided by the national backbone networks of their neighbours – a key rationale for regional co-operation.

In relatively undeveloped markets, such as in the SADC region, with suppressed demand and little local content, the bulk of demand is for international content, and the arrival of affordable international capacity is a key demand driver for national network expansion. Following the arrival of plentiful and cheap international bandwidth from competing submarine cables, it can be observed that major investments in backbone infrastructure are made and local broadband services rapidly expand. The chart below shows use of international capacity in SADC between 2002 and 2011, indicating the massive growth when the additional submarine cables began to arrive in the region in mid-2009.

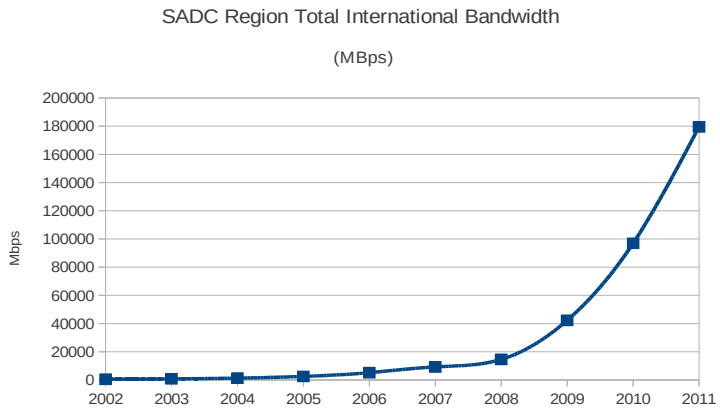

Figure 13: Trends in international bandwidth capacity-use SADC
Source data: Hamilton (2012)

As can be seen from Figure 14 in the map below, with the West African Cable System (WACS) submarine cable becoming operational this year, there will be at least 17 submarine cable landing stations in the region. All of SADC's Member State coastal countries will have access to at least one submarine cable, and most will have direct access to two. They only Member State without a potential backup cable (either directly or via a neighbouring country) is the Seychelles.

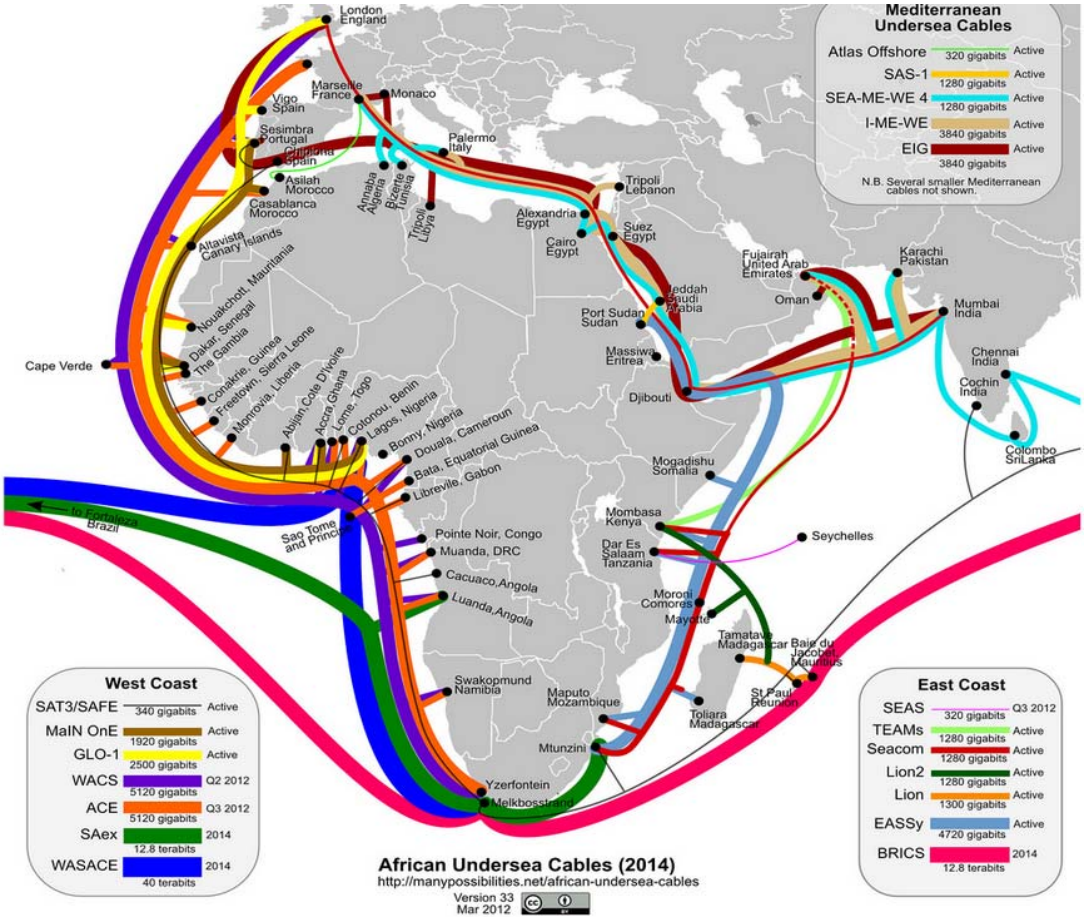

Figure 14: Submarine cables in Africa

Table 3: SADC Member State undersea fibre routes to the rest of the world

Country	Access to Rest of World and Backup Routes
Angola	SAT-3, WACS, (Brazil-Angola Cable)
Botswana	Namibia to WACS and via South Africa
DRC	WACS, ACE
Lesotho	Via South Africa
Madagascar	Eastern Africa Submarine Cable System (EASSy), Lower Indian Ocean Network (LION) (SEACOM)
Malawi	Via Tanzania and Mozambique
Mauritius	Southern Africa-Far East-West Africa submarine cable (SAFE), LION1 (LION2, BRICS)
Mozambique	SEACOM, EASSy, via South Africa
Namibia	WACS, via SA
Seychelles	SEAS, no backup
South Africa	SAT-3, SEACOM, SAFE, EASSy, WACS, (South Atlantic Express (SAex), BRICS)

Swaziland	Via SA and MZ
Tanzania	SEACOM, EASSy
Zambia	Via Namibia, Botswana, and Tanzania
Zimbabwe	Via South Africa and Mozambique

With the terrestrial fibre links between SADC Member States now in place (see below), there is also the possibility of accessing the submarine cables in neighbouring or even more distant countries if access to the local landing station is not competitively priced. The economic sustainability of using a foreign landing station depends on the affordability of national backbones to the neighbouring country, and is of particular importance for the private operators in countries surrounding South Africa (where the most submarine landing stations are located and the most competitive prices are likely to be) – Botswana, Lesotho, Mozambique, Namibia, Swaziland, and Zimbabwe. There is also now the possibility of using one of the new regional operators such as Liquid, which provide competitively priced access to the submarine cables from any of their Points of Presence (POPs) in the region (see below for further details).

2.1.4 Terrestrial Communication Infrastructure

There has been a tremendous improvement over the last few years in terrestrial fibre optic, microwave, and satellite capacity in most SADC Member States. Compared to other regions in Africa, SADC now has the most pervasive regional terrestrial fibre network. The bilateral links between national backbones of the incumbent operators in each country forms the basis for most of the cross-border terrestrial fibre in the SADC region, achieved under the aegis of Phase I of SATA's SADC Regional Information Infrastructure (SRII) project.

Figure 15 shows the extent of the cross-border and national fibre routes, taking into account both the incumbent, state and private/parastatal (non-incumbent) infrastructure, and routes that are already under construction (or fully funded with tenders launched - i.e. should be operational by end-2012 or early 2013 – shown by dotted lines).

While the map shows that much of the minimum required cross-border infrastructure is in place, this by itself does not guarantee that the capacity at the regional level is affordable. Most of it is owned and deployed by incumbent operators (except in Angola, South Africa, Zimbabwe and Tanzania) and although there is a lack of generally available information on pricing of fibre links, most of it is unlikely to be competitively priced, making it economically unfeasible to use efficiently.

Most efforts to address required fibre infrastructure in southern Africa (and elsewhere on the continent) has approached the need to address the missing links by facilitating the interconnection of the national infrastructure of incumbent operators. This approach has helped to minimise external funding requirements (as the costs are usually met by the operators themselves), but this has lead to network development that has discriminated against new market entrants because it is not based on “open access” or strong interconnection regulation, leading to high prices for access.

This trend has made operators in the landlocked SADC Member States even more vulnerable because they have to pay the full cost of terrestrial transit across their neighbours' territories to get to the coast, so that even if they are investors in the submarine cable, they may not be able to reap its full benefits. This was discovered to Namibia's cost when it invested in SAT-3, but found satellite capacity cheaper than renting terrestrial capacity from Telkom SA to get to the SAT-3 landing station in Cape Town. This was before the South African fixed market was fully opened, and at the time Telkom SA was able to charge whatever it wished for national capacity, even to its co-investor in the SAT-3 submarine cable consortium.

In conclusion, it can be said that aside from a few exceptions, affordable regional ICT infrastructure is not yet widely in place in the SADC Member States. The lack of competitive national infrastructure

compared to the extent of competition in submarine cables, is demonstrated by the fact that capacity from a southern African submarine landing station to Europe, North America or Asia is usually cheaper than the in-country national backbone capacity needed to get to the landing station. This is the case currently in the SADC Member States which have competing submarine cables, such as Mozambique and South Africa, where it may only cost US$200-US$300/Mbps/month for capacity from the coast to London, while it costs US$500-US$2000/Mbps/month for capacity from inland to the coast.

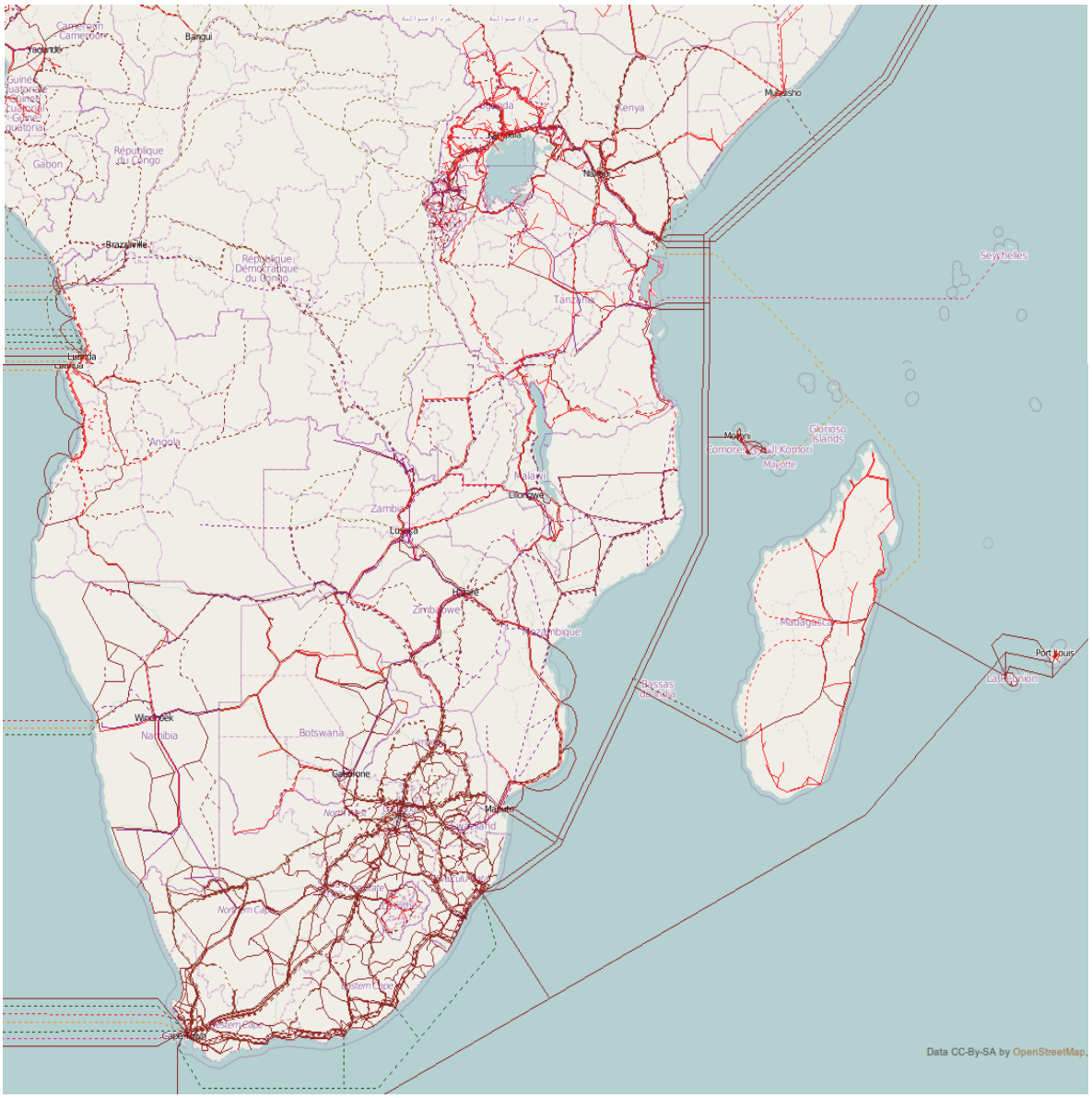

Figure 15: SADC Fibre and Microwave Telecommunication Infrastructure by 2012/13
Legend: Brown/purple lines: fibre, red lines: microwave, dotted lines: planned. Source: Hamilton Research[3] (2012)

The effect of competition on national backbone pricing can also be observed when comparing prices for capacity between, for example South Africa (which has at least four competing backbone providers) and Namibia, where Telecom Namibia is the only provider. In South Africa the cost of capacity is currently at least 45% less than the same capacity on the Namibian side.

The interconnection matrix shown in Table 4 below summarises the extent of cross border fibre infrastructure in place today, and also shows the degree of competition on routes, and nationally.

3 http://www.africabandwidthmaps.com

Table 4: Cross Border Interconnection Matrix

Country	Rest of World	Angola	Botswana	DRC	Lesotho	Malawi	Mozambique	Namibia	South Africa	Swaziland	Tanzania	Zambia	Zimbabwe
Angola	SAT-3, *ACE WACS*	Angola Cables											
Botswana	South Africa *WACS*		1: BTC										
DRC	Satellite, *WACS, ACE*	None		2: OCPT, SNEL									
Lesotho	Via SA				1: Telecom Lesotho								
Malawi	Via TZ and MZ					1: MTL							
Mozambique	SEACOM, EASSy					1/1: MTL/TDM	4: TDM, EDM, Vodacom, Viettel						
Namibia	Via SA or Angola until WACS 2012	1/1: Angola Cables/ Namibia Telecom	1/1: Telecom Namibia /BTC					1: Telecom Namibia					
South Africa	SAT-3, SEACOM, SAFE, EASSy, ACE, WACS		2/1: BTC/Telkom Neotel, DFA		1/1: LTC / Telkom		2/1: Telkom SA, BB Infraco/TDM	3/1: Neotel, Telkom X2, BB Infraco/Telecom Namibia	7: Telkom SA, Neotel, DFA, Vodacom, Cell-C, MTN, BB Infraco				
Swaziland	Via SA and MZ						1/1:SPTC / TDM		1/1: SPTC/ Telkom SA,	1: SPTC			
Tanzania	SEACOM, EASSy			None/NICTBB		1/1: MTL/ TTCL	None				1: NICTBB		
Zambia	Via BW, *TZ*	None	1/1: Zamtel/ BTC	2/2: CEC/ Zamtel, / SNEL-OCPT		1/1: Zamtel/MTL	None	1/1: Telecom-Namibia/ Zamtel			1/1: Zamtel/ NICTBB	2: ZamTel, CEC/Liquid	
Zimbabwe	Via SA, *MZ*		1/1: Powertel/BTC				3/1: Liquid Tel1 Utande Powertel/TDM	Via Botswana	3/3: TelOne, Liquid, Powertel /DFA BBInfraco, Telkom			2/2: TelOne, Liquid/Zamtel, CEC	3: TelOne, Ecoweb/ Liquid/CEC, Powertel,
Borders w at least one Link	7/7	**1/3**	**4/4**	**1/3**	**1/1**	**3/3**	**4/6**	**5/5**	**6/6**	**2/2**	**2/4**	**5/8**	**4/5**
Countries do not adjoin			**Incumbent monopoly backbone, or only 1 cross border link**					**Open Access govt backbones, or two or more competitors**					

Alternative/Utility Infrastructure – SADC Models for ICT Use

Powertel in Zimbabwe is one of the few successful examples of a national electricity grid operator spinning off a subsidiary to exploit the value-add of its network for providing telecommunications wholesale services.

By contrast in Zambia, the incumbent operator, Zamtel, was able to reach an exclusivity agreement with the electricity utility so that only it could make use of Zesco's grid. While this agreement is currently the subject of a dispute, the arrangement has so far meant that other operators need to build their own infrastructure along the main routes.

In the case of Tanzania and South Africa, the electricity distribution networks have provided their excess fibre, poles and rights of way to new state owned entities tasked with providing national backbone services. In the case of Tanzania this is the National ICT Broadband Backbone (NICTBB) which is being managed by the incumbent operator, and the network is the only one available currently.

In South Africa's case, the state owned Broadband Infraco is independently run, and is also an investor in the WACS submarine cable, so it can offer both domestic and international services. It also competes with a number of other private players in the market such as Telkom SA, Neotel and Dark Fibre Africa.

At a regional level these and the other national electricity distribution networks are increasingly being linked together as part of the Southern African Power Pool (SAPP), whose co-ordinating centre is located in Zimbabwe. As shown in the map below, there is much of this regional infrastructure that could be used to further extend terrestrial fibre backbones across borders.

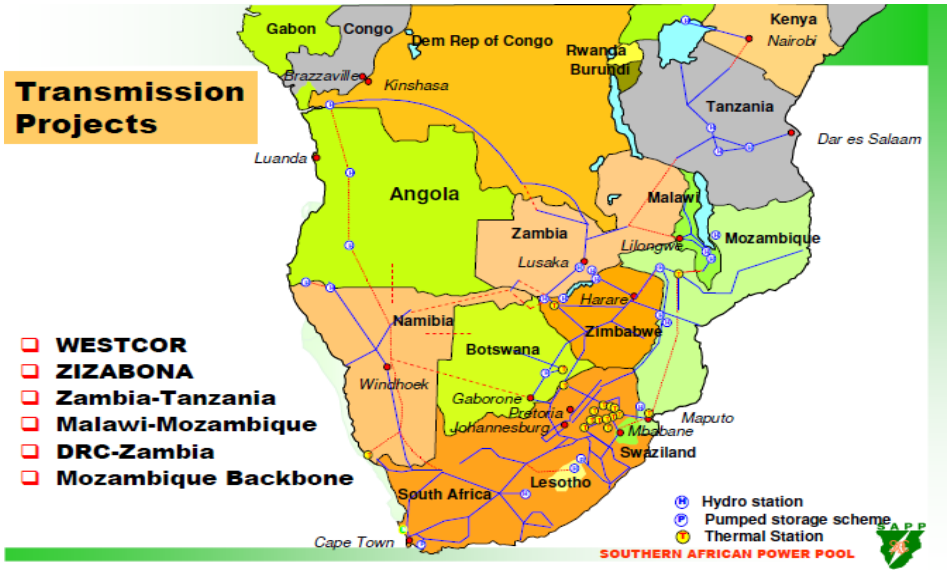

Figure 16: SAPP Network

2.1.5 Private Telecommunication Infrastructure Providers

With the spread of market liberalisation in SADC Member States there are a growing number of privately owned international telecom operators providing services in the region. Some are dedicated wholesale operators, but most operate mobile networks that in many cases have constructed their own transmission networks in order to carry traffic between base stations and to international gateways. As technology-neutral unified licensing expands, there are also a growing number of operators that provide a mix of mobile and fixed line services that in some cases now include a majority stake in the incumbent operator.

Most of these operators not only reach the borders of their respective countries, but in many cases they have a footprint in neighbouring countries. Many of the larger operators have also invested in one or more of the submarine cables landing in the region. Where the national regulatory environment allows them to interconnect internationally, and to resell capacity to third parties, they could provide a substantial number of competitively priced cross-border links.

The larger mobile operators, MTN, Bharti-Airtel and Vodacom have a particularly strong interest in connecting their infrastructure across borders because of their recent competitive play of implementing a 'no-roaming' or on-net tariffs for calls between users of their networks in different countries. In addition, these operators can take advantage of the many communities that are bisected by national boundaries, which have a strong suppressed demand to communicate with each other due to the high cost of international calls.

The interest of the private sector in deploying infrastructure also highlights the importance of policy and regulatory development in the RIDMP to further encourage competition in the carrier market and promote passive infrastructure provisioning, wholesale price regulation where needed, infrastructure sharing and open access networks.

The private retail operators present in the region (as well as in other countries outside the region but not listed here) are:

- Bharti-Airtel (ex ZAIN, Celtel) - DRC, Madagascar, Malawi, Seychelles, Tanzania, Zambia
- Econet Wireless - Botswana, Lesotho and Zimbabwe.
- Etisalat/Atlantique Telecom - Tanzania
- Expresso/Sudatel - Malawi
- Lap Green – Claims to have licences in DRC and Tanzania.
- Millicom International Cellular (Tigo) - DRC, Mauritius, and Tanzania
- MTN - Botswana, South Africa, Swaziland.
- Orange/France Telecom group - Botswana, Madagascar, Mauritius.
- Orascom Telecom – Namibia and Zimbabwe
- Vodacom - DRC, Lesotho, Mozambique, South Africa and Tanzania.

There are also an increasing number of companies specialising in regional wholesale terrestrial fibre carrier services, as described below.

Liquid Telecom

Econet Wireless' subsidiary Liquid Telecom has recently extended an 8,500 km fibre link running from the DRC border through Zambia and Zimbabwe to South Africa where it has established a direct connection to the SEACOM submarine cable. This is part of Liquid's plans to interconnect with Botswana, Mozambique and Namibia. The network also forms one of Zimbabwe's national backbones, linking major cities and towns.

Phase 2 comprises a route from Harare to the Mozambican border at Mutare, a second diverse route to Beitbridge via Masvingo and a second route to Zambia from Bulawayo to Victoria Falls. Phase 3 comprises the route from Bulawayo to the border with Botswana, a second route to Botswana (and Namibia) from Victoria Falls to Kasane, and a second route from Harare to Mozambique via Nyamapanda. A large section of the network in Zimbabwe uses the energy provider's fibre network (PowerTel), and similarly, operations in Zambia are a joint venture with the Copperbelt Energy Corporation (CEC).

Malawi and Mozambique have recently been included in Liquid expansion plans, and construction is starting in the Katanga Province of DRC where Liquid will eventually connect Lubumbashi to the capital, Kinshasa, by taking the cable on high voltage transmission lines.

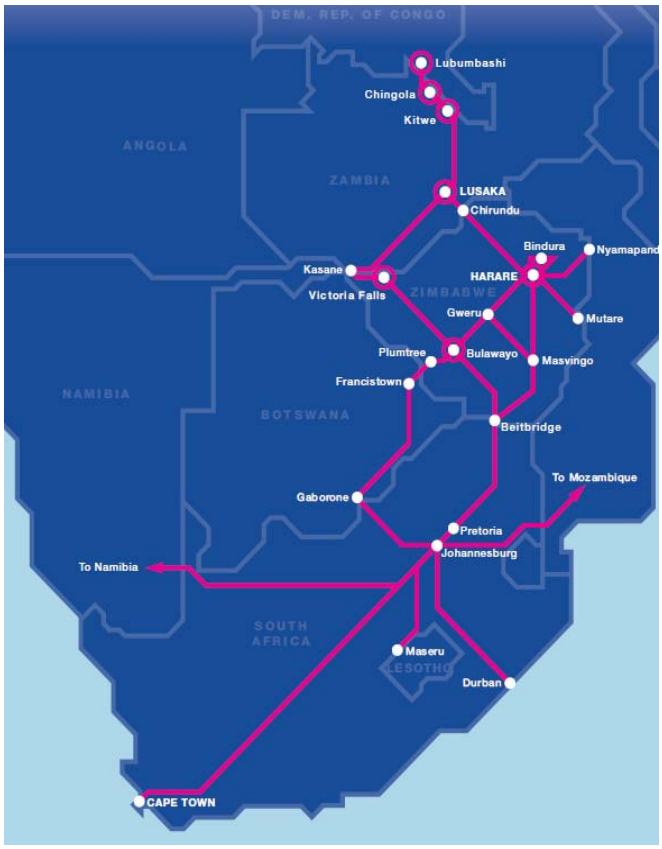

Figure 17: Liquid Telecommunication Current and Planned Regional Backbone

Gateway Communications

One of the largest wholesale carriers in Africa, Gateway is a subsidiary of Vodacom and has a presence in 13 countries and clients in about 40 African countries, mostly for its satellite-based services. Gateway has bought capacity on SEACOM and is an investor in WACS. In the SADC region, Gateway has offices in Angola, Mozambique, South Africa and Tanzania. Gateway has deployed fibre in Malawi and plans to further expand terrestrial networks into Namibia, Zimbabwe, Botswana and Swaziland in the short term.

MTN Business

MTN is a South African-based multinational telecommunications provider. After MTN's initial start as a mobile provider it has been growing its data network services business. In the SADC region MTN Business' main operations currently are in Botswana, Namibia, and Zambia, but it also provides connectivity in other African countries by partnering with local providers. MTN also lays its own national and international fibre where necessary, such as a project to interconnect Zambia, Botswana and Namibia. MTN is a major shareholder in SEACOM and it has invested in the West African cable system (WACS).

Internet Solutions (IS)

IS is a South African based internet provider which has expanded as a regional provider operating as a division of Dimension Data, a South African IT multinational listed on the London stock exchange. IS has bought a number of STM-1s on SEACOM, as well as having bandwidth on SAT-3. Seeking to

leverage this infrastructure, with plans to grow across Africa, IS has so far established offices and POPs in Botswana, Mozambique, Namibia, Zambia and Mozambique.

SEACOM

Mauritius offshore company SEACOM began operations in 2009 as the first east-coast submarine cable in Africa, but is now becoming a combined submarine and terrestrial regional carrier. The business model is structured so that the price of SEACOM capacity is the same, regardless of where it is purchased, on the coast or inland. To provide the service in Southern Africa it has partnered with Six Telecoms in Tanzania, TDM in Mozambique and Dark Fibre Africa in South Africa. SEACOM has also reached agreement with the West African private submarine cable operator MainOne, to share landing stations with each other so that customers can be offered access to points of presence on both coasts, including redundancy and additional capacity on both the east and west routes around Africa.

Orange/France Telecom

Orange is a long standing global player in the capacity market and the consolidation of its offerings in the region will likely take place if the ACE fibre cable (in which it is the main shareholder) extends to Angola, Namibia and South Africa. France Telecom is also investing heavily in submarine fibre infrastructure such as ACE and LION.

Satellite Operators

In addition, mention should be made here of the large number of satellite operators which have coverage in the region. These include RASCOM, EutelSat, PanamSat and Intelsat, which all compete with one other to provide telecommunication and broadcasting services. Due to the latency issues with satellite bandwidth and the high cost of capacity, unless there is no terrestrial alternative, satellite links are best suited to broadcasting and narrowband communication links, such as for border control data, financial transactions, ATM and bank-card authorisations, stock reports etc. In addition, if the terrestrial infrastructure has no redundancy/security, (often the case in more remote areas) then satellite links are necessary.

A new Medium Earth Orbit (MEO) satellite initiative called O3B (Other Three Billion) is due to launch satellite and services shortly which promise much lower latencies and capacity prices. The satellites need to be tracked as they pass overhead, so this necessitates much higher cost ground-station equipment than geo-stationary satellites. As a result the service is not oriented to end-users but is aimed at providing backhaul links for telecommunication operators needing to connect their remote networks where no terrestrial infrastructure exists or to provide backup links if the terrestrial infrastructure is insecure.

2.1.6 National and Regional Internet Traffic Exchange

National Internet Exchange Points (IXPs) are a vital part of ICT infrastructure, necessary for ensuring low latency between networks and minimising the flow of national/regional traffic that would otherwise travel outside the country or region. Most IXPs are operated by national associations of Internet Service Providers (ISPs). Governments sometimes play a role in providing a neutral facility to host the IXP, but generally, the IXPs that have emerged have not benefited from any specific involvement by government.

SADC is ahead of other regions in Africa, with the majority of Member States hosting at least one IXP – there are 12 IXPs in the region – and only Lesotho, Madagascar, Seychelles and Swaziland do not have one. Nevertheless, participation by local internet providers in some of the IXPs that have been

established is low, and has not reached a critical mass of operators to make them self-sustaining. In addition, local traffic is not always exchanged through the IXPs and only a few have additional shared facilities to minimise international traffic and increase quality of service, such as caching servers, mirror servers, domain name servers and Content Distribution Network (CDN) services.

As a result of the lack of regional exchanges and the absence of national exchanges in some SADC Member States, along with many poorly functioning[4] existing IXPs, millions of dollars annually are paid to off-continent internet transit providers for traffic which could stay local or regional, and exhibit much better network performance at far lower cost (assuming capacity pricing is reasonable).

As mentioned earlier, the lack of competitively priced national capacity is one of the key constraints to increased use of IXPs. High local bandwidth costs make it expensive to establish links from the internet provider to the IXP, and this makes it hard to economically sustain the link when combined with the extra administrative burden for the relatively small amounts of local traffic exchanged[5], especially if the policy environment restricts services such as Voice-over Internet Protocol (VoIP). IXPs appear more active where local bandwidth costs have come down and/or international capacity costs are relatively high (especially the case in the landlocked countries).

There are a variety of other reasons for the slow pace of IXP development, most of them non-technical reasons relating to capacity building needs, dominance of incumbents in the internet sector or international gateways, and the level of trust between providers in the market, which results in resistance to sharing resources.

The need to promote the development of IXPs has been recognised at continental and regional levels, with the AUC and SADC both declaring the need for their establishment. However this interest has not yet been fully translated into concrete policies to promote the establishment and improvement of IXPs, and there is lack of clarity over how best to ensure their sustainability, and how to develop their role in optimising regional traffic flows. There have been some proposals for projects to establish a SADC 'Regional IXP' which would interconnect the national IXPs. However regional IXPs usually evolve naturally as an outcome of vibrant carrier markets where IXPs located at the main points of fibre network interconnection[6] become 'super-IXPs' attracting international and regional carriers to locate their Points of Presence there to take advantage of the economies of scale that the traffic at these hubs brings. There is a strong 'network effect' in this process and the larger these exchanges become, the more attractive they are for other carriers to build their infrastructure to. Typical examples in Europe of local IXPs which have become regional or even global IXPs are the London Internet Exchange (LINX) and the Amsterdam Internet Exchange (AMS-IX).

Strong IXPs where multiple fibre carriers are located also perform an important function in helping the market for bandwidth to function as efficiently as possible, driving down pricing as carriers compete for business. This is because customers can very easily and quickly switch carriers with a simple router configuration change, making it possible to take immediate advantage of competing price offers.

4 Limited membership from the local ISPs, or low levels of traffic being exchanged through the IXP

5 The lack of locally hosted applications means the bulk of traffic is international, reaching 90% of total traffic, or more in some cases

6 e.g. Cape Town, Luanda, Mtunzini and Dar es Salaam which will all have at least 3 submarine landing stations by next year, or Johannesburg or Harare, where at least 3 international terrestrial fibre backbones interconnect.

An indication of the impact of high prices is particularly visible at the level of internet traffic passing between SADC Member States. A study[7] carried out by the Internet Society (ISOC) in 2011 found that there is very little internet traffic exchange directly between SADC Member States, mainly due to the high cost of national or cross-border infrastructure, making it cheaper to exchange traffic in foreign locations such as London, Frankfurt or Hong Kong. This even extends to the exchange of traffic between internet operators at the national level, where IXPs are not being used because it is cheaper to route traffic outside the country on submarine cables than it is to buy local capacity to exchange traffic (see below for more details).

The table below summarises the results of the ISOC study, which show that although over 80% of the borders between neighbouring SADC mainland countries have fibre links between them, internet traffic is only exchanged directly in less than 25% of the 132[8] potential links between SADC Member States. The much higher cost of direct traffic exchange over submarine cables is not as easily justifiable, so the SADC island nations were not included in the comparisons. Nevertheless, excepting the link between Madagascar and Mauritius, none of the three SADC island nations exchange traffic directly with any other SADC country, so if they were included, the figure would fall to less than 20%.

Table 5: SADC Mainland Interconnectivity Summary

Country	Number of Fibre Links to SADC Neighbours	SADC Neighbours not Connected by Fibre	Number of SADC IP Peers	SADC Member States Peered at IP level by at Least One Internet Provider
Angola	1/3	DRC, Zambia	1	Namibia
Botswana	4/4	None	3	South Africa, Zambia, Zimbabwe
DRC	1/3	Angola, Tanzania	0	None
Lesotho	1/1	None	1	South Africa
Malawi	3/3	None	2	Mozambique, Tanzania
Mozambique	4/6	Zambia, Tanzania	2	South Africa, Malawi
Namibia	5/5	None	3	Angola, South Africa, Zambia
South Africa	6/6	None	8	Botswana, Lesotho, Mozambique, Namibia, Swaziland, Tanzania, Zambia, Zimbabwe
Swaziland	2/2	None	1	South Africa
Tanzania	2/4	DRC, Mozambique	3	Malawi, South Africa, Zimbabwe
Zambia	5/8	Angola, Malawi, Mozambique	3	Botswana, Namibia, South Africa,
Zimbabwe	4/5	Namibia[9]	3	Botswana, South Africa, Tanzania
International Links in place vs Total Links possible	38/47		30	30/132
% of Total Available	**80.9**			**22.7**

Source: ISOC (2011)

The figures above actually tend to overstate the extent of both fibre and IP level interconnection due to a variety of reasons, listed below:

1. The proportion of the traffic exchanged at the IP level between SADC Member States is actually much less than the 22.7% figure implies, which just counts the number of operator

7 The study is currently still in the process of finalisation, cf Karen Rose, rose@isoc.org

8 The number 132 is derived from the 12 mainland SADC Member States which could have operators exchanging traffic directly with each other – i.e. each could peer with 11 other countries – 12 x 11 = 132. Even if there is only one operator of fibre routes out of the country, (such as in the case of Lesotho) internet providers could still peer over this link with providers in other SADC Member States if traffic levels and costs justified this relative to the costs of paying for transit.

9 Due to the close proximity with Zimbabwe's link to Zambia and Botswana at this border, a separate link to Namibia may not make much technical or economic sense, unless transit to Namibia via Botswana or Zambia proves unsustainable.

connections, rather than the amount of traffic. Ideally internet providers in each country would be routing all of their traffic by the most efficient and direct routes between the SADC Member States, but currently this is largely confined to incumbent and mobile operators in landlocked SADC Member States using the networks of their sister coastal country operators to gain access to the rest of the world.

2. Most of the cross-border fibre links are established as bilateral arrangements between neighbouring incumbent operators, and capacity on the link is usually not available at competitive prices to third parties. Also, more than one link between neighbouring countries is required to ensure continuity of service in the event of a cable cut, and/or to promote competitive pricing on the route.

Table 6: List of operators exchanging traffic directly with each other in the SADC mainland

Cross Border Link	Operators Exchanging Traffic Directly
Angola/Namibia	Internet Technologies NA/Internet Technologies Angola
Botswana/South Africa	BTC/Neotel,Telkom
Botswana/Zambia	BTC/Zamtel
Botswana/Zimbabwe	BTC/Powertel
Lesotho/South Africa	TL, Vodacom LS,/Vodacom Telkom
Malawi/Mozambique	Malawi Telecom/TDM
Malawi/Tanzania	MTL/TTCL
Mozambique/South Africa	TDM, Intradata /Telkom SA, IS
Namibia/South Africa	Telecom Namibia/Neotel, Telecom Namibia/ MTN Business
Namibia/Zambia	Telecom Namibia/Zamnet, UUNet, QuickEdge
South Africa/Swaziland	Telkom, Vodacom, MTNBS/SPTC, Vodacom, RealNet Swaziland
South Africa/Tanzania	IS/WIA, Six Telecom
South Africa/Zambia	MTN Business, UUNET/MTN, Sprint
South Africa/Zimbabwe	Telkom SA/TelOne, AfricaOnline
Tanzania/Zimbabwe	SpiceNet/Telecontract

Source: ISOC (2011)

Direct traffic exchange between internet network operators takes place through use of the Border Gateway Protocol (BGP) in conjunction with an Autonomous System Number (ASN), which allows any independent network to identify itself uniquely in the global routing tables and automatically route traffic for itself over multiple paths. As a result counting the number of ASNs provides a good indication of the level of maturity and extent of interconnection between operators in a country.

The chart below shows the uneven and generally low level of use of ASNs in the region. Even excluding South Africa, the number of ASNs per country in the rest of the region varies by more than a factor of 10. The number of ASNs would normally be expected to reflect the country's population size, wealth and maturity of the internet sector, but the figures below show this is clearly not the case yet, and that basic policy constraints currently have a more significant impact on the level of internet development in the country.

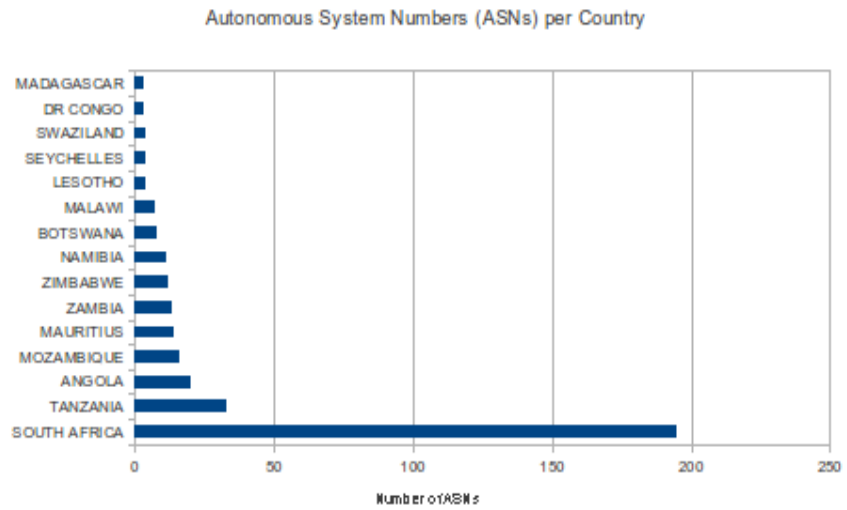

Figure 18: ASNs in SADC Member States
Source: RIPE (2011)

2.1.7 Postal Infrastructure

Similarly to other regions, the public postal sector in SADC is undergoing challenging times due to competition from the private sector in some services, and greater use of the internet for letters and legal documents. As a result the region has recorded an average annual decline of 5% in mail volumes in recent years. Following international trends, this decline can be expected to continue in the foreseeable future. However globally, parcel mail appears to be increasing steadily as a result of increasing use of e-commerce and this is likely to take place in SADC as well.

Within SADC the basic postal infrastructure is largely in place and the exchange of regional mail is functioning, although coverage of post office branches is still limited in most rural areas and mail traffic is probably not as rapid and secure as might be desired. Aside from the constraints created by the limited capacity of the postal operators, other reasons for failure to achieve international service standards are:

- Lack of direct flights;
- Aging vehicle fleets; and
- Delays in clearance of items by customs officials.

With regard to the latter, customs practices and procedures can significantly affect courier services – for example, if a Member State has no customs clearance policies that specifically recognise courier service products, this may require them to be treated under time-consuming procedures designed for regular cargo. However, on average nearly 98% of postal items remain in the domestic service while just over 2% of items cross national borders.

The modes of mail and parcel international exchange partly depend on the infrastructure of other sectors – principally transport and communications. The growing cross-border air and road networks are improving the options in the region for the transport of physical mail. Generally the international postal systems are dependent on the major air transport hubs for routing air mail, particularly Johannesburg, although some of these might be outside the region – for example Nairobi airport for Tanzania. The expanding telecommunication networks in the region are increasing the options for linking up postal branches for electronic and financial services and administrative purposes. Improving the security and reliability of the physical networks continues to be a priority. Along with

increased competition from private courier companies this appears to have helped encourage significant improvement in the quality of service.

In an effort to improve mail exchange in the region, postal services established the Regional Road Transport Network (RTN) in 2010, to allow international mail coming into the region via South Africa, to be transported by road to various SADC Member States. The RTN covers eight SADC Member States (Botswana, Lesotho, Mauritius, Malawi, Mozambique, Namibia, Zambia and Zimbabwe), and volumes have steadily increased since the launch to about 45 000 kg of mail a month in October 2011.

According to the Universal Postal Union (UPU), public postal operators in SADC Member States held 96% market share of domestic letter post, and 80% of international letter-post, but only 28% of domestic parcel service and 20% of international parcel services. The courier component has largely been opened for competition and the private sector is particularly active in this market. In South Africa alone there are 50 courier companies. As liberalisation of the sector has taken place, courier service suppliers usually seek to take larger shares of additional international mail services. Efforts by postal services to reduce costs and increase coverage have also led to the use of franchising with retail outlets, petrol stations, and municipal offices often providing various postal services.

The International Postal System (IPS) for tracking and tracing mail has been implemented in 11 SADC Member States and nine offer track-and-trace online. However limited computerisation/branch office automation and skills shortages have resulted in a somewhat inconsistent service quality and coverage. So far only South Africa and Mauritius have fully computerised their postal networks.

Table 7: ICT Infrastructure Status of SADC Postal Operators

Country	ICT Infrastructure Support	Future Prospects
Angola	- Fibre optic installation in progress - Currently carrying out counter automation of offices	- Needs to share experiences with other postal administrations
Botswana	- 95% of country covered so far - Counter automation for urban and rural areas almost complete.	- All major cities and towns covered
Lesotho	- Partial coverage of ICT Infrastructure available - Networking offices in progress - 2 offices connected electronically and 46 offline	- Needs ICT infrastructure support for full coverage
Malawi	- Partial Coverage of ICT Infrastructure available - 48 offices connected electronically - 130 offices off line	- Needs ICT Infrastructure - Internet connectivity in major towns while other towns and rural areas covered by GPRS and telephones
Mauritius	- Partial coverage of ICT Infrastructure available - 60 domestic offices offering online electronic - 102 offering offline in 2010 and target of connecting all these by December 2011	- Needs IT infrastructure support for full coverage
Namibia	- Partial coverage	- Needs ICT support for full coverage
South Africa	- Infrastructure support available in both urban and rural areas	- Working on adoption of innovative IT solutions
Swaziland	- All 30 offices adequately covered - In the initial stages of procuring a postal automation system which will connect all offices from Escher	- Needs a system that links all offices electronically
Tanzania	- Most parts covered though through GPRS up to district level. - 14 offices online - 155 offline and 20 were expected online by Dec	- Need capital for expanding network.

	2011 - Counter automation using Post Global, already covered over 28	
Zambia	- ICT support available throughout the country - Successfully rolled out counter automation in 2010 to 21 offices and completion of roll out is 2012 - 120 offices online	- Mobile and internet access available
Zimbabwe	- Partial coverage of ICT Infrastructure available - 23 offices on WAN - Internet limited to 100 offices covered by mobile phones	- Needs capital for expansion of wide area network - Counter automation required

Source: SAPOA (2011)

As reflected in the charts below, expansion of government postal services to provide more universal coverage has been slow. Over the last five years the number of post office branches in the SADC region has only grown by 3%. The number of post office boxes has only increased by 6% over the same period (excluding South Africa, which accounts for almost 85% of the region's post office boxes, where the number has actually declined slightly over the period).

In the region as a whole, the average number of people per post office branch in 2009 was one in 63,000[10]. This is compared to the recommended UPU postal density ratio of one outlet per 10 000 people. Funding has been a major issue since most of the new outlets cover the rural and marginalised areas where the postal operators are obliged to open outlets in order to increase universal access, yet these areas are not viable in terms of business generation.

Table 8: Postal Branches, Post Office Boxes and Postal Code Addressing in SADC

Country	Number of Post Office Branches	Post Office Branches / 10 000 people	Number of PO Boxes	% PO Boxes / Capita	Postal Code Addressing Systems Status
Angola	57	0.04	28,412	0.21	None
Botswana	214	1.04	137,850	6.67	Feasibility Study
DRC	120	0.02	61,201	0.09	None
Lesotho	159	0.83	52,035	2.70	None
Madagascar	617	0.28	19,109	0.09	None
Malawi	333	0.21	60,554	0.38	Feasibility Study
Mauritius	115	0.88	2,396	0.18	Being implemented
Mozambique	126	0.05	16,934	0.07	None
Namibia	159	0.74	97,400	4.54	Feasibility Study
Seychelles	5	0.56	1,870	2.10	None
South Africa	2484	0.51	4,107,529	8.38	Present
Swaziland	91	0.66	36,400	2.66	Feasibility Study
Tanzania	569	0.13	175,912	0.41	Feasibility Study
Zambia	159	0.11	52,035	0.37	Feasibility Study
Zimbabwe	335	0.28	105,235	0.87	Feasibility Study
TOTAL/AVE	**5543**	**0.20**	**4,954,872**	**2.06**	**-**

Source: UPU 2010. (Figures in italics represent estimates to assist in comparability of data between SADC Member States).

10 This average obscures the very wide variation in densities between countries, with variance between 1:9 000 in countries such as Mauritius, and 1:450 000 in the DRC.

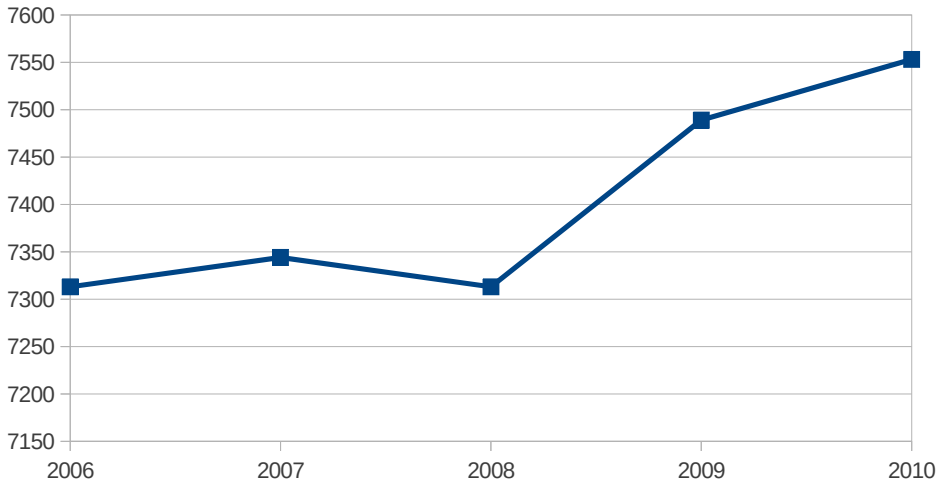

Figure 19: Number of post office branches in the SADC region
Source: UPU (2010)

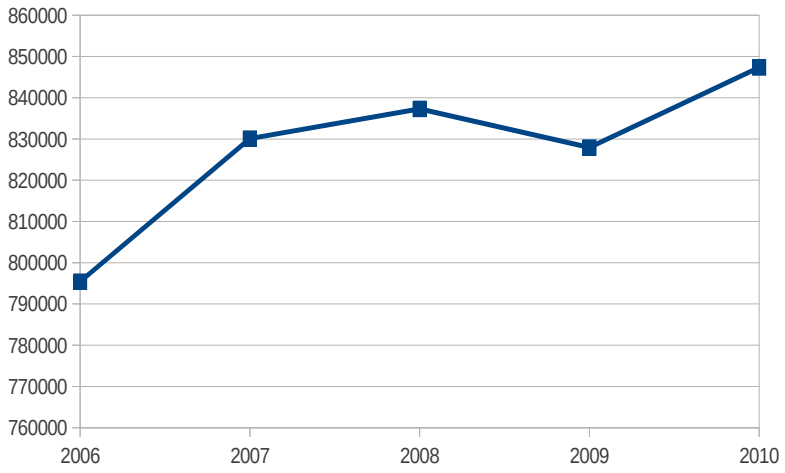

Figure 20: Number of PO boxes in the SADC region, excluding SA
Source: UPU (2010)

The ability to deliver mail is limited by the lack of postal codes and addressing systems in most Member States. Addresses are not only important for social and commercial reasons, but are also considered important for delivering health and emergency services, and providing access to basic public services such as electricity or water. In this respect there are a large number of different public and private stakeholders keen to see addressing systems in place, and people without addresses cannot easily vote or enjoy a full legal identity, nor can they easily open a bank account or qualify for credit or loans.

As shown in table 8 above, so far only South Africa has made effective use of its addressing and postal code system, although Mauritius is at an advanced stage of implementation, and Botswana, Lesotho, Malawi, Namibia, Swaziland, Tanzania, Zambia and Zimbabwe have carried out preliminary studies while further implementation awaits funding.

The postal system has also been diversifying, and the transport of physical mail is now just one of three pillars – physical, electronic and financial services. As a result post offices across the Region are now taking on responsibilities for services such as provision of public access to the Internet, e-government services and funds transfer between customers. The most common services currently

available are mobile money transfers, telephone money transfers, electronic money transfers, bill payments, banking services, and on line track and trace services.

2.1.8 Communications, e-Services and Applications

Due to the constraints to the use of the internet created by the historic lack of affordable and widespread broadband infrastructure in the region, there has so far been little need or effort made to measure the relatively small use of local e-services and other applications. It has not made sense for resource constrained governments to make the considerable effort of putting services online when only a small minority of the population have internet access. And by the same token, most NRAs and national statistical offices have not yet updated their data gathering to account for new technological developments, such as the types of e-government services available, number local web sites, or volumes of online transactions. As a result there are virtually no statistics that provide a clear indication of their diversity and uptake across the SADC region.

There are, however, some proxy indicators that can help provide some general indications of the extent of use of online services generally. These are the number of IP addresses and domain names per country, and the number of Facebook users. While each is subject to some provisos in interpretation (such as some mobile operators providing free access to Facebook, and many web sites in the region using the .com domain[11]), taken together they can be seen to follow similar national distribution patterns to wealth levels and the availability of affordable internet infrastructure.

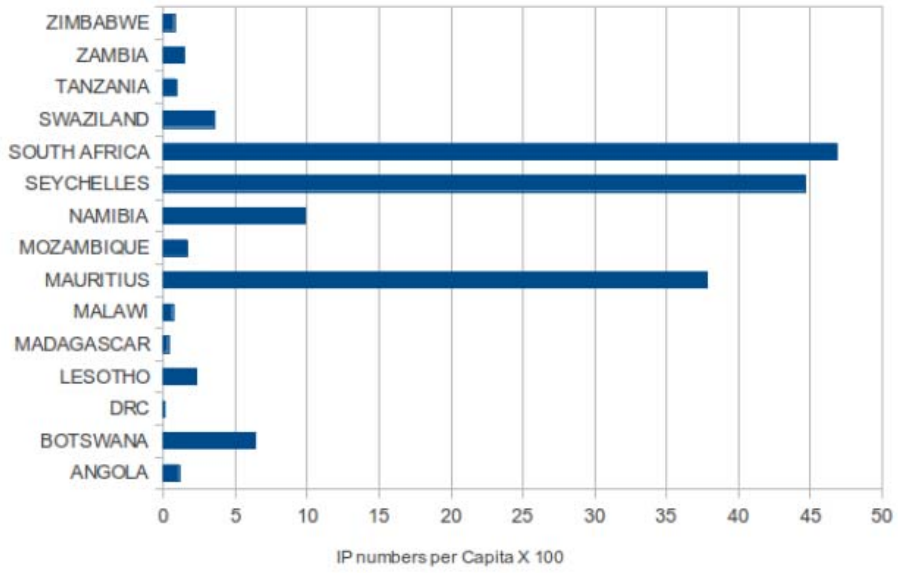

Figure 21: Internet Protocol (IP) addresses per capita in the SADC Region
Source: AfriNIC (2011)

11 In the future the dotAfrica top level domain (TLD) is proposed as a new gTLD (Generic Top Level Domain) for the promotion of African business, people and culture on the internet and will likely result in less use of the .com domain for web sites in the region.

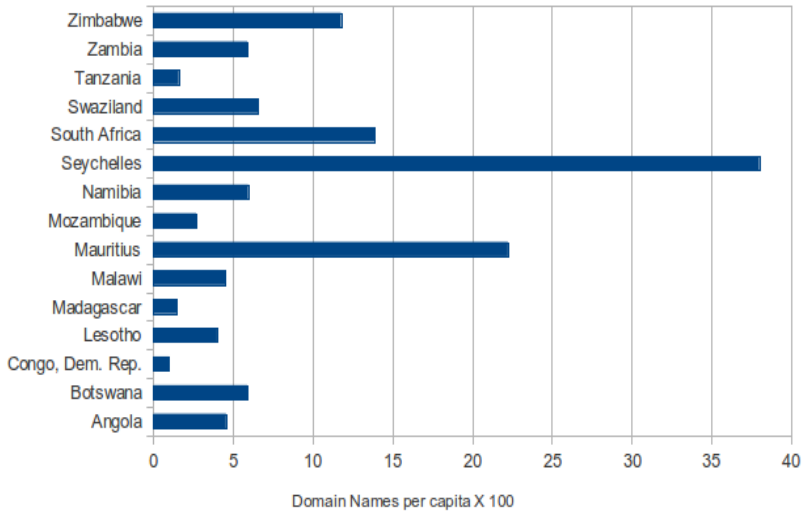

Figure 22: Number of Domain Names registered in SADC Member States
Source: Webhosting.info (2012)

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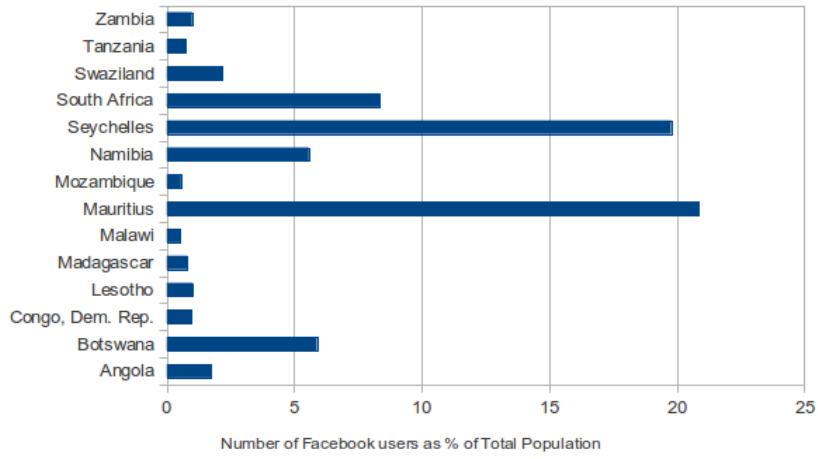


Figure 23: Facebook user penetration in SADC Member States
Source: Facebook 2011 (Statistics for Zimbabwe are not provided by Facebook)

2.1.9 ICT Costs/Tariffs

Similarly to the lack of data on wholesale capacity pricing mentioned earlier, there is a lack of up-to-date publicly available information and benchmarks on the costs of using ICTs in the region. However the ITU publishes a basic 'ICT price basket' comprising the average of fixed call costs, mobile call costs and fixed broadband costs, expressed as a percentage of Gross National Income (GNI)/capita, for most countries. Although the latest data available are for 2009, which do not include mobile broadband, and costs are expected to have dropped considerably since then in some SADC Member States, the figures do give some idea of the range of ICT costs in the region.

Table 9: ICT Price Basket for SADC Region

Country	ICT Price Basket 2009 (% of GNI)
Angola	21.45
Botswana	5.46
DRC	N/A
Lesotho	28.03
Madagascar	55.48
Malawi	52.85
Mauritius	1.67
Mozambique	56.16
Namibia	6.95
Seychelles	3.09
South Africa	4.2
Swaziland	36.15
Tanzania	53.72
Zambia	37.37
Zimbabwe	N/A
Average	**27.89**

Source: ITU (2010)

The figures above show large variations between SADC Member States, with Mauritius having the lowest costs and Mozambique having the highest (relative to income levels). The average cost across the region as a whole is some 25 times higher than costs in developed countries, which average about 1% of GNI/capita.

An easily available and more up-to-date proxy indicator of cost of communications (and the degree of competition and openness in the telecommunications market) is the charge for international VoIP calls. These prices reflect the voice termination rates that operators charge each other to handle calls from another network. Retail call tariffs are partly based on these settlement rates, which are much lower in markets that are competitive or strongly regulated. The two graphs below show that the cost of international voice connections to Member States in the region varies considerably; by a factor of 8 for fixed lines and 3 for mobiles. The average cost across the region is about 10 times higher for international calls to fixed lines in SADC Member States than it would be for calls to developed markets in Europe and North America, and about 30% higher for mobile lines[12].

12 Although the variation in costs of calling a mobile internationally vary considerably even in developed countries, where for some the rate is commonly around US$0.10c/minute, while in others such as Hong Kong it is US$0.02c/minute. For reasons unclear, a good number of developing countries also have much cheaper international incoming calls to mobiles, including China, India and Thailand which are also between US$0.2c and US$0.3c/minute

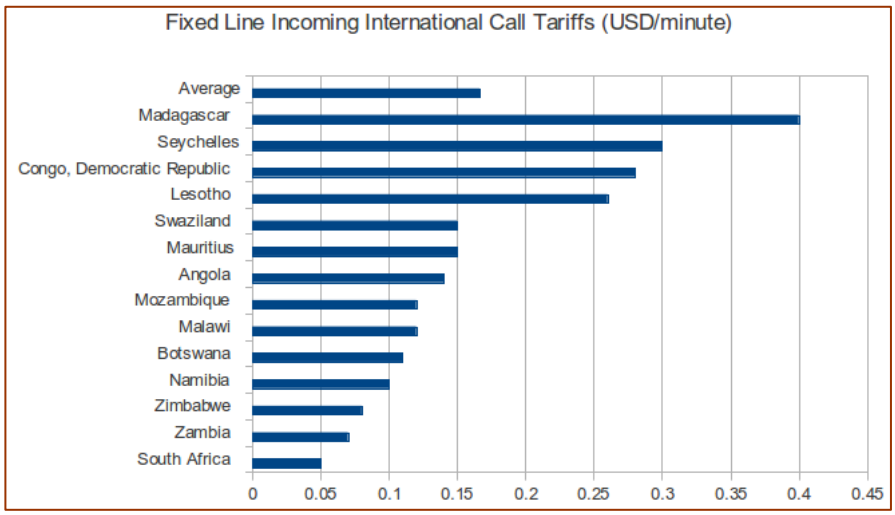


Figure 24: Fixed line international call tariffs per minute in SADC Member States
Source: GoogleVoice (2012)

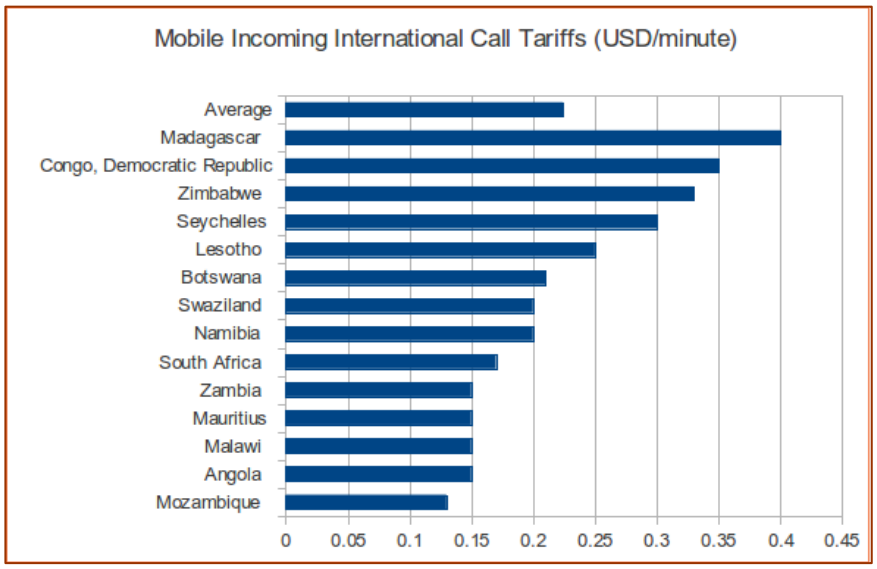


Figure 25: Mobile incoming international call tariffs per minute in SADC Member States
Source: Google Voice (2012)

While the high cost of incoming calls to the SADC region may not have a direct impact on ICT access within the Member States, it does provide a very good indication that SADC Member State markets are not efficient or competitive. In addition the high prices limit the amount of international calls made, especially for those without access to broadband. Underlining the lack of competitive pricing is the cost of outgoing international calls from the SADC region which are almost always significantly higher than calls in the other direction. And in contrast to some other economic regions, such as East African Community (EAC) where calls anywhere within the region are priced the same as a national call, calls made between SADC Member States are often much higher than they are to countries much further away in Europe or North America. For example, even though South Africa and Botswana are neighbours, directly interconnected by fibre, Telkom South Africa charges R1.52/minute to call a Botswana fixed line, and R3.20 to call a mobile, while it costs 0.70c to call any fixed or mobile number in Canada.

2.1.10 Research, Innovation, Training, Content & Industry Development

Similarly to the area of online services discussed in the previous section, there are very few available indicators of the current extent of ICT research, innovation capacity building, local content generation or ICT industry development, largely because few member states have begun to regularly publish up-to-date statistics relating to these crucial aspects of national development in the information age.

Nevertheless all SADC Member States have a range of higher education and research institutions, ranging from national universities to specialised agricultural research bodies, many of which have some form of ICT department. Most SADC Member States also have some type of Science Park, often closely associated with a university, and a technology transfer agency or initiative. A growing number of Member States also have ICT small business incubation facilities that are often closely linked to the local Science Park. Although most SADC Member States in the region have basic ICT equipment assembly and maintenance facilities (such as for desktop computers), Mauritius and South Africa are probably the only SADC Member States in the region with advanced ICT business support services and circuit-board level ICT manufacturing capabilities.

In summary, the key ICT related higher education, research institutions and business incubators of note within the region are listed below, many of which are members of the International Association of Science Parks (IASP):

- Angola: Kilamba Parque Tecnologico;
- Botswana: BOTEC, Botswana Innovation Hub;
- Madagascar: Malagasy i-Hub, Technopole du Toamasina;
- Mauritius: Ebène Cyber Tower, National Computer Board ICT Incubator Centre, Rose Belle Business Park;
- Mozambique: Mozambique ICT Institute (MICTI) and ICT incubator, Maluana Science and Technology Park;
- Namibia: Namibia Polytechnic/Business Innovation Centre (NBIC);
- South Africa: Bandwidth Barn, Cape IT Initiative (CITI), CSIR/Meraka Institute, Eastern Cape IT Initiative, Fort Hare Telkom Centre of Excellence in ICT4D, Highveld Techno Park (HTP), Midrand Innovation Hub, Pretoria Innovation Hub, North West University, Softline Technology Park (STP), SmartXchange, Technopark Stellenbosch, BlueIQ, Nemisa;
- Tanzania: Dar Teknohama Business Incubator (DBTi), Raphta City, Nelson Mandela African Institute of Science and Technology Science Park;
- Zambia: AWEP Business Incubator; and
- Zimbabwe: National University of Science & Technology Technopark.

In terms of local content generation, particularly in the area of learning resources, indigenous knowledge and cultural heritage preservation, little concerted effort has been made in the Region to publish material online. Again this is largely because of resource constraints, along with the low levels of broadband penetration up until very recently.

Nevertheless the national broadcasting agencies and the press have the largest storehouses of potential material (in a mixture of digital and analogue format) that could be made available online or for re-broadcasting. Crowd sourcing of some material from individual users is also becoming an increasingly viable opportunity as more and more people gain broadband connectivity. Digitisation of the content of national archives and national libraries of the Member States is also at a similarly low level, with the exception of the South African National Archives. There are also some private and non-profit efforts to develop electronic educational materials such as South African based MindSet.

There is considerable potential to share content and content development costs between Member States with the same national languages and similar cultural groupings. However one of the constraints to broadening the availability of relevant content is the lack of clarity regarding use of intellectual property rights in the region.

2.2 Enabling Environment and Institutional Arrangements

As indicated above, the pattern of ICT infrastructure distribution and usage in Southern Africa is largely a reflection of the policy and regulatory environment in place at the continent-wide level, regionally and within the various SADC Member States.

Institutions at the global level have had a role in supporting the development of an enabling policy and regulatory environment on the continent, as well as promoting the adoption of world standards and supporting institutional capacity building – in particular the International Telecommunication Union (ITU) and the Universal Postal Union (UPU). In addition the United Nations Educational, Scientific and Cultural Organization (UNESCO), United Nations Conference on Trade and Development (UNCTAD), United Nations Industrial Development Organization (UNIDO) and the United Nations Center for Science and Technology for Development (UNCSTD) all play various roles in supporting policy development for use of ICTs in education, services, trade, industry, and R&D. The World Trade Organization (WTO), World Intellectual Property Organization (WIPO), supports mediation in international trade and intellectual property disputes, which can involve ICTs.

2.2.1 International/Continental Level

At the continental level, the key features of the policy and institutional frameworks that apply were initially encapsulated by the African Information Society Initiative, adopted by the UNECA Conference of Ministers in 1996 as a common vision for Africa's quest to bridge the digital divide. It was subsequently endorsed by the AU's predecessor, the Organization of African Unity (OAU).

Several implementation activities have since taken place in the following areas:

- Policy awareness;
- Training and capacity building;
- National Information and Communication Infrastructure (NICI) plans;
- Development information;
- Democratising access to the Information Society;
- Sectoral applications; and
- Infrastructure development and internet connectivity.

The African Telecommunication Union (ATU) has also been active in promoting similar goals within the Telecommunication sector.

In 2008 the African Union Commission's Reference Framework on ICT policies and regulations was published, partly as a response to the broad policy goals identified by the Connect Africa Summit in 2007. The Reference Framework is a set of ICT goals, strategies, policies and regulations proposed for adoption by Member States and the Regional Economic Communities (RECs), including SADC.

In support of AISI, the Connect Africa Summit and the Reference Framework, the AUC has been developing the Programme for Infrastructure Development in Africa (PIDA), which was adopted at the Heads of State meeting in January 2012. At the project level, implementation and execution will be led by country governments and supported by the NEPAD Planning and Co-ordinating Agency

(NPCA). Implementation progress is to be monitored by the RECs, including SADC, and the RECs have a key responsibility in the PIDA framework to assure the harmonisation and implementation of policy and regulatory measures in their Member States.

The Pan African Postal Union (PAPU) is responsible for the development of the postal sector on the continent, and has been active in defining and supporting an enabling policy environment for postal operators. PAPU's current main activities in this area are the development of:

- Common standards across regions;
- Public/private partnerships;
- National addressing and postal code systems;
- Coherent, consistent regulatory frameworks and reform of the postal sector; and
- Scope of Universal Service Obligations and their harmonisation.

PAPU has also endorsed the proposal of Egypt to establish an African Regional Training Centre, which would include capacity building in some postal policy areas.

2.2.2 Regional Cooperation (policies, strategies and plans)

SADC has been promoting improved use of ICTs among Member States for 20 years, beginning in the early 1990s when it began to develop regional policies on the use of ICT for development as an instrument for regional integration and assisting Member States to achieve the Millennium Development Goals. This culminated in the 1996 Protocol on Transport, Communications and Meteorology, known as the TCM protocol.

Improved use of ICTs was further underlined at the 18th SADC summit in Mauritius in 1998, when it was agreed that the 1999 SADC Consultative Conference theme would be: "SADC in the next Millennium: The Challenges and Opportunities of Information Technology". This was underscored by the Summit declaration[13]: "The mastery of information technology (IT) and the capacity to fully utilise IT [is] a prerequisite for the SADC region to be an active participant in the global economy whereby strategic advantages are derived from timely access to information or its speedy dissemination to the market place".

In 2000, the SATCC Committee of Ministers Decision 52/2000 urged Member States to give ICTs priority for national and regional socio-economic development, and in the following year the 2001 SADC Heads of States (HOS) meeting in Blantyre decided on the following priority areas of action:

- The regulatory environment for ICT;
- Infrastructure for ICT development;
- Community participation and governance in ICT development;
- ICT in Business Development;
- Human resource capacity for ICT development.

In 2002 the SADC e-Readiness Task Force was constituted which recommended three means of directly improving e-readiness and harnessing ICT for social and economic advancement within the SADC region:

- Establishing the policy framework for action,
- Building the necessary infrastructure, and

13 http://www.info.gov.za/speeches/1998/98b24_4629811399.htm

- Undertaking ground-level projects.

As outlined in the TCM Protocol, the Committee of SADC Ministers Responsible for the Transport, Communications and Meteorology portfolios is the highest regional policy body in the ICT Sector. The Committee of ICT Ministers reports to the SADC Council of Ministers, which normally meets on an annual basis and is responsible for overall assessment of the adequacy of ICT infrastructure in meeting the economic growth and development of the region, approving amendments to the protocol and various other high-level functions.

Reporting to the Committee of Ministers, the Committee of Senior Officials meets at least twice a year and consists of the Permanent Secretaries, Director Generals and other similar officers responsible for Transport, Communications and Meteorology. Among other functions, it is responsible for reviewing policies, recommending the regional policy agenda and co-ordinating the implementation strategies developed.

The I&S Directorate has the overall responsibility for ensuring progress in infrastructure development, to: "Promote and monitor the implementation of regional protocols, policies and strategies on energy, transport and communication, tourism and water that contribute to poverty alleviation".

To facilitate project implementation, a Project Co-ordinating Unit (PCU) for infrastructure development has been set up within the I&S Directorate. The PCU has four sector experts appointed to it, including one for ICTs, and it also participates in Trans-boundary Infrastructure Project Steering Committees, NEPAD and Development Finance Institution meetings. Alongside the PCU, the SADC Project Preparation and Development Facility (PPDF) is being operationalised to complement existing project preparation facilities from other financing sources, and would be expected to include ICT expertise.

One of the responsibilities of the newly formed Cluster of Ministers Responsible for Infrastructure Development is to review the status of the development of the RIDMP. The group held its first meeting in Zimbabwe in June 2010. At the meeting the Ministers committed themselves to fast track the conclusion of Memorandums of Understanding (MoUs) for cross-border projects, strengthen Member States' national and cross-border structures to oversee the implementation of projects, and leverage support for financing of infrastructure projects from the Ministers responsible for Finance.

The Cluster of Ministers also works closely with the Ministerial Task Force on Regional Integration, and at its June meeting focussed on the SRII Phase II, Digital Television Migration, Home and Away Roaming, the RASCOM Africa-wide communications satellite and the Pan African e-Network Project[14].

In addition there is the sub-sectoral Telecommunications Committee and a Postal Services Committee comprising a) senior officials and technical experts responsible for policy development and technical co-ordination in the sub-sector, and b) consultative members representing service providers, users, regulators, labour groups and other relevant stakeholders. These committees make recommendations to the Committee of Senior Officials regarding their policy reviews. The sub-sectoral committees are responsible for ensuring compliance with international obligations and co-ordinating time frames for harmonisation.

14 A joint initiative between the Indian Government and the African Union, aiming to connect African countries to satellite and fiber-optic networks. The services currently offered under the project are telemedicine and e-learning.

The three regional institutions that are recognised by the TCM protocol and have a strong role to play in the RIDMP are the Communications Regulators Association of Southern Africa (CRASA), the Southern Africa Telecommunications Association (SATA) and the Southern African Postal Operators Association (SAPOA).

The purpose of CRASA is to facilitate the development and harmonisation of policy and regulation within the region and it has been active in the development of a number of guidelines, model policies and regulations and subject area toolkits. CRASA was formerly TRASA ('Telecommunications' was changed to 'Communications' to reflect its converged role). It represents all the national regulators, apart from Madagascar and Seychelles (Seychelles and Swaziland do not yet have separate regulators, and Madagascar is not currently an official SADC member). In addition, CRASA has seven Associate Members – operators and equipment manufacturers - Angola Telecom, Ericsson, Multi-Choice (South African digital TV broadcaster), Nokia Siemens Network, the Vodacom Group, Vodacom-Tanzania and Qualcomm (the US-based integrated circuit manufacturer).

In 2011 CRASA completed its merger with SAPRA, the Southern African Postal Regulators Association. SAPRA's membership of national postal regulators was smaller, comprising about half the SADC Member States - Lesotho, Malawi, South Africa, Tanzania, Zambia and Zimbabwe. SAPRA's remit focussed on the harmonisation of postal regulatory frameworks, the promotion of postal sector reform, the development of common service standards compatible with international ones, ensuring affordable universal postal services and improving postal security. The TCM protocol also binds Member States to provide efficient and affordable market related universal postal services. This is to be accomplished by promoting commercialisation and legal autonomy of postal administrations, restructuring of postal services and harmonised regulatory and operational policies. Improvement of postal security and co-operation with transport services is promoted to improve speed and security of mail services.

SATA was established in 1980 as the Southern Africa Telecommunications Administration, until 1999 when it came under the ambit of the TCM protocol as an association of all the government-owned, fixed line operators within the Southern African region. SATA is now open to any licensed operator in the region, though in practice, few of the private operators have joined. Since 1999 only three private operators have become members – Movicel Angola, Econet Ezi-Cel Lesotho and Teleaccess Zimbabwe. The noteworthy exceptions to SATA's membership are OCPT (the DRC incumbent), Neotel (the 2nd fixed network operator in South Africa) and Cable & Wireless Seychelles.

SATA aims to encourage technical and business co-operation between its members, assist in the implementation and monitoring of the TCM Protocol and has been co-ordinating the implementation of the SADC Regional Information Infrastructure (SRII) to interconnect its members on a bilateral basis. It has also been tasked with developing an e-Waste strategy. Within the context of the TCM Protocol, SATA's remit is to:

- Collaborate with the relevant organs within the ministries responsible for ICT to ensure effectiveness of the Protocol's provisions;
- Encourage all relevant public and private sector ICT service providers and other stakeholders to comply with the provisions of the Protocol as far as the implementation strategies are concerned;
- Maintain regional impetus for implementation and monitoring of regional ICT programmes by facilitating collective participation of members; and
- As a Sectoral Consultative Member of SADC on ICT, SATA programmes and facilitates detailed implementation of sectoral strategies, evaluates performance, surveys results and identifies strengths and weaknesses throughout the region.

On the postal side, the Southern African Postal Operators Association (SAPOA) was inaugurated in 2001 to improve the quality of postal services in the region, support the common interests of the postal operators, and promote regional standardisation and harmonisation of the postal network design and service delivery systems. SAPOA's 2009-2012 strategic plan addresses five strategic issues:

- Harmonisation of postal policies;
- Development of postal policy and regulation;
- Utilisation of ICTs to bridge the digital divide;
- Development of harmonised addressing systems; and
- A common approach to market liberalisation and Universal Service Obligation.

In addition, at the regional level the Southern Africa Broadcasting Association (SABA) is the group of broadcast industry members whose main role is to ensure quality broadcasting and high industry standards in the region. It also engages in some initiatives to improve media capacity in the region. At SABA's 18th AGM in 2011 it was decided to undertake a review that would take into consideration the economic, technological, social and political changes that have been taking place since the establishment of SABA in 1993. It also recognised the need for collaboration between CRASA and SABA in accelerating harmonisation of broadcasting policy and regulatory frameworks and broadcasting infrastructure rollout in the region. To this end the CRASA and SABA Secretariats are negotiating a MoU between the two associations in order to enhance the working relationships, especially regarding issues relating to the planned migration from analogue to digital broadcasting.

At the supra regional level, SADC is part of the COMESA-EAC-SADC Tripartite Framework of RECs that are in the process of merging. In the lead up to this long-term process, the three RECs are collaborating on regional infrastructure projects. In this respect the RIDMP is a key input to the proposed Tripartite Framework Inter-regional Infrastructure Master Plan, as well as to the African Union's continent-wide PIDA.

So the SADC regional / cross-border infrastructure would be developed not only to serve the SADC region more efficiently, but to be part of the continental infrastructure that will make inter-regional trade easier and more competitive for the benefit of the broader group of African citizens. The network effect has a positive role to play here, since increased accessibility of SADC infrastructure to the rest of the continent will in turn increase the attractiveness of investment in SADC infrastructure.

The North South Corridor (NSC) project is the flagship Tripartite project and with the recent inclusion of ICT expertise on the project team, there are increased opportunities for promoting regional co-operation in the development of ICT infrastructure here, most likely based on augmenting regional backbones with access to alternative infrastructure via 'smart corridors' as proposed by PIDA. These would involve ensuring sufficient ducts for the long term along the corridor and laying initial fibres as needed by the operators along the way to provide for their longhaul/middle-mile needs as well as to provide the corridor itself with high levels of broadband availability to support the emerging intelligent transport systems.

In the past it was envisaged that the regional fibre backbone network in SADC would be linked to the proposed COMESA Comtel Network. However this network has not been established and instead the countries in SADC's neighbouring regional economic communities (ECCAS, EAC and COMTEL) are currently interconnected with SADC Member States on an *ad-hoc* basis.

There is also the issue that most SADC Member States are also members of other RECs. Aside from the majority being members of COMESA, Angola is also a member of ECCAS and Tanzania is also a

member of EAC. As a result Angola and Tanzania form 'bridges' to ECCAS and EAC as both SADC Member States are also in the process of linking up with their other REC regional fibre-optic backbone initiatives (CAB in ECCAS and EAC-BIN in EAC).

In conclusion, the SADC region's range of institutional frameworks and initiatives provide most of the instruments required for effective implementation of the ICT Sector Plan (See Annexure 4 for further details of the ongoing programmes). However further harmonisation of ICT policies and regulations between Member States still needs to occur, along with speeding up of sector reform to reduce the cost of entry for new, often smaller players, and introducing more effective regulatory enforcement.

A binding mechanism, such as a regional law, that helps to ensure the national adoption of policies and regulations promulgated at the regional level would help in this respect. The Economic Community of West African States (ECOWAS) region in West Africa (and the European Union), has benefited from this type of mechanism to encourage rapid regional harmonisation and policy development, in which penalties can be instituted on Member States which fail to comply with ECOWAS directives. Thus the decisions of the regional telecommunication regulatory association, West African Telecommunications Regulators Assembly (WATRA), that are endorsed by ECOWAS, become mandatory for transposition to national level.

2.2.3 Dynamics at the Member State Level

At the national level, there is usually a set of national ICT strategies, policies and regulations within each country, supported by a Ministry of Telecommunication or ICTs, and a national regulatory authority (NRA) which is sometimes constituted as a general utilities regulator and occasionally supported by a competition law, and an associated competition commission or tribunal.

As shown in table 10 below, most Member States have developed a national ICT strategy. Many of these were built using the National Information and Communication Infrastructure (NICI) planning process established by the AISI in the late 1990s with support from UNECA. The countries with long-established national plans may need updating to reflect recent developments and learning from similar initiatives elsewhere in the region and in other developing countries.

Table 10: National ICT Strategies

Country	Existence of a national strategy	Implementation status
Angola	A plan known as "Strategy for the Development of Information Technology 2000-2010" has been elaborated	The Government of Angola created a National Commission for Information Technology by decree no. 6/2002 of 4 April 2002
Botswana	The Maitlamo-National Policy for ICT Development, 2007 has been established	The policy is being implemented under various initiatives such as "Connecting Communities", "Thuto- Net (School Connectivity)" and "Government on-line"
DRC	National ICT Policy exists	Needs to develop strategy
Lesotho	National ICT Policy 2008 is in place	Needs strategy development
Madagascar	Has a plan developed by Ministry of Telecoms, Posts and Communications in collaboration with UNDP	Has an action plan 2007-2012
Malawi	The process of developing a national strategy started in 2002	The ICT policy framework was finalised in May 2002. The NICI plan is being finalised
Mauritius	The National IT strategic plan of 2007/2011	124 projects cutting across various sectors such as education, tourism, health, industry, agriculture and government are being implemented with a view to making ICT the fifth pillar of the economy and transforming Mauritius into a regional ICT hub
Mozambique	Has a 2002 strategy	Needs updating as per the Open Society Initiative for Southern Africa (OSISA) report

Country	Existence of a national strategy	Implementation status
Namibia	Namibia has a 2009-2013 strategy in place	Government adopted and launched strategy in 2010
Seychelles	A National strategy on ICT has been put in place	The implementation started on many sectors linked to trade and capacity building
South Africa	ISAD 2010-2013	Strategy is in place
Swaziland	Swaziland has a NICI policy adopted by Government in 2006	An implementation plan is under development
Tanzania	The national ICT policy (2003) is in place	Needs to develop strategy as per OSISA report
Zambia	The national policy was completed in 2006	It is being implemented as evidenced by the new ICT Act of 2009, the Postal Act of 2009 and the Electronic Communication and Transactions Act
Zimbabwe	An e-Strategy 2010-2014	Strategy is in place

As referred to in the previous section, and also identified in the e-SADC strategy, the level of national implementation of SADC ICT infrastructure policies has been relatively low. As a result, the development of cross-border, backbone infrastructure and retail service provision has suffered in many Member States in the region. Aside from holding back the development of affordable e-services and content across the region, landlocked Member States are especially vulnerable to this lack of implementation and harmonisation – their need for low-cost international access is dependent on their neighbouring country policy environments and if these are not open, the landlocked country will be unable to achieve its connectivity goals affordably, even if it has, itself, implemented a progressive policy and regulatory environment.

One of the other reasons for the variation in policies and regulations between SADC Member States is that the harmonisation process is still an ongoing process in many of the Member States, which have only recently begun to implement the necessary policy changes. The legal and political processes for implementing these changes is often slower than might be expected given the priority that most of the Member States have given to promoting the use of ICTs.

It should be noted here that much reliance is placed on the national regulator for making progress in the infrastructure related elements of the above, and this can pose problems for many Member States. As HIPSSA's consolidated report notes, regulatory authorities often have insufficient human resources to effectively implement the complex regulation regimes adopted, and they often lack the financial resources and capacity to effectively monitor and enforce regulations.

2.3 Projections and Trends for 2027 - Infrastructure Requirements

2.3.1 Backbone Infrastructure

There is probably no faster growing commodity in the world than bandwidth. Exploding capacity utilisation is even more apparent in regions such as Southern Africa, where demand has been suppressed, but is now being liberated by the arrival of lower cost and more plentiful supplies of national and international capacity. As mentioned above, international bandwidth-use is currently growing at greater than exponential rates across the region.

It is too early in the process of improving the supply, or fulfilling new demand, to know how steep this curve could become, especially as access devices and applications continue to come down in cost while increasing in functionality, and penetrating more widely amongst the population. In addition there is the increasing intensity of bandwidth-use per subscriber as they become more familiar with the technology and learn how to exploit more of the range of bandwidth consuming features. Even in more mature markets such as in Europe, the traffic generated per subscriber has increased by seven times over the last five years, and now reaches 17 Gb per month per fixed line broadband subscriber

in the UK. It should be noted here that residential use requires the most capacity, of which about half is video.

Fortunately data transmission technology developments are continuing to keep pace with exploding demand and the latest low-latency 100 Gbps per wavelength technologies are now beginning to be commercially deployed. Existing DWDM capable fibre can be used, so this means that most recent fibre infrastructure deployments are future proof, and capacity can be upgraded many times as needs grow[15].

Given that civil works is by far the largest cost item for optical fibre trunking (up to 90%), the bulk of the investment will be preserved if duct planning is done correctly[16]. Future financing required to upgrade links to meet additional demand will be much smaller than the initial capex, which fortunately means that accurate forecasts of demand in 15 years time are unnecessary – once the ducting and fibre is in place, only marginal investments will be required to upgrade capacity as it is needed. Thus virtually all of the financing required for backbone infrastructure projects would be for short-term (1-2 year) time horizons to deploy the fibre links for the first time, and any further upgrade costs later on should easily be covered by the revenue generated by the link.

In relation to international data capacity requirements, by later this year (2012) when every coastal country in the SADC region will have at least one submarine landing station, and many will have two, there will be sufficient international capacity available in the region to service current and future demand. By conservative estimates, at least 20 Terabits per second of submarine cable capacity will be available to sub-Saharan Africa, with the possibility of 50-500% more in the short-term if SAex, the BRICS Cable or WASACE go ahead. Even if broadband penetration was to jump from less than 5% to over 20% of the population, the total international capacity required for all of Sub-Sahara would still be likely to be less than 15 Tbps.

Taking into account the relative population size of the SADC Region vs sub-Saharan Africa (about 270 million vs 850 million), SADC Member States should have access to about 30% of the total international capacity available, or over 6 Tbps. At an average population growth rate of 2.5% per year, the region's population would reach about 404 million by 2027. Even if no new submarine cables were laid in the next 15 years, based on current benchmarks for international capacity utilisation per capita, 6 Tbps would still be about 20% more capacity than is actually required by the region. Of course some of the capacity will be used for redundancy/restoration, but considering that even more cables are planned, and there will also be cross-continental routes to reach the many Mediterranean submarine cable backbones, this is a comfortable margin for the long term.

Now that the required submarine cable infrastructure is virtually in place, and as highlighted by the earlier discussion on ICT uptake, the main drivers for international capacity demand will be:

- National ICT market dynamics – network access costs and coverage (mainly influenced by policies on competition, access to alternative infrastructure, availability/cost of required radio spectrum, wholesale & 3/4G licence costs);
- Penetration/cost of access devices (computers, handhelds – affected by technology trends, taxes and affordable lines of consumer credit, including bundling of laptops/3G set top boxes as part of the broadband services); and
- Availability of reliable low-cost energy to power networks and access devices, especially in rural areas (affected by national energy policies, including Independent Power Producer

15 Latest technology developments indicate that 8Tbps per individual fibre will be achievable shortly.

16 Conduit or ducts of sufficient size and buried sufficiently deeply (or protected overhead) to minimise the chances for accidental breakage or vandalism.

policies (IPPs[17])).

Levels of wealth and literacy are also variables that can affect broadband uptake, but in most of Southern Africa these factors will have very little impact on broadband penetration in the short to medium term because of the other constraints outlined above that have created high levels of suppressed demand. In addition bandwidth requirements are largely independent of voice traffic, which is insignificant compared to broadband requirements and usually not even taken into consideration by European operators in their traffic models.

Based on current trends and a 2.5% population growth rate, the most likely scenario for the 2027 bandwidth requirements in Southern Africa is estimated to be an average penetration of 20% of the population with high-speed broadband and 60 Kbps per subscriber of required international capacity, and 120 Kbps per subscriber of domestic capacity. Based on this the total capacity required by the SADC Member States as a group is estimated to be about 9.7 Tbps nationally and 4.8 Tbps internationally, as shown in the table below.

Table 11: Forecast National and International Capacity Requirements by 2027

Country	National Mbps	STM-1 Equivalents		International Mpbs	STM-1 Equivalents
Angola	475,227	3,066		237,614	1,533
Botswana	73,586	475		36,793	238
DRC	2,554,996	16,484		1,277,498	8,242
Lesotho	68,580	443		34,290	222
Madagascar	781,190	5,040		390,595	2,520
Malawi	565,748	3,650		282,874	1,825
Mauritius	46,449	300		23,225	150
Mozambique	817,625	5,276		408,813	2,638
Namibia	76,514	494		38,257	247
Seychelles	3,178	21		1,589	11
South Africa	1,745,922	11,265		872,961	5,633
Swaziland	48,826	316		24,413	158
Tanzania	1,522,982	9,826		761,491	4,913
Zambia	494,566	3,191		247,283	1,596
Zimbabwe	430,541	2,778		215,271	1,389
Total	**9,705,932**	**62,619**		**4,852,966**	**31,310**

It could be said that a 20% penetration rate for broadband may seem low given the expected uptake in wireless smartphones over the coming years, but as observed by operators in North Africa and Europe, smartphone bandwidth-use is virtually insignificant compared to the high-speed broadband usage of desktops, laptops and triple/double-play devices connected to either the fixed networks, or mobile networks using wireless modems. Thus the 20% population penetration figure may be more closely equated to a 60-80% household penetration level.

17 Grid feed-in tariffs which allow small scale renewable energy users/providers to recover some of the costs of the power production facilities or even generate an income, thereby making the investment more viable.

Similarly the 60 Kbps/user of international capacity requirement may appear small, but is verified by operator field data in more advanced economies, and is explained by a) as markets mature a more significant amount of traffic is local rather than international, b) high bandwidth international traffic is cached locally (such as YouTube), and c) 60 Kbps is the multiplexed capacity permanently allocated per subscriber, and since the user is not online 24hrs a day, this is the user's actual utilisation averaged over an entire day.

It should be noted here that aside from voice requirements being so much smaller than for broadband, voice traffic puts even less pressure on trans-border or regional infrastructure requirements when compared to internet needs. In a developing country with a relatively small local web content-base, 80-90% of internet traffic is to sites outside the country, while voice traffic is predominantly domestic. In SADC this is corroborated at the international level with projections for international voice traffic being less than 10% of total international capacity required.

Fortunately the speed of fibre optic cables is still increasing rapidly – 30 Tbps is now possible per fibre pare – so cables will have far more capacity than the requirements currently forecast.

International links are among the most costly elements of the ICT ecosystem, and a major determinant of end-user tariffs. Although the arrival of cheaper international capacity on the Southern African coast may not have seen immediate reductions in broadband subscription fees, capacity delivered to the end-user has increased substantially and is expected to continue as the level of competition in the markets intensifies. This will depend a great deal on the extent of coverage and competition in the national backbone markets. For landlocked SADC Member States this is crucial as they depend on the enabling environment being present in their own country as well as that of their neighbours.

2.3.2 Postal Sector

In the case of the postal sector, where it is concerned with the movement of tangible items and people passing through branch offices, ramping up supply or meeting increased demand is an inherently resource-intensive process. This means that more careful planning and steady organic growth would likely need to take place to sustainably meet the needs of the public. However in the area of electronic and financial services, these could show rapid growth trends if the barriers to their use are addressed and the sector moves quickly to take advantage of the revolution in mobile/cell phone based payment systems.

The experience internationally is that markets for traditional mail services are declining, and letter post volumes are already dropping in the region as more people come online. Even in 2007, the region recorded an average decline of 5% in mail volumes (approximately 50% of the total revenue of the postal operators in the region was derived from normal letter post). While letter post is likely to continue this trend, if efficient payment systems and financial services are combined with the emergence of vibrant e-commerce and affordable internet services, there could be major growth in demand for postal services. Globally the growth in parcel business is attributed to the development of e-commerce and the associated transactional mail and advertising mail. Another observation during the recent financial crisis was that the postal financial services showed growth in the number of new accounts being opened and an increase in deposits. These trends are likely to become noticeable in the SADC region as well.

Affordable and pervasive national connectivity and cross border connectivity will also be crucial to support the need for expansion of the postal system into rural areas, and to diversify into electronic and financial services. Considering that postal branches may be in remote areas without direct access to terrestrial links, the postal system in many Member States will require access to satellite links to

ensure comprehensive coverage, at least in the short to medium term.

While progress needs to be made in institutional strengthening before increased volumes of physical post become apparent, increases in postal mail to be moved could also be constrained by the quality of the transport infrastructure, but will be unlikely to require the transport sector to increase infrastructure on the strength of mail volumes. For mail to be carried by air, this could have an effect on the number of flights, as seen with multi-national courier operators who have their own aeroplanes. This would, however, be a commercial consideration and would be very unlikely to affect the airport infrastructure requirements at regional level.

To reach the UPU recommended postal branch density of 1 per 10 000 people, the number of branches in the region would need to expand very substantially – from the current levels of about 5 500 to over 40 000. The Member State breakdown of branch requirements per country is shown in the table below (based on average population growth rates in the region of 2.5% until 2027).

Table 12: Postal Branches required to reach UPU recommendations of 1:10 000 people in 2027

Country	Postal Branches Required	Current Number of Postal Branches
Angola	1,980	57
Botswana	307	214
DRC	10,646	120
Lesotho	286	159
Madagascar	3,255	617
Malawi	2,357	333
Mauritius	194	115
Mozambique	3,407	126
Namibia	319	159
Seychelles	13	5
South Africa	7,275	2484
Swaziland	203	91
Tanzania	6,346	569
Zambia	2,061	159
Zimbabwe	1,794	335
Total	**40,441**	**5543**

2.3.3 Additional ICT Infrastructure Requirements

Aside from affordable, reliable and pervasive backbone and postal networks, a variety of other infrastructure elements will be needed in order to see the Digital SADC 2027 vision fulfilled. These are:

- A progress monitoring system being used to measure achievement of goals;
- Up to date National ICT Strategies defining the role of ICTs in the development priorities of the individual Member States;
- National and regional satellite links connecting remote areas too far from terrestrial infrastructure;
- Internet traffic exchange points in every major city keeping traffic local, supported by data-centres in strategic locations providing cloud services;

- Regional exchange points keeping traffic within the region and attracting international operators to build out their infrastructure to these points;
- Effective national Computer Emergency Response Teams (CERTs) in each country and a SADC Region CERT quickly responding to network threats;
- Awareness of applications for ICTs in solving social and economic problems – at a personal level and institutionally, supported by small business incubation and R&D facilities;
- A sufficiently large pool of technical skills in the region developing, implementing and maintaining ICT infrastructure without requiring human resources from outside the region, supported by Centres of Excellence (CoEs);
- Local ICT manufacturing capacity producing low cost access devices and other ICT equipment;
- Regional and national government administrations with online systems across all departments for interacting with the public and business, creating transparency, public data availability and efficient government service delivery; and
- Regional repositories and content generation hubs for digital media, recording cultural and natural heritage, indigenous knowledge and other learning materials that can be accessed via broadcasting or online.

2.4 Assessment of Gap between Current Situation and 2027 Requirements

Grouping the issues around the key elements of the Digital SADC 2027 framework, the key gaps in the different areas are outlined below.

2.4.1 Infrastructure

Submarine Fibre Cable

The capacity available on the submarine cables that will be operational in the region by next year is more than sufficient for SADC's medium-term international capacity requirements, and thus the main issue will be one of cost – how quickly prices for capacity will come down where there is competition between cables. If the incumbent or mobile operators are the only shareholders in the cable, in the absence of tariff regulation, or alternative routes through neighbouring countries, they will be unlikely to share their low prices with other competing local operators and prices can remain high for all but the incumbent's clients, especially if it competes in both the wholesale and retail markets. This is most likely with SAT-3, EASSy, WACS and ACE which are operated as consortia of mainly incumbent and mobile operators, although with EASSy as the WIOCC open access vehicle and WACS (and probably the BRICS cable) having the South African state owned Broadband Infraco as an investor, these could provide pricing that is more cost-based.

In this respect the gaps are mainly in the policy and regulatory environment to ensure a cost-based pricing environment is in place to access capacity provided by the submarine landing stations. This can be achieved either by ensuring there is sufficient competition in the sector, through tariff regulation, or by instituting open access ownership of the landing station via government or Public Private Partnership (PPP) vehicles, such as already instituted in Angola with ACE, and South Africa with BB Infraco's share in WACS.

In addition Seychelles requires a second submarine cable link to ensure reliability of service in the event of a cable cut on its existing SEAS cable. This could also provide lower international capacity prices on some routes if landing at a well connected hub.

Terrestrial Fibre Cable Infrastructure

Virtually all the required terrestrial infrastructure in the region is in place, and only a few cross border links are missing, as shown in table 13 below. However the main problem is that most of the

infrastructure that is available is not equally available to all operators. This is because efforts to address required fibre infrastructure in Southern Africa (and elsewhere on the continent) have approached the need for "missing links" by facilitating the interconnection of the national infrastructure of incumbent operators. This approach has helped to minimise external funding requirements (as the costs are usually met by the operators themselves), but has led to network development that discriminates against new market entrants because it is not based on "open access" or strong interconnection regulation, leading to high prices for access. As a result, landlocked SADC Member States still pay more to get to the coast or to the rest of Africa than they do to get from the coast to Europe, the US or Asia, and national backbones need considerable extension to cover more population, as well as more affordable pricing.

The lack of competitively priced links is also partly because complementary infrastructure is not yet exploited to the fullest extent possible. Because civil works is the main cost of deploying new green field fibre, up to 90% cost-savings can be achieved by using the existing cabling, ducts and rights of way of utility networks (energy, transport, water and sanitary). Currently the awareness of the extent of these cost benefits is low, and the licensing regime may not yet authorise third party usage, or the infrastructure may already be locked up in long-term lease arrangements with the incumbent operators. And where such infrastructure is available, prices charged by the alternative infrastructure operators are usually unrealistically high, because there is little tariff regulation currently taking place in the region.

Infrastructure sharing and land-use planning rules have also not yet been widely adopted to enforce the deployment of fibres, ducts or conduit on new telecom, transport or energy infrastructure. This is being seen as critically important because government already owns the rights of way on the most important routes (national roads and border posts, regional long distance high-tension pylon networks, cross-border rail and fuel pipelines etc) and can easily facilitate access to these, especially the rights of way, for the laying of new fibre.

Often these government assets are the only cost-effective routes, to which state-owned incumbent operators naturally have better access than other operators. A number of competing private initiatives have found this to their detriment when trying to deploy their own fibre over tracts of private land. The time involved and high cost of purchasing individual rights of way from hundreds of different private land-owners can make some routes economically unjustifiable and have held back some of these projects in the region.

In addition limited levels of government and private civil works co-ordination mean that fibre infrastructure may be unreliable because of frequent accidental cuts by utilities providers or other telecom operators deploying or maintaining their own cable. Low penalties for theft or vandalism of this strategic asset also contribute to reduced reliability and increased cost of the available infrastructure.

Fibre optic cables have a 20 to 25 year lifespan, but as most of the high capacity submarine and terrestrial cables have been laid in the last five years, the bulk of the infrastructure will still be operational in 2027. Furthermore, for terrestrial infrastructure (and landing stations) most of the cost is in the civil works for securing the rights of way and installing the ducts, which will likely last much longer than 20 years, so replacing old fibre cables is much cheaper than laying new routes. Nevertheless some of the early deployments of fibre optic cables in the region, mainly links between South Africa and its neighbours, may need to be replaced before 2027. However, it is also likely that additional fibre will be laid along most of these routes by competing regional providers, making replacement unnecessary in many cases, and with the much lower costs of simply replacing the fibres, this cost should be met out of the ongoing revenues generated from the route.

Table 13: Cross Border Interconnection Status and Needs

Inter Country Fibre Link	Cities Linked	Road Distance between Cities	X-border Fibre Link Operators	Primary or Secondary Link Options	Link Status
Angola-DRC	Luanda-Kinshasa	545	1/1: Angola Cables/OCPT	DRC side still needed to link to Angola border. Kinshasa - Matadi survey completed. Benguela rail option, 400Kv power transmission option 2016, Lobito-Benguela Rail Corridor	Implementation status to be confirmed by SATA
Angola-Namibia	Luanda-Windhoek	1,572	1/1: Angola Cables/ Namibia Telecom	Secondary Link – terrestrial route not identified, could use submarine route or NA/AO power transmission option 2016 (Baynes Project)	1 Operational
Angola-Zambia	Luanda-Lusaka	1,773	1/1:Angola Cables/Zamtel	Planned as SRII, Zambia side still required (Lusaka - Mwinilunga)	Status TBC by SATA.
Botswana-Namibia	Gabarone-Windhoek	928	1/1: BTC/Telecom Namibia	Secondary Link not identified, via Kasane or later – ZIZABONA power transmission option 2014, or Trans Kalahari rail link.	1 Operational
Botswana-South Africa	Gabarone-Johannesburg	275	1/2: BTC/Telkom, Neotel	Liquid/CEC planning this route from Zimbabwe.	2 SA networks (Telkom & BB infraco) link to 1 network in Botswana (BTC), Telkom/BTC also have 2 physically independent links.
Botswana-Zambia	Gabarone-Lusaka	1,060	1/1: BTC/Zamtel	Secondary Link not identified. ZIZABONA power transmission option 2014, Kazangula Bridge option, timing TBD	1 Operational
Botswana-Zimbabwe	Gabarone-Harare	925	1/1: BTC/Powertel	Liquid/CEC are planning this route to South Africa. ZIZABONA power transmission option 2014	1 Operational
DRC-Tanzania	Kinshasa-Dar es Salaam	2,671	OCPT/NICTBB	DRC side from border to Lubumbashi required. North South Corridor option	Status TBC by SATA.
DRC-Zambia	Kinshasa-Lusaka	1,867	2/2: SNEL-OCPT / CEC, Zamtel	Lusaka-Lumbumbashi being implemented, SAPP power transmission fibre commissioned Lumbumbashi to Kinshasa, plus Solwezi to Kolwezi increase to 500MW planned. North South Corridor option (Kasumbalesa)	1 Operational by end 2012
Lesotho-South Africa	Maseru-Johannesburg	348	1/1: LTC / Telkom	Secondary link: Neotel/BB Infraco/DFA options, planned Lesotho-South Africa rail link timing TBD	Telkom/LTC operate 2 physically independent links, 1 needs upgrade
Malawi-Mozambique	Blantyre-Maputo	1,155	1/1: MTL/TDM	Secondary link – MZ-MW connector power transmission option 2016, Nacala Corridor	1 Operational
Malawi-Tanzania	Blantyre-Dar es Salaam	1,096	1/1: MTL/NICTBB	Secondary link not identified	1 Operational
Malawi-Zambia	Lilongwe-Lusaka	620	1/1: Zamtel/MTL	Secondary link not identified/may not be needed for some time. Nacaa Corridor option.	Fibre link status TBC by SATA
Mozambique-South Africa	Maputo-Johannesburg	450	2/1: Telkom SA, BB Infraco/TDM	Secondary Link: SAPP, and SA options: DFA, MZ options: Motraco	2 SA networks (Telkom, BB Infraco) link to 1 network in Mozambique (TDM).
Mozambique-Swaziland	Maputo-Mbabane	150	1/1:SPTC / TDM	Secondary link not identified, Motraco option	1 link said to be operational but not used
Mozambique-Tanzania	Maputo-Dar es Salaam	2,244	NITCBB	NICTBB is at border.	Status TBC by SATA
Mozambique-Zambia	Maputo-Lusaka	1,254		TDM/Zamtel, Liquid	Status TBC by SATA
Mozambique-Zimbabwe	Maputo-Harare	915	3/1: Liquid Tel1 Utande, Powertel /TDM	2nd Interconnector power transmission option for secondary link 2017. Beira -Masasa Phase II gas pipeline, no timeframe. North South Corridor option (Nyamapanda)	3 Zimbabwe networks link to 1 network in Mozambique
Namibia-South Africa	Windhoek-Johannesburg	1,181	3/1: Telecom Namibia – Neotel/Telkom X2, BB Infraco	Also Cape Town-Windhoek, and Kudu - Cape gas pipeline, no timeframe.	2 SA networks (Telkom, BB Infraco) link to 1 network in Namibia (Telecom Namibia),, Also Telkom SA/TN have two separate links
Namibia-Zambia	Windhoek-Lusaka	1,419	1/1: Telecom-Namibia/ Zamtel	Secondary Link not identified	1 Operational
Namibia-Zimbabwe	Windhoek-Harare	1,548	Via Botswana	May not be needed	n/a
South Africa-Swaziland	Johannesburg-Mbabane	309	1/1: SPTC/ Telkom SA	Secondary link: MTN-SA, BB Infraco, DFA options	1 Operational
South Africa-Zimbabwe	Johannesburg-Harare	980	3/3: TelOne, Liquid, Powertel /DFA BBInfraco Telkom	2nd Interconnector power transmission option for secondary link 2017	3 Operational
Tanzania-Zambia	Dar es Salaam-Lusaka	1,534	1/1: Zamtel/NICTBB	Secondary: Zambia-Tanzania-Kenya (ZTK) Power Inter-connection option 2016. North South corridor option (Nakonde/Tunduma), TAZARA rehabilitation	1 Operational
Zambia-Zimbabwe	Lusaka-Harare	408	2/2: Zamtel, CEC/TelOne, Liquid	ZIZABONA power transmission option 2014, extension of TAZARA (Lions Den – Kafue link (Zimbabwe – Zambia).	2 Operational
Total Kms		**27,227**			
Total Fibre Cost USD	**@25KUSD/Km**	**680,675,000**		**Not yet implemented**	**2 or more separate routes**
Inter-Regional Cross-border Fibre					
Inter Country Fibre Link	**Cities Linked**	**Road Distance between Cities**	**X-border Fibre Link Operators**	**Primary or Secondary Link Options**	**Link Status**
Angola-ROC	Luanda-Brazzaville	550	1/1: Angola Cables	Festoon System	TBC by Angola
DRC-Burundi/Rwanda	Kinshasa-Kigali/Bujumbura	1662/1563	1/1: OCPT/Rwandatel	Second spur of the DRC's national backbone (the first spur from Kinshasa to Lubumbashi is already being commissioned). Would likely run along the Congo River for much of its length, and reach Rwanda as well as Burundi. Project could also include the SADC southern route spurs to Luanda/Angola and Lusaka/ Zambia from Lubumbashi. Main DRC backbone to Burundi: up to 2100km, DRC-Angola/DRC-Zambia Spurs: 450km	TBC by DRC
DRC-CAR	Kinshasa-Bangui	1,031	1/1: OCPT/Orange	Awaits DRC national backbone	TBC by DRC
DRC-ROC	Kinshasha-Brazzaville	13		Kinshasa-Brazzaville Bridge – Road/Rail option	
Tanzania-Kenya	Dar es Salaam-Nairobi	671	1/1:NICTBB/NOFBI	Three links envisaged - KDN, Orange	1 Operational
Tanzania-Rwanda	Dar es Salaam-Kigali	1,153	1/1: NICTBB/Rwandatel	Secondary Link not identified	1 Operational by end 2012
Tanzania-Uganda	Dar es Salaam-Kampala	674	1/1: NICTBB/UTL	Secondary Link not identified	1 Operational by end 2012
				Not yet implemented	

In summary, while it can be misleading to generalise from the wide range of conditions across the SADC region, the terrestrial infrastructure gaps and constraints which have been identified are:

- Existing fibre optic infrastructure that is not equally accessible to all operators. Constraints include: the limited extent of competitive cross-border and national routes (market dominance from incumbent operators in many countries, and even formal monopolies still persist in some SADC Member States), limited number of fibre pairs for use by different operators, old fibre which may be unsuitable for modern protocols like Dense Wave Division Multiplexing (DWDM) or with many repaired cuts leading to signal attenuation;
- Some missing links between SADC Member States (especially backup links), and also between the SADC region and its neighbours;
- Many cross-border routes with only one link, with resulting lack of redundancy and competitive pricing;
- High charges for use of the existing fibre on utility networks (transport/energy);
- Limited broadcast TV and radio signal coverage;
- Lack of national and regional traffic exchange points (IXPs) resulting in domestic traffic between local operators that travels outside the country, and intra-regional traffic that is exchanged in Europe, North America or Asia, increasing the cost of capacity, limiting options for competitive local service provision and reducing network performance;
- Lack of an integrated approach to planning, implementation and delivery of infrastructure, leading to waste of resources through lack of low cost access to ducts on roads, rail lines, electricity grids etc. These need to be a planning requirement on all public infrastructure, including commercial buildings;
- No plan for sharing a satellite service to lower the cost of provisioning government services in isolated areas across the region; and
- Lack of up-to-date and publicly available regional ICT infrastructure coverage, usage and pricing information.

2.4.2 Confidence and Security in Networks and Services

As ICT infrastructure becomes more pervasive and affordable, government, business and the public become increasingly dependent on the smooth functioning of the networks and services provided. In addition, as more end-user devices become connected to high-speed networks and more applications are used, more vulnerabilities may be exposed for exploitation. As a result special measures are needed to ensure networks and services are as secure and reliable as possible, and do not pose undue threats to their users or limit use through lack of confidence, presence of potential threats or service interruptions.

One of the chief gaps in this respect is that currently there are no national or regional standards, guidelines or regulations for cable laying (mandatory trench depth, cable ring topologies etc) that help to ensure that networks are not vulnerable to accidental or intentional cuts. In addition there are no special measures to address theft, vandalism and accidental damage of these vital national resources. Without these standards or legal penalties for vandalism, theft or lack of due care, service interruptions are likely to regularly leave large sections of the population cut off for indeterminate amounts of time (repairing fibre cables may take days if not weeks).

As an additional safeguard for cables, regulations can be used to make it mandatory to provide reciprocal access to each other's infrastructure so that the impact of any cable downtime is minimised.

As the number of devices connected to the internet in the region grows, cyber-security threats are likely to increase, both nationally and from across borders. While the development of cyber-crime

legislation is now relatively well advanced in most of the region, so far only a minority of Member States have established Computer Emergency Response Teams (CERTs) to be able to respond to network security threats.

A vital consideration is the number exhaustion in the current version of the Internet Protocol (IPv4). The number of devices connected to the internet cannot continue to grow without moving to the next version of the protocol – IPv6 – which has virtually unlimited address space (every device connected to the internet needs its own unique IP number). Awareness of this problem, the resources to upgrade outdated equipment and the technical skills in the region to effect the changes are low, and as a result the level of transition to IPv6 that has already taken place is small, and the region is currently running the risk of falling further behind in the transition process.

2.4.3 E-Services & Applications and Capacity Building & Content

The key ICT gaps that need to be addressed under the twin pillars of a) Capacity building & Content, and b) e-Services and Applications, are:

- Lack of availability of local or regional ICT applications and content, including government data and in local languages;
- Limited collaboration and cost sharing between Member State governments in e-applications and content development;
- Limited public resources for switching from manual to automated systems;
- Limited awareness of the public in use of e-services in government;
- Few fiscal incentives for businesses to invest in automation and in ICT training;
- Low levels of public and private investment in digital content aggregation on local and indigenous knowledge – lack of capacity in regional content development hubs;
- Lack of access to public data held by governments and lack institutional systems for storing, managing and making public data available;
- Lack of government investment in ICT e-governance applications development;
- No national and regionally standardised ICT training certification;
- Limited pool of ICT skills and training facilities;
- Lack of technical capacity in national regulators and CERTs;
- Limited amounts of early start-up funding for new ICT businesses; and
- Few and costly local web hosting and data centre facilities.

2.4.4 Research, Innovation and Industry Development

The ICT gaps that need to be addressed in order to improve support for the pillar of Research, Innovation and Industry Development are:

- Limited collaboration at national and regional levels between research institutions;
- Few specialised ICT research institutions and generally low levels of ICT research capabilities/research outputs and higher degrees in ICTs;
- Limited high speed connectivity within and between research institutions and other centres of excellence;
- Low levels of ICT manufacturing capacity and few fiscal incentives for developing manufacturing capabilities;
- High cost of access devices and software – limited soft funding sources and low economies of scale in purchasing;
- Lack of ICT incubator facilities, funds for their development and incentives for supporting them;

- Lack of national and regional standards and plans for dealing with e-waste, and/or regulations that have put e-waste in the same group as other hazardous non electronics waste, or the mandate provided to the Local Authorities to manage the e-waste without proper technical expertise or guidance; and
- Lack of awareness of ICT's role in reducing carbon footprints.

2.4.5 Enabling Policy and Regulatory Environment

The most important challenge for national policy and regulatory development is to ensure it keeps up to date with the fast changing market and technology environment in the ICT sector. The Global Symposium of Regulators (GSR) meeting in Dakar in November 2010 provided a succinct summary of the main issues here: "the GSR 2010 noted the growing complexity of the ICT market environment and need to rethink the different degrees of regulation to anchor national broadband strategies and regulatory frameworks around the multi-facetted concept of open access to and over networks, which provides for achieving effective competition while ensuring accessible, affordable and reliable services for consumers."

Part of the problem is that the extent of market liberalisation required is often not fully appreciated. The degree of competition in the mobile sector can easily lead policy makers to believe that the overall ICT market is more competitive/open than it really is. In addition, expectations of pricing levels for national and international wholesale capacity are much higher than they need be, which further reinforces the perception that existing policies are sufficient, or that they are effectively enforced.

Also, regulators often have low levels of institutional capacity to evaluate market developments, devise appropriate policies and enforce regulations. Well-financed operators have far more resources and can easily tie up under-resourced regulators in court. Regulators also often do not have support from Competition Law or anti-Competition institutions, as many SADC Member States have not yet established these legislative instruments.

The consolidated HIPSSA report identified a variety of implementation challenges which militate against the Member States achieving optimal policy and regulatory goals. These challenges relate to the:

- Reluctance by governments to relinquish their shareholdings in the incumbent fixed network operators and allow private participation;
- Slow pace of implementing policies and regulations to support the deployment of services;
- Lack of human resources, due to movement of human capital from government institutions and Regulatory Authorities to the private sector where there are more attractive incentives and remuneration;
- Absence of well-defined timetable and conditions for the transition from a monopoly in the fixed line market to a fully liberalised market including information about conditions for awarding of licences; and
- Conflict of interest from governments with shares in incumbent operators.

As far back as the 2001 SADC HOS Summit in Blantyre it was noted that "the capacity limitations in the region, in particular the shortage of skilled ICT personnel, and the high cost of development of ICT infrastructure, creates slow progress in the deregulation of the telecommunications sectors leading to monopolies, un-affordability of universal access due to high tariffs and internet charges, lack of economic commerce readiness, and reluctance of acceptance for ICT culture and innovations."

The HIPSSA report observes that a considerable number of the Member States are not signatories to the WTO Agreement on Basic Telecommunications commonly known as the Reference Paper, and says: "It would be ideal for the SADC as a regional body to ensure that its Member States become signatories to the reference paper as this would give investors more confidence and the regulatory regime more credibility in that it is an indicator that Member States agree to abide by international commitments."

In addition there is still a low level of awareness of the importance of non-discriminatory access to transport and energy networks in speeding up and massively reducing the cost of deployment. Also, constraints to market entry have combined with the lack of enabling policies for the use of transport and energy infrastructure for telecommunication fibre to further slow network extension.

Rapid wireless technology developments have made it difficult for regulators to keep up to date spectrum-management plans. Change here is also resisted by the vested interests of operators who have already spent large amounts to secure rights to spectrum, while some operators have found the fees required for them to obtain the 3G spectrum prohibitively expensive.

At the same time, there is lack of clarity among the policy makers and regulators regarding procedures for awarding 3G/4G licences. The regulators also sometimes have to wait for a long period of time for the ministries of information and communication technology to approve spectrum for 3G/4G networks. Fortunately the current priority to update radio spectrum management plans for 4G and digital broadcasting migration is helping to drive efforts toward improved radio frequency management and has also highlighted the need for passive infrastructure sharing - of masts and of base-stations. This will encourage further policy development for access to passive infrastructure and help to ensure rapid development of cost-based infrastructure.

Many national policy makers and regulatory authorities also require support for more effective policy and regulation in some other key areas:

- Support for introduction of open access backbones and competitive markets at all levels in the value chain;
- Control of dominant operators through Significant Market Power (SMP) determinations, wholesale tariff controls, separation of wholesale from retail operations, and support from general competition legislation;
- Requiring all new alternative infrastructure and large buildings to include appropriate fibre or ducts for telecommunication purposes;
- Ensuring reasonable access to existing alternative/complementary infrastructure (transport & energy), and associated Rights of Way;
- Adopting detailed planning guidelines for identifying and implementing new regional and cross-border links; and
- Gathering and publishing of up-to-date ICT market and infrastructure data, especially to address the lack of postal information at the national and regional levels.

2.4.6 Postal-Specific Gaps

Aside from the need to the address the challenges of market liberalisation and expand the branch office networks of the postal operators, the major gap currently observed in the region is the lack of addressing systems. In some SADC Member States there are also serious shortcomings in the services offered by the operators as regards the main quality indicators, for example, on time delivery, reliability and security. In addition, separation of posts from telecommunications still needs to take place in Swaziland and the DRC.

The following issues have been noted as being critical for the development of the SADC Postal Sector:

- Legislative and regulatory reforms to promote postal development;
- Harmonisation of postal policy and regulatory framework;
- Redefinition of postal market structures; and
- Resourcing of regulatory authorities both with human and financial resources to deal with Sector specific regulatory issues.

Other important gaps that need to be addressed in some postal operators are:

- Lack of connectivity at all branch offices, including remote locations via satellite;
- Limited use of ICTs and automation within the national postal systems;
- Lack of harmonisation in security standards between the national postal systems;
- Lack of expertise and skilled human resources for postal operators; and
- Lack of a QoS measurement system.

2.4.7 Cross-cutting Gaps

While most of the required policies and regulations have already been developed at the regional level, it has already been observed above that one of the overarching reasons for the slow pace of policy adoption in some areas is that the protocol and treaty establishing SADC does not include mechanisms for the legal enforcement of the decisions of the Committee of Ministers. This is in contrast, for example, to the binding nature of ECOWAS decisions on their Member States. Similarly, most of the guidelines published by CRASA simply provide national regulators with a suggested course of action to be followed.

Other general constraints on ICT sector development that have been noted include:

- Lack of committed long-term support from the top executive level contributing to delays in implementing and enforcing the required directives;
- Given the vital importance of adequate power supply for using the internet, in the countries that do not have this, there is a lack of Independent Power Producer (IPP) policies which allow those who have established their own energy producing facilities to sell excess capacity back to the grid (grid feed-in tariffs);
- Lack of consensus on the gathering of ICT market data on which to base strategic decisions - lack of clarity on what to measure and limited co-ordination at the national level of the various ICT statistics gathering activities of the different institutions - regulators, National Statistics Offices (NSOs), Departments of Trade etc.; and
- The overlapping membership of SADC Member States with other regional organisations with their own set of policy and regulatory guidelines has created some difficulties and delays for policy harmonisation.

In the area of project financing, the main gaps that have been noted are:

- Lack of development funding for ICT project preparation and investment - in contrast to the extent of development funds available for transport, water and energy projects;
- Cumbersome and bureaucratic processes for investment approvals;
- Lack of financial resources due to competing social obligations on the part of Member State governments;
- Lack of funding for project preparation and investment;
- Poor alignment between regional and national projects;

- Lack of pipeline of bankable projects to be seriously considered by investors;
- Slow pace of development of MoUs for Cross-border Projects;
- Varying enabling environments for investment between Member States; and
- Shifting of public sector financing to other pressing socio-economic priorities.

3. Strategic Framework

3.1 Strategy for Addressing Gaps and Expected Results by 2027

3.1.1 Significance of Sector and Priority Goals

Information and communication technologies have become the lifeblood of the knowledge economy, and affordable access to ICTs is a human right as well as a significant contributor to economic growth and social well-being. The potential impact of ICTs cuts across virtually all other social and economic sectors, and is a key enabler for meeting the region's strategic goals. Supporting improved availability and use of ICTs will have a number of key benefits for the region, in particular:

- Well-informed rapid decision-making – efficient, transparent governance, globally competitive industries and knowledgeable public;
- Lifelong learning – instant access to knowledge and better jobs;
- Social and cultural inclusion – the end of isolation and discrimination;
- More wealth and livelihood creation options and employment opportunities;
- Efficient cross-border travel and seamless markets for goods and services;
- Increased agricultural production and more efficient produce markets;
- Accessible government, commercial and financial services, cultural heritage and indigenous knowledge; and
- A healthier, happier population.

3.1.2 Policy and Regulatory Framework

Based on the identification of policy and regulatory gaps outlined in section 2.4 above, a stable and uniform national and regional Policy and Regulatory Framework to support the pillars of the Digital SADC 2027 framework would entail:

1. Regulations which reduce the dominance or significant market power (SMP) of incumbents, such as provisions for mandatory access to essential facilities, infrastructure sharing & co-location rules, and tariff setting;
2. Increased numbers of communication service licences issued to encourage competitive pressure on prices for access to ICT infrastructure;
3. Low licence fees and rapid licensing procedures;
4. Converged technology neutral licensing regimes that promote use of VoIP and IP TV;
5. National VoIP numbering plans and availability Direct Inward Dialling (DIDs);
6. Passive and alternative infrastructure provision and sharing – ducts, masts, energy grid and rail links etc;
7. Reduced sales and import taxation on communications services and equipment, especially the high levels of sales or value added taxes in some Member States on communication services for the end-user;
8. Improved enforcement capacity of national regulators and competition boards and improved dispute resolution processes for telecommunications and postal competition disputes;
9. Smooth processes for obtaining cable-laying permits, including cross-border rights of way;
10. Up-to-date national and regional ICT market statistics gathering and publication, including publicly available ICT service performance and tariff information;
11. Efficient management of radio spectrum (cost based pricing and rapid processing of applications);
12. Clear Universal Access & Service Objectives, and efficiently managed Universal Access/Service Funds (USFs) with clearly delineated scope of activities (including support for postal and rural energy for ICTs);

13. Links with between USFs in the Digital Terrestrial Television (DTT) migration strategy for those unable to afford set-top boxes;
14. Requirements for ICT reticulation plans (ducting and housings) in buildings as part of municipal planning regulations;
15. National and regional CERTs to identify threats and assist with cyber-security operations;
16. Maximised ICT infrastructure opportunities in Transboundary Regional Corridor projects, such as deployment of large ducts capable of holding multiple cables for future use by ICT infrastructure providers;
17. Regional standards for burying cable at sufficient depth, or erecting at sufficient height on pylons, and ensuring sufficient security protection on cable-ways, buildings and transport vehicles (for postal);
18. Fiscal incentives for establishing local and regional ICT industries;
19. Appropriate cyber-security, e-transaction and consumer privacy legislation to support the maximal use of e-services as well as postal services and products; and
20. Prioritisation of expenditure on the development of e-government, e-health, e-education and postal services in national budgets, along with roadmaps and targets for the introduction of e-services.

3.1.3 Institutional Arrangements

With regard to ensuring the implementation of the ICT Sector Plan, the key roles of the SADC Secretariat are to:

1. Develop the regional ICT frameworks and policies, and support and encourage their national transposition. As indicated above there is no legal mechanism at the regional level to help enforce national transposition of policies and this may need to be addressed;
2. Establish the legal and regulatory conditions for regional ICT infrastructure;
3. Identify, develop and involve all the actors in regional infrastructure projects;
4. Promote optimisation of investments in regional infrastructure by sharing costs between sectors (ICT, transport, energy) and operators;
5. Carry out studies and establish guidelines for each of the different ICT infrastructure environments and infrastructure corridors; and
6. Regularly (usually quarterly) publish regionally consolidated ICT market and infrastructure data and annual regional ICT progress reports and ICT strategy reviews.

In this context, the role of Member State governments is to:

1. Support the e-transformation of their countries and implement appropriate policies for this migration facilitated by National ICT strategies to define priorities in alignment with national development objectives, and using appropriate agencies to implement the solutions that are best suited to the particular local context;
2. Provide budgetary support for e-applications development and systems integration within line ministries, and for postal service strengthening;
3. Be responsible for the incorporation of regional institutional directives into national legal and regulatory frameworks;
4. Support the reform of the ICT market sector to encourage competitive and open-access service provision at all levels – international, national and local;
5. Provide co-ordinated support for land use planning involving ICT aspects – i.e. also the ministries in charge of other infrastructure (transport and energy), as well as metropolitan and rural district authorities;
6. Facilitate transboundary infrastructure deployment and cost-based access to rights of way; and
7. Facilitate access to alternative/complementary infrastructure (transport/energy).

The key role of CRASA and the national regulatory authorities (NRAs) is to ensure the enabling environment is in place and ensure that all actors abide by it through appropriate enforcement mechanisms. This requires that NRAs have sufficient financial resources and legal tools to enforce adherence to the regulations. The capacity of the NRAs to collect market and infrastructure data also needs to be reinforced by the legal environment to compel operators to submit their data on a quarterly basis.

NRA support for optimising the use of radio frequencies is essential for deployment of cost-efficient wireless broadband access. Of particular importance is to ensure that the spectrum freed up from analogue to digital TV migration is made available for broadband, and that interim measures are made to use TV whitespace spectrum for broadband.

Operator Roles

Network operators are the main actors in broadband development, offering connectivity services and investment in infrastructure. Although not directly part of the regional institutional framework, national and regional operators are able to identify the bottlenecks that hinder the deployment of infrastructure and can be involved at both the national and regional levels in terrestrial infrastructure projects, sharing the costs with the public sector where needed. As a result policy makers and regulators will need to ensure there are adequate mechanisms to establish formal multi-stakeholder consultation procedures with the industry, which would include the alternative infrastructure providers which have potential facilities for operators.

Open Access Institutional/Ownership Models

Because of the infrastructural and operational problems currently faced in Southern Africa, it will likely be necessary to implement open access models for the deployment of some key fibre-optic networks. The open access model is a framework enabling fibre-optic cable carriers to share the use of the infrastructure. The model separates the roles of the service provider and the network operator, and provides services to operators on a fair and non-discriminatory basis. The aim is to ensure effective deployment and a competitive, level playing field. This strategy is expected to more quickly achieve the required broadband infrastructure than by simply letting the market take its course. However this approach requires that non-discrimination in access is upheld and that the investment reinforces competition at the service level.

Where alternative infrastructure is used, the core task of the structure for operation and maintenance will be to maintain the infrastructure, and to facilitate fibre-optic connections to operators and other services such as collocation facilities and interconnection points between the different users.

In order to make the Open Access model financially attractive to operators and service providers, as well as to donors and public investors, pricing needs to be cost-based. This is expected to be achieved by operators/users paying the cost price for the provision of the service, plus maintenance costs. The strategy should be operator-neutral, providing a network that is open to all players on equal terms.

The institutions owning and maintaining open access links could be:

- An independent company created for the purpose, often called a Special Purpose Vehicle (SPV);
- A private company dedicated to offering such services (such as the tower companies model);
- A specific department or service offer by operators (for example the Openreach model of British Telecom);

- Road/rail corridor authorities or Ministry of Transport; or
- Energy Pools or national energy ministries.

The most viable ownership and financing option will depend on the specifics of each project and the particular local environment regional and national levels.

The infrastructure will likely be developed in stages, beginning with a variety of consultations:

- With stakeholders and governments to ensure that the presence of the required enabling environment and conformity with any digital infrastructure master plans if present;
- With operators and service providers to align the programmes with their strategic development plans and reinforce the potential of shared facilities; and
- With the potential investors to identify their interest and form of investment - as capital, IRU, rights of way etc. These consultations should provide an indication of the potential of the infrastructure for downstream usage at national, district and rural level, and allow definition of a forecast price for usage by drafting a price and services catalogue (equivalent to a Reference Interconnection Offer (RIO) and a Service Level Agreement (SLA).

In addition, the initiating institutions will likely need to establish dispute resolution procedures for the various stakeholders during the implementation.

3.1.4 Projects and Interventions

Aside from the policy and regulatory interventions listed above in section 3.1.2, the ICT Sector Plan aims to help ensure that policy & regulatory capacity is built up at a national level and that there is sufficient awareness of the need of regulators for support by general Competition Law and its related institutions (Commissions, Tribunals etc), as well as multi-stakeholder consultation processes.

Similarly, the most recent trends in the communications sector need to be taken into account, particularly in relation to convergence of voice and data services (VoIP/ Next Generation Networks (NGNs), interconnection, transit and peering arrangements, separation of wholesale versus retail services, and convergence between telecommunications, broadcasting, financial and postal services. For example, these trends have an impact on capacity requirements, needs for the deployment of Internet Exchange Points (IXPs), licensing regimes and strategies for public postal services.

In terms of the individual pillars of the Digital SADC 2027 framework, the following sections outline the requirements for projects and interventions.

Infrastructure

The Infrastructure pillar is still the area requiring the most initial focus, without which the remaining pillars will not have a solid base of widespread and affordable connectivity on which to thrive. In this respect, the ICT Sector Plan aims to help ensure that:

1. There is broadband inter-connectivity between all SADC Member States and major cities to ensure that intra-regional traffic is reliably and quickly routed between major cities in the region at the most cost efficient rates. This would include availability of fibre infrastructure based on open-access principles and the presence of at least one Internet Exchange Point (IXP) in each country and one for the region;
2. The public have affordable high-speed broadband and broadcasting access by adopting models of best practice, such as in the use of terrestrial wireless and satellite technologies for reaching the last mile;

3. Connectivity for postal services, including physical transport and financial networks, is improved;
4. Regional connectivity with the rest of the Africa via terrestrial and submarine links with the continent is available to each Member State. This would include ensuring cost effective access to submarine cables by landlocked SADC Member States and redundant routes to ensure reliability;
5. Connectivity with the rest of the world via submarine cable connections is available, (including satellite where necessary, and physical transport systems for mail and packages), to meet the demand for international capacity, and in order to make the region an integral part of the global ICT village;
6. Private sector participation in the ICT infrastructure sector is present to complement public sector efforts, either through independent investment or through PPPs. It is noteworthy here that in contrast to the other infrastructure sectors, the immediate return on most ICT infrastructure investment is much higher, and once an enabling environment is fully in place, the private sector should meet much of the need for trans-boundary infrastructure financing;
7. Capacity costs are minimised and reliability maximised (presence of alternative routes) by exploiting infrastructure sharing synergies, for example in local loop unbundling, duct & mast sharing, active equipment sharing, deployment & maintenance cost sharing, and ensuring open access to alternative/complementary infrastructure such as the networks operated by the transport and energy utilities. This last element applies especially to electricity grids and rail or road links, particularly where they form regional infrastructure, or corridors, such as the SAPP or the Beira-Lobito trans-Africa highway;
8. Human capacity and skills are developed at the policy maker, regulator and operator levels, so as to gain the maximum potential of the investment in ICT infrastructure;
9. The needs for redundancy and sufficient bandwidth are taken into account to reliably support communications for personal, commercial and government services;
10. Voice over IP (VoIP) services are universally available, including non-geographic numbering plans and rental of DID numbers; and
11. The special needs of the relatively large number of landlocked countries in the SADC region are taken into account. These need special attention to ensure they have access to affordable international submarine cable capacity from the coastal countries. Similar objectives need to be applied for special case countries and small island states. These three groups may require ICT infrastructure projects focussing at a national level to ensure that all SADC Member States are able to achieve a more equal level of development with regard to the use of ICTs.

The ICT Sector Plan also requires the use of mechanisms for prioritising proposals for upgrading of existing infrastructure, versus needs for deployment of new infrastructure. This would likely take advantage of the opportunities for using the latest most efficient technologies and business models for the provision of transboundary capacity, such as DWDM, dark fibre or the appropriate ducts or conduit. Upgrading of existing terrestrial infrastructure may be particularly necessary in locations with older or lower-quality fibre cables which cannot transmit data at the maximal rates available today, or where there are limited numbers of fibres in the cable (sharing fibre is much less attractive to the major providers, which need to lease dark fibre rather than just capacity or wavelengths).

Security and Confidence in Networks and Services

To build the Security and Confidence in Networks and Services pillar of the Digital SADC 2027 framework it is necessary to ensure that Member State and regional communication networks are secure and reliable, and do not pose undue threats to their users and do not limit use through lack of confidence, presence of threats or potential service interruptions. This requires:

1. Building institutional capacity at a national and regional level to respond to network threats;

2. Implementing regionally harmonised regulations to ensure effective responses to cyber-security threats;
3. Adopting cable laying standards to maximise the reliability of any newly deployed optic fibre infrastructure;
4. Ensuring that penalties are in place to deter cable theft or vandalism; and
5. Conducting capacity building to ensuring a smooth transition to IPv6.

e-Services and Applications

The e-Services and Applications pillar of the Digital SADC 2027 framework aims to ensure that:

1. Regional applications are available to facilitate free trade and the free movement of people between SADC Member States in the region;
2. Regional platforms are present for encouraging knowledge sharing, cost sharing and adoption of appropriate standards in the development and implementation of public e-Services – particularly home affairs and land-use administration, transport, health, agriculture and education;
3. Professionals working in the priority e-services sectors of health, education, agriculture, commerce and civil administration are aware of, and have sufficient skills to help define needs for e-services/applications and are able to make the best use of them;
4. Regional funds transfer, e-commerce and e-marketplace platforms are widely available, and integrated within postal systems;
5. Government data is made accessible to all via an Open Data platform18;
6. e-Services are available for use on devices ranging from desktop computers to hand-held smart phones and basic feature phones; and
7. The public is sufficiently ICT literate to adopt the use of widely available e-services.

Capacity Building and Content

To support the Capacity Building and Content pillar of the Digital SADC 2027 framework it will be necessary to ensure that:

1. Human capacity in the region is sufficient to be able to take advantage of ICTs, through training and awareness raising activities which are conducted at the regional level to take advantage of increased efficiencies and cost sharing between Member States;
2. Repositories and content development hubs are established for freely available online and broadcasting content, focussing in particular on public data, educational resources, including digitising the content of local museums and national archives, and gathering traditional knowledge in online databases;
3. A sufficient skills pool is present to create relevant local content, develop appropriate interfaces to it and make it available in local languages;
4. The public is able to take full advantage of e-services through provision of national call centres to provide support, and awareness-raising and training programmes to ensure the public, especially the youth and the disadvantaged, are familiar with the use of available digital services, as well as their wealth creation and employment potential;
5. Information literacy is promoted through adoption of harmonised regional certification

18 With minimal cost government can make large amounts of data available so others can build innovative applications and e-Services. The EU's study of Open Data's economic impact indicates that it increases direct business activity by up to €40 billion per year, which translates into adding 0.3% of GDP. The same study showed overall benefit of Open Government Data policy, including direct and indirect effects, could be up to €200 billion per year, or 1.7% of GDP.

standards for ICT training courses;
6. Centres of Excellence in ICTs and Postal Services have a recognised accreditation system; and
7. National broadcasters, NRAs and CERTs are aware of the latest technology developments through regional training courses.

Research, Innovation and Industry Development

A supportive Research, Innovation and Industry Development pillar for the Digital SADC 2027 framework requires:

1. Strong regional ICT research institutional capacity and collaboration;
2. High-speed interconnectivity within and between national and regional research institutions;
3. Widely used knowledge sharing mechanisms and networks between research institutions in the region, and vibrant communities of interdisciplinary research;
4. National science and technology parks promoting collaboration with industry, incentives for attracting world-class expertise, and efficient knowledge transfer mechanisms within industry;
5. ICT small business incubation facilities;
6. Regional ICT manufacturing, content and software development such as in Digital TV set-top boxes; and
7. Supporting development of national and regional strategies for mitigating the negative environmental impacts of ICTs (e-waste and climate change), and using ICTs more generally in other sectors to reduce their carbon footprints.

Cross-cutting Aspects

More generally, the Master Plan also takes into account strategies to help mitigate the impact of indirect factors that affect the entire ICT sector, such as low levels of basic literacy, and in broadening electricity supply, as well as in maximising the benefits of the cross-cutting synergies of the ICT across economic sectors, government services, and cultural groupings. Adoption of appropriate institutional models to promote Head of State level leadership, multi-sectoral co-ordination and multi-stakeholder collaboration are clearly key aspects here. A related aspect would be strategies to co-ordinate with the other overlapping RECs – ECCAS, COMESA and EAC – principally through the Tripartite, for the latter two.

Monitoring access to and supply of ICT infrastructure, is crucial in measuring progress in the implementation of the Master Plan. Hence the ICT Sector Plan also aims to establish an agreed set of regularly updated regional e-readiness indicators to help SADC Member States progress in a harmonious manner, and for them to be better able to base their strategic decision-making on valid and up-to-date data. Capacity building would take place to apply appropriate analytical techniques in order to best capture these indicators so that patterns, trends, and other benchmarking exercises can easily be performed at national and regional levels.

Currently the development of statistical data in SADC is guided by the Strategy Document approved by Council in 1998, which stipulates that SADC statistics are critical in the monitoring and evaluation of the SADC Programme of Action and the regional integration process. The strategy highlights the following challenges:

- Inadequate resources allocated to statistics in some of the Member States and consequent disparities in the statistical capacity among them;
- Inadequate statistical capacity at the Secretariat to co-ordinate statistics in the region;
- Absence of a legal instrument for regional cooperation in the area of statistics;
- Lack of dissemination mechanisms (including databases and connectivity); and

- Long time lag between collection of data and dissemination of statistics.

The implementation of the strategy focused on a number of sectoral priorities, but does not mention ICTs specifically. The RISDP noted that there is need for a legal instrument for regional co-operation in the area of statistics. The instrument would ensure that the institutional arrangements for collecting, processing and dissemination of statistics are adequately resourced and would also provide a framework for enforcing compliance on minimum standards for quality statistics.

3.2 Inter-relationships and Integration with other Infrastructure Sectors

Uptake of ICTs is particularly dependent on energy, without which ICTs cannot function. This presents special problems in rural and remote areas in the region, many of which are without grid power. While off-grid energy solutions are possible, these are often economically unfeasible due to their high initial cost. Supplying remote base stations with fuel for generators is one of the chief costs in maintaining wireless networks in some Member States. Worthy of note here is that in Senegal, the government has determined that the key bottleneck to ICT uptake in rural areas is the lack of power, and has determined that Universal Service Funds may be used for energy projects.

In any event, project synchronisation between the two sectors needs to take place to ensure that energy and ICT infrastructure can be made available simultaneously if possible.

Deficient transport networks make deployment and maintenance of ICT infrastructure slower and more costly. On the other hand, inclusion of ducts for fibre on new transport networks can radically reduce the cost and increase the speed of fibre optic network deployment.

The following table outlines the main links with the other infrastructure sectors of the Master Plan, highlighting the opportunities and challenges in improving ICT access. These opportunities highlight the potential and need for 'Integrated Infrastructure Development', especially for rural areas where the costs of deployment relative to the populations served are much higher.

In terms of cross-border fibre optic infrastructure opportunities created by trans-boundary transport and energy projects, these are detailed in the Cross-border interconnection table, table 13.

Table 14: Links with Other Infrastructure Sectors

Tourism	ICT is a key factor in global competitiveness in tourism for many different reasons: • ICT is the basis of reservation systems, which are fundamental to airline and hotel bookings. Internet-based marketing and bookings, including online payments are now the main source of tourism transactions. The Web has become the main source of information for tourists, both in planning, booking and purchasing their trips and also during the trip. This is being augmented by DVDs/video, and real-time webcams. • The emergence of the mobile internet has enabled tourists to access holiday products and information directly from their handsets as they need it, and they are also able to obtain funds or make payments using these new platforms. • Postal systems are well known for their importance to tourists sending letters and parcels back home, and for receiving the same, often with some urgency due to their short stay and potential need such as lost credit card replacement or forgotten medicines. Similarly tourists often continue to send post back to the countries they have visited. • The availability of low cost high-speed connectivity also encourages tourists to stay longer, especially knowledge workers who can often work anywhere they can plug in their laptops. These high earning foreigners often choose areas of outstanding cultural or environmental attraction to set up shop temporarily, or even more permanently. • Relationships with small businesses encountered during tourist travel often persist and are nurtured if the local population has affordable access to the internet, text messaging and postal systems.

Energy	• There is a complex and rapidly evolving relationship between ICTs and energy. The cost of high capacity bandwidth and centralised processing power is plummeting, while energy costs are increasing, and concern for climate change is creating further constraints on growth in energy consumption. This has created a new dynamic in which bandwidth costs can be cheaper than energy costs. As a result, in shared hosting services (now more commonly referred to as cloud computing), it may make more economic and environmental sense to host data services outside the country where energy is cheapest. This could mean that data centres for the region might be best located near the major hydro generating stations planned in the DRC, Mozambique etc. In any event, the carbon footprint created by the use of ICTs is already large (10% in the US) and growing rapidly – minimising the energy consumption of data centres, postal branches and delivery services, and ideally also of the equipment of the end-user is clearly a priority. • On the supply side, independent renewable power producer policies (IPPPs) with special feed-in tariffs and/or soft loans for purchasing solar, wind or bio energy generators, are vital for ensuring the cost of energy to power ICT equipment remains as low as possible, while making it possible for operators and end-users to justify investing in the renewable power generation equipment needed to ensure reliable connectivity. • 'Smart energy grids' and 'smart buildings' with power meters and controllers on all energy-using devices are also expected to be a major growth area to meet demand for more efficient use of electricity to reduce costs and minimise carbon footprints. The initial demand is likely to be in the grids themselves, then moving on to commercial and public buildings, followed by the residential market, which is already beginning to take off in Europe and North America following the advent of higher energy prices. • Energy transmission systems – high-tension electricity grids and gas/oil pipelines - are a key resource for minimising the costs of fibre optic infrastructure deployment. Similarly to transport networks, these can be used to provide much lower cost routes than greenfield trench digging. High-tension cable lines often already have spare fibre cables as a by-product of the energy transmission control systems, and these also provide added security. The Southern African Power Pool (SAPP) offers many such opportunities.
Water	The Water sector has an unexpected number of linkages with ICTs. The main ones are: • Where e-waste disposal is an issue, causing groundwater pollution. • Water resources and wastewater reticulation networks can benefit from remote sensing and telemetry (e.g SCADA) monitoring/management systems. • Internet and mobile applications can be used for reporting water leaks, requesting/terminating services and paying water bills. • Water safety and water-saving awareness-raising can also be augmented with online applications. • GIS systems can assist in planning water distribution and identifying risks from flooding, especially when combined with telemetry; and crowd sourced mapping information can also be applied to the water sector. • Where water projects involve energy generation (hydropower), given the significant size of these in the SADC region, they offer important prospects for ensuring that ICTs are supported with sufficient and affordable energy supplies. • Some rare cases where rights of way on canals, rivers, lakes or long distance distribution water pipelines could be used for fibre optic cable laying. The most apparent option here is laying cable in the Congo River.
Transport	• Transport is similar to the energy distribution infrastructure, with roads, rail lines and waterways providing important opportunities to deploy fibre optic infrastructure at much lower cost than through new trench digging, especially if ducting has already been installed. This is a particularly important opportunity on the cross border routes being developed as part of the corridor projects in the region, in particular the North South Corridor (NSC). • These thoroughfares also require connectivity along the route for the travellers and transport systems, including for cargo tracking. This provides the opportunity to provide real-time monitoring of networks of trucks, passenger and rail vehicles to help maximise efficiencies and improve security. With the growth in use of smart phones and laptops, provision of broadband connectivity in public transport systems is increasingly in demand. • Inadequate transport networks also increase the costs of deploying and maintaining ICT

	networks, in particular for optic fibre mobile base stations in rural areas. • The quality of the transport system and trans-border procedures also directly affects the delivery of international mail and parcels. Aside from the logistical aspects, security on transit routes can be a particular concern, especially as security systems, such as in airports, are beyond the direct control of the postal system. Transport companies may also compete with the postal service for delivery of parcels.
Meteorology and climate	• ICTs have revolutionised the potential for remote sensing, which is an important component of meteorology. New social networking systems also provide the opportunity to augment traditionally gathered data with crowd-sourcing techniques (e.g. WeatherUnderground). • Weather and climate modelling require substantial computing power and high-capacity links to move large data sets. • The SADC Meteorology sector has a priority project specifically focussed on the use of ICT – the proposed interconnection of meteorological centres. There is potential here to minimise the costs by using a regional satellite service provider shared with other branch offices of public services (e.g. border posts, clinics and emergency services, conservation offices and postal branches). • As mentioned above, ICT energy consumption (already 10% of all energy consumption in the US, and growing) is also being linked to climate change concerns. And similarly, climate change monitoring will both use ICTs, and help inform the ICT sector on its potential climate change impacts. • Solar eruptions can adversely affect satellite communications

3.3 Assumptions and Risks

3.3.1 Assumptions

- The necessary human capacity and financial resources are available to promote the projects identified, finalise their detailed formulation and implement them;
- Member States will cooperate to give priority to the projects identified and the ICT/Postal sectors generally;
- Financing will be available from the development community, Member States and the private sector;
- The political climate and economic conditions in Member States will continue to improve, or at least not deteriorate;
- That related e-application development projects, especially e-government, continue rapid development to take advantage of and drive demand for better connectivity, based on availability of sufficient skills;
- That utility infrastructure projects (transport/energy), especially trans-border corridor projects are sufficiently aware and forward thinking to ensure that adequate provisions are made for fibre infrastructure;
- The cost of fibre deployment will vary tremendously depending on the terrain, ownership of the land, permit procedures and opportunities to use alternative infrastructure and state-owned rights of way; and
- Each major provider is likely to require its own pair of dark fibres on most backbone routes. As has been shown in the more advanced country markets in Europe, North America and Asia, each of the national operators lights their own fibre pairs as needed, in order to manage their network and compete effectively.

3.3.2 Risks and Potential Mitigation Actions

Differences between countries' national priorities can create a lack of regional harmonisation of ICT policies and regulations. This can take place at a higher level, such as in civil strife and other political or economic issues suspending normal processes of regional policy transposition. At a more direct level, variation in government policy on opening the fixed line sector to competition with the incumbent is evident. For example, despite SADC guidelines to the contrary, many Member States

have still maintained their public monopolies in the fixed line sector. As stated in the RISDP, and though significant advances in many countries have taken place, it is still valid for some: "Although at policy level, Member States have demonstrated that there is unanimous consensus to adopt ICT as a tool to speed up development (ICT declaration of 2001), in practice at the strategic level, no serious implementation took place."

Other potential risks and mitigation actions are:

- The process of reform continues to take place but not at the pace desired. This will depend on the country or group of countries, and may involve political constraints, lack of human or budgetary capacity to enforce policy or regulations, or delays in reaching agreement among Member States implementing trans-boundary projects. Fortunately there are few regional ICT infrastructure projects that are likely to fall into this category, except perhaps in the case of the introduction of competition in some sectors, keeping prices high for landlocked countries wishing to reach the lowest cost submarine landing stations;
- Slow project formulation leading to lost opportunities to ensure ducting is included on all new transport and energy distribution projects. Opportunities are lost every day with projects that are being finalised without the incorporation of ducts or conduit to cut the cost of laying fibre by up to 90%. As a matter of urgency, a short-list of cross-border roads, rail and energy projects in the final stages of planning could be created and the possibilities for ensuring that they include the necessary ICT infrastructure be examined;
- Limited Member State public financing available. This is can be a question of cabinet-level lobbying on how the pie is cut, and sufficient awareness-raising of the cross-cutting importance of the ICT sector can help to address this, along with ensuring leadership for projects at head-of-state level;
- Outlook for the global investment climate deteriorates further. This may be a possibility, and project prioritisation should help prepare for this, but ultimately the economic cycle should pick up again;
- Limited cooperation from transport and energy providers in giving access to their infrastructure for fibre networks. If regional guidelines in this area are developed this would help address this problem;
- Capacity for project development and managing implementation of projects is limited, at the SADC Secretariat, and in Member State governments. Ensuring sufficient ICT skills are maintained within the public sector is an ongoing problem when these skills are scarce and the private sector is able to offer higher rewards. Establishment of parastatal ICT entities that are not subject to civil service pay scales is the usual means to address this, but more generally, investment in ICT literacy training at all education levels will be necessary to help maximise the available pool of ICT skills. More specifically, ensuring the hiring of sufficiently experienced ICT staff at the project level is vital to ensuring project success. Also, fortunately, many of the ICT projects can be out-sourced to the private sector, if not directly initiated and implemented by them;
- Infrastructure deployed may be unreliable due to poor maintenance, theft and vandalism. Standards and guidelines for burying cable at sufficient depth, or at height on pylons, and ensuring sufficient security protection on cable-ways, buildings and transport vehicles (for postal) are necessary. Special penalties for vandalism and theft of strategic national assets could also be applied; and
- Regulators, policy officials and local planning authorities lack capacity to enforce adherence to the enabling environment policies due to corruption. This is an ongoing problem that affects the public service at many levels and, given the revenues from the licensing process and the value of contracts, needs ongoing vigilance and use of transparent decision-making as well as budgetary systems available for public scrutiny.

3.4 Preparing for Future Sector Trends (beyond 2027)

The extremely rapid pace of technological evolution in the ICT sector makes it virtually impossible to prepare for sector trends beyond 2027 at this point. At best, it can be hoped that sufficient investment in human resources and capacity building will allow the next generation to adapt to the dynamics that emerge over the coming years. This could be augmented with a regular (every 5 years) re-evaluation and updating of the Sector Plan.

Fortunately fibre optic cable investments made today are likely to last well beyond 2027, but it is likely that all the electronic equipment in use currently and deployed over the next decade will need to be replaced well before then. In addition some of the early deployments of fibre optic infrastructure, mainly links between South Africa and its neighbours, may need to be replaced before 2027, but it is also likely that additional fibre will be laid along most of these routes by competing regional providers, making replacement unnecessary.

4. Implementation Strategy

4.1 Implementation Plan

4.1.1 Priority List of Projects and Resource Requirements

Policy and Regulatory Harmonisation

The key actions required for addressing gaps in Policy and Regulatory Harmonisation of the ICT sector would be:

1. Rapid assessment of key ICT policy constraints in Member States - Identification of immediate policy changes required for:
    - Access to broadband radio spectrum and use of TV whitespace for broadband
    - Access to national fibre backbones and the fibre infrastructure of utility operators at market-based rates
    - Open market and technology neutral licence availability for new infrastructure operators;
2. Integrated National ICT policy reviews and national broadband strategy development. Member States would convene multi-stakeholder forums to address the policy and regulatory issues by an independent regional assessment of the status of ICT sector reform and market liberalisation, and to develop national broadband strategies. The assessment study would consider: a) regulator institutional capacity, particularly to enforce regulations and to institute operator tariff controls, pricing transparency, interconnection and infrastructure sharing (including support from Anti-Competition Laws), b) Openness of ICT markets to new entrants and presence of technology/service neutral converged licensing regimes, c) Structural separation of wholesale from retail operations among incumbents, d) Spectrum management (cost based spectrum fees, sub-licensing of spectrum, up to date allocation plans), e) Presence of taxation constraints to ICT uptake and fiscal system opportunities to promote ICT uptake, and f) Alignment of ICT policies to the government's overall development goals;
3. Define national broadband strategies, supported at regional level through a) identification of ICT uptake targets for Member States, b) development of guidelines on best practices for supporting extension of national fibre backbones, especially to more remote areas (e.g. case studies of government backbone owners, use of PPPs and Universal Service Funds), c) support for implementation of regulations which update land-use planning approval procedures to ensure that all new public infrastructure includes fibre and ducts (including public and commercial buildings (e.g. Botswana)), d) promoting the establishment of National and Regional IXPs to maximise performance and reduce costs by ensuring that SADC traffic is kept within the region, local traffic is kept local (by supporting regional forums of ISPs), e) promoting wholesale pricing information exchange across the region, by implementing a capacity trading platform, f) reviewing and updating spectrum allocation plans to take into account needs for broadband and latest technology developments (e.g. assess the feasibility of using new radio technologies such as TV white-space (802.22) as an interim measure until DTT migration has taken place, plus development of proposals for broadcasting spectrum fee regulations), and g) Support for public sector operators to transition to new market environments (national studies for SADC Member States where needed). Three regional workshops to review the outputs of the above activities;
4. Update the framework for SADC regional home and away roaming regulation; and
5. National Postal Policy Development and Regional Harmonisation, including updating of the Guidelines & Toolkit on Universal Service Funds (USFs) to include Postal Services.

Confidence and Security in Networks and Services

To ensure that networks in the region are secure and reliable, the following will be required:

1. Develop model strategies and best practices for ensuring infrastructure security against threats such as theft, vandalism and accidental damage;
2. Support for establishment of multi-stakeholder Computer Emergency Response Teams (CERTs) in each Member State and at the regional level;
3. Support for capacity building for timely switch-over to IPv6 in civil service networks; and
4. Implement common security standards for postal systems.

Infrastructure

Aside from the missing backbone and access infrastructure purely at the national level, the key short-term infrastructure projects in the region that have been identified consist of:

1. Relatively short cross-border links to connect with the national infrastructures of neighbouring SADC Member States and regions, in particular Tanzania-Mozambique, and Angola-Zambia (these are included under the SRII);
2. A few key unimplemented national backbone links that play an important role in connecting the country to its neighbours or to connect regions or neighbours to each other, such as DRC-Burundi and Angola-ROC (Congo Brazzaville);
3. Install, where needed, multiple cross-border links to ensure that all SADC Member States have two physically independent links to two different submarine landing stations and that all land-locked SADC Member States competitively reach multiple submarine landing stations (i.e. in Lesotho, Seychelles and Swaziland);
4. Implement national or regional traffic exchange points to reduce costs by ensuring that SADC traffic is kept within the region, local traffic is kept local, and to maximise performance (all SADC Member States and regionally);
5. Deploy government-built backbones or, via public private partnerships, ensure infrastructure is built to more remote and rural areas where it might otherwise be unprofitable to do so. This includes a study to determine best practices and to produce guidelines on deployment of government built/owned and other forms of open-access backbones. Angola, South Africa and Tanzania have opted to establish state owned national fibre optic backbones, based on knitting together various elements of the parastatal rail and power grids with new fibre deployments. Evaluate how effective this model is versus letting the private sector compete to provide the required infrastructure. Best practices from other regions and continents could also be examined;
6. Extend postal branches to more locations;
7. Establish postal code addressing systems in Member States that do not have them;
8. Support DTT Migration for SADC Member States where needed; and
9. Establish a SADC shared satellite network for connecting remote government offices in the Region. With use of an existing satellite, the costs of a ground-station hub, well connected by fibre, could be shared by Member States wishing to participate in the network.

e-Services & Applications, Capacity Building & Content

The following activities will be required to support the development of needed e-Services and Applications, Capacity Building and Content generation:

1. Establish regional online systems at SADC Member State border posts to facilitate free trade

and the free movement of people between all SADC Member States, leading to regional e-services and content development platforms and cost sharing mechanisms;
2. Establish regional repositories and content generation hubs for online and broadcast learning materials in the relevant different languages (English, French and Portuguese);
3. Improve use of ICTs in postal systems and use of Global Monitoring System (GMS) for measuring quality of postal services;
4. Establish an accreditation system for regional centres of excellence in ICT and Postal training;
5. Adopt regional ICT training certification standards and procedures;
6. Build ICT knowledge capacity of NRAs, National broadcasters and national and regional CERTs;
7. Develop model national e-commerce and e-marketplace strategies, including implementation of e-payment systems and integration with postal systems;
8. Develop government Open Data policies and management systems for providing access to public data and related spatial data mapping facilities;
9. Establish national call centres to help citizens with use of e-services and access to government information online;
10. Develop a reference model for use of ICTs in public 'intelligent transport' systems to monitor movement of vehicles for traffic management planning and providing connectivity for passengers; and
11. Carry out awareness-raising and training programmes to ensure the public, especially the youth, women and other disadvantaged individuals, are familiar with the use of available digital services, as well as their wealth creation and employment potential.

Research, Innovation and Industry Development

To address the Innovation, Research and Industry Development pillar, the following activities will be required:

1. Regional ICT research institution capacity building and promotion of knowledge transfer with industry, in particular, supporting interconnectivity and knowledge sharing between national and regional research institutions;
2. Develop guidelines and strategies for the establishment of ICT small business incubation facilities, support for their establishment in Member States;
3. Promote regional ICT manufacturing, content and software development. This could be initiated by supporting the DTT migration process now taking place, by exploiting the use of the co-ordinated transition using a common standard across many countries to establish set-top box manufacturing or assembly facilities for the region. This would also be an export opportunity because many other countries around the world are also adopting the same standard. A market and technical feasibility study would provide initial support for this effort, and be combined with a scoping exercise to identify other technologies amenable to local manufacturing, software and applications development;
4. Hold a regional colloquium with industry to verify the above study conclusions, identify and align business owners with the additional opportunities, and raise awareness of the initiative more generally in the private sector; and
5. Identify national and regional strategies and standards for mitigating the negative environmental impacts of ICTs (e-waste and climate change) and using ICTs to reduce carbon footprints in other sectors.

For coherence and efficiency in project management, all of the above activities have been grouped into the project programme outlined in the table below, and further details are included in Annexures 1-4.

Table 15: Summary of ICT Master Plan Regional Projects and Resource Requirements

Project Title	Resource requirements	Timeline
Platforms		
Enabling policy and regulatory environment	US$2,006k	6-18 months
Ensuring Confidence and Security in Networks and Services	US$871k	12-18 months
Pillars		
Infrastructure – Communications	US$21,139,007k	18-36 months
Infrastructure – Postal Sector	US$286,170k	12-36 months
ICT Capacity Building & Content	US$5,289k	12-18 months
e-Services and Applications	US$7,686k	12-24 months
Research, Innovation and Industry Development	US$6,061k	12-36 months
General		
Monitoring and evaluation of progress toward Digital SADC 2027	US$330k	12-24 months
Total	**US$21,447,423k**	

In summary, the main activities under each of the above programme areas are as follows:

Enabling Policy & Regulatory Environment for Maximising ICT Infrastructure Deployment:

- Rapid regional assessment of key National ICT policy constraints in Member States;
- National ICT policy reviews;
- National broadband strategy development;
- Model national postal policy development and regional harmonisation; and
- Updating the framework for SADC regional home and away roaming regulation.

Ensuring Confidence and Security in Networks and Services

- Help to establish multi-stakeholder Computer Emergency Response Teams (CERTs) in each Member State and regionally;
- Capacity building for timely switch-over to IPv6 in civil service networks;
- Development of standards and model national guidelines and regulations for cable laying and cable protection;
- Implementation and harmonisation of security standards in postal systems so as to respond to cyber-crime, terrorism, drug trafficking, and money laundering; and
- Harmonisation of cyber-security frameworks (ongoing SADC programme).

Infrastructure

a) Consolidation of Regional Communications Infrastructure

- Address needs for additional cross-border links between SADC Member States where there is only one such link, including submarine link for Seychelles;
- Support for implementation of additional cross-border or international links to improve competition and reliability;
- Regional IXP development;
- Support DTT national migration;
- Set up a shared satellite-based service platform for remote/rural areas (use of existing satellite); and
- Implementation of a Regional and National Integrated Broadband Infrastructure.

b) Postal Sector Strengthening

- Implementation of postal code addressing systems in Member States that do not have them;
- Extension of national postal branch networks to more locations, especially in rural areas;
- Improving use of ICTs in postal systems; and
- Regional GMS for mail QoS measurement.

Capacity Building and Content

- Awareness-raising for policy makers and development practitioners of strategies for ICT supported development;
- Establishment of national call centres to help citizens with use of e-services and access to government information;
- Promotion of information literacy through adoption of harmonised regional ICT training standards and certification;
- Capacity building of NRAs, National Broadcasters and CERTs in ICT technological developments;
- Develop regional repositories and content generation hubs in multimedia learning and cultural heritage materials for access via the web and broadcasting; and
- Establish regional Centres of Excellence (COEs) in ICTs and in postal systems.

e-Services and Applications

- Develop regional platforms for e-Government services and applications;
- Develop model national e-commerce, e-marketplace, e-logistics and national/regional e-payment applications, and integration within postal systems;
- Develop Open Data policies, management systems and related spatial data mapping facilities for providing access to public data;
- Reference model for Global Positioning System (GPS) and 3G-Wifi gateways on public vehicles for use in 'intelligent transport systems'; and
- Establish a common cross-border traffic administration platform for all border posts in the region.

Research, Innovation and ICT Industry Development

- Promote improved collaboration, information and knowledge sharing between research centres;
- Establish incubators for small ICT businesses, develop guidelines for their governance and strategies for financing;
- Develop ICT equipment manufacturing facilities, software and applications; and
- Mitigate negative environmental impacts of ICTs (e-waste and climate change).

Monitoring and Evaluation of Progress toward Digital SADC 2027

- Decide on the indicators to be measured;
- Ensure data is provided quarterly to regulators; and
- Data gathering and publication by regulators, to provide support for ICT observatory.

In addition to measuring general progress toward Digital SADC 2027, each pillar would also have its own monitoring and evaluation procedures with measurement of appropriate progress indicators.

Aside from the linkages to other sectors as outlined in section 3.2, particular attention needs to be paid to the linkages between related activities. In particular these are:

- Postal addressing systems and branch offices are required for e-marketplaces to be optimally effective and a wide variety of stakeholders have a strong interest in ensuring that addressing systems are in place (emergency services, police, etc);
- The modalities and cost assessment for a SADC shared satellite-based connectivity service are required for the other pillars, so that it is possible to develop strategies and budgets for extension of e-postal and other public e-services and civil administration in remote areas;
- Joint purchasing will require agreement between Member States to either use one country's institution as the purchaser, or to establish a new entity to make the purchases;
- The industry colloquium would initiate further dialogue with industry regarding strategies and PPPs to be developed;
- Planning regulations and smart corridor feasibility studies should synchronise with other regional infrastructure priority projects, corridors etc; and
- Connectivity provision to border post areas needs to be in place for corridor projects, both to assist in their development and to provide ongoing services when the corridors are fully operational.

4.1.2 Implementation Modalities

Annexure 1 summarises the implementation strategy and timelines for the projects. As can be seen most of the activities are expected to begin as soon as funding is committed, and most projects would be complete (at least in terms of requirement for external funding) within 2-3 years, i.e. it is assumed that funding will become available in 2013 and so virtually all projects commence in 2013. The most urgent ones would be complete by 2014, while others continue for three to five years. This is expected to provide a number of quick wins[19], as well as laying the groundwork for further developments, and due to the fast moving nature of the sector, an evaluation and reassessment of strategy will then be required in 2018. In addition, the outputs of the studies envisaged in the 2013-2014 period are likely to identify other project areas and financing needs before 2018, and additional project formulation is expected to take place prior to this date.

A more detailed cash flow analysis would also need to be carried out to fine-tune the funding requirements over the course of the projects.

4.1.2.1 Initial Agreement and Maintaining Commitment of Member States

SADC Regional ICT infrastructure would range from simple projects that involve two Member States to complex ones that involve several or all Member States, in keeping with overall regional objectives.

Most projects include an initial study and then a verification workshop to agree on the details of the implementation plan. Cross sectoral and corridor synergies are also noted where present.

Most cross-border or multi-country ICT infrastructure projects are implemented at the national level, but co-ordination and support at the regional level can be critical for their success. In this respect the role of the SADC Secretariat is to be the incubator or facilitator of regional projects but it is not expected to implement the projects, rather to ensure their initiation, manage the agreement process and approve the deliverables.

19 In particular in reducing access costs and increasing coverage through improved broadband provision

In addition, the key responsibility of SADC (and CRASA) is to help ensure the enabling environment is present in each Member State, and act as a forum for information sharing and discussion between all the stakeholders which have an interest in the projects.

4.1.2.2 Financing Mechanisms in the Sector

Most Member States have significant resource constraints and it unlikely to be possible for them to allocate meaningful resources for all the projects. As a result donor funding and public private partnerships (PPPs) will be vital to ensuring adequate funds are available.

The ICT sector is fortunate in that it requires the least amount of financing of all the infrastructure sectors and a significant portion of the funds required for hard infrastructure deployment are expected to come from the private sector (except for the public postal sector). This places the emphasis and burden of financing on 'soft' projects to ensure the enabling environment is in place to maximise private sector investment. Fortunately much of the cost of these soft capacity building and policy development projects can be shared by Member States participating in regional projects, although the substantive infrastructure project costs will still be for implementation at the national level.

For fibre infrastructure financing and ownership, three different models for deployment can be envisaged:

- Initiated by private sector where the environment encourages investment and there are high demands for capacity;
- Initiated by state or other public investors to build open-access infrastructure for all actors, managed independently – more useful where capacity demands are lower; and
- A shared PPP model required by the operator, especially where there are many small operators.

The amount of financing required for the terrestrial fibre infrastructure programme is linked to some ongoing planned initiatives by some SADC Member States. In particular there is a significant amount of proposed national infrastructure that could form part of regional infrastructure, in particular the national backbones in the DRC.

In addition it should be noted that a major part of the required backbone infrastructure is likely to be financed by private operators or investors and public funding may only be required for civil works and ducting to secure open access or reinforce the sustainability of investment. Some SADC Member States have special circumstances and their national projects are also proposed in the ICT Sector Plan, despite not being regional. In this respect, and in developing the criteria for project selection, it is necessary to take into account the grouping of SADC Member States with common priority needs – a) countries with special needs, such as those with the lowest levels of economic development and those emerging from strife such as the DRC, b) the small island states – Mauritius and Seychelles, and c) landlocked countries.

The sources of finance for projects in the SADC ICT Sector can be summarised as follows:

- **Local and international operators investing in their own network and services development**. This is probably the primary source of ICT infrastructure finance – organic growth built on revenue flows from the customer base. Telecommunication operators in the SADC region alone have invested US$15-20 billion over the last 10 years in their networks. Focusing on the mobile operators, with about 130 million subscribers across the region this year, at an average

revenue per user (ARPU) of about US$10/month, this translates into a total revenue of over US$15 billion generated across the region this year – roughly the same amount that has been invested in all operator network infrastructure over the last 10 years.

- **Local operators investing together** in shared infrastructure. This often takes the form of bilateral or multilateral arrangements such as consortia to co-build submarine cables or a mast for a remote location. A different version of the model is where wholesale carriers and mast operators provide services to local retail operators. Similarly, the virtual network operator MVNO model is a form of shared network financing. In South Africa the deployment of a shared 4G network is being considered, especially for rural areas.
- **Large user groups** – these are the smaller ISPs, government administrations, national research and education networks (NRENs) and large national corporate users which may pre-purchase capacity on a planned network as Indefeasible Rights of Use (IRUs), often at special discounts. This is also often one of the sources of operator finance above, and has been used to finance the deployment of some of the private submarine cables in Africa.
- **National governments** who may finance or co-finance measures to improve the enabling environment, or contribute state assets as in-kind investment, such as the fibre on the transport and energy agencies' infrastructure, or their ducts and the rights of way. Governments may also use public funds to invest in new open-access national backbones, cross border links or metropolitan networks, often supported by grants or soft loans from the DFIs or EXIM banks (see below).
- **Multilateral development finance institutions,** particularly the World Bank, African Development Bank, Development Bank of Southern Africa, JICA, Islamic Development Bank (only Mozambique), International Finance Corporation, and their consortia, such as ICA.
- **European Union** has a special relationship with SADC, and has long supported its regional integration and infrastructure development goals although there has been relatively little activity in the ICT sector specifically focussed on SADC Member States, except for the European Investment Bank (EIB) linked funding for the Seychelles submarine cable, SEAS. Aside from the EU-Africa Infrastructure Trust Fund, the EU also has large amounts of unspent funds allocated to ICT development in Africa and (through the EU-Africa Infrastructure Fund) has also committed to supporting infrastructure development in the COMESA-EAC-SADC region, but has not been specific as to levels of commitments. However, as an outcome of the AUC-EC Port-Moresby Agreement, a total of US$950 million has been allocated for ICTs on the continent. RECs such as SADC are being invited to apply for the funds in support of the Priority Project identified for the ICT Sector, which is: "Support for development of African ICT broadband backbone and related policy objectives and a system of interconnected regional databases for infrastructure". There are four sub-projects under this: 1) Feasibility study of selected missing links on the African ICT broadband backbone and preparation of priority sections, 2) Development of harmonised guidelines on OpenAccess and related services and strategies, 3) Study on the implementation of harmonised continental public resource and services (numbering, IP, Domain Name System (DNS) and emergency numbers), and 4) Support for development of a system providing interconnected regional databases for infrastructure.
- **Specialised emerging market infrastructure investment funds**, in particular the Africa Finance Corporation, Africa Infrastructure Investment Fund, the JP Morgan Emerging Markets Infrastructure Fund, the Emerging Africa Infrastructure Fund (EAIF), Aureos Capital, Forward Global Infrastructure Fund, Macquarie Emerging Markets Infrastructure Income Fund, and EMP Global Africa Fund.
- **Bilateral government funding**, usually for capacity building and enhancement, studies and institutional start-up, but also concessional loans, e.g. China EXIM Bank for national fibre backbones and Swedish export credit agency EKN for Econet Zimbabwe. This is also a common form of vendor finance, with the loan linked to equipment supply – for example, Huawei or ZTE for China, and Ericsson for Sweden.

- **Other local and international non-ICT private players** (commercial banks, pension funds, entrepreneurs) who may bring debt or equity finance to specific projects, often based on their relationship with the recipient of the funds.
- **Tripartite Financing.** Co-operation on financing between the three RECs – COMESA-EAC-SADC – in the Tripartite Framework will be important and will need decisions on strategy for routing project funds directly to SADC or via the Tripartite. The three RECs have initiated cooperation in the funding of infrastructure projects through the holding of joint corridor investor conferences and in 2008, the Tripartite developed an Aid for Trade Pilot Programme on the North South Corridor (NSC) to address infrastructure and facilitation issues together, and the corridor as a single network. This has enabled the three RECs together with their Member States to gain additional support from the DFIs to implement the programme. The High Level North South Corridor Investment Conference, and the High Level Tripartite & the Intergovernmental Authority on Development (IGAD) Conference on Infrastructure Investment held in Nairobi in September 2011 directed the three RECs to develop joint financing and implementation mechanisms for infrastructure development within one year. The Tripartite Trust Account (TTA) has now been established at the Development Bank of Southern Africa (DBSA) with DBSA as a Fund Manager. In addition, an Investment Committee has been established and is now operational. The fund has a total of GBP67 million (from the Department of International Development (DFID)) and US$1 million (from DBSA). Other donors to the TTA are being sought. Both SADC and the Tripartite have agreed to ensure that concrete PPP policies are enacted across the region by 2013, in order to enable private financing to emerge as a major source of funding for infrastructure investment.

As with most development projects, the problem is not usually a lack of finance but lack of appropriately structured projects that make the case for the investment. This can present difficulties for social ICT projects, which, as with other cross-cutting areas, the full economic and social returns of the investment may not be directly evident within the ICT sector, but will show up in the indirect impact on other sectors. The case for these linkages is usually quite easy to make in general terms, but quantifying the broader benefits is usually left in the realm of speculation, due to the complexity of the relationships. For example, the controversial analysis that appears to show that GDP increases by about 1% for every 10% increase in broadband penetration.

Nevertheless the extensive analysis that has been done since the 1990s, culminating in the World Summit on the Information Society (WSIS), indicates that there is a clear cut case for aiming to ensure that every citizen has access to broadband internet connectivity and local online services. This leads to a fairly clear set of requirements in terms of international, national, municipal and local connectivity. Since the bulk of the cost is in the civil works and masts, and the extent of this requirement can be objectively established, there need be little argument about the extent of finance required. The main issue will be identifying the time frame for reaching the most remote/under-served areas and the extent of public finance required to fill the gap left by private investment. The two are interrelated, as the private sector may well get to the remote areas, but only at a later date than is desired by public policy. This is probably where the strongest case can be made for obtaining development/public finance, especially for the postal sector.

4.1.2.3 Milestones and Key Steps

Annexure 2 contains the detailed Milestones and Performance Objectives of the ICT Sector Plan.

SADC's effectiveness in ensuring regional harmonisation of regulatory policies will determine the level of investment in projects by the private sector and also help ensure the ICT infrastructure's optimal use. This will require project implementation structures and procedures are in place to

ensure that harmonisation takes place which meets the criteria set for a project to progress to implementation stage.

In general, ICT infrastructure projects will likely be developed in stages, beginning with a variety of consultations:

- With stakeholders and governments to ensure the presence of the required enabling environment and conformity with any digital infrastructure master plans if present, and to agree on sharing any development costs where appropriate;
- With operators and service providers to align the programmes with their strategic development plans and reinforce the potential of shared facilities; and
- With the potential investors to identify their interest and form of investment – as capital, debt, support in kind, IRU, rights of way etc.

In addition, the initiating institutions will need to establish dispute resolution procedures for the various stakeholders during the implementation.

At the Tripartite level, the Tripartite Taskforce progress report on implementation of decisions of the first COMESA-EAC-SADC Tripartite Summit has mapped out their initial steps in infrastructure project development. The Tripartite Project Preparation and Implementation Unit (PPIU) will be responsible for Draft Project Information Memorandums (PIMs), working with sub-regional core Tripartite partners, for facilitating, co-ordinating and monitoring progress of implementing projects and programmes. The Tripartite Infrastructure Project Steering Committee established for the North-South Corridor pilot programme will be extended to oversee the overall implementation of the Tripartite and IGAD Corridor Programme. The already defined functions of the Tripartite Infrastructure Project Steering Committee will apply and detailed work plans will lay out implementation each year from 2011-2016 as the initial phase.

4.1.2.4 Monitoring Mechanism for Status of Implementation

Given the importance placed on regular monitoring and evaluation, especially in such a fast moving and complex field as ICTs, a separate line item has been devoted to developing the appropriate progress monitoring indicators and procedures. The strategy is to take a pragmatic approach, avoiding proliferation of indicators and only considering the elements that are critical to measure and are regularly available.

For the ICT Sector Plan, the overall level of progress of each of the Member States in adopting the key ICT strategies, policies and regulations would be the most important measure, assessed against achievements in the following areas:

1. Up to date National ICT strategy and adoption of ICTs as a national policy priority for development;
2. ICT policy environment – openness to new operators, cost-based licence fees, tariff and infrastructure sharing regulation, number portability, infrastructure sharing;
3. Communications infrastructure density – extent of national backbones, cross-border links, IXPs, satellite access, postal branch density, digital broadcast coverage, traffic volumes, users (mobile, fixed), education, research and health institution connectivity – number of schools and hospitals/clinics connected with high capacity low cost bandwidth;
4. Progressive spectrum allocation policy and low-cost, efficient licensing;
5. Cyber security and e-commerce/e-transaction legislation and presence of CERTs;

6. Consumer protection legislation;
7. e-Services/applications available, especially e-government;
8. Presence of Universal Service Objectives and Funds, and other support for public access facilities including postal branches;
9. Exemption from duties and taxes on ICT equipment and services, and fiscal or other financial incentives to promote ICT adoption;
10. Human resource investment – education, training, capacity building and networking;
11. Public investment in research and development; and
12. Up-to-date data collection and statistics publication.

Further details are given in the Annexure.

4.2 Critical Factors for Successful Implementation

As indicated throughout the ICT Sector Plan, the most important factor in success is likely to be the commitment of Member States to ensuring the enabling environment is in place, i.e. opening up ICT markets to new players, ensuring there is open-access or competitive wholesale backbone infrastructure provision, ensuring there is access to radio spectrum for broadband, providing sufficient resources for regulators to enforce regulations and putting ICTs on top of the development agenda.

ANNEXURE 1 - PROJECT IMPLEMENTATION STRATEGY SUMMARY & TIMELINE

1.	Enabling Policy & Regulatory Environment for Maximising ICT Infrastructure Deployment				
	Strategic Interventions	**Project Activities**	**Budget US$ ('000)**	**Funding/ Action Party**	**Timeline**
	1.1 Rapid regional assessment of key national ICT policy constraints in Member States	Short term evaluation of: 1) Access to broadband radio spectrum, 2) Access to national fibre backbones, 3) Open market and technology neutral licence availability for new infrastructure operators. Regional Workshop.	88.5	SADC, CRASA, Member States, Development Partners	2013-2014
	1.2. National ICT policy reviews	Integrated assessment of status of national ICT sector reform. National studies and national workshops.	440.0	SADC, Member States & NRAs, Development Partners	2013-2014
	1.3. Regional and national broadband strategy development	Regional development of broadband access targets and identification of best practice strategies to meet these.	50.0	SADC, CRASA Member States & NRAs, Development Partners	2013-2015
		Development of regional guidelines and regulations on tariffs for use of public infrastructure assets (in particular transport and energy grids).	40.0		
		Identification of best practices and guidelines for extension of national and international terrestrial fibre backbones.	80.0		
		Guidelines and updated planning approval procedures to ensure that all new public infrastructure includes fibre and ducts, including public and commercial buildings.	15.0		
		Hosting of three regional fora for ISPs on IXP development.	115.5		
		Review and updating of spectrum allocation plans to take into account latest technologies.	50.0		
		Promoting telecom capacity pricing information exchange across the region – feasibility study for regional capacity trading platform, implementation support if feasible.	290.0		
		Support for public sector operators in Member States to transition to new market environments where needed.	490.0		
		Three Regional Policy and Regulatory 3-day workshops to review the results of the above activities.	115.5		

	1.4 Model national postal policy development and regional harmonisation	Identification of strategies for creating regulated postal markets and autonomous operators, addressing institutional/cultural and productivity issues, raising the profile of the postal system in national budget allocations, in national ICT strategies, and in access to the Universal Service Funds.	50.0	SADC, Member State Ministries of ICTs, SAPOA, Development Partners	2013-2017
	1.5 Updating the framework for SADC regional home and away roaming regulation	Updating national regulations/implementation (ongoing).	Ongoing	SADC, CRASA Member States, Development Partners	2012-2014
PROJECT 1 SUB-TOTAL inc 10% Project Management			**2,007.0**		

2	**Monitoring and evaluation of progress toward Digital SADC 2027**				
	Strategic Interventions	**Project Activities**	**Budget US$ ('000)**	**Funding/ Action Party**	**Timeline**
	2.1 Identify the indicators to be measured	Study for development of proposed set of ICT progress markers for verification at regional meeting, two more regional meetings for follow-up to 2.1, 2.2, 2.3, including capacity building for data analysis and presentation.	155.5	SADC, Policy, Planning, Resource Mobilisation and Statistics, CRASA, National Regulators, NSOs Development Partners	2013-2014
	2.2 Ensuring operators submit data periodically quarterly for some, annually for others to regulator	Development of model regulatory guidelines for national adoption to compel operators to submit quarterly data.	20.0	SADC Member States Development Partners	2013-2013
	2.3 Implementation of regulator data gathering and publication, and ICT observatory	Pilot for 2 years – regulator data gathering, ICT observatory establishment, GIS mapping integration, (review & training workshops covered in 2.1 costs)	125.0	SADC, CRASA, Member States Development Partners	2013-2015
PROJECT 2 SUB-TOTAL inc 10% Project Management			**330.5**		

3	**Ensuring Confidence and Security in Networks and Services**				
	Strategic Interventions	**Project Activities**	**Budget US$ ('000)**	**Funding/ Action Party**	**Timeline**
	3.1 Help to establish multi-stakeholder Computer Emergency Response Teams (CERTs) in each Member State and regionally	Development of model guidelines for CERTs and National implementation support in SADC Member States where needed.	500.0	SADC, CRASA Member States Development Partners	2013-2015
	3.2 Capacity building for timely switch-over to IPv6 in civil service networks	Three regional training workshops.	115.5	SADC Member States, AfriNIC, Development Partners	2013-2014
	3.3 Development of standards and model national guidelines and regulations for cable laying and cable protection	Study and two regional meetings.	107.0	SADC, CRASA Member States Development Partners	2013-2014
	3.4 Harmonisation of security standards in order to respond to cyber-crime, terrorism, drug trafficking, and money laundering.	Capacity building of postal operators to apply appropriate security measures. Two regional training workshops.	70.0	SADC, CRASA, SAPOA, Member States, Development Partners	2013-2015
PROJECT 3 SUB-TOTAL inc 10% Project Management			**871.75**		

4	**Infrastructure (a) Consolidation of Regional Communications Infrastructure**				
	Strategic Interventions	**Project Activities**	**Budget US$ ('000)**	**Funding/ Action Party**	**Timeline**
	4.1 Assess needs for additional cross-border links between SADC Member States where there is only one such link	Feasibility study for links, and use of passive trans-boundary smart corridors. Study plus.	80.0	SADC, SATA, Member States, Operators Development Partners	2012-2017
		Corridor facilitation meetings.	75.0		2012-2017
	4.2 Implementation of cross-border links	Deployment of 5,000 km of optic fibre @ 15K/km.	75,000.0	SADC, SATA, Operators, Member States, Development Partners, PIDA	2012-2017
		Deployment of 3,000 km of submarine optic fibre for Seychelles second link/2nd Asia route for SADC.	50,000.0		2013-2017
	4.3 Regional IXP development	Feasibility study and facilitation for Regional IXP. Consultancy and two Regional meetings.	95.0	SADC, Member States, ISPs, Telecom operators Development Partners, PIDA	2012-2017
	4.4 Shared satellite network development	Assess needs and economic feasibility for a shared regional VSAT network for connecting remote research centres, schools, meteorology stations, wildlife conservation posts, border posts, clinics, emergency services and postal branches. Would include evaluation of best location for initial Earthstation hub, migration path to national ground-stations if needed.	40.0		2013-2014
		Satellite network/hub implementation support for construction of satellite hub (6M antenna, redundant RF equipment, NOC, installation).	900.0	SADC, Member States Development Partners	2014-2017
	4.5 DTT Migration support	National initiatives for Member States where needed.	180.0	SADC, Member States, National Broadcasters, Development Partners	2012-2015

	4.6 Regional and national integrated Broadband infrastructure	Deployment of regional and national integrated core broadband infrastructures providing a fully redundant self-healing resilient, ubiquitous and cost-effective broadband access network covering the harsh terrain of SADC Member States reaching even the rural or under-served areas.	21,000,000.0	SADC, SATA, Member States, Operators Development Partners	2013-2017
SUB TOTAL inc 10% Project Management			**21,139,007.0**		

5	**ICT Capacity Building and Content**				
	Strategic Interventions	**Project Activities**	**Budget US$ ('000)**	**Funding/ Action Party**	**Timeline**
	5.1 Awareness raising for policy makers & development practitioners of strategies for ICT supported development	Development of briefing paper to ensure workshop participants are familiar with the use of available digital services, as well as their wealth creation and employment potential. 3-day regional conference for 100 participants + facilitation by briefing paper authors.	149.0	SADC, Member State Min ICTs, Dev. Partners	2013-2017
	5.2 Establishment of national call centres to help citizens with use of e-services and access to government information	Study for reference design of workshops and call centres.	40.0	SADC, Member State Min ICTs, Dev. Partners	2013-2015
		National support for call centre setup in SADC Member States where needed @300K each.	1,800.0		
	5.3 Promotion of information literacy through adoption of harmonised regional ICT training standards and certification	Development of regional certification standards for information literacy. Model national ICT literacy training syllabus development and ICT training standards/certification harmonisation needs assessment.	60.0	SADC, Member State Min ICTs& Education, Dev. Partners	2013-2014
	5.4 Capacity building of NRAs National Broadcasters and CERTs in ICT technological developments	3 X 4 day regional training workshops, facilitation.	144.5	SADC, Member State Min ICTs, NRAs, Nat. Broadcasters, CERTs, Dev. Partners	2013-2014
	5.5 Development of regional repositories and content development hubs for access to multimedia learning and cultural heritage materials for access via the web or for broadcast	Identification of content gathering and hosting entities, content sources and providers, identification of gaps in available content, intellectual property issues, opportunities for sharing with other regions. 2 day review workshop, plus implementation support.	575.0	SADC, Member State Min ICTs& Education, Dev. Partners	2013-2017
	5.6 Establishment of regional centres of excellence	Regional DTT training facility institutional support.	500.0	SADC, SATA, Member State Min ICTs& Education, Dev. Partners	2013-2015
		Development of regional accreditation procedures for the CoEs, including postal CoE.	40.0		
		Establishment of regional centre of excellence in ICT and postal systems.	1,500.0		
SUB TOTAL inc 10% Project Management			**5,289.35**		

6	**Regional e-Services and Applications**				
	Strategic Interventions	**Project Activities**	**Budget US$ ('000)**	**Funding/ Action Party**	**Timeline**
	6.1 Develop e-government services and applications	Study to identify required e-government applications to be developed, potential business models and sources of software/developers and systems for shared services/back office/cloud computing platforms for government, and evaluation of potential for regional cost sharing through creation of a single library of regional applications that can be localised for national implementation.	100.0	SADC, Member State Ministries of Home Affairs, Health, Education, Transport, Trade and Agriculture, Development Partners	2012-2017
		2 day regional workshop for verification of study conclusions	35.5		
		Implementation support for governments of special case SADC Member States – 6 states @ US$500k ea	3,000.0		
	6.2 Develop model national e-commerce, e-marketplace and e-payment strategies and integration with postal systems	Study for identification of needs / feasibility assessment for national and regional payment gateways and e-marketplaces for small business web site hosting and shared online services provision. Strategies for integration with postal systems. Identification of other partners outside ICT sector that may be required.	110.5	SADC Trade Industry Finance & Investment, SADC Regional Chamber of Commerce (ASCCI), SADC Business Forum, SADC Bankers Forum, Member States Min Trade, Development Partners	2012-2014
		Implementation support for governments of SADC Member States where needed.	1,800.0		
	6.3 Develop accessible government Open Data policies, management systems and related spatial data mapping facilities for public data	Design of national and regional reference models and policies, and technical/economic feasibility assessments for national implementation and regional consolidation. Two-day regional verification workshop.	110.5	SADC, Member States Min ICT, Min Housing, Transport, Land, Home Affairs, Agriculture Development Partners	2013-2015
	6.4 Reference model for GPS and 3G-Wifi gateways on public transport vehicles (intelligent transport systems)	Development of technical and business implementation strategy for 'intelligent transport systems' to monitor movement of the public transport for traffic management planning and provide connectivity for passengers.	25.0	SADC, Member States Min ICT, Min Transport, private transport companies, Development Partners	2013-2015
	6.5 Establish a common cross-border traffic administration platform for all border posts in the region (ICT support for One Stop	Assessment of connectivity requirements and software/hardware needs, opportunities for sharing these costs across the region. Identification of	235.5	SADC, SADC Transport and Tourism sector Development Partners	2013-2014

	Border Posts and smart corridors)	software and network architecture requirements for sharing information between border posts and between border agencies (customs, immigration, Interpol, health, agriculture etc). Plus 2 day regional verification workshop.			
		Shared regional software development (estimate for allocation). Funds used essentially to kick-start the establishment of a shared software development platform for government services amenable to sharing development costs across the region. Includes initial feasibility/modalities study and two regional meetings	1,571.0	SADC, Corridor Authorities, Member State Min Home Affairs/ Customs/Immigration, Transport, Agric, Health, Police/Security Development Partners	2013-2016
SUB TOTAL including 10% project management			**7,686.8**		

7	**Research, Innovation and Industry Development**				
	Strategic Interventions	**Project Activities**	**Budget US$ ('000)**	**Funding/ Action Party**	**Timeline**
	7.1 Promote improved collaboration, information and knowledge sharing between research centres	National support for research institution connectivity (campus and backhaul) in SADC Member States where needed @ US$500,000 each.	3,000.0	SADC, Member State Ministries of ICTs, Higher Education, Science & Research, Trade and Industry, SARUA	2013-2015
	7.2 Establish incubators for small ICT businesses	Study to identify model strategies and governance structures for the establishment of ICT small business incubation facilities (offices, shared facilities, low cost high speed internet, web hosting, marketing support etc).	35.0	SADC Trade Industry Finance & Investment, SADC Regional Chamber of Commerce (ASCCI), SADC Business Forum, SADC Bankers Forum, Member States Min Trade, Science & Technology Development Partners	2013-2016
		Support for establishment of incubators in SADC Member States @ US$350,000 each.	2,100.0		
	7.3 Develop ICT equipment manufacturing facilities, software and applications	Market and technical feasibility study on regional ICT equipment manufacturing facilities, possibly building on the DTT set top box manufacturing opportunities. Includes scoping exercise to identify other technologies amenable to local manufacturing, software and applications development and identify appropriate roles and modalities for government support to incubators (such as guarantees on working capital or loan funds, or other incentive packages for setting up facilities), and identify governance structures, potential incubator implementers, trainers/ mentors and fund managers.	60.0	SADC, Trade Industry Finance & Investment, SADC Regional Chamber of Commerce (ASCCI), SADC Business Forum, Member States Min Trade, Member States Min ICT, Development Partners	2013-2017
		Industry colloquium to verify study conclusions and identify additional opportunities, raise awareness of initiative.	69.5		
	7.4 Mitigate negative environmental impacts of ICTs (climate change and e-waste)	Development of regional and national standards and best practices for addressing climate change, e-waste, and Environmental Impact Assessments (EIAs) for infrastructure projects. Include reference design for smart renewable energy-based data centres and evaluation of the cost of the SATA proposals for e-waste handling. Two day verification workshop.	95.5	SADC, SATA, Member States Min ICT, Min Environment, Development Partners	2013-2015
		Support for regional centre for management of e-waste.	150.0		2013-2020
SUB TOTAL including 10% project management			**6,061.0**		

8	**Infrastructure (b) Postal Sector Strengthening**				
	Strategic Interventions	**Project Activities**	**Budget US$ ('000)**	**Funding/ Action Party**	**Timeline**
	8.1 Implementation of postal code addressing systems in Member States that do not have them	Alignment of the national addressing standard with the UPU S42 Addressing Standard, establishment of delivery points databases, establishment of a change of address system, numbering of streets and houses in line with country requirements.	110,000.0	SADC, Member State Ministries of ICTs, SAPOA, Development Partners	2013-2016
	8.2 Extension of national postal branch networks to more locations, especially rural areas	Study for strategy development for extension of national postal branch networks to more locations, especially rural areas, including consideration of options such as franchise models and access to universal service funds.	50.0	SADC, Member State Ministries of ICTs, SAPOA, Development Partners	2013-2016
		Regional Meeting to consider results of studies.	35.0		
	8.3 Improving use of ICTs in postal systems	Strategy development and assessment of economic feasibility for introducing improved use of ICTs in postal systems (network connectivity, capacity building & training, public access to internet facilities and augmented service delivery), postal branch office process counter automation. Country by country analysis to establish exact funding needs.	70.0	SADC, Member State Ministries of ICTs, SAPOA, Development Partners	2013-2016
		Allocation for implementation (SAPOA initial estimate - 100m + 40m for counter automation).	140,000.0		
	8.4 Regional GMS for mail QoS measurement	Implementation of a regional GMS for mail by postal operators.	10,000.0	SADC, Member State Ministries of ICTs, SAPOA, Development Partners	2013-2014
	SUB TOTAL including 10% project management		**286,170.5**		
Grand Total for all Projects			**436,050.0**		

ANNEXURE 2 - Milestones and Performance Objectives

Milestone	Strategic Objective	Key Performance Indicators	Actions	Status	Timeline (months)	Lead Agency	Potential Financing Sources
Establishment of enabling policy and regulatory environment	Update and harmonise national ICT policies and legal framework to improve the supporting ICT infrastructure policy and regulatory environment to ensure that the objectives for Digital SADC 2027 can be most efficiently and rapidly achieved.	A uniform policy and regulatory environment across the region which encourages the uptake of ICTs, acts transparently, ensures a level playing field where disadvantaged communities are not isolated from the ICT revolution. Improved sustainability/return on investment (ROI) on infrastructure investments and simplified administrative processes for deploying infrastructure. Increased private sector investment in the sector. Lower cost of access/tariffs, roaming charges. More broad-based uptake among low income groups. More sustainable high-capacity infrastructure deployed in remote areas. Efficient national and regional Internet traffic exchange. Internet providers have access to the	Identification of key policy bottlenecks: 1) Access to broadband radio spectrum, 2) Access to national fibre backbones, 3) Open market and technology neutral licence availability for new infrastructure operators. Integrated assessment of status of National ICT sector reform. Regional development of broadband access targets and identification of best practice strategies to meet these. Development of regional guidelines and regulations on tariffs for use of public infrastructure assets (in particular transport & energy grids). Identification of best practices and guidelines for extension of national and international terrestrial fibre backbones. Guidelines and updated planning approval procedures to ensure that all new public infrastructure includes fibre and ducts, including public and commercial buildings. Hosting of 3 regional fora for ISPs on IXP development.	Approval	6-18	SADC Secretariat	EU, DfID, USAID, AfDB/PIDA, IsDB, DBSA, AFD, CIDA, SIDA, GIZ

Milestone	Strategic Objective	Key Performance Indicators	Actions	Status	Timeline (months)	Lead Agency	Potential Financing Sources
		most cost effective technologies for broadband provisioning. Lower cost access to international broadband capacity. More efficient national telecommunication operators. More efficient and more accessible postal networks. Lower costs of roaming for the public	Review and updating of spectrum allocation plans to take into account latest technologies Promoting capacity pricing information exchange across the region – feasibility study for regional capacity trading platform. Implementation support if feasible. Support for public sector operators in Member States to transition to new market environments where needed. Model National Postal Policy Development and Regional Harmonisation. Updating the framework for SADC regional home and away roaming regulation.				

Milestone	Strategic Objective	Key Performance Indicators	Actions	Status	Timeline (months)	Lead Agency	Potential Financing Sources
Progress monitoring mechanism in place in all Member States	Monitor and evaluate progress toward Digital SADC 2027	SADC Secretariat and Member states have up to date information on uptake of ICTs. Strategic decision-makers, government, public sector agencies, private sector, NGOs and consumer groups have better information on which to base their decisions and policies.	Study for development of proposed set of ICT progress markers for verification at regional meeting. Two more regional meetings for follow-up, including capacity building for data analysis and presentation. Development of Model regulatory guidelines for national adoption to compel operators to submit quarterly data. Pilot for 2 years, regulator data gathering, ICT observatory establishment, GIS mapping integration, (review & training workshop).	Approval	6-18	CRASA	EU, DfID, USAID, AfDB/PIDA, IsDB, DBSA, AFD, CIDA, SIDA, IDRC
Secure, reliable networks and services	Ensure Member State and regional communication networks are secure and reliable, and do not pose undue threats to their users and do not limit use through lack of confidence, presence of threats or potential service interruptions Ensure institutional capacity at a national and regional level is in place to respond to network threats	Business, government, civil society and the consumer benefit from being able to place increased reliance on electronic and postal communications.	Establish multi-stakeholder Computer Emergency Response Teams (CERTs) in each Member State and Regionally. Capacity building for timely switch-over from IPv4 to IPv6 in civil service networks in order to respond to the exhaustion of the IPv4 address space. Development of standards and model national guidelines and regulations for cable laying. Identification of strategies for ensuring infrastructure security against threats such as theft, vandalism and accidental damage.	Approval	12-36	SADC Secretariat	EU, DfID, USAID, AfDB/PIDA, IsDB, DBSA, AFD, CIDA, SIDA, IDRC, CISCO, ISOC, internet providers, telecom operators

Milestone	Strategic Objective	Key Performance Indicators	Actions	Status	Timeline (months)	Lead Agency	Potential Financing Sources
	Implement regionally harmonised regulations and systems to respond to cyber and postal security threats		Development of legal penalties for vandalism and lack of due care, and mandatory reciprocal access to other operator infrastructure. Postal network security optimisation - harmonisation of security standards in order to respond to cyber-crime, terrorism, drug trafficking, and money laundering.				
Complete Intercontinental, Inter-Regional, Regional, and National Communications Backbones and Networks	Ensure that the region is fully interconnected nationally, regionally and globally through reliable and affordable high-capacity fibre optic links Complete the remaining SADC cross-border infrastructure gaps Fulfil the Connect Africa and AU goals for each country to be connected to its neighbour Ensure each Member State capital city is linked to all of its Member State neighbours via at least two routes, and to at least two cable landing stations of different cross-continental	Improved national, regional and global integration, accelerated economic and social development supported by pervasive affordable high speed connectivity. Presence of competitive routes for direct traffic exchange between SADC Member States and elimination of the need to rely on expensive submarine fibre capacity. Presence of backup routes to neighbouring country submarine landing stations. Provision of broadband capacity to communities along the routes. Increased international interconnection between operators. Increased inter and intra Regional traffic.	Feasibility study for links, and use of passive trans-boundary smart corridors. Study plus 15 corridor facilitation meetings. Deployment of 5,000 km of optic fibre. Deployment of 2nd Seychelles submarine link. Regional IXP development. Regional and national needs and economic feasibility assessment for satellite network/hub. Implementation support for satellite network. DTT Migration support.	Some links in progress, remaining are pre-feasibility	12-36	SADC Secretariat	EU, World Bank, AfDB/PIDA, IsDB, DBSA, AFD, China EXIM Bank, Private Operators, Member States

Milestone	Strategic Objective	Key Performance Indicators	Actions	Status	Timeline (months)	Lead Agency	Potential Financing Sources
	submarine networks. Ensure the region is connected to its neighbouring regions – EAC/COMESA/ECCAS, and thereby to the rest of Africa (i.e. initially via Angola and Tanzania to the countries to the north, and then also via DRC). These links also to provide access to additional submarine cable systems, such as TEAMS and LION which land in Mombasa, and could be reached via links to Tanzania Ensure affordable satellite based connectivity solutions are in place for remote areas outside the near-term reach of fibre infrastructure. Ensure that the whole SADC Region has a fully integrated, redundant, self-healing, resilient core broadband infrastructure reaching even the rural or under-served areas	Increased traffic on submarine cables. Increased international bandwidth per country (Mbps). Increased broadband coverage, accessibility and reliability. Increase broadband subscriber numbers per country. Increased ISP peering observed at IXPs. Increased Number of ASNs per country. Reduced price of international incoming and outgoing calls. Reduced price of broadband access and usage. Increased average broadband speeds. Reduced price of local hosting. Increased number of local web sites. Increased number of terrestrial ISP licences. Reduced price of international and domestic wholesale capacity.					

Milestone	Strategic Objective	Key Performance Indicators	Actions	Status	Timeline (months)	Lead Agency	Potential Financing Sources
Increased ICT capacity and literacy in the Region	Maximise human capacity in the region to be able to take advantage of ICTs through training and awareness raising activities which are conducted at the regional level to take advantage of increased efficiencies and cost sharing between Member States Build a critical mass of online content which can be delivered to as wide an audience as possible via the full range of access methods – television, radio, desktops/tablet PCs, and mobile handsets	Policy makers and professionals are better able to exploit the potential of ICTs to support socio-economic development. National NRAs better able to identify issues and enforce regulations, broadcasters better able to respond to the challenges of technology convergence and CERTs able to react quickly to incidents and minimise their impact. Common information literacy certification of employees is uniformly recognised across the region.	Awareness-raising for policy makers & development practitioners of strategies for ICT supported development. Establishment of national call centres to help citizens with use of e-services and access to government information. Promotion of information literacy through adoption of harmonised regional ICT training standards and certification. Capacity building of NRAs, National Broadcasters and CERTs in ICT technological developments. Development of Regional Repositories and content generation hubs for multimedia learning and cultural heritage materials accessible via the web and for broadcast. Establishment of national and regional centres of excellence in ICTs and Postal Services.	Approval	6-36	SADC Secretariat	EU, World Bank, AfDB/PIDA, IsDB, DBSA, AFD, IICD, GIZ
Availability of e-Services and Applications	Improve efficiency of public service delivery and e-commerce	Government e-services reduce costs for both government and the public, increased transparency, efficiency and quality of service.	Provide support for development of e-government services and applications aimed at creating better service delivery, internal efficiencies and significant cost savings.	Approval	6-36	SADC Secretariat	EU, DfID, USAID, AfDB/PIDA, IsDB, DBSA, AFD, CIDA, SIDA,

Milestone	Strategic Objective	Key Performance Indicators	Actions	Status	Timeline (months)	Lead Agency	Potential Financing Sources
	Facilitate administration of regional flows of people, goods and services Provide open access to public data	Reduced government expenditures on service delivery, more rapid service delivery. Data available to the public helps to find solutions to challenges in education, health and other sectors, along with more transparent governance. Improve land delivery, tenure security and curb corruption. Increased opportunities for SMEs to develop applications, services and market goods and services locally, regionally and globally. Improved efficiency of public transport systems and ability to tele-work while travelling.	Identification of opportunities for sharing costs regionally for applications development, bulk purchasing of capacity and ICT equipment. Develop model national e-commerce and e-marketplace strategies, including e-payment systems and integration with the postal sector. Develop government Open Data policies and management systems for provision of public data and related spatial data mapping facilities. Develop reference model for GPS and 3G-Wifi gateways on public transport vehicles to monitor movement of public transport for 'intelligent transport systems' - traffic management planning and providing connectivity for passengers. Establish a common cross-border traffic administration platform (customs, immigration, agriculture etc) for all border posts in the region. Formulate a model software platform for general sharing of software development costs across the region. Identify short- to medium-term opportunities to port similar government services online.				

Milestone	Strategic Objective	Key Performance Indicators	Actions	Status	Timeline (months)	Lead Agency	Potential Financing Sources
Effective R&D supporting vibrant ICT industry	Strengthen R&D and research institutions and SMEs working in the ICT sector Promote national and regional institutional collaboration, innovation and development of local ICT industry Increase the number of jobs in the ICT sector. Minimise the negative effects of ICTs on the environment	Researchers, teachers and entrepreneurs with improved access to knowledge, leading to increased R&D, innovation, jobs and wealth creation in the local ICT sector. ICT equipment costs minimised – especially DTT set-top boxes. Minimised negative environmental effects of ICT equipment deployment, manufacture and use.	Promote improved collaboration, information and knowledge sharing between research centres. Establish incubators for small ICT businesses and ICT research parks and improve links between the academic sector and ICT industry. Develop ICT equipment manufacturing facilities, software and applications. Identify and mitigate negative environmental impacts of ICTs (climate change and e-waste). Establish regional centre for e-Waste management.	Approval	12-48	SADC Secretariat	EU, WB, DfID USAID, AfDB/PIDA, IsDB, DBSA, AFD, CIDA, SIDA, IDRC, NorAID, IFC
Efficient affordable and widely available postal systems	Strengthen national postal systems	Increased social and economic inclusion, more use of e-commerce, financial services and public access to electronic information services, especially in remote and rural areas. Businesses operate more efficiently, improved emergency services due to improved addressing systems, and increased regional integration and e-commerce due to more efficient and secure international mail between member states.	Implementation of postal codes & addressing systems in Member States that do not have them Extension of national postal branch networks to more locations, especially rural areas. Improved use of ICTs in postal systems to support: automation of postal systems (front office/counter automation, back office and mail processing). Capacity building of postal operators to apply appropriate security measures.	Approval	6-48	SADC Secretariat	Member States, UPU, AfDB, DBSA, IsDB, AFD, SIDA

Milestone	Strategic Objective	Key Performance Indicators	Actions	Status	Timeline (months)	Lead Agency	Potential Financing Sources
		Addressing systems provide proof of existence to individuals and organisations and helps rural people to participate in the economy. Customers benefit from improved speed of delivery and tracking of international mail.	Implementation of a regional end to end measurement system (GMS) to improve the quality of service on international mail.				

ANNEXURE 3 - ICT Project Details

Title of Project 1	**Enabling Policy & Regulatory Environment for Maximising ICT Infrastructure Deployment**
Project Sponsors	SADC, CRASA, Ministries of ICTs, National Regulators, Competition Commissions
Corridor	All
Participating Countries	All Member States
Objectives	Improve the supporting ICT infrastructure policy and regulatory environment to ensure that the objectives for Digital SADC 2027 can be most efficiently and rapidly achieved.
Project Description	1. Rapid assessment of key ICT policy constraints in Member States. Identification of immediate policy changes required for: • Access to broadband radio spectrum and use of TV whitespace for broadband; • Access to national fibre backbones and the fibre infrastructure of utility operators at market-based rates; and • Open market and technology neutral licence availability for new infrastructure operators. 2. Integrated National ICT policy reviews and national broadband strategy development. Member States would convene multi-stakeholder forums to address the policy and regulatory issues by an independent regional assessment of the status of ICT sector reform and market liberalisation, and to develop national broadband strategies. The assessment study would consider: a) Regulator institutional capacity, particularly to enforce regulations and to institute operator tariff controls, pricing transparency, interconnection and infrastructure sharing (including support from Anti-Competition Laws). b) Openness of ICT markets to new entrants and presence of technology/service neutral converged licensing regimes, c) Structural separation of wholesale from retail operations among incumbents, d) Spectrum management (cost based spectrum fees, sub-licensing of spectrum, up to date allocation plans), e) Presence of taxation constraints to ICT uptake and fiscal system opportunities to promote ICT uptake, f) Alignment of ICT policies with the government's overall development goals. 3. Definition of national broadband strategies would be supported at regional level through a) Identification of ICT uptake targets for Member States, b) Development of guidelines on best practices for supporting extension of national fibre backbones, especially to more remote areas (e.g. case studies of government backbone owners, use of PPPs and Universal Service Funds), c) Support for implementation of regulations which update land-use planning approval procedures to ensure that all new public infrastructure includes fibre and ducts (including public and commercial buildings (e.g. Botswana)), d) Promoting the establishment of National and Regional IXPs to maximise performance and reduce costs by ensuring that SADC traffic is kept within the Region, local traffic is kept local (by supporting regional fora of ISPs), e) Promoting wholesale pricing information exchange across the region, by implementing a capacity trading platform, f) Reviewing and updating spectrum allocation plans to take into account needs for broadband and latest technology developments (e.g. assess the feasibility of using new radio technologies such as TV whitespace (802.22) as an interim measure until DTT migration has taken place, plus development of proposals for broadcasting spectrum fee regulations), g) Support for public sector operators to transition to new market environments (national studies for SADC Member States where needed). 3 Regional workshops to review the outputs of the above activities. 4. Development of Model National Postal Policy Development and Regional Harmonisation, including strategies for creating regulated postal markets and autonomous operators, addressing institutional/cultural and productivity issues, raising the profile of the postal system in national budget allocations, in national ICT strategies, and in access to the Universal Service Funds. 5. Updating the framework for SADC regional home and away roaming regulation.

Expected Results	A uniform policy and regulatory environment across the Region which encourages the uptake of ICTs, acts transparently, ensures a level playing field where disadvantaged communities are not isolated from the ICT revolution. Improved sustainability/ROI on infrastructure investments and simplified administrative processes for deploying infrastructure leading to increased private sector investment in the sector. Lower cost of access/tariffs leading to more broad-based uptake among low income groups. More sustainable high-capacity infrastructure deployed in remote areas.
On-going Related Activities in SADC/ Tripartite Region	Enabling policy and regulatory environment support is one of the three PIDA ICT priorities - US$25m is proposed for continent-wide support for policy and regulatory development. ITU/EU HIPSSA project has already been active in promoting harmonised policies and guidelines for the ICT market as well as building human and institutional capacity in Sub-Sahara. HIPSSA supported proposals for the revision TCM protocol and the Telecommunication Policy Guidelines. The following components are existing SADC projects: • National broadband strategies development; • Monitoring and evaluation of the SADC Action Plan for Digital - Broadcasting Migration; • Framework for SADC regional roaming regulation; and • SADC Frequency Band Plan - Development of a Radio Spectrum Channelling Plan. Ongoing revision of the SADC Model Telecom bill and some national legislation also includes some of elements the programme. The establishment of IXPs is expected to be achieved without further intervention due to existing initiatives and support for regional fora for internet providers – the PIDA budget includes USD$130 million for IXPs and the African Union also has an existing IXP support project now being tendered for. Botswana has carried out stakeholder consultations to ensure minimum provisioning of the ICT internal reticulation networking for Government and Commercial buildings. This confirmed that the existing Botswana Standards (BOS) should be mandatory and be given a higher profile earlier in the planning process. South Africa has a) Introduced an “Administrative Incentive Pricing (AIP) scheme” for radio spectrum to introduce greater efficiency in the use of spectrum and ensure that fees only cover the administrative cost incurred to regulate spectrum, and b) A schedule for periodic review of markets; Regulations for monitoring and investigating anti-competitive behaviour; Significant market power determinations; Pro-competitive licence conditions; Methodology to determine effectiveness of competition; and Methodology to define and identify markets The US government is giving technical assistance to Kenya in developing strategies for broadband deployment and universal access, including management of Universal Service Fund. The COMESA Secretariat is developing a concept paper on a planned study on the readiness of Member States to migrate and deploy Next Generation Network and broadband connectivity, and to develop a road-map and enabling policy options for the same. COMESA and EAC have established regional competition authorities. The European Commission has published a guide for local and national governments setting out good practice in planning broadband investments that combine public and private investment. The South African Government is conducting an ICT policy review and developing a white paper on an integrated ICT policy, and plans to ensure 100% broadband penetration by 2020, and has begun a TV whitespace for a broadband pilot project in the Western Cape.

Description of National Plan to the project	Member State Ministries of ICTs, NRAs and competition boards are responsible for implementing recommendations and regulations, facilitating consultations and hosting workshops. Top level commitment to sector reform and rapid policy change to address the chief bottlenecks.
Status	Project elements to be approved.
Next steps	Approval of project, promotion for financing, esp. to PIDA.
Business Model	Main project cost is in human resources for studies, capacity building and regional workshops. It is based on grant funding with no direct revenue generation, although government expenditure will ultimately result in increased tax returns along with many other intangible benefits to society.
Main parties in place	SADC, CRASA, Ministries of ICTs, NRAs, competition boards in some SADC Member States, ISP associations in some SADC Member States.
Main parties to be procured	Studies/expertise, workshop organising, facilitation.
Technical/ Operational Notes	The rapid initial assessment is needed to institute the well-known urgently required policy changes, with longer-term assessment of status of ICT sector reforms for identification of all national policy constraints and development of integrated national broadband strategies, i.e. removing limits to the number of communication licences to improve competitive pressure on prices, reducing the cost of licensing and speeding up the licensing process. The national ICT policy reviews would also include evaluation of progress toward technology/service neutral licensing regimes, experience with regulations which mitigate the dominance or significant market power (SMP) of operators. The concluding element would be to assess the degree of alignment of ICT policies with general national development policy goals and competitiveness agendas. Support for development of national broadband plans, goals and regional harmonisation would also cover assessment of opportunities to use fiscal incentives to help accelerate broadband deployment. Fiscal system decision-makers need information on the benefits of reducing multiple taxation, and special taxation on ICT services (taxes at both national and local levels which add to the costs for the operator or end-user, especially the high levels of sales or value added taxes on communication services and equipment) and on opportunities for using tax incentives to promote the use or deployment of ICTs, especially for assistive technologies for people with special needs. As summarised above, also supported would be: a) Identification of priority inter-sectoral synergies, cost sharing opportunities and policy coherence (e.g. postal, schools, clinics, tourism and meteorological network connectivity needs, smart energy grids) b) Identification of strategies to assist state owned operators (often chronically under-resourced compared to the private mobile operators) to make the strategic shifts in order to adapt to the ICT market in which voice is an increasingly small part of revenues c) Development of regional guidelines and regulations required to limit the tariffs often requested by the owners for use of their public infrastructure assets such as the dark fibre of incumbent operators and utility networks (energy/transport), as well as passive infrastructure such as ducts, electricity poles, pylons, rail lines etc. d) Urgent updating of the regional spectrum allocation plan is required to address the critical need for efficient wireless spectrum management to ensure wireless broadband can be fully deployed. Currently lack of access to the most suitable spectrum for wireless internet in the 400MHz, 800MHz and 2600MHz bands - is amongst the most serious bottlenecks to improving access. Standards such as IEEE 802.22 enable the sharing of spectrum between broadcasters who have already been allocated the frequencies, and new commercial uses, especially to allow for penetration into rural and remote areas. Broadband operators would not need to focus solely on the 700-800 MHz band but could also use the other white space frequencies - the unused spectrum that is between the TV channels. This spectrum is prime for wireless broadband services because it can travel long distances and penetrate walls (8-10Mbps @ up to 10kms). The study to assess the feasibility of this approach in the region could be combined with development of proposals for broadcasting spectrum fee regulations.

	e) A regional capacity trading platform is needed to improve transparency in the market to make it more efficient and help to drive down prices. Could be modelled on the SAPP Energy internet-based trading market (http://www.sappmarket.com). A regional capacity trading market could function well in conjunction with local carrier neutral data centres and IXPs. Postal Policy harmonisation needs: 1) Smooth the differences in the treatment of mail originating from industrialised countries, 2) Reduce the disparities within the Region in mail pricing, and 3) Assess progress in updating of National Universal Service Funds to include Postal Services. Updating of National Universal Service Funds to include Postal Services is vital to ensure that the costly outlying remote and isolated areas have functional postal systems. SADC has agreed on 2013 as the goal for DTT migration and most Member States need further assistance in being able to meet the deadline. To exploit the benefits of digital television also requires addressing issues relating to content development, especially local and indigenous content, and as an e-government platform. DTT migration is also linked to assessment of potential for Universal Service/Access Funds to support DTT set top box acquisition. Interim measures may also be required to ensure unused broadcasting frequencies and whitespace for wireless broadband is made available until DTT migration takes place (see above). SADC regional roaming regulation aims to reduce cost of roaming for the consumer. Integration of all of the above would be expected to lead to the formulation of long-term National Information and Communication Infrastructure (NICI) plans, as outlined in the e-SADC strategy.
Project documentation available	SADC Roadmap for Digital Broadcasting Migration, Plan of Action. RIA reports on roaming. EU African Union IXP support project plan.
Intervention for which Financing is required	Guidelines and regulations development, feasibility assessments, support to national regulators, regional workshops
Revenues for Repayment of Financing	No direct revenues, grant funding expected, ongoing activities would mainly be part of NRA responsibilities supported by Member States.
Estimated Total Cost	***US$2,006,950***
Finance unsecured	***Financier Remark***
US$2,006,950	

Title of Project 2	Monitoring Progress toward Digital SADC 2027
Project Sponsors	SADC I&S Directorate, Policy, Planning, Resource Mobilisation and Statistics, CRASA, National Regulators, NSOs
Corridor	N/A
Participating Countries	All Member States
Objectives	To support the progress of Member States in achieving the Digital SADC 2027 goals by ensuring the availability of up to date information on levels of ICT use in each country and as a region, in order to support strategic decision-making and measure progress toward the 2027 goals.
Project Description	Ensure the quarterly publication of National and Regional ICT progress indicators. Three phases to the project: a) Identify the indicators to be measured – initial study and regional workshop b) Ensure regulators can obtain the data from operators and other stakeholders, and perform the required analysis on the data – regional workshop on data gathering procedures, capacity building for data presentation and statistical analysis. c) Pilot gathering and publication for 2 years, support for ICT observatory, review workshop
Expected Results	SADC Secretariat and Member states have up to date information on uptake of ICTs. Strategic decision-makers, government, public sector agencies, private sector, NGOs and consumer groups have better information on which to base their decisions and campaigns.
On-going Related activities in SADC/ Tripartite Region	1999 SADC Summit: "Ensure timely and responsive regional information and data gathering, develop a mechanism to monitor the relative progress of member states in achieving information society goals". e-SADC addresses harmonisation of indicators and aims to establish a methodology for data collection and analysis. SADC Secretariat has begun development of ICT statistics database. Some initial work has been done on data gathering in some COMESA countries under the Regional ICT Support Programme (RICTSP), and a roadmap was agreed: a) Address key challenges in e-readiness assessment, benchmarking and information society measurement ranging from lack of adequate skills to limited coordination between stakeholders at national and regional levels; b) Strengthen national initiatives to collect, organize, share and manage ICT data; c) Build the capacities of the member states in data analysis, research and dissemination of results; d) Promote regional cooperation and coordination in e-readiness assessment and information society measurement; e) Harmonize and coordinate with similar regional and international initiatives; and f) Sustain e-readiness assessment, benchmarking and information society measurement taking into account the rapid advancement in ICTs.
Description of National plan to the project	Member state regulators and national statistical offices take primary responsibility for consolidating and publishing the data submitted by operators and other stakeholders who would be legally required to submit data quarterly, and the regulators need to have the capacity to challenge the operators if the data is not supplied on time, incorrectly etc, and to analyse and present the data in formats that are readily understandable to the public, and comparable between SADC Member States.
Status	Project to be approved
Next steps	Approval of project, Promotion for financing.
Business Model	Costs are mainly in meetings, human resource development and training to establish agreement on the set of national indicators, and in implementing the data gathering and publication procedures at national level. Part-time national regulator staff-person each quarter needed for consolidating the statistics, loading them on the national web site, submitting to SADC and writing a short 1-2 page briefing on the notable changes to the previous quarter. An annual briefing would also be prepared. Ongoing costs would normally be financed out of national regulator budgets and consolidation at regional level by the regional regulator.
Main parties in place	SADC I&S, CRASA, NRAs, NSOs, other public utility regulators
Main parties to be procured	Studies, workshop organising, facilitation, translation
Technical/Operational Notes	A national ICT e-readiness scorecard would be developed at the initial regional workshop to

	assess levels of progress and identify needs. The focus would be identifying a small set of easy to measure, up to date and objective indicators. Examples of factors measured could include: a) Number of technology and service neutral licenses b) presence of Number Portability, c) number of local DID numbers (VoIP/PSTN gateways), d) IXP traffic and membership, e) number of BGP Peers, local DNS and IP addresses (especially IPv6), f) length of and locations of physical fibre routes, nationally and to neighbouring countries, g) network coverage, h) types of access devices in use, i) tariffs: Interconnection, Call termination, Wholesale & retail broadband capacity price, letter/parcel price j) postal traffic and branch penetration, j) availability and use of content and e-applications, k) public investments in ICT education, research & development This data would be analysed, graphically presented and then consolidated at regional level by CRASA/SADC and would include a GIS/online database of national and regional fibre infrastructure and utility infrastructure that could be used for fibre links – rail, electricity, pipelines, roads. Some capacity building of regulators may be needed for GIS systems operation and data presentation and statistical analysis (such as S Time series/distance gap analysis). Selection and analysis of tariff data will require particular attention, and will likely need to use a basket of services, and present the data relative to purchasing power. Establishment of ICT observatory – details TBD
Project documentation available	E-SADC Strategy, COMESA RICTSP
Intervention for which Financing is required	Studies and workshops/training sessions.
Revenues for Repayment of Financing	None planned (grant financing expected)
Estimated Total Cost	***US$330,500***
Finance unsecured/	***Financier Remark***
US$330,500	

Title of Project 3	Ensuring Confidence and Security in Networks and Services
Project Sponsors	SADC Secretariat I&S Directorate, CRASA
Corridor	N/A
Participating Countries	All Member States
Objectives	To help ensure that Member State and regional communication networks are secure and reliable, and do not pose undue threats to their users and do not limit use through lack of confidence, presence of threats or potential service interruptions Ensure institutional capacity at a national and regional level is in place to respond to network threats. Adoption of cable laying standards to maximise the reliability of any newly deployed optic fibre infrastructure.
Project Description	Help to establish multi-stakeholder Computer Emergency Response Teams (CERTs) in each Member State and Regionally. Capacity building for timely switch-over from IPv4 to IPv6 in civil service networks in order to respond to the exhaustion of the IPv4 address space. Development of standards and model national guidelines and regulations for cable laying (mandatory trench depth, cable ring topologies etc). Also to be included would be identification of strategies for ensuring infrastructure security against threats such as theft, vandalism and accidental damage, including developing legal penalties for vandalism and lack of due care, and mandatory reciprocal access to other operator infrastructure. Harmonize cyber-security regulations and frameworks (ongoing) Implementation and harmonisation of postal security standards in order to respond to cyber-crime, terrorism, drug trafficking, and money laundering. Capacity building of postal operators to apply appropriate security measures
Expected Results	Business, government, civil society and the consumer benefit from being able to place increased reliance on electronic and postal communications.
On-going Related activities in SADC/Tripartite Region	Harmonisation of cyber-security regulations and frameworks and training workshops for establishment of CERTs is already ongoing through the HIPSSA project. Botswana, Mauritius, South Africa and Zambia already have cyber-security legislation. Some SADC Member States have already implemented CERTs. As part of an EACO initiative, Tanzania is planning to set up a CERT with the assistance of ITU. Global and regional Cybercrime Treaty being discussed to ensure cyber-criminals cannot act across borders – compliance with the EU Cybercrime Treaty (Budapest, 2001) proposed, South Africa has already become a signatory. Rwanda Ministry of ICT and Rwanda Utilities Regulatory Agency (RURA), have put in place measures where operators are required to tap available bandwidth of other operators at a pre-negotiated price to ensure reliability of infrastructure. AfriNIC has launched its African IPv6 Task Force to set the official road map of IPv6 deployment on the continent.
Description of national plan to the project	Member states are responsible for implementation of cable laying standards, security legislation and support for operation of CERTs and postal security systems, including 24-hr response centres.
Status	Project to be approved.
Next steps	Approval of project, Promotion for financing.
Business model	No direct revenues, grant funding to be sought. Main implementation cost is at national level, in human resource development for establishing CERTs, training in IPv6 transition.

Main parties in place	SADC I&S Directorate, national security agencies, bureau of standards, AfriNIC.
Main parties to be procured	Studies, workshop organising, facilitation, translation.
Technical/ Operational Notes	24-hour contact centre for CERTs required. Regional CERT functions could be hosted at a National CERT, especially to support countries without CERTs initially. Development of model regulations for national CERTs and creation of an 'Association of National CERTs'. Cable laying guidelines to include clarification of procedures for Environmental Impact Assessment (EIA). Aim to build a pool of regional expertise for IPv6 migration. IPv6 is no longer optional and is becoming critical for continued network sustainability.
Project documentation available	HIPPSA reports on cyber-security and CERTs.
Intervention for which Financing is required	Studies and workshops.
Revenues for Repayment of Financing	None (grant financing expected).
Estimated Total Cost	***US$871,750***
Finance unsecured	***Financier Remark***
US$871,750	

Title of Project 4	Consolidation of Regional Communications Infrastructure
Project Sponsors	SATA, SADC, Member States, regional/cross-border operators
Corridor	All
Participating Countries	All Member States
Objectives	Ensure that the region is fully interconnected nationally, regionally and globally through reliable and affordable high-capacity fibre optic links. This would first complete the remaining SADC cross-border infrastructure gaps, which would fulfil the Connect Africa and AU goals for each country to be connected to its neighbour. Then ensure each Member State capital city is linked to all of its Member State neighbours via at least two routes, and to at least two cable landing stations of different cross-continental submarine networks. Ensure the region is connected to its neighbouring regions – EAC/COMESA/ECCAS, and thereby to the rest of Africa (i.e. initially via Angola and Tanzania to the countries to the north, and then also via DRC). These links also provide access to additional submarine cable systems, such as TEAMS and LION which land in Mombasa, and could be reached via links to Tanzania. Ensure DTT Migration for all SADC Member States. Ensure affordable satellite based connectivity solutions are in place for remote areas outside the near-term reach of fibre infrastructure. Ensure that the whole SADC Region has a fully integrated, redundant, self-healing, resilient core broadband infrastructure reaching even the rural or under-served areas.
Project Description	1. Complete missing cross-border fibre backbones: a few International links and the SADC - Other region cross-border fibre links, e.g. DRC-Burundi, Angola-ROC. 2. Identify needs for additional cross-border links between SADC Member States where there is only one such link currently, and identify opportunities for using Corridor developments to establish new low cost fibre links. 3. Support DTT Migration in SADC Member States where needed. 4. Support for development of regional IXP 5. Assess needs and feasibility for bulk purchase of capacity on a shared regional VSAT network for connecting remote research centres, schools, meteorology stations, wildlife conservation posts, border posts and postal branches. 6. Build pervasive regional and national integrated broadband infrastructures that complement each other and also cover the rural parts of Member States. This would support rapid and reliable interconnection between national operators/new entrants and deployment of broadband services to even isolated areas. It supports the deployment of sector specific networks such as connectivity for all financial institutions, e-government: backbone connectivity for all Government Offices (e-Government Network), and the establishment of Local Government sites (point of presence) in each administration region countrywide in each SADC Member State. It also facilitates rapid cross-border Point of Interconnection (POI) with virtual landing stations of the submarine cables.
Expected Results	Improved national, regional and global integration and accelerated economic and social development supported by pervasive affordable high speed connectivity. Presence of competitive routes for direct traffic exchange between SADC Member States and elimination of the need to rely on expensive submarine fibre capacity. Presence of backup routes to neighbouring country submarine landing stations. Provision of reliable and pervasive broadband capacity to the whole SADC region. This addresses simultaneously regional interconnections with multiple routes and accessibility to all parts of SADC in a holistic manner. Migration of analogue to digital broadcasting.
On-going related activities in SADC/ Tripartite Region	SATA reports that some of the links listed above are already in progress as part of the SRII project.

	A number of independent private sector operators are also interested in establishing some links. Terrestrial infrastructure links are one of the three PIDA ICT priorities – has budgeted US$320m for continent-wide support to ensure each country is interconnected by at least two links and to ensure access to submarine cable for all landlocked SADC Member States. PIDA also proposes 'Smart Corridor' projects to include fibre in transport initiatives. In mid 2011 the Tripartite Task Force had planned to release the draft Terms of Reference for ICT initiatives as part of the North South Corridor (NSC) project and a consultancy service would be funded from the NSC project funds. Links to other regional networks provided by Angola, DRC and Tanzania (EAC-BIN, ECCAS regional backbone projects). DTT migration taking place in a number of Member States Some SADC Member States have a broadband strategy but it is limited to their respective national agenda. There is a need to define what is required as a region and then build it from the bottom-upwards together from a national strategy, by each Member State playing a key role.
Description of National plan to the project	Neighbouring member states work with operators on each side of the border to identify financing requirements and modalities. Hold multi-stakeholder workshops to assess the needs and challenges for cross-border fibre projects. Identify needs for DTT migration support. Government to consolidate the needs of the different sectors/projects for remote connectivity to build economies of scale for regional satellite network.
Status	Project to be approved.
Next steps	Approval of project, promotion for financing, especially to PIDA
Business Model	Main project costs to be covered by operators requiring use of the infrastructure, marginal routes could be covered by PPP. Can be sale of open access conduit or fibre. On a capacity or an IRU basis. IRU is usually a good method to raise capital through operator capex budgets. Funds required for needs assessment for additional routes Assuming no plans and no existing funding made available for the above links, cost for greenfield deployment would be approximately USD$75 million @ US$15k/km. Cost components: Initial assessment, EIA, tendering, permitting, trenching, laying of ducts along roads and under/along bridges, between pylons, interconnection equipment. Initial cost assessment for a Seychelles-Maldives link is about US$50m – link can provide an alternate regional traffic route to Asia Options for financing are; a) each country applies for financing to build their own link, leveraging commercial banks and development agencies, b) vendors propose financing solutions, c) consolidate groups of links and procure collectively. Satellite connectivity financed by usage with small initial cost for equipment/setup. Integrated Broadband infrastructure cost deployment may be covered by operators themselves or possibly by a regional or national Special Purpose Vehicle consisting of stakeholders such as SADC operators, government, utilities companies, and financial institutions etc.
Main parties in place	SATA, Ministries of ICTs and Broadcasting, SATA, Corridor Authorities, existing and new operators.
Main parties to be procured	Studies, neighbouring country workshop organising. Partial public financing for some routes, private operators.

Technical/Operational Notes	Phase 1 would be implementation of the few remaining cross-border links to connect with the national infrastructures of neighbouring SADC Member States, to address special needs of landlocked SADC Member States, and for the key unimplemented international links that would play an important role in connecting SADC's regional infrastructure to its neighbouring regions (SADC-EAC/COMESA, and SADC-ECCAS). List of these key unimplemented links, status to be confirmed by SATA: 1. Angola-DRC (Luanda-Kinshasa) 2. Angola-Zambia (Luanda-Lusaka) 3. Angola-ROC (Luanda-Brazzaville) 4. DRC-Burundi/Rwanda (Kinshasa-Kigali/Bujumbura) 5. DRC-CAR (Kinshasa-Bangui) Cross REC link 6. DRC-ROC (Kinshasha-Brazzaville) Cross REC link only 13kms 7. DRC-Tanzania (Kinshasa-Dar es Salaam) 8. Mozambique-Tanzania (Maputo-Dar es Salaam) Tanzania already at border 9. Mozambique-Zambia (Maputo-Lusaka) 10. Seychelles 2nd submarine link See Links Table & Matrix in Annexure for further details. Estimated links cost – 5,000 km @ US$15 K/km, plus US$50 million for submarine link. Feasibility study required for additional cross-border links between SADC Member States where there is only one such link and long-term planning for fibre cable renewal. This would include: a) Identification of needs for upgrading existing links to DWDM (and identification of links where this is not possible), and b) Identification of opportunities and modalities for using Corridor development projects to establish new low cost fibre links to reduce costs of cross-border fibre links – assessment of the potential for passive transboundary smart corridors). In synergy with other sectors, these would be established in combination with road or power transmission lines on existing corridor projects. The smart corridors would consist of optical cables for transboundary and national traffic, empty ducts for future deployment of cables by others and "Shared facilities" for hosting intermediate points of interconnection along the route. With the nominal useful life of optic fibre cable of 25 years, all the links that are in operation now will have to be replaced by 2035. The age of all the regional links needs to be ascertained, although a significant portion of the existing fibre infrastructure is already over ten years old, notably between South Africa and its neighbours. Two phases of fibre optic cable replacements are likely to be needed: at about 2025, and around 2035. But it is also likely that additional fibre will be laid along most of these routes by competing regional providers, making replacement unnecessary. New proposed links will need Environmental Impact Assessments (EIAs), especially for crossing any water bodies or areas of environmental sensitivity. Medium level capacity routes may only need 12-24 core cable but should allow space in conduit for more cables later if needed. Low cost DTT set top box production strategy needs to be in place. Assess feasibility for implementing a shared regional satellite network to reduce connectivity costs and ensure availability of links for remote public administration offices outside the short- to medium-term reach of fibre optic and terrestrial microwave infrastructure. This could draw on experience from the Pan African e-Network project. Would compare O3B option vs traditional geostationary satellite vs inclined orbit satellite, and identify optimal location for shared ground station hub. Some SADC Member States are relatively large and new technologies should be used or developed to ensure that all inhabited areas are covered.
Project documentation available	SATA Missing Links Feasibility Study - Final Report SADC-SATA ICT Infrastructure Report 2010 PIDA ICT Infrastructure Reports, NEPAD e-Schools report
Intervention for which Financing is required	Studies, fibre optic/satellite infrastructure deployment, DTT migration

Revenues for Repayment of Financing	TBD from operators interested in purchasing capacity on the links, the links have differing levels of profitability based on the amount of build required, the traffic demand for each country and the routing of traffic across the region. Choice of complementary broadband technologies may also be an important factor in determining favourable financial returns.
Estimated Total Cost	**US$21,139.007 million**
Finance unsecured	***Financier Remark***
US$21,139.007 million	Cost for greenfield deployment, assuming no plans and no existing funding made available for the above links. Most of the funds to be provided by private sector.

Title of Project 5	ICT Capacity Building & Content
Project Sponsors	SADC Secretariat, I&S Directorate, Directorate of Social and Human Development and Special Programmes, National Ministries of Education, Ministries of ICTs, National Broadcasters
Corridor	N/A
Participating Countries	All Member States
Objectives	To maximise human capacity in the region to be able to take advantage of ICTs through training and awareness raising activities which are conducted at the regional level to take advantage of increased efficiencies and cost sharing between Member States. To build a critical mass of online content which can be delivered to as wide an audience as possible via the full range of access methods – television, radio, desktops/tablet PCs, and mobile handsets.
Project Description	A range of regional human resource development interventions to support improved use of ICTs: 1. Regional workshop for government development practitioners, NGOs and consumer groups to raise awareness of potential for ICT supported development and governance innovations, for the public generally, and also for disadvantaged groups (youth, women, poor). 2. Establishment of national call centres to help citizens with use of e-services and access to government information online, identifying service offering refinements and new e-services needs required to be developed. Study for reference design of workshops and call centre activities. National support in SADC Member States where needed. 3. Promote harmonised information literacy through adoption of regional ICT training standards and certification. 4. Build ICT knowledge capacity for NRAs, National broadcasters and CERTs. 5. Establish regional repositories and content generation hubs for multimedia learning and cultural heritage materials accessible via the web and for broadcast. 6. Development of regional accreditation system and support for national and regional centres of excellence (CoEs) in ICTs and postal systems.
Expected Results	Policy makers and professionals are better able to exploit the potential of ICTs to support socio-economic development. NRAs better identify issues and enforce regulations, broadcasters better able to respond to the challenges of technology convergence and CERTs able to react quickly to incidents and minimise their impact. Common information literacy certification of employees is uniformly recognised across the region.
On-going Related Activities in SADC/ Tripartite Region	SATA has an existing project funded by Norway to accredit/certify CoEs in Telecommunications, and centres in four SADC Member States are now accredited. ARICEA has proposed support for consumer protection associations. ARICEA aims to become an 'information hub' on ICT regulatory and policy issues and ICT sector development in the COMESA region.
Description of National Plan to the project	Member states' Ministries of ICTs, Ministries of Education, NRAs, national broadcasters, other mass media, training and research organisations are all stakeholders in the project.
Status	Project to be approved
Next steps	Approval of project, promotion for financing.
Business Model	Main project cost is in human resources development and awareness-raising activities. Potential to leverage private sector resources in combination with grant funding.
Main parties in place	SADC, Ministries of ICTs, Ministries of Education, NRAs, National Broadcasters, some CERTs, some emerging CoEs
Main parties to be procured	Capacity building facilities, consultancy, trainers/facilitators and materials, project management

Technical/Operational Notes	For sustained impact, training & awareness-raising is targeted at regional level (proliferation of national projects puts strain on tight country resources and loses opportunities for collaboration). Economies of scale at the regional level will help leverage co-financing from the private sector. Regional activities will also facilitate joint implementation of projects, ensure continuity and increase efficiency in project implementation. Awareness-raising and training workshops would aim to ensure the public, especially the youth, women and other disadvantaged, are familiar with the use of available digital services, as well as their wealth creation and employment potential. Briefing paper would include discussion of role of consumer protection associations to incorporate ICTs in their remit, in particular to inform the public about competitive ICT service offerings to bring more transparency to the market (e.g. publish price comparisons and provide consumers with knowledge of online tools to measure what levels of broadband service they are actually receiving). Promotion of information literacy. Currently there are no statutory frameworks for IT professional Standards and Certification and efforts have to rely on voluntary uptake. Model national ICT literacy training syllabus development & ICT training standards, certification and harmonisation strategy development study. Capacity building of NRAs, national broadcasters and CERTs to ensure they are aware of the latest ICT technology and industry trends, and that NRAs have sufficient capacity to implement and enforce regulations. This would include identification of roles and procedures for a) Dispute resolution – role of NRAs, national competition boards/commissions, the courts (ensure that regulators are sufficiently supported by general Competition Law and its related institutions (Commissions, Tribunals etc), as well as multi-stakeholder consultation processes, b) Cross-border cyber-security threat resolution procedures, and c) e-National security (e.g. Interception of Communication Laws). Establishment of regional repositories of online/distance learning requires gathering, online publication and broadcasting of teaching and training materials in the relevant languages (English, French and Portuguese). Activities would include: identification of content providers, potential content generation hubs, content gathering and hosting entities (including opportunities for collaboration with higher education and research sector to use Open Content Distribution Networks to integrate cloud and content services into a seamless service); identification of gaps in available content; opportunities for bulk purchasing of content; intellectual property issues; potential for sharing costs with other regions; and requirements for supporting more formal distance learning and existing national curricula. Establishment of national and regional centres of excellence would be related to the key priorities/goals for achieving the e-SADC goals, and could take a phased approach, e.g. DTT training centre for basic courses, and then later develop innovation hub. Study and workshop and regional accreditation procedure for the CoEs. International partners such as UNESCO could assist with the establishment of CoEs. CoEs could help with ICT infrastructure project preparation and management.
Project documentation available	e-SADC Strategy
Intervention for which Financing is required	Institutional support, training & facilitation services, consultancies
Revenues for Repayment of Financing	No direct revenues, cost savings through improved strategic decision making, indirect revenues through improved job mobility and earning power of graduates from training programmes. Grant funding expected.
Estimated Total Cost	***US$5,289,350***
Finance unsecured	***Financier Remark***
US$5,289,350	

Title of Project 6	Regional e-Services and Applications Development
Project Sponsors	SADC Secretariat, SADC I&S, SADC Trade Industry Finance & Investment, Ministries of Home Affairs, Health, Education, Transport, Trade and Agriculture, SADC Regional Chamber of Commerce (ASCCI)
Corridor	N/A
Participating Countries	All Member States
Objectives	Improve efficiency of public service delivery and e-commerce. Facilitate administration of regional flows of people, goods and services. Provide open access to public data.
Project Description	1. Provide support for development of e-Government services and applications aimed at creating better service delivery, internal efficiencies and significant cost savings, using opportunities for local outsourcing and identifying opportunities for sharing costs regionally for applications development, bulk purchasing of capacity and ICT equipment. 2. Develop model national e-commerce and e-marketplace strategies, including implementation of e-payment systems. 3. Develop government Open Data policies and management systems for provision of public data and related spatial data mapping facilities. 4. Develop reference model for GPS and 3G-Wifi gateways on public vehicles to monitor movement of public transport for 'intelligent transport systems' - traffic management planning and providing connectivity for passengers. 5. Establish a common cross-border traffic administration platform for all border posts in the region. 6. Formulate a model software platform for general sharing of software development costs across the region. Identify short-medium-term opportunities to port similar government services online.
Expected Results	Government e-services reduce costs for government, business and the public, increased transparency, efficiency and quality of service. Reduced government expenditures on service delivery, more rapid service delivery. Government data made available to the public helps to find solutions to challenges in education, health and other sectors, along with more transparent governance. Open Data results in new economic activities and wealth creation spinoffs. Improve land delivery, tenure security and curb corruption. Increased opportunities for SMEs to market goods and services locally, regionally and globally. Improved efficiency of public transport systems and ability to tele-work while travelling.
On-going Related Activities in SADC/ Tripartite Region	South African Department of Trade and Industry's Regional Spatial Development Initiative (RSDI) will soon provide free online maps (of areas where investment is required) to help attract investors to Southern Africa. Some Member States using ICT for land management and some have already established information systems for border control. E-commerce Readiness Study and Strategic Action Plan taking place. ASCCI validation workshop March 2012 to set up organisation in Gaborone. The ICT Strategic Planning Project in SADC Parliaments is being jointly implemented by the United Nations Department of Economic and Social Affairs (UNDESA), through the Global Centre of ICT in Parliaments, and the SADC Parliamentary Forum. South Africa has joined the global Open Government Partnership (OGP), while Tanzania is developing its commitments to the OGP. A total of 22 one-stop border posts (OSBPs) are planned for SADC region.
Description of National Plan to the Project	Government departments to agree on common reference models and software design to share costs of development regionally, implement e-government services. Open Data initiatives for their sector based on reference models developed at regional level.
Status	Project to be approved
Next steps	Approval of project, Promotion for financing.

Business Model	Main cost is to for software development, and systems integration support at national implementation level in special case Member States. Investment in e-service development will pay itself back through increased efficiencies. Some services amenable to PPP model – i.e. revenue split between service provider/developer and government. Major savings made by creating internal efficiencies and shared/bulk purchasing. Leading to reduced administrative service charges and thereby creating more demand for services. Increased government revenue from reduced corruption, improved tax collection, and more transparency. Increased government revenue from broader tax base and higher levels of economic activity in the ICT sector and through use of ICTs in other commercial sectors, esp financial services, trade and agriculture.
Main parties in place	SADC, ASCCI, Civil Service admin departments, network of ICT Professionals in SADC Parliaments, SADC Business Forum, SADC Bankers Association, application developers.
Main parties to be procured	Applications development, GIS and data hosting and gathering expertise, project management
Technical/ Operational Notes	Regional online systems at SADC Member State border posts to facilitate free trade and the free movement of people between SADC Member States in the region. Also used as a means to kick-start the development of a regional platform for sharing the costs of software development and systems integration for other government sectors, and to support the creation of a critical mass of local software development skills. Requires assessment of connectivity requirements and software/hardware needs. Design of software and network architecture needed for sharing information between border posts and between border agencies (customs, immigration, Interpol, health, agriculture etc). Significant economies yielded by developing this once, for the whole region and then re-using, refining the process for other sector priorities. Priority areas for e-service development would be government procurement, land registries, and judiciary, followed by health, education, agriculture, intra-regional trade, tourism, meteorology, energy, public transport (traffic management). This would be facilitated by creation of a checklist of required e-government applications to be developed at national and regional levels, identification of potential business models and sources of software/developers and systems for shared services/back office platform for government, and evaluation of potential for creation of a single library of regional applications that can be localised for national implementation. Includes assessment of potential savings from sharing costs of software development between Member States and adopting a shared national or regional cloud computing architecture for government services, and feasibility assessment of establishing a dedicated government cloud computing platform or outsourcing using existing private cloud providers. One potential scenario is a set of 2 or 3 regional data centres located near reliable hydro power generating facilities. For e-commerce strategy support, assessment of feasibility for national and regional payment gateways and e-marketplaces for small business (web site hosting and support) are required, along with integration in postal systems. May need involvement of partners outside ICT sector. Note e-SADC E-commerce Readiness Study and Strategic Action Plan. Priority areas for National Open Data provisioning and mapping would be: land data, census data, and public service delivery points. ICT infrastructure and public service mapping layers would be used to identify gaps in required communications infrastructure to support other infrastructure sectors such as energy, transport and tourism, and for meteorological, postal, and school networks. Data collected at national level and regionally consolidated. Implementation support needed for governments of special case SADC Member States. Installation of GPS and 3G-Wifi gateways on public vehicles to monitor movement of the public transport for traffic management planning and providing connectivity for passengers. Development of technical and business implementation reference model. This will complement smart corridor development.
Project documentation available	E-SADC strategy, AU-ECA-AfDB Land Policy Initiative: A Framework to Strengthen Land Rights, Enhance Productivity and Secure Livelihoods
Intervention for which Financing is required	Training services, reference applications development assessment, economic feasibility assessment. Hardware, software, training and support for implementation in Member States

	where needed.
Revenues for Repayment of Financing	Revenues will depend on nature of the e-service; many manual services have existing revenue streams that will be more efficiently used, thereby reducing operational costs.
Estimated Total Cost	US$7,686,800
Finance unsecured	***Financier Remark***
US$7,686,800	

Title of Project 7	Research, Innovation and ICT Industry Development
Project Sponsors	SADC Secretariat I&S Directorate, Ministries of ICTs, Higher Education, Science & Research, Trade and Industry, SARUA, ASCCI, SATA
Corridor	N/A
Participating Countries	All Member States
Objectives	To strengthen R&D and research institutions and SMEs working in the ICT sector, promote national and regional institutional collaboration, innovation and the development of local ICT industry. Increase the number of jobs in the ICT sector. Minimise the negative effects of ICTs on the environment.
Project Description	1. Promote improved collaboration, information and knowledge sharing between research centres. 2. Establish incubators for small ICT businesses and ICT research parks and improve links between the academic sector and ICT industry. 3. Develop ICT equipment manufacturing facilities, software and applications. 4. Identify and mitigate negative environmental impacts of ICTs (e-waste and climate change), including support for a regional e-waste management centre
Expected Results	Researchers, teachers and entrepreneurs with improved access to knowledge, leading to increased R&D, innovation, jobs and wealth creation in the local ICT sector. ICT equipment costs minimised – especially DTT set-top boxes. Minimised negative environmental effects of ICT equipment deployment, manufacture and use.
On-going Related Activities in SADC/Tripartite Region	A variety of related activities are being implemented by SARUA, (whose mission is to promote, strengthen and increase higher education, research and innovation in the SADC region). SARUA has proposed a SADC regional research and development fund. UbuntuNet Alliance is implementing the US$15m EU funded AfricaConnect project to assist in higher education and research institutional connectivity. Some Member States have already set up or are setting up ICT incubators and research parks, e.g. the innovation hubs in Botswana, Mauritius, Mozambique, Namibia, South Africa and Tanzania. IFC has supported study for an ICT centre and business incubator in Mozambique. Research parks in Mauritius, Mozambique, and South Africa. SA Government: a) Announced plans to create 1 million jobs in the ICT sector by 2020, b) Developing strategy on local and digital content development, c) Has begun a set top box manufacturing sector development strategy, and d) Awaiting outcome of study on the trends of digital local content and uptake rates. COMESA-ECA-SADC Programme on Climate Change Adaptation and Mitigation launch April 2012. Some Member States have established some e-waste guidelines as part of general hazardous waste mitigation strategies and the SATA Secretariat has been directed to propose Regional Guidelines on e-Waste Disposal. In the interim it has recommended: (a) Develop policies and regulations on e-waste management to govern e-waste processes from collection to final disposal; (b) License key actors of e-waste; (c) Develop an e-waste collection system; (d) Launch a consumer awareness campaign; (e) Launch capacity development programmes in the e-waste sector, possibly funded by fees levied on importers of second-hand equipment; (f) Develop an e-waste management system comprising a multi-stakeholder process which includes the participation of the civil society; (g) Support and promote the establishment of e-Waste Recycling Plant in the Region; and (h) Support and promote the establishment of NGN Conformity and Inter-operability. Proposals are under discussion to draft a COMESA regional model e-Waste Strategy and Policy by March 2012 and develop a regional e-waste management system.

	Pan-African Forum on E-Waste has agreed on priority measures to reduce the environmental and health impacts of electrical and electronic waste on the continent.
Description of National Plan to the Project	National education and research support for improved connectivity between academic and research institutions. Government to provide facilities/land/buildings/connectivity for hosting incubators and science parks. Regional agreement needed to increase budget allocations to R&D, to combine purchasing initiatives to build economies of scale in manufacturing and software development. Agreement needed to share resources to reduce impact on the environment (e.g. cloud computing and regional data centres located at the most energy efficient locations). National level agreement on standards and strategies for e-waste disposal.
Status	Project to be approved
Next steps	Approval of project, Promotion for financing
Business Model	Main cost is implementation at national level, in institution building, supporting interconnectivity between research institutions and in establishing incubators, research parks and manufacturing facilities. Some of the investment costs for setup and for ongoing R&D could be met by the private sector.
Main parties in place	SADC, Ministries of Higher Education, Science & Research, Trade and Industry, SARUA, ASCCI
Main parties to be procured	Workshop organising, facilitation, networking providers, land and building facilities
Technical/Operational Notes	Shared R&D at the regional level has considerable potential to reduce costs, build on economies of scale. Needs to be augmented with provision of high speed connectivity within and between research institutions in the region and to the rest of the world (campus, national and regional) research and education networks (RENs). Potential for collaboration on developing Open Content distribution networks to integrate cloud and content services into one seamless service offering. Support for network deployment in some SADC Member States may be necessary. Development of model strategies and governance guidelines for supporting the establishment of ICT small business incubation facilities (offices, shared facilities, low cost high speed internet, web hosting, marketing support etc). This would focus on identifying appropriate roles and modalities for government support to incubators (such as guarantees on working capital or loan funds), and identify potential incubator implementers, trainers/ mentors and fund managers. Provide support for establishment of incubators in SADC Member States where needed. Promotion of regional ICT manufacturing, content and software development. This could be initially supported by the DTT migration process now taking place, exploiting the co-ordinated transition using a common standard across many SADC Member States to establish set-top box manufacturing or assembly facilities for the region. This could also be an export opportunity because many other countries around the world are also adopting the same standard. A market and technical feasibility study would provide initial support for this effort, including an assessment of the economies of scale for bulk orders, and export opportunities. This would be combined with a scoping exercise to identify other technologies amenable to local manufacturing, software and content development. A regional colloquium with industry would verify the study conclusions, identify and align business owners with the additional opportunities, and raise awareness of the initiative more generally in the private sector. Development of regional and national guidelines and best practices for addressing climate change, e-waste, and EIAs for infrastructure projects. This would include reference design for smart renewable energy-based data centres and evaluation of the cost of the SATA proposals on a way forward for e-waste handling.
Project documentation available	• e-SADC Strategy; • Towards a Common Future: Higher Education in the SADC Region. Research Findings from Four SARUA Studies. ICT: A Status Review of ICT in Universities in the SADC Region; • High-growth ICT enterprise business incubation, infoDev working group, Final Report (April 2010), Youth focused business incubation, infoDev working group, Final Report (Dec 2009); and • Science and technology parks: An overview of the ongoing initiatives in Africa.

Intervention for which Financing is required	Studies and workshops, network infrastructure providers and systems integrators for implementation in some Member States.
Revenues for Repayment of Financing	Mainly grant with some loans required. Long-term investment in human resource development and intellectual capacity in the higher education and research sector. Some more immediate revenues will be generated once local manufacturing facilities are established – therefore private sector investment will help to cover start-up costs. Job and wealth creation through SME support will result in increased tax returns. Reduced fossil fuel consumption will reduce operating costs but may require higher up front investment.
Estimated Total Cost	***US$6,061,000***
Finance unsecured	***Financier Remark***
US$6,061,000	

Title of Project 8	Strengthening of the Postal Sector
Project Sponsors	SADC Secretariat I&S Directorate, SAPOA, CRASA, Min ICTs
Corridor	N/A
Participating Countries	All Member States
Objectives	To support the development of sustainable, reliable and affordable postal systems that provide the full range of up-to-date services to all SADC citizens, inter-operating efficiently across the region.
Project Description	Postal services revitalisation, new services development, geographic coverage expansion and improved postal network security/reliability. Key elements would involve: 1. Implementing postal codes and addressing systems in Member States that do not have them; 2. Extension of national postal branch networks to more locations, especially rural areas; 3. Improved use of ICTs in postal systems to support: automation of postal systems (front office/counter automation, back office and mail processing), network connectivity, video-based capacity building & training, providing public access to internet facilities, e-government services, and electronic funds transfers, printing and other services; and 4. Implementation of a regional end to end measurement system (GMS) to improve the quality of service on international mail.
Expected Results	Increased social and economic inclusion, more use of e-commerce, financial services and public access to electronic information services, especially in remote and rural areas. Businesses operate more efficiently, improved emergency services due to improved addressing systems, and increased regional integration and e-commerce due to more efficient and secure international mail between member states. Addressing systems provide proof of existence to individuals and organisations and help rural people to participate in the economy. Improved speed of delivery and tracking of international mail.
On-going Related Activities in SADC/Tripartite Region	SAPOA has prepared a Regional Strategic Postal Plan to support the postal operators to handle the challenges of market liberalisation. The existing priority projects are: a) Improve quality of service within the postal network, b) Improve interconnection among physical, electronic and financial postal networks within the region, c) Countering acts of terrorism, malpractices and money laundering through the postal network, and d) Development of a sub-regional road transport network within the SADC Region. Software has been developed for postal financial services in the region and most of the national postal systems in the region are in the process of implementing international electronic funds transfer systems. Some Member State postal systems have joined the Global Monitoring System (GMS). Some SADC Member States have started feasibility studies for addressing systems, Malawi and Zimbabwe and some other COMESA countries have begun implementation. The South African Postbank Bill is to create a standalone entity under the South African Post Office, which aims to be the bank of first choice for underserviced communities. COMESA and UPU are organising capacity building for postal regulators and implementing a postal code addressing project: a) Sensitising governments and other stakeholders to the importance of postal code and addressing systems as a national infrastructure programme, b) Fast tracking implementation of postal code and addressing systems in Member States, and c) Training focused on designing national projects to develop and extend usage of geographical and postal addresses. PAPU's e-Post Africa Project aims to provide enterprises with an opportunity to offer a range of ICT based products and services using the RASCOM Satellite. The pilot projects in 15 countries are selected from each of the 5 sub-regions. Currently no SADC Member States are participating. The UPU is exploring how to extend access to financial services to the poor through postal networks, with support from the Bill and Melinda Gates Foundation. About US$700,000 is

	being spent to determine how Posts can enter into partnerships with financial institutions and mobile-money operators to better serve the underprivileged, the exchange of know-how among stakeholders and initiating pilot projects. Some operators have significantly automated while others have networked main centres only. Some others have not commenced although feasibility studies have been done.
Description of National plan to the project	National postal operators would be responsible for implementing the projects.
Status	Project to be approved
Next steps	Approval of project, promotion for financing
Business Model	Main implementation cost is at national level in investment in postal branches. Improved use of ICTs within postal systems will improve their quality of service, and extend the range of available services, making them more profitable/self-sustaining – costs of implementation to be partially recouped from increased cash-flow.
Main parties in place	SADC I&S Directorate, SAPOA, CRASA, national postal systems, SADC Bankers Association, ASCCI
Main parties to be procured	Workshop organising, facilitation, networking providers, systems integration, equipment and software
Technical/Operational Notes	Development of addressing systems and postal codes is required to promote social inclusion, support emergency services and e-commerce. Since the majority of people in the region live in rural areas and the affordability of post boxes is limited, the address system adopted will need innovative approaches, such as use of GPS co-ordinates or phone numbers. Technologies also exist that could facilitate shared and unstructured addresses for individuals or groups. The project will also require: a) Alignment of the national addressing standard with the UPU S42 Addressing Standard, b) Establishment of delivery points databases by each designated operator, c) Establishment of a change of address system by each operator, and d) Numbering of streets and houses in line with country requirements. To meet the postal system's universal service objectives there is a strong need to expand the number of postal branches and post office boxes and new services, especially those which leverage the postal network's physical infrastructure, such as public access to internet, printing, photo and video CD burning. Public support for the postal system would also be provided through use of Universal Service Funds, and regional USF guidelines would be updated accordingly. E-postal services development – public access services, integration with mobile networks for mobile-based postal services, e.g. parcel tracking, deposits etc. Also requires identification of potential cross-sectoral regional infrastructure development synergies to improve quality of postal services. Improved regional ICT, transport and energy infrastructure is likely to have a positive impact on postal service quality and costs. How can postal systems best respond to these opportunities? Areas to be examined would include evaluation of potential of public access tele-centre facilities, assessment of resource requirements for capacity building and logistical augmentation to effect surface deliveries through new cross-border roads and access to power in remote/rural postal branches. Also needed is guideline development of common interoperable systems in the region to provide for international augmented services, in particular, track and trace, cash on delivery (COD), insured parcels, registered letter and sign-on delivery systems. Includes ensuring security of physical postal networks. Needs integrated regional payment system including cross-border services and banking facilities for all post office branches. Initiate with regional economic assessment study and include evaluation of role of mobile payment systems. Support for gathering of up-to-date postal statistics to address the current lack of available data in some SADC Member States. Implementation of monitoring system (GMS) will help ensure there is no significant loss of revenue when the Universal Postal Union (UPU) implements the payment of terminal dues based on a country's quality of service link set for 2014.

	Priority to support development of national postal infrastructure in some Member States in particular such as the DRC, Madagascar and Mozambique which have amongst the lowest levels of postal services. Potential feasibility of a shared regional satellite network for connecting remote postal branches to be assessed under the infrastructure project 3. Security standards for postal systems should be benchmarked according to UPU International Security Standards.
Project documentation available	SAPOA Strategic Plan: The Significance of addressing for the development of Nations by Pierrre Rossouw, SAPO Addressing Expert, July 2009 Postal Solutions: The Impact of Address Systems on Mail Volumes (2003) – Worldwide Benchmarking Study
Intervention for which Financing is required	Studies, institutional support, equipment, services, and expertise
Revenues for Repayment of Financing	Potential to generate improved revenues from postal sector if it can leverage its brand trust to provide improved secure services, transactions and transport. See Business Model above.
Estimated Total Cost	***US$286 170 500***
Finance unsecured	***Financier Remark***
US$286 170 500	

ANNEXURE 4 - PROJECT BUDGET DETAILS

1	**Enabling Environment – Policy and Regulatory Harmonisation**	
	National ICT Policy Reviews	
	Rapid Regional assessment of key National ICT policy constraints in Member States	
	Consultancy fees (US$)	50,000
	Regional Workshop	38,500
	Integrated assessment of status of ICT sector reform. The study would consider: a) regulator institutional capacity to enforce, b) Openness of markets to new entrants, c) implementation of technology/service neutral converged licensing regimes, d) Structural separation of wholesale from retail operations), e) Spectrum management (cost based spectrum fees, sub-licensing of spectrum, up to date allocation plans). f) Identify taxation constraints to ICT uptake and fiscal system opportunities to promote ICT uptake.	
	1 lead consultancy to design the study questions at regional level @ US$20k, and to manage 14 national consultancies @ US$15k/country to gather the data, and co-facilitate the workshops	
	Consultancy fees (US$)	160,000
	28 National workshops @ US$10k each, 2 per country to consider the results and review follow up	280,000
	Support for national broadband strategies development	
	Assessment study to develop broadband availability targets (coverage, speed, cost and deployment timeline) for the region and variations for groups of Member States. Would also cover identification of strategies to reach these targets, including assessment of potential impact of universal service funds.	
	Consultancy fees (US$)	50,000
	Regional guidelines and regulations on tariffs for use of public infrastructure assets	
	Consultancy fees (US$)	40,000
	Identification of best practices and guidelines for extension of national and international terrestrial fibre backbones	
	Consultancy fees (US$)	80,000
	Guidelines and updated planning approval procedures to ensure that all new public infrastructure includes fibre and ducts, including public and commercial buildings	
	Consultancy fees (US$)	15,000
	Support for 3 regional 3-day ISP fora	115,500
	Review and updating of spectrum allocation plans. Study to assess the feasibility of using new technologies such as whitespace (802.22) as an interim measure until DTT migration has taken place, development of proposals for broadcasting spectrum fee regulations.	
	Consultancy fees ($)	50,000
	Promoting capacity pricing information exchange across the region – feasibility study for regional capacity trading platform to improve transparency in the market	
	Consultancy fees (US$)	40,000
	Implementation support	250,000
	Support for public sector operators to transition to new market environments	
	Consultancies – 7 studies @ US$70k each	490,000
	3 Regional Policy & Regulatory 3-day Workshops	115,500

	Study for Model National Postal Policy Development and Regional Harmonisation, including strategies for creating regulated postal markets and autonomous operators, addressing institutional/cultural and productivity issues, raising the profile of the postal system in national budget allocations, in national ICT strategies, and in access to the Universal Service Funds.	
		50,000
	Total	**1,824,500**
	+10% project management	**2,006,950**
2	**Monitoring and evaluation of progress toward Digital SADC 2027**	
	Development of Model regulatory guidelines to ensure operators submit data quarterly to regulator.	
	Consultancy fees (US$)	20,000
	Development of proposed set of ICT progress markers for verification at regional meeting. Plus one regional meeting for mid-term review (2018) and capacity building for data presentation and statistical analysis	
	Consultancy fees (US$)	40,000
	Regional Meetings: Cost per meeting:	
	Days of meeting	3
	20 Participants	20
	DSAs (US$)	150
	Flight cost (US$)	750
	Total Participant Cost	**24,000**
	Venue Hire	7,500
	Interpretation	5,000
	Facilitation	2,000
	Total Venue	**14,500**
	Total for 3 Meetings	**115,500**
	Total Including Consultancy	175,500
	2 year pilot data gathering and publication by regulators and ICT observatory	125,000
	Total, including 10% project management	**330,550**
3	**Ensuring Confidence and Security of Networks and Services**	
	Consultancy for development of standards and model national guidelines and regulations for cable-laying (mandatory trench depth, cable ring topologies etc). Also to be included would be identification of strategies for ensuring infrastructure security against threats such as theft, vandalism and accidental damage, including developing legal penalties for vandalism and lack of due care and mandatory reciprocal access to other operator infrastructure.	
	Consultancy fees (US$)	30,000
	Cost per meeting:	
	Days of meeting	3
	20 Participants	20
	DSAs (US$)	150
	Flight cost (US$)	750
	Total Participant Cost	**24,000**
	Venue Hire	7,500
	Interpretation	5,000
	Facilitation	2,000
	Total Venue	**14,500**
	Total for 2 regional Meetings	**77,000**
	Total Including Consultancy	107,000
	Capacity building for timely switch-over to IPv6 in civil service networks	

	3 Regional training workshops	115,500
	Assistance with establishment of CERTs	
	National Implementation in SADC Member States where needed @ US$75k each	450,000
	Development of model regional and national CERT regulations and guidelines	50,000
	Harmonisation of security standards in order to respond to cyber-crime, terrorism, drug trafficking, and money laundering. Capacity building of postal operators to apply appropriate security measures – two regional training workshops	70,000
	Total	792,500
	+10% project management	**871,750**
4	**Consolidation of Regional Communications Backbones**	
	5,000 km @ US$15K/km	75,000,000
	Seychelles submarine link	50,000,000
	Feasibility study and facilitation for additional cross-border links between SADC Member States where there is only one such link. Emphasis on identification of opportunities and modalities for using corridor development projects to reduce costs of cross-border fibre links. Assess potential for passive transboundary smart corridors. In synergy with other sectors, these ICT corridors would be established in combination with road or power transmission lines on existing corridor projects. The smart corridors would consist of optical cables for transboundary and national traffic, empty ducts for future deployment of cables by others and "Shared facilities" for hosting intermediate points of interconnection along the route. Corridor stakeholder Workshops/Meetings facilitation.	
	Consultancy fees (US$)	80,000
	15 Workshops/meetings @ US$5k each	75,000
	DTT Migration support for Member States where needed	
		180,000
	Assess needs and economic feasibility for a shared regional VSAT network for connecting remote research centres, schools, meteorology stations, wildlife conservation posts, border posts, clinics, emergency services and postal branches.	
	Consultancy fees (US$)	40,000
	Feasibility study and facilitation for Regional IXP. Consultancy and 2 Regional meetings. US$25K + US$70k	95,000
	Satellite network/hub implementation support	900,000
	Total including links, 10% project management	**139,007,000**
5	**ICT Capacity Building & Awareness Raising**	
	Awareness raising for policy makers & development practitioners – 1 regional conference 100 participants and briefing paper	
	Background briefing paper	10,000
	Cost of meeting:	
	Days of meeting	3
	Participants	100
	DSAs (US$)/person	150
	Flight cost (US$)/person	750
	Total Participant Cost	**120,000**
	Venue Hire	12,000
	Interpretation	5,000
	Facilitation	2,000
	Total Venue	**19,000**
	Total Cost Including Consultancy	**149,000**

	Establishment of national call centres to help citizens with use of e-services and access to govt info, identifying service offering refinements and new-service needs required to be developed	
	Consultancy for reference design of workshops and call centres	40,000
	National support in SADC Member States where needed @ US$300k each	1,800,000
	Establishment of national and regional centres of excellence	
	Regional DTT training facility institutional support	500,000
	Development of regional accreditation procedure for the CoEs	40,000
	IT & Postal CoE establishment	1,500,000
	Developing regional certification standards for information literacy- capacity building and certification standards harmonisation	
	Model national ICT literacy training syllabus development and ICT training standards harmonisation needs assessment	
	Consultancy fees (US$)	60,000
	Capacity building of NRAs, National Broadcasters and CERTs	
	2 X 4 day regional workshops	
	Facilitation fees (US$)	20,000
	Cost per meeting:	
	Days of meeting	4
	20 Participants	20
	DSAs (US$)	150
	Flight cost (US$)	750
	Total Participant Cost	**27,000**
	Venue Hire	7,500
	Interpretation	5,000
	Facilitation	2,000
	Total Venue	**14,500**
	Total for 3 Meetings	**124,500**
	Total Including facilitation	144,500
	Online Repositories of Learning and Cultural Heritage Materials	
	Identification of content gathering and hosting entities, content generation hubs, content sources & providers, identification of gaps in available content, intellectual property issues, opportunities for sharing with other regions, and opportunities for bulk purchasing of e-content and creation of digital content generation hubs.	
	Consultancy	45,000
	2 day regional workshop	
	Days of meeting	2
	20 Participants	20
	DSAs (US$)	150
	Flight cost (US$)	750
	Total Participant Cost	**21,000**
	Venue Hire	7,500
	Interpretation	5,000
	Facilitation	2,000
	Total Venue	**14,500**
	Implementation support for pilot online repository	**575,000**
	Total	4,533,500

	10% Project management	4,986,850
6	**E-Services & Applications development**	
	Development of checklist of required e-government applications to be developed at national and regional levels, identification of potential business models and sources of software/developers and systems for shared services/back office platform for government, and evaluation of potential for creation of a single library of regional applications that can be localised for national implementation. Includes assessment of potential savings from sharing costs of software development, bulk purchases of capacity and equipment between member states, and adopting a shared national or regional cloud computing architecture for government services, and feasibility assessment of establishing a dedicated government cloud computing platform or outsourcing using existing private cloud providers.	
	Consultancy for above	100,000
	2 day regional verification workshop	
	Days of meeting	2
	20 Participants	20
	DSAs (US$)	150
	Flight cost (US$)	750
	Total Participant Cost	**21,000**
	Venue Hire	7,500
	Interpretation	5,000
	Facilitation	2,000
	Total Venue	**14,500**
	Implementation support for governments of SADC Member States where needed – @ US$500k each	3,000,000
	Total	**3,135,500**
	Development of e-commerce strategy. Identification of needs/feasibility assessment for national and regional payment gateways and e-marketplaces for small business web site hosting are required. Identification of partners outside ICT sector that may be required.	
	Consultancy for above	75,000
	2 day regional verification workshop	
	Days of meeting	2
	20 Participants	20
	DSAs (US$)	150
	Flight cost (US$)	750
	Total Participant Cost	**21,000**
	Venue Hire	7,500
	Interpretation	5,000
	Facilitation	2,000
	Total Venue	**14,500**
	Total	**110,500**
	Implementation support for of SADC Member States – where needed @ US$300K each	1,800,000
	Development of national and regionally consolidated government Open Data policies and management systems for public data and related spatial mapping. Design of national and regional reference models, and technical/economic feasibility assessment.	
	Consultancy for above	75,000
	2 day regional verification workshop	
	Days of meeting	2
	20 Participants	20
	DSAs (US$)	150
	Flight cost (US$)	750

	Total Participant Cost	**21,000**
	Venue Hire	7,500
	Interpretation	5,000
	Facilitation	2,000
	Total Venue	**14,500**
	Total	**110,500**
	Development of technical and business implementation reference model for GPS and 3G-Wifi gateways on public vehicles to monitor movement of public transport for traffic management planning and providing connectivity for passengers.	
	Consultancy	25,000
	Regional online systems at SADC Member State border posts to facilitate free trade and the free movement of people between SADC Member States in the region. Assessment of connectivity requirements and software/hardware needs, preliminary costing for development and implementation.	
	Consultancy fees (US$)	200,000
	2 day regional verification workshop	
	Days of meeting	1
	20 Participants	20
	DSAs (US$)	150
	Flight cost (US$)	750
	Total Participant Cost	**21,000**
	Venue Hire	7,500
	Interpretation	5,000
	Facilitation	2,000
	Total Venue	**14,500**
	Total	**235,500**
	Software development (estimate for allocation)	1,500,000
	2 day regional verification workshop	71,000
	Days of meeting	2
	Total	**1571,000**
	Project Total	
	Plus 10% project management	**7,686,800**
7	**Supporting Research, Innovation and Industry Development**	
	National support for research institution connectivity SADC Member States where needed X US$500,000	3,000,000
	Study for model strategies and governance guidelines to promote ICT small business incubation facilities. This would focus on identifying appropriate roles and modalities for government support to incubators (such as guarantees on working capital and other incentive schemes).	
	Consultancy	35,000
	Support for establishment of incubators in SADC Member States where needed. US$350,000/country	2,100,000
	Market and technical feasibility study on regional DTT set top box manufacturing opportunities. Includes a scoping exercise to identify extra-regional export opportunities and to identify other technologies amenable to local manufacturing, software and content development.	
	Consultancy fees (US$)	60,000
	Industry colloquium to verify study conclusions and identify additional opportunities, raise awareness of initiatives	
	Conference costs	
	Days of meeting	2

	50 Participants	50
	DSAs (US$)	150
	Flight cost (US$)	750
	Total Participant Cost	**52,500**
	Venue Hire	10,000
	Interpretation	5,000
	Facilitation	2,000
	Total Venue	**17,000**
	Total	**129,500**
	Development of regional and national guidelines and best practices for addressing e-waste and ICT induced climate change. Include production of reference design for smart renewable energy-based data centres, and evaluation of the cost and technical feasibility of the SATA proposals on a way forward for e-waste handling.	
	Consultancy fees	60,000
	2 day regional verification workshop	
	Days of meeting	2
	20 Participants	20
	DSAs (US$)	150
	Flight cost (US$)	750
	Total Participant Cost	**21,000**
	Venue Hire	7,500
	Interpretation	5,000
	Facilitation	2,000
	Total Venue	**14,500**
	Total	**95,500**
	Regional e-waste management centre establishment	150,000
	Project total	
	+10% project management	**6,061,000**
8	**Postal Sector Strengthening**	
	Implementation of Postal Code addressing systems in Member States that do not have them (SAPOA estimate)	110,000,000
	Study for strategy development for extension of national postal branch networks to more locations, especially rural areas, including consideration of options such as franchise models.	
	Consultancy fees (US$)	50,000
	Strategy development and assessment of economic feasibility for introducing improved use of ICTs in postal systems (network connectivity, capacity building & training, public access to internet facilities and augmented service delivery), postal branch office process counter automation.	
	Country by country analysis to establish exact funding needs	70,000
	Implementation support initial allocation (SAPOA estimate – 100m + 40m for counter automation)	140,000,000
	Harmonisation of security standards in order to respond to cyber-crime, terrorism, drug trafficking, and money laundering. Capacity building of postal operators to apply appropriate security measures.	

	Implementation of a regional global monitoring system (GMS) for mail by postal operators.	
	Implementation cost (SAPOA estimate)	10,000,000
	Regional Meeting to consider results of studies	35,000
	Total	**260,155,000**
	+10% project management	**286,170,500**
	Total for all projects	**436,050,300**

ANNEXURE 5 - SADC Pre-Existing Ongoing Activities

At the 2010 Luanda Ministerial meeting, the SADC ICT Regional Priorities for 2011/2012 were grouped along the three key priority areas of Infrastructure Development, Policy and Regulatory Framework, and Postal Operations and Regulation. In addition there is the priority area of regional coordination leading on to international events. The details of each of these areas are as follows:

1. Infrastructure Development
   i. SADC Regional Information Infrastructure (SRII) Phase 2– Intelligent nodes;
   ii. Implementation of the NEPAD ICT Broadband Infrastructure;
   iii. Study on the harmonisation of Broadband Infrastructure Projects in SADC; and
   iv. Setting up of National and Regional Internet Exchange points (NIXPs and RIXP).

2. Policy and Regulatory Framework
   i. Development and implementation of the e-SADC initiative;
   ii. Regional digital migration plan;
   iii. Development of a framework for SADC Regional Roaming Regulation;
   iv. Home and away roaming;
   v. SADC frequency band plan; and
   vi. Harmonisation of Cyber Security Regulatory Frameworks in SADC.

3. Postal Operations and Regulation
   i. Regional Project to improve quality of service within the postal network;
   ii. Regional Project to improve interconnection among physical, electronic and financial postal networks within the Region;
   iii. Strategy to counter acts of terrorism, malpractice and money laundering through the postal network; and
   iv. Regional Project on development of a sub-regional road transport network within the SADC Region.

In the area of regional coordination, this includes coordination of SADC positions on international postal, telecommunications and ICT initiatives (World Telecommunications Development Conference; ITU Plenipotentiary Conference and the UPU Strategy Conference); and coordination of ICT Programmes with other key stakeholders. In addition, three new priorities were identified at the 2010 Luanda Meeting:

- Development of a toolkit for best Practice Universal Service and Access;
- Monitoring and evaluation of the SADC Action Plan for Digital Broadcasting Migration; and
- Development of a Radio Spectrum Channelling Plan.

The major areas where most activities and advances have been made are outlined below.

1. Roaming

The high cost of international roaming in the region has received substantial attention by policy makers and regulators. In late 2008 CRASA created the Regional Alliance Task Team (RATT) on SADC Home and Away Roaming comprising representatives of the SADC Secretariat, CRASA, GSM Africa, Southern Africa Telecommunication Association (SATA) and the SADC Parliamentary Forum as an observer. The RATT's primary task was to investigate possible mechanisms to reduce international mobile roaming charges in the region. In 2009 CRASA commissioned a regulatory impact assessment study on home and away roaming in SADC on behalf the RATT. Due to financial constraints, a partial

RIA was carried out, and following further refinement of the methodology, a second study, RIA II, has been commissioned to provide more conclusive answers to the various roaming issues and to produce a draft 'Harmonisation Policy Framework for SADC Home and Away Roaming'. In the meantime CRASA has called on its members to request mobile operators to be more transparent in their roaming charges.

2. Universal Service/Access

Development of policies and legal frameworks to ensure broader accessibility through Universal Service/Access Funds have also been an ongoing area of activity in the region. In May 2007 the SADC Ministers responsible for Telecommunications, Postal and ICTs directed the SADC Secretariat, in conjunction with CRASA, to develop a report on the "Best Practices in Utilisation of Universal Service/Access Funds in SADC". This was in response to concerns raised by operators that governments in the region had been collecting funds for Universal Service, however, no substantial utilisation of the funds had been done in the region.

This was followed up, with support from HIPSSA, by the drafting of "SADC Universal Service Guidelines, an assessment of the implementation of universal service/access strategies in the region" and the development of the "SADC Tool Kit on Best Practices in Utilisation of Universal Service Funds". After feedback from CRASA members, the document has been forwarded to the SADC Secretariat for inclusion on the SADC ICT Ministers meeting agenda.

3. Consumer Protection

Secure consumers and the inclusion of the socially excluded are seen as a pre-requisite for a broad-based information society, and the SADC Ministers responsible for Telecommunications, Postal and ICT have approved, in principle, the "ICT Consumer Protection Guidelines", but have directed the SADC Secretariat in conjunction with CRASA to amend the Guidelines in order to include issues relating to elderly people and civic education.

4. Digital Terrestrial Television (DTT) Migration

Ensuring smooth migration from analogue to digital broadcasting technologies is a crucial area, not only to improve availability of better broadcast services, but equally as importantly, to liberate vital areas of the radio spectrum for the delivery of wireless broadband services.

The choice of the DTT standard for use has been controversial and this has delayed the migration process to some extent. CRASA has developed a draft Digital Broadcasting Migration Action Plan, and convened a Working Forum on Digital Broadcasting Migration in Ebene, Mauritius in 2009 which recommended a draft "Roadmap on SADC Digital Migration". The Roadmap recommended that the region should consider adoption of the DVB-T standard for the implementation of DTT, but the SADC Ministers responsible for Telecommunications, Postal and ICTs held a Special Session on Digital Broadcasting in November 2010 in Lusaka, Zambia and decided that SADC Member States should adopt DVB-T2 with MPEG4 compression and any other GEO6 compliant equivalents as the digital terrestrial television broadcast standard for the region. They approved the revised SADC DTT Migration Roadmap, reviewed progress of Member States, and set up a special desk at the SADC Secretariat to oversee the programme, as well as an implementation steering committee, with a DVB forum to be held twice a year. At the CRASA AGM in March 2011 a project on Monitoring of Migration to Digital Broadcasting in SADC was included under the Action Plan Priority List for the year 2011/12.

The 3rd Digital Broadcasting Migration Forum in October 2011 (Luanda, Angola) – recommended that DTT should be seen as a central government project of greater public and national interest and not

simply as an ICT project. In addition the Forum proposed:

- That various funding mechanisms to fund DTT Migration be explored, including Universal Service Funds, Public Private Partnerships, and licensing of the digital dividend to other electronic communications services;
- The establishment of a Technical Steering Committee comprising of Member States and SADC organs, including CRASA, SABA and Consumer groups, under the guidance of SADC Secretariat; and
- That Member States continue to optimise the spectrum to achieve maximum benefits in line with the GE06 and the Regional Spectrum Plan.

A National Inter-Ministerial Committee also proposed National DTT Migration Project Management Offices, National and Regional Multi-stakeholder Forums to deal mainly with consumer issues, and a Regional Project Management Office at the SADC Secretariat to monitor and assess the implementation of the DTT Roadmap and Action Plan as well as to assist Member States on challenges faced with the implementation of Roadmap at National level.

In February 2011 it was announced that over ZAR 1 billion had been set aside by the South African treasury to ensure a smooth transition from analogue broadcasting to digital.

5. Radio Spectrum Management

The Luanda SADC Ministers' meeting approved the adoption of the SADC Frequency Allocation Plan (FAP), and encouraged Member States to harmonise their national Frequency Band Plans with the approved SADC FAP. The validation workshop for the SADC FAP, which was held in Swaziland in February 2010, identified the following issues for CRASA in order to reach a comprehensive harmonised spectrum allocation and management framework:

- Harmonisation of the HF cross-border coordinated frequencies for trucking;
- Harmonisation and development of specifics for Short Range Devices (SRDs);
- Harmonisation of spectrum provisions for Public Protection and Disaster Relief (PPDR);
- Finalisation of the channelling arrangement (Channel Plan) for all key bands i.e. IMT, CB, BFWA and microwaves links;
- Review of the footnotes applicable to SADC in readiness for WRC;
- Reconsideration of the deployment of T-DAB in the bands 1452 to 1492 MHz;
- Harmonisation of HF usage in SADC, which mostly is used for government defence under the SADC military harmonisation initiative; and
- Review of the applicable bands for the Digital Radio Mondiale (DRM) service.

The Frequency Planning, Technology and Advanced Services Committee met in Salima, Malawi in May 2010 and agreed to a large work plan with the following elements:

- Develop a common SADC Cross Border Trucking Licence template;
- Engage with the SADC Military Alliance to formalise the harmonisation of the bands that have been requested for usage for the regional defence programme;
- Urge each NRA to review its footnotes in both the SADC Frequency Allocation Plan (FAP) and ITU Plan prior to the SADC WRC Preparatory Meeting;
- Review the MoU on Cross Border Coordination to allow for effective implementation of services other than GSM and to revive the Sub-Committee on Cross Border Coordination;
- Consider and analyse the option to introduce spectrum trading to manage the spectrum use in SADC;
- Urge Country Members to publish their Band Plans and Standards in use;

- Urge SADC Member States to enforce the implementation of Mutual Recognition of Type Approval in the SADC Region;
- Resuscitate the One-Stop-Shop (OSS) for SADC in order to overcome the challenge of type approval of equipment from regions other than Region 1;
- Urge CRASA members to Monitor Usage of the 13 harmonised HF frequency channels and to consider alternative use where necessary;
- Develop the CRASA Framework on harmonisation of frequencies for SRDs;
- Develop the CRASA Model Framework on harmonisation of frequencies for PPDR;
- Prepare Draft Paper with Recommendations on the current ITU Radio Regulations footnotes reflecting SADC country names;
- Develop Harmonised radio frequency channelling arrangements for terrestrial fixed and mobile systems in SADC; and
- Review the "Implementing a Harmonised PMR 446 Two Way Radio Service in SADC" and add the document as an addendum to the new SRD Framework.

The March CRASA AGM also approved guidelines on: a) Harmonised Radio Frequency Channelling Arrangements for Terrestrial Fixed and Mobile Systems in SADC, and b) the Framework for harmonisation of frequencies for Public Protection and Disaster Relief (PPDR) in SADC.

The CRASA Priority Projects for 2010/11 were agreed as follows:

- Development of a framework for SADC Regional Roaming Regulation;
- Development of Toolkit for the Best Practices in Universal Service and Access;
- Harmonisation of Cyber Security Regulatory Frameworks in SADC;
- Monitoring and evaluation of the SADC Action Plan for Digital Broadcasting Migration; and
- Development of a Channelling Plan.

6. Commentary on Existing SADC Projects

An existing set of 16 proposed projects was identified through consultations with the SADC Member States. Of the 16 approved projects, four are related to infrastructure development, five are focussed on policy and regulatory frameworks, four on postal services, and three are new priorities. All are SADC Member State priorities for implementation, and are not dependent on cooperation with any other Member State, but provide national benefits and contribute more generally to regional integration, cost sharing and a common market.

Infrastructure Development

SADC Regional Information Infrastructure (SRII) Phase 2-Intelligent Nodes

This project is mainly a business decision by the SATA members to continue the process of upgrading their networks to the next generation of technologies (all-IP based systems) which would help them to provide better services while cutting their operating costs (reduced human resource requirements and equipment cost/maintenance). In its entirety it is unlikely to qualify for development finance as it is potentially fundable on a country-by-country basis by the commercial banks or by the foreign shareholder where the operator has been partially privatised. If the network upgrade can be sectioned out for the more remote and rural areas, which may not be economically justifiable, it may be possible to make a case for DFI funding for these aspects, or the funds could come from the USF if available.

Setting up National & Regional Internet Exchange Points (NIXPs and RIXP)

As indicated earlier in the report, all SADC Member States, except Lesotho, Madagascar, Seychelles and Swaziland, already have national IXPs and some have two. However most of the existing IXPs are

not functioning optimally, so as a first step, this project could be re-aligned around improving the functioning of IXPs in the region, while setting up new ones where required, which could include secondary cities if there are multiple independent networks operating there. A study could be conducted to evaluate the efficiency of operations of IXPs and their operating environment in SADC Member States, identify the bottlenecks to their establishment or effectiveness, and use the outputs of this to develop a regional programme to improve internet interconnectivity within the region. This project could gain synergy from the African Union/EC AXIS project which also aims to build the strength of IXPs on the continent. Aside from national governments and local Internet providers, other potential partners/sponsors, which have shown interest in this area are: Internet Society (ISOC), Cisco, regional data centre operators such as such as Teraco, and content distribution networks (CDNs), e.g. Google.

Digital Television Broadcasting Migration

This project has already gained considerable momentum in the region, and while it is important to ensure that funds are available to complete the process, this will ideally be a fairly short project if the 2013 switchover goal is reached (with slippage to 2015 envisaged). However during the period leading up to the final switchover there is likely to be considerable preparatory work required to make the process as smooth as possible. In addition, given that South Africa has allocated R1 billion to the process, some of the SADC members with lower levels of economic development may need external assistance to finish the migration, and as already proposed, some Universal Service Funds could be applied to support the process. This is linked with the 'Regional digital migration' project under policy and regulation category below.

Study on the Harmonisation of Broadband Infrastructure Projects in SADC

Knowledge of the opportunities and needs for standardisation in extending broadband infrastructure across borders, such as through using alternative infrastructure or transport corridors will help to maximise the level of interconnection regionally. In terms of national broadband plans for local access, there is potential for the development of a toolkit to guide policy makers in best practices, making use of experiences in other parts of the world.

Policy and Regulatory Framework

Implementation of the e-SADC Initiative

There are seven strategic objectives in the e-SADC framework (conducive legal, policy and regulatory environment for the development of an ICT culture; ICT infrastructure and security; human resource development; e-applications including e-government; usage of ICT in business; local ICT industry; and development of institutional mechanisms). This is a programme with a wide remit which will need to be considered in detail to determine how best the RIDMP can support it. The ICT infrastructure and security objective is among the most closely aligned with the regional mandate, as well as with support for regional research and an enabling environment.

Regional Digital Migration Plan

Project 3 above, supporting 'Digital Television Broadcasting migration', could be closely linked with this project to help maximise the potential benefits of the digital dividend in terms of being ready to allocate the spectrum for broadband as soon as it becomes available (linked with project 4 below on SADC frequency band plan) and with the project 1 under New Priorities, 'Monitoring and evaluation of the SADC Action Plan for digital broadcasting migration'.

Development of a Framework for SADC Regional Roaming Regulation

This project awaits the outcome of the RIA II study to help determine the best strategy. With the

growth of low cost inter-regional terrestrial fibre networks interlinking mobile operators with multi-country footprints, roaming is becoming a business competition element with free international calls between users on the same parent network (MTN or Bharti-Airtel for example). Consideration will also need to be made of how best to leverage the interest in low cost roaming to scale it up for the Tripartite, as well as for the African Union's roaming project.

SADC Frequency Band Plan

Continued technology developments in wireless communications and shifting requirements from existing and new operators emerging in the market require continuous updating of frequency band plans. Particularly extensive and rapid changes will need to be accommodated in the wake of the DTT migration process.

Harmonisation of Cyber Security Regulatory Frameworks in SADC

The importance of national security and the development of effective legislation to deal with issues of personal privacy, data protection and countering cyber-crime is a critical requirement in the policy frameworks. Three legal instruments can be envisaged here for facilitating e-commerce - e-transactions, personal data protection and cyber-crime. This project has regional significance because with growing broadband interconnectivity, cyber-crime can easily be perpetrated across borders and criminality often emanates from 'safe havens' or exploits locations and situations with lax legislation. In addition exploding numbers of consumer devices connected to the network along with mass financial transactions, increase the opportunities for security breaches. Security facilities could also be shared by countries, especially by paring countries with scarce resources with those with better resources, at least initially. Aside from SADC activities here, it should be noted that an extensive cyber-security project is also being developed by COMESA, including proposals for a regional Public Key Infrastructure (PKI), and a regional cooperation agreement between Member States on cyber security matters e.g. investigation, enforcement, digital certification. To this end, a cyber-security Implementation Roadmap was adopted at the 5th COMESA Transport, ICT and Energy Ministers' meeting in Swaziland in 2011.

Postal Operations and Regulation

Regional Project to Improve Quality of Service within the Postal Network

High quality postal services are vital to ensuring the economic sustainability of the public postal system, and a critical requirement for a vibrant e-commerce ecosystem. Use of ICTs in logistic system, along with improved cross-border terrestrial and air transport routes hold considerable potential for improving postal QoS.

Regional Project to Improve Interconnection among Physical, Electronic and Financial Postal Networks within the Region

Interconnection of postal systems at all operational levels and at multiple geographic points is vital for providing a sustainable, affordable and efficient postal service. This project involves a mix of hard and soft aspects, some of which are dependent on other aspects of the RIDMP – energy supply, transport infrastructure, national broadband and regional backbone connectivity. In the area of physical interconnection, this could extend to the establishment of regional standards for addressing systems and post-codes, and possibly assistance in their implementation. Use of GPS based information and GIS systems are also potential aspects to this project. COMESA and the UPU have agreed to conduct a study on postal code and addresses and organise training for postal regulators.

Strategy to Counter Acts of Terrorism, Malpractices and Money Laundering through the Postal Network

Potentially, this is a capacity building programme to help build internal security systems in national postal networks. This project has links with project 5 above on harmonisation of cyber regulatory frameworks, and needs to establish national public/private sector postal industry stakeholder forums to establish common procedures and share information. A toolkit based on best practices worldwide appears relevant here.

Regional Project on Development of a Sub-Regional Road Transport Network within the SADC Region

This project would have very strong linkages with the transport sector components of the RIDMP, on which it would likely depend for the successful achievement of this goal.

7. New Priorities

Monitoring and Evaluation of the SADC Action Plan for Digital Broadcasting Migration
Implementation of the Action Plan requires up-to-date monitoring of its progress and identification of potential constraints to its completion. Given the importance of this process, both for the introduction of improved broadcast services and to liberate much needed radio spectrum, this project would be closely linked with the two digital migration projects above.

ICTs and Climate Change
Increased uptake and intensity of use of ICTs, from the end user device to wireless base stations and data centres, is leading to exploding levels of energy demand, increasing carbon footprints everywhere. In the USA, ICTs are now responsible for about 10% of total energy consumption. Energy consumption can be mitigated to some extent by adopting optimal networking topologies, low power consuming equipment and use of cloud computing systems. This is a fast moving field also tied to energy policy (e.g. IPPs) and renewable energy infrastructure. At the same time, ICTs can help monitor climate change, and industrial or domestic energy consuming activities to increase the efficiency of energy use.

Postal Security
Postal security is closely related to project 1 above on improving Quality of Service in the Postal Network. The use of online real-time security cameras and other monitoring systems is linked to Project 2 above on ensuring electronic interconnection within the postal system.

Many of these projects support the goals of the other RECs in the Tripartite Framework – COMESA and EAC, as well as further afield in ECOWAS and the UMA, and at the continent-wide level with the African Union and PIDA (see Annexure 5).

ANNEXURE 6 - PIDA ICT Infrastructure Recommendations

This section outlines the main PIDA strategic recommendations for the ICT sector and these have been used to help identify supporting or complementary projects to the ones already identified, and to determine the gaps in the proposed list of projects.

More efficient use of existing infrastructure – in the short term, there are massive benefits to be gained simply by improving access to what is existing – i.e. the efficiency of the current fibre infrastructure. The major part of the e-Africa vision can be achieved by ensuring that the extensive fibre infrastructure that is currently in place is made available at competitive or cost-oriented prices. This will require creating an enabling policy/regulatory environment (especially through price regulation and non-discriminatory access requirements on SMPs) for:

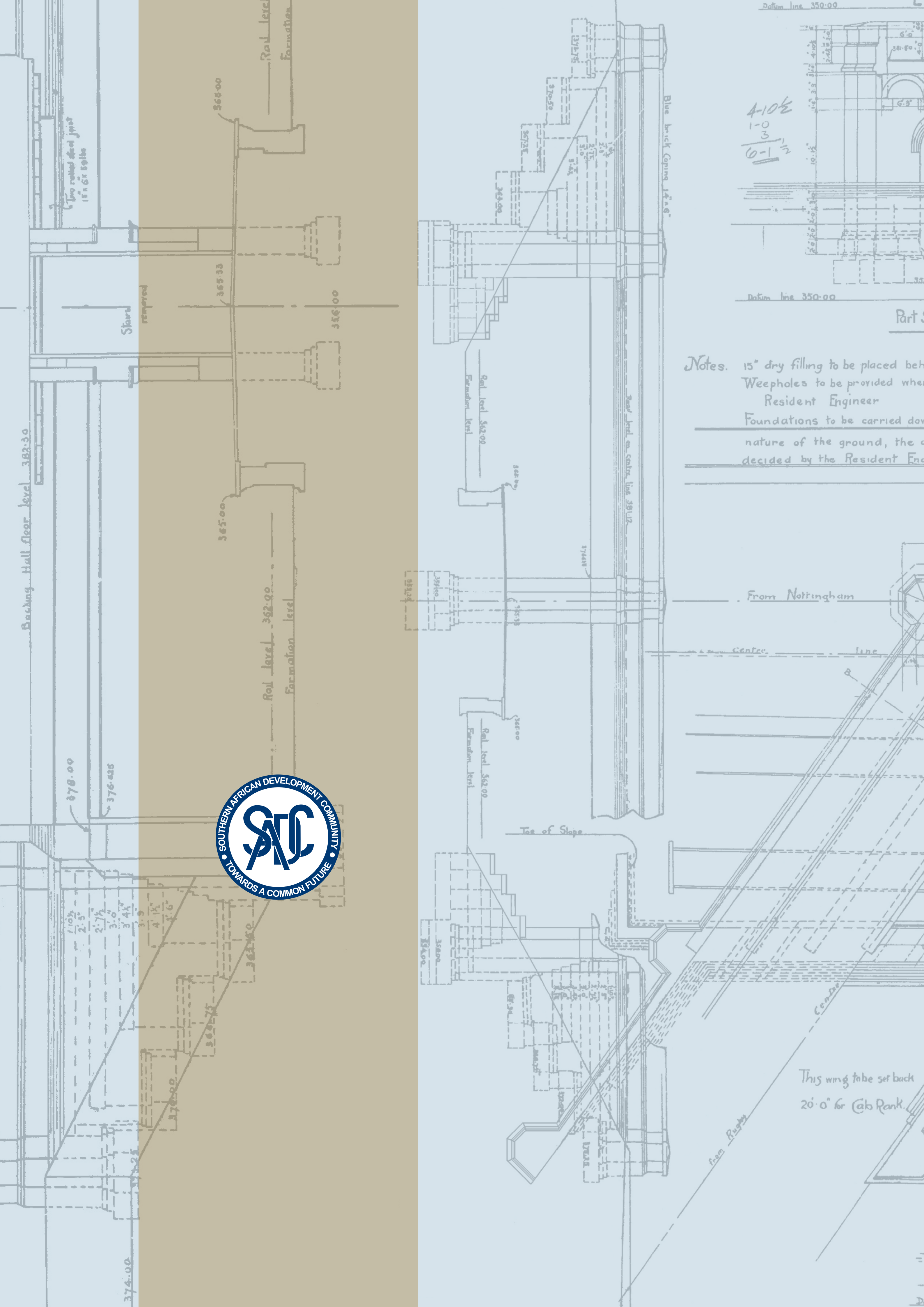
- Optimising the use of existing telecommunications fibre (reducing costs and providing access to all operators);
- Ensuring access to existing alternative infrastructure (transport and energy) to provide additional routes and competitive choice;
- Conducting regular ICT market and infrastructure data gathering to support more informed decision making, monitoring and evaluation; and
- Developing an awareness-raising and peer-review process to ensure commitment from all countries to the strategy and encourage countries that are lagging behind to catch up.

Connecting the remaining missing links – both between countries, and submarine landing stations where needed.

Increasing international demand – opening markets to new access providers, establishing national traffic exchange points (IXPs), lowering ICT taxes and licence/spectrum fees, supporting extension of national/international backbones to remote and rural areas (PPP/reverse auction), and deploying fibre on alternative infrastructure.

Establishing a more conducive environment for future fibre deployments – domestic markets need to be opened to increased competition to encourage private sector investment in cross-border and national backbone infrastructure. To optimise the large potential cost savings for new fibre deployments, planning regulations need to be developed to ensure that all new transport and energy infrastructure includes ducts and fibre for telecommunications purposes. To further support this activity, 'smart ICT corridors' need to be established with all new trans-border road links to ensure they include the required fibre facilities.

Deploying domestic satellite infrastructure to improve backbone reliability where there is only one fibre link, for broadcasting, and to fill the gaps in rural broadband coverage, especially in the remote areas where it may be many years before terrestrial infrastructure becomes available. Satellite infrastructure would also be necessary for regional remote sensing applications.



SOUTHERN AFRICAN DEVELOPMENT COMMUNITY
SADC
TOWARDS A COMMON FUTURE