

Broadband ICT Policies in Southern Africa: Initiatives and Dynamic Spectrum Regulation

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Abstract: The paper reviews the broadband ICT policy initiatives in Southern Africa with a focus on the status and trends following the commission of ITU member states by the World Summit on the Information Society in 2003. The paper also presents the framework of dynamic spectrum regulatory policies necessary for the Southern Africa countries in order to achieve an all-inclusive broadband ICT universal access target by mid of 2015. The document is relevant to the national and international policy makers in assessing their progress when compared with their neighbouring economies regarding the implementation of the dynamic radio spectrum regulation and ICT policies.

Keywords: Broadband ICT policies, Current ICT initiatives, Dynamic spectrum regulations.

1. Introduction

The wireless broadband communication infrastructure has a better opportunity to address the growing demand for high speed and low cost information technology and communication (ICT) access in the African continent region than the wired communication networks. This is because the wireless infrastructure is quicker to roll-out, more efficient and cheaper to build. It forms a ubiquitous and an all-inclusive Internet connectivity when compared to the wired network. Thus, wireless networks have become the most preferred means of providing ICT access to unserved and/or underserved population in most African countries. However, the success of the deployment of wireless networks relies on efficient, transparent, consistent and up to date broadband ICT policies by various governmental ICT regulatory agencies. These ICT regulatory agencies had been established with the aim of liberalizing the telecommunications sector to ensure that governments are not the direct providers of telecom services, but the regulators [1]. Moreover, due to out-dated and inefficient spectrum regulation policies existing in many African countries, there is a need for a paradigm shift towards dynamic spectrum regulations (which are spectral and economic efficient) policies.

The recognition that ICTs can be a development enabler is central to the ICT development index (IDI) conceptual framework. The IDI framework is a composite index combining eleven indicators into one benchmark measure that serves to monitor and compare developments in the ICT across many countries worldwide [15]. The main objectives of the IDI are four fold: first is to measure the *level* and *evolution over time* of ICT developments in countries and relative to other countries. Secondly, to measure the progress in ICT development in both *developed* and *developing countries*: the index should

be global and reflect changes taking place in countries at different levels of ICT development. Thirdly, to measure the *digital divide*, i.e. differences between countries with different levels of ICT development. Fourthly, is to measure the *development potential* of ICTs or the extent to which countries can make use of ICTs to enhance growth and development, based on available capabilities and skills. The need to bridge the digital divide and make wireless broadband internet access universal has been recognised within key international development goals, such as the Millennium Development Goals (MDGs) and the targets of the World Summit on the Information Society (WSIS) [4]. With the 2015 target date only two years away, ITU and its partners are actively working towards positioning the need for universal access to the wireless broadband infrastructure at the very centre of attention of policy-makers [15]. Unfortunately, not many member states of ITU in the Southern Africa and other developing regions have adjusted to the pace needed to achieve the much anticipated universal wireless broadband access. Indeed, such international ICT development goals demand liberal and dynamic spectrum regulation policies designed at a country level and more importantly across a majority of countries in the same region.

This paper highlights various initiatives aimed at formulating the all-inclusive broadband ICT policies by the Southern Africa Developing Community (SADC) region. The entire SADC region consists of 15 member states namely, Angola, Botswana, Democratic Republic of Congo (DRC), Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe. All these countries are members of the Communication Regulators' Association of Southern Africa (CRASA). The priority focus of CRASA is to harmonise the postal and ICT regulatory frameworks in the SADC region to achieve improved business and investment climate, leading to the economic growth [6]. The CRASA Secretariat is hosted by the Botswana Telecommunications Authority (BTA). This paper concentrates on seven Southern African countries, namely, Botswana, Lesotho, Mozambique, Namibia, South Africa, Swaziland and Zimbabwe. These countries have relatively high cost of ICT services stemming from the limited access to the scarce undersea fibre-optic networks and much lower-income inhabitants, on average when compared to the global status [16].

2. Objectives

In connection with these ICT policy challenges in the Southern Africa, the objectives of this paper are to:

1. Review the initiatives of broadband ICT policies in the Southern Africa since the launch of World Summit on the Information Society (WSIS) in 2003.
2. Assess the developments regarding the dynamic spectrum regulation policies in the Southern Africa.

3. Initiatives towards the Broadband ICT Policies in the Southern Africa

3.1 National Broadband Policy

In December 2001, the United Nations (UN) General Assembly (through the International Telecommunication Union (ITU) Resolution 56/183 [4]) endorsed the holding of WSIS. The summit was held in two phases; the first phase was held in Geneva (Switzerland) in December 2003 and the second one was held in Tunis, Tunisia in November 2005 [3]. In order to become an information society, several countries since then have developed their national broadband plans [2] based on the WSIS outcomes [3]. Internationally, different countries adopt their own definition for broadband connection. The SADC defines the broadband as "Internet access with a high capacity, usually 512 kbit/s or more in one or both directions" [19].

Within the SADC regions, few member states have developed their national broadband or ICT policies that focus on connectivity that bring more and more of its citizens into the information society and building ever-faster connections to the rest of the world [18]. The Botswana government released the “National ICT Policy” (called Maetlemo) in 2004 [7] and the “National e-Government Strategy 2011-2016” (Vision 2016) [8] in 2010. These policy documents address the broadband provision and promote the use and access of ICT services (such as e-Government, e-Education, e-Health, e-Commerce, and e-Agriculture) by the government and the communities at large [18].

In July 2010, the Department of Communications (DoC) of South African government released a “Broadband Policy” [5] “to ensure realisation of the goal of an all-inclusive information society that can enjoy the economic benefits associated with broadband in both urban and rural areas”. During April 2012 there was a call by the South African’s Minister of Communications (Ms Dina Pule) to review the ICT policies. The review was initiated to examine the policy and regulatory frameworks that apply to telecommunications, broadcasting, postal and e-commerce and could lead to an adoption of a White Paper on the Integrated ICT Policy Framework for South Africa. The Department has set itself to develop a Green Paper on Integrated ICT Policy Framework by March 2013 [10]. In addition to the above, a South African ten years ICT Research, Development and Innovation (RDI) Roadmap was developed by the Department of Science and Technology (DST) and the Council for Scientific and Industrial Research (CSIR) Meraka Institute in 2012. This ICT RDI Roadmap’s vision is to create a digital advantage through twenty seven (27) market opportunities (MO) that were grouped in six clusters (broadband infrastructure and services, development, sustainability and environment, grand science, industrial applications and the service economy) as shown in Figure 1. The players who were expected to contribute towards the realization of this roadmap include the science research councils, government departments, and industry and higher learning institutions.

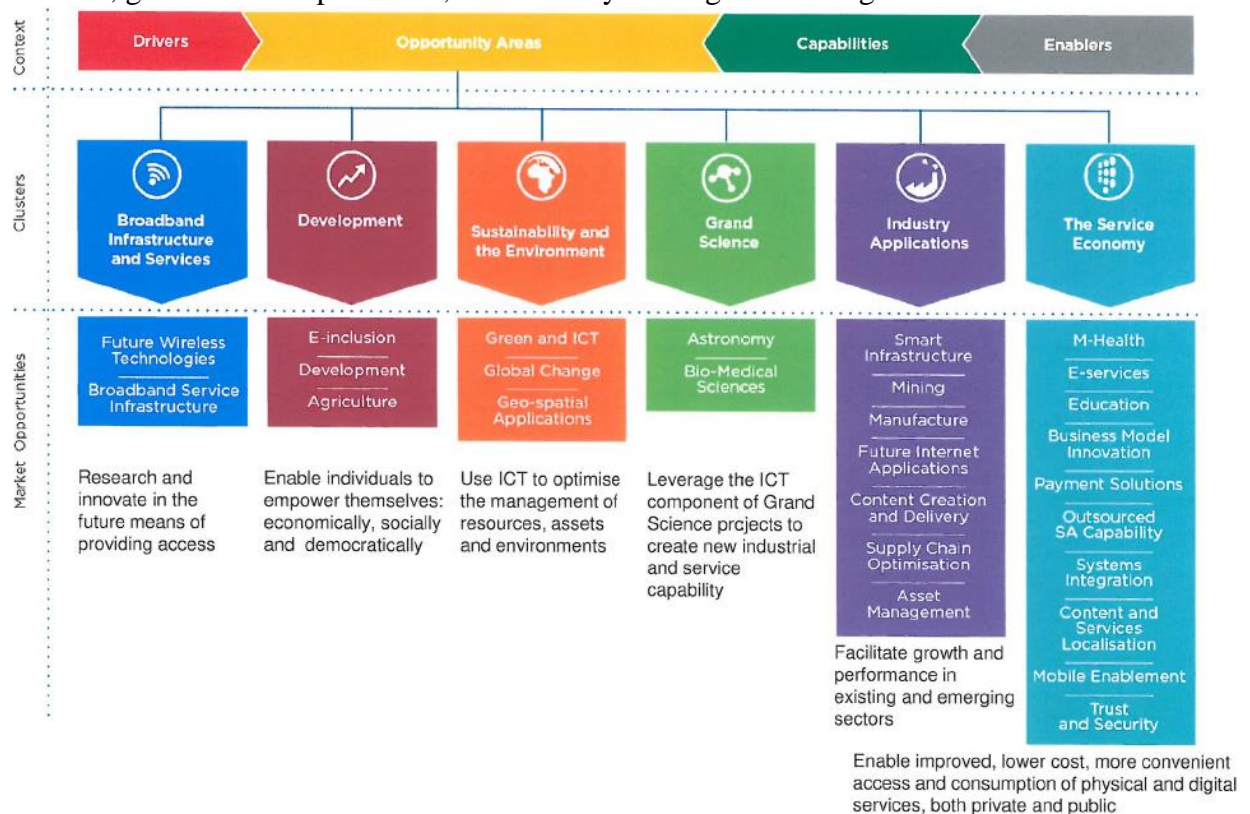


Figure 1: The DST and CSIR Meraka Institute South African ICT RDI Roadmap

In 2009, the Namibian government developed their “Overarching Information Communications Technology (ICT) Policy” to provide Namibia with clear policy guidelines towards achieving their vision 2030 [11]. This policy was aimed at ensuring a seamless convergence of the telecommunications, broadcasting, information technology, and postal sectors. However, the Namibian government’s minimum broadband speed is 20 Mbps as opposed to the South African’s 256 kbps speed.

A few SADC member states, which have published their broadband ICT policies but are not discussed further in this paper include: The Ministry of Communications and Transport in Tanzania who had published its national ICT policy in 2003 to meet the Tanzania Development Vision 2025 [9]. This policy was intended to enhance nation-wide economic growth and social progress by encouraging beneficial ICT activities in all sectors. The Ministry of Information and Communication Technology in Mauritius, who in January 2012, had released its “National Broadband Policy 2012 – 2020” [12]. This policy was aimed at facilitating the provision of affordable, accessible, universal access to broadband infrastructure and services to promote the social and economic opportunities for Mauritius to grow further as a knowledge-based society. Finally, the Malawian government who developed a “National ICT for development (ICT4d) Policy” in 2006 [13] with the chief aim of building their country to become a knowledge based economy and information rich society (vision 2020). The policy mandated the telecommunications service providers to develop and expand ICT infrastructure in rural communities; and deploying secure broadband and integrated multi-platform ICT infrastructure throughout the country. Other SADC member states have not yet published their broadband policies at the time of writing this paper, but are in the process of developing them.

3.2 ICT Penetration in the Southern Africa

In 2012, the ITU noted that mobile cellular telephony had demonstrated the highest ICT penetration rate between 2008 and 2011, while the fixed broadband subscriptions were the least over the same period in the Southern Africa [15]. This statistical profile has been illustrated by Figure 2. It was noted that the high cost of broadband internet services was a major contributing factor. The effect of ICT in the improvement of democratic processes, empowerment of communities and adaptation to the knowledge society in the region is still relatively low on average compared to the rest of developed countries [18].

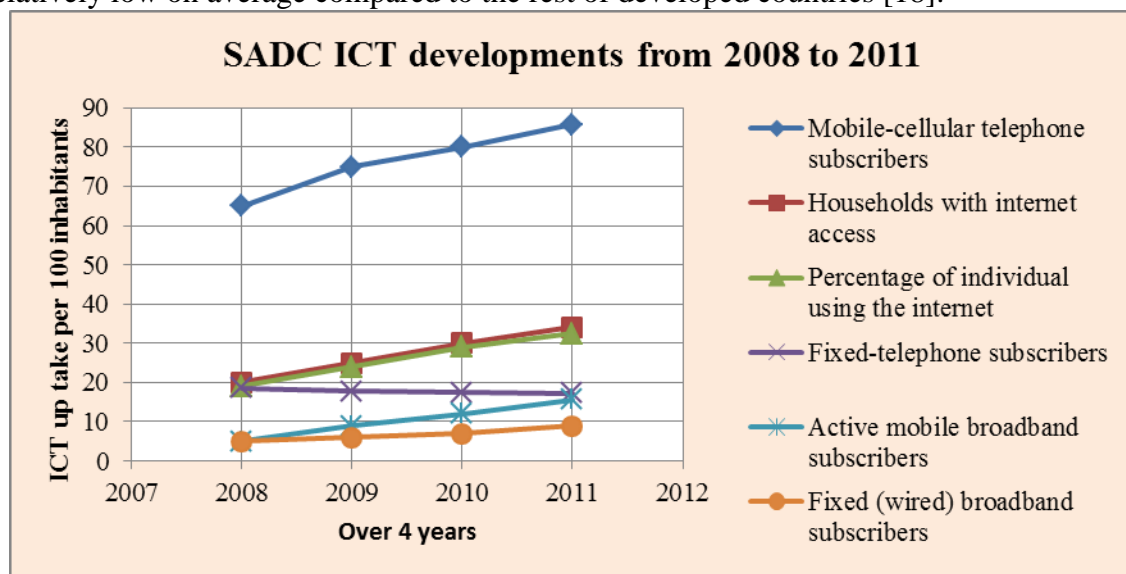


Figure 2: The Southern African (SADC) ICT developments between 2008 and 2011
Source: extract from ITU World Telecommunication/ICT indicators database [16].

According to the ITU-Information society statistical report released in March 2009, the ICT penetration in South Africa was the highest compared to other Southern African countries. South Africa had 8.6% internet users and 92 mobile cellular subscribers per 100 inhabitants, followed by Botswana with 6.2% internet users and 89 mobile cellular subscribers per 100 inhabitants, while Mozambique trailed the SADC region with 1.6% internet and 20 mobile users per 100 inhabitants, respectively [14]. This could be attributed to the lack of broadband ICT policy framework in Mozambique despite of the presence of undersea fibre-optic networks along the coastline of the country. In 2011 Botswana projected that its mobile cellular penetration rate will amount to 164%, fixed-telephony to 7.4% and Internet broadband to 9.5% by the end of 2012. Zimbabwe on the other hand had projected its mobile penetration rate to reach 85%, fixed telephony to 3% and internet broadband to 12% [15]. While Botswana's ICT development progress is partly due to the nationwide fibre backbone that supports a wide range of services, access to international bandwidth which is being improved by a regional fibre backbone network and new submarine fibre optic cables off the continent's east and west coasts, Zimbabwe faced an environment of strictly controlled traditional media, coupled with limitations on the international bandwidth for the landlocked country have affected development of the sector. This paper pushes for an ICT-based regulatory reform that will turn the SADC countries into more liberalised telecommunications markets, including service-neutral licensing regimes which take into account the increasing convergence of technologies and services.

3.3 ICT Price Basket in Southern Africa

To provide insightful information on the cost and affordability of ICT services in these Southern African countries, the ITU ICT Price Basket (IPB) benchmarking tool developed in March 2009 is used. The IPB is composed of three distinct prices – for fixed-telephone, mobile-cellular and fixed-broadband services – and computed as a percentage of countries' average gross national income (GNI) per capita. This puts prices into perspective, and makes it possible to monitor the affordability of ICT services. The price of ICT services has a significant impact on the formulation of broadband ICT policies. Prices strongly influence how many people are able and willing to subscribe to a service. The concept of 'affordability' is useful for service providers, policy-makers and analysts in ascertaining the potential user base of ICTs and identifying limits on ICT uptake [15]. In comparing the affordability of ICT services in SADC countries, Mozambique had the least affordable fixed telephone services with 33.7% in 2010 to 31.4% in 2011. Swaziland's fixed telephone was the most affordable at 2.3% in 2010 and 2011. Zimbabwe had the least affordable mobile cellular and fixed broadband services at 53.4% to 53.7% and 1059% to 78.3%, respectively, in 2010 to 2011. Botswana had the most affordable mobile cellular and fixed broadband services in the region with 2.6% to 2.3% and 5.2% to 5.2%, respectively, in 2010 and 2011 [16]. It is imperative to note that, while Southern Africa's mobile cellular sector has shown outstanding growth recently, sustaining this level of growth in the future may prove difficult. This is because additional mobile subscriptions and use of ICT services will likely come from lower income segments of the population, typically including people in rural and remote areas. This segment is harder for operators to address because the costs of infrastructure provision are high.

In pushing for the mobile cellular uptake and development in Southern Africa, policy makers face stringent challenges including the regulations that enhance competition and develop mobile broadband, incorporate roaming agreements and reduce import taxation. Competition through mobile virtual network operators (MVNOs), mobile number portability (MNP) and the regulation of mobile termination rates (MTR) are supposed to be adopted in a widespread. In South Africa, Virgin mobile has been operating as an MVNO by using the infrastructure of licensed mobile operator; Cell C. Through such infrastructure

sharing, costs and prices can be reduced, making ICTs more affordable for a wider segment of the population. Roaming agreements that allow mobile users in one country to use their mobile phones in another country at local rates should also be encouraged when developing the ICT policy framework. The lack of such agreements and heavy prices has discouraged inter-country's roaming services and consequently low up take of ICTs. Given the low average income levels in the Southern Africa region, import duties on IT equipment, VAT on goods and services and excise taxes on communication services raise prices, limiting take-up and discouraging use, should be reduced or removed completely. At present, the VAT on communication services range from 5 to 23% across the region, a move which hinders the up-take of ICT by low income inhabitants from the region [15].

3.4 Broadband ICT Access in Southern Africa

Southern Africa's progress in the ICT access is mainly due to the improvements in two indicators: mobile cellular subscriptions per 100 inhabitants, and international Internet bandwidth per Internet user. As the number of Internet users also grew significantly in the period, international Internet bandwidth per Internet user grew at a slower rate, yet it more than doubled from 2002 to 2007. The shortage of international Internet bandwidth has been acknowledged as a critical impediment for Southern Africa, especially in landlocked countries and others that do not have access to the scarce undersea fibre-optic networks, such as the SAT-2 and the SAT-3/WASC/SAFE systems in the western coast, and the SAS-1 in the eastern coast [14]. The increase in international Internet bandwidth reflects the efforts undertaken by Southern African governments to develop sub-continental broadband infrastructure. These efforts are likely to show its full results in the coming years, once some of the most ambitious initiatives come into operation. Other submarine cables that are currently deployed include EASSy, also targeting Africa's eastern coast, and west African coasts, which links South Africa and Europe through Africa's western coast. Notably, South Africa improved in the access, due to remarkable gains in mobile cellular penetration (from 30 to 87 per cent), and in international Internet bandwidth per Internet user (182 to 852 bits/s/user), although the total international Internet bandwidth per Internet user remained rather low. On the other hand, little progress was achieved in the percentage of households with access to the Internet (4.8 in 2007), and in the number of Internet users per 100 inhabitants (from 6.7 to 8.2 per cent).

4. Developments Towards the Dynamic Spectrum Regulations

4.1 TV Broadcast Digital-Switch-Over Readiness

In 2000, the ITU made a decision to globally migrate from the analogue terrestrial television to digital terrestrial television (DTT) broadcast by 17 June 2015 for region 1 and 2020 for other regions. To ensure interoperability, the ITU Region 1 established the Geneva Regional Agreement GE06 that governs the use of broadcast frequencies (in 174-230 MHz and 470-862 MHz bands) and also defines the technical standards for digital television infrastructure and consumer equipment. The Communications Regulators' Association of Southern Africa (CRASA) is a consultative and collaborative body of regulators established under article 10.7(6) of the SADC protocol to deal with ICT and postal services among member states. As such, CRASA is directly involved with the coordination of TV digital-switch-over (DSO) in the region inline with the GE06 agreement.

In 2009, the SADC region adopted a "Roadmap for Digital Broadcasting Migration" [6]. This roadmap highlights the need for the region to complete their TV DSO by 31 December 2013 in order to achieve the ITU region 1 migration deadline of 17 June 2015. The roadmap's objectives includes: the development of harmonized technical standards for

digital broadcasting equipment and Set Top Boxes (STB); development of harmonized frequency band plans for the provision of the digital broadcasting services; the development of a harmonized licensing frameworks; and the development of harmonized switch off date [6]. It is important to note that DVB-T was chosen as a baseline standard for DTT with a provision for member states to upgrade to DVB-T2 standard should they decide to do so. Such a move will ensure, if adopted, that more spectrum spaces for dynamic spectrum regulations by the regulators and dynamic spectrum allocations to the DTT operators. Although a few SADC countries have already started with the DSO trials, other member states are confident that they will achieve the ITU deadline of 2015.

4.2 Dynamic Spectrum Access

Existing license-free industrial, scientific and medical (ISM) bands (i.e. 2.4 and 5 GHz) have proven to be a hot-bed for innovation in wireless communications [17]. However, the rich eco-system in these bands is built on the limitation in the transmit power. This low transmit power limitation severely hampers the range of wireless services, which makes them unsuitable for broadband connectivity in sparsely populated rural areas. With the introduction of radio frequency (RF) spectrum aware cognitive radio (CR) technology and the availability of television (TV) spectrum, focus is now on dynamic spectrum access (DSA) regulatory framework and license-free operation on TV spectrum (as already implemented in the USA and UK). While CR technology promises intelligent and efficient utilization of RF spectrum, the TV spectrum provides favourable propagation characteristics which will ensure that larger areas are covered for wireless access than the current Wi-Fi system.

The CRASA members in the SADC region have not yet made a ruling on how to take advantage of CR for DSA regulation. However, there are on-going studies within the SADC region to look at the advantages offered by the CR and DSA approaches. During the previous ITU WRC-12 conference, the SADC members managed to discuss the agenda items on CR and software defined radio (SDR) with the aim of observing the ITU developments.

There are different initiatives from other ITU Region 1 members and the US to introduce new spectrum regulation policies for the twenty-first century with the aim of moving away from the outdated and static spectrum regulations (which are still used in SADC regions). Proposed DSA regulations includes opening the TVWS for license-exempt use, secondary spectrum licensing, pluralistic licensing [17] and ISM Advanced [17] license-exempt licensing. African regulators therefore need to be pro-active in developing or adopting DSA regulation to ensure efficient use of RF spectrum.

5. Business Benefits

The study of broadband ICT policies in Southern Africa is important for policy makers in the region to prepare its citizens to become an all-inclusive knowledge based economy so as to have a competitive edge with the first class world countries. The full value of the digital dividend and TV white space spectrum in the SADC region can only be realised when sound dynamic spectrum access policies are in place. Consequently, this will allow dynamic spectrum trading which will spur the emergence of innovative and disruptive business models that will utilise spectrum in small portions or in its aggregate form in a space, time or frequency domains. With billions of things to be connected, the potential business benefits that may emanate from sound dynamic spectrum access policies are quite broad. For example, in the Machine-to-Machine (M2M) aspect alone many applications are currently discussed by various interest groups, these include but not limited to: smart

buildings, energy (smart metering), healthcare, transportation, retail for point-of-sale terminals, and public safety.

6. Conclusions

The demand for high speed wireless internet access anywhere anytime can be achieved as long as there are enough usable RF spectrums available to support new wireless technologies. Studies have shown that traditional spectrum regulation policies (such as command-and-control) are some of the causes of lack of usable RF spectrum. There is a need for RF spectrum policies' reform from static spectrum regulation to dynamic spectrum licensing policies. This paper proposes possible dynamic spectrum licensing policies that Southern Africa countries could find useful to give them competitive advantages over their counterparts globally. It was learnt that existing broadband ICT policies in the target SADC countries faced implementation challenges linked to bad governance and lack of dynamic spectrum regulation policies. Moreover, the all-inclusive ICT penetration, prices and access are primary held back by lack of liberal ICT policies in such countries.

This paper is relevant to national and international policy makers regarding the radio spectrum regulation and ICT policies that boosts national growth and development towards the all-inclusive information systems to the Southern Africa developing communities.

References

- [1] Global Internet Policy Initiative, *Best Practices for Telecommunications Reform* (May 2002), 1. <http://www.apdip.net/documents/policy/regulations/gipi01052002a.pdf>, May 2002.
- [2] Organisation for Economic Co-operation and Development (OECD), "National Broadband Plans", *OECD Digital Economy Papers*, No. 181, OECD Publishing. <http://dx.doi.org/10.1787/5kg9sr5fmqwd-en>, 2011
- [3] International Telecommunication Union (ITU), "Outcome documents: Geneva 2003 – Tunis 2005", *World Summit on the Information Society (WSIS)*, Dec 2005.
- [4] ITU General Assembly, "World Summit on the Information Society", *ITU Resolution 56/183, Agenda Item 95 (c)*, January 2002. http://www.itu.int/wsis/docs/background/resolutions/56_183_unga_2002.pdf
- [5] Department of Communications (DoC), "Broadband policy for South Africa", *Government Gazette No. 33377*, Republic of South Africa, 13 July 2010.
- [6] Communications Regulator's Association of Southern Africa (CRASA) "SADC roadmap on digital broadcasting migration", Nov 2010.
- [7] Republic of Botswana, "Maetlemo: Botswana's National ICT Policy", *Final Report*, http://www.bits.org.bw/downloads/MAITLAMO_NATIONAL_ICT_POLICY.pdf, December 2004.
- [8] Republic of Botswana, "Botswana's National e-Government Working-Draft Strategy 2011-2016", <http://www.gov.bw/Global/MTC/E-gov.Working-Draft%20Strategy.pdf>, 2010.
- [9] United Republic of Tanzania, "National Information and Communications Technologies Policy", *The Ministry of Communications and Transport*, <http://www.tanzania.go.tz/pdf/ictpolicy.pdf>, March 2003.
- [10] South African Department of Communications, "Invitation to nominate ICT policy review", *Government Gazette No. 35408*, vol. 564, 1 June 2012.
- [11] Republic of Namibia, (2009) "Overarching information communications technology (ICT) policy for the Republic of Namibia", [Online], Accessed: 18 July 2012, Available from: http://209.88.21.36/openems/export/sites/default/grnnet/MIB/Legislation/policies/NMICT_Overarching_Policy_incl_Postal_v15.pdf.
- [12] Republic of Mauritius, "National Broadband Policy 2012 – 2020", *Ministry of Information and Communication Technology* <http://www.gov.mu/portal/goc/telecomit/file/NationalBroadband.pdf>, January 2012.
- [13] Government of Malawi, "Malawi national ICT for development (ICT4D) policy", <http://unpan1.un.org/intradoc/groups/public/documents/unpan/unpan033688.pdf>, *Ministry of Information and Tourism*, July 2006.
- [14] ITU, "Information Society Statistical Profiles 2009, Africa," Available from: <http://www.itu.int/ITU-D/ict/publications/>. Accessed on 07/12/2012.
- [15] ITU, "Measuring the Information Society, 2012" Available from: <http://www.itu.int/ITU-D/ict/publications/>
- [16] ITU, "World bank The Little Data Book on Information and Communication Technology 2012", <http://www.itu.int/ITU-D/ict/publications/>. Accessed on: 07/12/2012
- [17] European COST-TERRA Action IC0905, "Pluralistic Licensing", <http://www.cost-terra.org>. Access on 30/11/2012.
- [18] The World Bank and the African Development Bank, "The transformational use of ICT in Africa," 2012. www.eTransformAfrica.org. Accessed on 15 February 2013.
- [19] Southern Africa Developing Community, "SADC guidelines on universal access and services", Adopted by: Meeting of SADC Ministers responsible for telecommunications, postal and ICT, Gaborone, Botswana, 16 June 2011. http://www.crasa.org/tempex/doc_pub_eng61.pdf, Accessed on 14/02/2013.