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ASSEMBLY OF THE UNION Fifteenth Ordinary Session 25 - 27 July 2010 Kampala, Uganda

Assembly/AU/17(XV) Add.4

SOCIO-ECONOMIC TRANSFORMATION AND INFRASTRUCTURE DEVELOPMENT IN AFRICA: ENERGY (ELECTRICITY), RAILWAYS, ROADS AND ICT SECTORS

(Item Proposed by the Republic of Uganda)



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Acronyms

AfDB African Development Bank

AICD Africa Infrastructure Country Diagnostic study 2008

AUC African Union Commission

bps bits per second

EU European Union

ICA Infrastructure Consortium for Africa

ICT Information and Communication Technology

kWh kilowatt hour

LDCs Least Developed Countries

MDG Millennium Development Goals

MW Megawatts

NEPAD New Partnership for Africa's Development

OECD Organization of Economic Cooperation and Development

PPP Public Private Partnership

PIDA Programme from Infrastructure Development in Africa

SSATP Sub Saharan African Transport Policy Programme

TAH Trans- Africa Highway



SOCIO-ECONOMIC TRANSFORMATION AND INFRASTRUCTURE DEVELOPMENT IN AFRICA: ENERGY (ELECTRICITY), RAILWAYS, ROADS AND ICT SECTORS (ITEM PROPOSED BY THE REPUBLIC OF UGANDA)

1.0 Overview

1. The GDP per capita of most African countries were comparable to Asian Countries in the 1960s. However, presently most African countries lie in the Least Developed Countries (LDC) category and low middle income category. This slow socioeconomic transformation over the period is attributed to inadequate infrastructure to drive economic growth. The paper benchmarks the infrastructure situation (Power, roads, railways and ICT) in Africa against upper middle level income countries. presents the gaps that Africa has to address in order to foster faster socio-economic transformation and sets targets to be achieved within a defined period of 30 years. On average, Africa should increase its electricity consumption per capita by over 3090 kWh per capita. This translates to over 900,000MW. In the transport sector, the percentage of paved roads has to increase by 40% and the road density by 70 km per 100km². In the ICT sector, the average bandwidth capacity is estimated at 78 bps per capita. To reach average of high income countries, of approximately 18,240bps per capita, there is need to increase the capacity of the bandwidth to 23 Tbps by 2025. The networks within the countries should be extended to increase the penetration to at least 60 internet users per 100 people. To achieve this, the declarations made in the 12th and 14th AU summits in Addis Ababa must be supplemented by clear funding mechanisms which have been a major impediment of implementation. These include ring fenced national funds, Public Private Partnerships (PPPs), infrastructure bonds, pension funds, capital markets and concessional loans.

2.0 Energy (Electricity)

2.1 Background

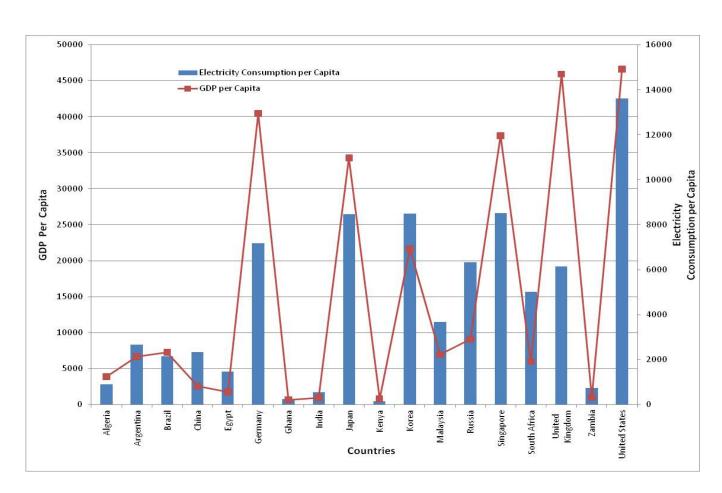
2. Energy (Electricity) is an essential driver of socio-economic transformation of a nation. It is the main driver of industrialization that subsequently increases employment and economic growth. Low or lack of electricity is the main reason why African countries export raw materials or low value added products. In addition it is needed to meet the basic needs of food, shelter, health and education.



2.2 Situation analysis

3. The electricity consumption per capita (2007 figures) is highly related to the GDP per capita (2007 figures)¹ as shown in figure 1 below. Countries with higher electricity consumption per capita also have higher GDP per capita thus improved welfare for their population.

Figure 1: Electricity Consumption per Capita and GDP per Capita for Selected 18 Countries in the World



4. The average **electricity consumption per capita** for Africa in 2007 was estimated at **578** kWh per capita (IEA, 2009)², which is a quarter of the world average estimated at **2752** kWh per capita and a fourteenth of the OECD average estimated at **8477** kWh per capita. This African average is not equally distributed as countries like South Africa has a high consumption rate estimated at 5,013 kWh per capita. Figure 2 below shows some of the 15 Africa countries and how the consumption per capita

² Kev World Energy Statistics 2009, International Energy Agency



www.imf.org, World Outlook database April 2009.

varies. This is mainly due to insufficient generation capacity. This low electricity consumption per capita has led to consumption of other sources of energy mainly biomass which has had serious detrimental effects on the environment. It is important to note that 50% of this electricity consumed comes from coal which has high carbon emissions and not environmentally friendly.

5. To address this issue and increase electricity consumption per capita to levels of upper middle-income countries over a period of 30 years, an additional substantial investment in power infrastructure is required. To add about 3090 kWh per capita to increase African average to 3668 kWh Per capita, a total of about 900,000MW electricity generation capacity will be required. Table 1 shows capacity projections over the period of 30 years. Given the current capacity, Africa needs to fundamentally change its investment direction to prioritize energy to address the gap. Figure 2 shows country specific deficits to meet the target of 3,668 kWh per Capita.

Table 1: Projections of the Generation Capacity Requirements

| Years | 2007 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
|-------------------------------------|--------|---------|---------|---------|---------|---------|---------|
| Population (Millions) ³ | 944 | 1,153 | 1,276 | 1,400 | 1,524 | 1,647 | 1,769 |
| Consumption (kWh/capita) | 578 | 1093 | 1608 | 2123 | 2638 | 3153 | 3668 |
| Estimated Capacity (MW) | 83,049 | 191,822 | 312,388 | 452,449 | 611,995 | 790,784 | 987,968 |

³ World Population Prospects: The 2008 Revision Population Database



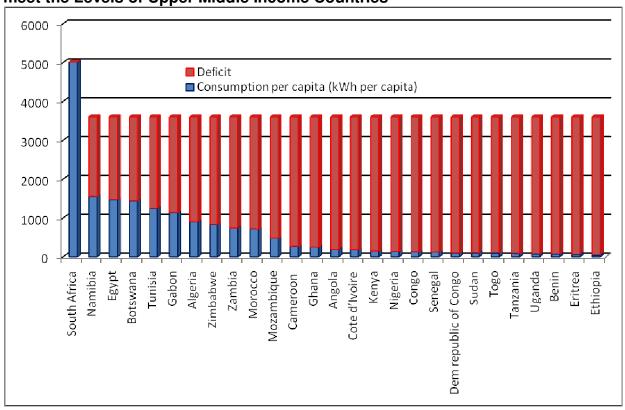


Figure 2: Graph Showing the Electricity Consumption per capita and deficit to meet the Levels of Upper Middle Income Countries

6. Africa must diversify the current energy sources to meet the required demand. The cleanest energy source would be hydropower. However, the hydropower potential is estimated at 300,000MW. Another clean energy source, geothermal, has limited potential estimated at 14,000MW. These leave a deficit of about 600,000MW to be met from other sources. The natural gas reserves are estimated at 14.4 trillion cubic metres and are expected to increase over time. However, to date over 70% of the gas is still flared⁴. Estimating that each cubic meter of gas provides 3.2 kW and will be exploited over a period of 50 years, the gas is also limited. The other sources of energy especially solar, wind and fossil fuels are still expensive and increase the cost of doing business. For example solar is estimated to be over 50 Cents per kW. Therefore, Africa must invest in nuclear energy, which is less costly and can provide substantial amounts to address the shortcomings. Furthermore, interconnectivity between countries and Regional Economic Communities (RECs) will be paramount as the distribution of energy sources varies across the continent. There will be additional resources needed to develop a transmission network to interconnect various RECs to enhance energy security in Africa.

⁴ African Energy Commission (Afrec) Report 2008



2.3 Specific Recommendations for Energy

- i) Governments should make electricity infrastructure development a key priority sector in the national development plans.
- ii) There is need to allocate adequate resources for the Power sector. Putting in place a dedicated fund would help address the area of financing the necessary infrastructure.
- iii) Private sector participation should be encouraged to complement efforts of Governments. Resources should be availed to undertake the necessary studies so that bankable projects are packaged and developed by either the public or the private sector.
- iv) Realizing that conventional energy resources are not sufficient to meet the growing demand, it is important to consider developing our capacity to generate power from non-traditional sources such as nuclear energy in the long term. A sound policy framework should be put in place, capacity should be developed to enable us generate power from nuclear resources.

3.0 Transport Infrastructure

3.1 Background

7. Transport is an important sector of the economy impacting on development, socio-economic growth and the welfare of people. It is a pillar that supports rapid economic growth and reducing poverty. As engines of economic integration, transport infrastructure and service facilities constitute a precondition for facilitating trade and the movement of goods and persons. Efficient transport systems provide economic and social opportunities and benefits that result in positive multiplier effects such as better accessibility to markets, employment and additional investments.

3.2 Road Infrastructure Situation in African

8. In 2001, the road density in Africa was low at about 6.84km per 100 sq. km. The total length was about 2.06 million km of roads. The network had expanded to 2.42 million km by 2005, with a proportional growth in the road density to 8.3 km per 100 sq. km. This is low compared to middle income countries like Korea at 101.6, per 100 sq. km, Malaysia at 30.0 km per 100 sq, km, Singapore at 462.7 km per 100 sq. km, United Kingdom at 160.2 km per sq km⁵.

⁵ World development indicators 2009





9. Most of the road network is not paved. About 580,066 Km or 22.7 per cent was paved in 2005. This is low compared to average south Asian Countries estimated at over 56.9%. A look at the proportion of paved roads by sub-region shows a huge diversity. Whereas, Northern Africa had the highest share (49 per cent) of the continent's paved roads, leading the rest of the sub regions by a wide margin, the second highest share (27 per cent) of the paved roads was found in Southern Africa. The share of paved roads in the other sub-regions ranged from 1 to 13 per cent. The sub-Saharan countries are the ones most affected with percentages at 11.9 %. This is in contrast to Middle East and North Africa at 81% and South Asia at 56.8%.

3.3 Rail Network Situation in Africa

10. Railways are a most cost-effective mode of transport for moving bulk cargo, energy efficient and climate-friendly but capital-intensive means of land transport. Whereas most industrialized countries have an extensive railway infrastructure, often with double tracks and electrification, most developing countries have only a limited length of often single tracks. In 2005 Africa had a total railway network of 90,320 km or 3.1 km per 1,000 sq. km, which is nearly 8.7% of the world total length estimated at 1,033,948km. It is a third of the total rail network in USA that had over 227,058 km (World Bank database, 2008) where Africa is more than 3 times larger than USA.



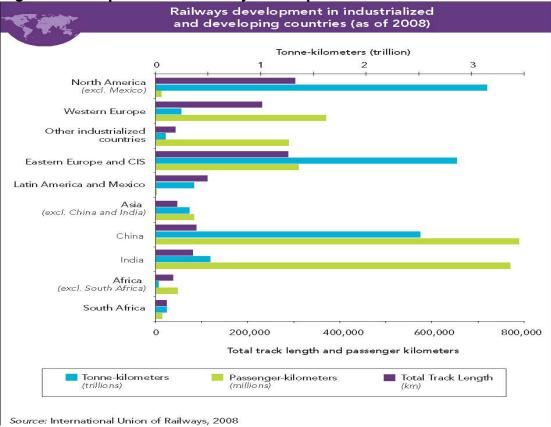


Figure 3: Comparison of Railway Developments in the World

- 11. There are seventeen African Union member countries that have no rail network. These are: Burundi, Cape Verde, Central African Republic, Chad, the Comoros, Equatorial Guinea, the Gambia, Guinea Bissau, Libya, Mauritius, the Niger, Rwanda, Sao Tome & Principe, the Seychelles, Sierra Leone (the railway no longer works) and Somalia.
- 12. The interconnectivity of the rail network in Africa is hindered by the existence of different gauges. African Railway lines use nine different gauges. The following three are widely used; the 1.067 m gauge is the most widely used gauge, representing 61.3 per cent of the continent's network, mainly in Sub Sahara African countries; the 1.000 m gauge representing 19.2 per cent of the continent's network and, the 1.435 m gauge representing 14.5 per cent of the continent's network (dominating in Northern Africa.). These different rail gauges across the continent complicate the integration of rail systems across some borders, and even within some countries.
- 13. The rail assets are also unevenly distributed among African countries. Sub-Saharan Africa boasts about 83% of all Africa's railways, and South Africa's share of the African total is some 35%, or 42% of Sub-Saharan Africa's system. South Africa



accounts for about 47% of the total number of locomotives of all types in Sub-Saharan Africa or 32% of the African total. However, South Africa's dominance of electric locomotives is nearly complete, with about 96% of Sub-Saharan locos and 92% of the continent's total number of electric locomotives. The African freight wagon fleet is small by international standards, and here too, South Africa's dominance is notable, with about 62% of the total African fleet and 74% of the Sub-Saharan total. The amount of rail freight tons moved also occurs mostly in the South African system, with about 71% of the African total and some 91% of Sub-Saharan traffic.

14. In spite of the major investments made over the 1970s and 1980s in infrastructure and rolling stock, the role of railways, both in the transport of goods and of persons, has continued to decline nationally and sub regionally. The poor maintenance of rail infrastructure and the paucity of available rolling stock have contributed to the deterioration of rail service quality. In addition, railways are facing competition from road transport over the long haulage distances in which they enjoyed a comparative advantage. The situation called for reform in a number of African countries through privatization, commercialization or simply the closure of some railways.

3.4 Progress and Initiatives Underway

- 15. African countries have taken a number of concrete actions and made some progress towards implementation of transport-related commitments and goals. Sub regional, regional and international entities as well as ministerial conferences and Heads of State Summits have adopted resolutions with the view to accelerating development of an integrated transport system in Africa. A number of programmes have been developed to improve transport in Africa. These include the United Nations Transport and Communications Decade in Africa (UNTACDA-I), which was launched in 1978. The second decade programme, UNTACDA-II was launched in 1991 with the long-term objective of establishing an efficient and integrated transport and communications system as the basis for the physical integration of Africa. Out of the 708 projects approved, 466 projects had been fully or partly implemented by 2000. The level of resources mobilized for the projects was \$9.0 billion, compared to the financing requirement of \$16.6 billion, indicating 54 per cent achievement
- 16. The Trans-African Highway (TAH) program was launched with an objective of linking Africa's capitals and other commercially important centers of production and consumption. TAH was first included in the UN Transport and Communication Decade in Africa. The TAH consists of eight major routes: Cairo-Gaborone, Lagos-Mombasa, Dakar-Djamena-Djibouti, Algiers-Lagos, Beira-Lobito, Tripoli- Windhoek, Lagos-Nouakchott, and Cairo-Dakar. The total length of these highways is 54,962 km, of which



72 per cent is paved and the remaining 28 per cent is classified as secondary or feeder roads.

- 17. The Programme for Infrastructure Development in Africa (PIDA), jointly initiated by African Union Commission (AUC), African Development Bank (AfDB) and the New Partnership for Africa's Development (NEPAD) Secretariat, is underway. The Sub-Saharan Africa Transport Policy Programme (SSATP) Poverty Reduction and Transport Strategy Review (PRTSR) underway in many countries is helping to integrate transport planning within poverty reduction strategies, and has the potential to serve as a tool for policy development in all aspects of the transport sector.
- 18. African countries have established Road Funds to help mobilize additional resources for financing the transport sector. By 2007, twenty-seven countries in the region had established Road Funds with the aim of providing a predictable and sustainable source of finance for road maintenance. The establishment of Road Funds was one of the important results of the Road Management and Financing initiative launched under the SSATP.
- 19. Developed countries have provided financial and technical support to African countries to help develop the transport sector. The Infrastructure Consortium for Africa (ICA), financed by the G-8 Group and other bilateral donors, has committed an increasing volume of financing for Africa's transport projects during the past few years. Financing commitments from ICA sources increased from about \$2.6 billion in 2005 to nearly \$3.6 billion in 2007. The bulk of the financing from ICA sources for the transport sector is provided by EU, World Bank and AfDB, with EU contributing the highest share. There is also an encouraging development in the composition of donors, with the addition of non- OECD members, such as Arab countries, China and India.
- 20. Africa's private sector participation in transport investment had lagged far behind other infrastructure sectors until 2005. It had an average share of 11 per cent, limited to port and railway concessioning in a few countries. In 2006, the share of private sector investment in transport improved to 21 per cent compared to private sector investment in all infrastructure sectors.
- 21. In the railways sub-sector, the Brazzaville Declaration and Plan of Action on African Railways adopted by the first meeting of the African Ministers responsible for railway transport that was held in Brazzaville in 2006, reaffirmed the commitment of African governments to develop an effective railway system that would promote Africa's development and integration. A follow-up conference organized by AUC in collaboration with the Republic of South Africa for railway professionals looked into issues such as interconnection and interoperability of continental railway networks and made recommendations on harmonization of standards for infrastructure, equipment, practices and procedures.



22. A number of African countries have introduced a wide range of reforms aimed at stemming the declining performance of their railways and improving efficiency and safety. Since 1993, fourteen railway concessions, costing US\$0.4 billion to private investors have been registered. The AICD study reported that frequent renegotiations, low traffic and costly public service obligations (PSO) have kept private investment in the railways below expectations. I wish to remind you of the recommendations made in the 12th AU summit in 2009

3.5 Specific Recommendations for Transport

- i) Include in their national priorities the various regional and continental interconnection infrastructure network projects and programmes.
- ii) Harmonize regulations and standards to promote interconnection and efficient operation of networks and market development.
- iii) Create appropriate institutional framework for development of the major integration projects and carry out the necessary reforms to ensure better operation and maintenance of these projects.
- iv) Contribute financially to the NEPAD infrastructure projects preparation facility.
- v) Increase public financing of infrastructure and promote public-private partnerships (PPPs) to speed up the development of transport.
- vi) Give high priority to environmental protection and to transport safety protection and to transport safety and security to promote sustainable development of infrastructure and related services.
- vii) Reduce the cost of construction and maintenance of railway infrastructure by using cheap labour provided by National Armies.

4.0 Information and Communication Technology (ICT) in Africa

4.1 Background

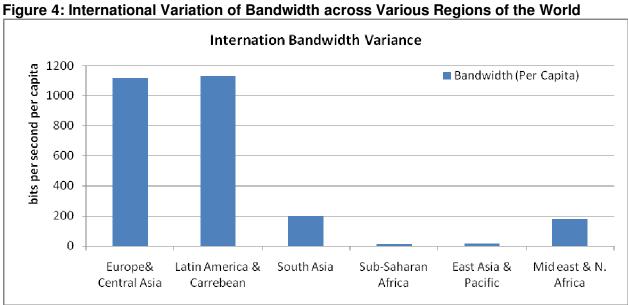
23. ICT is a major tool for socio- economic transformation. It has increased productivity, lowered the operating costs of firms thus supporting economic growth. It has increased agricultural production by helping farmers have better access to crop market prices, local weather forecasts, latest sowing techniques, training, and job opportunities. It has played a catalytic role in the development of trade and egovernment, and has sparked off export-led growth and job creation. It drives intense,



productive uses of online applications and services, making it possible to improve processes, introduce new business models, drive innovation, and extend business links to other parts of the world. In general ICT sector has been a major factor that has driven the service sector of economies. According to a recent World Bank econometrics analysis of 120 countries, for every 10-percentage-point increase in the penetration of broadband services, there is an increase in economic growth of 1.3 percentage points (Qiang 2009).

4.2 Situation Analysis

- 24. Broadband is the core of ICT sector. Broadband networks permit the delivery of modern communication and information services that require high rates of data transmission. However, the broadband capacity and penetration is low in African countries which subsequently affects the internet penetration and usage. The broadband penetration is just 2 percent of the population and it is concentrated in urban centres in LDCs while the average for Europe is about 20% and US at 30%.
- 25. There is also significant disparity in the capacity of broadband service among different regions of the world. In high-income economies, average per capita international bandwidth increased from 586 bits per second (bps) in 2000 to 18,240 bps in 2007. Among developing regions, Europe and Central Asia and Latin America and the Caribbean have the greatest capacity. Between 2000 and 2007, bandwidth per capita increased from 12 bps to 1,114 bps in Europe and Central Asia and from 8 bps to 1,126 bps in Latin America and the Caribbean but in Sub-Saharan countries it is still below 8 bps. Therefore need to address the situations.

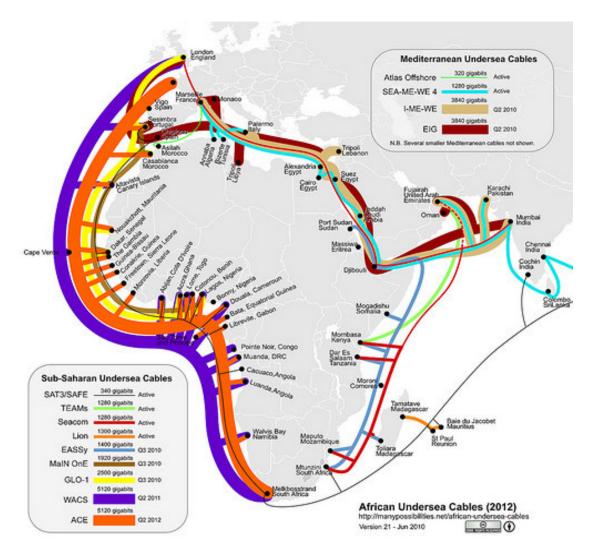




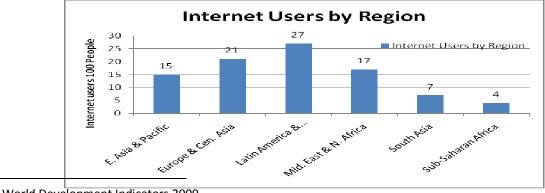
26. The bandwidth situation in Africa is due to limited presence of optic fibre backbones. Currently, there are seven undersea cables but they are mainly concentrated on the western coast. These include Seacom, EASSy, TEAMs, WACS MainOne, GLO1 and ACE. Among these, Seacom was the first one to be complete in July 2009 when all other regions of the world were already having such infrastructure in place. As can be seen from the Table below and the Map of Africa, the capacity of the undersea cables on the Western Coast are much higher (5.12 Tb/s) as compared to those on the Eastern Coast(1.28-1.4 Tb/s). Another factor affecting the cost of international bandwidth in Africa is ownership. Countries like South Africa, Kenya and Nigeria have made deliberate efforts in strategically investing in the undersea cables.

| | Seacom | EASSy | TEAMs | WACS | <u>MainOne</u> | GLO1 | ACE |
|------------------------------|--------------------------------------|--|---|--|------------------------|--------------|--|
| Cost (millions of USD) | 650 | 265 | 130 | 600 | 240 | 150 | 700 |
| Length (km) | 13,700 | 10,000 | 4,500 | 14,000 | 7,000 | 9,500 | 14,000 |
| Capacity | 1.28 Tb/s | 1.4 Tb/s | 120 Gb/s – 1.28 Tb/s | 5.12 Tb/s | 1.92 Tb/s | 2.5 Tb/s? | 5.12 Tb/s |
| Completion | July 2009 | June 2010 | Sept 2009 | Q3 2011 | Q2 2010 | Q2 2010 | Q2 2012 |
| Ownership | USA(25%), SA(50%), Kenya (25%) | African Telecom Operators 90% | TEAMs (Kenya) 85% Etisalaat (UAE) 15% | Telkom, Vodacom, MTN, Tata (Neotel), Infraco et al | US Nigeria, AFDB | | France Telecom et al See below for full list |





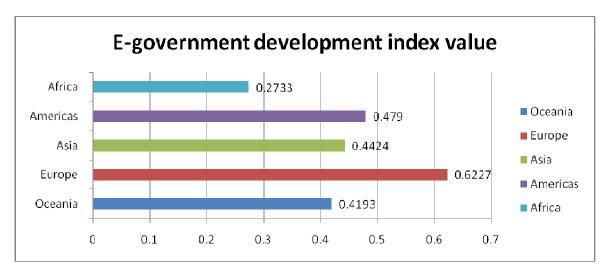
This Broadband infrastructure has affected the internet users in developing countries. Worldwide the number of Internet users more than tripled between 2000 and 2007. However, there is great disparity between countries and regions as shown in figure below⁶.



⁶ World Development Indicators 2009.



- 28. Inadequate broadband infrastructure has affected affordability of Internet Services. The Internet price basket for sub-Saharan Africa is about 62 percent of average monthly per capita income, while it is about 12 percent in South Asia, and less than 9 percent in all other developing regions. In high income economies, Internet service costs less than 1 percent of average monthly income.
- 29. The Exports of ICT goods and services from a particular country are related to the broadband infrastructure and its usage. Some developing countries have already become key exporters of ICT goods and services. The top-five exporters of ICT goods in 2006 were China (\$299 billion); the United States (\$169 billion); Hong Kong (\$136 billion); Japan (\$125 billion); and Singapore (\$124 billion). In terms of the share of ICT goods exports in total goods exports, economies in the East Asia and Pacific Region were leaders: the Philippines (56 percent); Singapore (46 percent); Malaysia (45 percent); Hong Kong, China (42 percent); and China (31 percent).
- 30. The broadband infrastructure also affects the application of ICT in Government and Commerce: Governments are becoming increasingly important users of ICT, particularly in the context of e-government, making them a major factor in fostering ICT uptake and setting standards. High-income countries enjoy the top rankings in the e-government development index in 2010 as in previous years. Among the top five countries in the 2010 United Nations E-Government Survey, the Republic of Korea received the highest score (0.8785), followed by the United States (0.8510), Canada (0.8448), the United Kingdom (0.8147) and the Netherlands (0.8097). On average, Europe (0.6227) and the Americas (0.4790) score above the world average (0.4406). Asia (0.4424) is almost the same as the world average while Africa (0.2733) and Oceania (0.4193) score below the world average.





31. To have sufficient broadband width to support economic growth in African countries, most especially in the Sub-Saharan region, substantial investment must be put in to upgrade the capacity of the undersea cables to 23Tbps by 2025 to cater for population of 1.4 billion. Furthermore the networks within countries must be extended to increase number of internet users to at least 40 internet users per 100 people.

4.3 Specific Recommendations for ICT

- i) Broadband significantly increases productivity and contributes to economic growth so African countries should strategically invest in broadband and integrate it in their development strategies.
- ii) Promote Public-Private-Partnership in the provision of ICT infrastructure with governments strategically investing in underserved areas and encourage coastal countries to facilitate access to submarine cables for African landlocked countries.
- iii) Establish and operationalise ICT Incubation centres and ICT Parks to harness the economic benefits of increased bandwidth.
 - Regulatory frameworks must promote competition i.e. Regulatory frameworks lower entry barriers in order to increase competition, reduce prices, and drive growth.
- iv) Adopt e-government models that have been demonstrated to work elsewhere (Rwanda, Arab Republic of Egypt, South Africa, Kenya and Senegal have e-governance models that have accrued benefits in their countries).

4.4 General Recommendations

32. There is need to fast track what was agreed upon under the declaration on transport and energy infrastructure in Africa adopted by the 12th Ordinary session of the Assembly of the African Union, 1-3rd February 2009, Addis-Ababa and declaration on ICT in Africa adopted by the 14th Ordinary session of the Assembly of the African Union, 31st January to 2nd February 2010, Addis-Ababa. These among others recommended support to the development of infrastructure in Africa within the Programme for Infrastructure Development in Africa (PIDA). Below are some of the recommendations on how we can secure the financing to expedite the implementation of infrastructure projects.



- i) Prioritize and ring fence infrastructure funding in national budgets for infrastructure development to enable long term planning and development of the projects. Funds from internal savings should be set aside annually to support this.
- ii) Utilize and promote Public Private Partnerships to implement the infrastructure projects. This may entail respective countries to have PPP policy; legal and institutional framework to implement the PPPs. Government must show commitment by contributing certain percentage of funding.
- iii) Generate funding using infrastructure bonds at national, regional and international markets for specific infrastructure projects.
- iv) Encourage public companies to float shares to generate revenue from the public which can be used for infrastructure development.
- v) Commercial financing of projects.
- vi) Carbon credits in case of energy projects.
- vii) Utilize pension and social security funds which are quite substantial in size in number of countries.
- viii) Utilize concessional loans and grants from multilateral and bilateral organizations to finance the interventions.
- ix) Use a well balanced mix of energy for sustainable electricity generation and supply. Overdependence on few sources of energy is not sustainable and some of them are highly prone to climatic variation. African nations should explore use of nuclear energy.
- x) Plan and package the projects at regional and or inter-state level to make them more commercially feasible and reduce risk of investment.
- xi) Seek Support from Multilateral and bilateral development partners to make it a priority to support Energy development in Africa in order to meet the MDGs and subsequently reduce dependency in long term.



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"We are determined to deal once and for all with the scourge of conflicts and violence on our continent, acknowledging our shortcomings and errors, committing our resources and our best people, and missing no opportunity to push forward the agenda of conflict prevention, peacemaking, peacekeeping and post-conflict reconstruction. We, as leaders, simply cannot bequeath the burden of conflicts to the next generation of Africans." (Paragraph 9 of the Tripoli Declaration of 31 August 2009).



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