



GRAND DUCHY OF LUXEMBOURG
Ministry of Foreign Affairs

Directorate for Development Cooperation



European Union Africa
Infrastructure Trust Fund

Regional Internet Carrier Policy and Regulation Best Practice

Cross Border and Interconnection Policies



The Vision/Goal

- Outline the key national and regional policy changes needed to address the current constraints to the flow of Internet traffic within and between countries, regions and other continents
- If implemented, these policies and related regulations will ensure the emergence of multiple Internet carriers and content networks at national, regional and international levels, resulting in well functioning national IXPs located at hubs for multiple international fibre cables growing to become Regional IXPs (RIXPs)

Cross border and Interconnection Policies

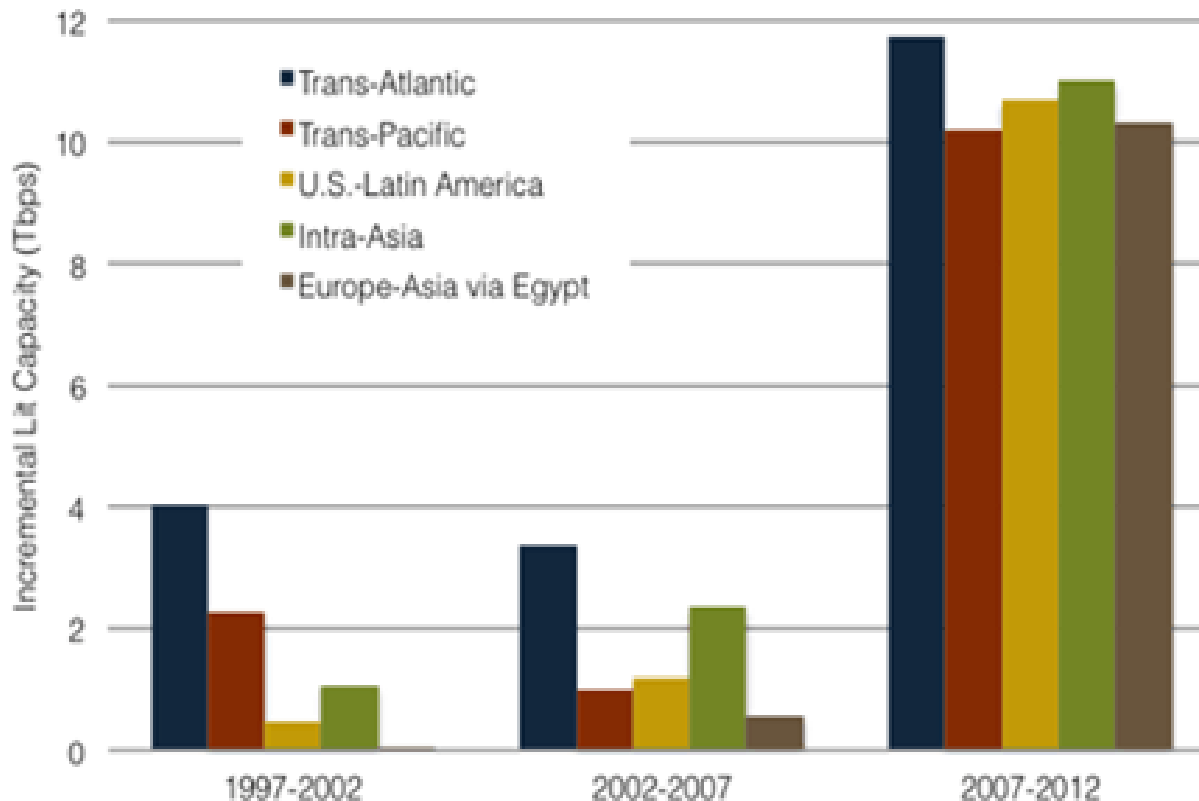
- **Session Aim:** Scoping the options for creating an enabling policy environment for interconnection.

- **Topics Covered:**
 - Africa and the Global Context for Broadband Access and Interconnection
 - Fibre Infrastructure Status
 - Policy and Regulatory Deficiencies
 - The Continent-wide and Regional Policy Context
 - Scope of Policies to Maximise Interconnection

The Global Context: Exploding Amounts of Traffic Resulting from Growth in Broadband

Demand for international bandwidth grew at a compounded annual rate of 53% between 2007 and 2012

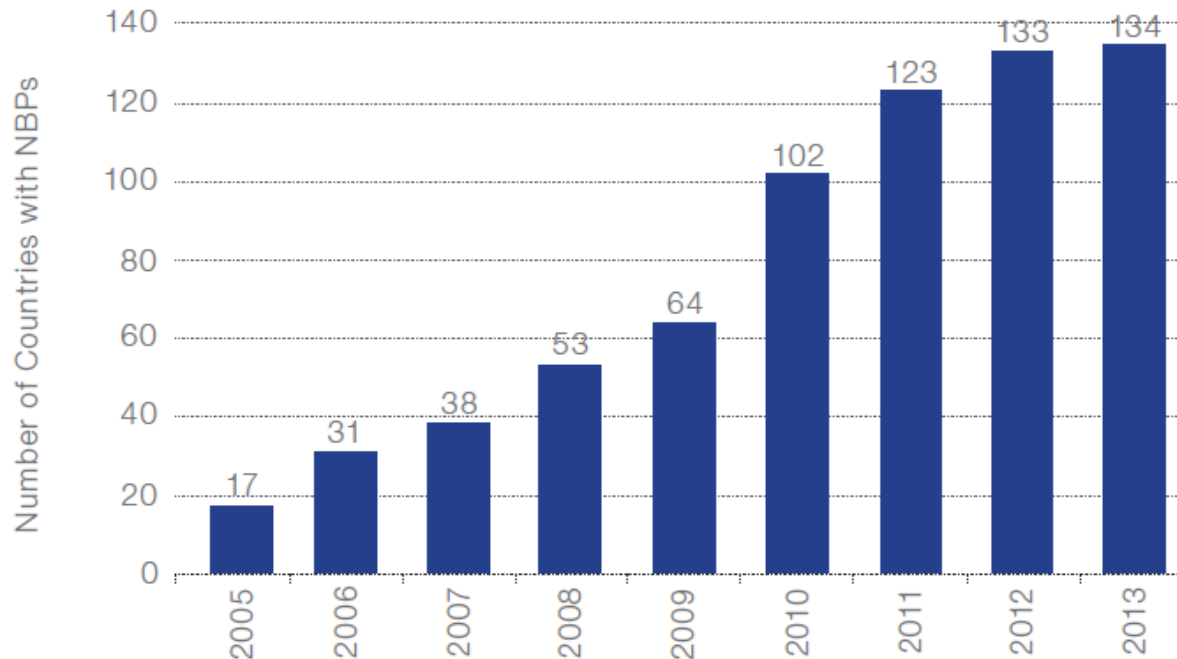
New Capacity Deployments on Major Submarine Cable Routes



Traffic Increases Are Mainly From Developed Countries But Many Developing Countries Are Making Efforts to Improve Broadband Access

- A majority (70%) of governments worldwide have now begun national broadband plans

Figure 4: Growth in National Broadband Plans, 2005-2013



Source: Broadband Commission

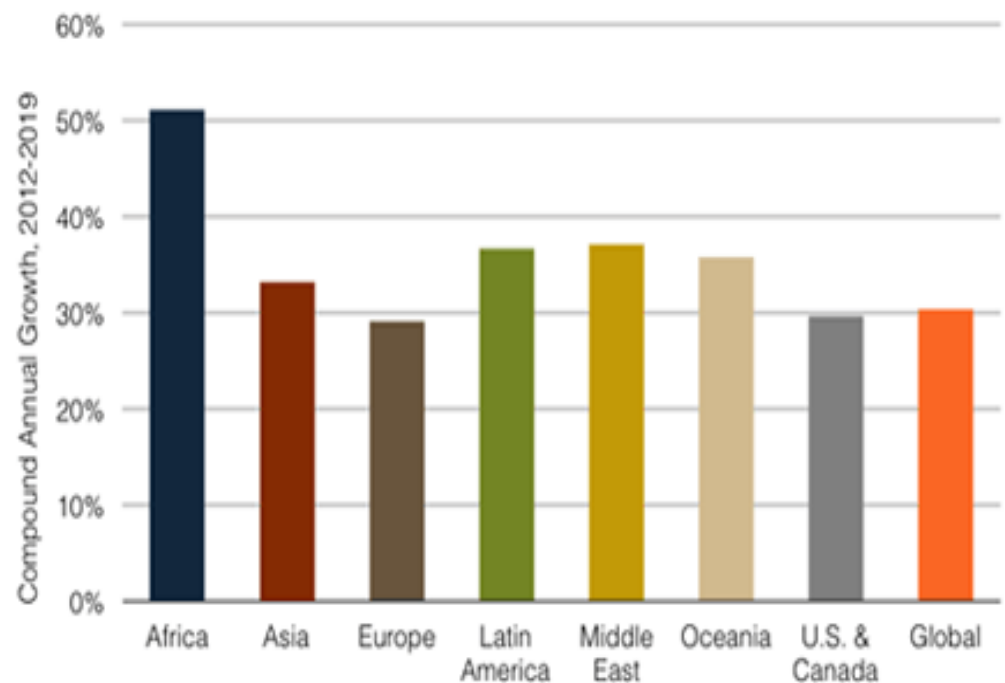
Some Objectives:

- Develop access to high-speed internet >1Mbps per user
- Develop more optical backbones (national and international)
- Encourage FTTx and high speed wireless networks

Growth in Africa's International Bandwidth Will Lead the World 2012-19

- Projected to grow more than tenfold at an annual rate of 51% -Faster than Latin America or the Middle East
- Will reach 17.2Tbps in 2019
- But this capacity will still be less than Canada alone! (37million people vs 1.27billion people in Africa in 2019)

Projected International Bandwidth Demand Growth by Region



Source: TeleGeography

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Africa Is So Far Behind Because Capacity is Still in Poor Supply and Demand is Still Constrained

A few locations in Africa are better served, but generally:

- Many demand-side constraints limit the use of broadband by the public, notably high prices, slow speeds and lack of relevant content, especially in rural areas where the majority live
- Supply-side constraints in network infrastructure capacity, coverage, pricing and interconnection mean that Internet Service Providers (ISPs) are usually unable to provide a ubiquitous, fast and affordable service

Fibre Infrastructure in Africa

Fibre links between all of the African capitals are in place or will be complete by next year, with possible exception of Bangui and Asmara. Most of these links have been built to access international submarine fibre or to meet the needs of landlocked countries to get to the coastal submarine landing stations.

==> National backbone & cross-border infrastructure in many countries (not all) is still relatively limited - in coverage or pricing

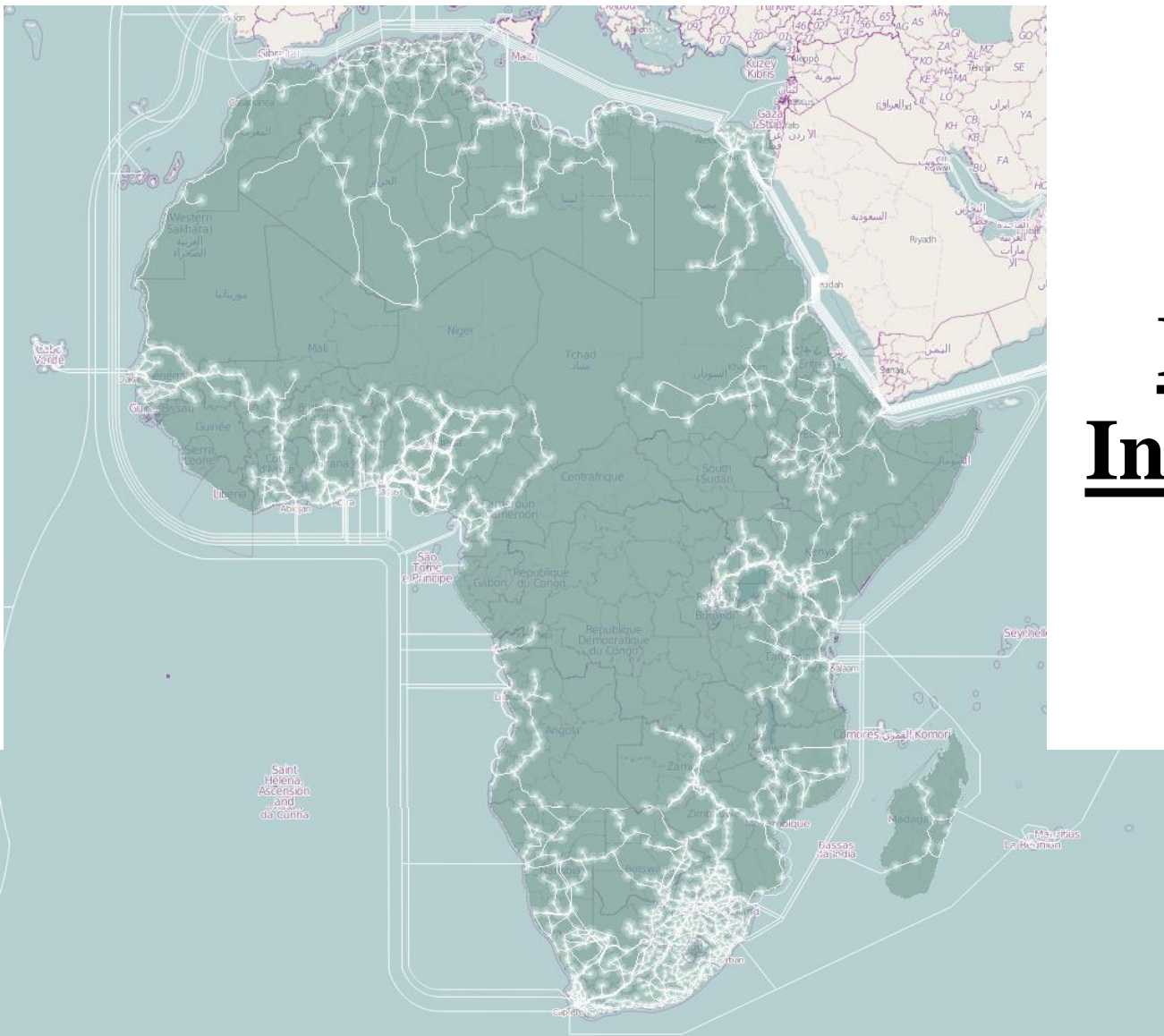
E.g In Southern Africa, a recent Internet Society study found that of the total 47 national boundaries between the mainland countries in the region, only two boundaries have two or more links operated by competing providers.

<http://manypossibilities.net/african-undersea-cables>

<http://manypossibilities.net/afterfibre/>

<http://www.flickr.com/photos/ssong/sets/72157627195113720/>

Current Backbone Infrastructure In Africa



Source: Paul Hamilton <http://www.africabandwidthmaps.com> 2013

Major Network Infrastructure Deficiencies

- Missing optic fibre links between neighbouring countries – either no link at all, or only 1 link. At least two or more physically independent links are required for reliability and competitive pricing
- Monopoly international submarine cable landings - At least two or more independent submarine cable landings are required for reliability and competitive pricing
- Lack of fibre deployed on alternative infrastructure (transport, energy and water networks)
- Many congested microwave links from mobile base stations to backhaul and backbones due to increases in data traffic
- Poor network interconnection - lack of or poorly functioning IXPs
- Lack of interconnection between IP networks and public voice networks (mobile and fixed)

Effect of Deficiencies in Network Infrastructure

Except for South Africa and its neighbours, most Internet traffic between African countries is exchanged in Europe, North America or Asia. Even where the traffic passes through the neighbouring country!

e.g Landlocked Rwanda and Uganda exchange traffic in the UK even though the Rwandan link runs through Uganda to get to the international submarine cables

The problem also affects exchange of traffic between Internet operators at the national level, where Internet Exchange Points (IXPs) don't exist, or are often not being used effectively because it is cheaper to route traffic outside the country on submarine cables than it is to buy local capacity to exchange traffic.

e.g In Southern Africa, although over 80% of the borders between neighbouring mainland countries have fibre links between them, Internet traffic is only exchanged directly in less than 25% of the 132 potential links between the countries

Impact of Backbone Infrastructure Deficiencies

- Unreliable services where there is only one network or cross-border link (that can be cut)
- Slow and congested services due to longer data paths and high contention ratios necessary to maximise the return on high-cost links
- High prices due to lack of competition or regulated pricing
- Large numbers of unserved population due to poor network coverage
- Dependency on developed countries for voice & data interconnection - African countries pay hundreds of millions of USD each year to countries outside Africa to carry intra-African traffic (tromboning).
- These costs are passed on to the end-user, thereby further reducing demand and also resulting in unnecessary flow of funds off-shore

The Five Features of Broadband Supply and Demand Constraints

1. **Affordability** – high cost of access to last mile and backbone infrastructure, especially relative to income levels
1. **Coverage** – limited geographic diffusion of backbone and last mile networks, even mobile broadband outside cities is virtually non-existent
1. **Speed** – slow speeds, also more extreme in rural areas
1. **Content** – limited number of attractive/useful services
1. **Universality** – the digital divide in minorities, women, the disabled and other groupings is usually even higher

The Role of Regional IXPs

- The many different factors that cause lack of supply and demand need to be tackled in unison to ensure a functioning Internet ecosystem
- In essence, the presence of an Regional IXP is not something that can just be 'set-up', but is rather an indicator of the vibrancy of the Internet ecosystem in that region.
- Regional IXPs will evolve out of well functioning national IXPs at the hubs on the continent wherever there are many different international and cross-border fibre links and network operators attracted by the enabling policy environment in the hub country and those surrounding it

Summary of Policy and Regulatory Deficiencies (1)

- Poorly functioning national and regional Internet infrastructure in many (but not all) countries in Africa are caused by a wide variety of policy and regulatory deficiencies:
 - Government tolerance of dominance in fibre and copper infrastructure by incumbent/legacy operators often due to conflict of interest by government full or partial ownership of the incumbent
 - Few or very limited alternatives to mobile networks for wireless broadband – in particular very few opportunities for small village-based or sub-national fixed wireless operators
 - Few technology-neutral Unified Licensing regimes which take into account the convergence of voice and data
 - Restrictions against new market entrants in wholesale network infrastructure provision – no new licenses or high license fees

Summary of Policy and Regulatory Deficiencies

(2)

- Restrictions on use of existing fibre held by alternative infrastructure providers
- Duplication of civil works and accidental fibre cuts due to lack of 'dig-once' and infrastructure sharing policies
- Delays and high costs for obtaining rights of way and cross-border permits for laying new fibre
- Lack of regulations mandating interconnection of IP networks with public voice networks
- Restrictions on access to essential facilities - monopoly submarine landing stations and international gateways, no local loop unbundling, no mast sharing requirements and absence of tariff/price controls on SMP/essential facilities

Summary of Policy and Regulatory Deficiencies

(3)

- Constraints on access to spectrum – unavailable bands for broadband, slow licensing procedures, high license costs, restrictions on use of Wifi/ISM bands (unlicensed WiFi technologies require licenses in many countries)
- Slow digital migration to free-up radio spectrum for mobile broadband
- Policy and regulatory uncertainty and non-transparency adding to barriers to private investment in infrastructure
- Lack of implementation and enforcement capacity among national regulators
- High taxes and duties on ICT equipment and services

Summary of Policy and Regulatory Deficiencies (4)

- Limited effectiveness of Universal Service Funds in bringing infrastructure to remote areas
- Limited range of useful content & services - e-commerce, e-government, e-health, e-agric etc.
- Lack of e-commerce, cyber-security, content licensing, intermediary liability and privacy legislation
- Limited awareness and understanding of the benefits of broadband access
- Low levels of information/computer literacy

Indirect Factors Affecting Broadband Supply and Demand

- Poor coverage and high prices for transport and energy infrastructure leading to high cost of Capex and Opex for networks and low levels of usage
- Low economies of scale in smaller and lower-income countries
- Low income levels of the average user
- Low levels of economic integration & demand for cross-border traffic
- Low levels of basic literacy

Context for National Policy Change (1)

- At the national level, most of the required policies have already been proposed but not yet implemented.
- The Ministries of ICT are ultimately responsible for interconnection policy adoption and implementation.
- Head of State support is often vital in ensuring rapid implementation.

Related policies and regulations

Related policies and regulations can be divided into 5 main areas:

1. The priority of broadband in the overall development strategy for the country
2. ICT sector development, particularly telecom/ISP market liberalisation, the introduction of competition, and opening access to the existing infrastructure of incumbents, utilities, etc
3. National or regional infrastructure development projects
4. Policies to promote ICT access and uptake - demand building and/or removal of constraints to uptake such as import taxes, lack of energy etc.
5. Efforts to harmonise policies with neighbouring countries

The Context for National Policy Change (2)

- Increasing government awareness of the importance of universal affordable access to broadband
- Lack of understanding of the deficiencies in the current environment, particularly protection of legacy operators and expectation that mobile operators will fulfill all broadband needs for the public
- Insufficient resources provided to regulators
- Lack of co-ordination between line-ministries in network development strategies

Context for National Policy Change (3)

Policies are implemented as regulations by the National Regulatory Authorities (NRAs), which have been established by almost all countries in Africa except for a handful

Regulatory capacity to quickly respond to license and spectrum requests, or new technology and business models, or to enforce regulations is low in many countries

The main areas of focus / contention are:

- Competition – number of market entrants/licenses for infrastructure operators, including wireless local access
- Significant Market Power (SMP) designations for dominant /incumbent operators, associated wholesale tariff regulations
- Interconnection regulations
- Rights of Way fee regulation
- Radio spectrum management and digital migration

Context for National Policy Change (4)

- The most prevalent market model is 2 or more mobile operators dominating the end-user market, while the incumbent fixed line operator languishes, except in backbone network services
- Many fixed line operators are state owned and may still have monopoly on national backbones, international gateways or other areas
- Unified technology neutral licensing regimes have only been adopted in a few countries
- A wide variety of national backbone models present – incumbent, mobile operator, private wholesale, public (government), PPP
- Foreign providers usually need a license to connect to local IXP
- Regulators are unable to regulate monopolies due to inadequate capacity or poor quality of governance

Continental Policy Context

- The NEPAD ICT Programme identified the major constraints to affordable and reliable ICT (particularly broadband) services:
 - The lack of backbone infrastructure
 - The lack of appropriate policy and regulatory environments
- The goals outlined under the African Union's strategic objective “Develop Integration Infrastructure” in its strategic Plan 2004-2007 were:
 1. Establish integrated telecommunications infrastructure systems that are reliable, efficient and affordable
 2. Carry out all the necessary actions for the harmonization of policies, strategies and regulation in telecommunications

2007 Kigali Connect Africa Summit Goals

1. Interconnect all African capitals and major cities and strengthen connectivity to the rest of the world by 2012
2. Connect African villages to broadband services by 2015 and implement shared access initiatives such as community telecentres and village phones
3. Adopt key regulatory measures that promote affordable, widespread access to a full range of broadband services
4. Capacity building – support the development of a critical mass of ICT skills required by the knowledge economy
5. Adopt a national e-strategy including a cyber-security framework, deploy at least one flagship e-government service, e-education, e-commerce, and e-health service using accessible technologies in each country in Africa by 2015

Post-Kigali Milestones

- November 2009: AU ICT Ministers committed themselves to “integrate ICT into national programmes including education training systems and public administration with a view to produce a critical mass and increase skilled human capital to promote access and use of ICTs at 10% growth rate per annum”
- Recommendations urged the AU Commission, RECs, Member States to interconnect ICT backbones, including national and regional Internet Exchange Points (IXPs), with the objective of lowering the tariffs and providing a better quality of service

Programme For Infrastructure Development in Africa (PIDA) – (1)

PIDA was adopted by Heads of State at the 18th AU Summit in December 2012. PIDA's short term goals 2012-2015:

- Complete the basic missing fibre links between countries
- Improve access to what is existing - Price regulation and non-discriminatory access requirements on SMPs enforced
- Increase national demand – open markets to new providers, lower ICT taxes and license/spectrum fees, support extension of national/international backbones to remote and rural areas (PPP/reverse auction), use satellite where needed

Programme For Infrastructure Development in Africa (PIDA) – (2)

- Create enabling policy/regulatory environment for:
 - a) optimising use of existing fibre
 - b) investment in competing cables and
 - c) access to alternative infrastructure (road/energy)
- Encourage local and international content hosting and local applications development
- Improve availability of electricity
- Improve literacy levels

Revised AU/NEPAD African Action Plan 2010-2015

- Establish harmonized policy, legal and regulatory frameworks
- Accelerate development of integrated infrastructure
- Promote e-applications and services
- Increase global competitiveness of Africa
- Reduce or eliminate transit of intra and inter-regional traffic

The RECs are expected to be the driving force for the implementation of the AU's Reference Framework for Harmonisation of ICT Policies and Regulation, with ECA, ITU, ATU and ADB other partners supporting the RECs to do this

Development of ICT policy and regulatory environment to continue under the programme for Harmonisation of ICT Policies in Sub Saharan Africa (HIPSSA), supported by the ITU and the European Commission

ICT Policy and Regulatory Development in the Regional Economic Communities

- All the RECs in Africa (ECOWAS, UMEOA, ECCAS, SADC, COMESA, EAC) have adopted varying degrees of policies and regulations to promote the adoption and use of broadband among their member states. The key features of most REC policies and regulations are:
 - Establishment of regional associations of national regulators
 - Harmonization of ICT policies and regulations
 - Market Liberalisation and competition
 - Infrastructure development policies, with regional infrastructure projects e.g extension of fibre backbones to remote areas or across borders
 - Promotion of affordable access e.g Universal Access/Service policies
 - Spectrum Management and analogue to digital television migration
 - Cyber-security
 - Human Resource Development
 - Promotion of affordable access to ICTs for disadvantaged groups, such as institution of Universal Access/Service policies

Regional Regulatory Associations

- The regional regulatory associations play key role in policy and regulatory development and harmonisation through awareness raising, sharing of best practices and publication of guidelines

Regulatory Associations (Regional)



Regional Policy Shortfalls

Level of coherence between regions (RECs) has accelerated recently, now very similar policies and regulations at both regional and continental levels. But level of transposition or implementation at the Member State level is relatively slow and inconsistent. Causes:

- Much activity is so recent, many policies and regulations have not had sufficient time to be transposed to national level
- Institutional model of the regional body – eg among the RECs, only ECOWAS' WATRA has a strong role in that WATRA decisions and directives issued by the Conference of Regulators are also binding on all national regulators. In other cases the RECs themselves publish the policies and guidelines which may or may not be binding, depending on the REC
- Lack of political will at national level - limited awareness of the importance of policy change, resistance to change by vested interests (dominant operators), conflict of interest of governments deriving major revenue source from the incumbent operator
- Limited availability of up-to-date data on progress (or lack thereof)

Regional Policy Shortfalls (2)

- Most current REC programmes depend on deployment by incumbent operators which do not provide non-discriminatory access to their networks
- Many of the infrastructure projects proposed are really overlay-network projects which would make use of existing infrastructure, rather than aiming to build new infrastructure
- Strategies to reach multiple submarine landing stations are limited
- Very little use of alternative infrastructure is made
- REC centric network building programmes don't follow pattern of fibre cable needs which might be required to cross RECs

Improving Interconnection Market Dynamics - Key Considerations

- The private sector will invest in most of the necessary cross-border infrastructure if a supportive enabling policy environment present
- National backbones can provide part of cross-border links
- Public sector funds can be reserved for fibre links to remote areas for ducts on alternative infrastructure – esp roads, rail lines, and fibre is incorporated into high-tension electricity distribution grids
- Need for a strategy to ensure nations adhere to REC policies on market liberalisation
- Need to identify missing links – i.e each country needs at least two physically independent national backbones, cross-border links and links to different submarine cables
- Need to assess how many existing links are viable - will countries declare these essential facilities (impose open access rules), or build new links
- Need for improved data gathering to monitor progress

Ensuring the regulator is an effective and independent expert agency able to implement the necessary policies

This will require:

- Structural independence from other governmental entities and telecom providers
- Sufficient and predictable funding stream
- Creating a climate of regulatory certainty with clear, transparent regulations
- Ensuring the regulator has the authority, jurisdiction, accountability and capacity to enforce regulations
- Implementing effective regulation of anti-competitive behaviour when necessary

Policies to Maximise Interconnection (1)

- Provide overall direction through adoption or updating of national and regional broadband policies, this includes establishing multistakeholder/multisectoral information sharing and coordinating mechanisms
- Open infrastructure markets to full competition - relaxing restrictions on competition is the key requirement to stimulate the needed investment in infrastructure and reduce end-user costs – this can be achieved through ensuring adherence to REC policies on market liberalisation
- Eliminate restrictions on international gateways which limit them to incumbents and mobile

Policies to Maximise Interconnection (2)

- Minimise the role of Government in network ownership and operations
- Optimize investments where possible by infrastructure sharing or share deployment by involvement of all actors at different levels
- Foster private investment in broadband through incentive regulation and tax incentives
- Formulate guidelines on investment, governance and ownership models - pure private, PPP, BOT
- Require government funding of infrastructure only where it is required to develop competition or where it is not economically viable
- Require government owned backbones and public alternative infrastructure networks to sell conditional indefeasible rights of use (IRUs) and dark fiber

Policies to Maximise Interconnection (3)

- Make allowances for self provisioning of infrastructure by ISPs
- Mandate co-location on incumbent infrastructure, unbundling, access to dark fibre and other essential services
- Mandate all new and rehabilitated roads, other rights of way (rail, electricity grids, oil/gas/water pipelines) and new buildings to deploy ducts and fibres through introduction of land-use planning regulations
- Institute tariff caps on non-competitive services and subsidise non-competitive services for underserved areas and marginal groups
- Allow use of Wifi and other fixed wireless technologies, VoIP and VSAT for the end-user operators

Policies to Maximise Interconnection (4)

- Allow existing alternative infrastructure operators with fibre to provide wholesale services to others
- Ensure rapid permitting for cross-border infrastructure
- Mandate adherence to requests for interconnection between local telecom operators, ISPs and content providers
- Allow Internet providers to offer VoIP services and to terminate their traffic onto the fixed and mobile networks
- Institute tariff controls on operators with Significant Market Power (SMP)
- Mandate separation of wholesale from retail services so that wholesale providers do not compete retail ISPs

Policies to Maximise Interconnection (5)

- Mandate cost-based interconnection of both voice and data
- Mandate local loop unbundling
- Adopt standards for government funded fibre cabling (number of pairs, quality of fibre, location of add-drop points, cabinet size and power needs)
- Improve spectrum planning and assignment while minimising spectrum fees, and opening up of ISM bands in the 2.4 and 5Ghz wavebands to end-users
- Ensure more efficient use of existing radio frequency spectrum assignments by adopting policies for dynamic spectrum sharing such as use of TV White Space (TVWS) technologies and associated spectrum databases

Policies to Maximise Interconnection (6)

- Implement measures to monitor the use of traffic management techniques to ensure that those do not unfairly discriminate between market players (network neutrality)
- Publish tariff and service level comparisons to measure progress and adapt strategies, through government/private sector co-operation

End User Demand Building Policies (1)

Required Interventions:

- Modernize Universal Service Programmes and Funds to ensure they can effectively subsidize access for low income and educational institutions and provide subsidized end-user devices
- Implement a government interoperability framework to ensure that national and regional e-government systems all work together
- Grant tax incentives to stimulating innovation and development of applications and services
- Expand or introduce digital literacy programmes and subsidized training for strategic segments of the population

End User Demand Building Policies (2)

- Reduce taxes on communication equipment and services
- Promote the role of broadband networks in monitoring climate change and reducing energy consumption through smart grids
- Adopt proficiency requirements for educational institution entrance criteria
- Address content related legislative needs – I.e. privacy and data protection, security and digital signature
- Increase priority for rural electrification programmes

Thank You

Any Questions?



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