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DEVELOPING NATIONAL INFORMATION AND COMMUNICATIONS INFRASTRUCTURE (NICI) POLICIES, PLANS AND STRATEGIES: THE 'WHY' AND 'HOW'

Developing National Information and Communications Infrastructure (NICI) Policies, Plans and Strategies: the 'why' and 'how'

Introduction

1. The emergence and convergence of information and communication technologies (ICT) remain at the centre of global social and economic transformations. The ICT sector is a gamut of industries and services activities – Internet service provision, telecommunications equipment and services, information technology (IT) equipment and services, media and broadcasting, libraries and documentation centres, commercial information providers, network-based information services and other related information and communication activities. These technological components which used to be accounted as separate activities have converged to characterise all aspects of ICTs. This has also led to the introduction of the concept of national information infrastructure (NII) or global information infrastructure (GII) defined as the "technologies, organisations, and capabilities that facilitate the production and use of ICTs" [1].

2. As a result, the definition of National Information and Communications Infrastructure (NICI)[1] plans and strategies has become high on the agenda, and developing countries are confronted with the challenge to be responsive and flexible to the convergence of telecommunication, audio-visual and computing technologies. NICI plans and strategies need to reflect overall development priorities, redefine sectoral policies and support the introduction of new regulatory framework so as to improve the efficiency and to mobilise resources for building national information and communication infrastructure. Attempts are made in this paper to assess the ICT situation in African countries, to outline the pressing need to build-up NICI plans and strategies and the various steps to be taken to enable countries to be part of the information society.

The Conventional National Information Policies within the African Context[2]

3. While the concept of national information policies (NIPs) has been on the international agenda for over three decades now, the emergence of the Information Society has brought about a new dimension to the subject in which information itself is the strategic resource [2], a commodity and the foundation of every activity. At the initial stage, the formulation of NIPs was targeted to libraries, documentation centres and archives as they were 'historically' the major storehouses and suppliers of information. The increasing application of IT in traditional information systems and institutions for the acquisition, processing, storage and repackaging of information has led to a complete re-examination of conventional information rules and policies. As a consequence, NIPs have evolved to

[1] The African Information Society Initiative (adopted by the ECA Conference of Ministers in 1996) adopted the term "National information and communication infrastructure (NICI)" policies and plans to emphasize the importance of communication in such plans. However, the concept is very close to that of national information infrastructure (NII).

[2] Based on the technical report of the Workshop on National Information and Informatics Policies in Anglophone sub-Saharan African Countries, Addis Ababa, Ethiopia, 28 November - 1 December 1988, Kisiedu, C. (comp).

embrace the emerging capabilities of ITs to create, organise and disseminate data, information and knowledge unhindered by geographic location, and to mobilise resources to set up national information infrastructure.

4. The development of national information policies (NIPs) in Africa has been one of the major pre-occupations of ECA, IDRC and UNESCO for a number of years, all of them promoting the acquisition, processing, and dissemination of development information and advocating the development of information policies. This concern culminated with the establishment in 1980 of the Pan African Documentation and Information System (PADIS) which in 1988 changed its name to Pan African Development Information System to reflect the type of information processed and the needs of its clients. PADIS served as a conduit for information and data for development, centered around national, sub-regional and regional networks to which all members will voluntarily contribute and share information. One of its main activities was the delivery of advisory services to member States on aspects related to formulation of information plans and policies. In collaboration with its partners, PADIS organised various conferences, meetings and seminars to explore the rational and systematic approach to Africa's information problem, and to define the modalities for the formulation of national information policies (NIPs) in Africa.

5. Even though early NIPs were broader in conceptualisation, empirical evidence shows that the conventional approach to the formulation of NIP in the African countries was marked by its lack of comprehensiveness in terms of contents and coverage. In those few countries that did embark on the NIP formulation process, they were largely oriented towards library and documentation activities, and the main flag bearers of the exercise were the library and documentation community [3].

Towards ICT policy

6. The advent of the information technology revolution and its unprecedented capabilities to process, store, refine and disseminate data, information and knowledge in a variety of ways across borders has dramatically changed the ways in which Governments, the public and private sectors operate world-wide. Most African countries have embraced the IT revolution, though the ability to effectively harness the technology varies from country to country. The elaboration of IT policy, an integral part of NIP, is a major determinant factor in setting-up the underlying supporting infrastructure and enhancing the optimal use of the technology. Development of an IT policy is an important exercise and hence should receive the support of all citizens and institutions in a country. Once established, the policy should aim at sustaining the country's vision and goals. It should embrace strategies and action programs which will ensure the building of information, knowledge, and decision support systems to enhance Africa's socio-economic growth and policy formulation utilising information, and communications technologies [4].

Transition from Conventional to "Information Age" Plans and Strategies

> "Information and communication technologies can no longer be seen as a luxury for the elite but as an absolute necessity for the masses. The global movement to an information age and the world-wide technological innovations of recent years, along with other structural and economic

developments, have led to rapidly falling costs for information and communication technologies. These have combined with changes facing global and national telecommunication regimes to present a clear window of opportunity for appropriate "leapfrog" strategies to accelerate the development of the continent. The creation of the African information infrastructure is both a necessity and an opportunity to accelerate development in all spheres of African economic and social activity "[3] [5].

7. This entails the need for a complete re-examination of traditional national information and IT policies to account for the new emerging technologies and the need to formulate broad and coherent national ICT plans and strategies to advance the development of national information and communications infrastructure. It is important to recognise that the process for setting-up ICT policies and strategies is a work in progress (even very slow to come) as it requires concerted efforts from all parties, mainly from national governments for effective leadership and direction.

National Information Infrastructure, Plans and Strategies

8. When adopting the African Information Society Initiative (AISI) in 1996, the objective of ECA member States was to have an African Information Infrastructure through access to the Global Information Infrastructure for developmental needs and to build their own National Information and Communication Infrastructures.

9. The African Information Society Information had its origins in the "African Regional Symposium on Telematics for Development" organised in Addis Ababa in April 1995 by the ECA, ITU, UNESCO, IDRC and Bellanet International. The Regional Symposium urged the ECA Conference of Ministers to consider the importance for Africa of the global information revolution. In May 1995, the twenty-first meeting of ECA Conference of Ministers responsible for economic and social development and planning passed resolution 795 (XXX) entitled "Building Africa's Information Highway" that called for work on national information and communication networks for planning and decision-making as part of Africa's information highway and for the establishment of a High-level Working Group made up of African experts on Information and Communication Technologies. In May 1996 through its resolution 812 (XXXI) the twenty-second meeting of ECA Conference of Ministers approved the plan of action prepared by the High Level Working Group entitled: "the African Information Society Initiative (AISI): an action framework to build Africa's information and communication infrastructure".

10. AISI calls for the elaboration and implementation of national information and communication infrastructure plans in all African countries and the pursuit of priority strategies, programmes and projects which can assist in the sustainable build up of an information society in member States. The impact from new information and communication technologies is no longer confined to the communications and information sectors. It has become a pervasive mass technology with a much wider scope of influence, affecting virtually all sectors of society [5].

[3] African Information Society Initiative: An Action Framework to build Africa's Information and Communication Infrastructure, Addis Ababa, May 1997

Table 1 shows some of the NII potential to improve economic development in Africa [6]

Table 1

Opportunity Areas of NII in Africa

Sector	Possible area of NII application
Agriculture	Improving food security through access to timely information for determining optimal harvesting times, locating sources of surplus, distribution channels and storage facilities; Provision of equitable access to new techniques for improving agricultural production; Improving communication and information flow for better research and extension service linkages; Increased co-ordination of donors and information flow among donors working in the food sector.
Education	Providing equitable remote access to resources in support of both distance education and the strengthening of local educational capacity; Connecting schools, universities and research centres to national and international distance education facilities, national and international databases, libraries, research laboratories and computing facilities; Reducing communications and administrative costs by building communications networks linking all educational establishments; Promoting and supporting collaboration among teachers and researchers; Extending the reach of educational facilities in informal learning. Especially to community level
Environment	Monitoring areas threatened by environmental degradation and natural disasters using ICT tools and Geo information systems; Developing databases to improve knowledge on the availability of natural resources; Improving the management and monitoring of the implementation of environment-related projects; Using low-cost terrestrial and satellite radio communication systems in emergency situations where there is not access to adequate telecommunications.
Public Administration	Improving internal revenue management; Improving social security administration; Facilitating electronic tendering systems; Improving accessibility to national public administration information, especially to citizens who live in rural areas; Supporting national and regional as well as zonal co-ordination, co-operation and standardisation of regulations and legislation.
Tourism	Attracting more tourists and other visitors by offering high quality information and telecommunication services in tourist resorts; Reducing the costs of international promotions for attracting tourists; Increasing the visibility of the attractions through on –line promotional campaigns; Building national and regional tourism related databases for destinations and facilities; Providing a mechanism for virtual travel and information gathering utilising the Internet; Provision of tourism related information and indicators that encourage and facilitate investment in tourism projects.
Health	Enhancement of health administration and management through medical information systems; Establishment of general information "health profiles"(i.e. for AIDS, for infectious diseases, etc.), specific patient "Information profiles" and decision support systems on regional, national, provincial and district levels; Linking health centres, delivery services and medical transport to enhance patient access to these facilities and provide more efficient services to the patient; Improving access to skilled diagnosis through tele-medicine; Improving distribution and reducing costs of medical supplies.
Governance and democratic participation	Making government document available to general public in order to facilitate information access on decrees, policy papers and other information; Setting up of community networking for democratising access to local and international information; Establishment of link between various media sources (government, private and international) to exchange information; Initiation of discussions on various issues related to governance and other areas that empower individuals and communities; Use of ICT to improve efficiency in governments operations and attain transparency (on-line bidding , submitting and analysis of information on various government functions) Empowering women through computer mediated communication.

Based on: African Information Society Initiative and Towards Information Society in Mozambique available from http://www.bellanet.org/partners/aisi and http://www.idrc.ca/acacia

NICI and its Current Status in Africa

The Telecommunications Sector

11. The telecommunications network remains the backbone of ICT services and applications. According to Hardy, there is a positive correlation between economic development and telecommunications density, and some studies even claim that a causal relationship exists in both directions [7]. On a world-wide level, Africa has still the least developed infrastructure with only 2% of the world's telephone and an average teledensity of less than 2 per 100 inhabitants (1.89% in 1997). Sub-Saharan Africa (excluding South Africa) has an average teledensity of about 0.5 per 100 inhabitants and most of the lines (above 50%) are located in the urban areas. During the last few years, the African telecommunications sector has shown a more liberal policy to attract foreign investment and to improve its infrastructure and services [8]. By the start of 1998:

    - A total of 20 countries had established independent regulatory agencies compared to two in 1990, and some countries are in a process to follow suit.
    - A total of 17 African telecom operators had allowed some degree of privatisation and/or foreign ownership (this number was only 8 in 1995).
    - The African mobile cellular market has shown a steady growth. Today, only 14 countries on the continent are without cellular systems. Unlike African telecom operators, most of the cellular services are introduced and run by private companies. "Access is mainly limited to capital cities, some secondary towns and major trunk roads but some cellular providers are implementing innovative approaches to the provision of phone shops and mini-telecentres in rural areas in South Africa"[9]

12. The following table provides a summary of the status of telephone and cellular networks in Africa. Detailed figures for each country are listed in Annex 1.

Table 2
Telephone and Cellular Networks in Africa – 1997

Sub-Regions *	Population for 1997 in '000	Main Telephone Lines	Main lines per 100 inhabitants	Cellular subscribers	Cellular subscribers per 100 inhabitants
North Africa	164,400	7,360,406	4.47	105,985	0.06
West Africa	220,690	970,535	0.44	82,825	0.04
Central Africa	28,458	151,690	0.53	13,232	0.05
East Africa	236,902	742,718	0.31	45,229	0.02
Southern Africa	110,202	5,140,372	4.66	1,031,035	0.94
Southern Africa (excluding South Africa)	68,106	881,733	1.29	78,035	0.11
Total Africa	760,652	14,365,721	1.89	1,278,306	0.17
Sub-Saharan Africa**	626,542	7,169,933	1.14	1,176,121	0.19
Sub-Saharan Africa (excluding South Africa)	584,446	2,910,794	0.50	823,121	0.14

* Based on UNECA sub-regional classification

** Excludes countries from North Africa except Mauritania and Sudan

13. According to ITU, the increase in telephone lines has been considerable in the last decade. A comparison of the years 1996 and 1997 (Table 3) shows a growth rate of 6.7% and 11.3% for fixed and cellular lines respectively in the African continent. The growth rates for sub-Saharan Africa (excluding South Africa) were 8% and 75% for fixed and cellular lines respectively. The highest increase in cellular subscribers in the sub-Saharan region can be attributed to the introduction of new cellular networks to countries that previously had no cellular operations.

14. Despite the blossoming of the telecommunications market in Africa, the disparity in terms of telephone penetration between the various sub-regions of the continent remains a major concern (Table 2). Three of the sub-regions in the continent - Central Africa, East Africa and West Africa - have the lowest teledensity in the world. Countries such as Ghana and Uganda have allowed the introduction of new entrants (second line operators) in the fixed line market to address the situation while countries like Senegal have introduced second cellular phone providers in 1999 in order to allow wider access to the telephone network.

Table 3

Telephone Networks in Africa - A Comparison
1996-1997

	1996		1997	
	Africa	SSA*	Africa	SSA*
Main Telephone Lines	13,463,500	2,685,500	14,365,721	2,910,794
Main lines per 100 inhabitants	1.81	0.47	1.89	0.50
Cellular subscribers	1,148,000	127,300	1,278,306	223,121
Cellular subscribers per 100 inhabitants	0.15	0.02	0.17	0.04

* Excludes South Africa

15. Despite the poor national links, the highly unreliable telephone networks (mainly during the rainy season), the very low level of telephone penetration and the recurrent political and economical problems, the liberalisation of the sector and many of the international initiatives which are underway will undoubtedly contribute to the improvement of the telecommunications infrastructure in the continent in the years to come.

ICT Networking

16. Internet connectivity (Annex 2) has shown a rapid increase in the continent with only three countries (Congo, Eritrea and Somalia) remaining without local Internet access by the end of April 1999. The key indicators [8] for Internet development are the number of host sites, the number of users and the number of Internet Service Providers (ISPs):

Internet Host Sites: According to a survey carried out by Network Wizards (NW) (http://www.nw.com) in July 1998, Africa had about 148,436 Internet host sites (140,577 of these were in South Africa), and a growth rate of 14.7 % compared to a similar survey by NW in July 1997 (Table 4). A separate comparison for sub-Saharan Africa (excluding South Africa) shows a rate of increase of 31% for the same period.

Internet Users: According to Mike Jensen [10], the current estimates put the number of Internet users in Africa as of April 1999 at 927,985, out of which 800,000 were found in South Africa. A comparison to 1997 figures (Table 5) shows increases of 3.5 % and 83% for the entire continent and the sub-Saharan region (excluding South Africa) respectively. The highest growth rate in the sub-Saharan region could be attributed to the establishment of new Internet facilities in countries that previously had no local Internet access.

Internet Service Providers (ISPs): According to Mike Jensen, there were almost 400 ISPs in the region by late 1998, or 300 ISPs excluding South Africa, and most of the countries in the continent, except for 14 countries, had more than one ISP.

17. A comparison of Internet connectivity (in terms of number of users per 10,000 inhabitants) at a sub-regional basis (Table 4) shows that Southern Africa is the most connected region, followed by North Africa, Central Africa, East Africa and West Africa.

Table 4

A Summary of Internet Connectivity in Africa

Sub-Regions	Population estimates 1998 '000	Internet Host Sites	Host Sites per 10,000 inhabitants	Internet Users	Users per 10,000 Inhabitants
North Africa	170,439	2,620	0.15	60,900	3.57
West Africa	225,991	996	0.04	14,400	0.64
Central Africa	29,270	71	0.02	3,600	1.23
East Africa	239,749	988	0.04	25,625	1.07
Southern Africa	113,687	143,761	12.65	823,460	72.43
Southern Africa (excluding South Africa)	69,348	3,184	0.46	23,460	3.38
Total Africa	779,136	148,436	1.91	927,985	11.91
Sub-Saharan Africa*	639,733	145,836	2.28	867,485	13.56
Sub-Saharan Africa (excluding South Africa)	595,394	5,261	0.09	67,485	1.13

* Excludes countries from North Africa except Mauritania and Sudan

Table 5

Internet Connectivity in Africa - A Comparison
1997-1998

	1997		1998	
	Africa	SSA*	Africa	SSA*
Internet Host Sites	129,326	3,991	148,436	5,261
Host Sites per 10,000 Inhabitants	1.70	0.07	1.91	0.09
Internet Users	896,120	35,620	927,985	67,485
Users per 10,000 Inhabitants	12.21	0.63	11.91	1.13

* Excludes South Africa

18. Despite the growth in Internet connectivity in the region, Internet services remained confined to capital cities, though in some countries the services extend to major secondary towns. Quite a few countries such as Angola, Benin, Botswana, Egypt, Ghana, Kenya, Morocco, Namibia, Tanzania, Tunisia, Zambia and Zimbabwe have established POPs in some locations, with South Africa having POPs in 70 locations. Unless there is a move to extend Internet connectivity in the rural areas, the threats to further marginalise the rural population, which is already disadvantaged and which accounts for 70-80% of the total population of the continent remain evident.

19. In order to overcome the low level of NICI policy development in Africa, a number of multilateral and bilateral development agencies are working together in the framework of PICTA - Partners for Information and Communication Technologies in Africa - which was set up in 1997 to support African countries in the process of building their national information and communications infrastructure in accordance to the prevailing development priorities in each country (See www.bellanet.org/partners/picta/).

Formulation of NICI Policies, Plans and Strategies

Background

20. The development of a national NICI policy is required to provide a strategic framework to harness the full spectrum of ICT potential leading to economic growth and social benefits. NICI plans or policies can be defined as "an integrated set of decisions, guidelines, laws, regulations and other mechanisms which are geared to directing and shaping the production, acquisition and use of ICTs [11].

21. Since the ICT sector extends beyond the traditional boundaries of the industrial and services sector, the formulation of ICT policy could only be achieved through a broad-

based participatory process. According to Talero [12] the following major stakeholders should be engaged in the policy process:

i. Government ministries as well as productive and service sectors;
ii. Private sector, both national and international, as a key supplier of investment, finance and technical services;
iii. Independent regulatory bodies as implementers of policy directives and responsible for managing regulatory system;
iv. The telecommunications sector with vital interest in sectoral policy reform, investment and services;
v. Non-Governmental Organisations (NGO) with increasing role as providers of services in society;
vi. Scientists, IT personnel and other professional bodies as providers of input on the technological, scientific and human-resource implications and requirements of NICI
vii. International and regional institutions involved in supporting NICI policy making process.

22. Considerations have to be made to establish a task force or commission responsible for the elaboration of NICI plans and strategies, the identification of priorities and the setting-up of mechanisms for updating and procedures for implementation. It is desirable if the formulation process encompasses the following strategic components [13]:

i. Awareness-raising: this includes the undertaking of surveys and need analysis, the identification of priorities and opportunities for NICI in the economy, and the assessment of current strategic information systems project in the country.
ii. Formulation of strategic goals and targets: this includes defining strategic information systems to be developed, required policy and institutional reforms, and knowledge and skills required in the workforce to implement the NICI; and
iii. Decision making process: this is mainly the implementation and oversight of the NICI strategy.

23. According to the AISI framework, development of NICI plans requires developing and improving the following four major components[5]:

- Institutional framework and legal, regulatory and management mechanisms
- Human resources
- Information resources (Infostructure)
- Technological resources (Infrastructure)

Institutional Framework

24. It is essential to address the legal, regulatory and institutional practices in African countries which inhibit the development of national information services and connectivity to the global information infrastructure. The legal, regulatory and institutional framework refers to a series of applicable policies, laws, regulations and executing institutions and mechanisms that collectively provide the framework for action by different stakeholders. Policy should be directed at the effective utilisation of NICI to address the following priorities:

- the development of the local market for ICT services and products;
- the development and protection of the local ICT industry;
- economic growth through value addition;
- the eradication over time of existing disparities in access to information and opportunities between different sectors of society, notably rural communities;
- human resource capacity building.

Policy should reflect the impact of technology and globalisation on:

- the protection of intellectual property rights and the licensing of information products and services;
- the right of free access to information;
- the affordability and availability of information generated by the public sector;
- issues connected with the transborder flow of information.

25. "The institutional, policy, legislative and regulatory framework, and the associated institutions and mechanisms should be reviewed and adopted on an ongoing basis in view of technological convergence and other factors. This is to ensure effective decision making and action in the crucial first decade of the 21st century" [14].

Human Resources

26. Whereas technological infrastructure has traditionally been regarded as the most critical component of the NICI, leaders and experts world-wide increasingly recognise human resource capacity development as potentially the most crucial constraint in the effective deployment of NICI to build sustainable information societies [14]. Hence, preparing Africa for the information age primarily necessitates appropriate investment in its human resources. Training, education and promotion will be the cornerstones of Africa's new society. Development of human resources also requires having a new profile of management/labour forces; the ability to adapt, adopt and exploit new technologies and to manage the change; and creating new job markets where skills and knowledge learned can be applied. Capacity building programs should be developed tailored to the need of each user. AISI, in its Human Resource Development program, has identified the following main users: decision makers, businesses community, researchers and students, skilled workers, the general public, information systems specialists, information service providers, telecommunication and networking specialists. Each of the above users need a specific program to be able to benefit from the Information Society.

Infostructure Development (Information Resources, Content and Applications)

27. This theme requires development of the national information sources of data and information on the African continent and ensuring their coverage of all sectors of the economy. It should include:

- building issue-based local and sectoral databases in accordance with national priorities;
- establishing mechanisms for the continuous gathering, updating and processing of data;

- maintaining national databases and information resources.
- providing value added information services in key areas of the economy such as trade and e-commerce, employment opportunities, tourism services, legislation, etc.
- providing primary information sources and helping to close the resource gap by making textbooks and periodicals electronically available, especially for schools, universities and research centres. This can be provided through building national electronic (on-line) libraries and providing access to international on-line resources.

28. It should be noted that in this area of infostructure development the major issue is, on the one hand, to ensure affordable and easy access to global information and, on the other hand, to assure the generation, utilisation and commercialisation, where applicable, of local information and knowledge resources. Also all projects should be monitored, assessed and reviewed on the basis of experience to ensure sustainability and cost effective replicability[14].

Technological Resources (Infrastructure)

29. Effective information and communication systems require reliable, low-cost and widespread technological resources such as computers, software and all the components of the telecommunications infrastructure for processing data and information. It will be necessary to upgrade and develop the physical and logical telecommunication infrastructure and network at the national level, in addition to improving continental interconnectivity and providing gateways to international telecommunication networks. However, it is here where technological advancements offer Africa cost-effective and appropriate technologies to "leap-frog" over several generations of intermediate technologies still in use in the industrial world[5].

30. The AISI framework (presented in Annex 3) indicates the various steps to follow when defining NICI plans.

The African Experience

31. Within the context of NICI policy making, evidence shows that only a few countries in Africa have embarked in the ICT policy formulation process. Countries like Ghana, Guinea-Bissau and Mali have embarked on the development of a sector-related policy "national policy on communication for development". The Food and Agriculture Organisation (FAO) of the United Nations has assisted the Governments of Guinea-Bissau and Mali in the formulation process, and based on the learning experiences in these countries, there are plans to undertake similar exercises in Central African Republic, Congo and Burkina Faso [15].

32. Mauritius, Tunisia, Senegal and South Africa could be cited as the best examples for their efforts to develop NICI plans and strategies. Senegal has commissioned a study entitled "Senegal 2015" which examines a number of issues to which NICI could provide responses to such as adaptation of the education system, expansion of social communication, reinforcement of self reliance and solidarity, management of the consequences of increased urbanisation and revitalisation of rural areas [16]. Senegal has also started preparation for a comprehensive Government Intranet called "Voice and Data" based on fiber optic

backbone linking all the ministries and the provincial commissions. The Secrétariat d' Etat à l'Informatique (SEI) in Tunisia has developed a national strategy 1997-2001 with emphasis on information and communication infrastructure. Mauritius has embarked in the elaboration of a national IT strategy plan (NITSP) with the help and support of external professionals in the field - the National Computer Systems (NCS) of Singapore. The first phase of the plan which assessed the current and desired states of IT exploitation in the country has been completed, and preparations are underway to move to phase II. The NITSP aims at setting up the foundation and framework for the growth and the efficient and effective use of ICT in Mauritius [17]. South Africa has reformed the telecommunications sector and established the Universal Service Agency (USA) whose prime purpose is to extend access to telecommunications networks to rural and disadvantaged areas. In March 1998, the South African cabinet approved the proposal to develop a NICI strategy, which will consolidate all of the existing government networks in one 'Intranet' based on a high-speed fiber optic backbone to be built by the PTO (Telkom). As part of the strategy, the Department of Communications would prepare legislation for e-commerce, digital signature, multimedia convergence and encryption. (Annex 4 provides examples of NICI plans in selected African countries)

33. Thus only a few countries have made progress in laying the foundation for national information and communication infrastructure and developing the strategy to move forward. In most cases, the formulation mechanisms seem to fall short of integrating social considerations, including gender perspectives, and of intersecting with various policy spheres, such as technology policy, media policy, industrial policy and telecommunications policy. In some instances, there is a tendency to focus on a specific area/activity such as information/documentation or communication, sidelining the need to be responsive to the convergence of telecommunications, audio-visuals, computing and information technologies. This confirms that multilateral and bilateral agencies, UN bodies and donors have a valuable role to play in guiding national governments in the preparation and implementation of NICI plans and strategies. It is also critically important to note that national ICT policy making is a work in progress, and this will not be achieved without the pro-active role of the state and the involvement of as many stakeholders as possible.

34. As part of the AISI efforts, ECA and its partners have jointly organised national workshops on NICI development in Namibia, Rwanda and Tanzania. The objective was to assess the current ICT situation in the countries and to bring together all the stakeholders in the information and communication sectors, government policy makers, researchers and others, and to assist them in their debates and discussions on the applications of ICTs to support their development needs, and on the elaboration of national information and communications infrastructure (NICI) plans and strategies. These activities, as a major step towards the formulation of NICI plans, have been instrumental in creating the necessary awareness and identifying priorities and opportunities for ICT in the economy, and assessing current strategic information systems project at country level.

35. The NICI plan development work is being extended, with co-operation from other partners such as Acacia, IDRC, UNESCO, UNDP, USAID and the World Bank, to Burundi, Ethiopia, Malawi, Mali, Morocco, Nigeria, Cape Verde, Ghana, Benin, Mauritania, Gabon, Burkina Faso, Tunisia, Togo, Cote d'Ivoire, Congo, Cameroon, Madagascar, Mauritius, Central African Republic, Tchad, and Guinea; and the four Acacia countries[16]:

Mozambique, Senegal, South Africa and Uganda. All the above countries will finalize their NICI plans or will start developing them for presentation, discussion and funding during the first African Development Forum (ADF) organized by ECA in Addis Ababa from 25-28 October 1999.

Conclusion

36. The challenge to governments in African countries is the re-examination of their role, their laws, their regulations, and their national policies in the Information era, so that they could exploit to the fullest potential the positive benefits emerging from the convergence of information and communication technologies and the advent of Information Societies. This entails a challenge to exercise clear vision and leadership of how NICI could serve their national interests, and to promote the necessary organisational change. Putting in place of NICI plans and strategies are a 'key building block' required to meet those challenges. The AISI framework has been developed to assist African countries to build their respective information societies.

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Annex 1. Telephone and Cellular Network in Africa - 1997[4]

Countries *	Population for 1997 in 1000	Main Telephone Lines	Main lines per 100 inhabitants	Cellular subscribers	Cellular subscribers per 100 inhabitants
North Africa					
Algeria	29,473	1,400,343	4.75	15,000	0.05
Egypt	62,010	3,452,707	5.57	7,224	0.01
Libya	5,784	380,000	6.56	0	0
Mauritania	2,392	13,145	0.55	0	0
Morocco	27,518	1,378,000	5.01	74,422	0.27
Sudan	27,898	150,973	0.54	3,800	0.01
Tunisia	9,325	585,238	6.27	5,539	0.06
Total	164,400	7,360,406	4.47	105,985	0.06
West Africa					
Benin	5,720	36,453	0.64	4,295	0.08
Burkina Faso	11,087	36,528	0.33	1,503	0.01
Cape Verde	406	33,241	8.19	20	0.004
Cote d'Ivoire	15,250	129,808	0.85	32,400	0.21
Gambia	1,141	21,319	1.87	3,096	0.27
Ghana	18,338	77,886	0.42	12,766	0,07
Guinea	7,614	19,786	0.26	2,868	0.04
Guinea-Bissau	1,112	7,633	0.69	0	0
Liberia	2,880	4,500	0.16	0	0
Mali	11,480	23,488	0.20	2,842	0.02
Niger	9,787	16,404	0.17	98	0.001
Nigeria	118,369	405,073	0.34	13,000	0.01
Senegal	8,762	115,902	1.32	6,942	0.08
Sierra Leone	4,428	17,382	0.39	0	0
Togo	4,316	25,132	0.58	2,995	0.07
Total	220,690	970,535	0.44	82,825	0.4
Central Africa					
Cameroon	13,937	70,558	0.51	2,200	0.02
Centrafrican Rep.	3,416	9,704	0.28	471	0.01
Chad	6,702	6,004	0.09	0	0
Congo	2,745	22,000	0.80	1,000	0.04
Equat. Guinea	420	3,668	0.87	61	0.01
Gabon	1,138	37,253	3.27	9,500	0.83
Sao Tome & Principe	100	2,503	2.50	0	0
Total	28,458	151,690	0.53	13,232	0.05

* Based on UNECA sub-regional classification

[4] ITU source – 1998 African Telecommunications Indicators

Annex 1. Telephone and Cellular Network in Africa - 1997 (Cont.)

Countries	Population (Thousands) 1997	Main Telephone Lines	Main lines per inhabitant	Cellular Subscribers	Cellular subscribers per 100 inhabitants
East Africa					
Burundi	6,190	15,181	0.25	525	0.01
Comoros	652	5,508	0.84	0	0
Congo Dem. Rep.	48,040	36,000	0.07	8,900	0.02
Djibouti	634	8,151	1.29	110	0.02
Eritrea	3,780	18,919	0.50	0	0
Ethiopia	60,148	156,536	0.26	0	0
Kenya	33,140	269,773	0.81	5,345	0.02
Madagascar	15,845	43,197	0.27	4,000	0.03
Rwanda	5,883	15,000	0.26	0	0
Seychelles	76	14,864	19.56	1,149	1.51
Somalia	10,217	15,000	0.15	0	0
Tanzania	31,506	92,760	0.29	20,200	0.06
Uganda	20,791	51,829	0.25	5,000	0.02
Total	236,902	742,718	0.31	45,229	0.02
Southern Africa					
Angola	11,570	55,843	0.48	7,052	0.06
Botswana	1,496	72,189	4.83	0	0
Lesotho	2,078	15,975	0.77	1,262	0.06
Malawi	10,440	35,471	0.34	3,700	0.04
Mauritius	1,141	222,747	19.52	37,000	3.24
Mozambique	18,265	66,123	0.36	2,500	0.01
Namibia	1,613	100,848	6.25	12,500	0.77
South Africa	42,096	4,258,639	10.12	953,000	2.26
Swaziland	938	22,602	2.41	0	0
Zambia	8,275	77,935	0.94	2,721	0.03
Zimbabwe	12,290	212,000	1.72	11,300	0.09
Total	110,202	5,140,372	4.66	1,031,035	0.94

Annex 2. Internet Connectivity in Africa - 1998

Countries	Population estimates 1998[5] '000	Internet Hosts[6]	Hosts/Sites per 10000 inhabitants	Internet users[7]	Users per 10000 inhabitants
North Africa					
Algeria	30,203	19	0.006	500	0.17
Egypt	65,708	2043	0.31	50,000	7.60
Libya	5,995	1	0.001	0	0
Mauritania	2,460	22	0.09	100	0.41
Morocco	28,000	478	0.17	6,000	2.14
Sudan	28,576	-	-	300	0.10
Tunisia	9,497	57	0.06	4,000	4.21
Total	170,439	2620	0.15	60,900	3.57
West Africa					
Benin	5,895	13	0.02	2,000	3.40
Burkina Faso	11,427	93	0.08	700	0.61
Cape Verde	416	1	0.02	50	1.20
Cote d'Ivoire	14,564	265	0.18	2,000	1.37
Gambia	1,192	-	-	150	1.26
Ghana	18,892	241	0.13	4,500	2.38
Guinea	7,658	0	0	300	0.39
Guinea-Bissau	1,135	13	0.11	150	1.32
Liberia	2,804	1	0.004	50	0.18
Mali	11,854	1	0.0008	400	0.34
Niger	10,144	5	0.005	200	0.20
Nigeria	121,960	91	0.007	1,000	0.08
Senegal	9,023	189	0.21	2,500	2.77
Sierra Leone	4,597	-	-	100	0.22
Togo	4,430	83	0.19	300	0.68
Total	225,991	996	0.04	14,400	0.64
Central Africa					
Cameroon	14,353	5	0.003	2,000	1.39
Centrafrican Rep.	3,492	-	-	200	0.57
Chad	6,896	-	-	200	0.29
Congo	2,827	1	0.004	-	-
Equat. Guinea	430	-	-	200	4.65
Gabon	1,172	1	0.009	1,000	8.53
Sao Tome & Principe	100	64	6.4	-	-
Total	29,270	71	0.02	3,600	1.23

[5] UN estimates for 1998

[6] Data from Network Wizards 1998 mid year count. *http://www.nw.com*

[7] Adapted from Mike Jensen's overview on Africa Internet Status. *http://www3.sn.apc.org/africa/afstat.htm*

Annex 2. Internet Connectivity in Africa – 1998 (Cont.)

Countries	Population estimates 1998 '000	Internet Host Sites[a]	Host Sites per 10,000 inhabitants	Internet Users[b]	Users per 10,000 inhabitants
East Africa					
Burundi	6,610	-	-	75	0.11
Comoros	672	9	0.13	50	0.74
Congo Dem. Rep.	47,000	8	0.002	100	0.02
Djibouti	652	-	-	400	6.13
Eritrea	3,555	0	0	300	0.84
Ethiopia	64,966	76	0.01	2,400	0.37
Kenya	29,064	692	0.24	15,000	5.16
Madagascar	16,386	18	0.001	700	0.43
Rwanda	6,678	-	-	100	0.15
Seychelles	100	7	0.7	1,000	100
Somalia	10,715	-	-	-	-
Tanzania	32,000	137	0.04	2,500	0.78
Uganda	21,351	41	0.02	3,000	1.41
Total	239,749	988	0.04	25,625	1.07
Southern Africa					
Angola	11,995	2	0.002	1,500	1.25
Botswana	1,700	578	3.4	1,000	5.88
Lesotho	2,186	17	0.08	200	0.91
Malawi	10,459	-	-	400	0.38
Mauritius	1,141	370	3.24	960	8.41
Mozambique	18,643	83	0.04	3,500	1.88
Namibia	1,653	665	4.02	2,000	12.10
South Africa	44,339	140,577	31.7	800,000	180.40
Swaziland	932	397	4.25	900	9.65
Zambia	8,711	236	0.27	3,000	3.44
Zimbabwe	11,928	836	0.70	10,000	8.38
Total	113,687	143,761	12.65	823,460	72.43

Annex 3. Guidelines for developing National Information and Communication Infrastructure (NICI) Plans[8]

- Define vision, mission, strategic objectives, scope
- Define the institutional framework.
- Define the regulatory framework.
- Define the information technology business sector.
- Define the development priorities (five-year plan, cabinet directions, etc.).
- Define the economic and business sectors as well as the market trends.
- Define education and science and technology infrastructure.
- Define needs and priorities for information, decision support, networking, information services, etc.
- Define the data/information and decision support agencies, actors, etc., at the different levels: national, local.
- Define the technology infrastructure.
- Identify, formulate and develop programmes and projects.
- Formulate strategies for development of NICIs.
- Develop a detailed action plan, time schedule, priorities and budget.
- Determine the implementation agencies in charge.
- Solicit the commitment of policy makers, industry leaders, etc.
- Formulate the public awareness campaign.
- Implementation.
- Evaluation.

[8] AISI, pp. 51-52

Annex 4. Examples of NICI Plans in Selected Countries in Africa

Country	Leading Institutions	NICI Plan Interventions
Burkina Faso	DELGI - Délégation générale à l'informatique	With the support of IICD and ORSTOM, DELGI and the national telecom (ONATEL) organised in March 1997 a national workshop on the development of information society in the country. The workshop was instrumental in the design of a strategy to increase the use of ICT, the networking of major public institutions, and the support in content and applications development.
Ethiopia	ESTC - Ethiopian Science and Technology Commission	With assistance from ECA, ESTC has undertaken a preliminary exercise in 1999 as part of its objectives to formulate a national ICT policy.
Ghana	GNICC - Ghanaian National Information and Communications Committee	With the support of the government, GNICC coordinated by the University of Ghana, and comprising representatives from various sectors of society, has developed a draft national communication policy.
Guinea-Bissau	Government	Development of national policy on communication for development in 1996 with support from FAO.
Mali	Government	Development of national policy on communication for development in 1996 with support from FAO. ECA will support the NICI development process.
Mauritius	NCB - National Computer Board Ministry of Telecommunications and Information Technology	Established in 1996 as a parastatal institution, the National Computer Board has set up a National IT Strategy Plan (NITSP) as part of the Mauritius' government strategic objectives to move the country toward an information age economy.
Morocco	Secrétariat d'Etat auprès du Premier Ministre, Chargé de la Poste et des Technologies de l'Information	The Secrétariat was established in 1998, and its major task for 1999 is to formulate an NICI plans and strategies policy in line with AISI action framework. ECA will support the NICI development process.
Mozambique	Project on Information Policy, Office of the Prime Minister CIUEM - Centre Informatica at theUniversidade Eduardo Mondlane	CIUEM held it first Workshop on Developing the Information Society in Mozambique, Maputo, 4-5 February 1997. CIUEM stresses on the need to develop a national information policy and to establish a Programme for the Informatization of Mozambique (Programa da Informatizaço do Pais - PIP). IDRC, World Bank and USAID provide support
Namibia	The Ministry of Information and Broadcasting	The Ministry convened a conference on Building Namibia's National Information Infrastructure on May 1998 in Windhoek to implement AISI at the national level. ECA will support the NICI development process.
Niger	CIDES – Centre d'information et de documentation économiques et sociales	Under the Ministère du plan, CIDES is in the process of formulating a national scientific and technical information policy.
Rwanda	Ministry of Transport and Communications	A national workshop on Information and Communication Technology Policy for Rwanda, organised by the Rwanda Government, ECA, UNESCO and USAID, was held in December 1998. ECA will support the NICI development process.

Annex 3. Examples of NICI Plans in Selected Countries in Africa (Cont.)

Country	Leading Institutions	NICI Plan Interventions
Senegal	CNDST - Centre national de documentation scientifique et technique	CNDST is responsible for national policy development in the area of scientific and technical development. Senegal has commissioned a study entitled "Senegal 2015" in 1997 to examine the potential of NICI in various spheres of the economy. IDRC is the major funding agency.
South Africa	The Department of Communications (DOC)	In March 1998, the South African cabinet approved the proposal to develop a national information and communication strategy, which will consolidate all of the existing government networks in one 'Intranet' based on a high-speed fiber optic backbone to be built by the PTO (Telkom). As part of the strategy, the DOC would prepare legislation for e-commerce, digital signature, multimedia convergence and encryption. Prior to this, South Africa had already formulated a telecommunications policy.
Tunisia	SEI - Secretariat d'état à l'informatique	SEI has developed a national strategy for the period 1997-2001 with emphasis on information and communications infrastructure. ECA will support the NICI development process.
Uganda	Uganda National Council on Science and Technology (UNSCT)	As part of its Acacia national strategies, IDRC sponsored a workshop in Kampala in 1997 to define an action plan in four areas: policy, infrastructure and technology, human resources, and information content.

Source: Year one report on Acacia activities (http://www.idrc.ca/acacia)
Internet African connectivity (http://www3.sn.apc.org/africa)