**Mainstreaming environmental education and technology supported learning in Africa:
Challenges and Opportunities**

Table of Contents

Mainstreaming environmental education and technology supported learning in Africa: Challenges and Opportunities

1. Introduction

Established in 1985, the **African Ministerial Conference on the Environment** (AMCEN) is the main forum to strengthen co-operation on environmental issues among African governments. The mandate of AMCEN is to provide advocacy for environmental protection in Africa and among other things to ensure that basic human needs are met adequately and in a sustainable manner.

The objective of this paper is to encourage AMCEN to consider the issue of mainstreaming technology supported learning (which includes eLearning) into the work of national environmental authorities and mainstreaming environmental education and education for sustainable development programmes across other relevant ministries and educational institutions. The paper highlights a number of important international mandates of relevance to Africa; highlights a number of case studies that demonstrate best practice; and discusses the challenges and opportunities facing environmental and educational institutions.

As AMCEN-12 may wish to express itself on this important matter, a draft decision is appended (see Annex 1) to the paper for consideration by the working group on best practice and case studies.

A glossary of terms used in the field of technology support in learning is contained in Annex 2.

2. Technology Supported Learning and eLearning

Technology has become an important instrument in education. Attempts to use computer technologies to enhance learning date back to 1968 and to pioneering work in the USA. The use of technology as a resource to support student learning has generated both opportunities and challenges for educators. Computers, with their accompanying expansion possibilities of educational and productivity software, Internet resources, and networks, have provided a larger palette around which educators and trainers can create effective teaching and learning environments.

Computer-based technologies hold great promise both for increasing access to knowledge and as a means of promoting learning. Worldwide public imagination has been captured by the capacity of information technologies to centralize and organize large bodies of knowledge. Individuals are captivated by the prospect of information networks, such as the Internet, linking students around the globe into communities of learners.

What has not yet been fully understood is that computer-based technologies can be powerful pedagogical tools and not just rich sources of information. They are extensions of human capabilities and contexts for social interactions supporting learning. The process of using technology to improve learning is never solely a technical matter, concerned only with properties of educational hardware and software. Like a textbook or any other cultural object, technology resources for education, whether a software science simulation or an interactive reading exercise, function in a social environment, mediated by learning conversations with peers and tutors.

For instance eLearning[1] can contribute to environmental information becoming more readily available and also enhance networking and participatory exchange on environmental issues worldwide. ELearning can reduce costs for students by enabling them to learn from where they live or work and can also facilitate cross-cultural communication and networking. It presents a good opportunity for reaching more people not only to gain access to relevant training and information, but also to get to know the different technology tools that are available. It is also a major tool for environmental ministries and protection agencies in Africa to use in building the capacities of their extensive network of officials at the national level for effective monitoring and management of the environment.

As the World Wide Web continues to develop, a new family of tools known as Web 2.0 technologies has evolved that opens new opportunities to advance technology supported learning. Web 2.0 describes the new generation of web-based services that support the further development of the Web into a mass media as it enables swapping, sharing and linking of content and knowledge. Using mostly free "social software" such as Skype, wikis and weblogs, virtual communities and social networks are created online. Social software refers to software systems facilitating communication, interaction and cooperation.

One essential characteristic of Web 2.0 is that with its tools for contribution, commentary and appraisal it enables the users to develop their own social exchange and communicate easily between each other without an editor. Information provided is personal and subjective. The empowerment of users is one of the major goals of the "Web 2.0 trend". These software systems enhance the growth of social networks and virtual communities, including learning communities.

3. Environmental education and technology supported learning in the international environmental context

Over the years, the consensus of the international community is that education is crucial to the achievement of sustainable development. The issue of environmental education and technology supported learning has been addressed in a number of international environmental fora dating back to the 1972 Stockholm Conference on the Human Environment which laid the foundation for the United Nations Environment Programme which was formally established by resolution 2997 adopted at the 27th session of the UN General Assembly later that year.

3.1 Stockholm Conference on the Human Environment (1972)

Education was given a prominent role by the Stockholm Conference in contributing towards addressing the several environmental challenges that the world faces. For instance, **Principle 19 of the Stockholm Declaration** states, *inter alia,* that

> *"Education in environmental matters, for the younger generation as well as adults, giving due consideration to the underprivileged, is essential in order to broaden the basis for an enlightened opinion and responsible conduct by individuals, enterprises and communities in protecting and improving the environment in its full human dimension."*

---

[1] The Commission on Technology and Adult Learning (2001) defines eLearning as instructional content or learning experiences delivered or enabled by electronic technology. In practice, it incorporates a wide variety of learning strategies and technologies (LaRocque and Latham, 2003).

Consequently there were several provisions for education in the Stockholm Plan of Action for the Human Environment.

3.2 United Nations Conference on Environment and Development (UNCED) (1992)

However, it was at the subsequent Rio Conference that the centrality of the role of education for achievement of sustainable development was particularly highlighted. Chapter 36 of Agenda 21 states amongst others that

> "*Education, raising of public awareness and training are linked to virtually all areas in Agenda 21, and even more closely to the ones on meeting basic needs, capacity-building, data and information, science, and the role of major groups.*"

The UNCED (Earth Summit) in 1992 gave high priority in its Agenda 21 to the role of education in pursuing the kind of development that would respect and nurture the natural environment. It focused on the process of orienting and re-orienting education in order to foster values and attitudes of respect for the environment and envisaged ways and means of doing so. By the time of the Johannesburg Summit in 2002 the vision broadened to encompass social justice and the fight against poverty as key principles of development that is sustainable. The human and social aspects of sustainable development meant that solidarity, equity, partnership and cooperation were as crucial as scientific approaches to environmental protection. Besides re-affirming the educational objectives of the Millennium Development Goals and the Education for All Dakar Framework for Action, the Summit proposed the Decade of Education for Sustainable Development as a way of signalling that education and learning lie at the heart of sound approaches to sustainable development.

Chapter 36 of Agenda 21 emphasized that education is critical for promoting sustainable development and improving capacity of the people to address environment and development issues. Ever since sustainable development has been a common concern in all UN conferences and there has been a common consensus that education is a driving force for the change needed. It has also been pointed out that peace; health and democracy are mutually reinforcing prerequisites for sustainable development.

3.3 Millennium Development Goals (MDG) (2000)

Information and Communication Technologies (ICTs) are part of the MDGs where goal 8, target 18, indicators 47-48 make reference to them. Indeed the application of ICTs has an impact on the achievement of the other MDGs. Target 18 calls upon governments, in cooperation with the private sector, to make available the benefits of new technologies, specifically information and communications' with the following indicators:

- Total number of telephone subscribers per 100 inhabitants
- Personal computers per 100 inhabitants
- Internet users per 100 inhabitants.'

Infrastructure is not the only factor that impacts the availability of ICTs but includes knowledge (i.e. literacy), quality (i.e. international internet bandwidth) and affordability (i.e. internet access tariffs). ICTs can help achieve MDGs by delivering educational and literacy programmes to disadvantaged communities using appropriate technologies. The International Telecommunications Union (ITU) is the lead agency for the ICT components of the MDGs. The achievement of MDG goal 7 (ensuring environmental sustainability) can be supported by greater

application of remote sensing technologies and communications networks that permit more effective monitoring, resource management and mitigation of environmental risks.

For Africa, pertinent issues are readiness, access, use and impact as described below:

Readiness: Appropriate and effective elements (infrastructure and policies) are in place to ensure the rapid adoption and widespread use of ICT.
Access: Wide diffusion and accessibility of ICT across all regions and sectors of society
Use: Use of ICT by business, government and civil society demonstrating what innovative e-applications are being developed and used.
Impact: A description of how ICT is enhancing development opportunities at local, national and international levels.

3.4 World Summit on Sustainable Development (WSSD) (2002)

The World Summit on Sustainable Development (WSSD) held in Johannesburg in 2002 broadened the vision of sustainable development and re-affirmed the educational objectives of the Millennium Development Goals and the Education for All Dakar Framework for Action. The Summit proposed the Decade of Education for Sustainable Development and the United Nations General Assembly in its 57th Session in December 2002, proclaimed the Decade of Education for Sustainable Development for the period 2005 – 2014.

3.5 World Summit on the Information Society (WSIS) (2003, 2005)

WSIS was organised in two phases in accordance with UN General Assembly Resolution 56/183 of 21 December 2001. The first phase (Geneva, 10-12 December 2003) adopted the Geneva Declaration of Principles and the Geneva Plan of Action. The second phase (Tunis, 16-18 November 2005) adopted the Tunis Agenda for the Information Society.

The Geneva Plan of Action stated (para 3) that Governments have a leading role in developing and implementing comprehensive, forward looking and sustainable national e-strategies. The private sector and civil society, in dialogue with governments, have an important consultative role to play in devising national e-strategies. International and regional institutions, including international financial institutions, have a key role in integrating the use of ICTs in the development process and making available necessary resources for building the Information Society and for the evaluation of the progress made. On the subject of e-environment, the Geneva Plan of Action further stated that Governments, in cooperation with other stakeholders are encouraged to use and promote ICTs as an instrument for environmental protection and the sustainable use of natural resources.

The Tunis Agenda outline eleven separate action lines (C1 – C11) with leads and co-leads from the UN family. Action line C7 (ICT applications) addresses both **eLearning** (Lead UNESCO and co-leads ITU/UNIDO) and **E-environment** (Lead WMO and co-leads WHO/**UNEP**/UN-Habitat/ITU/ICAO). UNEP is currently implementing programme activities that complement both of these action lines.

3.6 United Nations Decade of Education for Sustainable Development (UNDESD) (2005)

In 2005 the United Nations launched the Decade of Education for Sustainable Development (UNDESD). The UN Decade of Education for Sustainable Development (UNDESD: 2005–2014) is seen as a crystallization of the consensus amongst the international community that education is

fundamental to the achievement of sustainable development. Chapter 36 of Agenda 21 on Education and Public Awareness adopted by the Rio Earth Summit in 1992 prioritized environmental education and training, and included concrete activities for implementation. It was thus only natural that the historic World Summit on Sustainable Development (WSSD) in 2002 expanded on these earlier efforts by proposing that the next 10 years 2005-2014 be declared as the Decade of Education for Sustainable Development (DESD).

This re-echoed the theme of the Report of the Secretary-General of the United Nations at the turn of the century and the Millennium Summit leading to the adoption of the Millennium Development Goals (MDGs). The United Nations rose to this challenge and on the 20th of December 2002 declared the years 2005 to 2014 the DESD. This was in response to the need to produce a new generation of leaders that would be imbued with a deep environmental consciousness and with integrated perspectives in linking the three pillars of sustainable development – economic, social, and environment.

4. Environmental education and technology supported learning in the Africa context

Environmental education and technology supported learning has been addressed to some extent in a number of regional fora and other initiatives that relate to Africa.

4.1 New Partnership for Africa's Development (NEPAD)

The **New Partnership for Africa's Development** (NEPAD) is a vision and strategic framework for Africa's renewal. The NEPAD priority areas are to establish the conditions for sustainable development; policy reforms and increased investment in selected priority sectors (e.g. building and improving infrastructure, including information and communication technology) and mobilisation of resources. The NEPAD Environmental Action Plan (2003) indicates that the state of the environment is a major determinant of the growth and development objectives of any nation and has a pervasive effect on the safety and standard of living of the populace. One of the strategic actions in the NEPAD Environmental Action Plan is the development of capacity in all aspects of environmental issues in Africa.

The Education sector features prominently therein together with Health, Science and Technology and Development of skills, among the priorities in terms of "human development". This all-encompassing approach to the priority areas of NEPAD reflects the holistic approach to sustainable development and clearly corresponds to the principles underlying education for sustainable development. In Africa, the Decade should therefore be an important vehicle for implementing the operative paragraph set forth in the Education component of NEPAD. The **Mainstreaming Environment and Sustainability into African Universities (MESA)** partnership is constituted as a major contributor to NEPAD's Environmental Action Plan. More information on MESA is provided in section 5.2 of this document.

4.2 African Ministerial Conference on the Environment (AMCEN)

Decision 7 adopted at AMCEN-11 (Congo-Brazzaville, 2006) on the issue of Integration of environmental dimensions into disaster risk reduction programmes in the context of the Africa Regional Strategy for Disaster Risk Reduction, called upon Governments to *support and develop capacity-building programmes, including activities to increase institutional capacities, training and environmental emergency management education programmes.*

UNEP has, among other contributions to the AMCEN programme of work, (i) facilitated innovative programmes in African universities to mainstream environment and sustainability into teaching and learning; (ii) provided institutional capacity-building and facilitation in the development of regional training courses in environmental education; and (iii) developed learning support materials on cross-cutting environmental issues.

4.3 Second Decade for Education in Africa

The UNDESD and the Second Decade of Education in Africa launched by the African Union (AU) in 2006 are in perfect synergy and mutually reinforcing, the objective of the latter being to extricate the continent from its 'deficit' in education. Special attention will be given to insufficient capacities and resources as well as the negative impact that they have on education, the uncertain economic growth, high population growth, armed conflicts, and structural adjustment programmes.. Furthermore, the issues relating to good governance should be a basic concern as the implementation of the strategy implies favourable working conditions.

In response to the UN Decade of Education for Sustainable Development (UNDESD), the African Ministers of Education made a commitment in March 2006 to implement the UN Decade of Education for Sustainable Development in the context of the Second Decade of Education in Africa. In their statement of commitment, the Ministers of Education of Sub-Saharan African States agreed to support the UNDESD and to *support the development of strategies* for implementing the UNDESD in their respective countries within the framework of the African Union's Second Decade on Education, and to *ensure that principles of sustainable development are included in educational development frameworks, programmes and activities at all levels.*

4.4 Education for All Dakar Framework for Action (EFA)

At the World Education Forum in Dakar in 2000, 164 governments adopted the Dakar Framework for Action and committed themselves to achieving quality basic education for all by 2015, with particular emphasis on girls' schooling. There was a pledge from donor countries and institutions that "no country seriously committed to basic education will be thwarted in the achievement of this goal by lack of resources." The Forum identified six goals to be achieved in the framework and pledged support, for among other things, to harness new information and communication technologies to help achieve EFA goals. In support of the EFA, Sub-Saharan countries have been encouraged to adopt new, appropriate and cost-effective information and communication technologies to complement the integration of indigenous educational methodologies (UNESCO, 2006).

4.5 The eLearning Africa series of conferences

ICWE GmbH - International Conferences, Workshops and Exhibitions based in Berlin, Germany, is an international conference organizer with a focus on education and training. Since 1995 ICWE has, with the support of the European Commission and the German Federal Ministry of Education and Research, organized the world's largest annual international eLearning conference "Online Educa Berlin": http://www.online-educa.com. ICWE, in cooperation with national stakeholders also organizes eLearning Africa - the premier Pan-African Conference on ICT for Development, Education and Training: http://www.elearning-Africa.com.

The first *eLearning Africa* event was successfully held in Addis Ababa, Ethiopia, in 2006 under the Patronage of the Minister for Capacity Building, the Hon. Tefera Waluwa and the United

Nations Economic Commission for Africa. The conference with about 250 expert speakers attracted more than 830 participants, 70 % coming from Africa.

The second *eLearning Africa* was convened in Nairobi, Kenya, from 28 - 30 May 2007 under the Patronage of the Kenyan Minister for Education, the Hon. Prof. George Saitoti. The event in May 2007 closed with the total of 1406 participants from 88 countries reflecting an increase of nearly seventy percent compared to the 2006 inaugural event in Addis Ababa. The conference programme in Nairobi featured the input of 308 speakers and chairpersons from 55 countries, and enjoyed the support of major international and African corporations and development agencies. Many of them used *eLearning Africa* as their annual continental hub and held their own meetings and events before or after the main conference. The extensive Nairobi programme of pre-conference events and workshops comprised sixteen full-day and half-day workshops with more than 830 participants. *eLearning Africa 2007* also hosted the 1st African UNESCO-UNEVOC TVET Summit: "Access to and Inclusion in TVET in Africa Through New ICT-Based Solutions", supported by the German "Federal Institute for Vocational Education and Training – BIBB". This one day event was attended by more than 150 participants.

The third *eLearning Africa* will be held in Accra, Ghana from 28 - 30 May 2008, under the Patronage of the Ghanaian Minister for Education, Science and Sports, the Hon Prof. Dominic K. Fobih. On May 28, 2008 UNESCO-UNEVOC will organise – together with BIBB - the 2nd African TVET Summit in Accra, Ghana.

5. UNEP's role in environmental education and technology supported learning

In response to the Bali Strategic Plan for Technology Support and Capacity Building (BSP) endorsed by governments in February 2005, a strategic decision was made in 2006 by UNEP to take advantage of modern information and communication technology tools in order to provide key training resources and courses to a wider user community in an innovative, experiential and participatory format. It was further decided to use eLearning as a key component of this strategic approach.

5.1 Marketplace for ENvironmental Training and On-line Resources (MENTOR)

Section F (Information for Decision-making) of the Bali Strategic Plan emphasizes the need to develop institutional capacities and train staff across a number of key areas related to keeping the environmental situation under review. In response, UNEP is now developing a web-based learning platform to disseminate appropriate tools, guidelines, methodologies and best practices in data collection, analysis, monitoring, integrated environmental assessment, early warning and observation, information networking, and support online training in the use of these tools and methodologies. This web based portal is called MENTOR (Marketplace for ENvironmental Training and On-line Resources) and a prototype will be available in 2008 with a 2010 target date for a fully operational platform.

The MENTOR platform incorporates an eLearning component tentatively referred to as eLearning MENTOR. The objective is to develop a set of eLearning resources for a diverse group of professional clients who are engaged in global, regional and national programmes aimed at keeping the environment under review. The target group includes staff in national environmental ministries, scientific institutions and non-governmental organizations. Geographically it includes clients in developed countries, developing countries and countries with economies in transition with different levels of knowledge, experience and time availability.

Following the First Expert Group meeting on the development of MENTOR, held at the World Resources Institute (WRI) in Washington DC on 13-14 December 2006, a good deal of progress has been made by UNEP in establishing an eLearning programme. Building the capacity of UNEP staff in the area of eLearning was a first priority if a formal eLearning programme was to be established and sustained in the long term. One of the first priorities was to engage a consultant to provide strategic advice for the design and development of the eLearning programme. Another priority was to network with other eLearning practitioners both within the UN family and beyond. UNEP staff attended the 2nd eLearning Africa conference held in Nairobi in May 2007 and the Online Educa Conference (Berlin, November 2007).

The experiences from this process are shaping the way for UNEP's eLearning strategy in the future, but at the same time they contribute directly to UNEP's core tasks. ELearning will make environmental information (and training) more readily available and it enhances networking and participatory exchange on environmental issues worldwide.

5.2 Mainstreaming Environmental Sustainability in Africa (MESA)

The MESA Universities Programme is an initiative by UNEP in close collaboration with UNESCO, Association of African Universities (AAU) and other stakeholders to support the United Nations Decade of Education for Sustainable Development (UN-DESD). It recognizes and builds on a number of commitments made by higher education bodies globally and regionally including the NEPAD Environmental Action Plan and the objectives of the African Ministerial Conference on the Environment.

The MESA Universities Partnership strengthens UNEP's special focus on Africa and is constituted as a major contribution to the United Nations Decade of Education for Sustainable Development. The overarching goal is to build the human capacity in African institutions to create innovative learning systems to address environmental and MDG's challenges. Closely associated with this is the promotion of a scientific knowledge base about ESD, meant for all students and staff, and the creation of skills to raise awareness and bring across specific issues, which is meant for the direct program participants.

Most significantly the initiative provides universities, civil society, communities and the private sector a platform for dialogue and collaboration on sustainable development projects at the local levels as well as to support and recognize innovations in African Universities that respond to Africa's most pressing economic, social and environmental challenges and opportunities.

In relation to this brief, UNEP in collaboration with the Global Virtual University in May 2006 developed a discussion forum for the exchange of information, ideas and discussions on the implementation of ESD in participating MESA universities. Further to ensuring that the rich resources UNEP produced reach out to universities to support teaching research and learning in sustainable development, UNEP held an AEO (Africa Environment Outlook) MESA workshop. The aim of the workshop held on 20th -21st August 2007 was to develop an AEO module (conventional and IT based) that would be adopted and used in African Universities. The module would be comprehensive, flexible and adopted by universities as a short or long-term course. The draft curriculum is intended to be ready for use in September 2008 in at least 5 pilot universities.

The role of universities in African is seen as crucial as they are the reproducers of graduates that go into various sectors as well as the environmental authorities and related institutions. The programme is designed to start a movement in African universities where ESD issues will be part of all programmes over the next 8 years.

6. African experiences in the areas of environmental education and technology supported learning

Although there are many obstacles and challenges facing African countries in mainstreaming technology supported learning into training programmes in the area of environmental education for sustainable development, it is important to highlight some examples of best practice that may serve as an impetus for institutions in other countries to initiate similar programmes.

6.1 Online education – a driving force for quality in education, standardised course development procedures and internationalisation of studies and joint degrees

Experience demonstrates that good online education can increase capacity considerably at many universities. Done correctly, online education can increase quality, facilitate student support and increase professorial flexibility and capacity. Online education can facilitate internationalisation of the curriculum and development of joint study programs, increase number of curriculum subjects and ensure recognition of competence.

Good online education can improve learning environments, and through the establishment of learning communities of practice increase understanding and prevent dropouts. With the advancement of electronic communication technologies, there is a trend of increasing cooperation in national as well as international networks, even between competing educational institutions (Suarez-Villa, 2004).

A World Bank report (World Bank, 2002) suggests several measures for building knowledge societies and reducing the problem of brain drain from poor to rich countries. Among the suggested measures are increased reliance on joint degrees; purchasing ICT equipment for scholars and bridging the digital divide. Other suggestions are life-long learning approaches, creation of international quality assurance frameworks in higher education, international recognition of qualifications and avoid sending scholars for longer sojourns of study in industrialised countries.

In its formal pedagogical sense environmental education implies an integrated course cutting across traditional subject areas, including both the pure sciences and the social sciences. A basic objective of such a course aims to enhance in the learner, an awareness, understanding and concern for the environment and its associated problems, through dissemination of knowledge, development of skills and attitudes, and inculcation of motivation and commitments pertinent to aspects of the environment in relation to human activities.

Africa presents an example of a continental environment which is affluent in nature's variety of resources and in which human activities are varied, endogenous and exogenous. It has been generally accepted that achieving sustainable development will require balancing environmental, societal, and economic considerations in the pursuit of development and an improved quality of life.

Agenda 21 formed the basis upon which environmental education curricula were developed. Since then, several institutions of higher learning in Africa have initiated environmental education and other related courses.

Following the Rio Conference, Africa witnessed an increased emphasis on environmental education, however, it is not fully evident if technology supported learning has received sufficient attention, particularly in the environment and sustainable development community.

The acknowledgement of technology supported learning has not been adequately emphasized in Africa. In Kenya for instance, there have only been few pockets of eLearning initiatives usually driven by individual interest. Thus the initiatives are more small scale and fail to be embraced by the wider policies of the institutions. It is therefore not surprising to see that no institution has taken up eLearning as an option towards attainment of degree.

It is however appreciated that the education sector in Africa acknowledges the richness of the online environment in supporting learning. Most lecturers now advise learners to search and use information from the internet to enrich their academic experience. At postgraduate level, online references are now widely accepted.

In most institutions, eLearning has only developed to the extent of use of technology to support blended learning whereby the physical presence of the teacher is still needed. In Kenyatta University in Kenya, eLearning is appreciated as a mode of learning but its implementation has only progressed to use of the blended mode. Kenyatta University's Department of Environmental Sciences is on record as having offered two courses in 2006 using the blended learning approach. Sections of learning therefore require physical interaction with the teacher such as examinations and group presentations. This happens despite wide appreciation of potential of eLearning taking place even without physical contact with the teacher.

6.2 African regional case study from the non-formal environmental education sector - The SusWatch Initiative

In Africa, national Civil Society Organisations (CSO) networks from Kenya, Mozambique, South Africa, Tanzania, Togo, Uganda and Zimbabwe are participating in this initiative.

Each of the seven countries have been able to consolidate a strong network made up of NGOs/CSOs that participated in the Rio + 10 project and a few that have been recruited during the current phase. In South Africa, the membership consists of 4 networks that work as an alliance led by one of them, the Environmental Monitoring Group, which has a membership of 20 NGOs/CSOs. Combined, the South Africa network has a membership of 445 individual members. Zimbabwe and Uganda Suswatch networks each have 35 member organizations while Kenya has 71, Tanzania 34, Mozambique 40 and Togo 67. The member organizations include NGOs and CBOs of women, youth, farmers and trade unions. They also include groups in the science and technology category, advocacy and lobbying groups, policy and research as well as academic institutions.

Uganda and Tanzania have registered their networks as legal entities, Uganda Coalition for Sustainable Development and Tanzania Coalition for Sustainable Development. Others have preferred to remain as a loose network but with well defined organizational structures and clear terms of reference for each level/position within the structure.

The seven country networks contributed to the development of the first International Sustainability Watch Report that focused on existing implementation barriers hindering the effective realization of sustainable development goals in Africa. The process leading to this report started in 2005, when the national networks in all the 7 participating Countries produced *National Sustainability Watch reports* - independent assessments on progress in pursuit of international sustainable development targets and commitments at the national level.

Among others, the first International SusWatch Report focuses on the level of (internal and external) financial resources allocated to sustainable development, actual implementation barriers to sustainable development; and linkages between poverty, environment, sustainable development and good governance. The Report therefore provides governments, civil society and donors with a useful perspective on how to improve the capacities to overcome the current implementation crisis in pursuit of poverty reduction and environmental sustainability.

As a follow up, the networks Africa have agreed to work together to scale up Sustainability Watch project in the coming phase. They recognize that the issues and challenges of achieving sustainable development including poverty and deprivation, related large-scale agricultural development, dwindling catchment forest resources, pollution from industries, provision of alternative affordable energy options for the fast growing population, state of water and sanitation in the growing urban areas, are so broad that no one agency can be able to design interventions to adequately overcome them and realize it single handedly. The networks also recognize climate change as an important phenomenon that affects the levels at which sustainable development will be achieved.

A review of the African networks' activities carried out in 2006 identified the following issues among others that need to be addressed for effective implementation of its goals and objectives:
(i)   The need to undergo organizational capacity assessment to determine their ability to conduct lobbying and advocacy and design a capacity building plan for each network to be implemented alongside other SusWatch project activities.
(ii)   The need to increase the available human resources in line with the growing tasks and activities of the network.
(iii)   Localization of global issues like the MDGs using approaches that are appropriate and innovative for the particular network.
(iv)   More physical interactions between SusWatch members especially the NFPs and network staff at regional and global levels. Each network is to be facilitated to be able to cater for more regular meetings of its members.
(v)   Training of media in all countries involved in this project to report on sustainable development and in particular the MDG approach which would help to get more support and participation of various stakeholders such as the Governments and the private sector.

Achievements of SusWatch therefore include the making of profound decisions on member countries sustainability concerns through cyber meetings, the internet, websites, MSN and teleconferencing. Also through networking, within the member countries, it has assisted them to carry out advocacy and lobbying activities and the producing of the SusWatch Report for the World Bank for a conference in Singapore in 2005.

Challenges to the SusWatch network include:

   1) Technological incapacitation
   2) Internet services -very expensive, including connectivity
   3) Individual computer skills-lacking
   4) Development gap between the north and south-challenging
   5) Funding problems
   6) Threatening changes for African countries in technological advancement.

6.3 Case studies from the formal environmental education sector on technology supported learning

The following selected case studies are drawn from educational institutes, environmental authorities and ministries of education across the governmental sector in three regions of Africa.

6.3.1 Southern African Network for Training and Research on Environment (SANTREN)

The Southern African Network for Training and Research on Environment (SANTREN) is a regional network which was launched in September 1996. SANTREN is comprised of professionals from research and educational institutions, a concentrated core of experts in Southern Africa who are already realizing the benefits of networking and exchange of information in the region. The main objective of SANTREN is demand-oriented contribution to the improvement of information and the training courses in the SADC region in order to support efforts towards environmentally sustainable development.

SANTREN functions through working groups, each focussing on a case study arising from needs surveys in the region. The working groups, led by coordinators, are composed of multi-disciplinary professional members aimed at giving a combined set of services to projects. Meetings, workshops, courses and research activities facilitate intensive exchange of information and the promotion of new ideas towards training and capacity building to deal with the ever challenging environmental issues arising in the region and beyond. SANTREN delivers environmental courses through face-to-face and via internet (eLearning) and experience has shown that eLearning reduces training costs for clients.

For clients aiming to develop eLearning courses, SANTREN also offers expertise in course transformation, tele-tutoring and virtual course administration using an approach that helps course developers target, attract, retain and cultivate the learners.

SANTREN has collaborated with InWEnt (Capacity Building International) and national level partners in various SADC countries on the development of a number of eLearning courses in the area of environmental protection. The following are brief descriptions of a selection of these courses:

6.3.1.1 Malawi: Cleaner Production eLearning Course - Tutor supported

Originating Institution/Experts: Polytechnic Blantyre
Network: SANTREN – Southern African Network for Training and Research on the Environment
Funding Institution: InWEnt Capacity Building International, Germany
Consultancy: common sense - eLearning & training consultants
Target Group: Municipalities, Government, Industry
Scope: 30 hrs plus 2 day face-to-face workshop

Along a case study of the fictional City of Zabweka, participants learn about the "Great Plague of Zabweka" and the Waste Management measures connected with it. They assume the role of a municipal manager and learn about all necessary steps to counteract such a scenario.

6.3.1.2 South Africa: Department of Water and Forestry – Induction for new Staff by eLearning

Originating Institution/Experts: DWAF
Consultancy: KnowledgeCruicible SA, common sense - eLearning & training consultants
Target Group: New staff members of the South African Department of Water and Forestry
Scope: 20 hrs plus 1 day face-to-face meetings with supervisor
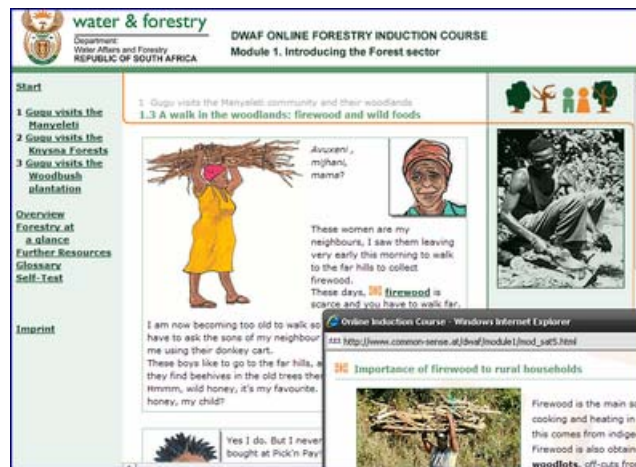
New staff members at DWAF are introduced to the fictional staff member Gugu Xaba, who is also new to the Department. Together, they explore the different responsibilities of the organization, get to know the top staff levels, and the jurisdiction. Small self tests and blended learning aspects with local supervisors allow users to learn everything about their new place of work.

6.3.1.3 Botswana: Water Quality and Monitoring

Originating Institution/Experts: University of Botswana
Network: SANTREN – Southern African Network for Training and Research on the Environment

Funding Institution: InWEnt Capacity Building International, Germany
Consultancy: common sense - eLearning & training consultants
Target Group: Municipalities, Privatized Water facilities, Government
Scope: 30 hrs plus 2 day face-to-face workshop
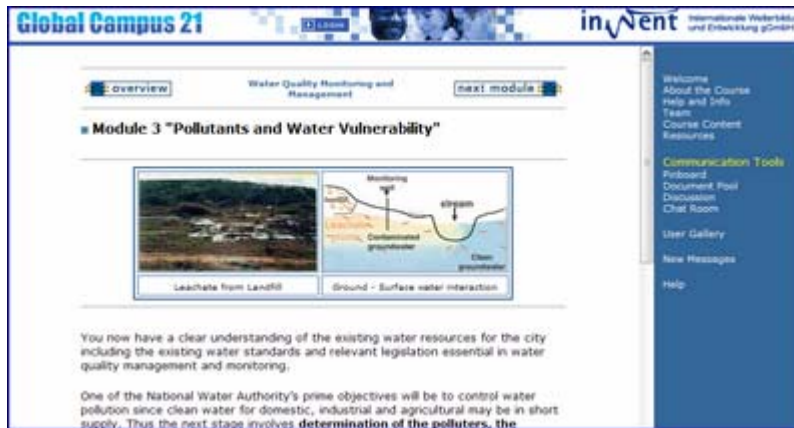
Along the tasks of a municipal water manager, participants learn about the assignments of such a position and get to know the essentials about water quality monitoring and assessment

6.3.1.4 Zambia: Mining and the Environment

Originating Institution/Experts: University of Zambia
Network: SANTREN – Southern African Network for Training and Research on the Environment
Funding Institution: InWEnt Capacity Building International, Germany
Consultancy: common sense - eLearning & training consultants
Target Group: Middle Management of Mining companies, Government
Scope: 30 hrs plus 2 day face-to-face workshop

A local mine manager and his assistant are confronted with new environmental legislation and regulations concerning mine dumps and run-offs. They have to find a way to make the mine compliant with national environmental legislation accordingly

6.3.1.5 Zambia: Air Pollution

Originating Institution/Experts: University of Zambia
Network: SANTREN – Southern African Network for Training and Research on the Environment
Funding Institution: InWEnt Capacity Building International, Germany
Consultancy: common sense - eLearning & training consultants
Target Group: Middle Management of production companies, municipalities
Scope: 30 hrs plus 2 day face-to-face workshop

The course is based on the case story Mango village, a rural community that had successfully balanced between the needs of the inhabitants' agricultural and other economic activities and those of a new factory that had been set up within the vicinity of Mango village. The factory was meant to process mineral based materials. Participants learn how to deal with air pollution issues, control and monitoring.

6.3.2 East Africa: Kenya's Education for Sustainable Development (ESD) strategy and its relation to eLearning

Learning about the environment and sustainability in Africa needs to be given top priority for the current and future generations' well-being. Engaging in a dialogue about e-environment and eLearning alone will not do it. As channels are being established for learning about the environment on the web, internet, teleconferences and so forth, the shift and focus should now be directed towards strategies that will profoundly provide the much needed content and define the exact context of how learning about the environment and sustainability through eLearning should be harnessed, and an assurance of the same (e.g. sound ICT policies) be provided by all the stakeholders i.e. governments, agencies, NGOs, CBOs, learners, experts, and donors.

The rationale behind having a technology supported learning approach towards an environmental education and education for sustainable development (EE/ESD) strategy is that it will provide the methodology and framework through which all stakeholders will learn or be informed, through the eLearning process, about the environment and sustainability. The eLearning process should be made vibrant by 'feeding' it with all the necessary environmental information that all stakeholders need to know and learn from. This information should be rich in content and precise to the context, taking stakeholder needs into consideration, and the information impinge on all the pillars of sustainable development and all the aspects of the MDGs. Elearning will become a tool for implementing the EE/ESD strategies. Hence, on those grounds, every country in Africa has

the mandate and duty to come up with an environmental strategy (EE/ESD or the equivalent) that will be the cornerstone of their carrying out of environmental eLearning processes. This will act as a 'feeder' to the environmental eLearning and communication networks. The following conceptual framework illustrates this strategic approach of using eLearning to support EE/ESD implementation.
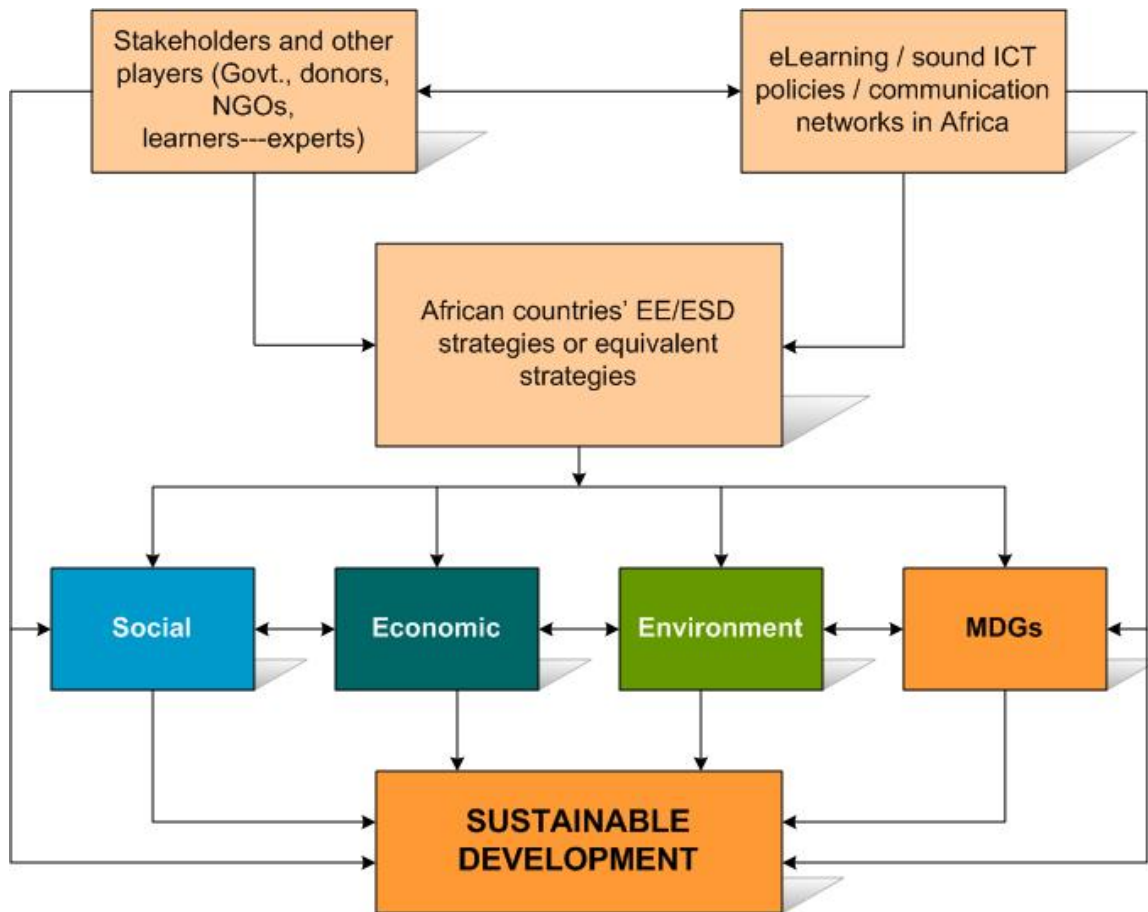
Fig. 1 - Suggested conceptual framework on the use of eLearning as a tool for the implementation of a country's ESD Strategy

The Kenya ESD strategy (2005-2014) demonstrates the importance of putting eLearning in context. Recognising that eLearning is a methodology of delivering education content is crucial. It addresses all levels and modalities of education, including non formal, technical and vocational education (TVET), higher education, quality media and corporate training programmes.

Sustainable development issues in Kenya are complex and intertwined. The issues can be classified into social, economic, and environmental. Social issues include: human rights, peace and security, gender equality, cultural diversity, intercultural understanding, poor governance and corruption, increased incidences of diseases, erosion of cultural values and morals, among others. The economic issues include corporate social responsibility and accountability, marketing, increasing levels of poverty and the widening gap between rich and poor; unsustainable production and consumption leading to inefficiency and wastefulness, and poor enforcement of

policies and regulations governing production and marketing. Environment challenges include unsustainable utilization of natural resources, climate change, rural development, urbanization, disaster prevention and mitigation**.**

ESD further seeks to promote and advocate for;

- Interdisciplinary and holistic learning embedded in the whole curriculum, not as a separate subject;
- Sharing of values and principles underpinning sustainable development;
- Critical thinking, problem-solving and action learning leading to confidence in addressing the dilemmas and challenges of sustainable development;
- Different pedagogies;
- Learners participating in decisions on how they are to learn;
- Addressing local as well as global issues, and using language(s), which learners most commonly use.

The Kenya ESD strategic objectives are to;

- enhance the role of education and learning for equitable, efficient and sustainable utilization of the country's resources.
- promote improved quality of life and productive livelihoods through diverse learning and public awareness.
- develop appropriate strategies at all levels to build or strengthen capacities in ESD including training, linkages and networking among stakeholders.
- promote teaching and learning that inculcates appropriate values, behaviours and lifestyles for good governance and sustainability.

The key domains of the strategy are: improving quality of education, reorienting education at all levels, creating public awareness and enhancing public understanding and building capacity for sustainability. Additionally, the strategy focuses on related challenges including reducing poverty, enhancing gender equality, promoting health care, conserving and protecting the environment, managing rural transformation, promoting sustainable production and consumption practices and enhancing intercultural understanding, promoting peace, tolerance and conflict resolution.

Emphasis is placed upon supporting initiatives at the local level and ensuring linkages at the national, regional and international level. Regional Centres of Expertise (RCE) are being established to bring together organizations at the regional and local level to jointly promote ESD. They build innovative platforms to share information and experiences and to promote dialogue among regional and local stakeholders through partnerships for sustainable development. The RCE Greater Nairobi is already operational.

Stakeholders for ESD include: Government which co-ordinates policy development to steer change in instructional practice at all levels; Private sector provides opportunities for practical demonstrations of sustainable development; Media integrates ESD and sustainable development awareness building into communication strategies; Civil Society Organizations (CSOs) link communities with policy making and undertake advocacy and lobbying; In liaison with other stakeholders, development partners foster partnerships in the spirit of enhancing the Decade of Education for Sustainable Development in Kenya.

The ESD strategy has seven interlinked strategies to ensure that educational approaches keep pace with the evolving challenges of sustainable development, i.e. advocacy and vision building; consultation and ownership; partnership and networking; capacity building and training; research and innovation; information and communication technologies; monitoring and evaluation. The use of information and communication technologies (ICTs) is vital for networking partners, storing data and sharing of information among all the stakeholders in Kenya. They also offer new opportunities for dialogue and experience sharing for the achievement of sustainable development.

The Kenyan ESD Strategy, as a response to the challenges of SD, proposes such issues like; policy formulation, public awareness and advocacy, resource material development, research and innovation, capacity building, networking, partnership and vision-building. Therefore, with a country's properly formulated ICT policies, and having the support of all stakeholders, such a strategy would automatically form the basis of the content and context of the environment and sustainability for the e-environment and eLearning processes in Africa.

Kenya currently is working towards the expansion of its communication sector by bringing in more players and has also already formed a media council and an ICT body. With such efforts, the dissemination of information will soon be done through a very conducive environment which in turn can be used as an opportunity to harness the dissemination of environmental information through the e-environment and eLearning processes.

In the development of the Kenyan ESD Strategy, the stakeholders have been mutually supportive which gives the strategy a conducive environment for its practical execution and practise. Such stakeholders include - the Ministry of Environment and Natural Resources (National Environment Management Authority-NEMA), Ministry of Education (Kenya Institute of Education-KIE), Kenyatta University, among others. Other organizations include Kenya National Chamber of Commerce and the Kenya Organization for Environmental Education (KOEE).

UNESCO, UNU-Japan and UNEP have also offered advice on ensuring that Kenya, like other United Nations member states, embraces the decade of Education for Sustainable Development (DESD) and develops and implements the ESD Strategy. Also, the RCE-Greater Nairobi, with its secretariat housed at KOEE, has played a major role in the developing the Kenyan ESD Strategy.

Finally, other countries in Africa may wish to take the Kenyan model into consideration with a view to formulating their own ESD strategies supported by partnership structure such as a steering committee that will implement the strategy and assist in developing ESD eLearning content.

6.3.3 West Africa: Groundwater Flow Modeling and GIS

InWEnt has collaborated with various international and West African experts in the area of water resources management and geographic information systems (GIS) to develop an eLearning course on groundwater flow modeling targeting water resource managers in central and local government. The duration of the course is 250 hrs plus 10 days in two face-to-face workshops.

The Lake Chad provides the backdrop for this Blended Learning scenario. Participants use the lake as case study to learn about GIS tools, groundwater and surface water flow modeling. The program follows a blended learning approach, with two regional workshops, one in the beginning, and one at the end of the program.

7.   Challenges facing the large scale take-up of technology supported learning in Africa

The challenges facing Africa's education systems do not differ very much from those of the rest of the world. The World Bank (World Bank, 1998) argued that the emergence of global knowledge economy is being met by an increased need by governments to invest more in education. Lifelong learning has led to the need to upgrade skills and knowledge by workers so as to remain competitive in the market, thus has increased the need for part time learning.

ELearning is gaining wider acceptance as a new form of learning due to its flexibility in meeting the needs of people who cannot attend regular classes. In response, the more entrepreneurial tertiary institutions now recruit students from a global pool and reach out to other countries through educational programs provided at a distance or the internet approaches. As a result, Bennell (1998) claimed that tertiary education is becoming an internationally tradable commodity in an increasingly competitive global market. This is gaining momentum and acceptance in Africa and globally.

In the view of such prevailing circumstances, a key question is - how can Sub-Saharan Africa expand its very low tertiary education enrolments and prepare its tertiary institutions for the educational demands of the 21st Century and accomplish this under severe resource constraints without sacrificing educational quality?

HIV/AIDS pandemic in Africa, which accounts for 70% (World Bank, 1999) of all new AIDS cases in the world, will require many of these countries to produce even higher numbers of university graduates in order to maintain existing human resource capacities. Planning for academic staff supply at universities will need to be based on unprecedented assumptions concerning the rate of attrition. If these same countries would seek to improve their tertiary enrolment ratios, say by a few additional percentage points, they would have to triple current tertiary enrolments by the year 2010. This makes online or technology supported learning critical in helping Africa meet her educational needs. This is possible if prioritization and allocations of

resources are weighed and systematically planned for and with strong political will and commitment.

In the view of the foregoing circumstances it is therefore clear that it is highly unlikely that these countries (and many others) will be able to expand tertiary enrolments using conventional face-to-face teaching methods and the current residential campus model. Coupled with the cost of investing in physical infrastructure for on campus learning, especially for large student populations, the use of new information and communications technologies, are a viable option for African governments and societies that wish to expand higher education enrolments in the decade ahead. Distance learning programs are not by themselves the solution to the problems. However, they can make a much larger contribution to meeting the challenges than they have to date.

Ideas associated with distance learning are not new to Africa. The University of South Africa began in 1946 as a correspondence university and has evolved into one of the world's largest open distance learning universities. Since then other countries such as Kenya, Botswana, Malawi and Zambia have used distance education for teacher training. During the 1980s and 1990s teacher upgrading through distance education programs has been undertaken in Benin, Burkina Faso, Burundi, Cameroon, Central African Republic, Côte d'Ivoire, Mali and Togo (World Bank, 1999).

Besides distance education, Internet-connectivity is expanding rapidly but unevenly. Several African countries have access to the Internet in their capital cities. Particularly active Internet markets are found in South Africa, Ghana, Senegal, Mozambique, Kenya, Uganda, Zimbabwe, and Côte d'Ivoire. In early 1999, a survey of Internet capability at 15 Sub-Saharan Africa universities outside of South Africa (considered to be among the more progressive in their use of information and communication technology) concluded that only 4 possess full Internet capability, including websites; 6 have limited Internet capability; 3 have e-mail only provided through a campus network; and 2 have limited e-mail capacity through individual connections in some departments (Materu-Behitsa and Levey 1998). With the implementation of the marine fibre optic cable to link Africa to the rest of the world, broadband internet connectivity will be available in Africa and this will revolutionise the online business and training in Africa.

Africa has joined the information and communication technology revolution, but faces the challenges of institutionalizing the development of ICT and allocating its benefits in formal and informal education sectors.

Rapid developments in information and communication technologies (ICT) and evolving learner behaviour require learning institutions to continuously re-evaluate their approaches to pedagogy, both in the physical and virtual 'classroom' spaces. The increasing availability of low-cost mobile and wireless devices and associated infrastructure heralds both opportunities and challenges for educational institutions and their teachers and learners in Africa as elsewhere in the world.

Integrated media, also referred to as converging technologies, only serve as cultural tools for learning, but do not constitute a theory of learning. For any gain from the power of communication technologies and multimedia to be made, one must create a theoretical basis for effective learning environments. Several researchers in this field have suggested several reasons for the potential power of integrated media with regard to learning. For instance, Salomon (1979) argued that use of multiple representation of information (as visual, text, and audio) improves retention of the information gained. Laurillard (1993) on the other hand, argues that fostering an appropriate conception of learning is fundamental to any kind of teaching, but particularly so with the use of educational technology, as this usually entails a reduction in teacher-student contact.

Emerging new technologies and educational practices are forging new links and closer relationships. The term *convergence* signals the fusion of computer technologies with telecommunications and information technologies. Notable changes today are the evolution of schools into learning communities, the globalization effect of the Internet services and the networking links between homes, schools, communities, universities and international organizations. As the world is becoming more globalized, Africa will need to invest substantially to its IT sector to help improve the knowledge base of her citizens. The emergence of online learning is a major step forward and many companies and institutions (both public and private) in Africa are quickly embracing this technology to reach many of their clients. Companies such as Cisco Systems, Microsoft, and Intel are integrating eLearning into their training programmes to help in capacity building in Africa. Cisco Systems, for example, has the Cisco Network Academy initiative that is growing both in terms of enrolment and number of branches.

7.1 Challenges for environmental education programmes and technology supported learning in the formal education sector in Africa

It is generally agreed that the world today is slowly moving from an industrial economy to a knowledge economy and Africa is no exception. According to Tinkler and others, (1996) skills for the knowledge economy are depicted as forming a hierarchy, where data and information are the raw materials as shown in Fig 2 below.
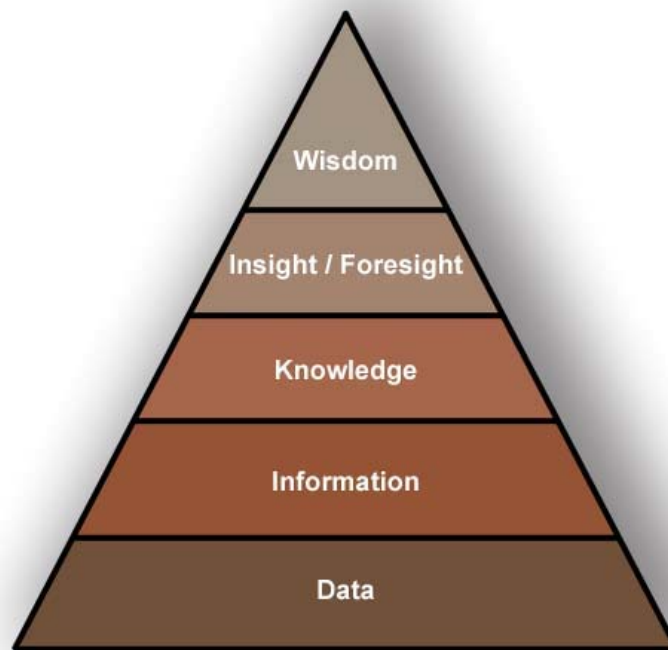

Fig 2: Hierarchy of Knowledge Economy (Source: NBEET, 1995)

Concurrent with the new focus on information literacy, there is an awareness of the need to merge concepts of computer and information literacy with the skills associated with lifelong learning (Candy, 1994) which include:

- An inquiring mind;
- Sharp vision;
- Information literacy;
- A sense of personal agency
- Learning skills.

Accordingly, there are increased expectations of students and additional competencies that are perceived as necessary to participate in *the knowledge economy of the information society.* The following issues need to be considered by policy-makers and educators.

a) ELearning computers and other technological facilities are relatively expensive in Africa.
b) 'Curriculum greening' is lacking in most African learning institutions.
c) Environment is not a top priority in most African institutional development agendas.
d) Education levels in most instances do not match the extensive knowledge needed by the technological advancements in the dissemination of environmental information.
e) Government support and other partner support are limited.
f) ELearning as a concept has not fully been embraced in some African countries, hence the draw-backs in implementing e-environment information in learning institutions.
g) Lack of funds
h) Regulations missing in place or not favourable (ICT policies)
i) Connectivity still a challenge for some African countries
j) Human resource expertise in the area of ICT expertise is lacking
k) Improve quality, increase access, reduce costs - costs are very high and number of students in ICT is still very low - the challenge is to do more with fewer resources.
l) Modularization of education through use of learning objects - the challenge is to see whether learning objects can be used in higher education to deliver a quality learning experience yet also be easily reusable.
m) Changing role of the faculty and teacher. It is a considerable challenge to prepare stimulating up-to-date and engaging teaching materials that is at the same time inoffensive, understandable and linguistically clear to all cultures. A much wider range of examples, case studies and references is necessary, at the same time as much more scrutiny of language and expression. Students using a second language are confused by local expressions, jargon and abbreviations, and international students easily misunderstand references to national events or other topical items.
n) Need for eLearning skills. There is growing certainty that, at the very least, what should be learned in schools is how to learn, to become a discerning learner, and to be equipped with the knowledge, skills and understanding to become an effective citizen.
o) Supporting eLearning - one implication of the use of ICT in all forms of higher education is the issue of increased workload. There is mounting evidence that both the development of on-line materials and the tutoring of students online are more time consuming for academics than the traditional lecture. While many 'early adopters' of technology have turned enthusiastically to online teaching and have devoted more than the normal number of hours to becoming experts in their fields, the question arises as to whether this is suitable in the long run.
p) New kinds of instructional leadership. Elearning initiatives require change in leadership style and approaches within universities. The turbulence created by the depth and degree of change in universities has meant that effective leadership of educational institutions has never been more crucial. The impact of technology in the whole institution is of such

a magnitude that the leaders of the university can not delegate decisions about technology strategy to the information officer. For most universities the senior team needs to manage IT issues and integrate them into the strategic plan. Institutional leaders must develop and support this vision and communicate it to the whole university. They need to ensure institutional alignment of support and policies.

7.2 Challenges for developing countries identified by UNEP in piloting eLearning courses in 2007

Throughout 2007, a number of UNEP staff based at UNEP headquarters in Nairobi and various outposted offices subscribed to eLearning development and eLearning in practice courses organised by InWEnt through its Global Campus 21 platform. In addition, the eLearning team at UNEP piloted three eLearning courses on the MENTOR platform. Based on their experiences, the following challenges were identified for developing countries in technology support learning and training:

(a) Lack of technical infrastructure for internet access (e.g. limited broadband) in developing countries is an obstacle towards reaching a broader base of clients through eLearning.

(b) The current culture with respect to learning tends to lean towards the traditional face-to face (f2f) approach in a classroom environment. Trainees are not accustomed to self tuition and the discipline that it requires to complete a course of a given time period.

(c) Prohibitive internet access tariffs exist in some countries.

(d) Language can be a barrier for non-English speakers in accessing information and communication technologies, including eLearning courses. English is the dominant language on Internet and in the ICT community.

(e) General lack of ICT skills in developing countries resulting in minimal awareness of the latest Internet technologies.

(f) Actions are needed at both the policy and operational levels to facilitate eLearning take-up by environmental institutions. Capacity building in ICT and in different areas of eLearning is a clearly identified need.

(g) The work of the UN Country Teams in formulating and implementing UNDAFs (UN Development Assistance Framework) in collaboration with national partners could be supported by training programmes that apply eLearning and blended learning approaches.

(h) Massive changes in learning culture and instructional approaches towards more self-directed learning processes are taking place in the developed world which is widening the technology supported learning gap with the developing world.

(i) Web 2.0 offers a huge potential for informal learning versus institutionalized learning and better social inclusion. Informal learning should be considered especially to take into account all the latest developments when the learning process is being institutionalised. Universities and companies are taking informal learning and the impact of web 2.0 into account. Developing countries need to take advantage of Web 2.0 technologies.

(j) Digital gaps exist within societies in that a young techno-savvy generation is emerging rapidly thereby opening a gap with the older generation that have no connection to digital technologies.

(k) Problems of radical modernisation ('leapfrogging') - media competency cannot develop 'naturally', but needs to be learnt fast. Problems here include copyright and intellectual property rights (IPR) issues, and reliability of content.

7.3 Challenges for African countries identified through the eLearning Africa series of conferences

The eLearning Africa series of conferences has highlighted the following challenges:

(a) Sustainability - eLearning projects which are not sustainable in itself (e.g. are supported by a business model) cannot survive. Many eLearning initiatives started with a big bang and plenty of euphoria, but turned into nothing because not enough funds were available for maintenance, learning culture was not analyzed, and teacher training neglected. Trainers need to stay up to date, both from the technology aspect as well from the content aspect. If not, what is on offer will not be attractive to the learner. As an example, a trainer cannot enthuse a young learner with a Powerpoint type display anymore, as they will expect inclusion of peer interaction, video, podcast, and instant messaging which they know from using technology on a daily basis.

(b) New Trends - Green IT, Solar-PCs, e-Waste-strategies and so on. As with the content side (e.g. Web 2.0) the technology has to include the latest developments. Africa can profit from avoiding early mistakes made in the West (i.e. by leapfrogging).

(c) Localisation - Content has to be developed locally; must be responsive to cultural differences and be relevant and interesting to the trainees.

(d) Pedagogy and Research in Technology Enhanced Learning – Teachers must be supported, otherwise they will feel neglected and also overwhelmed by ICT application challenges as in Europe and the USA. Consideration should be given as to how ICT can be introduced into the classroom in a meaningful way using established, online pedagogy and supported by the latest information on Brainscience and other resources.

(e) Standards – It is important to maintain coherent educational standards in eLearning and ensure consistency in certification. Certificates need to fulfill standards and be comparable, for example, certification of eLearning offers; otherwise a general acceptance will not be reached.

(f) Cultural factors - The need to take into account cultural and traditional circumstances

(g) Other challenges – These include high internet costs, infrastructure, language, gender, diversity, and inclusion.

8. Opportunities for the large scale take-up of technology supported learning in Africa

Several researches have found that convergent communications technologies provide tools and resources that support and enhance student learning. For example, computer technologies can, when appropriately deployed, promote problem solving behaviours; heighten levels of interaction and collaboration between students and foster learners' greater self direction by giving them control over their learning (Hoyles and others, 1994). The learners may be given the privilege of making their learning calendar and time table in a manner that suits them. This is in complete contrast from the formal classroom situation in schools where learners have to be present in a particular class at a particular time. Computers, multimedia and telecommunications offer novel and inspiring instructional options, such as:

- The distribution of study to the home, for instance where access to the World Wide Web provides unlimited data and experiences;
- Electronic messaging;

- Asynchronous and synchronous communication across geographically separated locations;
- Virtual, three dimensional, learning environments.

Computers enable us to acquire and refine the tools of thoughts such as writing, accessing information, and communicating e.g. by use of email. Besides, computers can be thought of as *cognitive amplifiers*, that is they help improve our cognitive ability or as *cognitive tools* (Lajoie and Derry, 1993). Computers can extend cognitive abilities by enabling users to access different resources (e.g. the World Wide Web) and by helping us to multiply our intellectual achievements (generating text faster, editing documents; programming, and managing data).

Computer-based environments may provide effective support for the social construction of shared knowledge. The interactive properties of computers mean that they have the capacity to foster special kind of learning opportunities, by providing a forum for shared activity. The use of interactive CDs, and discussion forum as well as chats encourage sharing of the knowledge and information over the internet through computers. Computers also facilitate collaboration- a process by which individuals renegotiate and share meanings relevant to the problem-solving task at hand (Roschelle and Teasley, 1993). In computer supported learning environments, when students are presented with a problem to solve, they are more likely to share perspectives, challenge others' approaches and collaborate in finding a solution.

There are numerous potential benefits for the use of technology to support environmental education in Africa. If adequately managed, online technology supported education could enable an expansion of tertiary enrolments at less cost per student than under the traditional residential campus system. Once one has access to internet, learning can take place anywhere on the globe. The cost of transport and other things required for residential training is thus reasonably reduced or eliminated altogether. Greater flexibility in the design and delivery of curriculum content than is normally associated with classroom teaching enables online education courses to adapt to specific student needs or work requirements, thereby enabling greater relevance.

It can also effectively reach those learners who have been denied access to tertiary education; for example, women who are unable to attend traditional educational programs because of household responsibilities or cultural constraints, economically marginalized groups, refugees, and the incarcerated, as well as some bright students who due to some reasons failed to get admission into the public universities.

Also, learning programs at the post-graduate level, delivered by universities in the developed world through the Internet and supported by on-line virtual libraries, are increasingly available to self-motivated students in Africa who seek post-graduate qualifications. With the increasing need for environmental education in Africa, this method is gaining a lot of popularity. It also help to reduce the need for additional academic staff to meet the increasing enrolments and one tutor can tutor more students over the internet than in a real classroom situation.

These benefits have made tertiary distance education the world's fastest growing educational sector. According to UNESCO (1998), Asia now boasts of 3.5 million tertiary online learning students, with China alone accounting for 1.4 million. Latin America has more than one million tertiary level distance education students, with particularly active programs in Brazil, Colombia, Mexico and Venezuela (World Bank, 1998).

ELearning can be much more than just using Internet and computers in classrooms. Mobile phone coverage extends the Internet coverage by far in African countries. Mobile devices also offer the

advantage of ubiquity compared to computers, and people are familiar with the gadget. The lower barriers and less efforts are needed to make learners familiar with the technology. The same applies to TV and video, great learning tools as well, so in general, rather use a blend of technologies.

Most learning opportunities that include technology use a mixture of classroom and autonomous, self-paced learning. Pure eLearning models can function well, but requires high pedagogical expertise and trained online tutors. Lifelong Learning concepts are needed with consideration given to all groups within society. Technology supported learning can offer opportunities for all groups and sectors of societies to participate in education.

8.1 Kenya eLearning Centre (KeLC)

The Kenya eLearning Centre was born out of the partnership between Directorate of e-Government, Office of the President (DEG/OOP) and the Global e-Schools and Communities Initiative (GeSCI), under which GeSCI is providing strategic advice and DEG the coordination and facilitation. This partnership is based on the need for DEG to leverage technology in fulfilling its mandate of training civil servants in all aspects of ICT as part of the rollout of e-Government, and the recognized expertise of GeSCI in this area. Since its inception, KeLC has since brought on board other strategic partners including UNEP, UNESCO, InWEnt, NOLNet and Cisco Systems, among others.

The Government of Kenya recognizes the central role of Information and Communication Technology (ICT) in human development and in the development of a knowledge-based economy. In this regard it has embarked on a number of initiatives through the e-Government Directorate in the Office of the President (DEG/OOP), to establish a conducive environment for use and application of innovative ICTs to enhance learning, efficiency and improved service delivery across the various sectors. One of the initiatives focuses on the field of eLearning.

ICT and eLearning development in Kenya is at a particularly dynamic stage. This situation presents opportunities and challenges for Kenya. At the international eLearning Africa Conference in Nairobi in May 2007, the DEG organised an eLearning stakeholder's roundtable at which public, private and civil sector were represented. The participants at the roundtable indicated a need for a mechanism to promote sharing of information and resources and coordination of eLearning developments. In response to this, a Rapid Institutional Assessment (RIA) of a number of key players in the Kenyan ICT landscape was done by DEG supported by GeSCI between September 2007 and February 2008. RIA provides valuable insights about the status of e-readiness among key training institutions, the opportunities available and the challenges experienced, as well as the gaps identified.

At present, approximately 40 organizations are engaged in the development of KeLC under three sectoral pillars – education, health and environment. Within each sector, working groups have been established to focus on four priority areas: Content Development; Human Capacity Development; Quality Assurance & and Monitoring & Evaluation; and ICT Infrastructure & Connectivity.

8.2 Namibian Open learning Network Trust (NOLNet)

Namibia is an example of a country that realized the importance of eLearning in teaching and learning practices and took the lead in starting the process of establishing an eLearning Centre under the auspices of the Namibian Open learning Network Trust (NOLNet) with support from

InWEnt (Capacity Building International, Germany). The eLearning Centre Namibia (NOLNet eLC) is a joint project of the Office of the Prime Minister, the Minister of Education, the University of Namibia and the National Institute for Educational Development.

NOLNet's main focus is supporting open and distance learning. It facilitates collaboration and sharing and the joint development of skills, materials, support tools and mechanisms for all open and distance institutions. Currently NOLNet has a presence in all the 13 political regions of the country through its 49 affiliated learning centres.

To date the NOLNet eLearning Centre (eLC) has trained numerous educational stakeholders in the understanding of eLearning principles and the usage of Web 2.0 technologies as part of existing teaching and learning processes, hence focusing on a blended learning approach to eLearning. This process has helped educational stakeholders in Namibia to come on board the eLearning bandwagon. NOLNet eLC has also assisted other regional partners in establishing eLearning centres such as Kenyan eLearning Centre (KeLC). NOLNet eLC also envisages in the near future, the roll-out of eLearning into other sectors, other than the educational sector such as tourism and environmental issues.

8.3 African Virtual University (AVU)

The African Virtual University (AVU) is a 'university without walls' that uses information and communication technologies to give the countries of sub-Saharan Africa direct access to some of the highest quality academic faculty and learning resources throughout the world. Its delivery method combines the use of satellite and other internet technologies to reach the students in different parts of the world. Building upon the success of its pilot phase, AVU has transitioned from a World Bank project initiated in 1997 to establish itself as an independent non-profit organization headquartered in Nairobi, Kenya. Today several universities in The United States, Canada and the Dublin Institute of Technology originate courses in engineering and science received at 16 African universities – in Ethiopia, Ghana, Kenya, Namibia, South Africa, Tanzania, and Uganda.

In addition to AVU, several independent universities in Africa are separately offering online learning courses. In the web site of most Universities in Africa, one is likely to find a link to distance education or to an eLearning component. As the most modern form of educational provision, online learning or distance education at the tertiary level offers Africa the possibility of leap-frogging certain phases in educational development. Additionally, it creates the possibility of increased access to tertiary education at more cost effective levels. Rising mass education under the constraint of diminishing resources is a global phenomenon not limited to the African continent. However, these trends are more highly amplified in Africa. This provides an opportunity not only for Africa to tackle its tertiary education problems more effectively, but also to contribute better solutions to other nations for the provision of tertiary education.

8.4 Opportunities for the environment and sustainable development communities in Africa

A major opportunity exists in adopting technology supported learning for environmental education and education for sustainable development programmes. National environmental authorities have an opportunity to influence the design and development of appropriate training programmes within the formal education sector. Inter-ministerial cooperation is needed in order to address the challenges and capitalise on the opportunities that exist. Collaboration with the non-governmental community will be needed in order to ensure greater outreach of relevant training programmes to audiences that otherwise would have difficulty in gaining access to such

programmes. AMCEN as an inter-ministerial forum at the regional level is well positioned to strengthen the role of the national environmental authorities as catalytic agents within their respective countries.

The following points serve to illustrate some of the opportunities that are open to institutions engaged in the delivery of environmental education and education for sustainable development programmes.

a) An opportunity exists to share expertise and experience of the use of eLearning networks in various African countries. Rwanda currently serves as a good example as it has connected all its government and schools at all levels even in the rural areas on computer networks. Hence every school has a number of computers that the students use in their learning process. Such a networked approach can be applied to the dissemination of environmental information for education purposes using ICTs.

- This can make it easy for the flow of all-level information including that of the environment to be harnessed in schools through technology in the name of eLearning.
- This would require good will and a conducive environment from governments and lead agencies and partners, both financially and in kind.
- This could also be included in the quest for achieving the MDGs. The fast tracking of the realization of the MDGs and sustainability should itself be used as an opportunity and driving force behind the implementation of technologies concerning environmental information dissemination in schools and colleges.

b) Borrowing from e-commerce and e-business, the environment should be taken as a product of its own kind and its own right that needs to be re-launched periodically with the best marketing strategy.
- Like in the business sector, the application of ICT should be used by the environmental institutions in taking care of the environment and pursuing sustainable development objectives.
- The environment and its sustainability concerns should be re-packaged through technology to be 'consumer friendly.'
- Creativity and innovativeness from all players required.
- Environmentalists and technologists should form a partnership to formulate environmental information packages to be used for learning in institutions.
- Case studies like the Rwanda (as mentioned above) serve as an example of good practice that present an opportunity for other countries to follow.

c) Before adopting environmental information technologies in institutions for environmental sustainability, the environment - as an opportunity - should be incorporated in the learning curriculum i.e. the greening of curriculum first through the School Curriculum Greening Plans (SCGPs).

- This way, it will be easier to address environmental matters a step ahead in information technology terms.
- A programme like Kenya's Eco-schools is a good example of an opportunity that other countries could emulate.

d) The reduction of taxes on electronics should be used as an opportunity for the enhanced provision of eLearning facilities in institutions.

e) The establishment of the ICT bodies in some countries in Africa like Kenya can be used as opportunities in promoting the use of ICT facilities and incorporating e-environment in eLearning within institutions.

f) Public and private sector partnerships in eLearning for Africa are crucial. ELearning is a viable tool to address some of the education challenges in Africa. Adopting eLearning can make the access to education easier, ensure quality enhancement and reduce cost. Hence, as an opportunity, this needs the support of policy makers and donors, member states' political will and partnerships involving private and public sector actors.

g) Growth of virtual universities and partnerships for sharing of resources, costs and infrastructure to deliver eLearning, competing with international providers, and reducing duplication among existing universities.

h) Blended learning and eLearning are relatively new terms that are essentially 'electronic' although it is not the electronic nature of eLearning that captures its true value but rather the opportunity to integrate working, learning and community into the workplace.

i) Open Source and Open Courseware movement leading to freer flow of course materials on the web.

j) Growth of local study centres and telecentres is one way of meeting the demand for increasing access to higher education for both developed and developing countries.

k) Migration towards a more student centered pedagogy and use of internet to teach and learn (which is very favourable to students).

l) Better application of Web 2.0 technologies in building online communities of practice in the areas of environmental education and education for sustainable development.

9. Conclusion

This working paper should be viewed as a first attempt to draw to the attention of AMCEN the importance of technology supported learning in the implementation of training programmes for protecting the natural resources of Africa and the achievement of sustainable development. The paper presents a general overview of the challenges and opportunities facing AMCEN member states based on the first-hand experience of institutions and individuals engaged in implementing technology supported learning programmes.[2]

No attempt has been made to conduct an in-depth country-by-country review of these challenges and opportunities. However, a country level assessment of existing environmental education strategies coupled with an assessment of capacity building needs and challenges facing

Governments in the area of technology supported learning would provide useful feedback for policy-makers in both environmental and educational institutions mandated to implement relevant training programmes.

Ministries of Environment have an important catalytic role to play in mainstreaming environmental education across all relevant governmental institutions as well as fostering collaboration with the non-formal environmental education sector. AMCEN-12 provides the ideal forum to address this challenge from a policy-making perspective and initiate concerted action in AMCEN member states through the formulation of appropriate national level strategies supported by action plans that would also strengthen the catalytic and coordinating role of the environmental ministries. International stakeholders such as UNEP, the donor community, and centres of excellence also have a key role to play in supporting national governments and other relevant partners as articulated in various international mandates dating back to 1972. Capacity building is a major issue that needs to be addressed through the national action plans.

AMCEN as an inter-ministerial environmental forum at the regional level is well positioned to strengthen the role of the national environmental authorities as catalytic agents within their respective countries. Annex I of this paper presents a draft decision for consideration by AMCEN-12 that aims to address the above issues in a strategic manner and invites AMCEN member states to participate in implementing a set of pilot action plans.

References:

Bennell, Paul and Pearce, Terry (1998). The Internationalization of Higher Education: Exporting Education to Developing and Transitional Economies. Brighton, UK: Institute of Development Studies, University of Sussex.

Candy, P. (1994). Developing lifelong learning through undergraduate education. NBEET. Commissioned report number 28. Canberra: AGPS.

AMCEN-11 Congo-Brazzaville, 2006 (Decision 7)

GK (2007) Education for Sustainable Development (ESD) Implementation Strategy 2005-2014-NEMA

Hoyles, C.,Healy, L., & Pozzi, S. (1994). Groupwork with computers: An overview of findings. Journal of Computer Assisted Learning, 10, 202-215.

Lajoie, S. P. & Derry, S. J. (Eds) (1993). Computers as Cognitive Tools. Hillsdale, New Jersey: Lawrence Erlbaum.

LaRocque Norman and Latham Michael, (2003). The Promise of ELearning in Africa: The Potential for Public-Private Partnerships.

Laurillard, D. (1993a). Rethinking University Teaching. London: Routledge.

Laurillard, D. (1993b). Balancing the media. Journal of Educational Television, 14(3), 81-93.

Laudon, Kenneth and Traver Carol G. (2006). E-Commerce: Business, Technology, Society, 3 edition.

Materu-Bahitsa, Mary and Lisbeth Levey (1998). "Database of African Theses and Dissertations: Report of a Feasibility Study." Nairobi, Kenya: The Ford Foundation.

National Board of Employment, Education and Training (1995). Converging Technology, Work and Learning. Canberra. AGPS. Australia

National Environment Management Authority (2003). State of Environment Report for Kenya. Nairobi.

Otieno, D, 2005.United Nations Decade of Education for Sustainable Development -2005-2014: Overview Report on Status of Education for Sustainable Development in Africa, September, 2005 (Commissioned by UNESCO).

Otieno, D, 2007. Re-orienting Higher Education in Africa to address Environmental Sustainability and achieve MDGs: Lecture series of the Yokohama city University on21st November 2007 (RCE-Nairobi)

Reeves, T. (2003) Evaluating what really matters in computer-based education, University of Georgia, http://www.educationau.edu.au/jahia/Jahia/pid/179

Roschelle, J., & Teasley, S. D. (1993). The construction of shared knowledge in collaborative problem solving. In C. O'Malley (Eds), Computer Supported Collaborative Learning. Berlin: Springer Verlag.

Salomon, G. (1979). Media and symbol systems as related to cognition and learning. Journal of Educational Psychology, 74(2), 131-148.

Schleicher, A. (2006) The economics of knowledge: Why education is key for Europe's success. The Lisbon Council policy brief
http://www.naider.com/ateneo/articuloVentana.asp?id=220

Suarez-Villa, L. (2004) The role of networks
http://www.technocapitalism.com/applet/networks.htm

Tinkler, D., Lepani, B., and Mitchell, J. (1996). *Education and Technology Convergence: A Survey of the Technological Infrastructure in Education and the Professional Development and Support of Educators and Trainers in Information and Communications Technologies.* National Board of Employment, Education and Training Commissioned report no. 43. Canberra. AGPS.

UKeU (2002) Principles and practice in electronic courseware design, UK eUniversities Worldwide Limited, London, UK   http://whitepapers.silicon.com/0,39024759,60132472p-39000573q,00.htm

NEPAD Environmental Action Plan (2003)

UNESCO (1998). Statistical Yearbook. Paris: United Nations Educational, Scientific and Cultural Organization.

UNESCO (2002) Open and Distance Learning. Trends, policy and strategy considerations. Division of higher education, Paris. http://unesdoc.unesco.org/images/0012/001284/128463e.pdf

UNESCO (2006), Draft of Strategy of Education for Sustainable Development in Sub-Saharan Africa. UNESCO/IIEP.

UNESCO (2006). United Nations Decade of Education for Sustainable Development, 2005-2014: International Implementation Scheme. Paris: UNESCO

World Bank (1998). Knowledge for Development. World Bank Development Report 1998/99. Washington, DC: World Bank.

World Bank (1999). Tertiary Distance Education and Technology in Sub-Saharan Africa. Washington DC: World Bank.

World Bank (2002) Constructing Knowledge Societies: New Challenges for Tertiary Education. A World Bank Report

Annex 1

Suggested action by AMCEN-12 (draft decision)

Decisions and resolutions adopted by the African Ministerial Conference on the Environment at its twelfth session

Decision 1: Mainstreaming environmental education and technology supported learning in Africa: Challenges and Opportunities

We, African Ministers of Environment,

Having met in Johannesburg from 7 to 12 June 2008 at the twelfth session of the African Ministerial Conference on the Environment (AMCEN)*,*

Welcoming the working paper submitted by the UNEP/AMCEN secretariat entitled Mainstreaming environmental education and technology supported learning in Africa: Challenges and Opportunities;

Also Welcoming the NEPAD commitment towards the enhancement of Africa's human resources through the provision of more and better education and training, especially in Information and Communications Technology (ICT) and other skills central to a globalizing world;

Noting the commitment made by the African Ministers of Education in 2006 to implement the UN Decade of Education for Sustainable Development in the context of the Second Decade of Education in Africa and, in particular, to *support the development of strategies* for implementing the UNDESD in their respective countries within the framework of the African Union's Second Decade on Education, and to *ensure that principles of sustainable development are included in educational development frameworks, programmes and activities at all levels;*

Also noting the Geneva Plan of Action and the Tunis Agenda adopted at the World Summit on the Information Society, in particular the action line addressing e-learning and e-environment;

Recalling the Governing Council of the United Nations Environment Programme's decision at its twenty-fourth session in February 2007 to promote and support environmental education programmes as a highly effective tool for building an environmentally sensitive and responsive populace capable of partnering with Governments in achieving established policy goals and targets;

Further recalling, the adoption of the Bali Strategic Plan for Technology Support and Capacity-building by the Governing Council of the United Nations Environment Programme at its twenty-third session, in February 2005, as an inter-governmentally agreed approach to enhancing the capacities of developing countries and countries with economies in transition; and the implementation plan of the United Nations Environment Programme for the Bali Strategic Plan, presented at the ninth special session of the Governing Council/Global Ministerial Environment Forum, held in Dubai in February 2006;

Decides:

1.   To encourage Governments through their principal environmental authority to facilitate inter-ministerial cooperation to undertake, inter alia, the following key actions in the area of environmental education and technology supported learning:

        (a) an assessment of existing environmental education strategies and an assessment of needs and challenges facing Governments in the area of technology supported learning;

        (b) the development of a strategic approach to mainstreaming environmental education across all relevant governmental institutions including the design of programmes suitable for the primary, secondary and tertiary education sectors; as well as fostering collaboration with the non-formal environmental education sector;

        (c) the development of an action plan for technology supported learning (including eLearning) in follow up to the strategic approach;

2.   To request UNEP to provide strategic guidance and technical advisory services on how to undertake both of the activities mentioned above; and multilateral development partners to provide financial and technical assistance to strengthen the capacities of African countries in this respect;

3.   To invite a small group of AMCEN members to undertake, on a trial basis, the development of 1-2 year pilot action plans for technology supported learning;

4.   To request UNEP to identify partnerships involving international organizations, the donor community, the private sector, and centres of excellence that will support the implementation of the pilot set of action plans;

5.   To request the AMCEN members undertaking the pilot action plans to provide an interim report to AMCEN-13 and a final report to AMCEN-14 on the status of their implementation.

Annex 2

Glossary of Technology Supported Learning

Blended learning: Learning events that combine aspects of online and face-to-face instruction.

Broadband: 1) In layperson's terms, high speed transmission of data. In this use, the specific speed that defines broadband is subjective; the word often implies any speed above what is commonly used at the time. 2) In technical terms, transmission over a network in which more than one signal is carried at a time. Broadband technology can transmit data, audio, and video all at once over long distances.

CMS (content management system): A centralized software application or set of applications that facilitates and streamlines the process of designing, testing, approving, and posting eLearning content, usually on Webpages.

Collaborative learning: Learning that takes place in a peer-oriented environment. The development of collaborative tools such as asynchronous and synchronous web conferencing, instant messaging, email and weblogs allow collaborative learning to take place between individuals/ groups that are geographically dispersed.

eLearning (electronic learning): Term covering a wide set of applications and processes, such as Web-based learning, computer-based learning, virtual classrooms, and digital collaboration. It includes the delivery of content via Internet, intranet/extranet (LAN/WAN), audio- and videotape, satellite broadcast, interactive TV, CD-ROM, and more.

F2F (face-to-face): Term used to describe the traditional classroom environment.
Granularity: The degree of detail something can be broken down into, or the number of discrete components making up any type of system. In eLearning, granularity is defined by the number of content chunks.

Instructional designer (ID): An individual who applies a systematic methodology based on instructional theory to create content for learning.

Internet-based training: Training delivered primarily by TCP/IP network technologies such as email, newsgroups, proprietary applications, and so forth. Although the term is often used synonymously with Web-based training, Internet-based training is not necessarily delivered over the World Wide Web, and may not use the HTTP and HTML technologies that make Web-based training possible.

LCMS (learning content management system): A software application (or set of applications) that manages the creation, storage, use, and reuse of learning content. LCMSs often store content in granular forms such as learning objects.

Learning portal: Any Website that offers learners or organizations consolidated access to learning and training resources from multiple sources. Operators of learning portals are also called content aggregators, distributors, or hosts.

LMS (learning management system): Software that automates the administration of training. The LMS registers users, tracks courses in a catalog, records data from learners; and provides reports to management. An LMS is typically designed to handle courses by multiple publishers and providers. It usually doesn't include its own authoring capabilities; instead, it focuses on managing courses created by a variety of other sources.

Metadata: Information about content that enables it to be stored in and retrieved from a database.

Online community: A meeting place on the Internet for people who share common interests and needs. Online communities can be open to all or be by membership only and may or may not be moderated.

Open source software: Generally, software for which the original program instructions, the source code, is made available so that users can access, modify, and redistribute it. The Linux operating system is an example of open source software.

Podcast: A podcast is a series of digital-media files which are distributed over the Internet using syndication feeds for playback on portable media players and computers. The term podcast, like broadcast, can refer either to the series of content itself or to the method by which it is syndicated; the latter is also called podcasting. The host or author of a podcast is often called a podcaster.

Portal: A Website that acts as a doorway to the Internet or a portion of the Internet, targeted towards one particular subject.

Social tagging ("folksonomy"): Social tagging is a method for Internet users to safe, organize, categorise and manage bookmarks of web pages on the Internet with the help of metadata. With their own tagging system, they can search for their saved favourites and related links easily and also share their bookmarks with other users.

WBT (Web-based training): Delivery of educational content via a Web browser over the public Internet, a private intranet, or an extranet. Web-based training often provides links to other learning resources such as references, email, bulletin boards, and discussion groups. WBT also may include a facilitator who can provide course guidelines, manage discussion boards, deliver lectures, and so forth. When used with a facilitator, WBT offers some advantages of instructor-led training while also retaining the advantages of computer-based training.

Web 2.0: Web 2.0 is a trend in World Wide Web technology, and web design, a second generation of web-based communities and hosted services such as social-networking sites, wikis, blogs, and folksonomies, which aim to facilitate creativity, collaboration, and sharing among users. The term became notable after the first O'Reilly Media Web 2.0 conference in 2004.[2][3] Although the term suggests a new version of the World Wide Web, it does not refer to an update to any technical specifications, but to changes in the ways software developers and end-users use webs.

Weblogs: A weblog on the Internet is a virtual space (similar to a website) to regularly publish the authors' comments and views on a specified topic and to find an audience. Many weblogs can best be defined as digital diaries and contain entries on a special topic or even more general events from the authors' lives. Weblogs can be used as learning diary, as research and reading diary or as a personal portfolio.

Wikis: A wiki is a program that enables users to participate in the creation of a website's content. Via their own browsers, they publish their own content on the web and change other users' content. The best-known wiki these days is the online encyclopaedia Wikipedia. Wikis can be used to work together in a group on a document or on a complex content. Wikis allow internal linking and can be expanded, edited and commented by different users.

Virtual classroom: The online learning space where students and instructors interact.