



**MINISTERIAL CONFERENCE ON
SCIENCE & TECHNOLOGY**

**OUTLINE
OF A PLAN OF ACTION**

Johannesburg, Republic of South Africa,

6 - 7 November 2003

1. INTRODUCTION

1.1 The attainment of sustainable development goals of the New Partnership for Africa's Development (NEPAD) and of related initiatives, such as the United Nations Millennium Development Goals (MDGs) and the Plan of Implementation of the World Summit on Sustainable Development (WSSD) requires renewed political and financial commitments to the development and application of S&T at national, regional and continental levels.

1.2 Science and technology will play an important role in Africa's efforts to eradicate poverty, achieve food security, fight such diseases as malaria, tuberculosis and HIV/AIDS, reverse environmental degradation, and increase the pace of industrialization.

1.3 It was in recognition of this important role of science and technology, that the Secretariat of NEPAD in collaboration with the Department of Science and Technology (DST) of the Republic of South Africa convened the Ministerial Conference on Science and Technology in Johannesburg 6-7 November 2003 to formulate this outline of an action plan to promote the development and application of science and technology.

1.4 The outline is the outcome of deliberations during the conference. It is a synthesis of decisions taken on key issues relating to the development and application of science and technology for Africa's sustainable development. The outline lays the foundation for the formulation of a detailed Business Plan to implement specific flagship programmes agreed upon at that conference.

1.5 Flagship programme areas and the Declaration adopted by Ministers at the conference constitute core elements of this outline. In the Declaration, the Ministers pledged their commitment to provide appropriate political support for scientific and technological development of Africa. The flagship programmes are a range of priority areas elaborated in the body of this document.

1.6 This outline comprises four sections, namely, (a) overview of challenges that African countries face to develop and apply science and technology, (b) proposed flagship programme areas, (c) the Governance Structure and (d) Funding Mechanisms. It will guide the development of a coherent business plan. The business plan will be dynamic and should not prevent the future revision and addition of flagship programmes and funding mechanisms.

2. SCIENCE AND TECHNOLOGY CHALLENGES IN AFRICA

NEPAD recognizes that science and technology are central to its goals of promoting economic recovery, poverty reduction, better human health, good governance and environmental sustainability in Africa. One of its overall objectives is to bridge the technological divide between Africa and the rest of the world. It calls for the formulation

and implementation of measures to: “promote cross-border co-operation and connectivity by utilizing knowledge currently available in existing centers of excellence in the continent”; and “generate a critical mass of technology expertise in targeted areas that offer high growth potential, especially in biotechnology and geo-science.”

Challenges facing the development and application of science and technology in Africa include the following:

- weak links between science institutions and private sector
- relatively low or limited public and private sector expenditure on research and development (R&D)
- outdated science and technology policies in most countries
- limited public understanding of science and technology
- ‘brain drain’ associated with African scientists, engineers and technicians leaving the continent to work in other regions of the world; and
- weak and thinly spread R&D institutions or centres

To address the above challenges the Ministerial conference considered and adopted flagship programme areas outlined below. These will be elaborated on in a detailed costed business plan.

3. FLAGSHIP PROGRAMME AREAS

3.1 Resource constraints in science and technology (S&T) institutions in Africa point to the need for the continent to identify priority or flagship programmes that can be developed and implemented within the agreed timeframes. The pivotal role of women, the youth and other traditionally marginalised groups should be taken into account in developing and implementing such flagship programmes. The ministerial conference identified and adopted the following as flagship programme areas:

- Biodiversity science and technology
- Biotechnology
- Information and Communication Technologies
- Energy technologies
- Materials science
- Space science and technologies
- Post harvest food technologies
- Water sciences and technology
- Indigenous Knowledge & technologies
- Desertification research
- Science and technology for manufacturing
- Laser technology

3.2 Brief descriptions of these programme areas are in the annex to this document. Their development and implementation will be guided by the following cross-cutting themes at national and regional levels:

Centres of Excellence

3.2.1 In the NEPAD framework document, African countries have committed themselves to establish “networks of centres of excellence, especially through the Internet, for cross-border staff exchange and training programmes, ... and researchers.” Establishing such networks is one of the most significant ways of pulling together Africa’s scientific, technical and financial resources to achieve common goals of the proposed flagship programmes.

Under the guidance of the Steering Committee, the NEPAD Secretariat should propose for the Ministerial Council’s consideration and approval, clear ways and means of networking existing and/or new R&D institutions and strengthening these to grow into centres of excellence. The NEPAD Secretariat should facilitate the creation of an enabling environment for networking centres of excellence by:

- (a) Preparing criteria and guidelines for identifying and networking leading R&D institutions that have potential to grow into centers of excellence in the flagship programmes areas;
- (b) Supporting countries at national and regional levels to prepare profiles of their R&D institutions and promote cross-country sharing of information on the activities and capacity of the institutions;
- (c) Proposing and facilitating the adoption of common indicators for evaluating the performance of the networks of centers of excellence in the flagship programme areas; and
- (d) Mobilizing and making available technical expertise to support groups of countries through appropriate sub-regional and regional platforms to network R&D facilities and ensure efficient and effective utilization of these to achieve common goals

Innovation Hubs

3.2.2 A comprehensive study to determine those innovation hubs or technology incubators that are to be established or strengthened will be conducted by the NEPAD Secretariat.

Human Resource Development

3.2.3 Capacity building in S&T is critical in Africa and a co-ordinated approach should be adopted to ensure that countries of the region maximize benefits from common programmes aimed at building capacity in various key areas or fields. To this end the NEPAD secretariat should undertake the following actions:

- (a) Promote the development and adoption of training programmes on the interaction of science and technology with public policy at national level. Emphasis should be placed on how national and international policies influence the evolution of technology; how rapid development and growth of technology is shaping public policies; institutional forms to respond to technological opportunities and challenges; and how developments in technology can be influenced or shaped to contribute to Africa's economic recovery and growth.
- (b) Provide opportunities to African policy makers to exchange views and experiences on key S&T issues.
- (c) Establish a Web-based network and repository of resources on national and institutional practices that could serve senior officials, ministers and decision makers in S&T
- (d) Provide opportunities for countries to establish appropriate training programmes for capacity building in policy analysis and in mobilising and implementing resources to link S&T effectively with their national innovation systems.
- (e) To develop Africa-wide programmes for the promotion of the public understanding of science, engineering and technology and technology transfer to end users.
- (f) Make strategic interventions for the development of human resources through education at all levels in basic sciences, mathematics, and engineering in order to deliver the flagship programmes effectively, including youth and women. In support of this, a database of existing human capital in science, engineering and technology needs to be developed including a survey of the S&T capacity in the African Diaspora. The strategy should also focus on developing and retaining indigenous human capital.

S&T Policy Development

3.2.4 This Ministerial conference endorsed the compilation of indicators for scientific research, technological development and innovation activities. It also stressed that it is a priority for all countries to have comprehensive national science, technology and innovation policies with emphasis on the development of effective National Systems of Innovation.

Public-Private Partnerships to promote S&T Development

3.2.5 The assistance of the NEPAD Business Group shall be solicited to encourage multinationals and local businesses to participate in the development and implementation of the listed flagship programmes. Partnerships with African chambers of commerce and

other industry representatives should be encouraged to use of centres of excellence and other S&T institutions for sourcing technologies and smart solutions to meet their business needs. Both public and private sector partners are encouraged to collaborate for the creation of an environment for increased and sustained investment in S&T development.

Mainstreaming of S&T in priority sectoral and thematic programmes of NEPAD

3.2.6 All programmes of NEPAD should ensure that S&T are integral inputs in their conceptualisation and implementation in order to accelerate progress along the pathways for the realisation of Africa's goals: job and wealth creation, poverty reduction and environmental sustainability. Science and technology infrastructure is critical for the delivery of NEPAD priorities and requires new and additional financial resources.

NEPAD and the United Nations

3.3 The Conference noted that recent UN Summits like the Millennium Summit and the WSSD recognised the special needs of Africa. The ministerial conference invited the UN system to support the development the implementation of NEPAD S&T Business Plan. It also recognized with appreciation the role that the United Nations Education, Scientific and Cultural Organization (UNESCO) in preparing this conference.

3.4 The conference requested the UN Millennium Task Force on Science and Technology to reflect Africa's views and priorities in its final report by:

- (a) disseminating its draft report to relevant government departments and institutions in Africa for their comment,
- (b) collaborating with the NEPAD Secretariat to organize sub-regional and regional meetings to discuss the draft report, and
- (c) making specific suggestions on how the recommendations of the Task Force could be implemented by African countries.

NEPAD and the G8 Science and Technology Action Plan

3.5 The Conference took note of the G8 Science and Technology for Sustainable Development Action Plan and sought to be actively engaged with the G8 to promote its implementation. The NEPAD Secretariat is encouraged to pursue this active engagement with appropriate organs of the G8 to advance at the next G8 Summit, Africa's priority S&T activities.

International S&T Cooperation

3.6 Recognising the importance of international cooperation in science and technology, ministers at the conference committed their countries to improving the

quality of bilateral and multilateral S&T cooperation. It decided that to promote cooperation in science and technology, the NEPAD Secretariat shall:

- (a) Gather relevant information and facilitate sharing of experiences on implementation and management of bilateral and multilateral agreements.
- (b) Develop a programme of activities to build and strengthen the capacity of African nations to negotiate, implement and monitor international agreements.
- (c) Establish good-practice guidelines and undertake to transmit these through the mechanisms described in (a) and (b).
- (d) Identify and institute ways and means to facilitate increased mobility of scientists and engineers within Africa to ensure more effective research and development outcomes, knowledge sharing and networking.

Intellectual property

3.7 Recognising economic and other values of intellectual property arising from research and development, and challenges of ensuring that African countries fully participate fully in international domains and fora, the conference decided that the NEPAD Secretariat establishes a regional inclusive and consultative process to:

- (a) Examine the impact of intellectual property protection and technological innovation in Africa.
- (b) Develop a clear strategy to build and strengthen Africa's capacity to participate fully in the international patent system.

4. GOVERNANCE

In order to ensure the successful implementation of this outline and its Business Plan, the Ministerial Conference took the following decisions on the governance structure for the science and technology development of Africa:

4.1 Ministerial Council

The Ministers established the NEPAD Ministerial Council for Science and Technology. The Ministerial Council shall consist of all Ministers responsible for Science and Technology in African countries. The Council shall be responsible for the establishment of policies and priorities and for more coherent and coordinated approaches on strategies for S&T cooperation. The Council shall exercise policy oversight in the implementation of NEPAD's S&T programme, provide advice to NEPAD Heads of State and Government Implementation Committee (HSGIC) on S&T issues and seek decisions of from the Committee on policy, programmatic and funding requirements for the successful implementation of the proposed Business Plan. Ordinary meetings of the Council shall be held once every two years, with provision for extra-ordinary meetings should circumstances require this. The responsibility for costs of participation in meetings shall

met or covered according to accepted or approved NEPAD policies and practice. The NEPAD Secretariat will provide the required back-stopping for the Council.

4.2 Ministerial Council Chair

In accordance with established practice in African organisations, the host of the ministerial conference shall be the Chair of the Ministerial Council. South Africa was nominated to be Chair of this inaugural conference, with tenure of two years.

4.3 Steering Committee for Science and Technology

The NEPAD Steering Committee for Science and Technology was constituted with membership at the level of Directors-General, Permanent Secretaries or officials of equivalent rank, two representing each of the five geographic regions of Africa. In addition to regional representation, the host country shall serve on the Committee. The Steering Committee shall oversee the development and implementation of programme activities, including the formulation of the Business Plan and related flagship programmes. The Committee shall be chaired by the senior official from the same host country as the Chair of the Ministerial Council. The Chair of the Steering Committee, supported by the NEPAD Secretariat, shall convene a meeting of the Steering Committee at least twice a year. Venues for such meetings shall be determined and mutually agreed upon by members. The committee shall review progress of implementation and submit annual reports to the Ministerial Council for necessary actions. The tenure of the members of the Committee shall be for two years with rotational replacement by 5 of the 11-member representation to allow for continuity in its work. The composition of the Committee should also take into account gender considerations and representation by the African Union (AU) Commission.

4.4 NEPAD Secretariat

The NEPAD Secretariat shall provide coordination, fund raising and related technical support. It shall establish a databank of high-level African scientific expertise for the purpose of creating expert reference groups – as and when needed.

4.5 Integration with AU Structures

The above governance structure shall initiate the development and implementation of the S&T Business Plan of NEPAD. As soon as the modalities for the integration of NEPAD into the AU structures are in place, the structure shall be amended or reformed accordingly.

5. FUNDING MECHANISMS

5.1 To enable the successful execution of the Business Plan, resources from both internal and external sources will be required. Under the leadership of the Steering

Committee, the NEPAD Secretariat shall ensure that the Business Plan is costed, and contains clear strategies and policies for resource mobilisation.

5.2 Recognizing the need to identify and establish innovative ways of funding regional initiatives in the flagships areas and to ensure that the proposed Business Plan is implemented, the NEPAD Secretariat should investigate the possibility of creating a NEPAD S&T Fund.

Internal Resources

5.3 Public R&D investment

In the Lagos Plan of Action all African Heads of State have resolved to commit a minimum of 1% of GDP as expenditure to R&D. All countries are urged, where applicable, to give practical expression to this commitment. In particular, they are encouraged to allocate a specific budget-line to S&T programmes or activities in their annual national budgets. Through the proposed Business Plan African countries will strive to achieve and surpass the 1% of GGP milestone within the next 5 years and develop appropriate mechanisms to monitor progress in this regard. A review of the attainment of this goal will be integrated into the African Peer Review Mechanism (APRM). Each country, taking into account its social, economic and cultural conditions, should determine creative ways of mobilising a varied range of sources within their economies to supplement exchequer allocations for R&D in particular.

5.4 Private Sector investment in R&D

All countries should commit themselves to seeking innovative measures to stimulate private sector investment in R&D. This should include the creation of a conducive fiscal, legislative and regulatory environment where applicable. African Countries are called upon to adopt common practices and appropriate instruments to monitor progress in achieving increased private sector financial commitments and expenditures on R&D.

5.5 Research Institutions

Research institutions are called upon to take initiatives to supplement their incomes, such as by providing income-generating services or by receiving royalties from intellectual property. To encourage these initiatives, governments shall make every effort to use the services of national, regional, continental expertise before utilising external expertise.

External Resources

5.6 To enable the development and implementation of the Business Plan, co-ordination and collaboration will be sought with national and international funding partners in a manner that aligns respective objectives.

ANNEX

FLAGSHIP PROGRAMMES

1. Framework for Science and Technology in NEPAD

Science and technology are most effectively developed and applied in national and regional settings using a “system of innovation” approach which is defined as a network of interactive public and private institutions, policies and programmes that generate, import, modify and diffuse new goods and services, based on research and development, to achieve economic growth and improve the quality of life. The Ministerial Conference endorsed the use of a system of innovation approach, and decided that a common set of indicators for assessing Africa’s S&T status be developed and adopted. A key output of this effort would be an African innovation outlook produced frequently. To give effect to these goals, the conference decided that the NEPAD Secretariat promotes the system of innovation approach by:

- Developing country processes for senior policy-makers, assisted by consortia of experts, to explore and experiment with the application of NSI concept or approach.
- Holding sub-regional workshops to explore and/or elaborate the use of the system of innovation processes.
- Securing funding from national governments and development partners, and
- Involving of regional development banks, UN organisations and agencies and other regional structures as key partners.
- Developing indicators for surveying or assessing National Systems of Innovation

Initiate processes to develop national capacity to conduct science, technology and innovation surveys based on or guided by agreed a set of measurable indicators. Governments and all partners will be the key beneficiaries of such improved access to reliable and comparable data. The following steps are required:

- a process to define the indicator set and develop core methodologies,
- agreement and commitment by African governments and their partners to adopt the methodologies and definitions in their own data acquisition and use,
- budget requirements for initial indicator work, and
- facilitation of adoption by national governments.
- We urge the NEPAD Secretariat to take urgent and concrete steps to initiate this process and the required project activities.

(c) Annual African Innovation Outlook

We propose as a key output an annual report on the developments in science, technology and innovation in Africa at national, regional and continental level produced by the

NEPAD Secretariat under the mandate of the Steering Committee and transmitted to the Ministers Council for consideration.

BRIEF OUTLINE OF PROGRAMMES

2. Biotechnology

Recognising the ongoing debate on aspects of biotechnology and the need for African countries to develop and adopt informed national and regional positions in respect of, among others, genetically modified products we hereby call on the NEPAD Secretariat to:

- (a) Establish a participatory process to build a broad consensus on issues of common concern and develop effective strategies including joint R&D programmes where appropriate
- (b) Establish ways and means to build Africa's capacity for risk assessment and management of bio-safety, in particular promote the establishment of regional and sub-regional bio-safety facilities
- (c) Facilitate Africa's participation in international fora, processes and discussions on global biotechnology issues

3. Indigenous knowledge and Technologies

Recognising the importance of traditional knowledge in Africa's sustainable development and the increasing linkages between science and technology and the use of traditional knowledge and its relationship, among others to health care and biodiversity, we call on the NEPAD Secretariat to:

- (a) establish a study group and electronic platform for dialogue, to undertake reviews of current issues, share information and produce reports to support sound decision making and informed approaches in this domain
- (b) Establish appropriate mechanisms including national databases, where applicable on African Traditional Knowledge and to protect and promote the intellectual and economic value of traditional/indigenous knowledge and technologies of African communities and other indigenous knowledge holders.
- (c) Organise for the equitable distribution of benefits and for the protection of individual and community intellectual property rights

4. Science and Technology for Manufacturing

Manufacturing is a very important element not only for industrial development but also for the overall socio-economic development of a nation and region. Experience in a number of developing countries, has demonstrated that manufacturing can be increased

substantially through economic diversification, skills accumulation, and confidence building. Advanced processing of indigenous resources will add significant value to product for both internal and external consumption. In the light of this we recommend that the NEPAD Secretariat undertake the following:

- Setting up processes to engage African manufacturers and manufacturing networks to provide a platform for sharing experiences, knowledge transfer and updating, and connections to African research and innovation networks to promote competitiveness, within and outside the region
- Create fora and processes to encourage countries and institutions to further develop positive indigenous manufacturing experiences, the use of indigenous resources and adding value to them, as well as assisting manufacturing SMEs to transfer technology effectively
- Work with regional organisations such as UN bodies and AfDB to mainstream support for manufacturing capacities in their programs by supporting research, development and innovation activities.

5. Information and Communication Technology

Recognising the great potential of ICT in enhancing competitiveness of nations; and fully aware of the power of ICT in fostering leapfrogging in industrializing economies, and enhancing ICT usage in other sectors that impact quality of life, it is recommended that the NEPAD S&T implementation secretariat establish a working group to undertake the following tasks:

- Working from the priorities identified by the NEPAD e-Commission for Africa, select targeted research priorities based on established good practice and lessons learned from existing initiatives such as, among others, the AISI, to mainstream indigenous ICT solutions and effective practices to achieve the ICT goals of NEPAD;
- Establish networks of S&T focal points at universities and research institutes for constituency building, information sharing and collaboration to strengthen indigenous ICT research and develop effective research networks on the continent;
- promote the establishment of a network of centres of excellence in ICT research; and
- establish an African Research Network similar to GEANT, and the Latin American research networks.

6. S&T and the Energy Sector

Recognising the pivotal role of energy to sustainable development and that Africa is the lowest consumer of energy while exporting two-thirds of what it produces, it is recommended that the NEPAD Secretariat should:

- facilitate the development of regional RD&I and HRD strategies for the energy sector including:
 - an RD&I agenda to identify priority areas, among others, assessment and development of indigenous energy resources, provision of energy services to rural areas and energy efficiency and conservation;
 - a multi-year budget framework for R&D programmes, coordination and technology sharing;
 - promote mechanisms to create and recognise centres of excellence in key strategic research areas;
 - regional strategies for training researchers and building adequate research capacity and identify priority skills requirements;
 - attract funding for the development of the RD&I and HRD strategies (including the identification of priority research challenges and issues and priority skills requirements), with support from national governments and institutions; and
 - determine the sustainable funding requirements and modalities for implementation of the RD&I and HRD strategies.

The two aspects identified for focus are the following:

Renewable Energy

- Setting up the regional strategies in the field of research, development and innovation.
- Technological awareness on renewable energy to ensure a follow-up on the development of energy technologies
- Evaluation of effective technologies to generate electricity (Combined cycles, co-generation etc)
- Defining regional strategies for the training of researchers including a synergy with existing institutions.

Nuclear energy and its applications

- Development of research reactors for physics
- Safe installations and radiological protection
- Establishing relevant nuclear technologies for analysis and investigation
- Research on reactors in the field of radio-pharmaceutical products
- Establishing fundamental bases et human resources to introduce electro-nuclear technology in the countries.

7. Materials science and technology

Materials science and technology embraces a key range of disciplines that have high potential for development and economic growth. This is true of materials-based (metals, plastics, ceramics and natural fibres) and downstream manufacturing industries. More efficient application of established technologies, such as cement manufacture or ceramic production are complemented by many niche opportunities with high value materials-

based products, that can become a source of export income. The conference therefore resolves:

- 1) That encouragement be given to existing and new networks of materials scientists to strengthen cooperation at the sub-regional and continental levels, in partnership, where appropriate, with developed countries.
- 2) That sub-regional cooperation be initiated in respect of key infrastructure and equipment for the materials sciences leading, where appropriate, to the establishment of sub-regional centres of excellence focussed on materials of special relevance to development and economic growth, and
- 3) That effective mechanisms of technology transfer of materials production technologies and adoption by, in particular, rural communities be created in order to effectively utilise nearby raw materials deposits and sources for value addition.

8 Desertification research

Much of Africa is under threat of increasing desertification. Our agricultural base and biodiversity is at serious risk, particularly in the light of global climate change. We hereby call on the NEPAD Secretariat to:

- Coordinate existing national efforts in desertification research, and provide for needed expertise in that regard
- Rally the international community and public awareness to the effects of global warming and desertification
- Use available technologies specifically satellite technology to monitor desertification patterns

9. Science and Technology of biodiversity

Recognising the fact that human survival is dependent on the life forms of the planet earth, research capacity building on preservation and conservation of our biodiversity is of major importance.

In the context of biodiversity, there is a need to give much attention to research areas, which are neglected in most circumstances. These are forestry, micro-organisms, marine science and fishery research. To this effect, the NEPAD Secretariat will consider:

- The establishment of sub-regional gene banks
- Research capacity building in marine science, fishery and forestry
- Capacity building to develop technologies on sustainable use of genetic resources as well as capacity building in bio-prospecting
- The establishment of sub-regional data banks

10. Water Sciences and Technology

Water resources are vital for life and economic development and Africa has always suffered for lack of and access of adequate water supply. The application of science and technology should aim at alleviating Africa. Shortage of water, improve the quality of water and enhance its distribution for domestic, industrial and agricultural uses.

In particular the following areas should be given attention to:

- Rain water harvesting and storage
- Underground water management
- Water supply and distribution
- Water treatment quality
- Waste water recycling
- Destination technology

11. Post harvest food technology

As part of the fight against poverty and achieving food self-reliance (cereals in particular), the development of radiation technologies for food conservation would be useful. Implementing such a programme would entail the following stages:

- A comprehensive inventory of the radiation and radio – sterilisation facilities possessed by African countries.
- Encouraging exchanges of information, experience and expertise relating to food conservation, and promoting mobility of scientists and experiences amongst the African countries
- Provide training for specialists in the use of radiation
- Develop any new techniques as appropriate

12. Laser Technology

The application of laser technology to manufacturing technology and medical applications as well as to emerging technologies such as nanotechnology could enable Africa to strengthen its manufacturing capacity, as well as to leapfrog to the forefront of global technology trends.

Laser technology has very important applications in the medical sciences that are non-invasive, sustainable, clean and affordable. Such applications could be developed into niche areas of African expertise to address key health problems.

There are already advanced initiatives to develop an African Laser Centre as a Centre of Excellence, thus establishing a sound institutional framework within which to develop this technological expertise, and to collaborate with other Centres of Excellence in the world.

13. Space science and technology

The rich ethno-astronomical heritage of the continent is fertile ground for the development of space technology. Applications of space technology cover a wide range. A crucial application to support NEPAD is the management of natural resources through remote sensing and GIS mapping, for sustainable social and economic development.

Space technologies may also be used for world-class astrophysical applications such as the Southern African Large Telescope (SALT). Africa has natural advantages for space observation that enhance its potential as a competitive player in this field.

Centres of Excellence that attract large international collaboration research programmes can be established in Africa, thus affirming Africa's role in global science and technology.

In addition, there is significant potential for the development of a space and aeronautics industry if appropriate infrastructure and human resource capacity is developed.