

Building an African Network of Centres of Excellence in Water Sciences and Technology Development: A Strategic Plan for Action

Strategic context

1. A principle of the New Partnership for Africa's Development (NEPAD) is to anchor the development of Africa on its resources and resourcefulness of its people. Water as Africa's premier resource will be critical to eradicate poverty and to place African countries, both individually and collectively, on a path of sustainable growth and development. Thus, African leaders at various forums have committed themselves to "ensure sustainable access to safe and adequate clean water supply and sanitation, especially for the poor" and "[to] plan and manage water resources to become a basis for national and regional cooperation and development"
2. To address current water problems and those likely to emerge in the next 10 -15 years will require investments in research and development. This knowledge will be necessary for decision-makers to make informed choices among often conflicting and uncertain alternative actions¹. The World Summit on Sustainable Development (WSSD) Plan of Implementation recognises the role of science and technology in meeting water-related goals. In paragraph 27 it commits governments to "improve water resource management and scientific understanding of the water cycle through cooperation in joint observation and research, and for this purpose, encourage and promote knowledge-sharing and provide capacity-building and the transfer of technology, as mutually agreed, including remote-sensing and satellite technologies, particularly to developing countries and countries with economies in transition." In addition, to ensure that adequate clean water is available to the majority of Africans, affordable rural water technologies will be required.
3. The first NEPAD Ministerial Conference on Science and Technology held in Johannesburg, South Africa 6-7 November 2003 decided on water sciences and technologies to constitute one of main flagship programmes of NEPAD. The flagship programme will be designed to strengthen the continent's capabilities to harness and apply science and technologies to address challenges of securing adequate clean water as well as managing the continent's water resources. The Conference decided that a network of centres of excellence in science and related technological innovation is needed.
4. The importance of establishing centres of excellence in water sciences and technology has also been recognized by the G8 countries. The G8 Africa Action Plan also envisages international support for improving water resources management in Africa. It recognizes

the importance of strengthening Africa's scientific research and technical institutes for water. Specific actions that the G8 commits itself to include:

- Supporting African efforts to promote the productive and environmentally sustainable development of water resources
 - Supporting efforts to improve sanitation and access to potable water
 - Mobilizing technical assistance to facilitate and accelerate the preparation of potable water and sanitation projects in both rural and urban areas, and to generate greater efficiency in these sectors
 - Supporting reforms in the water sector aimed at decentralization, cost-recovery and enhanced user participation
5. At their Summit in Evian, France (June 2003), the G8 countries adopted an action plan on science and technology for sustainable development as well as an action plan on water for Africa. The plans placed emphasis on strengthening scientific and technical institutions for water research and management. The Commission on Africa has highlighted the special needs of Africa in terms of access to and management of water. The Commission has brought into sharp focus the need for the development and application of science and technology to achieve goals of providing clean water and managing Africa's water resources. It recommends that the international community should allocate US\$ 3 billion to the development of NEPAD centres of excellence in science and technology. In addition, the Commission's report recommends that:
- (a) More donor support should be directed to Africa's river basin organisations.
 - (b) There is a need for increased aid for water supply and sanitation, to enable African governments to achieve the Africa Water Vision commitment to reduce by 75 per cent the proportion of people without access to safe water and sanitation by 2015. The G8 will report back by 2007 on implementation of the G8 Water Action Plan agreed upon in 2003.
 - (c) Governments and donors should work together to harmonise future delivery and focus on those countries that are in dire need of such services; and that the African Ministers Council on Water (AMCOW) should co-ordinate this and formally report on progress to the Africa Partners Forum.
 - (d) Water supply and sanitation strategies should be fully integrated into broader human development and environmental policies at the country level with funding allocated to maximise results.
6. The AMCOW has created a road map for the way forward. At the Pan-African Implementation and Partnership Conference on Water, held in Addis Ababa in 2003, the Ministers considered practical ways and strategic approaches to be followed in pursuit of the water and sanitation targets.

Water research needs²

7. The availability and access to safe water largely determine patterns of economic growth and social development. Water is a critical requirement industry, mining, power generation, infrastructure, transport and nature (wildlife) conservation. Safe water-supply and appropriate sanitation are the most essential components for a healthy and prosperous life. The provision of safe drinking water and adequate sanitation facilities to the rural and rapidly expanding urban population can reduce morbidity and mortality rates of waterborne and water-related diseases such as cholera, diarrhoea and malaria. Safe water is a precondition for health and for success in the fight against poverty and hunger.
8. Although, Africa is endowed with immense renewable natural resources, natural phenomena, such as climate change and variability, and human factors, such as population growth, competition over water and pollution, increasingly threaten the sustainability of Africa's water resources, and hence, the livelihood of the many poor inhabitants in Africa. It is widely recognised that a radical change in approach is required for adequately addressing these threats in order for the available water resources not to become a constraint, but rather an instrument for accomplishing NEPAD's development goals of poverty alleviation, economic recovery and for securing a sustainable environment.
9. It is in this light that a shared Water Vision for Africa and water-supply and sanitation targets were defined (WWF The Hague 2000; see Box 1). The Vision calls for a new way of thinking about water and a new form of regional cooperation. It necessitates, among other things, the adoption of integrated and participatory approaches, management at the lowest possible level and the mainstreaming of gender issues.

Box 1: Africa Water Vision for the Year 2025 and MDG water and sanitation targets

“An Africa where there is an equitable and sustainable use and management of water resources for poverty alleviation, socio-economic development, regional cooperation, and the environment.”

Targets

- 75% reduction of the populations having no access to a hygienic and suitable system of drinking water-supply and sanitation before 2015.
- 95% of the populations having no access to a hygienic and suitable system of drinking water-supply and sanitation before 2025.

10. The major obstacles to accelerating the rate of progress in Africa towards NEPAD's development goals are natural phenomena and human factors. The continent suffers from one of the most unstable rainfall regimes worldwide, causing severe aridity in areas like the Sahara and Kalahari and extremely humid and tropical conditions in areas like the Congo Basin. The high temporal and spatial rainfall variability has also repeatedly led to

extreme climatic events (droughts and floods) that pose a continuous risk to Africa's people, their livelihood and national economies.

11. Yet, certain water-scarce regions in northern Africa have succeeded in providing water-supply facilities to large segments of their populations while in other regions in Africa with abundant water occurrence, such as in central Africa, water-supply and sanitation coverages are limited to less than half of the population³ (WHO/UNICEF 2004). This shows that the fundamental issue facing water resources in Africa does not appear to be one of water availability only, but also encompasses human factors as well. These human factors are related to the governance of the available resources, legislative and institutional frameworks, over-exploitation and pollution of the resources, conflict and political instability, inadequate technical know-how and institutional capability, and the low priority given to water and sanitation in terms of securing financial resources. Other important issues are the high rates of population growth and urbanization. The scale of water resource issues is best formulated in a number of critical issues that research needs to address in water resource management:
 - (a) Will there enough water to support social and economic development (including environmental obligations) taking into account:
 - Climate variability and change (droughts and floods)
 - High population growth and urbanization rates
 - Overexploitation of water resources
 - Pollution of water resources
 - (b) Will reforms in the water sector lead to:
 - Bringing us closer to the millennium development goals (MDGs)?
 - Ensuring broad and effective participation in water resource management (including contributing to governance of water resources)?
 - (c) Will inadequate human capacity, knowledge and data compromise addressing (a) and (b)?
 - (d) Will inadequate financial resources and institutional arrangements compromise addressing (a) and (b)?
12. Science, technology and innovation will be critical to address the above complex challenges.

Key stakeholders

13. The major stakeholders for the water sciences initiative fall in the following groups:
 - Politicians , political structures such as AMCOST and AMCOW
 - Water resource managers and planners, i.e. all those entrusted with developing and allocating water resources to meet the needs of the environment and various users;
 - Major water users including farmers, mines, industries, water service providers and civil society;

- International River Basin Commissions i.e. organisations entrusted with regulating the use of transboundary resources
- Private sector, civil society and research councils, including universities
- United Nations Agencies based in Africa e.g. UNEP
- Cooperating Partners

SWOT analysis

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|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Strengths</p> <ul style="list-style-type: none"> • There is recognition by national governments of the importance of S&T through the adoption of the consolidated action plan • Good policy and legislative frameworks for water resource management is being established in a number of member states | <p>Weaknesses</p> <ul style="list-style-type: none"> • The knowledge base (competency/capacity) to implement the water sciences and technology initiative is limited |
| <p>Opportunities</p> <ul style="list-style-type: none"> • There is a lot of interest from cooperating partners to support the implementation of the networks • Develop an Africa wide competency base in water resources • The need for research output recognised and sought after by implementers • The research outcomes will contribute to improved water resource management in Africa | <p>Threats</p> <ul style="list-style-type: none"> • Limited national budget allocations to support research • Diversion of research funds to support short term needs |

Scope

14. This programme on developing capacity in water resources focuses on water quality, sanitation and water resources management. Emphasis is on promoting increased use and production of scientific knowledge and technological innovations. Its specific goals are to:
- (a) Improve the conservation and utilization of the continent's water resources
 - (b) Improve the quality and quantity of water available to rural and urban households
 - (c) Strengthen national and regional capacities for water resource management and reduce impacts of water-related disasters
 - (d) Enlarge the range of technologies for water supply and improve access to affordable quality water.

Indicative Projects and Actions

15. The following project areas will constitute the core of this programme, at least in the short- and medium-term.

Project 1: Scientific Assessment of Africa's Water Resources and Systems

16. There is a relatively poor knowledge base of and scanty information on Africa's water resources and related ecosystems. Building scientific information on the continent's water resources is crucial for improving their development and sustainable management. Scientific research and assessment are also important to inform the formulation and implementation of policies and development of technologies for integrated water management. This proposed project will focus on:
- (a) Developing common scientific methodologies and tools for conducting a systematic assessment of the continent's water resources and ecosystems. Emphasis will be placed on river basins and underground water systems.
 - (b) Training African scientists and technicians on the methodologies and tools to conduct water assessments
 - (c) Launching and conducting water assessments at sub-regional and regional levels
 - (d) Developing a databank of Africa water resources and ecosystems; and
 - (e) Disseminating scientific information on the nature of water resources and ecosystems.

Project 2: Research and Technologies to Assess and Monitor Water-related Disasters (Emphasis on floods)

17. Many African countries suffer from frequent floods along their rivers and other water bodies. The impacts of floods on the continent's economies are significant and increasing. Every year thousands of people die and infrastructure estimated at millions of

US\$ is destroyed as a result of floods. While in the short-term floods cannot be prevented, their impacts can be reduced if appropriate technologies are used to conduct forecasts. Forecasts that provide relatively long lead time can be used to evacuate people from high-risk areas or even to create retention basins to reduce flood peaks and volumes.

18. This project will explore the possibility of developing and applying a continent-wide flood forecast system. It will focus on:
 - (a) Identifying and assessing existing technologies for flood control to determine their applicability in Africa. Emphasis will be placed on the kinds of resources required to acquire, modify and apply the technologies in Africa
 - (b) Developing a databank and disseminating information on the technologies
 - (c) Conducting research to modify, improve and develop flood control technologies

Project 3: Knowledge and Technologies to Improve Water Quality and Quantity

19. A fundamental prerequisite to the development and application of technologies for improving water quality and sanitation in Africa is a systematic and extensive set of water quality data on both sources of impairments and existing technical responses. Data are required to assess the different sources of contamination and their impacts. Many African countries do not have scientifically strong systems for assessing water quality and quantity as well as the relative seriousness of the related environmental and human health problems.
20. In addition to the generation of data, deliberate efforts need to be made to develop technologies for improving quality as well as increase the supply of water to African households.
21. This project will focus on:
 - (a) Reviewing existing international water quality assessment methodologies and techniques and promoting the use of appropriate ones through training workshops and postgraduate studies on water quality
 - (b) Research on and development of desalination technologies, with emphasis on small modular units that use low and renewable energy
 - (c) Research on and related technology development for treating and supplying drinking water from aquifers. This is crucial to ensure that poor populations in peri-urban areas have access to clean water
 - (d) Research and application of knowledge on eutrophication. A key aspect of improving and managing water in Africa is the prevention of eutrophication of dams, rivers and lakes, and biological control of weeds. It is recommended that research be conducted to develop new technologies to address eutrophication related problems.

Proposed actions for Implementation

22. The above proposed projects will be further elaborated on and implemented by a continental network of centres of excellence. The network will comprise regional hubs and nodes. To identify and designate such hubs and nodes as well as create the network as a whole, the following actions will be undertaken⁴:
- (a) A multi-disciplinary task team of experts and policy-makers has been established to prepare specific criteria and guidelines for identifying and designating centers or institutes (Annex 1). Such criteria and guidelines will spell out mechanisms for promoting the sharing of the centres' facilities and expertise across the continent as well as a means of ensuring the sustainability of the network.
 - (b) An inter-ministerial committee of water and science and technology departments and ministries will be created to ensure proper governance of the proposed network
 - (c) The task team should submit the criteria and guidelines to the African Ministerial
 - (d) Council on Science and Technology (AMCOST), AMCOW and the NEPAD Heads of State and Government Implementation their consideration and endorsement
 - (e) The secretariats of NEPAD and AMCOW should publish and disseminate the criteria and guidelines to all relevant government agencies and invite centers to prepare and submit their institutional capacity profiles for consideration and selection of those that meet the criteria.
 - (f) An assessment of human infrastructural capacity will be carried out throughout the continent. The assessment will provide information on the capacities available and identify gaps in human resources and infrastructural capacities. The design of the water platform will largely be informed by the outcome from the assessment.
 - (g) A strong outreach programme will be required to popularise the NEPAD/Water science and the regional networks.
 - (h) Members of the task team would visit and conduct verification of the institutional capacities and make recommendations on which specific centers should be designated to establish the network.
 - (i) AMCOST and AMCOW should, through a inter-ministerial mechanism, select appropriate centers and formally designate them as Africa's centers excellence in water sciences and technology
 - (j) The designated centers should develop and agree on a protocol for networking, including sharing of facilities, expertise and other resources.
 - (k) An inter-ministerial mechanism of AMCOW and AMCOST should consider and approve the governance and financing mechanisms proposed by the network of centers; and
 - (l) The network of centers should prepare comprehensive project proposals and budgets based on the programmatic elements or issues proposed below.
23. International agencies (such as the IRD and other French institutes) that have complimentary scientific and technical capacities and potential to add value to the African network of centres of excellence should be identified and encouraged to forge

strong partnerships with the African centres in specific activities aimed at implementing projects designed by the network.

24. In addition, the United Nations Agencies and international centres should be requested to provide technical and financial support to the establishment of the network and implementation of projects.

Governance of and financial Mechanism(s) for the Sustainability of the Network of Centres of Excellence in Water Sciences and Technology

25. The effectiveness, efficiency and sustainability of the proposed network of centres of excellence will largely depend on the nature of governance and financial mechanisms that are put in place by African governments. Clear structures for coordination, policy-making, resource mobilization and allocation, are monitoring and evaluation will be required. To establish appropriate structures and related instruments, it is proposed that the Secretariat of NEPAD in collaboration with AMCOW Secretariat and IRD should prepare a comprehensive proposal with clear indication of various options for governance of the network. Such a proposal may consider

- (a) the establishment of an inter-ministerial committee bringing together bureaus of AMCOW and AMCST to constitute the overall governing council of the network. Representatives of partner countries can be invited to serve on the council. The council would be responsible for approval of the programme of work of the network and related policy-making matters relating to financing. It would report to the NEPAD Heads of State and Government Implementation Committee on the performance, financing and management of the network
- (b) the establishment of a technical advisory committee that would consider project proposals for competitive grants, monitor and review performance of the network, and submit reports to the proposed governing council
- (c) the creation of Network Coordination Office in one of the network's hubs or centres. The Office would deal with day to day administrative and coordination tasks

26. In terms of a financial mechanism, there is need to consider the following:

- (a) The establishment of a special trust fund in the African Water Facility. The trust fund would be the financial mechanism for the network. Africa governments would be called upon to make contributions to the fund on basis of clear criteria. These may include: host countries of the centres being required to make some minimum annual contributions, other contributing on access basis of the GDP, etc.
- (b) The establishment of a donors' group comprising of bilateral and multilateral donors private foundations, and others willing to contribute to the proposed trust fund. Clear principles would be adopted to ensure that donors do not unnecessarily cause incoherency in the network's programme as a result of different competing

interests. Flexibility should be created so that donors can also fund specific projects and programmes of the network.

- (c) Sale of products or patents, publications, etc from the network's projects to generate revenue. Such other ways as the collection of water fees and public-private partnerships should be explored to generate financial resources for the network
- (d) Guidelines for the allocation of financial resources from the proposed trust fund would be developed and adopted by the governing council
- (e) The governing council would establish a special ministerial committee on funding the network. Such a committee would ensure that strategies for resource mobilization and allocation are designed and implemented.

Implementation Plan

- 27. Based on the challenges (as discussed above) and taking into account various strategic and operational issues, the Strategic Action Plan identifies key performance areas (KPA's), using a balanced score-card methodology. This will enable quantitative measurement of outcomes to support management of the process to build an African Network of Centres of Excellence in Water Sciences and Technology Development.

Stakeholder relationships

- 28. The objective is to mobilise political support to establish the networks of water sciences and technologies and to receive feedback with regard to the relevance and effectiveness of the programme. This area is linked directly to the challenge of leading water-centred knowledge. This area also addresses a number of identified strategic opportunities such as positioning of the networks; and the risk involved in the inability of the networks to keep abreast of changes (in Africa and globally) and the risk of the inability to build strategic alliances.

Progress to date:

Leadership in African S&T affairs

- 29. The initiative has been promoted at the following African S&T events:
 - OECD Workshop on International Scientific and Technological Co-operation for Sustainable Development, Kwa-Maritane, South Africa
 - 1st Regional Consultative Meeting of the National Committees for the UNESCO-International IHP Programme, Abuja, Nigeria
 - The InterAcademy Panel on Water for Africa, Pretoria, South Africa
- 30. The initiative was also presented at the 2nd AMCOST meeting in Dakar, Senegal. The presentation was well-received and resulted in the endorsement for AMCOST and

AMCOW to meet to discuss financial and governance mechanisms for the initiating the networks.

31. The programme to develop the initiative has been mentioned in the media:

32. Centres of Excellence as a response to the problem of access to water in Africa. Sources: http://www.eurekalert.org/pub_releases/2005-06/idrp-coe060605.php; and http://www.innovations-report.de/html/berichte/umwelt_naturschutz/bericht-45047.html

Stakeholder relationships objectives for 2006/2007

| GOAL/OBJECTIVES | INDICATORS | EXCELLENCE TARGET |
|---------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Leadership in African S&T affairs <ul style="list-style-type: none"> • African initiatives • Public appreciation received | African initiatives of key importance to the water, S&T and other related regional sectors where the Water Initiative plays a significant role | Five African initiatives e.g. <ul style="list-style-type: none"> • Extra-ordinary conference of AMCOST • AU Summit 2007: Scientific Research, Technology and Innovation for Africa's Socio-economic Development • Etc. |
| | Strategic positioning initiatives aimed to position the Water Initiative for future sustainability and growth | Two strategic positioning initiatives e.g. <ul style="list-style-type: none"> • AMCOW • ACP EU Water Facility |
| | Feedback regarding the relevance of the Water Initiative to Africa. | Three citations |
| Leadership in external affairs <ul style="list-style-type: none"> • Global | International player (activities such as global partnerships, participation in global projects, etc.) | Two global initiatives (50% ongoing/50% new) |

Financial perspective

33. The objective of this is to mobilise resources to support the implementation of the water initiative.

Financial objectives for 2006/2007

| GOALS/OBJECTIVES | INDICATORS | EXCELLENCE TARGET |
|--------------------------------|----------------------------------------------------------------------------------------------|---------------------------------------------------------|
| Improved financial performance | Income growth (income growth is measured as meeting the budgetary target of 2 million USD .) | Meet budget target in full |
| | Support the development of proposals to possible funding organizations | Three proposals developed to e.g. ACP EU Water Facility |

Learning and innovation

34. This aim is to contribute towards the water-centred knowledge base in Africa, including capacity building, as well as to enhance the Water Initiative's activities and positioning through knowledge sharing and leadership.

| GOALS/OBJECTIVES | INDICATORS | EXCELLENCE TARGET |
|------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Improved contribution towards capacity building (knowledge base) | Establishment and maintenance of a database of African water institutions and experts | Database established of African water institutions with their relevant expertise listed. |
| | Develop a comprehensive business plan for 2007 – 2012 | Business plan accepted by all relevant stakeholders |
| | Identify nodes for the Water Initiative | One node identified per sub-region of Africa e.g. the UNEP project on "Vulnerability of Africa Water Resource to Environmental Change" |
| Knowledge sharing and scientific leadership | Capacity building and training workshops held with relevant institutions to access EU funding programmes ¹ | Three workshops held |

¹ The EU is supporting a project to facilitate African Involvement in the EU Framework Programme.

Annex 1

Criteria and Indicators

- (a) **Availability of appropriate infrastructural facilities**
 - Functioning state of art equipment
 - Appropriate system of maintenance and repair of equipment
 - Adequate supply consumables
 - Adequate library facilities and Internet connections
- (b) **Quality of ongoing research and innovation**
 - Major research activities
 - Publications in peer-reviewed journals
 - Citations
 - Patents
- (c) **Outstanding leadership and quality of staff**
 - International recognition in scientific research
 - Managerial , facilitating and maintaining skills
 - Communication skills particularly with decision makers and general public
 - Fund raising skills
- (d) **Regional and continental outlook of the centres and ability to network within the institution's host country and in the continent**
 - Joint activities/initiatives with institutions in the host country as well as in the continent
- (e) **Flexibility and ability to forge scientific and technical partnerships with non African institutions including those in France, other OECD countries and developing countries**
 - Joint activities/initiatives with institutions outside Africa
- (f) **Demonstrated capacity to train and retain new generations of water expertise skills as well as facilitate their mobility and sharing of expertise**
 - Post graduate education programmes
 - MSC and PhD students
 - Postdoctoral students
 - Short term visitors
- (g) **Relevance and impact of research output including**
 - Recognised contributions to solving local and regional problems in issues related to water
- (h) **Partnerships with local and regional institutions and with industrial and private sectors**
 - Joint activities/initiatives with local institutions and private sectors
- (i) **Availability of an appropriate budget for programmes and activities and commitment by local Government to provide support to ensure the continuity and sustainability of the operation of the centre**
 - Annual budget of the Centres
 - Commitment by Government to support the Centre

(j) **Participation in regional and international water programmes**
Regional and international activities in which the Centre is participating

¹ US National Academy of Sciences (2004)

² This section is condensed from the AEO2 Report (UNEP 2006) : Chapter 4: Kevin Pietersen et al

³ WHO/UNICEF 2004

⁴ NEPAD (2005) NEPAD/African Biosciences initiative