

**THE
NATIONAL ENVIRONMENTAL RESEARCH
AGENDA FOR TANZANIA**

2008 - 2013



NATIONAL ENVIRONMENT MANAGEMENT COUNCIL

(NEMC)

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ISBN: 9987 435 04 1

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FOREWORD

The need to integrate environmental concerns into development planning in order to achieve sustainable development is underscored in the Tanzania's Development Vision 2025, the National Strategy for Growth and Reduction of Poverty (MKUKUTA), the National Environmental Policy (1997), the Environmental Management Act No. 20 of 2004 and in several sectoral policies as well as Multilateral Environmental Agreements ratified by Tanzania.

Increasingly, it is becoming apparent that well targeted and good quality environmental research, which addresses the priority needs of Tanzania, is needed in order to inform policy and decision making processes for sustainable development. The Agenda for Environmental Research in Tanzania (2008 – 2013) was developed through an in-depth consultations and participation of environmental management and research stakeholders in the country at both local and national levels. It is a framework document intended to technically guide planning for environmental research programmes, projects and activities in the country. It highlights the national priority research areas and possible themes, giving direction to environmental managers at all levels, researchers and the academia as well as development partners as they plan and fund their environmental related research activities in the country.

It is my sincere hope that research institutions and other stakeholders will promote and undertake research that is in line with the Agenda. In order to assist in the proper management and conservation of the environment, the government through NEMC will provide fora to discuss various findings and hence, an opportunity to synthesise them for improved environmental management, poverty eradication and consequently sustainable development.

Through the Agenda therefore the Government commits itself to implement the research related aspects of the National Environmental Policy and EMA 2004. Finally, through this Agenda, NEMC will continue working in partnership with stakeholders of environmental research and management in general, in order to contribute to the achievement of national goals of the improved livelihoods of all Tanzanians as well as a healthy environment.



RUTH MOLELE

**PERMANENT SECRETARY
VICE PRESIDENT'S OFFICE**

LIST OF ABBREVIATIONS

AHEEDT	African Health, Environment and Education Development Trust
ARI	Agricultural Research Institute
BCS	Biodiversity Country Study
CAWN	College of African Wildlife Management
CCP	Centre for Cleaner Production
CEEST	Centre for Energy, Environment, Science and Technology
COSTECH	Commission for Science and Technology
EAC	East Africa Cooperation
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
ERAC	Environmental Resource Advisory Committee
EWURA	Energy and Water Utilities Regulatory Authority
CBFM	Community Based Forest Management
GCLA	Government Chemist Laboratory Agency
GEF	Global Environment Facility
GHG	Greenhouse Gases
HBS	Household Budget Survey
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
ICM	Integrated Coastal Management
IPCC	Intergovernmental Panel on Climate Change
IIED	International Institute for Environment and Development
IRA	Institute of Resource Assessment
JET	Journalist Environmental Association of Tanzania
MDGs	Millennium Development Goals
MKUKUTA	Mkakati wa Kukuza Uchumi na Kuondoa Umaskini Tanzania
MTEF	Medium Term Expenditure Framework
NBS	National Bureau of Statistics
NCSSD	National Conservation Strategy for Sustainable Development
NEMC	National Environment Management Council
NERAC	National Environmental Research Advisory Committee
NERP	National Environmental Research Programme
NIMR	National Institute for Medical Research
NLUPC	National Land Use Planning Commission
NORAD	Norwegian Agency for Development Cooperation
NSGRP	National Strategy for Growth and Reduction of Poverty
OSHA	Occupational Safety and Health Authority
PMO	Prime Minister's Office
REPOA	Research on Poverty Alleviation
SUA	Sokoine University of Agriculture
SUMATRA	Surface and Marine Transport Authority?
TAFIRI	Tanzania Fisheries Research Institute
TAFORI	Tanzania Forest Research Institute
TATEDO	Tanzania Traditional Energy Development and Environment Organisation
TAWIRI	Tanzania Wildlife Research Institute

TCMP	Tanzania Coastal Management Partnership
TFDA	Tanzania Food & Drug Authority
UCLAS	University College for Lands and Architectural Studies
UDSM	University of Dar es Salaam
UN	United Nations
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climatic Change
URT	United Republic of Tanzania
VPO	Vice President's Office
WHO	World Health Organisation
WTO	World Trade Organisation

EXECUTIVE SUMMARY

1. Effective environmental conservation and management of Tanzania's natural resources is crucial for sustainable development and livelihoods of the people. In this regard, adequate and appropriate attention to environmental issues is paramount. Fortunately, there are now serious initiatives taking place, nationally and internationally to respond to these environmental challenges. These initiatives include, for example, the formulation of the National Environmental Policy of 1997 and enactment of the Environmental Management Act of 2004.
2. The National Environment Management Council (NEMC) embarked on the preparation of the National Environmental Research Agenda to provide overall coordination of environmental issues, as required in the Environmental Management Act of 2004. This mandate is in line with the Council's vision and mission statements. The vision is "to excel in sound environmental management in order to assist the nation fulfil its aspiration for sustainable development". The Council strives to act as a catalyst for beneficial change, working through partnership at all levels to fulfil her mission, which aims "to ensure protection of the environment and sustainable exploitation of resources for enhancing the quality of the lives of the people of Tanzania."

This is also within the context of several key sector regulations and policies, the EAC treaty on natural resources management and environment, and international agreements that emphasise on sound management of the environment.

3. The Agenda for Environmental Research in Tanzania (2008 – 2013) was intended to be a technical guide for planning and undertaking environmental research programmes, projects and activities. The Agenda evolved through in-depth consultations and participation of a wide range of stakeholders in the country, at the village and district levels, civil society organisations, ministries responsible for natural resource management, and research and training institutions.

As such initiatives continue, a very glaring constraint has been lack of adequate and sound research data to guide effective decision-making and policy interventions formulation in environmental management. Urgent attention is thus needed to intensify quality and relevant environmental research. The development of an environment research agenda to serve as a guide for stakeholders in the prioritization of their research activities is widely considered to be an important prerequisite for stimulating quality and relevant environmental research.

4. The process used to identify key priority areas where research could be focused involved the following steps:
 - Development of the first draft of the agenda by NEMC staff. This was basically developed from literature review of relevant literature.
 - Holding of the first stakeholders' workshop that involved experts from key sectors to identify priority research areas.
 - To incorporate views from the stakeholders at grass-root level, ten districts were selected from different parts of the country: Selection of these districts was based on the geographical location and specific problems known to the area. Discussions were held with all officials involved in natural resources

management (agriculture, forestry, wildlife, community development, water, health and education). Based on these discussions an indication of the key problems and research priority areas were highlighted. Comments and suggestions from these consultations were incorporated into the research priority areas.

- Possible research areas that were also raised during the First and Second Scientific Conferences, priority issues from EMA (2004), and the Strategy for Urgent Action to Combat Land Degradation and Protection of Water Catchments, were also incorporated into the priority research areas.
 - The final draft of the agenda was forwarded to a wider range of stakeholders from the Government, Academic and Research Institutions, Development partners, representatives from the districts and Non-government and Community Based Organisations.
 - Comments from all the stakeholders were incorporated into the report to produce a document that was forwarded through the appropriate channels for adoption at the national level.
5. The priority research areas highlighted below evolved after lengthy consultations with several stakeholders of environmental research in the country. During the discussions with stakeholders it was agreed that some of the issues are cross-cutting and have to be addressed during the implementation of different research activities. These included Trans-boundary Environmental Issues, Sustainable Utilisation of Natural Resources, Biotechnology and Environment, Environmental Governance, Planning and Monitoring Systems, Environmental Information Management and Gender issues.

In addition to the aforementioned crosscutting issues, environmental research in Tanzania needs to focus on the following specialised priority areas:

- Sustainable Land Use and Conflict Management
 - Mining, Energy and Environment
 - Integrated Water Resource Management
 - Environmental Economics
 - Poverty and Environment
 - Climate Change and Vulnerability
 - Aquatic Ecosystems and Biodiversity
 - Terrestrial Ecosystems and Biodiversity
 - Social and Cultural Aspects of Resource Management
 - Pollution Control and Waste Management
6. NEMC has keen interest in seeing a fruitful implementation of the Research Agenda. Formulation and implementation of research programmes, projects and activities will, however, be the responsibility of research institutions or institutions with mandate for undertaking environmental research. NEMC will provide leadership in the dissemination of environmental research findings in the country through Regular Scientific Conference(s), an Environmental Research Website backed by an e-Library, an environmental research journal and other popular means of communication.
7. For purposes of coordination of Environmental Research, there will be an Environmental Research Advisory Committee. This body will provide advice to

NEMC and other stakeholders on how to strengthen environmental research coordination. The composition of the committee will be drawn from partner research institutions, Government and Civil Society.

NEMC will liaise with relevant authorities in order to see the appointment of strategic Environmental Research Focal Persons for the sectoral ministries, regional administrations, local government authorities, research institutions, civil society and the private sector. The focal persons will provide the critical link with NEMC on the implementation of the Research Agenda.

In addition to research programmes and projects initiated and implemented by other institutions, NEMC will establish an “Environmental Research Programme” focussing on the Agenda and mobilise funds for its operationalisation. Implementation of the programme will either be through competitive application for funds by research institutions and individual researchers or direct commissioning by NEMC.

8. Human and financial resources, information and facilities are among the most important resources for sustainable implementation of the Research Agenda. The sustainability will be enhanced through partnering and collaboration with relevant institutions at national, regional and international levels. Commissioning of research to capable institutions is another way of attaining sustainability in environmental research.

Chapter 1

INTRODUCTION

1.1 Preamble

This Agenda for Environmental Research in Tanzania (2008 – 2013) was created through in-depth consultations and participation of environmental management stakeholders in the country and is intended to be a technical guide for planning and undertaking environmental research programmes, projects and activities.

1.2 Background

Effective environmental conservation and management of Tanzania's natural resources is crucial for sustainable development and livelihoods of the people. In this regard, according adequate and appropriate attention to environmental issues is paramount. This is because environmental problems and resource use conflicts are on the increase and are adversely affecting the socio-economic well-being of the Tanzanians. For example, at the 2006 NEMC conference on implications of climate change in Tanzania noted that the country had started experiencing severe impacts of climate change - with drought and imminent threat of famine in many areas, unprecedented long dry spells that resulted into the drying up of often-reliable water flows in the Pangani and Great Ruaha Basins both for hydroelectric power generation and fishing (NEMC, 2006).

Environmental sustainability is increasingly being linked to the fight against poverty in the country. The poor are most vulnerable to the negative impacts of environmental challenges such as climate change. In many instances, the poor depend highly or wholly on natural resources, and unsustainable utilization of resources such as soil, water and forests, have resulted in soil erosion, deforestation and reduced water retention in the soils (NEMC, 2006)..

Fortunately, there are now serious initiatives taking place, nationally and internationally to respond to environmental challenges. Tanzania is a signatory to several conventions that promote environmental sustainability (see 2.7). The country has also been at the forefront in the implementation of the Millennium Development Goals, including One and Seven which relate to poverty eradication and environmental sustainability.

Tanzania has indeed taken important steps to ensure that environmental sustainability is prominent in the country's development agenda. These include the enactment of National Environment Management Act No. 19 of 1983 that established the National Environment Management Council (NEMC), which became operational in 1986, the establishment of Division of Environment at the Vice President's Office, formulation of the National Environmental Action Plan (1994), the National Conservation Strategy for Sustainable Development (1994), the National Environmental Policy (1997), the National Strategy for Growth and Reduction of Poverty MKUKUTA, and the recently enacted Environmental Management Act No. 20 of 2004.¹

¹Here in after known as EMA 2004

The National Environmental Policy of 1997 provides a framework for making fundamental changes that are needed to bring environmental considerations into the mainstream of decision making in the country. It provides a framework and guidance to the determination of priority actions in sectoral environmental policies, plans and programmes.

EMA 2004 provides for a legal and institutional framework for sustainable management of the environment, prevention and control of pollution, waste management, environmental quality standards, public participation, environmental compliance and enforcement. The Act also, provides basis for implementation of international instruments on environment. It gives NEMC the mandates to undertake enforcements, compliance, and review and monitoring environmental impact assessments, facilitates public participation in environmental decision making, exercise general supervision and coordination of all matters relating to the environment assigned to the council.

It is in realization of the causal link between poverty and the environment that MKUKUTA has singled out environmental management being central to the attainment of its objectives. This aims at making sure that natural resources and other ecosystems that people depend upon for production and reproduction are well managed and that land degradation and loss of biodiversity are reduced leading to increased access to clean, affordable and safe water, sanitation, decent shelter and safe and sustainable environment (NSGRP², 2005).

The Government is finalising a National Adaptation Plan of Action on Climate Change, which provides an important premise for addressing the impacts of climate change through urgent and immediate project activities. Through this Plan of Action, the government will make sure that immediate actions are taken to address the most pressing climate change adaptation needs, particularly those that directly impact on the livelihood of rural communities (VPO³, 2006).

As these initiatives continue, a very glaring constraint has been lack of adequate and sound research data to guide effective decision-making and policy interventions formulation in environmental management. Urgent attention is thus needed to intensify quality and relevant environmental research. The development of an environment research agenda to serve as a guide for stakeholders in the prioritization of their research activities is widely considered to be an important prerequisite for stimulating quality and relevant environmental research.

1.3 Justification

Tanzania is immensely endowed with natural and cultural resources which are the backbone for meeting the livelihood needs of her people. These resources face growing (environmental) threats from various quarters. The National Environmental Policy (1997), highlighted the country's key environmental concerns as land degradation, deforestation, deterioration of aquatic habitat, loss of wildlife habitat and biodiversity, lack of access to good quality water and environmental pollution. Several academic and

² National Strategy for Growth and Reduction of Poverty

³ Vice President's Office

research institutions (eg. UDSM, UCLAS, REPOA, SUA, TAFIRI, TAFORI and TAWIRI) address these issues through research. However, in many cases these research results are not utilised by the end users for the purpose of achieving the overall national goal of sustainable development and poverty reduction. Furthermore, independent institutions carry out research based on their individual mandates, availability of research grants, or even conditions set up by the partner institutions, without looking at the priority areas of research in the country.

It is in this context that a widely owned National Environmental Research Agenda (NERA) is needed in order to facilitate the coordination of environmental research in the country. The agenda is based on several studies that have been taken to identify priority environmental research areas at district, regional and national levels. It also identifies linkages and gaps in environmental research for better utilisation of resources and effective monitoring and management of environmental research activities in the country. Furthermore, livelihood issues have been mainstreamed into the Environmental Research Agenda so as to contribute to the overall goals of eradicating poverty and ensuring environmental sustainability in the country.

1.4 The Role of NEMC

The Environmental Management Act No. 20 of 2004 gives NEMC the mandate for co-ordination of environmental research. This mandate is in line with the Council's vision and mission statements. The vision is *"to excel in sound environmental management in order to assist the nation fulfil its aspiration for sustainable development"*. The Council strives to act as a catalyst for beneficial change, working through partnership at all levels to fulfil her mission, which aims *"to ensure protection of the environment and sustainable exploitation of resources for enhancing the quality of the lives of the people of Tanzania."*

In order to effectively coordinate environmental research, NEMC has taken the technical initiative and leadership to oversee the process of preparation of this document in close partnership with the key stakeholders, to ensure that the resulting research findings are synthesised and priority environmental concerns incorporated in Environmental Management Plans as required by EMA.

Environmental Research Functions in EMA

The Act mandates NEMC to perform the following research functions: *Section 18* of the Act gives NEMC the power of carrying out surveys which will assist in the proper management and conservation of the environment, to undertake and coordinate research, investigation and survey in the field of the environment, collect and disseminate information about the findings of such research, investigation or surveys and publish and disseminate manuals, codes or guidelines relating to environmental management and prevention or abatement of environmental degradation. *Section 48* of the Act gives NEMC the mandate to facilitate the carrying out of scientific research to prepare management plans for environmental protected areas. *Section 55* of the Act provides the council with the mandates of issuing guidelines and prescribing measures for the protection of riverbanks, rivers, lakes and lake shore. *Section 108* of the Act gives NEMC the mandate to undertake studies on the current state of technical knowledge for

effective undertaking of integrated pollution prevention and control and to follow the development of technology and techniques for preventing or reducing pollution of the environment due to the release of substances from prescribed processes. *Section 173* of the Act gives NEMC the power to gather and analyse existing data and information on the environment and natural resources and disseminate information to the public and private *users* and commission studies in demographic and trends impacting on environmental and developmental issues.

Also, *Section 174* of the Act gives NEMC the mandate to establish and operate a central environmental information system, which may bring together any findings, data and statistics generated by both public and private institutions in the course of environmental observations and management. *Section 177* of EMA gives NEMC the mandate to conduct surveys on the state of the environment and to research and make forecast on the environmental changes and other studies that may contribute towards the formulation of policies and preparation of actions and strategies with regards to environmental conservation and management.

1.5 Methodology

The development of the research agenda involved active participation of the main stakeholders of environmental research in the country. The process used to identify key priority areas was:

1. Initially, an internal workshop of NEMC staff reviewed the pertinent literature and brainstormed on the key priority research areas. An initial draft of the agenda was then presented to a workshop of experts from stakeholder/research institutions for review and improvement and produced the second draft.
2. The second draft was then forwarded to stakeholders from the Research Institutions, whose comments were also incorporated to produce the second draft of the research agenda.
3. To incorporate views from the stakeholders at grass-root level, ten districts were selected from different parts of the country. Details are highlighted below:
 - a. Selection of districts was based on their geographical location and specific problems known to that area. The ten selected districts were Ilala, Kinondoni (Dar-es-Salaam), Kondoa (Dodoma), Uyui (Tabora), Mikindani (Mtwara), Makete (Iringa), Ngara (Kagera), Mererani (Arusha), Mwanza urban (Mwanza) and Sumbawanga (Rukwa).
 - b. The entry point at the regional level was the Regional Administrative Secretary or his assistant, who provided an overview of the priority environmental issues within the region.

At the district level, discussions were held with the District Executive Director and all officials involved in natural resources management (agriculture, forestry, wildlife, community development, water, health, planning and education). Based

on these discussions an indication of the key problems and research priority areas were highlighted. Discussions were held based on the prepared checklist of issues that needed to be addressed.

- c. Three villages were visited in each district, and meetings were held to discuss about the key environmental problems and possible areas that had to be addressed were highlighted.
 - d. These priority research areas were compiled at district and national level.
4. Comments and suggestions from these were incorporated into the research priority areas.
 5. Possible research areas raised during the First and Second Scientific Conferences that focused on Agriculture and Climate change respectively, and during the rapid assessment of mountain ecosystems in Morogoro, Arusha, Dodoma, Mbeya and Kigoma were also included. Priority areas identified in EMA (2004) and the Strategy for Urgent Action to Combat Land Degradation and Protection of Water Catchments were also incorporated.
 6. The final draft of the agenda was forwarded to a wider range of stakeholders from the Government, Academic and Research Institutions, Development partners, representatives from the districts and Non-government and Community Based Organisations.
 7. Comments from all the stakeholders were incorporated into the report to produce a document that will be forwarded through the appropriate channels for adoption at the national level.

Chapter 2

THE STRATEGIC CONTEXT OF ENVIRONMENTAL RESEARCH

2.1 Introduction

There are major developments in the strategic context of environmental research in Tanzania which are presenting imperatives, opportunities and challenges for an effective environmental research agenda. These developments are related to the evolving legal, policy and strategy frameworks and international instruments. They are also related to roles, interests and capacities of key stakeholders for implementation of the agenda.

2.2 National Development Vision 2025

The National Development Vision 2025 envisions that Tanzania will have graduated from a least developed country to a middle-income country by the year 2025 with a high level of human development. The nation will attain:

- high quality livelihood
- peace, stability and unity
- good governance
- a well educated and learning society and
- a competitive economy capable of producing sustainable growth and shared benefits

Effective environmental management is one of the most important agents to enable Tanzania achieve its development vision. The requisite environmental management policies, strategies and activities require to be based on sound environmental research focused on well-shared priority areas of need. These needs are related to livelihoods as they are linked to sustainable utilisation of the environment and natural resources.

2.3 National Strategy for Growth and Reduction of Poverty (2005)

The National Strategy for Growth and Reduction of Poverty⁴ MKUKUTA keeps in focus the aspirations of Tanzania Development Vision 2025. It is committed to the MDGs which are internationally agreed targets to reduce poverty, hunger, diseases, illiteracy, and environmental degradation and gender disparities by 2015. It addresses poverty reduction and sustainable development in three broad clusters: (1) growth and reduction of income poverty, (2) improvement of quality of life and social well-being and (3) governance and accountability. Environmental management and research are expected to play a key role in achieving the relevant targets of MKUKUTA especially those related to cluster 2 and which cover the following environmental related issues: health, water, sanitation and waste management (waste management and ecological sanitation), pollution, vulnerability, environmental conservation and disaster management, ecosystems planning and management, environmental risks and energy management.

⁴ URT (VPO); National Strategy for Growth and Reduction of Poverty, June, 2005

2.4 The Strategy for Urgent Action on Land Degradation and Protection of Water Catchment (2006)

The Strategy has provided measures and directions that have to be taken to combat land degradation and protection of water sources in the country. Key challenges that have been highlighted include: i) prevention of environmental degradation due to illegal human activities, ii) limited public awareness on environmental management issues, iii) land use conflicts (agriculture, mining, establishment of protected areas), and, iv) pollution emanating from indiscriminate use of plastics. Different stakeholder Ministries and Institutions are involved in the implementation of short, medium and long-term measures to address these issues.

2.4 National Environmental Policy (1997)

The National Environmental Policy⁵ of 1997 aims at ensuring environmental sustainability, security and equitable use of resources for sustaining the livelihoods of the present and future generations; raising public awareness and understanding of essential linkages between environment and development; promoting individual and community participation in environmental actions; promoting international cooperation on the environmental agenda; and, expanding Tanzania's participation and contribution to relevant environmental bilateral, regional and global organisations and programs, including implementation of treaties.

The policy outlines the six key environmental concerns as land degradation, deforestation, environmental pollution, loss of wildlife habitat and biodiversity, deterioration of aquatic and terrestrial ecosystems, and lack of accessible good quality water. Continued research in these and other relevant areas for better-targeted management interventions is necessary.

2.6 The Environmental Management Act No. 20 of 2004

The Environmental Management Act⁶, No 20 of 2004 underscores the need for research information on the “state of the environment and actual and future threats to the environment, including any emissions to water, air or land as well as disposal and storage of hazardous waste.” This information, apart from being disseminated to the public, should be used to “contribute to the formulation of policies and preparation of action plans and strategies with regard to environmental conservation and management.” Therefore the agenda for environmental research is an important mechanism for implementing the EMA. Furthermore, the Act provides for the establishment of a National Environment Fund to facilitate research, amongst other activities. The Act also requires the appointment of Sectoral, Regional and District Environmental Coordinators.

2.7 Other National Policies and Legislation

Appendix 1 provides an overview of other policies and laws that are relevant to the Agenda for Environmental Research in Tanzania.

⁵ URT; National Environmental Policy, VPO, December, 1997

⁶ See Sections 18(2)(C)172-177

2.8 International Conventions

The Agenda for Environmental Research in Tanzania responds to various International Conventions cited below, of which Tanzania is a signatory:

- The Rio Convention on Biological Diversity and its subsequent Cartagena Protocol on Biosafety
- The United Nations Framework Convention on Climate Change and its subsequent Kyoto Protocol
- The United Nations Convention to Combat Desertification.
- The Stockholm Convention on Persistent Organic Pollutants
- The Convention on the Protection, Management and Development of the Marine and Coastal Environment of the Eastern Region
- The Basel Convention on Transboundary Movement of Hazardous Wastes
- The Rotterdam Convention on Trade of Hazardous Chemicals and Pesticides
- The International Convention for the Protection of Pollution from ships
- The Ramsar Convention on Wetlands
- The International Convention on Oil Pollution preparedness, response and cooperation.

The Rio Convention of Biological Diversity was inspired by the world community's growing commitment to sustainable development at the "Earth Summit". It represents a dramatic step forward in the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of benefits arising from the use of genetic resources.

Tanzania participated at the 1992 Rio de Janeiro *United Nations Conference on Environment and Development* which underscored the need for integration of environmental concerns and economic development and adopted Agenda 21, a comprehensive programme of action forming the basis for a new global partnership to halt and reverse the effects of environmental degradation and to promote sound and sustainable development in all countries.

The action programmes of Agenda 21 include the following priority actions/areas which are relevant to the environmental research in Tanzania: Accelerating sustainable development, integrating the environment and development in decision making, combating poverty, promoting sustainable human settlements development, urban water supplies, solid waste management and sewage-related issues, urban pollution and health, integrated approach to the planning and management of land resources, protection of the quality and supply of fresh water resources, promoting sustainable agriculture and rural development, combating deforestation; and managing fragile ecosystems (desertification; drought; coastal areas).

The UN General Assembly called for a 10-year review of progress achieved in the implementation of Agenda 21 at the Earth Summit in Johannesburg, South Africa, 2002. The review identified key remaining environmental issues as poverty, inadequate access to safe drinking water, poor sanitation, damage to the ecosystems, pollution,

unsustainable production and consumption, inadequate access to decent shelter, inadequate access to modern environmental friendly energy sources, inadequate environmental friendly energy supply for poor people, deforestation, erosion, land degradation, loss of biodiversity, disruption of water flows, and unsustainable tourism.

2.9 The EAC Treaty

The East African Cooperation (EAC) Treaty has a chapter addressing regional issues relating to environment and natural resources. The treaty amongst other things recognizes the importance of research in environmental management. Sub-article (2) of Article 112 of the Treaty calls for the partner states to adopt environmentally sound management techniques to ensure the control of land degradation issues such as soil erosion, desertification and forest encroachment, all of which have direct relevance to research in the maintenance of environment and sustainable livelihood.

2.10 Stakeholders

The key stakeholders of this Agenda are shown in Table 2.2, indicating key interests, constraints and potentials and implications related to environmental research. These stakeholders are:

- Government Institutions
- Research and/or Academic Institutions
- Non Government and Civil Society Organisations
- Private Sector
- Regulatory and Coordinating Institutions
- Development Partners

The outcome of the stakeholders' analysis underscores the fundamental role of linkages and partnerships among the stakeholders under the steering and coordination role of NEMC.

2.11 Key Challenges and Opportunities

The strategic context of environmental research presents important challenges and opportunities for the Environmental Research Agenda development and implementation process.

Challenges

- Low priority accorded on environmental issues in some sectors
- Inadequate capacity (human, financial and infrastructure) for carrying out environmental research
- Reluctance by some stakeholders to allow environmental research for fear of exposure of their bad practices
- Reluctance of some institutions to collaborate and lack of openness
- Inadequate dissemination of environmental research results and their application to improve relevant environmental decisions, policies and standards.

These complex challenges therefore, lead to inadequate environmental research outputs that are very pertinent in informed decision-making process.

Opportunities

- Enactment of the EMA No. 20 of 2004 and a variety of national (other) laws, policies and strategies that promote the need to address environmental concerns/issues.
- Establishment of the National Environment Fund to facilitate research, amongst other activities
- Appointment of Sectoral, Regional and District Environmental Coordinators.
- Need to undertake research for the purpose of enhancing environmental compliance and enforcement.
- Presence of institutions willing to collaborate on environmental research.
- Ratification of international conventions that call for international concern on environmental conservation.
- EMA (2004) provides NEMC with the mandate for co-ordination of environmental research, investigations and surveys in the country.

Chapter 3

VISION, MISSION, OBJECTIVES AND VALUES

3.1 Introduction

The Agenda for Environmental Research is an intended contribution towards efforts aimed at conservation and sustainable development. The agenda provides guidance and motivation for research whose results will make substantial and relevant impacts on formulating policies, action plans and strategies with regards to environmental conservation. It thus aims at promoting informed decision making in the overall development agenda of the country. In achieving this, it focuses on the need to improve research coordination, information sharing as well as prioritising environmental research that enhances growth and reduction of poverty.

The stakeholders which participated in the process of preparing the Agenda – reached consensus on the Vision, Mission, Objectives and Values to guide Environmental Research in Tanzania. They defined Environmental Research as any scientific investigation whose product, results or outcome solves or contributes to solving existing and potential environmental problems.

3.2 Vision

Decisions on sustainable development, growth and poverty reduction in Tanzania increasingly being informed by sound environmentally researched data

3.3 Mission

To facilitate/promote environmental research and ensure that it addresses the priority environmental concerns of Tanzania, links key stakeholders and strives for effective dissemination of its results/findings to inform environmental responses

3.4 Objectives

The key objectives of Environmental Research in Tanzania:

- To facilitate implementation of EMA and the National Environmental Policy of 1997.
- To contribute towards poverty reduction and sustainable development efforts of the country.
- To enhance the country's ability to fulfil its commitments in relevant regional and international agreements.
- To inform environmental and related policy analysis and development.
- To enhance the institutional capacities for research.

- To collect and document information on the environment and natural resources and to make it readily available.
- To facilitate the establishment of the state of environment and make forecast on environmental changes.

3.5 Values

The stakeholders uphold that the following values should guide the conduct of environmental research in Tanzania:

- **Professionalism:** Pursuit of excellence in environment research through rigorous scientific approaches
- **Ethical Standards:** Upholding high ethical standards
- **Applied Research:** Pursuit of research that addresses ‘burning’ environmental problems
- **Stakeholders Involvement:** Ensuring stakeholders involvement in all phases of research design, implementation and evaluation
- **Multidisciplinary:** Pursuing a research approach that recognises environmental issues are complex and require understanding from many different perspectives
- **Coordination:** Striving to promote coordination between research and other stakeholders.
- **Information exchange:** Strive to work towards harmonization of research data
- **Results delivery:** Building mechanisms in the research programmes and projects designed to ensure that the research results reach the people who can benefit from them.
- **Value for Money:** Identification and planning of environmental research programmes and projects should be based on the shared priority areas as reflected in this Agenda document.

Chapter 4

PRIORITY RESEARCH AREAS

4.1 Introduction

The priority research areas highlighted below evolved after lengthy consultations with stakeholders of environmental research in the country. These included NEMC staff, members from research and training institutions, district officials and villagers from ten selected districts in the country. Furthermore, pertinent research issues that were raised during the two Scientific Conferences⁷ that were organised by NEMC and challenges that were posed by the Honourable Minister of State, Vice President's Office (Environment) pertaining to climate change issues were also included among the priority areas for research in the relevant sections.

During the discussions with stakeholders it was agreed that some of the issues are cross-cutting and have to be addressed during the implementation of different research activities. It was also resolved that specific sectoral issues will be addressed by the relevant sectors.

4.2 Cross-Cutting Issues

During the consultative workshop, some of the issues were found to be of importance and have to be addressed in all aspects of research and development. These are:

- Trans-boundary Environmental Issues
- Sustainable Utilisation of Natural Resources
- Biotechnology and Environment
- Environmental Governance, Planning, Monitoring and Assessment
- Environmental Information Management
- Gender issues

4.3 Priority Areas

In addition to the aforementioned crosscutting issues, environmental research in Tanzania needs to focus on the following specialised priority areas:

- Sustainable Land Use and Conflict Management
- Mining, Energy and Environment
- Integrated Water Resource Management
- Environmental Economics
- Poverty and Environment
- Climate Change and Vulnerability
- Aquatic Ecosystems and Biodiversity
- Terrestrial Ecosystems and Biodiversity
- Social and Cultural Aspects of Resource Management
- Integrated Pollution Prevention and Waste Management

⁷ The 1st Scientific Conference focused on Agriculture, Environment and Poverty Eradication, whereas the 2nd focused on the Climate Change Challenges Faced by Tanzania

4.3.1 Sustainable Land Use and Conflict Management

The ever-increasing demand for land has ultimately led to its unsustainable utilisation and land degradation. While, the country's economic growth depends highly on income from land-based activities (agriculture, tourism, mining and forestry), all these depend on enhanced ecosystems functions and services like water supply and recycling, nutrients cycling, food production, decomposition of organic wastes as well as micro climate regulation.

However, to date there is little information on land use status and trend. For instance, though drought and desertification have been observed since 1920s, little quantitative data on the extent of land degradation exist in Tanzania (NCSSD⁸, 1994). Research is therefore needed to analyse and document different types of land use, to determine the geographical location, extent and root causes of land degradation, and hence promote its sustainable use in order to minimise conflicts over resources.

Priority Research Themes

- Land use and land cover change
- Land resource inventory and evaluation
- Restoration of degraded land
- Agricultural systems, animal husbandry practices and sustainable land management
- Impacts of forest fires on land degradation
- Land use conflicts
- Land policy, tenure, right of access and use
- Impacts of land use systems on biodiversity
- Status and utilisation of non timber forest resources
- Access and benefit sharing versus commercialisation of land-based resources
- Population dynamics and land resource management

4.3.2 Mining, Energy and the Environment

Tanzania has a great potential for mining gold, base metals, diamonds, ferrous minerals and a wide variety of gemstones, some of which are unique such as tanzanite. Coal, uranium, and various industrial minerals such as soda, kaolin, tin, gypsum, phosphate and dimensional stones are available at attractive economic rates.

A number of artisanal miners are heavily involved in the mining of minerals such as gold, and gemstones such as tanzanite. However, these use very crude extraction techniques thus resulting in pollution of water and land degradation, without any plans for restoration of degraded areas. Examples include the degraded areas due to mining of gold and tanzanite in Amani Nature Reserve in Tanga and Simanjiro, respectively.

The country is also endowed with tremendous amounts of biomass resources in the form of forest and agricultural residues. Other sources that include water, thermal, wind and gases do exist and in combination, produce a significant amount of energy for

⁸ National Conservation Strategy for Sustainable Development

development activities. Tanzania's energy consumption is estimated at 15 million tonnes of oil equivalent. Of this, wood fuels (fuel wood, charcoal and agricultural residues) account for 92%, while electricity and petroleum products account for 0.8 and 7.2% of primary consumption, respectively (United Republic of Tanzania, 2003). This high dependency of biomass energy creates enormous pressure on the forest ecosystems. Charcoal burning and tree cutting to meet energy demand accelerates the rate of deforestation thus influencing CO₂ emissions to the atmosphere.

Poverty influences energy choices and consumption at household level. Poor households look for cheap energy sources, which in most cases are not environmentally friendly. Untapped potentials on biomass conversion to electricity and energy for domestic and industrial uses, and the use of coal and natural gas for the same justify investing on research and development in order to prevent further dependence on forest resources. Research results will also provide avenue for scientific and economic analysis to support and inform policies and decision-making processes.

Priority Research Themes

- Biomass energy conservation
- Alternative and renewable sources of energy (bio-fuels such as ethanol, jatropha and sugarcane)
- Efficient production and use of energy technologies
- Indoor air pollution and energy sources
- Commercialization of environmentally friendly technologies
- Socio-cultural aspects of energy management
- Impacts of energy production and use on environment and livelihoods
- Land restoration and mine decommissioning
- Gender, poverty and energy management
- Impacts of mining and extraction technology on environment and livelihoods

4.3.3 Integrated Water Resource Management

Good water quality is important for all life forms. Tanzania aims to provide her urban and rural population with clean and safe drinking water, by protecting water sources and preventing environmental pollution. More than 40% of Tanzanians still use unprotected sources of drinking water such as surface water (rivers and lakes), springs and shallow wells (HBS⁹, 2002). Most of the studies on water quality and pollution have been carried out in the coastal cities, towns and on large water bodies such as Lake Victoria and Lake Tanganyika. Studies have shown that the quality of coastal waters in most parts of the country is relatively good, with the exception of water bodies fronting major cities and towns of Dar-es-Salaam, Tanga, and Zanzibar (TCMP¹⁰, 2003), whereas studies on the Lakes Tanganyika and Victoria have shown that pollution from industrial and municipal wastes, as well as runoff of chemicals from farming activities are greatest sources of

⁹ Household Budget Survey

¹⁰ Tanzania Coastal Management Partnership

contamination (Nkotagu, 2005). However, these are only a few water bodies that have been studied. Hence, research is needed to generate baseline information on the impact of these wastes on the water quality.

Apart from water quality issues, its availability is also of great concern as this important resource must also be shared among the existing life forms on the one hand, and utilisation for agricultural production and hydroelectric uses on the other. A typical example is that of Ruaha, where unsustainable and unmonitored utilisation of the water has led to the drying of Great Ruaha and the decrease of water levels within the Usangu plains and Ruaha National Park (The Ruaha Water Programme, 2006). Furthermore, most of the arid and semi-arid areas of the country suffer from frequent droughts, resulting into crop and livestock losses and consequent hunger and poverty. Catchments protection and rainwater harvesting measures are therefore urgently required to ensure that the little available water is properly conserved and utilized during the drought period.

Priority Research Themes

- Water supply and sanitation
- Assessment of water resources (quality and quantity)
- Indigenous technology in water management
- Impacts of human settlement and activities on water resources
- Rainwater harvesting systems
- Desalination options
- Pollution and water related diseases (e.g. cholera)
- Assessment and management of water catchments
- Water treatment technologies and recycling
- Management of trans-boundary water bodies
- Value enhancement of water resources

4.3.4 Environmental Economics

Good environmental management has an impact on the economy. It is therefore pertinent that balance is achieved between environmental sustainability and other socio-economic development goals. Without the economy, most environmental issues are simply research questions of concern to chemists or biologists and have no policy significance.

For most goods and services in a modern economy, we rely on markets to match producer costs with consumer demands in order to yield the 'right' amount of resource extraction. However, in most cases markets do not work to yield the socially desirable amount of resource extraction and cannot ensure its sustainability (Kolstad, 2000). This illustrates the extent to which environmental economics can play a major role towards providing some of those answers.

It is in this context that proper accounting of resources is required in order to make informed decisions on the extent of utilisation of such resources, and available options and priorities when planning for development interventions.

Priority Research Themes

- Environmental accounting and valuation
- Environmental economic instruments (market based and fiscal)
- Costing of environmental management interventions
- Trade and environment (Intellectual Property rights, WTO-TRIPS, bio-prospecting and eco-labelling)
- Ecological economics (footprints)
- Mainstreaming environment in socio-economic development

4.3.5 Poverty and Environment

The livelihoods of people and economic development depend either directly or indirectly on sustainable utilisation of resources and good environmental management. Hence it is pertinent that poverty eradication efforts address aspects of environmental management in development plans. There is hence, need to undertake research to get a clear understanding of poverty-environment linkages, and how sustainable development can be achieved with good environmental management, in line with the MKUKUTA goals highlighted in Section 2.3¹¹.

Priority Research Themes

- Vulnerability to natural and man-made disasters
- Monitoring through established poverty-environment indicators
- Decision support tools for assessment of poverty-environment linkages
- Indigenous knowledge and adaptation to environment
- Gender and resource management
- Health and Environment (focus on HIV/AIDs, cholera and malaria)

4.3.6 Climate Change and Variability

Climate change is a global phenomenon that is attributed directly or indirectly to anthropogenic activities, thus resulting in the change of composition of the global atmosphere (IPCC¹², 2001). It has been observed that in the last 150 years these activities have caused an increase of CO₂ emissions and an increase of temperature of about 0.3⁰C to 0.6⁰C. Studies at global level have predicted climate change impacts to cause frequent droughts and floods, sea level rise, change in disease patterns and alteration of ecosystem; thus affecting the existing ecological balance

Climate change predictions have been extensively carried out in Tanzania but most of the studies have focussed on GHG¹³ emissions and their removal (Mwandosya *et al.*,

¹¹ National Strategy for Growth and Reduction of Poverty

¹² Intergovernmental Panel on Climate Change

¹³ GreenHouse Gases

1998; VPO, 2003). Apart from studies carried out at industry sector, there is scanty information on other sectors such as agriculture, tourism and health. More research is therefore required in order to develop mitigation and adaptation measures at different levels in line with what has been proposed in the National Adaptation Programme of Action on Climate Change (2006).

Priority Research Themes

- Impacts of climate change on (agriculture, health, tourism, land use and energy) sectors and their cross-sectoral linkages in ecosystems sustainability
- Linkages between climate change and climate variability
- Systematic observation of changes in climate and detection of trends and cycles
- Vulnerability to climate change impacts
- Carbon Emission Trading: Challenges and opportunities for development
- Adaptation mechanisms in the context of Tanzanian communities
- Cultural aspects and gender impacts on climate change

4.3.7 Management and Monitoring of Aquatic Ecosystems

Marine and freshwater resources contribute significantly to the national income. Furthermore, wetlands as part of aquatic ecosystems have several ecological functions that sustain the environment in general, e.g. ground water recharge, flood control, toxicant retention, microclimate stabilization, and produce a number of biological resources that are vital for socio-economic development such as fish and papyrus (BCS¹⁴, 1998).

Taking into account the flora and fauna of aquatic systems, major threats to loss of marine and freshwater biodiversity include aspects such as coral bleaching, industrial and domestic pollutants, oil spills, destructive fishing and overexploitation of marine resources. It is estimated that about 50% of the listed fish species are threatened, including a number of endemic species (BCS, 1998). Furthermore, very little studies have been carried out on marine mammals, and world-rare species such as *Coelacanth*, which are found in the country. All these factors warrant further studies in order to have sound information for their management.

Priority Research Themes

- Assessment of keystone marine ecosystems (mangrove, estuaries, seagrass bed, coral reefs), and their biodiversity
- Management and restoration of freshwater systems (with emphasis on critical habitats)
- Aquaculture development, environment and livelihoods
- Species of ecological importance (indicator, exotic) in marine and fresh water ecosystems
- Impacts of impounding water (dams, diversions, etc) on aquatic ecosystems

¹⁴ Biodiversity Country Study

- Impacts of coastal and shoreline development (tourism, infrastructure, dredging, industries and human settlements) on the environment and livelihoods
- Indigenous Knowledge Systems and sustainable utilisation of aquatic resources
- Invasive species in aquatic ecosystems
- Loss and stability of aquatic biodiversity
- Aspects of bio-prospecting and bio-piracy

4.3.8 Management and Monitoring of Terrestrial Ecosystems

Terrestrial ecosystems form an integral part of the natural environment that comprise of the ecological processes taking place in the biosphere. These ecosystems sustain the livelihoods of Tanzanian communities and support the country's economic development at large.

From lowland grasslands to mountain forests Tanzania has a rich and diverse spectrum of fauna and flora, and a wide variety of other biological resources (BCS, 1998). The country has important populations of wildlife that attract a number of tourists in the country. These include, among others, the endangered large mammals such as the wild dog, black rhinoceros, chimpanzee, cheetah and the African elephant. Most of these are protected in the national parks and game reserves. There are also a number of terrestrial vertebrates and invertebrates that are unique to the natural forests such as those found in the Eastern Arc Mountains. Examples include the spray toad (*Nectophrynoides asperginis*) found in Udzungwa Mountains, butterfly species *Hypolimnys antevorta* in the Usambara Mountains, and the Mangabay monkey *Lophocebus kipunji* in the Southern highlands. Furthermore, there are several floral endemic species of Southern Highlands, and species of medicinal value that are of interest to local practitioners and medical scientists found all over the country. There is hence a need to carry out further research in order to ensure sustainable utilisation of these important terrestrial species for socio-economic development and improved human well-being.

Priority Research Themes

- Anthropological activities and terrestrial ecosystems
- Wildlife corridors and dispersal areas
- Assessment of critical terrestrial habitats (e.g. mountain ecosystems, refugia, riverbanks) and their management
- Participatory systems of conservation
- Invasive and alien species
- Species of ecological importance to the terrestrial ecosystems (Indicator, exotic)
- Indigenous Knowledge Systems and sustainable utilisation of terrestrial resources
- Invasive species and terrestrial ecosystems
- Loss and stability of terrestrial biodiversity
- Dynamics of species introduction
- Aspects of bio-prospecting and bio-piracy

4.3.9 Socio- cultural Aspects in Resources Management

There are a number of social and cultural aspects that are key to sustainable utilisation of the existing resources. For example the influx of refugees from neighbouring war-affected countries has significant negative impacts on the environment and the existing social framework in the host communities (UDSM¹⁵, 2003). There are also a number of social and cultural norms and values that govern sustainable utilisation of natural resources in some communities. These must therefore be studied and documented for future use in the planning process.

Priority Research themes

- Indigenous knowledge in relation to resources management
- Success and failures of social-cultural aspects in environment and natural resource management
- Environmental ethics and natural resources management
- Effective dissemination of social-cultural research finding on environmental management
- Social-cultural aspects in Environmental Governance and policies

4.3.10 Integrated Pollution Prevention and Waste Management

Pollution has become a world phenomenon and has increased dramatically in volume as the size of world industrial output expands. Furthermore, the rise in the volume of world trade has increased the likelihood of industrial and chemical accidents that cause serious environmental degradation such as the major disasters that have occurred in the nuclear plants and during transportation of petroleum products (Jorgensen and Sen, 1989).

In Tanzania, sources of pollution include municipal and industrial waste, emissions from petroleum products, improper use of agrochemicals and plastics. However, the status of pollution in urban and rural communities is not well understood. In view of these, pollution control and waste management research is very important as it will contribute to the establishment and adoption of environmental standards, which are essential to the monitoring of waste emission/discharge and law enforcement. Research results will help to make informed decisions that target priority sources for sustainable development programmes.

Priority Research Themes

- Air quality assessment and management
- Solid waste management (domestic waste, plastic, used values, etc.)
- Noise pollution assessment and management
- Status of agro-chemicals pollution (herbicides, fertiliser, pesticides)
- Solid waste management, (electronic equipment, radioactive materials, heavy metals, medical waste, etc).
- Liquid waste management (domestic sewage, industry effluent)
- Water recycling

¹⁵ University of Dar-es-Salaam

- Trans-boundary aspects of pollution
- Risk assessment and management
- Policies and regulations related to pollution and waste management

Chapter 5

IMPLEMENTATION FRAMEWORK

5.1 Overall Collaboration and Coordination of Research Activities

NEMC has the mandate to undertake and coordinate environmental research and therefore keen interest in seeing a fruitful implementation of the Research Agenda. Formulation and implementation of research programmes, projects and activities will, however, be the responsibility of research institutions or institutions with mandate for undertaking environmental research.

NEMC will provide leadership in the dissemination of environmental research findings in the country, principally through:

- Regular Scientific Conference(s) – currently biennial
- An Environmental Research Website backed by an e-Library
- Facilitation of publications of research articles in scientific journals (e.g. Environmental Research Journal, etc.)
- Other popular means of communication e.g. radio programmes (including local radio stations), magazines, leaflets, newsletters, etc
- Facilitation of publications of research articles in scientific journals
- Publication of environmental research in books

Furthermore, NEMC will design and implement modalities for collection of environmental information from the various research institutions so that the information will be easily available for packaging and dissemination.

5.2 Environmental Research Advisory Committee

For purposes of coordination of Environmental Research, there will be an Environmental Research Advisory Committee. This body will provide advice to NEMC and other stakeholders on how to strengthen environmental research coordination. The composition of the committee will be drawn from partner research institutions, Government and Civil Society.

The Committee will consist of eleven (11) members drawn from the following institutions:

- a. Director General - NEMC
- b. One representative from the VPO – Ministry responsible for the Environment
- c. One representative from the PMO – Ministry responsible for Regional Administration and Local Government
- d. One individual from Government of Zanzibar – Ministry responsible for the environment
- e. One representative from COSTECH
- f. Four representatives from the Research and Academic Institutions

- g. Two prominent individuals with environmental research interests from the Civil Society

The duration of the committee will be three years and will be chaired by an individual who will be chosen among them, excluding the Director General of NEMC, while the Directorate that is responsible for research will play secretarial role. The committee may also co-opt any member depending on the issues that will be discussed.

The main functions of the Environmental Research Advisory Committee (ERAC) will be:-

- To advise on the implementation of the Agenda for Environmental Research
- To propose reviews of the Agenda
- To promote the Research Agenda
- To assist in environmental research fund raising activities
- To assist in scrutinizing research applications – for funds mobilised by NEMC;
- To advise on any other emerging research issues.

5.3 Sector/Regional – Environmental Research Focal Points

Sector Ministries and Regions will establish Environmental Research Focal Points – to, among other things, coordinate Environment Research activities/issues within their respective sectors and regions and serve as a link with NEMC on the implementation of NERA.

5.4 District - Environmental Research Focal Points

Officers responsible for Environmental Management in the Local Government Authorities will also be the Environmental Research Focal Points. The main role of the Focal Points will be to coordinate and promote environmental research activities at the respective Council and to link with NEMC on the implementation of the National Environmental Research Agenda.

5.5 Environmental Research Institutions - Focal Points

All institutions active in environmental research will designate Environmental Research Focal Points which will be the link with NEMC on the implementation of the National Environmental Research Agenda.

5.6 Networks of Civil Society Organisations, Private Sector Organisations and Professional Bodies

All networks of Civil Society Organisations, Private Sector Organisations and Professional Bodies deemed to have significant stake in environmental research will be requested to designate Environmental Research Focal Points that will be the link with NEMC on the implementation of the National Environmental Research Agenda.

5.7 Environmental Scientific Conferences

NEMC with the support of ERAC will organise regular scientific conferences. The conferences will provide a forum for stakeholders to receive and deliberate on the research activities done by scientists and stakeholder institutions; and provide strategic feedback on the management of environmental research in the country in line with the Research Agenda.

5.8 NEMC Environmental Research Programme (NERP)

In addition to research programmes and projects initiated and implemented by other institutions, NEMC will establish an “Environmental Research Programme” focussing on the Agenda and mobilise funds for its implementation. Implementation of the programme will either be through competitive application for funds by research institutions and individual researchers or direct commissioning by NEMC. The following criteria will provide guidance in granting research funding under the programme:

- The research topic must address a priority environmental research theme which is in this Agenda;
- The research proposal must be scrutinised by the ERAC and approved;
- The research proposal must focus on, among other things, improving the livelihoods of communities and sustainable management of the environment (See MKUKUTA);
- The research proposal must clearly show the methodology/methodologies;
- The research must show mechanisms for Monitoring and Evaluation including indicators.

NEMC will develop detailed operational policies and procedures to guide funding, implementation and monitoring of research activities under the NERP.

5.9 Monitoring and Evaluation

NEMC will develop a Monitoring and Evaluation (M&E) system for the Research Agenda. The system will be designed in such a way as to ensure effective and efficient implementation of the Research Agenda and the sustainability of the intended impacts. The system will be instituted as a review mechanism to monitor the progress and assess outcomes compared to the original objectives, targets or expectations.

The system will include a standardized data reporting format to be filled annually by research institutions. The reported data will be used to produce monitoring reports that will be shared at various stakeholders’ fora. Additionally, implementation of the Agenda will be evaluated every three years. The monitoring and evaluation reports will provide inputs into the process of reviewing the Agenda.

5.10 Review and approval of the Agenda

The Research Agenda will be reviewed after 3 years. The review will be undertaken at three levels.

- An Internal Review by NEMC working with stakeholders
- An External Review by the NERAC
- Approval by NEMC Board.

Chapter 6

RESOURCES AND SUSTAINABILITY STRATEGIES

Human, financial, information and facilities are among the most important resources for sustainable implementation of the Research Agenda.

6.1 Human Resources

Several stakeholder institutions have different categories of scientists carrying out research on different environmental issues. Institutions such as universities have colleges, faculties, institutes and bureaux with qualified staff members in different fields of environmental management. These institutions will be encouraged by NEMC to direct their research activities at the priorities defined in the Agenda. Furthermore, NERAC will identify capacity building needs in implementing the Agenda and advise stakeholders accordingly in order to address them.

6.2 Facilities

Within the country, there are facilities that can be accessed to carryout different environment-related researches. These include laboratories, libraries and databases spread across stakeholder institutions in the country. NEMC will coordinate efforts to document and make available, on a regular basis, information of the research facilities and where available and how to access them.

NEMC has developed a website that will serve as a tool for information exchange. However, the Council continues to use its library as a major resource centre. Relevant information and tools are available such as EIA regulations, procedures and guidelines, draft air quality and waste-water standards, awareness materials, state of the environment reports, environmental references and other publications.

6.3 Financial Resources

There are different avenues that may be used to access funds for implementing the Research Agenda. These include:

1. Environmental Trust Fund. One of the objectives of establishing the Trust Fund is to facilitate research intended to promote sound environmental management. Hence, a mechanism will be put in place to ensure that some of the funds are allocated for research purposes.
2. Influencing budgetary allocation to research by the government resource allocation framework. Currently it is through the Public Expenditure Review and MTEF.
3. Collaborative Research Funding with stakeholder Institutions within and outside the country.
4. Support from Development Partners, and
5. Demand driven or solicited support of the private sector

Others avenues through which NEMC can access funds for research may include: fees that may be charged and payable to the Council, income generated by any project financed by the council, and any other lawful sources of income such as donations, gifts, grants, and loans.

NEMC will develop and implement strategies to maximise on the aforementioned potential avenues for financial resource mobilisation. These include:

- Development partners' conferences
- Targeted fund raising activities
- Lobbying to members of parliament and other pressure groups interested in environmental issues

It is expected that, guided by the Research Agenda stakeholders of environmental research will continue to look for financial resources to implement research activities in line with their mandates. NEMC, on its part, will coordinate efforts to sensitise the Government, private sector and the development partners to provide resources for implementing the Environmental Research Programme through the competitive schemes cited earlier on.

6.4 Linkages with other Institutions

The sustainability of research will be enhanced through partnering and collaboration with relevant institutions at national, regional and international levels. Commissioning of research to capable institutions is another way of attaining sustainability in environmental research.

In this regard, NEMC will work closely with other stakeholder institutions in this area (see stakeholder analysis).

Consequently, spatial and attribute data sharing will be promoted among various research institutions. However, there is going to be a need for community participation through collaboration with local government authorities. There are also great opportunities for international cooperation

BIBLIOGRAPHY

1. CENTRE FOR STUDY OF FORCED MIGRATION. 2003. The Impact of the Presence of Refugees in North-western Tanzania. University of Dar-es-Salaam. Commissioned by Africare, Concern, Oxfam GB and Tanzania Christian Refugees Services.
2. DASGUPTA, P. 2001. Human Well-Being and the Natural Environment. Oxford University Press.
3. ENVIRONMENTAL MANAGEMENT ACT. 2004
4. HOUSEHOLD BUDGET SURVEY. 2002
5. JORGENSEN, S.E. AND SEN, J. 1989. Principles of Environmental Science and Technology. ELSEVIER.
6. NATIONAL ENVIRONMENT MANAGEMENT COUNCIL. 2005. Five – Year Strategy for 2004/05 – 2008/09
7. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE. 2001. United Nations Framework Convention on Climate Change (UNFCCC).
8. MINISTRY OF NATURAL RESOURCES AND TOURISM. 1998. The National Wildlife Policy.
9. KOLSTAD, C. D. 2000. Environmental Economics. Oxford University Press.
10. KOZIELL, I. AND SAUNDERS, J. (eds). 2001. Living Off Biodiversity: Exploring Livelihoods and Biodiversity Issues in Natural Resources Management. International Institute for Environment and Development (IIED), London.
11. MWANDOSYA, M. J, NYENZI, B. S. AND LUHANGA, M. L. 1998. The Assessment of Vulnerability and Adaptation to Climate Change Impacts in Tanzania. Centre for Energy and Environment, Tanzania (CEEST).
12. NATIONAL BUREAU OF STATISTICS. 2002. Household Budget Survey.
13. NKOTAGU, H. 2005. Management of Shared Ecosystems: The Case of Lake Tanganyika. Paper Presented at the Workshop on Ecosystems Assessment, Tanga.
14. OZONE ACTION NEWSLETTER NO. 40. 2001.
15. TANZANIA COASTAL MANAGEMENT PARTNERSHIP. 2003. State of the Coast Report: The National ICM Strategy and Prospects for Poverty Reduction. Coastal Management Report #2002.
16. TANZANIA ELECTRICITY SUPPLY COMPANY. 1999. Kihansi Catchment Management Plan Project. Final Report, April 1999. Prepared by NORPLAN.
17. RUAHA WATER PROGRAMME. 2005. www.wwf.org.uk/filelibrary/pdf/ruaha/pdf.
18. UNITED REPUBLIC OF TANZANIA. 2003. Initial National Communication Under the United Nations Framework Convention on Climate Change (UNFCCC). Vice President's Office.
19. UNITED REPUBLIC OF TANZANIA. 1998. Tanzania Country Study on Biological Diversity. Vice President's Office/UNEP/GEF/NORAD.
20. UNITED REPUBLIC OF TANZANIA. 1994. The National Conservation Strategy for Sustainable Development. Vice President's Office.
21. UNITED REPUBLIC OF TANZANIA. The National Development Vision 2025.

22. UNITED REPUBLIC OF TANZANIA. 2005. The National Strategy for Growth and Reduction of Poverty. Vice President's Office.
23. VAN DER WEERD, V. 2004. Guidelines on Municipal Wastewater Management. UNEP/WHO/HABITAT/WSSCC.
24. VAN HOREN, D. J. M., LEMMENS A. M. C. and KATIMA, J. H. Y.. 1998. Studies in Environmental Science 33.
25. VICE PRESIDENT'S OFFICE. 1997. The National Environmental Policy.
26. VICE PRESIDENT'S OFFICE. 2006. The National Adaptation Programme on Climate Change.
27. NATIONAL ENVIRONMENT MANAGEMENT COUNCIL (2006). Second Scientific Conference on Environmental Sustainability in Tanzania - Implications of Climate Change Held on January 23rd – 26th, 2006. Kilimanjaro Crane Hotels, Moshi, Tanzania
28. NATIONAL ENVIRONMENT MANAGEMENT COUNCIL (2005). FIRST Scientific Conference on Environmental Sustainability in Tanzania – Agriculture, Environment and Poverty Eradication Held September 28 – 30, 2004. White Sands Hotel, Dar Es Salaam, Tanzania
29. The Environmental Management Act. 2004. www.parliament.go.tz
30. URT 2005. The National Strategy for Growth and Reduction of Poverty, Tanzania.

Appendix 1: Other National Policies and Legislation pertaining to environmental management

	Objectives related to Resource Conservation and Management	Relevance to the Research Agenda Process
Policies and Strategies		
National Tourism Policy (1999)	Describes overall environmental, social, economic and cultural objectives, as well as specific policy strategies, with respect to tourism development in Mainland Tanzania, including coastal tourism.	Raises issues related to eco-tourism and cultural tourism, including general principles for development with respect to development planning, environmental protection, impact assessment, and community participation.
National Water Policy (2002)	Addresses issues related to water resources management, rural water supply and urban water supply and sewage	Key issues include lack of accessible, good quality water for both urban and rural inhabitants and deterioration of aquatic systems and its impact on biodiversity as well as water pricing.
The National Energy Policy (2003)	Aims at ensuring availability of reliable and affordable energy supplies and their use in a rational and sustainable manner in order to support national developments	Raises issues of efficient energy production, procurement, transportation, distribution and end-use systems in an environmentally sound and sustainable manner
National Fisheries Sector Policy and Strategy Statement (1997)	Policy and strategy statements with respect to the conservation, management and development of fish resources.	Policy support for the conservation and protection of the environment related to fish resources.
National Integrated Coastal Environment Management Strategy (2003)	Describes principles and attributes of ICM, rationale for a national ICM strategy, and statements of overall vision, mission, goal and strategies.	Defines strategies and implementing mechanisms for ICM with significant emphasis on research and monitoring
Forestry Policy	Provides for the conservation and management of forests, including mangrove and other coastal forests.	<ul style="list-style-type: none"> Describes the development and implementation of management plans, community-based forest management (CBFM) (including both Village Forest Reserves, Community Forest Reserves), and permitting and licensing of forest uses.
National Health Policy (1990)	Ensures the availability and accessibility of health services to all, raise awareness on the role of communities in environmental sanitation, and enhance sustainable utilisation of traditional medicines.	Environmental health is diverse and multisectoral, as such it ought to be delivered and assessed on scientific principles by all stakeholders, supported by strong research findings.

	Objectives related to Resource Conservation and Management	Relevance to the Research Agenda Process
Policies and Strategies		
Agriculture and Livestock Policy (1997)	Aims at promoting integrated and sustainable utilisation of natural resources such as land, water and vegetation	Aims to provide a mechanism for addressing environmental issues emanating from agriculture related activities such as land degradation, pollution from pesticides and irrigation.
National Land Policy (1995)	Aims to promote sustainable utilisation of land resources without endangering the ecological balance of the environment	Aims to set mechanisms for protection of areas of ecological importance such as water catchment, beaches, wildlife migration routes and biodiversity hot spots.
Sustainable Industrial Development Policy (1996)	The policy guides the industrial sector to enhance sustainable competitive technological progress by promoting sound environmental management.	Attention is being paid on carrying out Environmental Impact Assessment (EIA) and propagating efficient use of raw materials and energy, elimination of toxic or dangerous materials as well as reduction of emission and wastes at sources.
The Mineral Policy of Tanzania (1997)	Aims at ensuring sustainable economic and social development, and contribute towards poverty eradication strategy	Initiates action to eliminate adverse environmental effects of mining, to improve health and safety conditions in mining areas and address social issues affecting women. Sets strategies for environmental protection through EIA and improving environmental awareness through media
Science and Technology Policy	Aims at promoting advances in technology	Promotes the use of science and its tools for better management of environment
Legislation		
Marine Parks and Reserves Act (1994)	Provides for the establishment, management and monitoring of marine parks and reserves.	Consultative process established for the establishment and management of marine protected areas. Research and monitoring related to the marine parks and reserves is an important need for effective management of these fragile resources.
Fisheries Act No. 22 (2003), and Regulations	Provides for protection, conservation, regulation and control of fish, fish products, and aquatic flora and fauna and its products.	Raises key issues as management and enforcement of fishing, aquaculture development, and conservation of fish and fish habitat.
Land (Amendment	Provides for basic law in relation to land and its	Addresses issues of sustainable use and management of land under

	Objectives related to Resource Conservation and Management	Relevance to the Research Agenda Process
Policies and Strategies		
Act No. 2 (2004), Land Act No. 4 (1999)	management	different categories of use
Mining Act No. 5 (1998)	Principal legislation pertaining to the management of all mining activities to ensure that environmental management procedures are in place	Issues such as those related to pollution, use of proper technologies are being used for mining must be addressed to ensure environmental sustainability
Atomic Energy Act (2003)	Relates to safe use of atomic energy and nuclear technology	

Appendix 2: Environmental Research Stakeholder Analysis

Stakeholder	Interests	Constraints	Strengths/Potential	Implications
Ministries (Environment, Agriculture, Mining, Natural Resources, Industries, Health)	<ul style="list-style-type: none"> • Information exchange • Preparation of environmentally sound policies, laws and regulations • Implementation of Environmental Conventions and Protocols 	<ul style="list-style-type: none"> • Inadequate follow up on implementation of laws and regulations • Inadequate research funds • Inadequate infrastructure for research • Lack of openness • Environmental research not a priority 	<ul style="list-style-type: none"> • Avenues for funding environmental research 	<ul style="list-style-type: none"> • Enhance compliance with Environmental Policies and Legislation
Research and Training Institutions (ARI, TAFORI, TAFIRI, TAWIRI, NIMR, IRA, UDSM, SUA, CAWM)	<ul style="list-style-type: none"> • Biodiversity Conservation • Research and training on sustainable management of natural resources • Dissemination of environmentally sound technologies • Services to the public (consultancy) 	<ul style="list-style-type: none"> • Inadequate funding • Political backup • Specially requested equipment/ facilities 	<ul style="list-style-type: none"> • Highly trained manpower (professors etc PhD holders) • Abundant resources • Motivated research assistants • Well structured training programmes at Masters, PhD, and undergraduate which can be used fairly well in research. 	<ul style="list-style-type: none"> • Sustainable resource management • Income generation and poverty reduction • Coordination with NEMC and other Governmental and non-governmental organisations • Two way interactions with other stakeholders
Civil Society Organisations (ENVIROCARE, AHEEDT, JET, CEEST, TEMCO, TaTEDO)	<ul style="list-style-type: none"> • Users of environmental research information • Dissemination of research information to communities • Advocacy of policies on sustainable utilization of natural resources 	<ul style="list-style-type: none"> • Financing of activities • Low capacity to disseminate environmental research information • Competition from new institutions that are now in place 	<ul style="list-style-type: none"> • Collaboration in research and development of environmentally sound technologies • Effective dissemination of technologies, policies and regulations on environmental 	<ul style="list-style-type: none"> • Due to financial and human resources constraints it is very difficult to carry out/ executive many projects at one time. • Projects are executed on first come, first served

Stakeholder	Interests	Constraints	Strengths/Potential	Implications
			management	basis.
Private Sector Organisations	<ul style="list-style-type: none"> • Compliance with international and national regulations • Application of research findings to improve business performance • Carrying out commissioned environmental research 	<ul style="list-style-type: none"> • Limited research capacity • Investment in research not a priority 	<ul style="list-style-type: none"> • Can fund research and capacity building 	<ul style="list-style-type: none"> • To develop the private sector as partners in environmental research
Primary Resource users (communities/ villagers)	<ul style="list-style-type: none"> • Sustainable use of natural resources • Utilisation of research findings 	<ul style="list-style-type: none"> • Little knowledge on conservation techniques • Research findings not disseminated to resource users 	<ul style="list-style-type: none"> • Willingness to utilise research findings and disseminate to others 	<ul style="list-style-type: none"> • To ensure effective dissemination of environmentally friendly technologies
Regulatory and Coordinating Institutions (NEMC, NLUPC, COSTECH, CCP, OSHA, EWURA, NBS, SUMATRA, GCLA, TFDA)	<ul style="list-style-type: none"> • Promotion of science and technology for sustainable development • Joint enforcement of environmental standards 	<ul style="list-style-type: none"> • Inadequate coordination of environmental research activities and information sharing • Limited resources 	<ul style="list-style-type: none"> • Willingness to promote research • Mandate to undertake research 	<ul style="list-style-type: none"> • Dissemination of environmental research findings • Joint research leading to development of environmental standards • Enhance capacities for research data synthesis

Stakeholder	Interests	Constraints	Strengths/Potential	Implications
				and feedback to decision makers in environmental management stakeholder institutions
Development Partners (UN Organisations, DANIDA, FAO, NORAD, UNEP, SIDA, Bilateral partners)	<ul style="list-style-type: none"> • Advocate and promote sustainable resource utilisation • Using development programmes as avenues for environmental research development 	<ul style="list-style-type: none"> • Sometimes there are differences in the priority areas accorded in environmental research • Influence of International policies • Driven by own guidelines and policies 	<ul style="list-style-type: none"> • Willingness to support environmental research • Willingness to support capacity building at different levels 	<ul style="list-style-type: none"> • Need to be well informed about the Agenda for Environment Research in Tanzania • Need a strategy for accessing environment research support from the development partners