

**THE UNITED REPUBLIC OF TANZANIA**



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**NATIONAL IMPLEMENTATION PLAN (NIP) FOR  
THE STOCKHOLM CONVENTION ON PERSISTENT  
ORGANIC POLLUTANTS (POPs)**

**VICE PRESIDENT'S OFFICE  
DIVISION OF ENVIRONMENT**

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## **PREFACE**

Persistent Organic Pollutants (POPs) present unique challenge as they persist in the environment, bioaccumulate in fat tissues of living organisms and pose risks of adverse effects to human health and the environment.

The Stockholm Convention on POPs entered into force in May 2004 and Tanzania ratified it on 30 April 2004. The objective of the Convention is to protect human health and the environment from persistent organic pollutants starting with an initial list of 12 chemicals namely, Aldrin, Dieldrin, DDT, Endrin, Chlordane, Hexachlorobenzene, Mirex, Toxaphene, Heptachlor, Polychlorinated Biphenyls (PCBs), Polychlorinated-*para*-dibenzodioxins (PCDD) and Polychlorinated dibenzofurans (PCDF).

Article 7 of the Stockholm Convention obliges each Party to develop and implement a plan for the implementation of its obligations under the Convention. The National Implementation Plan (NIP) for Tanzania elaborates current situation on POPs and states commitments and actions that it intends to undertake in the management and control of POPs for duration of 15 years starting from 2006.

The NIP has identified national challenges in management of POPs such as inadequate policy and regulatory regime; weak institutional capacity in terms of human resources and technical infrastructure; lack of facilities for sound disposal of wastes consisting of, containing or contaminated with POPs; very limited financial and technical resources for remediation of contaminated sites; lack of POPs release monitoring schemes; inadequate application of Best Environmental Practices (BEPs) and Best Available Techniques (BATs) for reduction of unintentional releases of POPs; and low awareness by the general public.

The focus of the NIP is in line with the National Strategy for Growth and Reduction of Poverty (NSGRP) of 2004 and the Tanzania's Development Vision 2025, both of which call for improvement of quality of life and social wellbeing. The NSGRP is a guiding policy framework for Tanzania in its quest for sustainable development. The Millenium Development Goals (MDGs) serves as the guiding targets for the NSGRP on reducing poverty, diseases and environmental degradation. The implementation of the NIP will therefore contribute to the national efforts of combating poverty and improve environmental quality.

Of recent, there have been many emerging global environmental concerns which demand joint efforts in reducing impacts to human health. POPs and other toxic chemicals pose challenges in protecting human health and the environment. This NIP is meant to be dynamic so as to accommodate new interventions to the emerging global environmental concerns which require similar approaches to deal with. This necessitates promoting synergies among related Conventions and international processes on chemicals management so as to realize multiple benefits such as maximizing use of resources, sharing of knowledge and experiences and integrated capacity building.

In view of the above, the Government is determined to implement the NIP and has already incorporated provisions of POPs management in the Environmental Management Act of 2004 and shall make every effort to allocate funds and encourage participation of stakeholders in addressing the challenges posed by POPs. Cognizant of the fact that environment is the common heritage for present and future generations, the Government welcomes support of the relevant stakeholders in our struggle to eliminate POPs and other toxic substances.

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**Dar es Salaam**

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## ACRONYMS AND ABBREVIATIONS

AAS	Atomic Absorption Spectrophotometer
AAT	Agrochemicals Association of Tanzania
ADSL	Asynchronous Digital Subscriber Line
ADB	Africa Development Bank
AGENDA	An NGO based in Dar es Salaam, Tanzania responsible for environment and development
AMU	Applied Microbiology Unit
ASP	Africa Stockpiles Programme
BATs	Best Available Techniques
BCD	Base Catalyzed Dechlorination
BEPs	Best Environmental Practices
BOD	Biochemical Oxygen Demand
BoS	Bureau of Statistics
BoT	Bank of Tanzania
CBO	Community Based Organization
CLI	Crop Life International
COP	Conference of the Parties
COSTECH	Tanzania Commission for Science and Technology
CEEST	Center for Environment, Energy and Science and Technology
CPCT	Cleaner Production Center of Tanzania
CPE	Chemical and Process Engineering
CTI	Confederation of Tanzania Industries
DALDO	District Agricultural and Livestock Development Office
DAWASA	Dar es Salaam Water and Sanitation Authority
dBA	Decibel
DDT	Dichloro Diphenyl Trichloroethane
DIA	Dar es Salaam International Airport
DNA	Designated National Authority
DNOC	Dinitro-ortho-cresol
DoE	Division of Environment
EAC	East Africa Community
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
FAO	United Nations Food and Agriculture Organization
FTIR	Fourier Transform Infra Red
GCLA	Government Chemist Laboratory Agency
GC-MS	Gas Chromatography – Mass Spectrometer
GDP	Gross Domestic Product
GEF	Global Environment Facility
GJ	Giga (10 <sup>9</sup> ) Joules
GLP	Good Laboratory Practice
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
HCB	Hexachlorobenzene
HPLC	High Performance Liquid Chromatography

IARC	International Agency for Research on Cancer
ICP	Induced Coupled Plasma
ICT	Information and Communication Technology
ILFEMP	Institutional and Legal Framework for Environmental Management Project
ILO	International Labour Organization
IMTC	Inter Ministerial Technical Committee
IPCS	International Programme on Chemical Safety
IPEN	International POPs Elimination Network
IPM	Integrated Pest Management
IPPM	Integrated Production and Pest Management
ISP	Internet Service Provider
ISV	In situ vitrification
IVM	Integrated Vector Management
IXP	Internet Exchange Point
JET	Journalists Environment Association of Tanzania
KCMC	Kilimanjaro Christian Medical Centre
KIA	Kilimanjaro International Airport
LGAs	Local Government Authorities
LGRP	Local Government Reform Programme
MALE	Ministry of Agriculture, Livestock and Environment (Zanzibar)
MAFS	Ministry of Agriculture and Food Security
MANREC	Ministry of Agriculture, Natural Resources, Environment and Cooperatives (Zanzibar)
MATI	Ministry of Agriculture Training Institute
MCT	Ministry of Communication and Transport
MDGs	Millenium Development Goals
MEM	Ministry of Energy and Minerals
MIT	Ministry of Industry and Trade
MJ	Megajoule (10 <sup>6</sup> ) Joule
MoH	Ministry of Health
MoW	Ministry of Works
MoWLD	Ministry of Water and Livestock Development
MNRT	Ministry of Natural Resources and Tourism
MW	Mega watt
MWATEX	Mwanza Textiles
MUTEX	Musoma Textiles
NAFCO	National Food Corporation
NBS	National Bureau of Statistics
NDC	National Development Corporation
NEAP	National Environmental Action Plan
NEMC	National Environment Management Council
NEP	National Environmental Policy
NEPAD	New Partnership for African Development
NGO	Non-governmental Organization
NIMR	National Institute for Medical Research
NIP	National Implementation Plan

NLUC	National Land Use Commission
NPPAC	National Plant Protection Advisory Committee
NSGRP	National Strategy for Growth and Reduction of Poverty
OSHA	Occupational Safety and Health Authority
PAs	Protected Areas
PARTS	Pesticides Approval and Registration Technical Sub-committee
PCBs	Polychlorinated Biphenyls
PCDD	Polychlorinated dibenzo- <i>para</i> -dioxins
PCDF	Polychlorinated dibenzofurans
PHS	Plant Health Services
PIC	Prior Informed Consent
PMO	Prime Minister's Office
PO-GG	President's Office – Good Governance
PO-PP	President's Office – Planning and Privatization
POPs	Persistent Organic Pollutants
PORALG	President's Office Regional Administration and Local Government
PRSP	Poverty Reduction Strategy Paper
RA	Radioactive Analyser
RBMP	Roll Back Malaria Programme
RMS	Risk Management Strategy
SAICM	Strategic Action for International Chemicals Management
SADC	Southern Africa Development Cooperation
SIDP	Sustainable Industrial Development Policy
SFPC	State Fuel and Power Corporation
SUA	Sokoine University of Agriculture
TAA	Tanzania Airport Authority
TANESCO	Tanzania Electric Supply Company
TAZARA	Tanzania Zambia Railway Authority
TBL	Tanzania Breweries Limited
TBS	Tanzania Bureau of Standards
TCAA	Tanzania Civil Aviation Authority
TCC	Tanzania Cigarette Company
TCCIA	Tanzania Chamber of Commerce, Industry and Agriculture
TEQ	Toxicity Equivalent
TFNC	Tanzania Food and Nutrition Center
THA	Tanzania Harbours Authority
TIE	Tanzania Institute of Education
TIPER	Tanzania Italian Petroleum Refinery
TIRDO	Tanzania Research Development Organisation
TJ	Terra ( $10^{12}$ ) Joules
TPCC	Tanzania Portland Cement Company
TPRI	Tropical Pesticide Research Institute
TRA	Tanzania Revenue Authority
TRC	Tanzania Railway Corporation
TTCL	Tanzania Telecommunication Company Limited
UCLAS	University College of Lands and Architectural Studies

UDSM	University of Dar es Salaam
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Education, Scientific and Cultural Organization
UNICEF	United Nations Children Education Fund
UNIDO	United Nations Industrial Development Organization
UNITAR	United Nations Institute of Training and Research
URT	United Republic of Tanzania
USEPA	United States Environmental Protection Agency
UV-VIS	Ultra Violet - visible
VPO	Vice President's Office
WAO	Wet Air Oxidation
WB	World Bank
WHO	World Health Organization
WWF	Worldwide Fund for Nature
ZIA	Zanzibar International Airport

## **EXECUTIVE SUMMARY**

### **POPs and their effects**

Persistent Organic Pollutants (POPs) are highly toxic chemicals of anthropogenic origin causing an array of adverse health effects, notably death, birth defects among humans and animals, cancer and tumours at multiple sites, neuro behavioural impairment including learning disorders; immune system changes; reproductive deficits of exposed individuals as well as their offspring; and diseases such as endometriosis, increased incidence of diabetes and others. Persistent Organic Pollutants are produced intentionally and used as pesticides or consumed in industrial processes; and some of them are generated unintentionally as by-products of various industrial or combustion processes. At present, twelve chemicals have been proved to exhibit POPs characteristics. They are composed of intentionally produced pesticides (i.e. Aldrin, Dieldrin, DDT, Endrin, Chlordane, Hexachlorobenzene, Mirex, Toxaphene and Heptachlor) and industrial chemicals, which are Polychlorinated Biphenyls (PCBs) and Hexachlorobenzene. The second category is the unintentionally produced emissions of certain industrial and combustion processes i.e. the Polychlorinated dibenzo-para-dioxins (PCDD) and Polychlorinated dibenzofurans (PCDF).

### **Purpose of NIP**

The National Implementation Plan (NIP) for the Stockholm Convention is an output of the project titled “Enabling Activities to facilitate Early Action on the Implementation of the Stockholm Convention on Persistent Organic Pollutants (POPs) in the United Republic of Tanzania. The Global Environmental Facility (GEF) financed the Project and the United Nations Industrial Development Organization (UNIDO) was the Implementing Agency providing technical guidance and facilitating administrative matters between GEF and the government of Tanzania. The NIP document elaborates current situation on POPs and states the country’s commitments and actions that it intends to undertake in respect of the management and control of POPs for a duration of 15 years commencing in 2006. The objectives are: -

- i) To demonstrate the commitment of the government to the objectives of the Stockholm Convention and to achieving compliance with the obligations assumed as a Party to it;
- ii) To present the information base and associated analysis supporting the development and implementation of effective Action Plans and Strategies to achieve reduction and elimination of POPs with associated improvement of environmental quality and human health;
- iii) To provide basis for monitoring the country’s progress in addressing the POPs issue, and specifically the effectiveness of the actions it has committed to in reducing or eliminating POPs use and release to the environment;

- iv) To facilitate public awareness, education and participation in respect of the POPs issue and overall improvement in environmental and public health protection;
- v) To provide the operational and institutional framework for attraction of international assistance such as might be provided under the Stockholm Convention's permanent financial mechanism for actions on POPs; and
- vi) To promote synergies with other related Conventions and international processes on chemicals management.

### **NIP Development Process**

The development of the NIP involved four main phases, namely: establishment of coordination mechanism and process planning; establishment of POPs inventories and assessment of national infrastructure and capacity, priority assessment and objective setting, formulation of the NIP and its endorsement by stakeholders.

Phase I – planning and organization - involved appointment of the National Project Coordinator (NPC), procurement of office equipment, establishment of the National Coordinating Committee (NCC) and organization of an inception workshop to promote awareness and build consensus on the project workplan by key stakeholders held in June 2002. Members of the NCC were drawn from sectors of Environment, Finance, Health, Communication and Transport, Agriculture, Industry, Energy, and Local Government and Private sector.

Phase II – inventory of POPs – involved identification and quantification of POPs releases, assessment of legal and institutional framework for management of POPs, assessment of POPs management practices, monitoring capacity and experience on POPs, identification of POPs contaminated sites and identification of public information, awareness and education tools and mechanisms. This resulted into country reports that were reviewed in a national consultative workshop held in September 2003. In 2004, another inventory of PCB and contaminated equipment was undertaken in the whole country. This was done through a SADC PCB Project supported by GEF through UNEP. The Environmental Council of Zambia Coordinated the project. The project output assisted to update the 2003 inventory of PCBs.

Phase III – priority assessment and objective setting - involved identification of measures as well as formulation of preliminary objectives and strategies (short, medium and long-term) to address gaps and deficiencies that were identified from the inventory of POPs. Prioritization of measures was based on the following criteria in line with Article 6, 10 and 11 of the Stockholm Convention: health impact, environmental impact, sustainability, monitoring of releases, management of contaminated sites, disposal facilities, knowledge base and institutional cooperation and collaboration. The resulting Country POPs Priority Assessment Report was reviewed in a National POPs Priority Validation Workshop in August 2003.

Phase IV – formulation of NIP and its endorsement – involved among others drafting of the NIP in accordance with the UNEP Guidelines on NIP Development (2002). The Draft NIP was reviewed in a National Consultative Meeting organized in March 2005. The stakeholders endorsed the NIP. Two technical meetings were organized to incorporate comments from the workshop participants and UNITAR. The National Coordinating Committee approved NIP document in October 2005. The NIP Development process involved local experts from government departments and agencies, academic and research institutions, NGO and private sector. The institutions from which the experts were sourced include Vice President’s Office – Division of Environment; Ministry of Agriculture and Food Security; Ministry of Industry and Trade; Tropical Pesticides Research Institute (TPRI); Government Chemist Laboratory Agency (GCLA); National Environment Management Council (NEMC) and Commission for Science and Technology (COSTECH); Ministry of Agriculture, Livestock and Environment (the then MANREC) - Zanzibar; University of Dar es Salaam, University College of Lands and Architectural Studies; TANESCO; State Fuel and Power Cooperation (SFPC)- Zanzibar and AGENDA. Training of the experts in inventory of POPs and Action Plan development was conducted by international and regional experts from UNIDO, UNEP, USEPA and the Environmental Council of Zambia respectively.

During NIP development, many stakeholders became aware of the Stockholm Convention and were sensitized to incorporate measures that reduce releases of POPs in the ongoing initiatives. Awareness creation was done through workshops and media coverage.

### **Assessment of POPs issue in Tanzania**

The inventory of POPs undertaken in early 2003, revealed that there are about 17.4 metric tones of obsolete stocks of POP Pesticides (including Aldrin, Dieldrin, and Toxaphene) and 170.6 metric tonnes of obsolete stocks of DDT stored in various areas in the country. These stocks will be cleared when the Africa Stockpiles Project commences in January 2006. At present the initial 9 POP pesticides are no longer registered for any use. There is no production or importation of POP Pesticides in the country. The inventory revealed that DDT has been used in the country for some years up to 1997 for both agriculture and public health. It was either being imported or formulated in the country. In Zanzibar, DDT was entirely used for public health up to 1988 and never used for agriculture.

The survey of electrical equipment that use fluids containing Polychlorinated biphenyls (PCBs) in 2004 showed that there are 418 equipment containing 273 metric tones of oil suspected to contain Polychlorinated Biphenyls. Out of these equipment 216 transformers and 17 oil circuit breakers containing 105 metric tones of oil are out of use. Concentrations of PCB in the oil were not determined. During the survey it has also been found that handling of oils suspected to contain PCB is poor leading to frequent spillage and often does not involve use of protective gear.

The inventory identified sources and quantified releases of Polychlorinated dibenzo-p-dioxins and Polychlorinated dibenzofurans in the country. About 517-gTEQ/annum and 249 gTEQ/annum are released through air emissions and residues respectively. The release to air is about 517 g TEQ/annum and to the land is 181 g TEQ/annum whereas that released in residues is about 249 g TEQ/a. The three leading sources of PCDD/PCDF are: uncontrolled combustion process (68%), hospital waste incineration (22%) and power generation and heating (10%). Forest and grassland fires constitute 65% of emissions in the sub-category of uncontrolled combustion. Household cooking and heating in the sub category of power generation and heating constitutes 99.7% of all emissions to air. There is no capacity or experience for monitoring of releases of PCDD/PCDF. There is limited awareness on effects of PCDD and PCDF. Neither the Best Available Techniques (BAT) nor the Best Environmental Practices (BEP) is being applied for the control of PCDD and PCDF releases. Some of the sources of PCDD/PCDF were not quantified due to lack of baseline information. These include releases from crematorium, fires at waste disposal sites and accidental fires in factories and vehicles. In addition, national emission factors for quantification of PCDD/PCDF releases are lacking; these need to be determined in order to improve inventory of PCDD and PCDF releases in Tanzania.

Thirty-three sites are possibly contaminated with PCBs while four storage sites were identified to be contaminated with DDT, Aldrin and Toxaphene. Moreover, twelve sites categorized as industrial and waste disposal sites are potential sources of PCDD/PCDF. Magnitude of contamination by POPs in some sites is alarming and needs urgent remedial measures.

There are several gaps with regard to POPs management in the country. These include:- inadequate policies and legislation to govern POPs management, monitoring, search for suitable alternatives, liability for POPs waste disposal and remediation of sites contaminated with POPs, public information dissemination, education and awareness. There are no guidelines to guide POPs waste management and remediation of POPs contaminated sites. There is weak enforcement of the existing legislation relevant to POPs management. In addition, there is inadequate capacity and experience for tracking human and environmental effects caused by POPs and their alternatives; management of such effects is not known yet. Few institutions have laboratory facilities and trained personnel that can facilitate monitoring of POPs and their alternatives, although these need strengthening in terms of specialized training and upgrading of equipment. Other deficiencies include: limited researches on alternatives of intentionally produced POPs, poor documentation system of POPs information both in the private and government institutions and lack of awareness at all levels. Also there is lack of planned information dissemination strategy to inform the public on POPs issues; weak mechanism to facilitate coordination and reporting on POPs issues; and the national environmental standards have limited coverage for monitoring of POPs releases.

## Overview of national priorities, implications and impacts of addressing them

The Government intends to take appropriate measures to ensure implementation of the national priorities on POPs as specified in the Action Plans. The main priority issues are grouped in four major areas namely, strengthening legal and institutional framework for managing POPs and chemical pollutants; establishing monitoring scheme of POPs and other chemical pollutants; enhancing transfer of appropriate technology for control of POPs releases; and improving public information, awareness and education. The specific priorities vary for the different Action Plans. These cover disposal of POPs wastes, capacity building in terms of human resource and technical infrastructure, remediation of contaminated sites, establishment of POPs monitoring schemes, strengthening policy and regulatory regime and awareness raising. Some of the identified top priorities for four groups of POPs chemicals are as shown below.

POPs chemical Category	Priorities
POP Pesticides	<ul style="list-style-type: none"><li>• Establishing environmentally sound technologies to manage POPs and PIC Pesticides wastes</li><li>• Developing mechanisms for promoting proper management of stockpiles of PIC and POP Pesticides wastes and contaminated sites</li></ul>
PCBs	<ul style="list-style-type: none"><li>• Developing facilities for disposal of PCBs</li><li>• Establishing clean up and remediation schemes for PCB contaminated sites</li></ul>
DDT	<ul style="list-style-type: none"><li>• Developing mechanisms for promoting management of stockpiles of DDT wastes</li><li>• Strengthening capacity in DDT management in terms of manpower and infrastructure</li></ul>
PCDD/PCDF	<ul style="list-style-type: none"><li>• Establishing coordination mechanism pertaining to the PCDD/PCDF management</li><li>• Institute mechanism for PCDD/PCDF management</li></ul>

It is anticipated that successful implementation of the identified priorities would reduce or eliminate altogether some of the POPs chemicals and wastes containing POPs. The Government intends to eliminate all POPs chemicals as effective alternatives become available countrywide. Illegal trade may interfere with Government intention to eliminate use of the initial 9 POP Pesticides. Hence support is needed to strengthen institutional capacity for monitoring imports of POP Pesticides as well as development of waste disposal facilities. Through the Africa Stockpile Project, is expected to set up mechanisms to control accumulation of pesticide wastes in future.

Testing and laboratory analysis of oils suspected to contain PCBs would need to be performed to confirm presence of PCBs in the identified equipment. Adequate external resource would need to be secured for disposal of PCB oils and contaminated equipment.

Elimination of PCBs is given highest priority in the respective Action Plan due to economic implications.

Eliminating DDT is a major challenge as the country intends to reintroduce DDT to fight against malaria. Malaria is a critical concern in sub-Saharan Africa, a region that accounts for more than 90% of the world's malaria deaths. In Tanzania, with about 18 million cases every year and 100,000 deaths yearly out of which over 70,000 are children under five years of age, malaria remains the number one killer disease in the country. It is estimated that over 90% of Tanzanians are at risk of the disease. Twenty five (25) districts have been identified to be malaria endemic areas. Over 40% of the country population live in these areas. Due to resurgence of malaria in these areas the government intends to reintroduce DDT for public health purposes, particularly against malaria vectors during epidemics. Its use will be restricted for indoor application in accordance with WHO Guidelines. In this regard, further support is needed for training on DDT use; research on alternatives and dissemination of available alternatives; and strengthening of institutional capacity for monitoring DDT imports, use and disposal.

Elimination of releases of PCDD/PCDF highly depends on: transfer of appropriate technologies; adoption of BATs and BEPs; strengthening relevant laws and their enforcement; increased public awareness in dangers of PCDD/PCDF; setting standards and appropriate monitoring protocols; and strengthening monitoring capacity. PCDD/PCDF being a new area external support and experience is needed to support the country in implementation of its Action Plan on PCDD/PCDF.

Tanzania is a Party to several Multilateral Environmental Agreements (MEAs) that address international chemicals management including the Bamako Basel and Rotterdam Conventions. Tanzania has been actively involved in the negotiation for establishment of the Strategic Approach for International Chemicals Management (SAICM). It is also actively involved in IFCS work. Since there is a broadening gap between the on-going initiatives on chemicals management and worsening global environmental situation, the NIP has considered synergies between Stockholm Convention and other related environmental agreements at sub-regional, regional and international levels. Thus the NIP provides a sound base for sustainable management of chemicals in the country. It addresses many cross-cutting concerns for this purpose, in particular capacity building in pollution prevention and control, monitoring of health risks and research on feasible alternatives to POPs chemicals; and the need for advancement in technologies and practices that are of less impacts to the environment and human health.

### **Implementation timetable and targeted milestones**

The timeframe of the NIP is 15 years commencing in 2006. It covers short, medium and the long-term actions. More measures may be incorporated during implementation as the country gains more experience in addressing concerns of POPs and hence necessitating the review of the Action Plans. The targeted milestones for each specific theme are as follows:

<b>Theme</b>	<b>Timeframe</b>	<b>Targeted milestone(s)</b>
1. Institutional and Regulatory Strengthening Measures	2006-2012	<ul style="list-style-type: none"> <li>• Strengthened POPs coordination on management of POPs and other chemical pollutants by 2009</li> <li>• Adequate policies, legislation and institutional capacity for effective NIP implementation on POPs management by 2012</li> </ul>
2. POP Pesticides	2006-2016	<ul style="list-style-type: none"> <li>• Increased use of substitutes and other alternative approaches to POP and PIC pesticides by 2012</li> <li>• Safe disposal of POP pesticides and other pesticides waste operationalized by 2016</li> </ul>
3. PCBs	2006-2012	<ul style="list-style-type: none"> <li>• Improved PCB database by 2010</li> <li>• Safe disposal of fluids and equipment containing or contaminated with PCBs operationalized by 2010</li> <li>• Safe disposal of fluids and waste containing PCBs and equipment contaminated with PCBs by 2010</li> </ul>
4. DDT	2006-2016	<ul style="list-style-type: none"> <li>• Strengthened management and control of DDT by 2011</li> <li>• Increased use of effective substitutes and other alternative approaches to DDT use in disease vector control by 2011</li> <li>• Safe disposal of DDT waste operationalized by 2016</li> </ul>
5. PCDD/PCDF	2006-2015	<ul style="list-style-type: none"> <li>• Established and strengthened Poison Centres by 2011</li> <li>• Improved PCDD/PCDF database by 2012 involving development of national emission factors and periodic inventory modeling</li> <li>• Adopted BATs and BEPs in major sources of PCDD/PCDF by 2015</li> </ul>
6. Contaminated Sites	2006-2015	<ul style="list-style-type: none"> <li>• Established awareness creation programmes on management of contaminated sites by 2009</li> <li>• Improved database of contaminated sites by 2011</li> <li>• Clean up and remediate sites contaminated by POPs operationalized by 2015</li> </ul>

7. Information Exchange	2006-2013	<ul style="list-style-type: none"> <li>• Enhanced capacity in information generation, storage, management, accessibility and dissemination by 2013</li> <li>• Established effective database on POPs by 2007</li> </ul>
8. Public information, education and awareness	2006-2009	<ul style="list-style-type: none"> <li>• Established and strengthened information centers by 2007</li> <li>• Training, educational and awareness programmes on POPs operational by 2009</li> </ul>
9. Monitoring	2006-2013	<ul style="list-style-type: none"> <li>• Improved research on effects of POPs and their alternatives by 2009</li> <li>• Strengthened monitoring capacity by 2012</li> </ul>
10. Reporting	2006+	<ul style="list-style-type: none"> <li>• Enhanced inter-institutional reporting capacity by 2008</li> <li>• Timely reporting according to the Convention obligations by 2007</li> <li>• Updated NIP and its constituent Action Plans every 3 years commencing in 2009</li> </ul>

### **Overall financial requirements**

The estimated cost for the implementation of NIP is **USD 49,987,200 over** a period of 15 years from 2006 to 2021. Funds will be secured from internal and external sources. Out of the total amount, Government contribution is USD 5,098,374 (10.2%). Investment projects amounts to **USD 32,562,500 (65%)** with the highest investment requirements in remediation and monitoring of contaminated sites (USD 7,560,000); disposal of waste stocks and use of alternatives to PCBs (USD 9,400,000); disposal of obsolete stock and promotion of alternatives to POP Pesticides (USD 5,100,000); disposal of obsolete stock and promotion of alternatives to DDT (USD 3,417,500); and upgrading of laboratories, research on alternatives and acquiring of equipment for POPs monitoring and inspection services (USD 5,035,000). Requirement for investment in information exchange amounts to US\$ 1,950,000 and for establishment of information centers is US\$ 100,000. The remaining portion (35%) of the NIP implementation cost is mainly for capacity building.

### **Government commitment**

The Government is determined to eliminate the intentionally produced POPs as soon as practicable by implementing the NIP. Already the Environmental Management Act of 2004 provides for management of POPs in line with the requirement of the Stockholm Convention, to which Tanzania is a Party since 30 April 2004. It is the intention of the

Government to undertake review of the relevant policies and legislation for effective implementation of the Stockholm Convention and the related conventions and international processes on chemicals management. This will facilitate strengthening of capacity of institutions that deal with POPs including the establishment of mechanisms for coordination, reporting and monitoring of POPs and the review and updating of the NIP. Also the Government realises the importance of generating and dissemination of public information and creation of public awareness at all levels to tackle concerns of POPs in a comprehensive way. In doing so, the Government within its limited capacity, shall make deliberate efforts to implement its obligations under the Stockholm Convention and hence eliminate POPs as scheduled. Tanzania is seeking cooperation of the international community in its endeavours to achieve the NIP objectives. The Division of Environment of the Vice President's Office, among others, is responsible for coordination and monitoring of NIP implementation. It shall continue to perform its coordination role on POPs management. Tanzania is also a Party to other sister Conventions, the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal and the Rotterdam Convention on the Prior Informed Consent on Certain Hazardous Chemicals and Pesticides in International Trade. In this regard, Tanzania is working towards strengthening collaboration with other related international and local programmes and projects as a way of complementing NIP initiatives.

#### **Qualification or conditionality**

Successful implementation of the NIP is subject to availability of financial and technical resources from both government budget allocations and external sources to support activities identified in the Action Plans. Moreover, strengthening of local skilled human resource base in POPs issues is important. The situation calls for further support from international community. It is assumed that there will be continuous political stability for the entire period of NIP implementation.

Tanzania being a SADC Member State is committed to phase out PCBs by 2010 as agreed in the sub region.

In addition, the country is implementing a Roll Back Malaria Programme, which intends to reintroduce DDT for malaria control in endemic areas for emergency situation In line with WHO Guidelines. .

## 1.0 INTRODUCTION

Persistent Organic Pollutants (POPs) are highly toxic chemicals of anthropogenic origin causing an array of adverse effects, notably death, disease and birth defects among humans and animals. POPs have been associated with cancers and tumours at multiple sites; neuro behavioural impairment including learning disorders; immune system changes; reproductive deficits of exposed individuals as well as their offspring; and disease such as endometriosis, increased incidence of diabetes and others.

Persistent Organic Pollutants are produced intentionally, used as pesticides or consumed in industrial processes, some are generated unintentionally as by-products of various industrial or combustion processes. At present there are twelve chemicals that have been proved to exhibit POPs characteristics. They are composed of intentionally produced pesticides (i.e. Aldrin, Dieldrin, DDT, Endrin, Chlordane, Hexachlorobenzene, Mirex, Toxaphene and Heptachlor) and industrial chemicals, which are Polychlorinated Biphenyls and Hexachlorobenzene. The second category is the unintentionally produced emissions of certain industrial and combustion processes i.e. the Polychlorinated para dibenzodioxins (PCDD) and Polychlorinated dibenzofurans (PCDF).

Having realized the threats of the POPs the global community agreed to take appropriate measures to reduce and ultimately eliminate the initial 12 chemicals that have been found to be the most dangerous to health and the environment. The Stockholm Convention was adopted in May 2001 for this purpose. This Convention contains strong provisions to reduce and eliminate releases of POPs to the environment. Among other things, the Convention intends to eliminate the production, use of POPs chemicals, that have been intentionally produced; to identify and remove of Polychlorinated biphenyls (PCBs) from use; to restrict DDT use to disease vector control in accordance to WHO guidelines; to minimize and where possible, ultimately eliminate those POPs formed as unintentional by-products and to eliminate releases of POPs from stockpiles and wastes. The Convention also calls for ceasing the production and use of new pesticides and industrial chemicals that have characteristic of POPs. The Convention establishes a register of specific exemptions for permitted production and use of POP Pesticides as well as acceptable use of DDT. It also provides the framework to expand the scientific monitoring of POPs levels in the environment.

Tanzania being a signatory to the Stockholm Convention on POPs (2001) was eligible for financial support from GEF through UNIDO for the development of the National Implementation Plan (NIP) through the Project known as “Enabling Activities to facilitate Early Action on the Implementation of the Stockholm Convention on Persistent Organic Pollutants”. Article 7 of the Stockholm Convention requires each Party to develop an Action Plan on POPs. The development of NIP will facilitate Tanzania to meet obligations under the Stockholm Convention. The Convention entered into force in May 2004. Tanzania became a Party to the Convention in April 2004 and is expected to have submitted her NIP to the Conference of the Parties of the Convention by August 2006.

## **1.1 Purpose of the National Implementation Plan (NIP)**

The National Implementation Plan (NIP) for Tanzania elaborates current situation on POPs and states commitments and actions that it intends to undertake in the management and control of POPs for duration of 15 years starting from 2006, in the context of Stockholm Convention. Article 7 of the Convention encourages Parties to integrate their NIP into their national sustainable development plans where appropriate. Therefore, the Plan presents the strategic measures, mechanisms and detailed activities that must be developed and implemented to make the elimination of POPs a reality.

The NIP is intended to achieve the following objectives:

- (i) To demonstrate commitment of the government to the objectives of the Stockholm Convention and to achieving compliance with the obligations assumed as a Party to it;
- (ii) To provide a national policy instrument and framework within which POPs issue is to be addressed as part of national policies on chemicals management, environmental protection, public health and sustainable development;
- (iii) To present an information base and associated analysis supporting the development and implementation of effective Action Plans and Strategies to achieve reduction and elimination of POPs with associated improvement of environmental quality and human health;
- (iv) To provide an operational and institutional framework for eligibility for financial assistance that might be provided under the Stockholm Convention's permanent financial mechanism for actions on POPs;
- (v) To provide basis for monitoring the country's progress in addressing the POPs issue, and specifically the effectiveness of the actions it had committed to in reducing or eliminating POPs use and release to the environment;
- (vi) To facilitate public awareness, education and participation in respect of the POPs issue and overall improvement in environmental and public health protection;
- (vii) To facilitate on-going efforts of dealing with broader environmental issues such as pollution and hazardous wastes control and overall pollutant releases and the development and strengthening of national sustainable development strategies;
- (viii) To facilitate country's overall efforts in coordinating national approaches to other chemical related Regional and International Agreements and international processes on chemicals management; specifically, the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade; the Basel Convention on the Control of

Transboundary Movements of Hazardous Wastes and their Disposal; and the Strategic Action for International Chemicals Management.

## **1.2 Context**

The Division of Environment under the Vice President's Office as a National Focal Point to the Stockholm Convention was the National Lead Agency in the preparation of the NIP. The overall mandate of the Division of Environment is overseeing and coordinating environmental management activities in the country. The drafting of the NIP involved a National Technical Team comprising 12 experts from relevant sector ministries, government agencies, NGOs and academic and research institutions. A National Steering Committee of 16 members from relevant government departments, agencies and private sector, guided and regularly reviewed the NIP development. The Terms of Reference of these Committees will be revised to incorporate new responsibilities as specified in the Action Plans in order to tap their wealth of knowledge and experiences during NIP implementation phase.

The Division of Environment will have the long-term responsibility of coordinating implementation of the NIP. Following the enactment of the Environmental Management Act (EMA) in November 2004 the Division of Environment has an improved coordination mandate and there is clear institutional framework for environmental management in the country. This provides decisive policy, legal and institutional basis for effective implementation of the NIP. More importantly, the Act provides an opportunity for linkage and synergy to other relevant programmes and policy initiatives at sector and Local Authorities levels. EMA (2004) is a framework Act that provides the relevant sectors and Local Authorities with responsibility on environmental management as derived from the National Environmental Policy (1997) and the institutional framework for effective management of environment of 2002. It takes into account existing sectoral mandates and defines mandates of environmental authorities on environmental management functions of cross cutting nature.

## **1.3 Preparation and Endorsement**

The development of NIP involved four main phases:

- i) Establishment of a coordination mechanism and process organization;
- ii) Establishment of POPs inventory and national infrastructure capacity;
- iii) Priority assessment and objective setting; and
- iv) Formulation of the NIP and its endorsement.

The process of developing NIP has involved many stakeholders including those shown in Annex I. During inventory of POPs stakeholders had an opportunity to provide baseline information through questionnaire and targeted visits. Throughout the process, stakeholders played a key role of reviewing project reports through workshops. Four national stakeholders' workshops were organized namely, the launching of the Project, review of the inventory reports, validation of POPs priorities and review of the NIP. The

workshops drew participants from government departments and agencies, academic and research institutions, private sector, NGOs and media.

Stakeholder endorsement of the NIP involved: - getting stakeholders reaction on the Draft NIP indicating their acceptance and giving comments to improve the NIP document through desk reviews and national workshops; updating the NIP document to incorporate stakeholders views; getting approval of the National Steering Committee and the higher authorities in the Vice President's Office.

## **1.4 Assistance Received**

### **1.4.1 International Level**

Tanzania being a signatory to the Stockholm Convention was able to access financial support from the Global Environment Facility (GEF) through the United Nations Industrial Development Organization (UNIDO) to assist in the development of National Implementation Plans (NIP). The funding provided was US \$ 498,000 to cover the NIP development activities and the cost of the implementing agency (UNIDO).

The GEF implementing Agency, UNIDO, provided technical support to the development of the NIP. Also, UNIDO assisted in the development of the project proposal and provided a Regional Programme Advisor and international technical backstopping.

UNITAR supported training on Action Plan development and in the review of the NIP at different stages.

UNEP provided training on inventory of POPs chemicals and Action Plan development through regional and sub-regional workshops. Also experts from US EPA and the Environmental Council of Zambia shared their knowledge and experiences in PCB inventories and management.

### **1.4.2 National Level**

The Government through the Vice President's Office and other actors provided in kind contribution in terms of personnel, office space, utilities and communication services totaling to about US\$ 90,000. These actors are: the Ministry of Agriculture and Food Security, Ministry of Health - GCLA, Ministry of Agriculture, Natural Resources, Environment and Cooperatives (Zanzibar), Ministry of Industry and Trade, National Environment Management Council (NEMC), State Fuel and Power Cooperation (Zanzibar), University of Dar es Salaam, University College of Lands and Architectural Studies (UCLAS), Tanzania Commission for Science and Technology (COSTECH), Tanzania Electric Supply Company (TANESCO) and AGENDA.

## **2.0 COUNTRY BASELINE**

### **2.1 COUNTRY PROFILE**

#### **2.1.1 Geography**

##### ***2.1.1.1 Geographical Location***

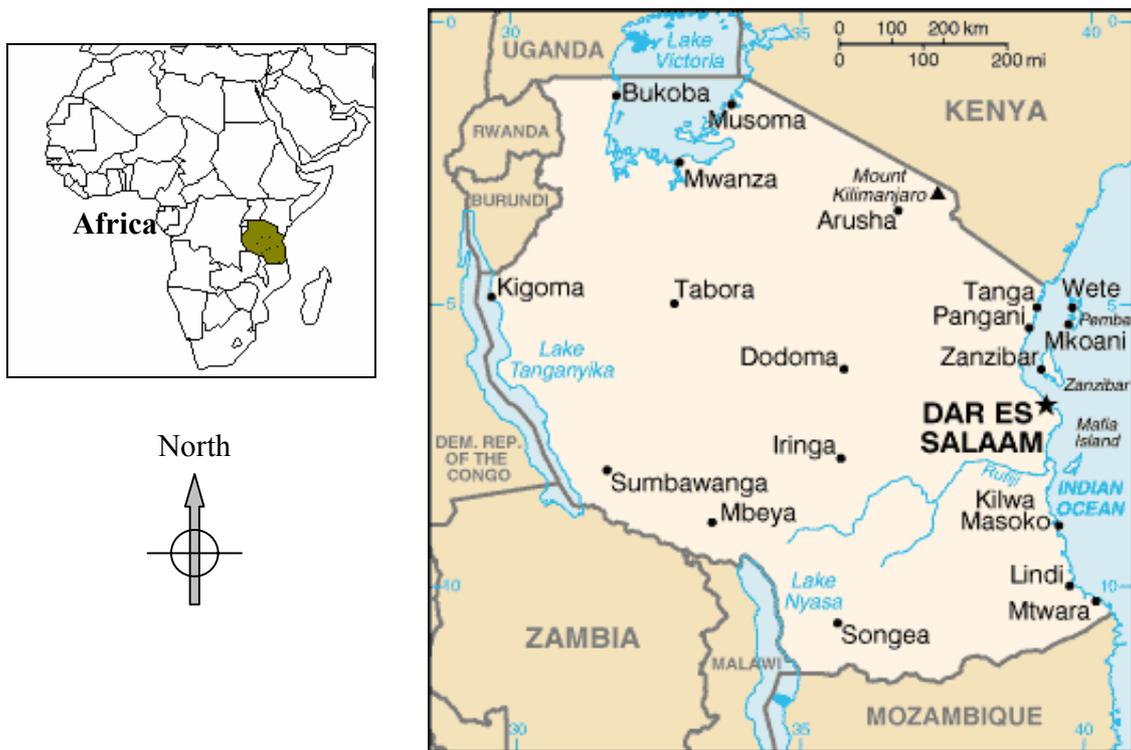
The United Republic of Tanzania is situated on the East coast of Africa within the range of latitudes 1°S to 11°45' S, and the longitudes 29°36' E to 40°29'E. The country borders Kenya and Uganda to the North; Democratic Republic of Congo (DRC), Rwanda and Burundi to the West; Mozambique, Malawi and Zambia to the South (see Figure 2.1). In the East is the Indian Ocean to which Tanzania has a long coastline stretching over 804 km. Tanzania has three of Africa's best-known lakes—Victoria in the north, Tanganyika in the west, and Nyasa in the south. Mount Kilimanjaro in the north, 5,895 m above sea level (19,340 ft), is the highest point on the continent. Dar es Salaam is still the *de facto* seat of government, despite the declaration of the inland town of Dodoma as a new national capital. The island of Zanzibar is separated from the mainland by a 22-nautical miles channel.

##### ***2.1.1.2 Land Area***

The country covers an area of 945,234 km<sup>2</sup> (including 61,000 km<sup>2</sup> of inland water) of which Zanzibar with its associated islands comprises 2,460 km<sup>2</sup>. This land is divided into eight ecological zones - Coastal (7.3%), Islands (0.3%), Arid lands (12.0%), Semi-arid Lands (23.6%), Plateaux (35.5%), Southern Highlands (10.0%), Northwest Highlands (8.7%) and Alluvial Plains (2.6%) (ADB, 1995 and URT, 1999). The arid and semi-arid areas are environmentally fragile and highly vulnerable to soil degradation and erosion.

##### ***2.1.1.3 Climate***

Similar to other countries in East Africa, Tanzania has a tropical climate with regional variations. Most parts of the country have two rainy seasons. The long rainy seasons start in mid March to end of May, while the short rainy seasons occur between October and December. The dry land areas of the country (Arid and Semi-arid zones) receive relative low rainfall ranging from 400mm to 800 mm per annum. Temperatures, evaporation and evapotranspiration are high while relative humidity is low. The average precipitation in the coastal areas ranges between 900 to 1100mm per annum. The coastal areas are hot and humid; with an average temperature of 30<sup>0</sup> C.



**Figure 2.1:** Map of Tanzania and its neighbouring countries

#### **2.1.1.4 Administration**

The United Republic of Tanzania is a union government of Tanganyika and Zanzibar. Within the union framework there is Government of the United Republic of Tanzania and the Revolutionary Government of Zanzibar, which has a semi autonomous status. In both Governments there are three organs: the Executive; Judiciary; and the Legislature that have powers over the conduct of public affairs. The Executive comprise of Central Government and Local Government Authorities.

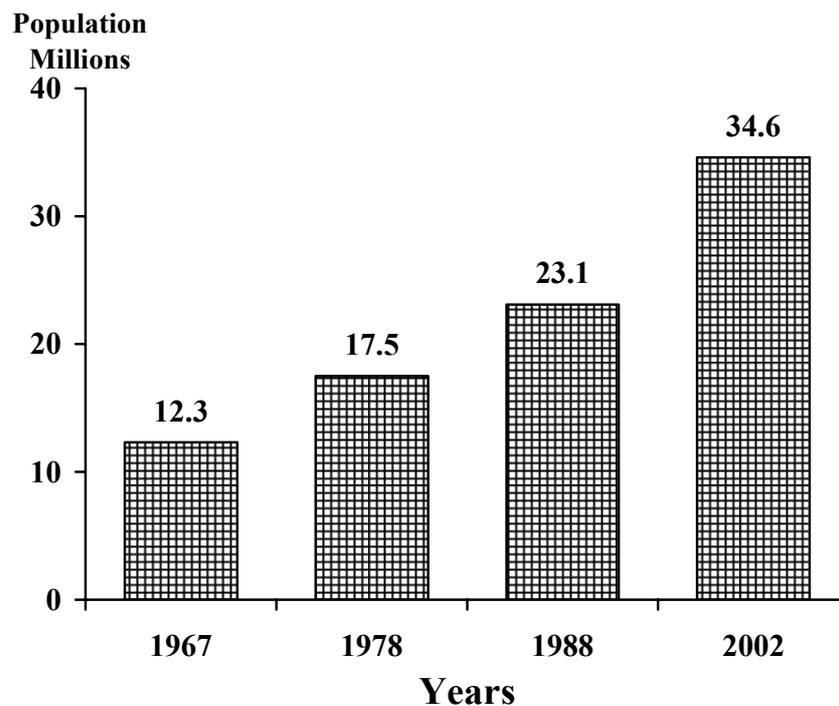
The government of the United Republic of Tanzania comprises of the President, the Vice President, President of Zanzibar, the Prime Minister and the Cabinet Ministers. The President is the Head of State, the Head of Government; and the Commander-in-Chief of the Armed Forces, and is assisted by the Vice President.

The United Republic of Tanzania is divided into 26 regions, 21 in Tanzania Mainland and 5 in Zanzibar. Each region and the respective districts is headed administratively by a Commissioner who is appointed by the President. At divisions, and ward levels, there are elected councils with appointed Executive Officers.

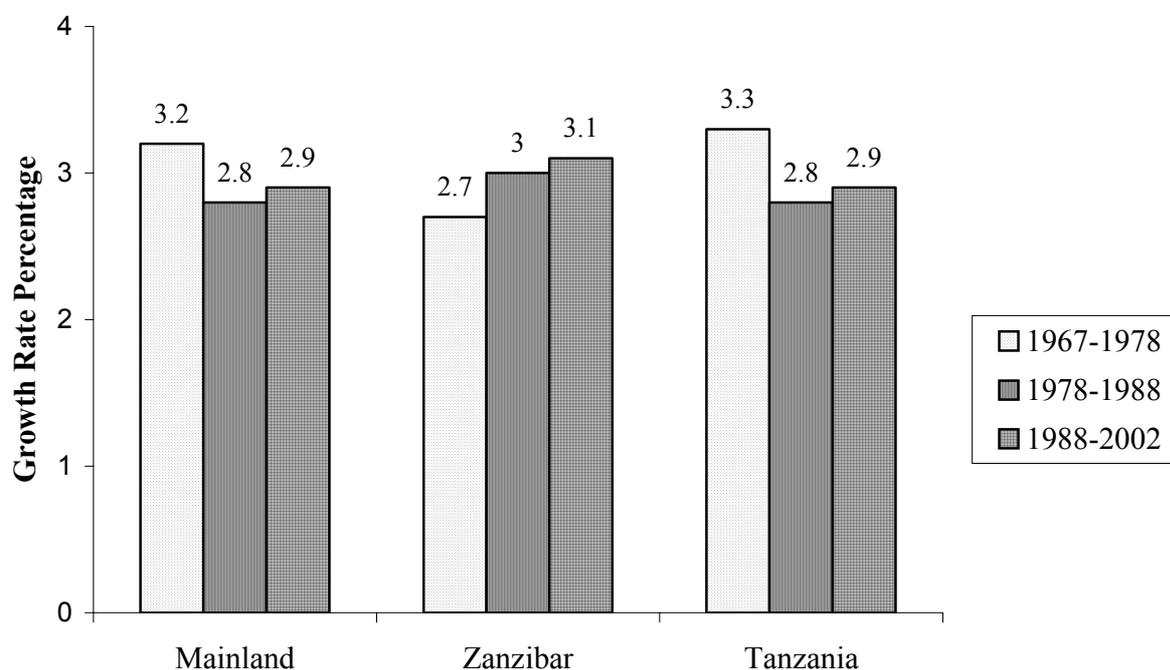
The Vice President's Office was established under Act No. 34 of 1994 for the purpose of assisting the President on all matters concerning the United Republic of Tanzania generally; and in particular, to coordinate union matters, environmental management, poverty eradication and the work of non-governmental organizations (NGOs).

### 2.1.1.5 Population

The population has grown from 12.3 million persons in the first post-independence census in 1967 to 34.6 million persons in the census held in August 2002 (Figure 2.2). Over the period from 1967 to 2002, the population of Tanzania has almost tripled. The rate of population growth has varied over this period as shown in Figure 2.3. The average population growth rate for Tanzania Mainland dropped from 3.2% to 2.8% and 2.9% for the period of 1967 – 1978, 1978 – 1988 and 1988-2002 respectively; while the growth rate for Zanzibar increased from 2.7% to 3% and 3.1% for the same period respectively (Figure 2.3).



**Figure 2.2:** Population of Tanzania; census counts (Tanzania National Website, 2003)



**Figure 2.3:** Average population growth rates 1967–2002 (Tanzania National Website, 2003)

The number of people per square kilometre of land area, or population density, in Tanzania varies considerably from region to region. People are particularly concentrated in Dar es Salaam region (1793 persons per km<sup>2</sup>) and Urban west region in Zanzibar (1700 persons per km<sup>2</sup>). The other four regions of Zanzibar and Mwanza region are also relatively densely populated.

Some social indicators in the country are summarized below (BoT, 2002; National Water Policy, 2002; UNICEF, 2003; PO-PP 2004; PO-PP, 2003):-

**(a) Demographic Indicators (2002)**

*Population (2002) :* 34,569,232

*Population growth rate :* 2.9% per annum (2002/2003)

*Population distribution*

*below 15 years: 48%*

*between 15-64 years: 49.6%*

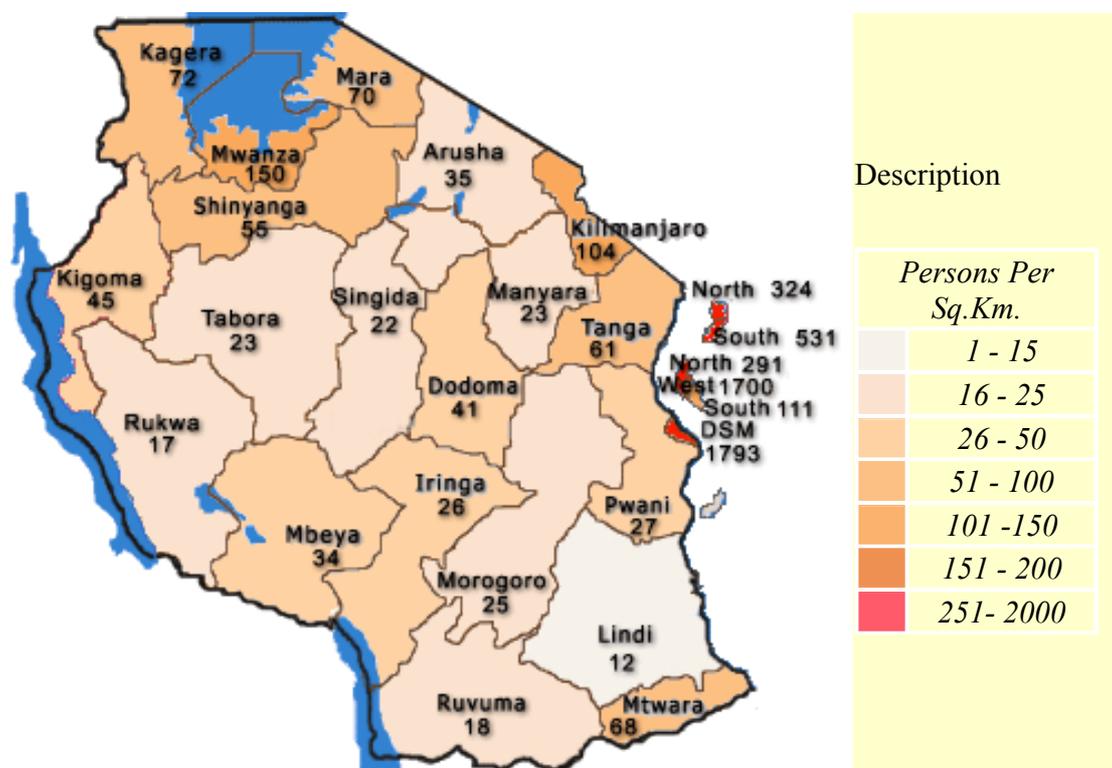
*above 64 years: 2.5%*

*gender (male, female): 48% , 52%*

*Rural, urban: 85%; 15%*

*Urbanization rate: 6.6 %*

*Literacy rate (adult): 75%*



**Figure 2.4:** Map of Tanzania showing Population Density by Region 2002 (Tanzania National Website, 2003)

**(b) Health and Education services indicators:**

<i>Infant Mortality Rate (2001):</i>	104
<i>Under five years mortality rate (2001):</i>	165
<i>Life Expectancy:</i>	51 years
<i>Access to Health services (1985-88):</i>	Urban 90%; Rural 72%; overall 74%.
<i>% of population using adequate sanitation facilities (2000):</i>	Urban 99%; Rural 86% total: 90
<i>% of population using improved drinking water sources (2003):</i>	Urban 73%; Rural: 53% total: 68
<i>Number of People/Physician (2003):</i>	18,637
<i>Number of people/Hospital Bed (1996):</i>	1,000
<i>Adult literacy rate (2000):</i>	Male: 84%, Female: 67%

## 2.1.2 Macro-Economic Profile

Tanzania is one of the least developed countries. The country has a per capita GDP of US\$ 210 (2001). The economic recovery program announced in mid 1986 has generated notable increase in economic activity through support for the program by bilateral and multilateral donors. The World Bank, the International Monetary Fund and bilateral donors have provided funds to rehabilitate Tanzania's weak economic infrastructure. During the period 1991 - 1999 there has been a notable increase in industrial production and minerals, led by gold (BoT, 2002).

The national economic objectives of the Government in the medium-term, as described in the policy framework paper for 2003/04 – 2005/06, include among other goals, the gradual increase of economic growth rate to 7.4% by the year 2006. The current growth rate stands at 6.2% (2002) compared to 5.7% in 2001 (PO-PP, 2003). This target is based on assumption that further improvements in infrastructure and normal weather conditions will allow for an agricultural growth rate of 5% - 6% per year. Investment in newly privatized state owned companies and new mines are expected to increase growth in manufacturing and mining by 6-7% and 20% per year respectively.

Other macro-economics indicators are summarized as follows (BoT, 2002; PO-PP, 2004):

<b>GDP - real growth rate:</b>	6.2% (2002)
<b>GDP - per capita: <i>purchasing power parity</i></b>	\$710 (2000 est.)
<b>GDP - composition by sector:</b>	Agriculture: 50%, Industry: 17% services: 34% (2002)
<b>Population below food poverty line:</b>	19% (2001)
<b>Inflation rate (consumer prices):</b>	4.6% (March 2004)
<b>Labor force:</b>	13.495 million (2002)
<b>Labor force - by occupation:</b>	agriculture 80%, industry and commerce 20% (2002)
<b>Unemployment rate:</b>	12.9% (December 2003)
<b>Budget:</b>	foreign reserves: USD 1.53 billion (2002)
<b>National Debt:</b>	USD 8.755 billion (2003)
<b>Industries:</b>	primarily agricultural processing (sugar, beer, cigarettes, sisal twine), diamond and gold mining, shoes, cement, textiles, wood products, metal processing and plastics, salt
<b>Industrial production growth rate:</b>	8.6 % (2003)
<b>Electricity - production:</b>	2.916 billion kWh (2002)
<b>Electricity - production by source:</b>	Thermal: 22.24% hydro: 77.76%
<b>Electricity – installed capacity:</b>	892 MW (2002)
<b>Electricity – imports:</b>	13 MW (2002)
<b>Electrification</b>	Urban (37%); rural (2%) (2003)

## **2.1.3 Profiles of Economic Sectors**

### **2.1.3.1 Agriculture Sector**

The economy of Tanzania is heavily dependent on agriculture, which accounted for 47.5% of its GDP in 2003 and recorded growth by 4% (PO-PP Budget Speech, 2004), provides 85% of exports, and employs about 80% of the total work force. It is also the major source of food supply and raw materials for the industrial sector. Subsistence farming is the most common activity and women are the main stakeholders in most agricultural activities. Major export crops can be categorized into traditional and non-traditional crops. Traditional export crops include coffee, cotton, sisal, cashew nuts, tobacco, tea, cloves and coconuts. Non-traditional export crops include groundnuts, cowpeas, winegrapes, copra, cut flowers, fruits and vegetables.

### **2.1.3.2 Fishing**

Tanzania's potential fish resources are promising in both marine and freshwater as well as in aquaculture. The export of fish fillets has significantly boosted Tanzania's exports to overseas markets. In the year 1999 fish fillets accounted for 9.6% of total export earnings (Trade Point-Tanzania, 2000).

The annual yield in fresh water fishing is about 307,105 metric tonnes while that of the coastal fisheries is around 51,669 metric tones. The total potential yield from fresh water and marine fishing is around 780,000 metric tones. The contribution of the fisheries sector to the economy is in providing food, employment opportunities and foreign exchange earnings. On average, from 1997 to 2002, fishing contributed to about 2.9% of GDP and its performance in 1999 indicated a growth of 3.1% per annum (Trade Point-Tanzania, 2000).

### **2.1.3.3 Livestock**

Tanzania is among the top three African countries having the largest livestock population. Other countries are Ethiopia and Sudan. Livestock keeping contributes an average of 7% of the country's GDP and about 13% of the country's agricultural produce. Tanzania's official statistics indicate an estimate of 17.7 million cattle, 12.5 million goats, 3.5 million sheep, 47.0 million poultry and 880,000 pigs (PO-PP, 2003). About two-fifth of the livestock population is concentrated in Arusha, Shinyanga and Mwanza. In 2002, production of livestock products was as follows: meat 332,000 tons; milk 900.5 million litres; and eggs 650 million. In addition, the livestock resources produce good quality hides and skins for export markets. However, there are no significant exports of animal products such as meat and animal fat. This is due to lack of meat canning and packaging industries.

### **2.1.3.4 Forestry**

Tanzania has an estimated forest and woodland area of 33.5 million hectares (MNRT, 1998). This is about half of the total land area of the country. The forestry sector account for 10% of foreign exchange earnings and over 90% of the fuel used both in rural and urban areas. The major products of this sector which are also exported are beeswax, honey, timber and timber products, mushrooms and to a lesser extent meat and animal trophies. Apart from its contribution of 6% to GDP, the forestry sector provides rural energy, protecting watersheds, conserving soil and the environment.

#### **2.1.3.5 Wildlife**

Tanzania is endowed with diverse wildlife such as the elephant, lion, leopard and buffalo that are found throughout the country. Tanzania has 19% of her surface area devoted to wildlife in protected areas (PAs) where no human settlement is allowed (national parks and game reserves) and 9% of its surface area to PAs where wildlife co-exist with humans (MNRT, 1998). The forms of wildlife utilization currently practiced include game viewing, tourist hunting and resident hunting. Hunting is well controlled with an emphasis on conservation, especially the maintenance of an ecological balance between the various species. It is only undertaken through obtaining hunting licences. During 2002, a total of US \$ 9.3 million were earned from tourist hunting activities (PO-PP, 2003). The number of tourists visiting national parks for the year 2003/04 was 304,103 as compared to a total of 576,198 tourists that visited Tanzania in the same year (MNRT Budget Speech, 2004), an increase of 90%.

#### **2.1.3.6 Tourism**

Tanzania's tourism sector is among the sectors with great economic growth potential. In 2001, tourism contributed 12.24 % of the GDP. It also provided employment for more than 30,000 people (MNRT, 2002). Unspoilt nature and their ecosystems especially outstanding scenery such as coastal areas, lakes and rivers, islands, mountain regions and historical sites and monuments, constitute the stock of natural and manmade resources for tourism and recreation (Mugurusi, 2002). In 2002, Tanzania received 575,000 tourists and the number is rising. Income from tourism activities stood at US \$ 730 million in 2002 (PO-PP, 2003).

#### **2.1.3.7 Industry**

Industrial sector employment accounts for about 18% of total wage employment and remains to be the largest single source of urban employment in the country. The sector also facilitates development of other sectors of the economy through supply and demand relationships. The GDP contribution of the manufacturing sector however declined from 8.7% in 1991 to only 8.3% in 1999. Most of the present industries were established in the light of import substitution strategy, whereas production focused in substituting previously imported goods in view of saving the country's meagre foreign exchange (Tanzania National Website, 2003).

In the past, chemicals were imported into Tanzania according to the demand channeled through the licensing Department of the Bank of Tanzania (BoT). Following liberalization of trade, few chemicals and chemical products require import permits of BoT (these are explosives, combustible preparation, mercury and ammunitions). Imports of pesticides per annum are estimated to be 81,500 metric tones, while that of industrial chemicals is 210,250 metric tones. Tanzania also imports about 22,200 metric tones of consumer chemicals per annum (BoT, 2002).

#### **2.1.3.8 Mining**

The mining sector is becoming an important foreign exchange earner for the country due to increase in private sector investments in mining. In 2003, the mining sector grew by 17% and export of minerals reached USD 491.1 million in the same year (PO-PP Budget Speech, 2004). In 2003 the mining sector contributed about 3% to GDP. The main mineral resources currently being exploited include gold, diamonds, gemstones and industrial minerals such as salt, kaolin, tin, gypsum, phosphate and meerschaum. However, gold is the major source of revenue and investment in the mining sector. The value of gold exported in 2002 was US \$ 396.1 million (PO-PP, 2003).

#### **2.1.3.9 Energy**

The energy sector contributed about 1.4% to GDP in 2002 (MEM Budget Speech, 2004). Biomass-based fuel (charcoal and firewood) accounts for more than 90 % of primary energy supply in the country. Petroleum and electricity accounts 8% and 1.5% respectively of the primary energy used. Coal, solar and wind account for less than 1 % of energy used (Ministry of Energy and Minerals, 2003; Mwiwaha and Mbise, 2003).

The estimated national fuel wood requirement is more than 46 million m<sup>3</sup> annually, with an average per capita demand of 2 m<sup>3</sup> of fuel wood per year (African Development Bank Group, 1995). On a sustained yield basis, the forests are only capable of producing 20 million m<sup>3</sup>/year. The combustion of wood and biomass is among the potential sources of unintentional production of Persistent Organic Pollutants (POPs) mainly PCDD and PCDF.

Electricity generation in Tanzania is from hydro (both macro and micro), diesel oil, imports (from Zambia and Uganda), coal, biomass, and to a small extent, solar photovoltaic. Electricity supply consists of both interconnected and isolated grid systems. The annual electricity generation in 2003 was 2,668.3 GWh (PMO Budget Speech, 2004) whereas electricity consumption in the same year was 2.39 billion kWh and the peak demand was 506 MW (MEM Budget Speech, 2004). The annual electricity consumption per capita is about 100 kWh and is estimated to be rising at 10% annually. The major end-users of electricity in the country are residential, small commercial and light industries (59.2%); industrial (34%); public lighting (0.1%); Zanzibar bulk supply (6.7%); whereas agriculture and transport consume relatively insignificant levels (Mwiwaha and Mbise, 2003). Table 2.1 shows the estimated and projected power generation and consumption in the country from 2000 to 2030.

**Table 2.1:** Estimated and projected power generation and consumption

<b>Year</b>	<b>2000</b>	<b>2010</b>	<b>2030</b>
Consumption (GWh)	1,913	4,720	11,298
Net Generation (GWh)	2,413	5,262	12,595
Peak (MW)	426	922	2,251

Source: Mwihava and Mbise (2003)

In 2002, the total electricity generation installed capacity was 892 MW of which 559 MW was hydroelectric and 304 MW was of thermal units whereas contribution from isolated thermal generation amounts to 29MW (Ministry of Energy and Minerals, 2003). Tanzania has immense potential for the generation of hydropower given the numerous permanent rivers. The country has a hydropower potential of 4.7 GW of installed capacity and about 3.2 GW of firm capacity. Only 13% of the potential installed capacity has been developed (Mwihava and Mbise, 2003). This indicates that about 70% of the available capacity is supplied by hydro systems while the balance is from grid and off-grid thermal systems.

Coal reserve is estimated to be 1,200 million tones (Ministry of Energy and Minerals, 2003). The major coalfield is at Mchuchuma in South Western Tanzania. It has a total reserve of 536 metric tones (NDC, 1999). There is an existing small coalmine at Songwe Kiwira, which started production in 1998. It has a potential of producing electricity up to 400 MW for 35-50 years. At present Kiwira coalfield produces 54,610 tonnes of coal (MEM Budget Speech, 2004) and generates 3MW of electricity.

Natural gas has been discovered at Songo Songo and Mnazi Bay, which have potential for commercial exploitation. The reserve for Songongo gasfield is estimated at 1-2 trillion ft<sup>3</sup> of natural gas; while Mnazi Bay gasfield is estimated to be 1 trillion ft<sup>3</sup> (TPDC Regional Stratigraphy). The project on construction of recovery plant and a pipeline from Songo Songo to Dar es Salaam was completed in July 2004 and the project cost was estimated at US \$ 350 million. The generation of electricity using Songo Songo gas has commenced and up to 112 MW of electricity is being generated for the national grid. Also industries such as Tanzania Portland Cement Company Limited (TPCC), Kioo Ltd and Tanzania Breweries Ltd (TBL) are already using the natural gas as source of energy.

The use of non-conventional renewable energy sources such as solar and wind energy, and biogas are yet to be fully exploited. It is estimated that solar electricity from small-scale installations amounts to 1 MW (MEM Budget Speech, 2004). There are plans to build wind farms in different parts of the country with electricity generating capacity of 30 – 50 MW.

In 2003, Tanzania consumed 1.24 million m<sup>3</sup> of petroleum products as compared to 1.0 m<sup>3</sup> in 2002. The transport sector accounts for over 50% of petroleum used in the country.

Current national petroleum demand stands at 3,400 tonnes per day (MEM Budget Speech, 2004).

### 2.1.3.10 Transport and Communication

Some of the macroeconomic indicators in the transport and communication sector are as shown below:

<i>Vehicles (2001)</i>	<i>2 per 1000</i>
<i>Navigable inland waterways:</i>	<i>0 km; only lakes are navigable</i>
<i>Ownership radios (2001):</i>	<i>406 per 1000</i>
<i>Ownership tv-sets (2001):</i>	<i>42 per 1000</i>
<i>Newspaper circulation (2001):</i>	<i>8 per 1000</i>
<i>Persons per post office (2001):</i>	<i>54,400</i>
<i>Personal computers (2001):</i>	<i>3 per 1000</i>
<i>Source: WorldBank, 2003</i>	

#### a) Transport

The transport and communication sector contributed about 5.4% to GDP in 2003 (PO-PP Budget Speech, 2004). The transport sector comprises road transport, maritime transport (inland water and sea transport), air transport and railway transport.

**Road Transport:** Road Transport plays a major role in the movement of goods and passengers accounting for about 70% of the total movement with the balance carried mainly by rail and a much smaller amount by coastal and lake shipping (MCT, 2001). Major road links are all weather, but only 4,837 km of the 85,000 km of classified roads are bitumenised (MoW Budget Speech, 2004). Further details are as shown in Table 2.2.

**Table 2.2:** Condition of road network in the country, June 2004

<b>Road Type</b>	<b>Bitumenised (km)</b>	<b>Maram/earth (km)</b>	<b>Total (km)</b>
Trunk Roads	4,177	6,123	10,300
Regional Roads	260	24,440	24,700
Rural Roads	500	49,500	50,000
<b>Total</b>	<b>4,837</b>	<b>80,063</b>	<b>85,000</b>

*Source: MoW Budget Speech (2004)*

**Railway Transport:** There are two railway systems, namely Tanzania Railways Corporation (TRC) with a length of 2605 km and the Tanzania - Zambia Railways Authority (TAZARA) with a length of 960 km. In 2002, TRC transported 1,445,757 tonnes of freight cargo and handled 684,799 passengers as compared to TAZARA that transported 677,000 tons of freight cargo and handled 1,212,000 passengers (PO-PP, 2003).

**Air Transport:** Tanzania has 125 airports including airstrips servicing domestic and international traffic; International Airports are Mwalimu Julius Kambarage Nyerere - Dar es Salaam (the then DIA), Kilimanjaro International Airport (KIA) and Zanzibar International Airport (ZIA). During 2002, the total number of flights was 123,136 whereas the total number of local and international passengers was 1,355,739 (PO-PP, 2003). The improved performance of the air transport sub-sector has been due to improved performance of the Tanzania Civil Aviation Authority (TCAA) and Tanzania Airports Authority (TAA) together with procurement and installation of modern radar and rehabilitation and maintenance of airports infrastructure and various equipment (PO-PP, 2003).

**Maritime Transport:** Maritime transport includes deep seas, coastal and inland waterways. There are four major seaports namely, Dar es Salaam, Mtwara, Tanga and Zanzibar. Dar es Salaam is one of the major regional ports serving the neighbouring land locked countries of Zambia, Malawi, Burundi, Rwanda, and Uganda. In 2002, Tanzania Harbours Authority (THA), which operates ports of Dar es Salaam, Tanga, Mtwara and minor ports of Kilwa, Lindi and Mafia, handled 4,524,808 tonnes of cargo while the number of ships handled by the ports was 3,930. Transport in Lakes Tanganyika, Nyasa and Victoria is co-ordinated by the Marine Services Company Limited. The Company owns a total of 16 vessels, out of which, 10 operate in Lake Victoria, 4 in Lake Tanganyika and 2 in Lake Nyasa. During 2002, the Company transported 370,588 passengers and 144,473 tones of cargo (PO-PP, 2003).

#### **b) Telecommunication**

Of recent, communication sector has recorded impressive service improvement, primarily due to increase in investments. This sector involves telephones, mobile phones, postal services and information and communication technology.

**Telephone:** In 2001, the country's telephone density (tele-density) stood at 0.5% per 100 inhabitants, well below the average for several neighbouring countries like Kenya (0.92) (MCT, 2001).

**Mobile phones:** Mobile phones subscribers have increased up to 2.5 million by May 2005 (MCT Budget Speech, 2005). However, the number of subscribers has been increasing gradually since then.

**Internet:** Tanzania has an Internet Exchange Point (IXP) located in Dar es Salaam that started operations in January 2004. There has been a significant increase in Internet users in the country over the recent few years particularly in urban areas. There are 25 Internet Service Providers (ISPs) and 272 Internet cafes in the country by June 2004 (MCT Budget Speech, 2004). The Tanzania Telecommunication Company Ltd (TTCL) plans to improve telephone service using "Asynchronous Digital Subscriber Line (ADSL) Broad Band" technology to facilitate access to Internet.

**Postal services:** In 2002, the total number of postal operators (sub post offices, franchised post offices and departmental post offices) stood at 424 post offices. In the same year, the number of private letterboxes installed was 305,076 and those rented was 137,467 (NBS, 2002). Following liberalization of the non-basic postal services, there are 16 licensed courier service operators by June 2004. The mail delivery centres stood at 27 by 2003 (MCT Budget Speech, 2004).

**Radio, TV and Newspapers:** A total of 60 radio stations, 28 TV stations (MCT Budget Speech, 2004) and more than 400 newspapers (PO-GG Budget Speech, 2004) have been licensed in the country by June 2004. Also a fixed frequency monitoring station for radio and TV has been established in Mikocheni, Dar es Salaam.

## **2.1.4 Environmental Overview**

The National Environmental Policy (1997) has identified six priority major environmental problems in the country. These problems are: land degradation; lack of accessible, good quality water for both urban and rural inhabitants; environmental pollution; loss of wildlife habitats and biodiversity; deterioration of aquatic systems; and deforestation.

### **2.1.4.1 Land Degradation**

Land degradation mainly results from the removal of woody vegetation especially when the rate of removal is higher than the rate of regeneration. A number of factors contribute to land degradation in the country. These include, among others, inappropriate cultivation techniques; a growing population; growing energy requirements; over stocking; and insecure land tenure. In the densely populated highland areas, the average farm size has decreased. In some areas, stocking rates have risen well beyond the carrying capacity of the rangelands. Closed dense forests cover only 3.2% of Tanzania. The remainder of forests comprise mainly of miombo woodlands and large areas of thorn-bush.

Land degradation is reducing the productivity of soils in many parts of Tanzania. Soil loss has been measured in Shinyanga region over a long time period. Rates in the 1970's were twice the rates of the early 1960's (105 tons/ha/year, 1960-1965; 224 tons/ha/year, 1970-1980) (URT, 1997). Measurements in Dodoma, Morogoro, and Arusha regions suggest similar high rates of soil loss.

### **2.1.4.2 Lack of Accessible, Good Quality Water for both Urban and Rural Inhabitants**

Available information on the incidence of water-borne, water-related and water-washed diseases indicate that these are mostly prevalent where people use contaminated water or have little water for daily use. Such diseases account for over half of the diseases affecting the population since more than 80% of Tanzania's population is living in rural areas.

In 2002, water services provision in urban areas increased to 73% compared to 70% in 2001 whereas provision of water services in villages was 53%, an increase of 3.0% as compared to 2001 (PO-PP, 2003). However, inefficient water uses, such as low efficiencies of many irrigation schemes (estimated at 10% to 15%); and leakages from domestic water supplies estimated at 52% of the water that is produced; contribute to reduction in water availability (URT, 2002)

The water sector contribution to GDP has remained at 0.2 per cent for some years, a proportion which is insignificant considering the importance of the sector to the economy (Tanzania National Website, 2003). In response, the government is encouraging private investment in the water sector.

#### **2.1.4.3 Environmental Pollution**

The rapid growth of urban areas in Tanzania (about 6.8 % per annum) has put tremendous pressure on existing services and amenities. As a result, in urban areas there are many sources of pollution as compared to rural areas. Water pollution is the most widely spread form of environmental pollution in urban and rural areas in the country; it is caused by agricultural, mining, industrial and transport activities. Apparently, indiscriminate solid waste and liquid waste disposal contributes significantly to water, air and soil pollution.

##### **a) Urban Environmental Problems**

**Solid waste:** Pollution arising from inadequate solid waste management particularly in urban areas is exacerbated by dominance of unplanned settlements which accommodate 70-80% of the urban population, the lack of waste separation between hazardous and non-hazardous wastes from industrial, domestic and hospital wastes; and lack of proper disposal facilities. It is estimated that over 5,000 tonnes of solid wastes are generated per day in the country but only about 30% are being collected (Madete, 2002). The uncollected waste finds its way into stormwater drains, or dumped in pits in the backyards, burned or is left openly to decompose. Where communities have resorted to dispose the uncollected wastes in unauthorized sites, such areas have become breeding sites for mosquitoes, vermin and other insects. The local authorities are generally under-equipped to deal with his problem. There is minimal recycling of recyclable wastes such as metals, paper and plastics. The situation is posing health risks particularly to urban inhabitants who live in unplanned settlements.

**Sewage:** In most urban areas, few households are served with central sewerage system while bigger part of the population rely on-site sewerage disposal systems. Due to low coverage of sewerage systems, overflows of untreated sewage are a common sight on streets in most towns in the country. It is estimated that 80% of the urban population in Tanzania depends on pit latrines as their excreta disposal facility, however 80% of these facilities used by most urban poor are substandard and offensive. In Dar es Salaam, for instance, sewers serve only 20% of the area and, of this, 80% is discharged untreated into

coastal waters. Only the remaining 20% receives basic treatment in oxidation ponds. Current data show that 40% of diseases most common in Tanzania are fecal related.

**Air pollution:** Air pollution in towns and the countryside is a growing risk to human health. Source of air pollution in the country are static and mobile sources. Static sources of air pollution include the manufacturing or production processes of industries such as cement factories and thermal power stations, chemical industries and paper industries. Many manufacturing industries lack air pollution control equipment. The problem is aggravated by old technology in most industries, which tend to consume much input resources of raw materials, energy and water, and consequently emit large quantities of waste. Improper disposal sites emit various gaseous pollutants and may have spontaneous fires. Mobile sources of air pollution include motorized transport that uses either gasoline or diesel of which emissions may contain lead, sulphur and hydrocarbons. Motorized transport is anticipated to become a major pollution problem particularly in urban areas due to inefficient motor vehicles particularly the second-hand vehicles which not only pose mechanical problems but also environmental problems. Most of these vehicles are poorly maintained due to limited financial capacity by most owners to ensure regular maintenance and high performance.

**Noise pollution:** Noise pollution, which is mainly caused by urbanisation and industrialisation, of late has been a growing problem in most urban centers particularly Dar es Salaam city. Noise pollution is a serious and neglected issue in most urban areas throughout the country. From a few number of noise pollution temporal studies (1999) in Dar es Salaam city, mean noise level, L50 was found to lie between 60 dBA and 70 dBA. These levels are comparable to those recorded elsewhere in industrialised countries. Some of the sources of noise pollution include industrial operations, transport and recreational centers. In some areas, recreational, industries and bus terminals are located near residential areas.

## **b) Rural Environmental Problems**

**Nutrient loading:** Due to increased input of nutrients into the water bodies from agricultural run-off in rural areas and the industrial and municipal discharge from urban areas, exotic waterweeds such as the water hyacinth have invaded many water bodies in the country. The plant has serious deleterious effects on freshwater fishing as it blocks the entry of light to the water underneath and reduces oxygen, temperature and pH; all have negative impact to fish. A case in point is Lake Victoria, which in recent years has been infested with water hyacinth primarily due to nutrient loading from catchments, atmospheric deposition as well as industrial and municipal effluents. The estimates on annual nutrient loading into lake Victoria indicated that there is about 23,550 t/y of BOD, 155,580 t/y of total nitrogen, and 32,050 t/y of total phosphorus entering into the lake (Twong'o and Sikoyo, 2003). The estimates were based on few measurements and indirect methods.

**Agrochemicals:** A survey of POPs conducted in 2003 revealed that the magnitude of contamination of some obsolete POP Pesticides storage sites is alarming and needs urgent

remedial measures. There are 17.4 metric tones of obsolete stocks of Aldrin, Dieldrin, and Toxaphene that are stored in various areas of intensive cash crops agricultural activities as well as in the respective industrial processing areas. In addition, there are 170.65 metric tones of DDT stored in different places. In some areas the pesticides have seeped into the ground and in case of powdered pesticides, dispersed by wind to surrounding areas. Some of these sites are heavily contaminated to the extent that less plants (flora), insects and other microorganisms (fauna) can be observed. One of these sites is Vikuge located in the Coast region whose source of contamination is obsolete stockpiles of pesticides mainly DDT. Initial studies conducted at the site suggest significant pollution levels in soil and groundwater. For instance, in a study conducted at Vikuge by NEMC in 1998, the soil at a depth of 1m showed concentrations of 100 mg DDT per kg soil. In another study undertaken by the Chemistry Department of the University of Dar es salaam in 2000, indicated DDT residue levels in the soil of up to 282,000 mg/kg of dry weight of soil (28.2%). These levels are well above WHO maximum residue limits (MRLs) and hence there is risk of human exposure to DDT through air and drinking water from wells close to the site. This situation accentuates significant health and environmental risks.

#### ***2.1.4.4 Loss of Wildlife Habitats and Biodiversity***

Tanzania has one of the broadest ranges of natural resources in the world, including marine ecosystems, fresh water, savannah, forests, and lakes (URT, 2001). However, an ever-increasing population has led to heavy poaching and a massive increase in demand for agricultural land. The consequences have been devastating; massive habitat loss through soil erosion, plummeting population numbers of indigenous large mammals and the extinction of many species. In 1996 for example, Tanzania has already lost 47% of her original wildlife habitats (URT, 2001). Data on population trends for key species in the protected areas indicate an almost total loss of the black rhinos, loss of two-thirds of the elephants, and increasing losses of buffaloes mainly due to illegal hunters (MNRT 1995). Without long-term management measures, habitats and species will continue to disappear at an alarming rate.

Human activities are directly responsible for current alarming rates of biodiversity loss as a result of habitat loss, fragmentation and degradation; invasive species; over-exploitation of wild living resources; pollution of atmosphere, water and soil; and global climate change.

#### ***2.1.4.5 Deterioration of Aquatic Systems***

There is concern over deterioration of aquatic resources in Tanzania because of increased human activities that degrade the marine and freshwater ecosystems. Some of the anthropogenic threats to aquatic resources include pollution from industrial, domestic and agricultural effluents; destructive fishing by use of dynamite, beach-seining and fish poisoning; trophy collection-coral and shell collection; unregulated tourism for example around some coastal areas; over-exploitation of aquatic resources; introduction of exotic

species; erosion and siltation due to overgrazing and deforestation; loss of habitats due to development activities, like construction of dams, mineral and aggregate mining, irrigation etc (URT, 2001). The contaminants, which pose the greatest threat to the aquatic environment, are sewage, nutrients, synthetic organic compounds, sediments, solid waste and waste oils.

#### **2.1.4.6 Deforestation**

Removal of woody vegetation, trees or shrubs in Tanzania is increasingly becoming a major threat to the environment. Although there are no reliable estimates on the rate of deforestation, the Forest Department estimates range from 130,000 to 500,000 ha per annum (MNRT, 1998).

The main causes of deforestation are uncontrolled cutting of wood, mainly for cooking, sale, drying fish, tobacco curing, burning bricks and also for building poles, small scale mining and bush fires (URT, 2004). Other factors contributing to deforestation include cutting tree branches to provide fodder to livestock and to make fences for the herds, clearing for cultivation, clearing driveway marauding animals and grain-eating birds, clearing to expand grazing areas and clearing to control tse tse fly. . It is estimated that about 70% of the deforestation in Tanzania is due to fuelwood harvests, directly or indirectly, with about 30% of the deforestation being the result of agricultural land clearing (URT, 1997). Cutting down trees to cure tobacco is also a major concern since it accounts for about 4% of annual deforestation in the country, a figure that does not include the amount of forest being cleared for new tobacco farms (Hammond, 1997). Further, it is estimated that forest fires in 2003 resulted in resource loss equivalent to 2-3% of the GDP (PMO Budget Speech, 2004).

## **2.2 INSTITUTIONAL, POLICY AND REGULATORY FRAMEWORK**

### **2.2.1 Environmental /Sustainable Development Policy and General Legislative Framework**

#### **2.2.1.1 Profile of the Government**

The United Republic of Tanzania is a union of two countries, which are the former Tanganyika and Zanzibar. Article 4 of the Constitution of the United Republic of Tanzania (1977) provides for three organs of the Government: Parliament (which is established under Chapter Three); the Executive (which is established under Chapter Two) and the Judiciary (which is established under Chapter Five).

#### **a) The Executive**

The Executive of the United Republic of Tanzania comprises the President, the Vice-President, President of Zanzibar, the Prime Minister and the Cabinet Ministers. The

President is the Leader of the Executive of the United Republic of Tanzania. He is the Head of State, the Head of Government; and the Commander-in-Chief of the Armed Forces.

The Vice President is the principal assistant to the President in respect of all matters in the government of the United Republic of Tanzania. He has also been given the responsibilities of Environmental Management, Poverty Eradication, and Coordination of NGOs and Coordination of Union matters.

The President of Zanzibar is the Head of the Executive for Zanzibar; Head of the Revolutionary Government of Zanzibar and the Chairman of the Zanzibar Revolutionary Council.

The Prime Minister is the Leader of Government Business in the National Assembly and has authority over the control, supervision and execution of the day-to-day functions and affairs of the Government of the United Republic of Tanzania and also performs any other matter that the President directs .

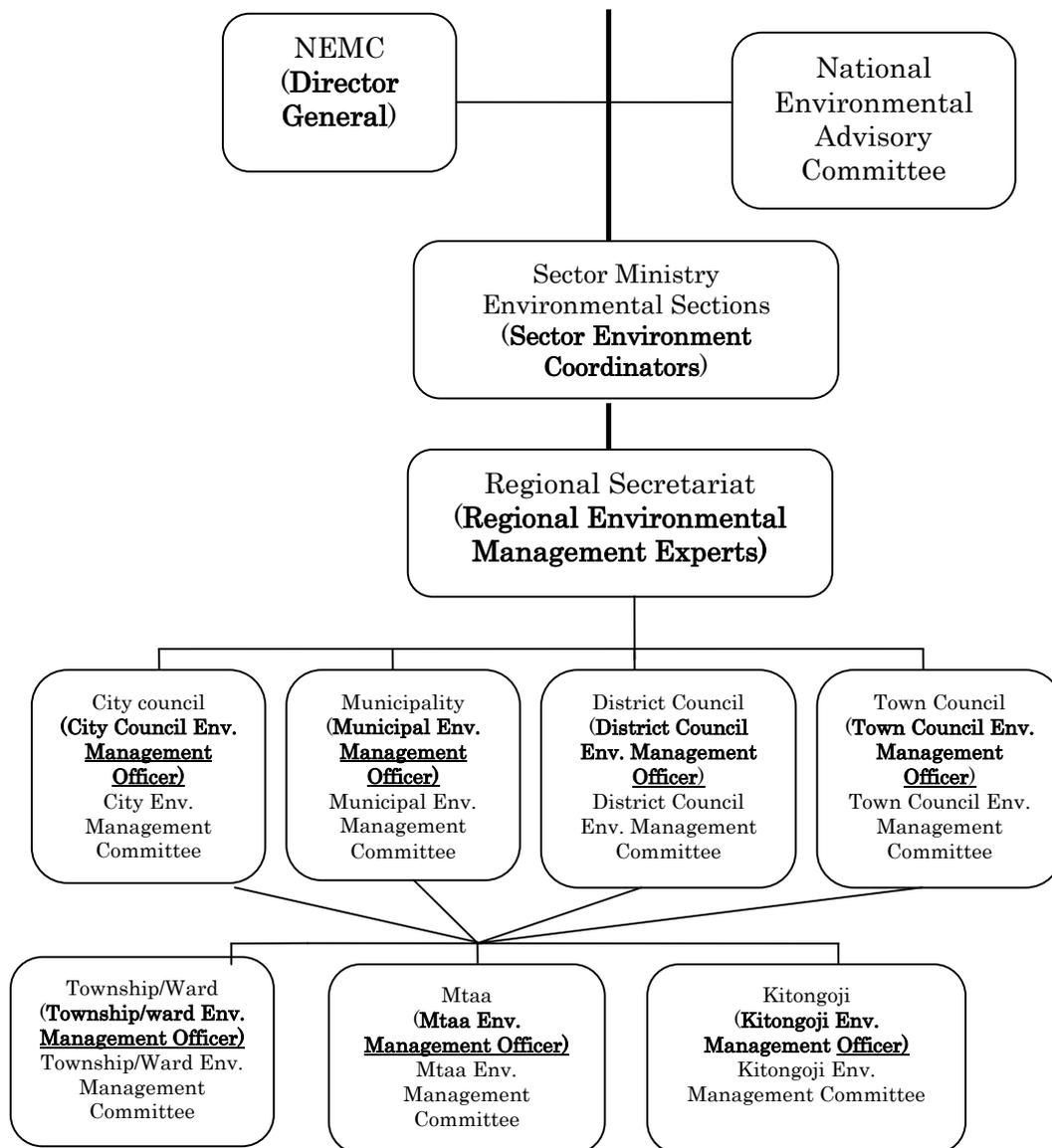
The Cabinet of the Union government comprises of the President, Vice President, Prime Minister, Ministers and the Attorney General. The Cabinet, including the Prime Minister is appointed by the President from among members of the National Assembly. The Government executes its functions through Ministries led by Cabinet Ministers. There are 27 Ministries. Each Ministry has a sector portfolio through Presidential Instruments.

#### **b) Local Government Authorities**

The United Republic of Tanzania is divided into 26 administrative regions, 21 being in the mainland and 5 in Zanzibar. A Regional Commissioner heads each region. The country has been divided into 130 Districts headed by District Commissioners.

Local Government Authorities exist for the purpose of consolidating and giving more power to the people to competently participate in the planning and implementation of development programmes within their respective areas. Local Government Authorities are mandated to play two main functions of administration, law and order; and economic and development planning in their respective areas of jurisdiction. Local Government Authorities are classified into two categories – the Urban Authorities and District Councils. Urban authorities are responsible for the administration and development of urban areas ranging from townships, municipalities and Cities. The second category is the Rural Authorities commonly known as District Councils. As of November 2005, there are 130 District Councils, and Urban Councils. The Urban Councils includes 5 Cities, 3 Townships and 16 Municipals.

Vice President's Office  
(**Minister Responsible for  
Environment**)  
Division of Environment  
(**Director of Environment**)



**Figure 2.5:** Institutional arrangement for environmental management

### c) The Parliament

The National Assembly is the principal organ of the United Republic and has authority on behalf of the people to oversee and advise the Government of the United Republic and all its organs in the discharge of their respective responsibilities. The President exercises authority vested in him by the constitution to assent the proposed laws a necessary procedure in the completion of the enactment process.

The Parliament is headed by the Speaker who is assisted by the Deputy Speaker and the Clerk to the National Assembly as Head of the Secretariat of the National Assembly. The major responsibilities of the Parliament are to enact laws and to oversee and advise the government and all its organs in the discharge of their respective responsibilities in accordance with the Constitution.

#### **d) Judiciary**

The Judiciary in Tanzania consists of four organs: the Court of Appeal of the United Republic of Tanzania, the High Courts for Mainland Tanzania and Tanzania Zanzibar, the Judicial Service Commission for Tanzania Mainland, Magistrates Courts and Primary Courts. The Judicial Service Commission for Tanzania Mainland consists of: the Chief Justice of the Court of Appeal of Tanzania (Chairman); the Justice of the Court of Appeal of Tanzania; the Principal Judge of the High Court; and two members appointed by the President. The Tanzania legal system is based on common law. The Tanzania Law Reform Commission is responsible for the review of the country's laws.

The Judiciary in Tanzania is headed by the Chief Justice, with the Registrar of the Court of Appeal as the Chief Executive Officer. The Principal Judge assisted by the Registrar of the High Court, is in charge of the Administration of the High court and the Courts subordinate thereto. Apart from sharing the Court of Appeal of the United Republic with Mainland Tanzania, Zanzibar has a distinct and separate legal system. According to the Constitution of the United Republic of Tanzania the High Court of Zanzibar is not a Union matter. Article 114 of the Constitution of Tanzania expressly reserves the continuance of the High Court of Zanzibar institutions with their jurisdiction. The Court system in Zanzibar has a High Court, Kadhis Courts and the Magistrates Courts.

#### **2.2.1.2 Policies and legislation formulation process**

The process of formulating National policies is initiated by the relevant department, which prepares draft policy. The draft policy is then circulated to various stakeholders before inviting them to a national workshop for improvement and consensus building. The next step is to submit the draft policy to the Cabinet through an Inter Ministerial Technical Committee (IMTC). The members of the Inter Ministerial Technical Committee are Permanent Secretaries. Once the Cabinet approves, it is then tabled in the Parliament for adoption. On the other hand the process of formulating and approving legislation is similar to that of policy.

#### **2.2.1.3 Public Service Reforms in Tanzania**

In response to public sector inefficiency and deep macro economic crises in mid 1980s, the government of Tanzania embarked on wide ranging policy and institutional reforms. The reforms which were geared to dismantle the commanding role of the State in the economy, focus on liberalization of the economy; privatization of public enterprises, reorganization and right sizing of public institutions, and relocating activities and

responsibilities that are currently assumed by the public sector to executive agencies and non public institutions; financial reforms and legal reforms.

The on going reforms include:

**i) Public Financial Management Reform Programme (PFMRP)**

This reform aims at addressing the constraints in public financial management. It seeks to develop public financial management capacity and sustainability throughout central government.

**ii) Public Service Reform Programme (PSRP)**

The reform takes forward the institutional reforms initiated under the Civil Service Reform Programme since 1991. It aims at transforming the public service into an efficient, effective, policy driven, responsive and results oriented institution. The programme has played a significant role in restructuring and decentralization; rationalization and streamlining of government structures; improving the policy and legislative environment; capacity building and most importantly re-defining the role of the state.

The initiatives undertaken by the Public Service Reform Programme include:

- Strengthening good governance and enhancing the effectiveness, efficiency, and quality of public service delivery;
- Stimulating public confidence through transparent, effective and efficient administrative processes in government institutions;
- Developing relevant capacities in the public service and to cater for private sectors needs efficiently;
- Enhancing leadership and management capacities in policy making, performance management, good governance and other related skills and competencies;
- Promoting public-private sector partnership.

**iii) Privatization Programme under the Management of the Parastatal Sector Reform**

This aims at reducing Parastatal dominance and promoting a larger role of the private sector, while ensuring effective use of resources.

**iv) Local Government Reform Programme**

This focuses on decentralization of the decision making process through the greater empowerment of local authorities, facilitating the delivery to the public of more efficient, sustainable and equitable services.

**v) Legal Reforms**

In response to a bureaucratic and outdated legal and regulatory framework, the government has amended, enacted a number of laws and policies such as the National Environment Policy (1997) and the Environmental Management Act (2004).

#### **2.2.1.4 Guiding Philosophies and Principles**

The following are the general philosophies and principles which are embedded in the Constitution of the United Republic of Tanzania and reflected in the Environmental Management Act (2004): -

- i) Environment is the common heritage of present and future generations;
- ii) Right to clean and healthy environment ; including the right for access by any citizen to the various public elements or segments of the environment for recreational, educational, health, spiritual and cultural purposes.
- iii) Stake and duty to safeguard and enhance the environment and to inform the relevant authority of any activity and phenomenon that may affect the environment significantly.
- iv) Adverse effects to health and environment shall be prevented and minimised through long term integrated planning and coordination, integration and cooperation of efforts, which consider the entire environment as a whole entity;
- v) The precautionary principle which requires that where there is risk of serious irreversible adverse effects occurring, a lack of scientific certainty shall not prevent or impair the taking of precautionary measures to protect the environment;
- vi) The polluter pays principle, which requires that any person causing adverse effect on the environment shall be required to pay in full social and environmental costs of avoiding, mitigating, and or remedying those adverse effects;
- vii) Right to the involvement of the people in the development of plans and processes for the management of the environment;
- viii) Right to environmental information; which enables citizens to make informed personal choices and encourages improved performance by industry and government;
- ix) Right to justice which gives individual and public interest groups the opportunity to protect their rights to participation and to unrest decisions that do not take their interest into account;
- x) The generation of waste shall be minimised wherever practicable, and that for proper management of waste, it shall, in order of priority, be reused, recycled, recovered and disposed of safely in a manner that avoids creating adverse effects;
- xi) Non renewable natural resources shall be used prudently, taking into account the consequences for the present and the future generations; and
- xii) Renewable natural resources and ecosystems shall be used in a manner that is sustainable and does not prejudice their viability and integrity.

### **2.2.1.5      *Environmental Policy and Legislative Overview***

Tanzania adopted the National Environmental Policy (NEP) in December 1997. Since environmental management involves a multisectoral as well as multidimensional issues, the policy formulated is a framework document, which gives direction on elements to be considered in order to mainstream environmental matters into sectoral policies. The importance of environmental management for sustainable development has been clearly stipulated in the NEP.

The Policy provides framework for environmental management issues for various sectors in order to achieve sustainable development. The objectives of the Policy include: to ensure sustainability, security, and equitable use of resources to meet the basic needs of the present population without compromising those of the future generation, without degrading the environment or risking health or safety. It also focuses on preventing degradation of land, water, vegetation and air, which are crucial elements for life. The policy advocates for development and application of environmentally friendly pests control methods without specific reference to POPs. The policy underscores the need for promotion and application of environmentally friendly technologies such as recycling, reuse and safe waste disposal.

Since environmental pollution does not recognize national boundaries, the environmental policy emphasizes the importance of international cooperation with regard to environmental issues. In that spirit therefore, Tanzania participates and implements relevant bilateral, sub-regional, regional and international treaties and programs that are related to environmental protection such as the control of toxic substances. These include the Bamako, Basel, Rotterdam and Stockholm Conventions.

In November 2004, the Parliament of the United Republic of Tanzania enacted the Environmental Management Act, 2004. The Act provides the legal and institutional framework for sustainable management of environment. It also provides principles for environmental management, impact and risk assessments, prevention and control of pollution, waste management, environmental quality standards, public participation, compliance and enforcement; and basis for implementation of international instruments on environment. Moreover EMA provides mechanisms for implementation of the National Environmental Policy and it establishes the National Environmental Fund. It repeals the National Environment Management Act, 1983 and provides for continued existence of the National Environment Management Council. Section 77 of the Act provides for the management of POPs and empowers the Minister to promulgate regulations covering among others compliance with international obligations; promotion of alternatives to POPs; disposal of obsolete stocks of POPs; and regulation of imports and exports of POPs chemicals. It requires safe transportation of POPs and other toxic chemicals; and compensation, clean-up and emergency response to spills and accidents as well as the national, city, municipal, town and village contingency plans.

Moreover, the Environmental Management for Sustainable Development Act of 1996 provides for institutional arrangement for management of the environment in Zanzibar.

The Act, among others, covers aspects of environmental management such as environmental planning, environmental impact assessment (EIA) and environmental standards.

The National Strategy for Growth and Reduction of Poverty (NSGRP) of 2004 is a new policy initiative, which has its roots on the Poverty Reduction Strategy Paper (PRSP) of 2000. The NSGRP keeps in focus the aspiration of Tanzania's Development Vision (Vision 2025) for high and shared growth, high quality livelihood, peace, stability, unity, good governance, high quality education and international competitiveness. It is committed to the Millennium Development Goals (MDGs) as internationally agreed targets for reducing poverty, hunger, diseases, illiteracy, environmental degradation and discrimination against women. In addition the strategy seeks to:

- Deepen ownership and inclusion in policy making processes by recognising a need to make participation more institutionalised rather than a one-off event;
- Pay greater attention to mainstreaming cross-cutting issues – HIV and AIDS, gender, environment, employment, governance, children, youth, elderly, disabled and settlement and;
- Address discriminatory laws, customs and practices that retard socio-economic development or negatively affect vulnerable social groups.

The NSGRP is a five-year framework policy. It outlines goals, targets and strategies for 3 clusters. These are:-

- (i) Cluster I - growth of the economy and reduction in income poverty;
- (ii) Cluster II – improvement of quality of life and social well-being;
- (iii) Cluster III – Good governance and accountability.

The issue of management of POPs falls under cluster II.

The government has endorsed several reforms programmes since mid-1980s. These include the Civil Service Reform Programme and the Local Government Reform Programme. The Local Government Reform Programme (LGRP), which began in 1997, aims at improving the quality of the access to public services provided through or facilitated by local government authorities. The LGRP comprises five inter-locking elements which are: decentralization of authority and responsibilities; strengthening accountability of Local Government staff and Councilors; increasing availability of resources to Local Government Authorities by improving the share of viable revenue sources accessible to LGAs and enhancing grants from Central Government; providing the framework for delivery of services on behalf of the Government; and building capacity for effective resource management.

#### **2.2.1.6 Environmental Regulatory Framework**

The Constitutions of the United Republic of Tanzania and that of Zanzibar both have no express provision on environmental rights, but they have clauses for the protection of natural resources. Article 27 (1) of the constitution of Tanzania stipulates that: “every person is obliged to safeguard and protect the natural resources of the United Republic,

State property jointly owned by the people, as well as to respect another persons property”. The provision on the protection of the natural resources can logically be extended to cover the environment. The right to clean and safe environment is not expressly provided for in the two Constitutions. However that lack of a specific provision on environmental rights has not hampered the courts in Tanzania from affirming them. This has been through the application of the clause in the Bill of Rights, which guarantee the right to life.

The Directive Principles of State Policy in the Constitution obliges the State and all its organs to ensure that the natural resources and heritage are harnessed, preserved and applied to the common good of Tanzanians ( (Article 9(1)(c) of the Constitution).

In Tanzania, there are many pieces of legislation dealing with different aspects relating to the utilization and management of natural resources. Most of such legislation put great emphasis on regulating access to and control of the use of natural resources, such as land, minerals, water, forestry and wildlife. The sectoral legislation empowers Ministers to enact regulations, which elaborates specific provisions of the sectoral laws and sets enforcement mechanisms. Also under the Local Government (District Authorities) Act the Minister enacts bylaws. These by laws and regulations generally deal with the prevention of soil erosion, tree planting, water management and conservation of water sources, the management of forest and forest reserves and waste management. There are limited bylaws and regulations on POPs.

Statutory laws rather than customary laws mainly govern access and the use of natural resources in Tanzania. As far as customary law is concerned, its application is limited to the community in which it is established and accepted, or to a community having similar customary law on the issue. The law as well as several court decisions have recognised the validity and legitimacy of customary law.

#### ***2.2.1.7 Related Policy, Legislative and Regulatory Measures***

##### **a) Agricultural and Livestock Policy (1997)**

The policy emphasizes on promotion of Integrated Pest Management (IPM) through plant protection and agricultural extension services. It also requires strengthening of agrochemicals registration and monitoring. However the policy does not provide specific guide on POP Pesticides. This is due to limited awareness on POPs issues at that time. However, it stresses on implementation of IPM. Tanzania embarked on IPM programme since 1992 and to date pest management technologies packages for cotton, maize, coffee and vegetables have been developed together with farmers and are being implemented. This has resulted in reduced use of pesticides. Also various substitutes are already in use. These include chemical, biological and botanical pesticides.

##### **b) The Sustainable Industrial Development Policy (1996-2020)**

The Sustainable Industrial Development Policy (SIDP) gives a framework of broad guidelines on factors, which influence the direction of the country's industrialization process for a period of 25 years. The national goals, towards which the industrial sector is geared, include human development and creation of employment opportunities, economic transformation for achieving sustainable growth, external balance of payments, environmental sustainability and equitable development.

Under the section on "sound environmental management" the policy framework states that; " In order to ensure promotion of environmentally friendly and ecologically sustainable industrial development, the following will be implemented:

- (i) The government will carry out sensitization on environmental awareness in its broader application;
- (ii) The government will forge deliberate and mandatory devices to reactivate legal mechanisms to enable involved institutions to be more effective in matters of environmental management;
- (iii) An appropriate motivational mechanism will be provided within the Investment Promotion Act geared to cater for promotion of investments which contain anti-pollution programmes;
- (iv) Environmental Impact Assessment (EIA) and appropriate mitigation measures will be enforced for all projects at implementation stage; and
- (v) The government will promote the continuous application, of an integrated preventive environmental strategy to industrial processes, products and services which will include propagating efficient use of raw materials and energy, elimination of toxic or dangerous materials, as well as reduction of emissions and wastes at source. In this regard, the government will develop the capacity within its institutional machinery and support other initiatives designed to enhance application of cleaner production concept as an important complement to end-of-pipe pollution control---".

Therefore the policy promotes the reduction and eventual elimination of discharges/emissions of toxic chemicals such as PCBs, PCDD and PCDF from industrial processes.

### **c) National Energy Policy (2003)**

The policy objectives are to ensure availability of reliable and affordable energy supplies and their use in a rational and sustainable manner in order to support national development goals. The policy therefore aims to establish an efficient energy production, procurement, transportation, distribution and end-use systems in an environmentally sound manner. The policy statements regarding environment, health and safety are: promoting environmental impact assessment as a requirement for all energy programmes and projects; promoting energy efficiency and conservation as a means towards cleaner production and pollution control; promoting development of alternative energy sources including renewable energies and wood fuel end-use efficient technologies to protect woodlands; promoting disaster prevention, response plans, and introducing standards for exploration, production, conversion, transportation, distribution, storage and fuel end-use.

Although there is no specific provision on POPs in this policy, the above mentioned measures could result into decreased releases of PCDD and PCDF.

#### **d) Health Policy (1990)**

The main objective of this policy is to protect public health, curing diseases and promoting human well-being and informed participation in primary environmental care. With respect to the reduction and elimination of POPs the policy is promoting research of safe alternatives to DDT for malaria vector control. DDT has not been used in disease vector control since 1980's. The alternatives being promoted include physical, chemical and biological controls. The Ministry of health has also prepared guideline on Environmental Health and Sanitation (2003).

#### **e) The Plant Protection Act (1997)**

The Plant Protection Act provides sustainable control of importation and use of plant protection substances in Tanzania. Sections 16(k) and 42(gg) of the Act provide for Prior Informed Consent (PIC) procedure on the importation and exportation and use of plant protection substances according to the framework of the FAO code of Conduct on the Distribution and Use of Pesticides. Section 27 of the Plant Protection Regulations (1999) stipulates restrictive registration conditions of pesticides with POPs characteristics. The Act has been scheduled for revision in the year 2003/2004 and among issues to be incorporated is the control of POP Pesticides.

Although currently there is no specific provision to control POPs releases, Tanzania recognizes the problems associated with POPs and has taken measures, which will result into reduction and eventually elimination of POP Pesticides. For example, up to 1999 the number of registered POP Pesticides for restricted uses went down to only three (Aldrin, Heptachlor, Chlordane). To date (2005) there are no POP Pesticides registered.

DDT has been banned for use in agriculture and thus is not registered. At present there is no provision to regulate DDT use in public health.

Under the Plant Protection Act (1997) inspectors have legally being appointed and are undergoing routine training to improve their performance. POP Pesticides are among critical issues being considered to control illegal importation.

#### **f) Industrial and Consumer Chemicals (Management and Control) Act, 2003**

The Industrial and Consumer Chemicals (Management and Control) Act No 3 of 2003 provides for the management and control of the production, import, transport, export, storage, dealing and disposal of industrial and consumer chemicals in the country. The

law provides for the registration, restrictions, prohibition and inspection of chemicals. Furthermore it has provisions for safe handling, chemical wastes, accidents; management of spills and contaminated sites and decommissioning of plants.

The Act gives a provision for establishment of the Chemicals Management and Control Board, which is responsible for the management, and control of all industrial and consumer chemicals in Tanzania. *Section 30 (1-e) of the Act, stipulates measures to be taken to enforce implementation of international conventions or treaty ratified in the United Republic for which the Board is empowered to restrict, severely restrict, ban or phase out the use and handling of chemicals specified under the 8<sup>th</sup> schedule of the Act.* PCBs have been included in the list of severely restricted/banned/eliminated chemicals in schedule 8 of the Act. The Act does not have specific provisions on management and elimination of PCBs and equipment containing PCBs. Further, the Act covers DDT as a consumer chemical although it does not restrict DDT use to public health in accordance with Stockholm Convention requirement.

#### **g) The Forest Act(2002)**

This Act provides for the management of forests and the related matters. It repeals certain laws relating to forests such as the Forest Ordinance Cap 389 and the Miscellaneous Amendments Act of 1997. The objectives of this Act include: to enhance the contribution of the forest sector to the sustainable development of Tanzania and promote the conservation and management of natural resources for the benefit of present and future generations; to delegate responsibility for management of forests resources to the lowest possible level of local management consistent with the furtherance of national policies; and to facilitate greater public awareness of the cultural, economic and social benefits for conserving and increasing sustainable forest cover by developing programmes on training, research and public education.

In addition, the Act provides for forest management plans which cover issues of forest reserves other than Village and Community Forest Reserve; permit and licenses for activities carried in national and local authority forests reserves; trade in forest produce; and conservation of trees, wild animals and plants.

The issues of wild fire and illicit felling of trees are well covered and given more weight in the Act by elevating the fines for offenders. There is no provision regarding control of emissions of PCDD and PCDF.

#### **h) Urban Authorities Act No 8 (1982) and Local Govt. District Authorities Act No. 7 (1982)**

The Act provides measures to curb land degradation caused by human activities such as overgrazing, development of human settlements and use of fuel-wood. It also takes care

of issues regarding sanitation and wastes management. In this regard the management of POPs has been indirectly addressed since there is no specific reference to POPs emission issues.

## **2.2.2 Organization of Environmental Management Regulatory Responsibility and Resource Allocation**

### ***2.2.2.1 Role of National Environmental Agencies***

The national environmental agencies in Tanzania include Division of Environment and the National Environmental Management Council under the Vice President's Office and the Department of Environment from Zanzibar, which is under the Ministry of Agriculture, Natural Resources, Environment and Cooperatives.

According to the Institutional and Legal Framework for Environmental Management Project, which began in 1998 and completed in 2000 there are basically two types of environmental management functions in the country. These are sectoral environmental management functions and coordinating and supporting functions. The sectoral environmental management functions deal with the management of specific natural resources or environmental management services, such as agriculture, fisheries, mining and waste management. The other type concern overall organisation roles, coordination of different and sometimes conflicting sectoral activities and integrating them into an overall sustainable system and providing the central support functions. They further involve the establishment of a coherent general context for environmental management. There are several ministries that perform sectoral environmental management functions. Also the role of coordination and oversight mandate on environmental management is vested under the Vice President's Office.

The Environmental Management Act 2004 provides mandates and functions of the Vice President's Office, sectoral ministries and local government authorities, as follows:

The Division of Environment under the Vice President's Office have the following mandates among others: -

- a) Coordinate various environmental management activities being undertaken by other agencies and promote the integration of environment considerations into development policies, plans, programmes, strategies, projects and undertake strategic environmental risk assessment with a view to ensuring the proper management and rational utilization of environmental resources on a sustainable basis for the improvement of the quality of human life in Tanzania;
- b) Advise the government on legislative and other measures for the management of the environment or the implementation of the relevant international agreements in the field of environment;
- c) Monitor and assess activities, being carried out by the relevant agencies in order to ensure that the environment is not degraded by such activities, environmental management objectives are adhered to and adequate early warning on impending environmental emergency is given;

- d) Prepare and issue a report on the state of the environment in Tanzania;
- e) Coordinate issues relating to articulation and implementation of environmental management aspects of other sector policies; and
- f) Coordinate issues relating to articulation and implementation of environmental management of the National Environmental Policy.

The Environmental Management Act, 2004 stipulates functions of the National Environment Management Council (NEMC). These include: -

- a) Carry out an environmental audit in respect of any project or undertaking that is likely to have significant impact on the environment;
- b) Undertake and coordinate research, investigation and surveys in the field of environment and collect and disseminate information about the findings of such research, investigation or survey;
- c) Review and recommend for approval of environmental impact statements;
- d) Enforce and ensure compliance of the national environmental quality standards;
- e) Publish and disseminate manuals, codes of guidelines relating to environmental management and prevention or abatement of environmental degradation;

Furthermore the Act establishes in each Ministry an environmental section that among others shall perform the following duties: -

- a) Ensuring compliance by the sector Ministry with the requirements of this Act;
- b) Ensuring all environmental matters contained in other written law falling under sector Ministry are implemented and report of their implementation to the Director of Environment;
- c) Liaise with the Director of Environment and the Council on matters involving environment and all matters with respect to which cooperation or shared responsibility is desirable or required under this Act;
- d) Ensuring that environmental concerns are integrated into the Ministry or departmental development planning and project implementation in a way which protects the environment;
- e) Collaborating with other institutions or agencies, evaluate existing and proposed policies and legislation and recommend measures to ensure that those policies and legislation take adequate account of effects on the environment;
- f) Preparing and coordinating the implementation of environmental action plans at the national and local levels as required under this Act;
- g) Ensuring that sectoral standards are environmentally sound;
- h) Overseeing the preparation and implementation of Environmental Impact Assessment required for investment in the sector;
- i) Ensuring compliance with various regulations guidelines and procedures issued by the Minister.

In addition, the Act requires that the concerned Local Government Authority appoint an appropriate Environmental Management Officer whose duties include to: -

- a) Ensure the enforcement of this Act in the respective area to which he belongs;

- b) Advise the environmental management committee to which he belongs on all matters relating to environment;
- c) Promote environmental awareness in the area he belongs on the protection of the environment and the conservation of the natural resources;
- d) Prepare periodic reports on the state of the local environment;
- e) Monitor the preparation, review and approval of environmental impact assessment for local investments; and
- f) Review by laws on environmental management on sector specific activities related to the environment.

### ***2.2.2.3 Background on Development of Environmental Responsibility***

From 1983 the Government interventions towards national development agenda gave more priority to environmental management in the country. In recognition of the increasing environmental problems, the Parliament enacted the National Environment Management Act, No 19 in 1983, which provided for the establishment of the National Environment Management Council (NEMC) under the then Ministry of Lands. Further institutional developments occurred in 1990s. In 1991 the Division of Environment was established under the Ministry of Natural Resources and Tourism. Since its establishment the Division of Environment in collaboration with stakeholders has prepared policies, action plans, strategies and programmes such as National Environmental Action Plan (NEAP) in 1994 and the National Environmental Policy in 1997. The Policy is guiding environmental protection in the country. In 1995 the Division of Environment was transferred to the Vice President's Office. This was done in order to give high priority to environmental issues, which are also cross cutting in nature.

In 2004, the Parliament of the United Republic of Tanzania enacted the Environmental Management Act, 2004. The Act provides for legal and institutional framework for sustainable management of environment; principles for management impact and risk assessments, prevention and control of pollution, waste management, environmental quality standards, public participation, compliance and enforcement. It repeals the National Environment Management Act, 1983 and establishes the National Environmental Fund.

Tanzania is also active in the international arena related to cooperation in environmental management. It took an active part in the preparation for, and during the United Nations Conference on Environment and Development that enshrined the integration of environmental concerns and economic development in the Rio Declaration on Environment and Development, and Agenda 21. The Vice President's Office through the Division of Environment is a National Focal Point to various environmental treaties including those related to chemicals.

### ***2.2.2.4 Organisational Structure and Responsibilities***

The Vice President's Office is the overall coordinator of all environmental issues in the country. The Division of Environment in the Vice President's Office is responsible among others for policy articulation, advocacy and implementation; monitoring and evaluation, environmental planning, environmental legislation, and international cooperation. There is also National Environment Management Council which is responsible for enforcement, compliance, EIA review and monitoring, environmental research, environmental education and awareness creation.

#### **Environmental Pollution Section:**

This is one of the three sections established under the Division of Environment in order to carry out the following activities:

- Formulation and review of policy and legislative measures for pollution control and management.
- Development, review and monitoring of programmes geared towards environmental pollution control and management.
- Development of strategies for effective participation of the civil society in environmental protection and management, and provision of technical assistance to groups undertaking environmental pollution control activities.
- Formulation and review of awareness raising programmes on environmental pollution.
- Initiation and supervision of environmental education and awareness raising programmes including production and distribution of environmental education materials.
- Review of research and extension activities related to environmental pollution control in various sectors and facilitation of research activities contributing to sustainable development.
- Development of national positions with respect to international and regional convention relevant to pollution control and overseeing their implementation,
- Liaison with international organizations dealing with pollution control and management such as UNEP, WHO, ILO, UNDP, UNESCO etc.

#### **The National Environment Management Council**

This is a parastatal organisation under the Vice President's Office lead by the Director General who reports to a Council Board. Organisational structure of NEMC consists of the Director General and five Directorates namely; Directorate of Environmental Information, Communication and Outreach; Directorate of Environmental Planning and Research; Directorate of Environmental Impact Assessment, Directorate of Environmental Compliance and Enforcement; Directorate of Finance and Administration.

#### ***2.2.2.5 Staffing and Budget Allocation***

The Division of Environment in the Vice President's Office has got 31 technical staff and 10 supporting staff. Issues of POPs are under the section of pollution control that has 10 technical staff. Out of them 5 are holders of Masters Degree in the fields of environmental sanitation, Environmental Science and Technology and Environmental Engineering.

NEMC has 54 technical staff and 42 supporting staff. The Directorate of Environmental Compliance and Enforcement that also deals with all pollution issues has got 15 postgraduate (Masters Degree level) staff with science background mainly in environmental engineering, process and chemical engineering, and chemistry.

Since 1989 the Government has embarked on the public sector management reform process consisting of the Civil Service Reform, the Parastatal Sector Reform, the Financial Sector Reform, the Local Government Reform Programmes and the Planning and Budget System Reform. The objective of the reform process is to achieve the most optimum and efficient use of public resources for better performance of the public sector and the economy at large. Nevertheless developmental activities remain poorly financed and fiscal support for environment is minimal. Since environment is a crosscutting issue, expenditure on it is made and found in different sectors at national and sub national levels.

On average the budget allocation for the Division of Environment and NEMC is about 1% of total public sector expenditure. A large proportion (sometimes up to 100%) of development expenditure for environment is financed from external sources. The meager government money covers staff salaries and other charges. In the Financial Year (FY) 2000/01, the amount approved for VPO-Division of Environment was lower than the budget requirement by 38%. At the same time, the actual amount released was less by 36% of the approved amount. In FY 2001/02, the amount released was less than budget requirement by 69%. This shows that VPO was under funded in FY 2000/01 and 2001/02. Regarding NEMC, the amount released was less than budget requirement by 77% and 65% for FY 2000/01 and 2001/02 respectively. Nevertheless, there was an increase in budgetary allocation to both the Division of Environment and NEMC by 61% and 106% for FY 2001/02 respectively.

Allocation and expenditure at sector level depends on the type of sector. For example, The allocation to sectors such as wildlife, forestry and beekeeping and fisheries are regarded wholly (100%) as being environmental, to other sectors like water, land and agriculture, only part of it is allocated for environmental management. For instance, the water sector in FY 2000/01 and 2001/02, allocated 13% and 1.4% of the total budget on environmental issues.

#### ***2.2.2.6 Practices and Procedures***

Since environmental policy involves many sectors and interest groups, its scope is necessarily broad, and the logistical demand for overseeing its implementation and ensuring coordinated attention to interconnected challenges is complex. The challenge is to ensure that all concerned take priority actions on all the main fronts; and their actions are mutually supportive, reflecting a mission commonly subscribed to, by all.

In Tanzania Mainland, the Vice President's Office (VPO) has been implementing broad based environmental programmes/projects for example development of various environmental plans and strategies. In implementing such projects the Office identifies relevant stakeholders and involves them at planning and implementation stages. In most cases the VPO forms National Technical Committees whose members are specific experts on the subject matter. The duties of the committee include providing technical advice on the overall implementation of the project and advice on the necessary expertise as needed for the proper execution of the project. The experts are derived from government Ministries/Institutions, academic institutions, NGOs, and the private sector. It also forms National Steering Committees whose members are at the level of decision makers. The functions of this committee include providing overall guidance and overseeing implementation of the project, review of policy issues contained in the project reports and endorsement of project technical reports. The members are also derived from the same stakeholders as in the Technical Committees.

In order to make sure that the process of developing a given plan is participatory as much as possible, the VPO organises National Workshops that bring in more stakeholders for consensus building.

### **2.2.3 International Commitments and Obligations**

#### ***2.2.3.1 Introduction***

There are several policies to address environmental issues; however the umbrella policy is the National Environmental Policy (NEP). The National Environmental Policy (1997) recognizes the importance and need for the international cooperation as the environmental problems have no boundaries. The policy is designed to provide a framework for planning and coordination. It calls for better coordination and the need to deal with environmental concerns systematically and at a multi-sectoral level in order to achieve environmentally sound development. The effective environmental policy is based on international cooperation, which takes into account both ecological relationships on regional and global scales, and the interdependence of the world economy. The policy states that global and transboundary resources, especially the atmosphere, the ocean and shared ecosystems can be managed effectively only on the basis of a common purpose and resolve, when all affected countries are part of the solution. The country's policy emphasizes the need for global, regional and national efforts towards ratification and implementation of the international environmental treaties and agreements. Understandingly, Tanzania has been intensifying its cooperation by expanding her participation and contribution to relevant bilateral, sub-regional, regional and global organizations and programs, including implementation of Conventions.

The country's approach to international environmental treaties and agreements is to collaborate with relevant sectoral ministries. All relevant sectors are involved in implementation of the Convention's obligations; they participate in the meetings and are required to report back to the Focal Point. Normally the Focal Point nominates sector

representatives to the meeting and also invites nomination of representatives from other relevant stakeholders.

The government has set a clear administrative and decision-making process that is normally used to make commitments to environmental conventions. First and foremost, the Focal Point prepares the cabinet paper, which then undergoes scrutiny by the Cabinet Secretariat. Thereafter, the draft cabinet paper is forwarded to the Inter-Ministerial Technical Committee (IMTC), which advises the cabinet on the way forward. The cabinet considers the draft and if acceptable, a parliamentary resolution is prepared by the Attorney General Office in collaboration with the Vice President's Office and submitted to the Parliamentary Committee on Environment and Natural Resources which if satisfied forward the resolution to the Parliament for ratification. Finally the Ministry of Foreign Affairs and International Co-operation prepares the instrument of ratification, which the President of the United Republic of Tanzania signs before submitting to the Secretary General of the United Nations.

The government maintains compliance with the conventions through negotiations, participation in the technical working groups and in the Conference of the Parties. In most cases the compliance is maintained through review of the legislation and regulations to conform with implementation of the Convention's obligations and monitoring of implementation.

### ***2.2.3.2 Procedures and Practices Applicable to International Commitments and Obligations***

The initial invitation to participate in the development of a Convention is forwarded directly to the Ministry responsible for Environment or through the Ministry of Foreign Affairs and International Cooperation and the respective Embassies. The designation of responsible agencies for such participation, typically a ministry or equivalent agency responsible for environmental concerns is based on the issues to be discussed. Whoever is addressed, an invitation is channeled to the responsible Director for advice. The Director proposes to the Permanent Secretary for approval the name of an appropriate person(s) with specialities in the subject of discussion to participate in the forum.

The country prepares itself in negotiations by convening a technical meeting to build up national positions on issues to be discussed. The national focal point calls for a meeting by inviting relevant stakeholders, who then are briefed on the matters and required to give their views/suggestions on how to respond to the decision or issues. The consensus agreed upon during this consultative meeting is taken as a national position of which delegates are required to stand upon during the negotiations.

In practice the creation and operation of a focal point for a convention is based on the relevancy of the issues to the mandates of the respective institution. The mandates of any ministry or independent government department are stipulated in the Presidential Decree that establishes government ministries. The Vice President's Office, which is established under the Presidential Decrees, has the responsibility to oversee environmental

management in Tanzania. It is a focal point of most of the environmental related conventions. Amongst other things, the focal point provides technical and policy advice to stakeholders on how to implement the convention obligations and coordinates activities under the convention. During operation, all relevant stakeholders are involved in implementation of the convention's obligations.

The administrative procedures demand any financial support to the government be channeled through the Ministry of Finance. The Ministry of Finance in consultation with relevant sector ministry signs agreement on the support on behalf of the government. Among the roles of the nation during meetings of the Conference of the Parties once a convention is in force include: coordination and projecting national positions and to support Sub-regional, Regional and G 77 proposals of national interest. Representation to the COP comprises of both technical experts, high level officials and Ministers. The decisions of COP are disseminated to the sector ministries and other stakeholders so as to incorporate them in their activities and programmes.

The Focal Point receives implementation reports from the relevant sector, consolidates them into a country report and finally submits to the relevant Secretariat.

#### ***2.2.3.3 Status Regarding International Environmental Conventions/Agreements***

Tanzania is a Party to several regional and global environmental treaties that are linked to POPs issues and fully participates in their implementation. These Conventions include: the Basel Convention on the Transboundary Movement of Hazardous Waste and their disposal (1989); Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement of Hazardous Wastes within Africa; and the Rotterdam Convention on Prior Informed Consent Procedures for Certain Hazardous Chemicals and Pesticides in International Trade (1998). The Vienna Convention for Protection of the Ozone layer (1985) and Montreal Protocol on substances that deplete the ozone layer (1987)

For quite a long time, Tanzania has been participating in various programmes and projects related to the above-mentioned treaties. In this regard it has acquired extensive experience for chemicals related treaties, which would be applied in the Stockholm Convention implementation activities.

### **2.2.4 Legislation and Regulations Related to Hazardous Waste Management, Contaminated Sites, Waste Water Discharge and Point Source Air Emissions**

#### ***2.2.4.1 Regulatory Control Measures Applicable to Hazardous Wastes***

Several policies and legislation are in place to address issues of pollution by liquid and solid wastes. These policies include: The National Environmental Policy (1997), Water Policy (1991) and its amendments of 2002, Health Policy (1991) currently under review and Human Settlement Policy (2000). Key legislation includes the Public Health

Ordinance (1954), Water Utilization (Control and Regulations) Act of 1974 and its amendment of 1981, 1988 and 2000, Plant Protection Act (1997) and its Regulation, Industrial and Consumer Chemicals (Management and Control) Act of 2003 and Local Government (District and Urban Authorities) Acts, No.7 and 8 of 1982.

Several efforts are on going on matters of waste management, these include: training in cleaner production concept and practices of industrialists that started way back in 1994; some industries have benefited, carrying out of the sustainable cities programme in five municipalities; sourcing out of solid waste collection in Dar es Salaam City, establishment of water and waste water authorities in certain urban centres, introducing cost sharing in waste management in Dar es Salaam, researches on waste treatment and disposal technologies and promotion of community based environmental sanitation projects.

The National Environmental Policy (NEP) provides specific environmental objectives to the above-mentioned sectors in order to address pollution issues. These objectives are: promotion of technology for efficient and safe water use, particularly for water and waste water treatment, and recycling; promotion of health related programmes such as separation of toxic/hazardous wastes and pollution control at the household level; development of environmentally sound waste management systems especially for urban areas; installation of resource saving and waste recycling facilities and use of cleaner technology and integrated planning and improved management of urban centres.

The common disposal method currently used in the country is crude dumping at selected dumpsites. In this case, sometime hazardous and non-hazardous wastes find their way to disposal sites. Therefore classification and separation of various categories of hazardous waste is not done because there are neither requirements nor standards applied to the various aspects of managing hazardous wastes. But even if there were, enforcement capacity in general is not there i.e number of personnel, skills and tools are not adequate. However, being a Party to the Basel and Bamako Conventions, the country tries her level best to abide to the requirements of the conventions on managing various categories of wastes.

#### ***2.2.4.2 Regulatory Control Measures Applicable to Contaminated Sites***

There are no provisions in the existing legislation for registering contaminated sites. However, there exist provisions in the Plant Protection Regulations (1999) that stipulates for management and immediate clean up of sites contaminated with pesticides. The Industrial and Consumer Chemicals (Management and Control) Act 2003 has also provisions for management and immediate clean up of sites contaminated with pesticides and industrial spills respectively. Additionally, the Acts require development of contingency plans and demand Environmental Impact Assessment (EIA) and dynamic risk assessment, but enforcement is weak.

The Environmental Management Act in the offing has taken into consideration gaps and deficiencies in the management of contaminated sites.

#### **2.2.4.3 Standards for Monitoring of Wastewater Discharges and Point Source Air Emissions**

Tanzania has set temporary permissible levels of contaminants permitted in wastewater discharges. The temporary standards define effluents as those, which are flowing out or fluid material, including wastewaters, (treated or untreated) discharges from domestic or industrial wastewater systems. They also include wastewaters or other pollutants from pens, commercial establishments, as well as cooling waters and wastes from energy or power plants and storm run offs, which due to their qualities, quantities and/or characteristics, might adversely affect the natural state, and impair the beneficial use of receiving waters.

The effluent standards apply to all treated and untreated domestic and industrial wastewater. The receiving water standards apply to any water body into which any effluent is discharged. Both standards operate simultaneously. The effluent standards give an indication of pollution load of individual institutions, agencies or individuals; whereas the receiving water standards serve as an indicator for pollution load of the water body for the particular category for which the water is ultimately intended.

The receiving water standards have overriding predominance, and any effluent discharge into a water body, be seen not to pollute the receiving water unduly. Table 2.3 summarizes effluent standards applied to some chemicals including POPs.

**Table 2.3:** Standards for effluents

Substance/characteristics	Unit	Maximum permissible value	
		Effluent meant for direct discharge into receiving waters	Trade and Industrial effluents meant for indirect discharge into receiving waters e.g. via municipal sewage treatment plant
<b>a) General</b>			
Suspended Solids	mg/l	Not to cause formation	No limit

		of sludge or scum in the receiving water	
Colour	Number (Pt-Co)	Not to cause any change in the natural colour of the receiving water	100
Taste and odour	-	Not to cause any change in the natural taste or odour of the receiving water	No limit
Temperature	°C	Not to cause any increase of the receiving water by more than 5° C	35°C or not more than 5°C above ambient temperature of the supplied water, which-ever is great
Total Dissolved Solids	mg/l	3,000; No restrictions for discharge into the sea	7,500
pH	-	6.5 – 8.5	
B.O.D. 5 days, 20°C	mg/l	30	No limit
B.O.D. 5 days, 25°C	mg/l	34	No limit
B.O.D. 5 days, 30°C	mg/l	37	No limit
B.O.D. 5 days, 35°C	mg/l	40	No limit
Permanganate value	mg/l	80	No limit
<b>b) Organic substances (including POPs)</b>			
Aromatic and aliphatic hydrocarbons	mg/l	1.0	5.0
Organochlorine pesticides	mg/l	0.005	0.005
Other pesticides	mg/l	0.01	0.01
Volatile chlorinated hydrocarbons (Cl)	mg/l	0.05	0.05

Source: Water Quality Laboratory (2001)

Section 140 of the Environmental Management Act (2004) among others, requires the National Environmental Standards Committee of the Tanzania Bureau of Standards to develop, review and submit to the Minister responsible for Environment proposals for environmental standards and criteria in relation to receiving environment ecosystem and limits for the pollutant discharge or releases. Hence more standards will be formulated.

In the case of air emission, the extent of pollution problem in Tanzania is not known although may be generally low. However, it is likely to be serious in some localized areas like in cities, where many sources of air pollution exist. The deterioration of air quality in these areas has mainly been linked with increased traffic volume, industrial activities and poor state of our roads conditions. Source of air pollution in Tanzania may be grouped under two major blocks: that is static and mobile sources. Static source of air pollution includes the manufacturing or production processes of industries such as cement factories, petroleum refineries, thermal power stations, chemical industries and paper industries. Also waste disposal sites, which emit various gaseous pollutants when burnt or through spontaneous fires. Mobile sources of air pollution are mainly associated with

motorized transports that use either gasoline or diesel of which emissions may contain lead, sulphur and hydrocarbons. The major types of air pollutants in Tanzania are carbon monoxide, sulphur dioxide, Particulate Matter (PM), lead, hydrocarbons, unintended products particularly PCDD and PCDF. However, only limited research has been carried out in the cities to ascertain the extent of pollution.

Tanzania is in the process of developing its own air quality standards, hence the WHO guidelines are at present been applied. The pollutant levels in some areas particularly in urban centers are higher than acceptable WHO guidelines. Results from a study of 1996 in Dar es Salaam, carried out by CEEEST indicate high levels of particulate matter above the WHO Guidelines (Table 2.4) The NO<sub>x</sub> and hydrocarbons levels were below detection limits whereas noise levels were at acceptable limits.

**Table 2.4:** Concentration of gaseous pollutants in selected sites in Dar es Salaam

Pollutant Sample Site	CO mg/m <sup>3</sup> (8hr average)	SO <sub>2</sub> mg/m <sup>3</sup> (8 hr average)	SPM ug/m <sup>3</sup>	Noise level dB MAX
Ubungo	2.473	256.33	56156	87.4
Kariakoo	5.790	213.00	42600	80.2
Samora Avenue/ Morogoro	7.236	288.00	45350	77.3
Oysterbay	2.620	BDL	60350	75.0
DSM Airport	Trace	BDL	1320	80.3
WHO Guidelines	10 (8 hr)	250 (24 hrs)(daily mean)	150-230 (daily mean)	90 dB

**Note:** B D L: Below Detectable Level  
dB: Decibels

*Source: Study on Air Quality in Dar es Salaam (CEEEST Report, July 1996)*

The Air Quality Monitoring Capacity Building Project in Dar es Salaam which started in January 2005 will end in June 2006. It will provide more information on status of air pollution in Dar es Salaam and thus give indication of air quality in urban centers.

There exists a number of legislation in the country that are applicable in monitoring of air emissions, these include: The Environmental Management Act (2004); The Penal Code (Cap. 16); Local Government (District and Urban Authorities) Acts, No. 7 and 8 of 1982; The Merchant Shipping Act No. 43 of 1967; The Tanzania Bureau of Standards Act No. 3 of 1975; Radiation Act No. 5 of 198 and Road Traffic Decree (Cap 135), of Zanzibar which has a general provision against vehicles emitting “avoidable smoke or visible vapour”. With the exception of EMA the other laws neither cover POPs issues nor its reporting requirements; hence need to be reviewed to incorporate the Stockholm Convention obligations.

## **2.2.5 Chemical and Pesticide Management Programmes**

### **2.2.5.1 Existing Policies**

Existing policies that cover aspects of chemicals management in Tanzania include the National Environmental Policy (1997) that addresses aspects of chemical pollution control but has no specific provisions for POPs management. The National Environmental Policy (1992) for Zanzibar has provisions to control chemicals. Other relevant policies include Agriculture and Livestock Policy (1997), National Health Policy (1990), Sustainable Industrial Development Policy (1996), National Energy Policy-Draft (2002), National Forestry Policy (1998), and National Human Settlements Development Policy (2000).

While these policies address their respective sectoral issues, also they cover environmental and chemical issues in general terms. However there is no specific reference to POPs management issues as stipulated in the Convention.

In 1997 the National Profile to assess the National Infrastructure for Managing Chemicals (NP) was prepared and revised in 2002. The NP was prepared with the aim of having an authoritative national reference document on state of affairs regarding chemical management in the country. It highlights strengths and weakness of chemical management. Among the identified strengths include: in terms of strengths it was noted that there are pool of experts for handling management of chemicals who might need additional specialised training and continuing education. In addition the research and development institutions and Universities have relatively better technical infrastructure in terms of expertise and analytical equipment for management of chemicals.

The Profile identified the following weaknesses: The infrastructure for transporting, handling, storing, formulating and applying chemicals is not adequate; the existence of threat of adverse effects of chemical exposure to human health and the environment; low awareness on chemical hazards; lack of government policy on management of chemicals; the existence of several fragmented legal instruments to manage various aspects of environmental management/pollution cannot assist the efforts of managing chemicals without a proper enforcement regime. The profile further acknowledged the weak mechanisms for inter-ministerial co-ordination and co-ordination with international organisations both in practice and procedures. The preparation of NP involved various stakeholders including government, academic, research and development and non-governmental institutions under the coordination of the Ministry of Health-GCLA. Apart from NP in 1999 the Ministry of Health-GCLA developed a National Action Plan (NAP) for chemicals management. The NAP provides an overview of short, medium and long-term goals, specific objectives and planned activities on the national chemicals management. The NAP is complementary to NP as it elaborates further on the activities to be done.

### **2.2.5.2 Chemicals and Pesticides Management Programmes**

Various programmes and actions related to chemicals management have been and some are being conducted in the country. These include:

#### **a) Chemical Waste Management Project**

In 1997 - 1998 a countrywide inventory of obsolete pesticides and veterinary wastes in Mainland Tanzania was conducted under the coordination of NEMC with assistance of Dutch Government. The inventory results indicated that more than 1000 metric tones of obsolete pesticides and 200 metric tones of veterinary wastes are scattered in more than 300 stores in the country. The inventory also showed that about 200 metric tones of the obsolete pesticides are POPs.

#### **b) Inventory to Assess the Status of POPs in Tanzania**

In May 2000 the Government of Tanzania in collaboration with the United Nations Environment Programme organized an inventory to assess status of POPs in Tanzania. The Ministry of Health through Government Chemicals Laboratory Agency (GCLA) coordinated the implementation of the project. The objectives of the inventory were:

- To collect information on possible sources of emission and management of POPs;
- To collect detailed information on PCBs and their management;
- To collect samples for analysis; and
- To collect any other relevant information on management of chemicals and other environmental/health concerns.

Results of the inventory indicated:

- a) The presence of PCBs in old electrical installations owned both privately and by the Tanzania Electrical Supply Company (TANESCO);
- b) Workers handling transformers oils were not properly cautioned and instructed by the company which installed the transformers;
- c) Poor storage of defective or scrap transformers causing leakages of oils on the ground;
- d) Most of the workers dealing with transformer oils were not aware of adverse health effects of PCBs. They handled the oil without protective gears;
- e) There are alternatives to PCBs in the country i.e. Mineral oil and SF<sub>6</sub>;
- f) Malpractices i.e, misuse of transformer oils;
- g) Open burning of mixed municipal wastes contribute to the emissions of Furans and Dioxins;
- h) Hospital wastes are burnt in open areas or buried within the hospital premises; and

- i) Burning of electrical equipment containing PCBs may be potential sources for PCDD and PCDF;
- j) There were about 200 metric tonnes of obsolete pesticides containing POP Pesticides i. e DDT, Aldrin and Dieldrin;
- k) Possible alternatives to POP Pesticides are available in the country but a detailed study on availability, effectiveness, safety, social and economical aspects need to be conducted.

The study concluded that in almost all visited sites there was a very low awareness of the potential adverse effects of POPs. In addition there was weakness in legislation and other regulatory mechanisms, which could limit the handling and disposal of potentially hazardous chemicals. This study was a baseline inventory that identified possible sources of POPs and therefore called for a comprehensive survey.

### **c) Capacity Building on Chemical Safety**

In 1999 the Ministry of Health/Government Laboratory Agency (GCLA) jointly with the United Nations Institute of Training and Research (UNITAR) and the International Programme on Chemical Safety (IPCS) conducted a capacity building project on Risk Management Decision – Making. The project involved training and Workshop on chemical safety to stakeholders dealing with chemicals management. After the training the stakeholders were involved in the assessment of the risk of Endosulfan, a pesticide widely used in Tanzania especially in the cotton growing areas (Lake Zone). Assessment was also made on the general situation regarding management of chemicals. At the conclusion of the project the stakeholders proposed numerous Risk Management Strategies (RMSs), which among others include:

- i) Training of end users who engage in direct application of pesticides for agricultural purposes;
- ii) Restrict transport and use of pesticides i.e the government will limit when, how and where pesticides are stored, transported and applied;
- iii) Mandate information disclosures i.e. the government will mandate that all information related to production, distribution and use of pesticides be made available to public;
- iv) Promote IPM systems;
- v) Tax pesticide use i.e. the government will place a mandated surcharge on the total volume of pesticides used by end users; and
- vi) Mandate Insurance Schemes i. e. the government will mandate that all the people and companies who store, use and distribute pesticides be required to purchase insurance to reduce risks against hazardous pesticides. Insurance holders and the insurance companies will be liable for any damages caused by endosulfan use.

### **d) Africa Stockpiles Programme**

The World Bank in collaboration with FAO and other major partners i.e. World Wide Fund for Nature (WWF) and Crop Life International (CLI) supports the programme under the coordination of NEMC. The overall objectives of the project is to dispose of about 1200 metric tons of obsolete pesticides and veterinary drugs stocks at priority sites, which were identified during the 1997/98 and current inventories and to support priority actions to prevent the future accumulation of new stocks of obsolete pesticides. The project will contribute to the improved general health of populations living in close proximity to the existing pesticide waste storage sites. The project will address the following specific objectives:

- i) To ensure safe and environmentally sound elimination of obsolete pesticide stocks heavily contaminated soils, buried pesticides and contaminated containers/equipment stored in Tanzania;
- ii) To prevent future accumulation of new stocks of obsolete pesticides through improved pesticides management, storage, distribution, adoption of international regulations e. g. FAO Code of Conduct (2002), the promotion of the correct use of pesticides by adoption of agriculture systems such as IPM and the use of alternatives to chemical pesticides; and
- iii) To develop national capacity in pesticides and chemicals management at national and grassroots level in Tanzania.

The project is scheduled to commence in January 2006.

**e) Integrated Pest Management and Integrated Vector Management Programmes**

In 1992 to 2002 GTZ supported the Ministry of Agriculture and Food Security to implement IPM. These programmes concentrated mainly in Lake Zone areas and in Arusha region. To date pest management technology packages for cotton, coffee and vegetables have been developed together with farmers and are being implemented in pilot areas. This has resulted in reduced use of pesticides by 50% in cotton farms.

### ***2.2.5.3 National Practices for Introduction of New Chemicals and Pesticides***

#### **Introduction of New Pesticides**

At present Pesticides including POP Pesticides are controlled by the Plant Protection Act (1997) and Plant Protection Regulations (1999). The legislation stipulates requirements

for registration, manufacturing/ formulation, importation, sale, use, transportation and disposal of pesticides wastes and their empty containers.

Section 17 of the Act requires that plant protection substances must be registered and approved before being used in the country. The procedures for a new registration include; submission to the Registrar of Pesticides, technical data/information and a written declaration from the country of origin that a pesticide has or has not been banned or restricted in the country of origin. The pesticide is then tested in a field for its effectiveness to the intended pests. The field results of efficacy of pesticides are then submitted to various technical committees for scrutiny and assessment before decision to approve or reject the registration application is made. Registered chemicals are gazetted. The power to implement the legislation has been vested to the Tropical Pesticides Research Institute (TPRI) and Plant Health Services (PHS) of the Ministry of Agriculture and Food Security.

According to the Plant Protection Act, Sections 19 and 42 (m), the procedures for the importation of pesticides require the importers in Tanzania to apply and state the type, quantity and intended use of pesticides to be imported. The applications for import permits are processed only for registered pesticides importers and registrants. In addition the Registrar of Pesticides issues pesticides import permits for the registered and approved pesticides only. As a further control measures, on arrival, pesticides are inspected at the point of entry for conformity to labeling requirements, dates of production/expiry, thereafter samples are taken for analysis for quality verification before been cleared at the port.

Furthermore the importers are required by law to keep records of the type and quantities and report the same on a periodic basis to the Registrar of Pesticides. Inspectors in the Inspectorate Services enforce compliance to the legislation requirements. Currently the POP Pesticides have been cancelled from the list of registered and approved pesticides in Tanzania. However, the cancellation of POP Pesticides were either due to voluntary withdraw by registrants due to market shrinkage or non-compliance to registration requirements including non-payments of registration fees as required by law. Tanzania is a Party to both Rotterdam and Stockholm Conventions, which also facilitates in the decision making during registration and banning processes of pesticides.

Assessment of competency of pesticide handlers and sellers is done as well as their premises and facilities used for keeping and handling pesticides. They are required to possess the necessary specialized knowledge before being certified in order to minimize risks to public health and the natural environment.

### **Introduction of New Chemicals**

The industrial and consumer chemicals PCBs and DDT included, are controlled by the Industrial and Consumer Chemicals (Management and Control) Act (2003). Part III of the Act provides for the control of production, importation, exportation, transportation, storage and dealing in chemicals.

Section 11 of the Act requires an application for registration of a chemical to be submitted to the Chief Government Chemist (Registrar) for scrutiny before being imported into the country. All chemicals that appear under the Third and Sixth Schedule i.e. List of Chemicals Requiring Registration and List of Highly Hazardous Chemicals respectively require registration.

Registration of a chemical may be done by producer, marketing firm, importer and exporter of that chemical. Section 12 to Section 18 prescribes requirements for chemical registration, approval or rejection, application for registration of a producer, importer, exporter, general requirements for producers, and dealers in chemicals, storage and warehousing. Section 19 of the Act provides procedures for registration. It requires each applicant/importer to accompany with the application the following information: the hazardous category of the chemical substance, details of composition i.e. the nature and quantity of its ingredients, details of the intended use, packaging materials, possible dangers to human health and the environment. The application should also accompany procedures for proper disposal or treatment, the instructions for safe handling and the information on suitable analytical procedures, which can be carried out using appropriate employed equipment to determine residue left after application of the chemical.

Section 11(6) of the Act states that a chemical cannot be approved for registration unless it conforms to the requirements laid out in the Act. Once the Registrar receives the application investigation is conducted including analysis of samples. Thereafter the report and the recommendations for application together with the chemical particulars are submitted to the Industrial and Consumer Chemicals and Control Technical Committee for scrutiny, thereafter forwarded to the Ministerial Advisory Board for its consideration and approval.

If the Board approves the registration of any chemical, the Registrar then enters the chemical in the register and allocates a registration number and issues a certificate of registration to the applicant thereafter that chemical is gazetted.

Section 21 provides for authorization to import, export, production, deal with and use of chemicals, which has not been registered (i.e. new chemicals) or provisionally cleared if the chemical is to be applied solely for public consumption, scientific and educational purposes.

Certification holders of chemicals are required by law to keep records of the type and quantities and report the same on a periodic basis to the Registrar of Chemicals. Inspectors in the GCLA enforce compliance to the Act. Chemical dealers are required to possess the necessary specialized knowledge before being certified in order to minimize risks to public health and the natural environment.

Section 30 of the Act provides power to the Registration Board to restrict, severely restrict, ban and phase out or even ban chemicals, even after they have been registered if they are:

- a) Proved to be dangerous to human life or environment;
- b) Proved to be highly hazardous, persistent or biologically accumulative;
- c) Proved to cause poisoning effect to human and animals of which no effective antidote is available;
- d) Severely restricted by national international Conventions or treaty; and
- e) Subject to action according to an International Convention or Treaty ratified in the United Republic of Tanzania

Some chemicals might be registered with restriction conditions e.g. those appearing under the Eighth Schedule of the Act.

The provisions of these Acts and current management practice do not meet all requirement of the Stockholm Convention. The main problem of the existing sectoral legislation dealing with chemical management is lack of coordination, conflicting functions of most of these laws, failure to review and streamline them and lack of adequate enforcement procedure. Furthermore there are no co-ordinated action plans or enforcement programmes of the legislation. There is therefore a need of harmonisation of the existing pieces of legislation dealing with chemical management in order meet all requirements of the Stockholm Convention.

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### **3.0 ASSESSMENT OF POPs ISSUE**

#### **3.1 INVENTORY OF POP PESTICIDES (ANNEX A, PART 1 CHEMICALS)**

##### **Summary**

This section examines the existing regulatory mechanisms; production, use, import/export, stockpile and their wastes; responsibility and liabilities of POP Pesticides in the country.

The inventory revealed that POP Pesticides were used in the past in a wide range of applications against various insect pests in agriculture and public health. These are Aldrin, Dieldrin, Chlordane, Heptachlor, DDT and Toxaphene. The survey revealed no POP Pesticides being sold in the shops.

At present there is no specific provision that regulates POP Pesticides production and use in Tanzania, however, like any other pesticides, the POP Pesticides are controlled by existing relevant legislation. There is no prospect for the importation of POP Pesticides at present and in the near future as POP Pesticides have been cancelled from the current list of registered pesticides in the country and pesticide registration procedures are specifically restrictive and stringent when it comes to POP Pesticides. There exists deficiency in enforcement, which leads to existence of illegal products in the market. This may be attributed to lack of enough resources to enable pesticides inspectors' conduct monitoring at all border entry points and pesticides shops.

In addition, it was observed that the magnitude of contamination of some obsolete POP Pesticides storage sites posing potential human health and environmental risks needs urgent remedial measures. About 17.4 metric tonnes of obsolete stocks of Aldrin, Dieldrin, and Toxaphene were found stored in various areas of intensive cash crops agricultural activities as well as in the respective industrial processing areas and these areas are Arusha (14.9 metric tonnes), Mbeya (0.5 metric tonnes) and Tabora (2 metric tonnes). Also, once pesticides have been sold, the fate of empty containers lies upon the buyer, who often decides what to do with the empty containers entailing a risk situation to farmers and communities around agricultural areas for re-using pesticides empty containers.

Some of the identified gaps include limited capacity and experiences in monitoring of POPs releases, assessment of effects to human health and the environment and management of wastes. In addition, the existing legal framework does not articulate the liability as far as POPs waste disposal is concerned and there is poor documentation system both in the private and government offices during importation, formulation and distribution of POP Pesticides.

### **3.1.1 Introduction**

The environmental and health hazards caused by POP Pesticides are of worldwide concern. The hazards caused are due to their distinct properties, which include non-biodegradability, low solubility in water, high solubility in body fats causing bioaccumulation. Wildlife and human being at high level in the food chain are at higher risks due to biomagnifications tendency of POPs. The initial list of POP Pesticides covers Aldrin, Chlordane, Dieldrin, Endrin, Heptachlor, Hexachlorobenzene, Mirex, and Toxaphene. There is no documented evidence that Endrin and Mirex as insecticides and Hexachlorobenzene (HCB) as fungicides have ever been used in Tanzania.

Various methods were used in the course of conducting an inventory including review of previous reports, physical visits of stores, shops, and also data were taken from dealers and entry points.

The criteria used to identify regions and sites to be visited included high concentration of business and agricultural activities, reports of the previous inventories of obsolete pesticides and major entry points for the importation. Furthermore, those institutions and offices involved in the cycles of POP Pesticides' use, control and management were consulted.

### **3.1.2 Institutional and Regulatory Framework**

At present there is no regulations specifically for POP Pesticides production and use in Tanzania. However, POP Pesticides like any other pesticide are controlled by the Plant Protection Act (1997) and the Plant Protection Regulations (1999). The legislation stipulates requirements for registration, manufacturing/formulation, importation, sale, use, transportation and disposal of pesticides wastes and empty containers. The power to implement the legislation has been vested to the Tropical Pesticides Research Institute (TPRI) and the Plant Health Services (PHS) of the Ministry of Agriculture and Food Security.

The main requirements for registration include: submission of technical information (chemical composition, potential adverse effects on human health and the environment, disposal procedures, instructions for use, packaging materials, and suitable analysis method), and a written declaration that a pesticide has or has not been banned or restricted in the country of origin. The pesticides are then tested for effectiveness against the intended pests. The field reports for efficacy are then tabled to various technical committees for scrutiny before approval and eventual gazetting.

The legislation further stipulates procedures for the importation of pesticides. The importers in Tanzania Mainland are required by law to apply and state the type, quantity and intended use of pesticides to be imported. The Registrar of Pesticides issues the pesticides import permits to Registered Pesticides Importers and Registrants for the registered and approved pesticides only. Furthermore, on arrival, pesticides are inspected at the point of entry for conformity with labeling requirements, dates of

manufacture/expiry, thereafter samples are taken for quality verification before being cleared at the port.

### **3.1.3 Past, Present and Projected Future Production and Use of POP Pesticides**

#### ***3.1.3.1 Procedures on Legal Requirements for the Production of POP Pesticides***

At present there is no specific provisions that control POP Pesticides although they have been withdrawn from the list of registered pesticides since 1997. Before 1997, the Tropical Pesticides Research Institute Act (1979) and the Pesticides Control Regulations (1984) controlled POP Pesticides, like any other pesticides. The POP Pesticides formulated were approved by the competent authority based on efficacy against the intended pests and proof of minimal human health and environmental effects. As from July 2001, the Plant Protection Act (1997) and Plant Protection Regulations (1999) became operational. The Act controls all plant protection substances including POP Pesticides throughout their life cycle. The Regulations provide for restricted use of pesticides that are highly toxic including those which are controlled by the Rotterdam Convention. At present there is no production and use of POP Pesticides. It is an offence for any person or firm to manufacture, formulate or use pesticides, which are not registered.

Importers are required by law to keep records of the type and quantities and report the same on a periodic basis to the Registrar of Pesticides. Inspectors in the Inspectorate Services who work in accordance to the legislation requirements do monitoring for compliance. As stated earlier, POP Pesticides have been cancelled from the list of registered and approved pesticides in Tanzania. However, the cancellation of POP Pesticides were either due to voluntary withdraw by Registrants due to market shrinkage or non-compliance to registration requirements including non-payments of registration fees as required by law. Still, pesticide regulation procedures are specifically restrictive and stringent when it comes to POP Pesticides. In some cases, production of POP Pesticides in developed countries has ceased making procurement more difficult. However, the quality verification undertaken is for the active ingredient specifications and other physical parameters like watability sieve test, emulsion stability and suspensibility. Other important parameters like identification of undeclared ingredients particularly POP Pesticides, solvents and adjuvant are not done. This is due to inadequate capacity at TPRI. There is need to strengthen capacity in this area.

In the case of commercial rights for pesticides handlers and sellers, there is a provision requiring pesticides sellers to possess the required competence and conform to conditions for premises used for keeping and handling pesticides. Applicants for such business are required to possess the necessary specialised knowledge before being certified. This is done to minimize risks to health, animals and the natural environment.

### **3.1.3.2 *Intended Applications of POP Pesticides before De-registering***

The POP Pesticides were used in a wide range of application against various insect pests in agriculture and public health. The POP Pesticides that were used as insecticide were Aldrin, Dieldrin, DDT, Chlordane and Heptachlor. In addition, Toxaphane was used as acaricide (control of insect pests in livestock).

### **3.1.3.3 *Future Measures for Preventing Production and/or Use of POP Pesticides***

Tanzania is a Party to both the Stockholm and the Rotterdam Conventions. Thus, the provisions of these Conventions guide decisions making during registration and importation processes of pesticides. There is need to consider a total ban to demonstrate commitment to eliminate POP Pesticides from the market. Meanwhile the existing legislation is under review to incorporate provisions of this Convention. Already EMA (2004) provides for the management of POPs and empowers the minister to promulgate regulations for compliance with international obligations under the Stockholm and Rotterdam Conventions.

## **3.1.4 Import and Export of POP Pesticides**

### **3.1.4.1 *Quantities for the Past, Present and Future Imports and Exports of POP Pesticides***

The survey revealed that Tanzania used to import POP Pesticides from different countries for various uses. Due to poor documentation of information, it was not possible to establish amounts. Huge amounts of POP Pesticides were imported above actual needs due to poor documentation system. The magnitude of the problem can be estimated retrospectively with reference to the presence of obsolete stockpile of POP Pesticides at present.

The survey revealed that Tanzania imported 113,000 litres of Dieldrin in 1989, 50 kg of Aldrin/Dichlovos, 5000 litres of Dieldrin in 1991/92, and 159,797 litres of Methidathion/DDT in 1991/92. The amounts were used to fight pests in maize, tobacco, cotton crops and in the control of termites. There is no prospect for the importation of POP Pesticides at present and in the near future as POP Pesticides have been cancelled from the current list of registered pesticides in the country.

### **3.1.4.2 *Characterization of Retailer and Wholesale Business***

Sellers of pesticides are certified for their competence. It is the requirement of the Plant Protection Act that retailers and whole sellers must possess the necessary specialised knowledge before being certified in order to minimize harmful effects on the health of humans, animals and the natural environment. Qualified retailers and whole sellers entail ability for self-protection and guarantee for the dissemination of appropriate information to end users on safe use and handling of pesticides. The sellers are required by law to sell registered and approved pesticides only.

### **3.1.4.3 Custom Control Procedures**

The Plant Protection Regulations (1999) declares the points of entry for the importation and exportation of pesticides into/out of Tanzania mainland. These include airports, harbors and overland border entry points. In most of these border posts, there are both custom officers and plant protection inspectors. Pesticides consignments passing through entry points are subject for constant checks by customs officers and Plant Protection Substance Inspectors (PPI). In the absence of PPI the responsibility lies on with custom officers who are not aware of the pesticides importation requirements. Currently there are a total of 165 inspectors (15 pesticide inspectors and 150 plant health inspectors), out of which, 60 inspectors had received further training to improve their inspection skills by April 2005. The current number of inspectors does not meet the inspection demand.

### **3.1.4.4 Extent of Stakeholder Responsibilities**

The importation and exportation of POP Pesticides involves competent authorities, importers, exporters, registrants, sellers and end-users. The main responsibility of competent authority, which is the Ministry responsible for Agriculture, is to ensure proper adherence to regulations during importation, distribution and exportation. The registrants are required to follow procedures stipulated in the Plant Protection Act (1997) during importation of pesticides. There is inadequate enforcement of the Plant Protection Act (1997) and its Regulations (1999), this need to be strengthened. The role of end users is to ensure that pesticides are handled and used in accordance with the instructions on the labels. Involvement of end users in pesticide management is still low and also there is low awareness among farmers on dangers of pesticides. Outreach programmes should be strengthened.

### **3.1.4.5 Loopholes for Illegal Trade**

There exists deficiency in enforcement, which leads to existence of illegal products in the market. This may be attributed to lack of enough resources to enable pesticide inspectors conduct monitoring in all border entry points and pesticides shops.

## **3.1.5 Identified Stockpiles of POP Pesticides and POP Pesticides Waste**

There are approximately 17.4 MT of obsolete stocks of Aldrin (3.5 MT), Dieldrin (2 MT) and Toxaphene (11.9 MT) in visited areas.

Large stocks of obsolete pesticides are situated in areas of intensive cash crops/ agricultural activities and in the respective industrial processing plants. These areas are Arusha (14.9 metric tonnes), Mbeya (0.5 metric tonnes) and Tabora (2 metric tonnes).

Since stockpiles are located in towns or villages and near water bodies, there are potential human health and environmental risks. However, there is no assessment that has been done to ascertain the health and environmental impacts associated with the stockpiles.

### **3.1.6 Present Management of POP Pesticides and Empty Containers**

#### ***3.1.6.1 Current Practices for POP Pesticides Management***

The Plant Protection Act (1997) and its Regulations (1999) guide management of Pesticides in general POP Pesticides included. Due to insufficient trained inspectors, lack of field test equipment and disposal facilities etc., the management of pesticides is still weak.

#### ***3.1.6.2 Involvement of Farmers' Organizations in Pesticides Management***

In areas where cooperative unions are active, their roles include, purchase and distribution of pesticides as well as providing extension services. These cooperative unions, however, currently do not provide adequate support in management of POP Pesticides and empty containers. It would be highly desirable for these cooperative unions to provide technical backstopping in management of pesticides including POP Pesticides and empty containers, therefore, there is need to build capacity in the top management of the cooperative unions.

#### ***3.1.6.3 Practices for Management of Empty Containers***

The Plant Protection Regulations (1999) attests that unwanted pesticides empty containers shall be disposed of following authorization from a competent authority. Currently all containers, other domestic and industrial wastes are collected and haphazardly disposed of at disposal sites. In some cases, containers are used for storage of food, water, milk and other household consumable products. This poses a risk to farmers and communities around agricultural areas, particularly due to re-using pesticides empty containers. There is no system for promoting collection of empty containers e.g refund system. Once pesticides have been sold, the fate of empty containers lies upon the buyer, who often decides what to do with the empty containers. Setting up and operationalizing guidelines and disposal facilities will improve the management of empty containers.

### **3.1.7 Current Capacity and Experience in the Field of POP Pesticides**

#### ***3.1.7.1 National Capacity and Practical Experiences in POPs Pesticide Management***

There is limited capacity and experiences in monitoring of POPs releases, assessment of effects to human health and the environment and management of wastes.

### **3.1.7.2 *Monitoring of Import and Export in Relation to National Consumption/ Production***

Monitoring export and import is reflected in the National Agricultural and Livestock Policy (1997), which outline areas of preference in the distribution of pesticides for agriculture and livestock sectors. The Policy does not address properly procedures and practices to be followed for the donations received by government from the donor community. In 1997/98 inventory, over 80% of waste pesticides were found to have resulted from uncontrolled donations but documentation on how this amount was distributed in the country is lacking.

Nevertheless, monitoring of import of pesticides is regulated by the Plant Protection Act (1997) and Plant Protection Regulations (1999).

### **3.1.7.3 *Routines, Procedures and Affiliated Capacities for POP Pesticides Wastes***

The management of pesticides wastes is generally covered by various laws , including the Plant Protection Act (1997), the revised Local Government Act (2000) and the National Environment Management Act (1983). The enforcement of laws is weak. The waste pesticide stocks have to be reported to the National Environment Management Council (NEMC) for technical advice on proper disposal procedures. Guidelines on proper disposal of empty containers are lacking. The Plant Protection Regulations (1999) has inadequate provisions on control of empty containers and their disposal.

## **3.1.8 *Assignment of Responsibility and Liability***

### **3.1.8.1 *Legal Framework for Assignment of Responsibility and Liability for the Containment and Disposal of POPs Pesticide Wastes***

The issue of liability in existing legal framework does not explicitly address the issue of POPs waste. These laws would need to be reviewed to adequately cover issues of responsibility and liability.

### **3.1.8.2 *Responsibility for Immediate Action***

The Plant Protection Regulations (1999) stipulates the need for prompt clean up and decontamination of pesticides contaminated sites. The primary responsibility on immediate action lies with owners. Government institutions own majority of sites. NEMC is consulted for advice when need arises. The communities in areas affected by pesticides have the role of reporting to the responsible authorities for technical guidance on immediate actions.

## **3.2 INVENTORY OF PCBs (ANNEX A, PART II CHEMICALS)**

### **Summary**

Two recent surveys of electrical equipment that use fluids based on polychlorinated biphenyls (PCBs) were conducted separately in 2003 and 2004. In 2003, the survey covered 16 administrative regions mainly where economic activity is largest whereas in 2004 the survey covered 25 administrative regions. The surveyed sites are in urban and peri-urban areas.

The survey investigated 588 electrical equipment mainly transformers and oil circuit breakers, containing 754 metric tonnes of oil, which according to the criteria used showed possibility of oils containing PCBs. Out of total equipment surveyed, 216 transformers containing 93.4 metric tonnes of oil suspected to contain PCB and 17 oil circuit breakers are not in use hence classified as waste. Test kits were used to identify presence of PCBs in oils and screen out equipment with lower concentration of PCB (<50 ppm). A total of 234 transformers out of the surveyed equipment were tested and 64 of them were found to have oils with possibility of PCB concentration above 50 ppm. The rest of the equipment containing 481 tonnes of oil indicated the concentration of PCBs were below 50 ppm. Also 7 soil samples indicated presence of PCB above 50 ppm. The major concern of many stakeholders is the need to test the remaining oil in 354 equipment and the contaminated soils in 33 sites in order to determine levels of PCB; and to confirm existence of PCB by chemical analyses.

In summary, there are 418 equipment containing 273 tonnes of oil suspected to contain PCB in Tanzania. Also 170 equipment containing 481 tonnes of oil can be classified as “non-PCB”.

The survey established that there is no capacity and experience not only in monitoring releases of PCBs into the environment but also in monitoring and managing the associated adverse effects to human health and the environment. Furthermore, the inventory also identified lack of awareness at all levels including management and workers of authorities managing PCB oils; poor management of electrical equipment and oils; and lack of planned information dissemination strategy that could be used to inform the public on issues of PCBs.

### **3.2.1 Introduction**

Polychlorinated biphenyls (PCBs) are a group of synthetic most stable organic chemicals that have been widely used in a variety of industrial applications since they were first used in industries in the late 1920's. They are non-biodegradable; persistent in the environment as a consequence they can disperse to distant places from the source; able to accumulate in fatty tissues in the body; and suspected of being carcinogenic. In general, PCBs become more toxic with increasing chlorine content.

Furthermore, PCBs are one of the 12 POPs controlled by the Stockholm Convention, the objective of which is to protect human health and the environment. Article 3 of the Convention requires Parties to take measures to reduce or eliminate releases from intentional production and use of PCBs. Additionally, Article 6 requires Parties to have in place measures to reduce or eliminate releases from stockpiles and wastes.

### ***3.2.1.1 Methodology***

In carrying out PCB inventory in 2003 and 2004, UNEP Guideline on Inventory of PCB (2002) was used through visits to the sites and administering a questionnaire to the owners of equipment suspected to contain PCBs.

To identify units that might contain PCB oil, information on the unit's nameplate was used. This included the name of the oil itself. Where there was no name or declaration of PCB content the oil density was used to establish status. Oil of density greater than 1000 kg/m<sup>3</sup> was taken to contain PCB oil. This is because PCB oils are heavier than water. The year 1986 was used as cut off of manufacture and thus all units manufactured in 1986 or earlier were considered to contain PCB oil. However, production and use of PCB oil continued in some developing countries and in countries with economies in transition such as former Eastern Europe, Russia, India and China even after 1986. So all units manufactured from these countries were also considered to contain PCB oil.

### ***3.2.1.2 Survey Findings***

Two separate surveys were conducted in 2003 and 2004 on electrical equipment that use dielectric fluids based on polychlorinated biphenyls (PCBs). In 2003, the survey covered 16 administrative regions mainly where economic activity is largest whereas in 2004 the survey covered 25 administrative regions. The surveyed sites are in urban and peri-urban areas.

The survey investigated 588 electrical equipment mainly transformers and oil circuit breakers, containing 754 metric tonnes of oil, which according to the criteria used, showed possibility of PCB oils. Out of total equipment, 216 transformers containing 93.4 metric tonnes of oil suspected to contain PCB and 17 oil circuit breakers are not in use. Test kits were used to indicate possibility of PCBs in oils and screen out equipment with lower concentration of PCB (<50 ppm). A total of 234 transformers out of the surveyed equipment were tested and showed that 64 transformers had oils with possibility of PCB concentration above 50 ppm. The rest had 481 tonnes of oils that indicated that the concentration of PCBs were below 50 ppm. Also 7 soil samples indicated presence of PCB above 50 ppm. The major concern of many stakeholders is the need to test the remaining oil in 354 equipment and the contaminated soils in 33 sites in order to determine levels of PCB and to confirm existence of PCB by chemical analyses.

In summary, there are 418 equipment containing 273 tonnes of oil suspected to contain PCB in Tanzania. Also 171 equipment containing 481 tonnes of oil can be classified as "non-PCB".

The survey established that there is limited capacity and experience to monitor releases of PCB into the environment as well as for monitoring and managing of the associated adverse effects to health and the environment. The survey also identified serious lack of awareness across board: from the shop floor to the highest management level. Handling of oils containing PCB is poor leading to frequent spillages and often does not involve use of protective gears.

### **3.2.2 Present Regulations Pertaining to PCBs**

The Industrial and Consumer Chemicals (Management and Control) Act of 2003, addresses some of the general aspects of chemicals management. PCB is one of the chemicals included in the list of severely restricted/banned/eliminated chemicals in Schedule 8 of the Act. However, the Act does not have specific provisions for elimination of PCBs in line with the Stockholm Convention requirements such as limitations of use in various areas. The Act came into force in July 2003 there is need to strengthen enforcement including inspectors and provision of specialised skills and field-testing equipment .

Section 73 of the Occupational Health and Safety Act (2003) declares general precautions in handling chemicals. The law needs to be reviewed to incorporate stringent provisions on monitoring of health effects and liability and compensation for damage resulting from exposure of PCBs.

### **3.2.3 Closed and semi-closed applications of PCBs**

The inventory covered both closed and semi closed application of PCBs. Closed category, as the name implies, are those applications in which the PCB are enclosed and cannot escape during normal use. On the other hand, semi-closed category refers to PCB-containing oil being employed as a fluid circulating around the equipment as a heat transfer fluid or as a hydraulic fluid with presence of joints and seals in the equipment posing the possibility that the equipment can release small amounts of fluids during operation. The surveyed closed applications of PCBs were transformers, capacitors and switchgears whereas for the case of semi-closed PCB applications the survey covered oil circuit breakers only.

A total of 588 electrical units were covered by the survey in 2004. These include transformers (524), switchgears (4) and rectifiers (3) containing a total of 718metric tones of oils possibly containing PCB. There are also 57 oil circuit breakers suspected to contain a total of 36metric tones of PCB oil. After field-testing of transformer oils for possibility of PCBs, the number of transformers with oils suspected to contain PCB went down to 418 with oil amounting to 273 metric tones.

### **3.2.4 Open applications of PCBs**

In open applications, the PCBs are generally incorporated into formulation, lubricants, adhesives, paints, inks, etc. However this amount is usually small though the inventory did not cover this category due to limited resources. This is an important area for further work.

### **3.2.5 Wastes containing PCB**

From the survey data, all units that have been decommissioned or somehow declared to have been out of service are regarded as waste. It is important to point out that the common practice in most sites, where waste oils are collected is that they are mixed in the same container. Also, for sites that have storage facilities, they are not adequate. In some cases, the oils are disposed of into drains, given free to individuals or burned in boilers.

The 2004 inventory results show that waste possibly containing PCBs at surveyed sites comprises of 216 contaminated transformers and 17 oil circuit breakers not in use containing a total of 105 metric tones. Other un-quantified wastes suspected to contain PCBs include contaminated solids, transformers, filters and residues from electrical equipment. Generally, there is no proper disposal mechanism of the above items in the visited sites. In some cases, defective equipment have been rehabilitated and re-used. In others, the waste oil has been given away or discharged haphazardly into the environment.

Inadequate or complete lack of awareness of the potential adverse effects posed by PCBs has contributed to the lack of any proper management practices in all sites visited. By the fact that the level of awareness is dismal in the visited sites, and that there is no monitoring and management practices, it is not likely to find on site Best Available Techniques (BATs) or Best Environmental Practices (BEPs) in management of PCBs.

Management and control of PCBs is a multidisciplinary endeavour but the capacity to coordinate efforts amongst different institutions, need to be strengthened. There are no specific provisions for regulating wastes containing PCB in the existing legislation.

## **3.3 INVENTORY OF DDT (ANNEX B CHEMICALS)**

### **Summary**

The inventory revealed that DDT has been used in the country since 1950's for both agriculture and public health. It was either being imported or formulated in the country. In Zanzibar, DDT was entirely used for public health and never used for agriculture. The preference to use DDT in public health, particularly against malaria vectors is due to its effectiveness and long residual effects. Zanzibar banned the use of DDT for malaria control programmes in 1988, whereas in 1997 Tanzania mainland gave an order to

prevent the formulation and use of DDT for agricultural purposes. The decisions were solely based on increase in awareness on the likely impacts of DDT to human health and the environment known worldwide.

The inventory also revealed that there are a number of storage sites that are contaminated with DDT. In some, the magnitude of contamination is alarming and needs urgent remedial measures. Furthermore, the survey revealed that there are inadequate capacity and experience for tracking environmental, human and ecological effects caused by DDT and other pesticides as well. Monitoring and enforcement for compliance to the legislation requirements governing pesticides including DDT is weak. Furthermore it was observed that there were poor systems of keeping records in both private and public institutions during importation, formulation and distribution of DDT.

### **3.3.1 Introduction**

The nature of the inventory involved review of previous reports, physical observation during visits to stores, shops and collection of data from dealers at entry points. Additionally, data was collected from institutions dealing with malaria control programmes. The 2003 DDT inventory revealed an obsolete pesticides stock of about 170,500 kg in Tanzania mainland and 150kg of DDT in Zanzibar.

### **3.3.2 Institutional and Regulatory Framework**

At present there is no specific legal provisions that regulate DDT use for public health in Tanzania. As a pesticide it is regulated by the Plant Protection Act (1997) and Plant Protection Regulations (1999), and the Public Health Act (1980) of Zanzibar.

The Plant Protection Act and its Regulations provides for management and control throughout the entire life cycle of plant protection substances including DDT as pesticide. They stipulate requirements for registration, manufacturing/formulation, importation, sale, use, transportation and disposal of pesticides wastes and their empty containers. Section 19 and 20 of the Plant Protection Regulations (1999), stipulates that it is mandatory that plant protection substances be registered and approved before being imported or used in the country. DDT as a pesticide is covered. However, the Act does not have provisions for DDT use as insecticide. Hence amendments of the respective laws are needed to facilitate DDT use in public health and enforce compliance with the Stockholm Convention. In general DDT importation and use will be restricted hence special conditions will be set for its use. The power to enforce this legislation has been vested to the Tropical Pesticides Research Institute and the Plant Health Services (PHS) of the Ministry of Agriculture and Food Security. Importers or dealers are required by law to keep records of the type and quantities and report the same on a periodic basis to the Registrar of Pesticides.

Inspectors in the Inspectorate Services who are responsible for checking compliance to the law are guided by the Plant Protection Regulations (1999). There are currently 15 pesticides inspectors; these will need additional specialized skills in DDT and matters

related to the Convention. Tanzania has ratified the Basel, Rotterdam and Stockholm Conventions; and thus provisions of existing legislation are being reviewed to incorporate requirements of these Conventions. In operationalising use of DDT in public health, additional inspectorate service is needed with speciality in public health for control and management of DDT use in accordance with WHO Guidelines.

### 3.3.3 Past, present and projected future production and use of DDT

In the past, Tropical Pesticides Research Institute Act (1979) and Pesticides Control Regulations (1984) controlled DDT formulation and use. From July 2001, the Plant Protection Act (1997) and Plant Protection Regulations (1999) became operational; the regulation controls production of all plant protection substances.

At present DDT is not in the register of plant protection substance following government order to stop its use in agriculture in 1997. The plant protection legislation attests that it is an offence for any person or firm to manufacture/formulate pesticides, which are not registered. Currently, production of DDT is not allowed because it is not registered. However, the plant protection legislation does not have any provision to ban use of DDT in agriculture.

Quantities of pesticides used were estimated by using application rate for the pesticides used in a certain crop, then multiplied with size of cultivated area. In reaching the estimated quantities of pesticides used; it was assumed that 75% of farmers in the main farming areas used DDT for maize cultivation, whereas only 25% was used in other areas. For the case of tobacco and cotton cultivation, it is assumed that all farmers used DDT. A summary of DDT quantities used is shown in the Table 3.1.

**Table 3.1:** Quantities of DDT used for agricultural purposes in Tanzania

<b>Crop</b>	<b>Area (Ha)</b>	<b>Application rate (Kg/Ha; Litres/Ha)</b>	<b>Quantity (MT)</b>	<b>Period</b>
Maize	5,963,940	30 kg/Ha	87,644.9	1985 - 1990
Tobacco	109,720	1.3 kg/Ha	142.6	1983 - 1988
Cotton	2,773,830	6 Litres/Ha	16,642.5	1984 - 1989

The Stockholm Convention provides for specific exemption to use DDT in public health particularly for disease vector control. Tanzania has registered her intention to use this exemption. Researches are underway to establish efficacy levels of DDT in mosquito control.

### 3.3.4 Import and export of DDT

The import permits are granted only to the registered pesticides importers or registrants. In Zanzibar the Plant Protection Division is responsible for procurement, distribution and

selling of pesticides. Few individuals are engaged in selling of pesticides. During the survey no DDT was found in shops.

In the past the main importers and suppliers of DDT were Crop Boards, Cooperative Unions, and the Ministry of Health through donations and health projects. There were no exports of the same. As earlier stated, there existed poor documentation systems and monitoring; hence the exact quantities of DDT imported to the country are not known.

For reasons of efficacy and cost effectiveness of DDT, the Ministry of Health plans to limit DDT uses to public health in emergency cases and controlled indoor residual spray application. Therefore, quantities for the future importation of DDT will depend on the demands of the National Malaria Vector Control. Tanzania being a large country with porous entry points, smuggling of DDT for other use may be a problem. Hence there is a need to establish effective monitoring schemes.

### **3.3.5 Identified Stockpiles of DDT and DDT waste**

The inventory of DDT undertaken in 2003 revealed an obsolete pesticides stock of about 170,500 kg in Tanzania mainland and 150kg of DDT in Zanzibar as shown by geographical locations hereunder: -

Korogwe in Tanga region (50,000 kg)  
DALDO Babati in Manyara region (440 kg)<sup>2</sup>  
NAFCO Hanang, Manyara region (10,000 kg)<sup>1</sup>  
MATI Uyole, Mbeya (6,000 kg)  
Tanzania Links, Morogoro (19,000 kg)<sup>1</sup>  
DALDO - Mahenge Ulanga, Morogoro (5,000 kg)  
SAPA Chemicals Temeke DSM (10,000 kg)  
Vikuge Farm, Coast region (70,000 kg)  
Plant Protection Division, Malindi - Zanzibar (150 kg)

#### ***Note on the asterisks:***

*1=Indicates mixture of POP Pesticides with other obsolete chemicals.*

*2= Indicates part or all obsolete chemicals were shifted to another place.*

Since stockpiles are located in towns or villages and near water bodies there is potential health hazards to human and the environment. However, there is no assessment that has been done to ascertain levels of hazards associated with DDT.

### **3.3.6 Present Management (Production, Use, Stockpiles and Waste) of DDT and Empty Containers**

In most of the surveyed sites, handling and storage of obsolete stocks of DDT is poor. In some sites the poor storage conditions of the obsolete stocks demand immediate attention; examples are: - Korogwe in Tanga; Babati and Hanang in Manyara region; Uyole in Mbeya; Mahenge-Ulanga and Tanzania Links in Morogoro region; SAPA Chemicals Temeke in DSM; Vikuge Farm in Coast region and Malindi in Zanzibar.

Although at present DDT management as a pesticide is governed by Plant Protection Act (1997) and its Regulations (1999), there are no specific legal provisions for management of DDT use in public health as well as the management of their wastes including empty containers. DDT has not been in use in agriculture since 1997 and for the case of public health since 1980's. As DDT will be restricted to public health use, farmers' organizations will have no roles to play with regard to DDT management in future. Few relevant government institutions and environmental NGOs will continue to educate the public on DDT. These efforts need strengthening.

Currently, there is no guideline on proper disposal of empty containers; hence end-users are not well guided. The Plant Protection Regulations (1999) covers disposal of containers and provision of appropriate disposal facilities. However, the practicability of this directive is hindered by lack of guidelines on proper disposal of empty containers.

The stockpiles and wastes are normally reported to NEMC for technical advice on sound disposal. The capacity of environmental inspectorate service needs to be strengthened in order to provide technical backups in the management of existing stockpiles and wastes of DDT. NEMC also holds Obsolete Chemicals Database established in 1998/99 and requires capacity strengthening in database management, remediation of POPs contaminated sites. The local Government authorities and other concerned sectors such as health also need skills in proper waste management practices.

### **3.3.7 Current Capacity and Experience in the Field of DDT**

There exists some capacity for the management of DDT in the country; for example, trained personnel, laboratory for analysis and the legislation. However, effective management is impeded by lack of resources, few trained personnel and inadequate monitoring facilities. There is also limited capacity to assess DDT effects in human and the environment.

The management of pesticides wastes including DDT is inadequately covered by the existing legislation including the Plant Protection Act (1997), The Local Government Act (2000) and the National Environment Management Act (1983). NEMC provides technical advice on disposal procedures. Currently, there is no guideline on proper disposal of empty containers or waste containing DDT.

### **3.3.8 Assignment of Responsibility and Liability**

The competent authority and other authorities have the responsibility of providing technical advice and facilitation in case of pesticide contamination. The primary responsibility on management and remediation lies with the owners. It is worth pointing out that retailers and storekeepers are seldom trained to handle spills and leaks. Furthermore, they do not have contingency plans to manage accidental spills.

The existing legal framework does not articulate the liability as far as the containment and disposal of DDT waste are concerned. The Local Government Act of 2000 requires

proper disposal of wastes including pesticides wastes. However there are no regulations or guidelines to facilitate implementation of the provisions. The Plant Protection Regulations (1999) sets out special attention to check damage, spills, deteriorated containers in the storage premises and clean-up and to decontaminate promptly in case of spillage. However, the regulations do not cover specific measures for DDT use in public health or assign responsibilities to the respective institutions, firms and individuals on matters of managing wastes and contaminated sites. Moreover guidelines to effect these provisions are lacking.

### 3.4 INVENTORY OF RELEASES FROM UNINTENTIONAL PRODUCTION OF PCDD AND PCDF

#### Summary

The inventory identified sources and quantified releases of PCDD and PCDF in the country. The estimated PCDD and PCDF releases at national level are as shown in Table 3.2.

**Table 3.2:** Estimated PCDD and PCDF releases at national level

Category	Source categories	Annual release (g TEQ/a)				
		Air	Water	Land	Product	Residue
1	Waste Incineration	112.84	0	0	0	0.011843
2	Ferrous and non-ferrous metal production	0.23	0	0	0	0.044
3	Power generation and heating	51.329098	0	0	0	0.303812
4	Production of Mineral Products	0.807	0	0	0	0.031009
5	Transport	0.599	0	0	0	0
6	Uncontrolled combustion processes	350.8818	0	181.443	0	248.070
7	Production of chemicals and consumer goods	0	0	0	0	0
8	Miscellaneous	0.00037	0	0	0	0
9	Disposal/landfilling	0	0	0	0	0
10	Identification of Potential Hot-Spot	ND*	ND*	ND*	ND*	ND*
	Total	516.689268	0	181.442	0	248.46894

\*ND = Not determined

From Table 3.2, the three leading sources of PCDD/PCDF emissions to air are:- uncontrolled combustion processes (67.91%), hospital waste incineration (21.84%) and

power generation and heating (9.93%). In the power generation and heating sub-category, the household cooking and heating contributes 99.7% of all emissions to air. Biomass burning mainly forest and grassland fires constitutes 64.7% of emissions in the category of uncontrolled combustion. The rest of emissions in this sub-category arise from domestic waste burning.

The survey identified lack of information in such areas as unintended waste burning and accidental fires; production and use of chemicals; and disposal/landfill. Other gaps include lack of capacity and experience for monitoring of releases of PCDD/PCDF; lack of awareness of the PCDD/PCDF; lack of Best Available Techniques (BATs) and Best Environmental Practices (BEPs); and lack of planned information dissemination strategy. The survey could not identify any intentional management practices of the sources of PCDD/PCDF. However, some industries such as cement industries have air pollution control systems, which could reduce the amount of PCDD/PCDF releases to the environment, even though their operational efficiency is not known.

### **3.4.1 Introduction**

PCDD and PCDF, more precisely Polychlorinated Dibenzo-Para-Dioxins (PCDD) and Polychlorinated Dibenzofurans (PCDF) are unintentionally produced from many industrial and all combustion processes. These emissions are environmental contaminants detectable in almost all compartments of the global ecosystem in trace amounts.

The identified sources of PCDD and PCDF in Tanzania are waste incineration; ferrous and non-ferrous metal production; power generation and heating; production of mineral products; transport; uncontrolled combustion processes; production of chemicals and consumer goods; miscellaneous (drying of biomass, crematorium, smoke houses, drying and cleaning residue); and disposal/landfilling.

Historical data was obtained from organizations whose activities are associated with releases of PCDD and PCDF. Prior to the inventory exercise, the study team identified the possible sources of PCDD/PCDF in Tanzania, and the areas to be visited. The selection of regions for survey was based on the concentration of activities that are associated with releases of PCDD/PCDF in those areas. The survey instruments were mainly the standard questionnaire provided in Standardised Toolkit for Identification and Quantification of PCDD and PCDF release. In some cases, however, it was necessary to use expert judgement where the available information was not in the required format.

### **3.4.2 Releases of PCDD/PCDF by Source Categories**

The sources of PCDD/PCDF in Tanzania considered in the survey were: medical waste incineration; iron and steel production and foundries; fossil fuel power plants; biomass power plants; household heating and cooking; cement production; lime production; brick production; glass production; transport; bush fires and domestic waste burning.

During the survey it was realized that incineration of municipal and hazardous waste, light-fraction shredder, sewage sludge, waste wood and biomass are not practiced in Tanzania. In addition iron ore sintering; coke production; production of copper, aluminium, lead, zinc, brass and magnesium; shredding and thermal wire reclamation are not practiced in Tanzania. Therefore estimation of releases from these categories was not done.

### 3.4.2.1 Waste Incineration

#### (a) Medical waste incineration

Hospital wastes comprise about 12 % of total hazardous wastes generated in the country, which is either incinerated or in some cases are disposed of together with other municipal waste at selected disposal sites.

At the time of inventory in 2003, the Ministry of Health had installed 15 medical waste incinerators in various health centres in Tanzania. As of early 2004 the number rose to 54 medical waste incinerators. Eleven (11) have been installed in Regional hospitals and the rest in District hospitals. The incinerators are designed to achieve a temperature of 1200 degrees centigrade. However, they lack facilities to control emissions including those of PCDD/PCDF. Some 75 District Hospitals and 15 Regional Hospitals have some kind of burning structures, which cannot be termed as incinerators. In the inventory exercise these have been disregarded.

The referral hospitals i.e. Muhimbili, KCMC, Bugando and Mbeya were surveyed and found to produce big quantities of medical waste, Muhimbili National Hospital being the largest producer. Based on the coverage of the surveyed hospitals it is assumed that the referral hospitals constitute 70% of the total incinerated medical wastes in Tanzania. National estimated figure of releases of PCDD/PCDF from this sub-category is shown in Table 3.3.

**Table 3.3:** Estimated national releases from incineration of medical wastes

Category	Process	Location	Activity statistic (t/a)	Default Emission factor ( $\mu\text{g TEQ/t}$ ) Medical Waste Burned		Potential Emission using Default Factors (g TEQ/a)		Remarks
				Air	Residue	Air	Residue	
Waste incineration	Medical waste Incineration/ burning	National	2821	40,000	200	112.84	0.017	Residuals are estimated at 3% of total incinerated waste

Note: Default emission factors are as provided in UNEP and UNIDO (2001) Standardised Toolkit for Identification and Quantification of Dioxin and Furan Releases

(b) *Combustion of animal carcasses*

Currently this is not practiced in Tanzania. However in the Dodoma and Dar es Salaam abattoirs, carcass incinerators are planned to be constructed and hence these may be regarded as future sources of PCDD/PCDF.

### 3.4.2.2 *Ferrous and Non-Ferrous Metal Production*

*Iron and steel production and foundries*

The survey covered 10 steel mills. The majority uses electric arc furnaces while others use induction or cupola furnace to produce steel from scrap. Mang'ula uses hot air cupola furnace. Since the information is not conclusive on how many use electric arc or induction furnaces the worst-case scenario, i.e. use of electric arc and dirty scrap, is assumed.

Majority of the surveyed industries are fitted with various flue gas treatment systems whose efficiency was not determined. For this reason, therefore, it is assumed that limited control measures are applied. Also, it is assumed that the surveyed industries constitute about 85% of the iron and steel production and foundries in Tanzania. Table 3.4 shows estimated annual releases of PCDD/PCDF in Tanzania from this sub category.

**Table 3.4:** Estimated releases of PCDD/PCDF from ferrous and non ferrous metal production

Category	Process	Location	Activity statistic (t/a)	Default Emission factor ( $\mu\text{g TEQ/t}$ ) of liquid steel		Potential Emission using Default Factors (g TEQ/a)		Remarks
				Air	Residue	Air	Residue	
Ferrous and non- Ferrous Metal Production	Cold air cupola with no gas cleaning	National	22,554	10	15	0.23	0.044	Residue generation rate is assumed as 129 kg/t of LS

### 3.4.2.3 *Power Generation and Heating*

(a) *Fossil fuel power plants*

This sub-category is made of power generation and heating activities. The main sources are power stations and industrial firing places (furnaces). Data for the annual consumption of fossil fuel for electricity generation is 188,540 MT/a. This data was obtained from Tanzania Electric Supply Company (TANESCO). Since TANESCO is the sole producer of electricity, it is assumed that TANESCO accounts for 95% of fossil fuel consumption in power generation. This is because the Independent Power Tanzania Ltd. of Dar es Salaam operates intermittently when there is electricity deficit in TANESCO supplies. Estimation of PCDD/PCDF releases from industrial furnaces and boilers was

not done due to lack of input data. Diesel is mainly used in the majority of thermal power plants.

Kiwira Coal Mine, located at Tukuyu, is the only power plant generating electric power from coal. The generated power is fed to the National Grid System. The plant has four boilers, which consume a total of 60-80 tons of coal per day. Table 3.5 shows the estimated releases of PCDD/PCDF in Tanzania from this sub category.

**Table 3.5:** Estimated releases of PCDD/PCDF from heating and power generation using fossil fuels

Category	Process	Location	Activity statistic (TJ/a)	Default Emission factor $\mu\text{g TEQ/TJ}$ of fossil fuel burned		Potential Emission using Default Factors g TEQ/a		Remarks
				Air	Residue	Air	Residue	
Power Generation and Heating	Diesel	National	819.7	2.5	-	0.002	-	1kg = 42MJ
	Coal	National	882	10	14	0.009	0.000012	1 kg = 35 MJ

Note: Residue has been taken as 10% of total coal combustion (Kiwira Coal Mine, 2003).

(b) *Biomass power plants*

Several industries use biomass for power generation. For example sugar companies use bagasse, coffee curing companies use coffee husks, cotton oil industries use cotton husks etc. Based on the fact that Sugar industry is the major producer of power from biomass it is assumed that the information gathered constitute 90% of the biomass used to generate power in Tanzania.

The survey covered 4 sugar production plants that use bagasse as source of energy; 1 Coffee curing company which uses coffee husks for generation of heat biomass power plants; 2 saw mills; 3 fibreboard industries; and 1 clove stem distillery. The visited regions represent 58% of all regions in Tanzania, the surveyed industries are estimated to constitute 50% of the biomass used in boilers. Table 3.6 shows the estimated releases of PCDD/PCDF from biomass power generation in Tanzania.

**Table 3.6:** Estimated PCDD/PCDF releases from power generation and heating using biomass fuel

Category	Process	Location	Activity statistic (TJ/a)	Default Emission factor ( $\mu\text{g TEQ/TJ}$ of biomass burned)		Potential Emission using Default Factors (g TEQ/a)		Remarks
				Air	Residue	Air	Residue	
Power Generation and Heating	Mixed biomass fired power	National	2,118,164	500	-	0.02	-	1kg. Of biomass is 15 MJ

	boilers							Residue content is considered to be negligible
	Biomass fired power boilers (Wood)	National	46,246.53	50	15	0.000035	0.0000052027	Ash content of 0.5% has been assumed

(c) *Landfill and biogas combustion*

Inventory of emissions from biogas combustion was not done due to limitation in data. Very limited data could be obtained from the respective national institutions. Moreover at present there is no engineered landfill in the country.

(d) *Household heating and cooking (biomass fuels)*

It is estimated that 85% of the Tanzanians use virgin fuel wood as a source of fuel (this also includes charcoal users). The annual per capita energy consumption estimates stands at 17.7 GJ. Based on 2002 National Census, the population of Tanzania stands at 34 Million. Using these figures, the estimates of national PCDD/PCDF releases from this subcategory were calculated and are shown in Table 3.7.

**Table 3.7:** Estimation of PCDD/PCDF releases from household cooking using biomass fuel

Category	Process	Location	Activity statistic (TJ/a)	Default Emission factor $\mu\text{g TEQ/TJ}$ of biomass burned		Potential Emission using Default Factors $\text{g TEQ/a}$		Remarks
				Air	Residue	Air	Residue	
Power Generation and Heating	Cooking (virgin fuel wood)	National	496,485	100	20	51.153	0.306918	Residue is assumed to be 3%

(e) *Domestic heating using fossil fuels*

A good number of Tanzanians still use fossil fuel (kerosene) for lighting and cooking. The inventory did not cover this segment. However, it is estimated that the amount of kerosene used nationally as cooking and lighting fuel stands at about 14,490 TJ/a. Table 3.8 shows the estimated PCDD/PCDF releases from fossil fuel and biogas used in house cooking.

**Table 3.8:** Estimation of PCDD/PCDF releases from household cooking using fossil fuel and biogas

Category	Process	Location	Activity statistic (TJ/a)	Default Emission factor $\mu\text{g TEQ/TJ}$ of biomass burned		Potential Emission using Default Factors g TEQ/a		Remarks
				Air	Residue	Air	Residue	
Power Generation and Heating	Cooking (Kerosene)	National	14,490	10	-	0.145	-	
	Biogas flaring	National	7.008	9	-	0.000063	-	

### 3.4.2.4 Mineral Industry

#### (a) Cement production

Tanzania Portland Cement (Dar es Salaam), Mbeya Cement (Mbeya) and Tanga Cement (Tanga) are the only cement producing companies in Tanzania. Mbeya Cement Company uses coal from Kiwira coal mine as fuel in the manufacturing processes, while Tanga Cement use industrial oil. During this survey Tanzania Portland Cement was using industrial oil although later on it started to use natural gas as well. They employ dry process for the manufacture of cement. Raw materials are calcium carbonate, silica, alumina and ferrous Oxide (red-soil), all of which react at elevated temperature to form clinker. The clinker is then ground or milled together with gypsum and other additives to produce cement. All cement industries have electrostatic precipitators although their operational efficiencies are not known. The kiln temperatures operate at 1400°C. Table 3.9 shows estimated national PCDD/PCDF releases from cement production.

**Table 3.9:** Estimation of releases of PCDD/PCDF from cement production

Category	Process	Location	Activity statistic (t/a)	Default Emission factor ( $\mu\text{g TEQ/t}$ ) of cement		Potential Emission using Default Factors g (TEQ/a)		Remarks
				Air	Residue	Air	Residue	
Mineral Industry	Dry kiln with APC	National	1,044,181	0.15	0.003	0.12829	0.002724	Residue is taken as 0.3% of cement produced

#### (b) Lime production

Lime production consists of the burning of calcium and/or magnesium carbonate between 900 – 1500°C. In Tanzania lime normally is produced in the Coastal areas of Tanga and Zanzibar. The total annual national production of lime is about 60, 000 tons. Table 3.10 shows national estimates of PCDD/PCDF releases from this sub-category.

**Table 3.10:** Estimation of releases of PCDD/PCDF from lime production

Category	Process	Location	Activity statistic (t/a)	Default Emission factor $\mu\text{g TEQ/t}$ of lime		Potential Emission using Default Factors $\text{g TEQ/a}$	
				Air	Residue	Air	Residue
Mineral Industry	Burning	National	60,000	10	ND	0.60	ND

(c) *Brick production*

Kisarawe Brick Factory Company Ltd. produces 156,240 tons of bricks per year from clay soil. This is the only industrial brick production plant in Tanzania. It has 1 - tunnel kiln made of firebricks operating at 950 - 1000°C, but it is not fitted with dust control. It produces two types of bricks, namely solid bricks (3.7 kg) and perforated bricks (2.5 kg). The furnace is fired with industrial oil. Table 3.11 shows national estimates of PCDD/PCDF releases from this sub-category. However, it should be noted that brick production is a relatively fast growing industry and therefore regular updating of the statistic data is necessary.

**Table 3.11:** Estimation of releases of PCDD/PCDF from brick manufacturing

Category	Process	Location	Activity statistic (t/a)	Default Emission factor $\mu\text{g TEQ/t}$ of brick		Potential Emission using Default Factors $\text{g TEQ/a}$		Remarks
				Air	Residue	Air	Residue	
Mineral Industry	Brick firing	National	156,240	0.2	-	0.031	-	Average weight per brick has been used

(d) *Glass production*

Kioo Ltd., the sole glass producer in Tanzania produces 31,000 tons of glass per year. Glass is produced from sand, limestone, dolomite and soda. It has one furnace operating at 950 - 1000°C, with air pollution control system. Table 3.12 shows estimated releases of PCDD/PCDF from glass production in the country.

**Table 3.12:** Estimation of releases of PCD and PCDF from glass manufacturing

Category	Process	Location	Activity statistic (t/a)	Default Emission factor $\mu\text{g TEQ/t}$ of glass		Potential Emission using Default Factors $\text{g TEQ/a}$		Remarks
				Air	Residue	Air	Residue	
Mineral Industry	Glass firing	Dar es Salaam	31,000	0.2	-	0.006		

(e) *Ceramics production*

At the moment there are no ceramic producing plants. Morogoro Ceramics Ltd. closed its operations in early 1990's. This has been included in the list of possible contaminated sites.

(f) *Asphalt mixing*

At the moment there are no asphalt mixing plants. There used to be one at Tanzania Italian Petroleum Refinery (TIPER), which closed its operations. This has been included in the list of possible contaminated sites.

### 3.4.2.5 *Transport*

In most cases it has been difficult to segregate fossil fuel consumption in the transport sector in respect to engine type and capacity as required by the dioxins/furans toolkit. However, Tanzania Revenue Authority registers car imports by category. The projection of fuel consumption per vehicle category up to the year 2020 was used as a basis for calculation. Table 3.13 shows estimated national releases of PCDD/PCDF from the transport sector.

**Table 3.13:** Estimation of releases of PCDD/PCDF from transport sector

Category	Process	Location	Activity Statistic (t/a)	Default Emission Factor ( $\mu\text{g TEQ/t}$ )	Potential Emissions Using Default Factors (g TEQ/a)	Remarks
Transport	4-stroke Leaded gasoline	National	129,477	2.2	0.28	44 MJ per kg
	2-stroke leaded gasoline	National	12,568	3.5	0.044	44 MJ per kg
	Diesel	National	475,190	0.5	0.24	42 MJ per kg
	Heavy oil fired engines	National	8,714	4	0.035	TRC and TAZARA

### 3.4.2.6 *Uncontrolled biomass Combustion*

(a) *Biomass burning*

Biomass burning considered under this category includes forest fires (deliberate and accidental), burning of grassland, uncontrolled burning of domestic wastes, and destruction by fire of agricultural residues, such as straw, in the field etc. The estimation of the forested land area is based on the fact that the area of Tanzania is 945,234 km<sup>2</sup>, out of this wetland cover 6% and habitated area 30%. The remaining 604,928 km<sup>2</sup> is occupied by forest (30%) and grassland (60%). It is assumed that 10% of forest land (181,478.4 km<sup>2</sup>) and 30% of grassland (362,956 km<sup>2</sup>) is burned annually. Material lost in fire is estimated as 10t/ha (forest) and 2.5 t/ha (grassland). Table 3.14 shows estimated national releases of PCDD/PCDF from uncontrolled biomass burning.

**Table 3.14:** Estimation of releases of PCDD/PCDF from uncontrolled biomass burning

Category	Process	Location	Activity Statistic (t/a)	Default Emission Factor ( $\mu\text{g TEQ/t}$ )		Potential Emissions Using Default Factors (g TEQ/a)		Remarks
				Air	Land	Air	Land	
				Uncontrolled Burning	Forest fires	National	$18.148 \times 10^6$	
	Grassland/ fires	National	$27.221 \times 10^6$	5	4	136.1088	108.851	30% of grassland is burned annually
	Agricultural residues fires	National	Data not available	30				Due to diffusive nature of the sector

(b) *Domestic waste*

It is assumed that the majority of the population living in rural areas produces very small amount of domestic waste. The major portion of solid waste is organic and is used in farms or as animal feed. The remaining portion containing inorganic waste materials is not burned instead it is buried. In urban areas less than 30% of domestic waste is collected for final disposal at municipal disposal sites, the rest is burnt or buried at household level. For example, in Dar es Salaam it is assumed that 20% of uncollected wastes i.e. 101,185.3 metric tones is burnt at generation points. In some municipalities with the exception of Dar es Salaam wastes at disposal sites is burnt to reduce volume of the waste. From the survey, 330,761.3 MT of domestic waste is burnt at disposal sites and at source of generation in 14 regions. It is also assumed that these amounts of waste constitute 75% of all waste burnt in the country. Hence the total waste burnt is estimated as 413,451.625 metric tones. Table 3.15 presents national estimates of PCDD/PCDF releases from uncontrolled waste burning.

**Table 3.15:** Estimation of releases of PCDD/PCDF from uncontrolled waste burning

Category	Process	Location	Activity statistic (t/a)	Default Emission factor $\mu\text{g TEQ/t}$ of material burned		Potential Emission using Default Factors g TEQ/a		Remarks
				Air	Residue	Air	Residue	
				Uncontrolled Combustion	Uncontrolled domestic Waste Burning	National	413,451.625	

### 3.4.2.7 Miscellaneous

In 2003 the production of cigarette by the Tanzania Cigarette Company (TCC) stood at 3.7 billion cigarette sticks per year. While there are some cigarettes exported to neighbouring countries there is also a substantial amount of cigarettes imported in Tanzania (these include cigars and other brands which are not produced in Tanzania). It is therefore assumed that the amount exported cancels the amount imported and hence all 3.7 billion sticks are smoked locally. Table 3.16 shows national estimates of PCDD/PCDF releases from cigarette smoking.

**Table 3.16:** Estimated releases of PCDD/PCDF from cigarette smoking

Category	Process	Location	Activity statistic (cigarette/a)	Default Emission factor (pg TEQ/cigarette)		Potential Emission using Default Factors (g TEQ/a)		Remarks
				Air	Residue	Air	Residue	
Miscellaneous				Air	Residue	Air	Residue	
	Cigarette smoking	National	3.7x 10 <sup>9</sup>	0.1	ND	0.00037	ND	

### 3.4.2.8 Possible Contaminated Sites

The survey shows that the biomass power generation plants produce the majority of PCDD/PCDF; and the major ones are the sugar production industries. Since these industries have been in operation for many years, they may also be considered under possible contaminated sites. Other industries that have closed business are also considered as potential contaminated sites by PCDD/PCDF. These are industries that *produced or consumed chemicals* in production process, such as Mufindi Paper Mills - Mlololo (due to high emission factors 1,000 µg TEQ/t); Tanzania Italian Petroleum Refinery (TIPER); Tanzania Chemicals Ltd; 4 Tannery industries (in Mwanza, Morogoro, Moshi, and Coast regions basically due to high emission factors in residue i.e. 1,000 µg TEQ/t); and Textile industries (such as Kiltex and Sunguratex of Dar es Salaam, - though with relatively low emission factors of 100 µg TEQ/t).

*Moreover hot spots* such as sites contaminated with leaking transformers and capacitors (The emission factors are very high as they range from 15,000 – 1,500,000 µg TEQ/t) and dumpsites such as Vingunguti, Tabata, Mtoni (all in Dar es Salaam) and Jumbi in Zanzibar.

## 3.4.3 Assessment

### 3.4.3.1 Principal Sources of Releases

According to this survey, there exist potential PCDD/PCDF releases to air, water and land in Tanzania. More than 517g TEQ/a and 249 g TEQ/a are released through air emissions and residues, respectively. A range of activities was found to contribute to this

including industrial activities, solid wastes burning, transportation, power generation and heating etc. More than 68% of the PCDD/PCDF releases in the air are due to uncontrolled combustion process while hospital waste incineration contributed 22% of emissions to air. Uncontrolled combustion processes were the only identified activities releasing the pollutants to land. Power generation and heating is the third largest sources of PCDD/PCDF releases in Tanzania.

#### **3.4.3.2 Present Management Practices**

In some industries air cleaning facilities such as electrostatic precipitators filters are fitted. However, these were not fitted to manage release of PCDD/PCDF but rather to manage general air pollution. This was evident because in all cases no personnel was found to understand what the PCDD/PCDF are and what are their effects. In fact most of people interviewed were surprised to learn that such noxious pollutants are being produced and they are unknowingly exposed to the same.

#### **3.4.3.3 Future Options for Release Reduction**

- (i) Remedial measures/clean-up campaigns of areas suspected to be contaminated with PCDD/PCDF;
- (ii) Promote research on alternative materials or technologies geared to reducing PCDD/PCDF;
- (iii) Establish monitoring programmes on emissions of PCDD/PCDF;
- (iv) Promote use and improve performance of air pollution control facilities in industries; and
- (v) Promote and encourage adoption of BATs and BEPs.

#### **3.4.3.4 Main Data Gaps**

Information on a number of sub-categories was not readily available including waste burning and accidental fires, production and use of chemicals, miscellaneous (e.g. drying of biomass, crematorium, smoke houses, drying cleaning residue), and hot spots (e.g. PCB-filled transformers and capacitors, dump sites etc). In addition, it was not possible to assess adverse effects of PCDD/PCDF to human health and areas surrounding sources due to lack of expertise and monitoring activities. Identification of critical cases was not possible. Due to absence of national emission factors in the toolkit on several potential sources, releases from these sources could not be estimated.

#### **3.4.3.5 Recommendations of the Assessment**

- (i) Develop emission factors based on local/regional conditions;
- (ii) Carry out specific studies to generate reliable input data for estimation of PCDD/PCDF releases; and
- (iii) Carry out further inventory in areas not covered by this survey.

## **3.5 SURVEY OF CONTAMINATED SITES**

### **Summary**

In this survey, three categories of POPs that have potential of causing contamination were considered; namely PCBs, POP Pesticides including DDT and PCDD and PCDF. The methodology used included literature review, field visit and administration of a modified standard questionnaire to collect relevant data on POPs and its locality. Additionally, information on amounts of POPs, and visual assessment of site contamination level was collected.

The identification of sites that are heavily contaminated was based on visual inspection, assessment and expert judgment. All sites with leaking units were considered to be sites that will potentially become contaminated in future if mitigation measures are not instituted urgently.

As the level of contamination varies from site to site, a priority setting criteria was set on the basis of leaking equipment, proximity to sensitive sites such as water source, settlements, etc. Thirty three sites are possibly contaminated with PCBs and four sites are likely to be contaminated with DDT, Aldrin and Toxaphene. Moreover, industries that have closed business and municipal disposal sites are potential sources of future releases of PCDD and PCDF. These industries are categorized as:- chemical, petroleum, tanneries, paper mills and textile industries.

### **3.5.1 Introduction**

The inventory of sites contaminated with POPs covered PCBs, POP Pesticides including DDT, PCDD and PCDF. In the case of PCBs, all sites with leaking units were considered to be sites that will potentially become contaminated in future if mitigation measures are not instituted urgently. Taking into account the lack of awareness identified leaks were likely to continue despite encouragement of the management to repair leaking equipment. The survey identified thirty-three (33) heavily contaminated sites in surveyed areas located in 25 regions of Tanzania, Zanzibar inclusive. A priority setting criteria was set on the basis of leaking equipment or contaminated site, very close to sensitive sites like marine and aquatic environment, public utility, human settlements, etc. that needs first priority mitigation measure.

For POP Pesticides, a total of 19 regions of Tanzania were surveyed. The selected regions for survey were those with high agricultural or trade activities, major entry points and areas of high concentration of industries. Reports of previous inventories of obsolete pesticides were also used. Over 40 stores have shown severe environmental contamination with possible high handling risks. Out of these, 4 sites are contaminated with DDT, Aldrin and Toxaphene. These are located in Kibaha and Korogwe districts. The identified sites were prioritized based on visual inspection, assessment and expert judgment.

Among the identified sites contaminated with PCDD and PCDF are nine industries that have closed business; these are chemical, petroleum, tanneries, paper mills and textile industries located in Dar es Salaam, Mwanza, Iringa and Kilimanjaro regions. Other sites are Tabata, Vingunguti and Jumbi municipal solid waste disposal sites located in Dar es Salaam and Zanzibar respectively.

### **3.5.2 Institutional and Regulatory Framework**

The responsible key institutions have limited capacity to manage contaminated sites in terms of human resources, laboratory equipment and facilities. Furthermore, the capacity to coordinate efforts amongst different institutions, even at government level is weak.

The management of contaminated sites involves various stakeholders such as government departments and agencies, research institutions, law enforcers, POPs chemical importers, handlers and users. Due to inadequate awareness of the potential adverse effects posed by POPs there have been no tangible management provisions in all sites visited.

At present the relevant laws for the control of POPs contamination are the Plant Protection Act (1997), Industrial and Consumer Chemicals (Management and Control) Act (2003); Environmental Management Act (2004); the Sustainable Environmental Management Act (1996) and the Local Government Acts of 1981 and 1982 and amendments of 2000. However, the Plant Protection Act has limited provisions on management of Pesticides contaminated sites. Also the Local government Acts have no specific provisions on handling of chemical contaminants such as POPs. The Environmental Management Act (2004) empowers the Minister to promulgate regulations for compensation, clean-up and emergency response to hazardous substances released into the environment and clean up of inactive hazardous waste disposal sites (Section 77(5)(q)). The Industrial and Consumer Chemicals (Management and Control) Act of 2003 has provisions for management and immediate clean up of sites contaminated with pesticides and industrial spills respectively. Additionally, the Environmental Management Act (2004) and the Industrial and Consumer Chemicals (Management and Control) Act of 2003 require development of contingency plans and demand Environmental Impact Assessment (EIA) and dynamic risk assessment.

### **3.5.3 Sites Contaminated with POPs**

Sites contaminated with PCBs are characterized with spillages and leakages of oil from electrical units that are suspected to contain PCBs; hence resulting to contamination of the surroundings including the ground. Furthermore, site contaminated with POP Pesticides are characterized with haphazard storage of obsolete stocks, intensive pesticides odors and pesticides contaminants. Generally, the packaging has deteriorated; hence leakage or spillage of pesticides on the floor or ground. Some of the stores have no concrete floor or are in open areas. Moreover, industries characterized by combustion or chemical production processes that have closed business are potential sources of future releases of PCDD and PCDF. There are nine industries categorised as chemical, petroleum, tanneries, paper mills and textile industries. Three (3) municipal waste

disposal sites currently closed are also potential sources of PCDD/PCDF releases. In addition, sites possibly contaminated with PCB and POP Pesticides are also considered potential sources of PCDD and PCDF releases. Characterization of sites possibly contaminated with POPs is as shown in Table 3.17.

**Table 3.17:** Characterization of sites contaminated with POPs

Sites Location	Size (m <sup>2</sup> )	Ownership	Responsible parties	Potential impacts	Public concerns
<b>PCBs</b>					
A total of 33 sites in 12 regions	Undetermined	TANESCO SFPC and Private	Public	-Pollution of the environment -Public health effects	Leaking equipment are close to sensitive sites (water sources, settlements, etc.)
<b>POP Pesticides</b>					
A total of 4 sites in Korogwe (Tanga), Mtwara Township, Babati (Manyara) and Vikuge (Coast)	Undetermined	Public and Private institutions	Public	-Pollution of the environment -Public health effects	Pollution of soil and water sources
<b>PCDD/PCDF</b>					
SPM (Iringa)	Undetermined	Public and Private institutions	Public	Pollute water sources	Contaminated soils which may leach out to water sources
TIPPER (Dar es Salaam)	Undetermined	Private	Public	Bioaccumulation in food chain	Contaminated soils may pollute ground water aquifers which is the major source for domestic use
TCI (Dar es Salaam)	Undetermined	Private	Public	Pollute water sources	Contaminated soils may leach out to water sources
Tanneries (Mwanza, Morogoro, Moshi)	Undetermined	Private	Public	Bioaccumulation in food chain	Contamination of fish and drinking water

Kiltex, Sunguralex (Dar es Salaam)	Undetermined	Private	Public	Pollute water sources	Contaminated soils may leach out to water sources
Tabata and Vingunguti municipal waste disposal sites (Dar es Salaam), Jumbi disposal site (Zanzibar)	Undetermined	Public	Public	Bioaccumulation in food chain	Contaminated soils may pollute ground water aquifers which is the major source for domestic use

Source: Country Survey Report on POPs Contaminated Sites (2003)

### 3.5.4 Preliminary Identification of Priority Sites

Identification of highly priority-contaminated sites was based on the criteria shown in the Table 3.18.

**Table 3.18(a):** Priority setting criteria for highly contaminated sites

Type of POPs	Criteria	Priority
PCBs	Leaking equipment or contaminated site, very close to sensitive sites (water sources, public, etc.) needs immediate mitigation	1
	Leaking equipment or contaminated site, needs mitigation	2
	Contaminated site will need mitigation	3
Pesticides	Quantities, status of store, proximity to water source and community	1
PCDD and PCDF*		

\* No criterion was predetermined for PCDD and PCDF due to complexity nature.

**Table 3.18(b):** Sites possibly contaminated with POPs

No.	Site	Priority
<b>PCBs</b>		
1	Bukoba-Sadelmi Store	2
2	Dar es Salaam City Centre Substation	3
3	Mwalimu Julius Kambarage Nyerere - Dar-es salaam initially known as Dar es Salaam International Airport (DIA)	1
4	DAWASA Lower Ruvu-Bagamoyo	1
5	DAWASA Upper Ruvu-Mlandizi intake	1
6	Gongo la Mboti Substation	3
7	Kikuletwa Mini Hydro	1
8	Mbalizi Minihydro Station-Mbeya	3
9	Kidatu Hydro Plant	3

<b>No.</b>	<b>Site</b>	<b>Priority</b>
10	Kidatu Switch Yard	2
11	Kilombero 2	2
12	Morogoro Msamvu Sub-Station	2
13	Morogoro Tanneries Industry	1
14	Mlandizi Sub-Station (TANESCO)	3
15	Musoma-Power Station	3
16	MUTEX-Musoma	3
17	MWATEX- Mwanza	3
18	Mtwara Power Station	1
19	Newala Power Station	1
20	Nyumba ya Mungu	1
21	Old Pangani Hydro	1
22	Old Tanganyika Packers	3
23	Southern Paper Mills	3
24	TANESCO Electrical Workshop at Ubungo	1
25	TAZARA Workshop- Mbeya.	3
26	Tosamaganga Mini Hydro Iringa	1
27	Tumbi Sub-Station (TANESCO)	3
28	Ubungo 33/11KV yard	3
29	Ubungo Thermal Power Station	2
30	Water Pump-Kibaha District	1
31	Zanzibar - Mtoni Sub Station	2
32	Zanzibar - Weshu Power Station	2
33	Zanzibar-Tibirinzi Power Station	2
<b>POP Pesticides</b>		
34	Korogwe (Tanga Region)	1
35	Mtwara Township	1
36	Babati (Manyara Region)	1
37	Vikuge farm (Coast Region)	1
<b>PCDD and PCDF</b>		
38	Southern Paper Mills, Mgololo, Iringa Region,	1
39	Tanzania Italian Petroleum Refinery Dar es Salaam Region	1
40	Tanzania Chemicals Industries Ltd. Dar es Salaam Region	2
41	Mwanza Tanneries, Morogoro Tanneries, Moshi Tanneries, Lake Tanneries	2
42	Textile industries e.g. Kiltex and Sungura Textiles (Dar es Salaam).	2
43	Vingunguti and Tabata waste disposal sites, Dar es Salaam Region	2
44	Jumbi waste disposal site, Zanzibar	1

### **3.5.5 Current capacity and experience**

The capacity of most of the institutions dealing with PCBs, PCDD and PCDF is very low and most of them have no knowledge on the associated hazards. Additionally, capacity to make regular and adequate monitoring and in general management and control of contaminated sites is lacking.

There are few institutions however, with limited laboratory facilities and if given additional specialized training could undertake monitoring releases of POPs. These are the Government Chemist Laboratory Agency (GCLA), Tropical Pesticides Research Institute (TPRI), National Institute for Medical Research (NIMR) and the University of Dar es Salaam.

### **3.5.6 Assignment of Responsibility and Liability**

The issues of liability and responsibility are not well addressed in the existing laws; hence there is a need to make more elaborate provisions. The responsibility and liability for clean up of the sites; as for all matters of environmental concern remain with the owner of the sites. Other stakeholders might take part to provide assistance in finance, expertise, technology, supervision, etc.

### **3.5.7 Overview of International Experience and Practice**

Remediation options for contaminated sites are many and diverse; some of the commonly used methods in contaminated sites remediation are in-situ and off-site technologies. The in-situ decontamination technology refers to the use of solvents and chemicals through a leaching method. The chemical solvent is applied to contaminated sites and drains the contaminant POP. This method is comparatively expensive and has difficulty in selection of appropriate solvents. The POPs-containing leachate is collected and treated in wastewater treatment facilities.

The off-site treatment involves excavation of contaminated sites to remove contaminated soil. The contaminated soil is treated at the treatment plant by incineration and/or chemical treatment. The availability of facilities such as incinerators, large treatment plants and others are the limiting factor for using this method particularly in developing countries such as Tanzania. The regional experience shows that most of site decontamination activities are done in line with off-site treatment. Tanzania has no application experience of these technologies.

## **3.6 FORECAST OF PRODUCTION, USE AND RELEASES OF POPs**

Table 3.19 is a summary of forecast of the intentionally produced POPs releases during production and uses as well as the releases of the unintentionally produced POPs. Presently Tanzania is not producing or using POP Pesticides. This situation is likely to

continue as actions by various actors to promote substitutes and alternative approaches, such as, IPM get strengthened. Likewise, at present there is no production or use of DDT. It is intended to be used for the control of vector diseases specifically control of malaria starting in 2008. Use will be restricted in endemic areas, in case of emergency situation. In this context about 2.8 metric tones of DDT per annum will be used. There is no production of PCBs in the country. Equipment and oils containing PCBs were imported. The identified equipment likely to contain oils with PCBs will be subjected to field testing and laboratory analysis before preparations for sound disposal commence. PCB contaminated equipment and oils that will show levels of PCBs above 50 ppm will be eliminated in accordance with the requirements of the Stockholm Convention and the commitment of the SADC member States which require removal from use, oils containing PCBs by 2010 and their safe disposal. In this regard, Tanzania plans to safely disposal of, wastes containing or contaminated with PCBs, possibly by 2015. Projection of the unintentional releases of PCDD and PCDF is based on growth rate of the respective sector or source category. In areas where the baseline information for releases of PCDD or PCDF is lacking, projections have not been made.

**Table 3.19:** Summary Forecast of POPs Production, Use and Unintentional Releases

Year	2003/04 Baseline Inventory	2005	2010	2020	2030	Remarks
<b>POP Pesticides</b>						
<b>Production (Tonnes)</b>						There is no production of POP Pesticides in the country
Aldrin	0.00 <sup>a</sup>	0.00	0.00	0.00	0.00	
Chlordane	0.00	0.00	0.00	0.00	0.00	
Dieldrin	0.00	0.00	0.00	0.00	0.00	
Endrin	0.00	0.00	0.00	0.00	0.00	
Heptachlor	0.00	0.00	0.00	0.00	0.00	
Hexachlorobenzene	0.00	0.00	0.00	0.00	0.00	
Mirex	0.00	0.00	0.00	0.00	0.00	
Toxaphene	0.00	0.00	0.00	0.00	0.00	
<b>Use (Tonnes)</b>						
Aldrin	0.00	0.00	0.00	0.00	0.00	
Chlordane	0.00	0.00	0.00	0.00	0.00	
Dieldrin	0.00	0.00	0.00	0.00	0.00	
Endrin	0.00	0.00	0.00	0.00	0.00	
Heptachlor	0.00	0.00	0.00	0.00	0.00	
Hexachlorobenzene	0.00	0.00	0.00	0.00	0.00	
Mirex	0.00	0.00	0.00	0.00	0.00	
Toxaphene	0.00	0.00	0.00	0.00	0.00	
<b>DDT</b>						
Production (Tonnes)	0.00	0.00	0.00	0.00	0.00	There is no

Year	2003/04 Baseline Inventory	2005	2010	2020	2030	Remarks
						production of POP Pesticides in the country
Use (Tonnes)	ND	ND	2.8 Metric tones *	2.8 Metric tones *	2.8 Metric tones *	Use will be restricted for endemic areas starting in 2008, specifically for emergency situation
<b>PCB</b>						
<b>Production</b> (Tonnes)	0.00	0.00	0.00	0.00	0.00	There is no production of PCBs in the country
<b>Use</b> (Tonnes)	273	<b>273</b>	<b>0.00</b>	0.00	0.00	Assumed that by 2010 field testing and laboratory analysis of transformer oils will have been accomplished and oils with concentration above 50 ppm removed from use and safely disposed of by 2015
<b>Waste</b>	105	105	0.00	0.00	0.00	All waste oils with concentration above 50 ppm will be disposed of safely by 2015
Closed and semi-closed applications	Same as in PCB use	Same as in PCB use	Same as in PCB use	Same as in PCB use	Same as in PCB use	
Open application	ND*	ND	ND	ND	ND	Not covered by the inventory

Year	2003/04 Baseline Inventory	2005	2010	2020	2030	Remarks
<b>Releases from Unintentional Production PCDDs/PCDFs</b>	(g I-TEQ)**	(g I-TEQ)	(g I-TEQ)	(g I-TEQ)	(g I-TEQ)	
Hospital waste incineration	112.84	114.623	114.559	116.277	118.021	Assume services sector growth of 1.5% per annum
Ferrous and non-ferrous metal production	0.23	0.242	0.254	0.267	0.280	Assume industrial growth of 5% per annum
Power generation and heating	51.329	53.896	56.591	59.421	62.392	Assume industrial growth of 5% per annum
Production of mineral products	0.807	0.896	0.9957	1.105	1.227	Assume construction sector growth of 11% per annum
Transport	0.599	0.637	0.678	0.721	0.767	Assume transport sector growth of 6.4% per annum
Uncontrolled combustion processes	350.882	354.391	357.935	361.514	365.129	Assume 1% increase per annum
Production of chemicals and consumer goods	ND*	ND	ND	ND	ND	No production at present
Waste disposal in landfill	ND*	ND	ND	ND	ND	There is no engineered landfill sites in Tanzania
Hot spots <sup>1</sup>	ND*	ND	ND	ND	ND	
Miscellaneous <sup>1</sup>	0.00037	0.00038	0.00039	0.00040	0.00041	Assume 1.5% per annum
<b>Hexachlorobenzene (HCB)</b>	ND*	ND	ND	ND	ND	Not covered by the inventory
<b>Polychlorinated</b>	ND*	ND	ND	ND	ND	Not covered by

Year	2003/04 Baseline Inventory	2005	2010	2020	2030	Remarks
biphenyls (PCBs)						the inventory

ND \* Not determined

\*\* I-TEQ International Toxic Equivalent

1 Areas requiring further study

### 3.7 MITIGATION CAPACITY FOR POPs MANAGEMENT AND POPs RELEASE

#### Summary

The survey assessed the mitigation capacity for POPs management releases with a view to protect human health and the environment. The major sources of POPs Chemicals in Tanzania include obsolete stocks of POP Pesticides; PCB oils possibly used in electrical equipment; and unintentional releases of PCDD and PDCF mainly from forest and grassland fires, domestic heating and cooking, hospital waste incineration and biomass power plants.

The survey results indicate presence of about 273 MT of oils possibly containing PCBs in 418 electrical equipment, some of them are not working; 17.4 MT of obsolete POP Pesticides and 170.7 MT of DDT stored in various areas; and more than 48 sites possibly contaminated with POPs.

Some of the identified gaps include; limited capacity for monitoring of POP Pesticides whereas for PCB, dioxin and furans is almost nonexistence as these are new areas; low awareness and knowledge on POPs; lack of monitoring schemes; and limited institutional capacity (infrastructure and equipment). Therefore, there is need for capacity building to strengthen the mitigation capacity for POPs releases management.

#### 3.7.1 Introduction

The mitigation capacity for POPs releases management is intended to reduce or eliminate POPs releases with a view to protect human health and the environment. In that context, the government is committed to undertake various interventions that are geared to minimize or prevent further releases of POPs. In a few cases some steps have already been taken that have resulted into significant reduction of releases of PCB and POP Pesticides. For example, ABB TANELEC Company based in Arusha that manufactures and services electrical equipment is no longer using PCB. Most of the POP Pesticides have been removed from the register of pesticides due to their toxicity and persistence as well as availability of promising alternatives.

The government realizes the need to take further efforts to prevent or minimize releases of PCB from equipment currently using oil-containing PCB and also reducing the releases of PCDD and PCDF through adoption of BATs and BEPs . Such efforts cannot be realized without further support to strengthen capacities of institutions, which are dealing with management, monitoring, training and research on POPs. This calls for financial and technical support from the developed countries.

There is limited capacity for monitoring of POP Pesticides and PCBs whereas for PCDD and PCDF is almost nonexistent as this is a new area. This calls for formulation of National standards and procedures for monitoring of POPs releases in environment. Procedures for the determination of human health impacts need to be developed.

To strengthen coordination and collaboration, the Vice President's Office, which is the National Focal Point of the Stockholm Convention, needs to establish permanent coordination mechanism to oversee implementation of the NIP and provide policy guidance.

In all surveyed regions, the representatives of stakeholders interviewed had very limited awareness and knowledge on POPs and their hazards. With this limitation, smuggling of DDT through porous entry points for illegal use might be a problem; hence there is a need to strengthen monitoring schemes. Illegal trafficking if not controlled could increase POPs releases to the environment and reduce pace for adoption of viable alternatives.

POPs issues are not covered in the existing school curricula. However, there are few institutions if given specialized training they can initiate and develop scientific research in impacts of POPs and promotion of viable alternatives of POPs. Such institutions include TPRI, GCLA, NIMR, SUA, University of Dar es Salaam, Forestry Research Institutes, Institute of Marine Science, Cleaner Production Centre of Tanzania, and the research institutes dealing with agriculture and livestock. The capacity of such institutions in terms of infrastructure and equipment for monitoring and training in POP issues is inadequate demanding financial and technical support.

### **3.7.2 Waste Management Facilities**

POPs waste management facilities such as storage, transportation and disposal facilities are non-existent. Handling of equipment containing POPs, as observed in most of the visited sites, is generally poor. Staff working with equipment possibly containing PCBs does not use protective gear. Spillages during topping-up of transformer oil, filtration and general services were observed in many sites. Filtration practices are carried out on non-concrete surface thus contaminating the soils, water and surrounding environment. No service bays for trapping transformer oil have been observed. Most of the defective equipment are stored in open-air non-concreted surface. Others have been rehabilitated and re-used. Some of storage containers for transformer oil are leaking. Waste transformer oil is kept in open areas for those who need it, burned or discharged haphazardly into the environment.

POP Pesticides stocks are generally haphazardly stored leading to leaks and spillages. In most cases the existing storage facilities do not conform to storage requirements. Tanzania has had experience of disposing of obsolete DNOC in cement kiln. There exists no evidence of Tanzania mainland having disposed of POP Pesticides wastes. The Plant Protection Regulations (1999) attests that competent authority shall dispose of obsolete pesticides and their empty containers. This is yet to be operationalised by making the necessary guidelines. Disposal of wastes containing POP Pesticides (e.g. empty containers, contaminated solids, filters, residues from electrical equipment and obsolete/decommissioned transformers, etc.) is generally done haphazardly. There is need to establish national strategies for management of POPs waste and waste management facilities such as incinerators and treatment plants.

### **3.7.3 Contaminated Site Remediation Capability**

Tanzania has never undertaken remediation of POPs contaminated sites. Generally, specialized services and facilities to manage remediation of POPs contaminated sites are not in place. There is a need to build capacity in this area. Training in specialized skills, undertaking of demonstration projects, and provision of monitoring equipment are crucial.

### **3.7.4 Environmental Monitoring Capability**

The capacity for monitoring of PCBs in food, humans and environment is limited to two institutions i.e the University of Dar es Salaam and Government Chemist Laboratory Agency(GCLA). Literally there is no capacity and experience for monitoring of PCDD and PCDF in the environment and humans. There is also limited capacity for monitoring of POP Pesticides within the existing institutions in the country such as the Tropical Pesticides Research Institute (TPRI), GCLA and the University of Dar es Salaam. Adhoc monitoring through studies or projects has been undertaken in selected areas. There has been no continuous monitoring. The existing evidence includes case studies, which were conducted by TPRI in 1997 on the effects of organochlorines in birds and agro-ecosystem of maize. The studies showed low levels of residues of organochlorines in the range of 0.001-1.45 ng/g. Preliminary studies conducted in 1995 in one of the areas with high agricultural activities to determine the extent of dieldrin residue and its metabolites in the soil, indicated a concentration of 0.3-0.9 ppb. In another study undertaken in 2000 by the University of Dar es Salaam, the levels of DDT in soil surrounding the Vikuge storage site were very high showing concentrations of up to 282,000mg/kg dry weight.

Institutions involved in monitoring of POPs products and releases are those responsible for policy formulation and implementation, environmental pollution monitoring, chemical management, training and research development and the major owners of electrical equipment, i.e. TANESCO and SFPC. However, capability and capacity of these institutions in ensuring effective monitoring of POPs releases is far from being adequate. The existing laboratory facilities for monitoring of POPs releases are as shown in Table 3.20.

**Table 3.20:** Laboratory Facilities for monitoring POPs releases

Name/ description of Laboratory	Location	Equipment/Analytical Capabilities	Application GLP (yes/no)	Purpose
TBS	Dar es Salaam	HPLC(1)	Yes	Quality assurance and training
TPRI	Arusha	HPLC (2), GC (2)	Yes	Regulatory and quality assurance
GCLA	Dar es Salaam	HPLC (2), GC (2), GC - MS (1)	Yes	Regulatory and quality assurance
CHEMISTRY - UDSM	Dar es Salaam	HPLC (1), GC (2)	Yes	Training, research and public services (consultancy)
CPE, UDSM	Dar es Salaam	HPLC (1), GC (3), GC- MS (1)	Yes	Training, research and public services (consultancy)
TIRDO	Dar es salaam	HPLC	Yes	Research and public services
TFNC	Dar es Salaam	HPLC (2),	Yes	Research and quality assurance
SUA	Morogoro	HPLC	Yes	Training, research and public services (consultancy)

**Key to symbols in the table above**

Symbol	Description	Detector (as superscript)
HPLC	High Performance Liquid Chromatography	1= IR; 2=UV
GC	Gas Chromatography	1=FID; 2=ECD
GC-MS	Gas Chromatography – Mass Spectrometer	

The following institutions and organizations have various roles on reporting of POPs issues to the National Focal Point. These include: -

- i) Tropical Pesticides Research Institute (TPRI)
- ii) Ministry of Transport and Communication
- iii) Ministry of Home Affairs
- iv) Ministry of Agriculture and Food Security - Plant Health Services
- v) Ministry of Health
- vi) National Environment Management Council (NEMC)
- vii) City and Municipal Councils
- viii) Government Chemist Laboratory Agency (GCLA)
- ix) Ministry of Industry and Trade
- x) Cleaner Production Center of Tanzania (CPCT)
- xi) Environmental NGOs such as AGENDA and TPWU

There is limited national capacity for reporting of POPs information in these institutions due to the following constraints: lack of clear inter-institutional reporting system; lack of monitoring and reporting programme; and lack of guidelines and standards for monitoring and reporting of POPs. Other constraints include limited coverage of POPs releases monitoring and reporting in the existing sectoral laws; limited institutional capacity in terms of specialized skills, equipment and financial resources; and low awareness of the general public. Information generation, storage, and management need improvement. The Action Plan on Monitoring and Reporting cover actions that minimize these weaknesses.

### **3.7.5 Health Monitoring Capability**

Currently, Tanzania has inadequate capacity and mechanisms for monitoring releases of POPs to the environment. Apparently, there are no detailed studies or assessment undertaken to come up with the actual adverse effects of POPs in humans. However, there are few evidences on the effects of POP Pesticides to wildlife population in the country. The most affected groups should be those living around contaminated sites.

As the health sector has no specific strategies to manage health effects associated with POPs, the victims of POPs effects normally remain un-attended due to lack of prior etiological evidence related to POPs. Currently, there are only three occupational health doctors in the country. This problem will persist if specialized training in this field is not granted.

### **3.7.6 Technical Support and Release Mitigation Services**

Technical support and release mitigation services are very limited in the country. In particular, there is limited analytical services capability in the areas of: High Performance Liquid Chromatography (HPLC); Gas Chromatography (GC); and Gas Chromatography–Mass Spectrometer (GC-MS).

The available analytical laboratories that may provide technical support for monitoring releases of POPs have limited specialized skills and financial resources. These laboratories are as shown in the Table 3.20.

### **3.7.7 Research and development assets**

The institutions that could be involved in research and development in POPs releases include: those responsible for policy-oriented research, environmental standards and monitoring and chemicals management. These institutions have a number of facilities and trained personnel that can facilitate some of the functions of R&D in POPs issues and undertaking of analytical works. These are the Chief Government Chemist Laboratory Agency, Tropical Pesticides Research (TPRI), and the University of Dar Es Salaam. Some of the facilities might however, need to be updated to enable them analyze trace values, e.g. in foods, soils, water, etc. A list of available equipment is shown in the Table 3.20

### **3.7.8 Information Management Capacity**

Capacity building in information generation, storage, management and dissemination is very important for a successful implementation of the Stockholm Convention.

There are several databases in the country that might either contain information on POPs or be used to store information on the same. For example, national and international data on chemical safety is available at government offices such as Occupational Safety and Health Agency, Government Chemist Laboratory Agency and NEMC.

However, exchange of information amongst relevant institutions is low. In addition, national mechanisms to facilitate improved information management as well as geographic information system are weak and uncoordinated.

Improvement of information management may therefore be achieved by:

- a) Building up of technical capacity for information management in relevant institutions including provision of necessary infrastructure i.e. computers, Fax facility, E-mail and Internet;
- b) Developing, facilitating and publicising the network for information bank in the country; and
- c) Make funds available as contributions to international databanks for becoming eligible for news subscription.

Location of national data related to the management of information and how to gain access to such data is shown in the Table 3.21. The table also indicates where the data is maintained, the source of the data, who has access to and the media in which the data is maintained.

**Table 3.21:** Location of National Data

Type of Data	Location(s)	Data source	Who has access?	How to gain access	Format
Import Statistics	BoS, TRA, TPRI and BOT	Custom offices and importers	Public	Request or buy	Automated data, Reports, files
Chemical Use Statistics	Customs, TCCIA, CropLife Tanzania and CTI	User industries	Public	Request	Reports
Transport statistics	BoS	Ministry of Transport Transporters	Public	Request	Automated data , files
Industrial Accident Reports	OSHA	Inspectors, Industries, Workers	-do-	-do-	-do-
Transport accident reports	Ministry of Transport & Communication and Ministry of Home Affairs	Public	-do-	-do-	-do-
Occupational Health Data (agricultural)	Plant Health Services	Ministry of Agriculture and Food Security TPRI, farmers, surveys	-do-	-do-	Files
Occupational Health Data (industrial)	OSHA and Ministry of health	Industries, workers, Inspectors, Ministry of health	-do-	-do-	Automated data, files
Poisoning Statistics	Ministry of Health, GCLA, Poisons centre and OSHA	Ministry of Home Affairs, Ministry of health and the Poisons centre	Public	-do-	Files
Hazardous Waste and other waste Data	NEMC, UCLAS, City and Municipal Councils	Environmental Engineering sustainable City Programme office, District medical officers, Head of medical waste management and researchers, surveys, studies, reports	-do-	-do-	Reports, automated data
Register of Pesticides	TPRI	Pesticide registrants	-do-	-do-	Automated data
Register of Toxic Chemicals	NEMC and GCLA	NEMC and GCLA	-do-	-do-	-do-
Inventory of Existing Chemicals	NEMC*	Industries and Ministries	Public	Request	Automated data
Register of imports	Customs statistics dept., customs, TCCIA, CTI and TRA	Importers, TRA, TPRI, TCCIA and CropLife Tanzania	Public	Request	Automated data, files
Tanzania Standards	TBS	TBS Library	Public	Request	Standards
PIC Decisions	GCLA in Dar es Salaam and Zanzibar and TPRI	IRPTC	Public	Request	Files
Cleaner production Reports	CPCT, MIT, DOE and LVEMP	CP Assessment Reports, Project Reports	Public	Request	Reports

Source: National Profile to assess the National infrastructure for Managing chemicals, 2002

### 3.7.9 Capacity Strengthening Requirements

Capacity gaps and potential requirements for strengthening POPs management and POPs release are as shown in the Table 3.22.

**Table 3.22:** Areas of intervention and capacity strengthening requirements

Area of intervention	Capacity Requirements
Waste management facilities	-Education and training particularly on POPs management issues - Facilities for disposal
Contaminated sites remediation	-Legislation and guidelines for DDT management -Remediation schemes -Programmes for raising awareness
Environmental monitoring	-Monitoring programs on POPs -Legislation and guidelines for DDT management -Updated policies and laws
Health monitoring	-Monitoring programs on POPs -Legislation and guidelines for DDT management
Technical support and release mitigation services	-Sound technologies to manage POPs - Institutional capacity to handle and analyse POPs - Institutional capacity for research and modelling of POPs release environmental fate and transformation
Research and development	-Programs to promote the use of alternatives of POPs -Research capacity on clean up and remediation technologies
Information management	-Generation, access and dissemination -Establishment of national information centers and network them

## 3.8 SYSTEMS AND CAPACITY FOR REPORTING POPs INFORMATION

### Summary

Reporting of POPs information is an important aspect because it can lead to application of precautionary principle particularly in areas, which are heavily contaminated, and those that have potential of being contaminated with POPs due to past and ongoing activities.

Article 15 of the Stockholm Convention requires Parties to report to the Conference of the Parties on the measures it has taken to implement the provisions of the Convention and on the effectiveness of such measures in meeting the objectives of the Convention.

Institutions involved in reporting include those involved in monitoring of POPs releases and those responsible for policy-oriented research, environmental pollution standards, chemicals management, training, research development and major owners of electrical equipment.

### 3.8.1 Introduction

The importance of reporting is to provide to the Secretariat statistical data on total quantities of production, import and export of each of the chemicals listed in Annex A and B of the Convention or a reasonable estimate of such data; and a list of the States from which it has imported each such substance; and the States to which it has exported each such substance.

Reporting of POPs information lies with the institutions involved in monitoring of POPs releases and those responsible for policy-oriented research, environmental pollution standards, chemicals management, training, research development and major owners of electrical equipment e.g. TANESCO and SFPC.

This section determines the current capacity of the country for reporting POPs information. It provides an overview of the Stockholm Convention on reporting obligations and national legislative framework, existing reporting system, and institutional capacity for future reporting requirements in Tanzania.

### 3.8.2 Institutional and Regulatory Framework

The Vice President's Office is the Focal Point for the Stockholm Convention and other related conventions, which Tanzania is a Party to; e.g. Rotterdam and Basel Conventions. However, there is lack of specific legal provisions for reporting POPs issues to the Focal Point of the Convention. There is also no regular inter-institutional reporting on POPs in the country due to weak inter-institutional linkages coupled with limited institutional capacity for information generation, storage, management and dissemination.

The Stockholm Convention reporting obligations are reflected as shown in the Table 3.23.

**Table 3.23:** Reporting obligations under the Stockholm Convention

Article	Specification
4	Registration of specific exemptions by means of a notification in writing to the Secretariat
5	Provide an action plan on evaluation of current and projected POPs releases, efficacy of the laws and policies, strategies, steps to promote education and training and a schedule for implementation of the action plan
6	Provide strategies for identifying stockpiles, products and articles in use and wastes consisting of, containing or contaminated with a chemical listed in

	Annex A, B or C.
7	Develop and transmit NIP to the COP within 2 years of the date on which the Convention enters into force.
8	Submit a proposal(s) to the Secretariat for listing a chemical in Annexes A, B and/or C.
15	Report to the COP on the measures taken to implement the provisions of the Convention and on the effectiveness of such measures in meeting the objectives of the Convention.

Some sectoral legislation provides for the monitoring of environmental quality. These include the Plant Protection Act (1997) and Plant Protection Regulations (1999), responsible for the control of the entire “life-cycle” of pesticides including POP Pesticides; Industrial and Consumer Chemicals (Management and Control) Act (2003) provide for the management and control of the production, import, transport, export, storage, and disposal of industrial and consumer chemicals in the country; The Water Quality (Utilization and Control) Act of 1974 and its amendments of 1982, 1997 and 2000, which provides for the monitoring of water quality, and liquid discharges; and Occupation Safety and Health Authority Act (2003) provides for safety and health at workplace.

### 3.8.3 Summary of Existing Reporting

At present, there is no regular inter-institutional reporting mechanism on POPs. However, for the purpose of the Convention, reporting mechanism has to be established.

### 3.8.4 Available Reporting Capacity for reporting on POPs

Reporting of appropriate information generation, storage, and management is very important in evaluating the success of implementation of the Stockholm Convention. However, in general, there is limited national capacity of reporting on POPs information and this may be due to lack of clear inter-institutional mechanism. Table 3.24 indicates a review of the available relevant reporting organizations in the country.

**Table 3.24:** Indicative available institutional reporting capacity

Institution	Facilities	Capacity for future reporting requirements*	Constraints
Vice President’s Office – Division of Environment (National Focal Point)	Internet, fax, telephone	Very limited	Lack of clear inter-institutional reporting mechanism; and reporting program; guidelines and standard for reporting; limited institutional capacity in terms of
Tropical Pesticides Research Institute (TPRI)	Internet, fax, telephone, register of pesticides	Inadequate	
Ministry of Transport and Communication	Internet, fax, telephone	Poor	
Ministry of Industry and Trade	Internet, fax, telephone	Poor	

Institution	Facilities	Capacity for future reporting requirements*	Constraints
Ministry of Agriculture and Food Security - Plant Health Services	Internet, fax, telephone	Inadequate	specialized skills; equipment and financial resources and low awareness of the general public
Ministry of Health	Internet, fax, telephone	Very limited	
National Environment management Council (NEMC)	Internet, fax, telephone, database of chemical waste	Very limited	
City and Municipal Councils	fax, telephone	Poor	
Government Chemist Laboratory Agency (GCLA)	Internet, fax, telephone	Inadequate	
Ministry of Industry and Trade	Internet, fax, telephone	Poor	
TANESCO	Internet, fax, telephone	Inadequate	
SFPC	Internet, fax, telephone	Inadequate	
OSHA	Internet, fax, telephone	Poor	

Criteria for reporting capacity: information generation, storage, dissemination and management

### 3.9 MONITORING OF RELEASES AND ENVIRONMENTAL AND HUMAN HEALTH IMPACTS

#### Summary

The inventory evaluates the current capacity of the country in monitoring of POPs. It provides an overview of the current priority POPs releases, monitoring standards, legal instruments and institutional capacity and experience in monitoring of POPs releases in Tanzania.

According to the inventory of POPs conducted in 2003, the priority pollutant releases are POP Pesticides, PCBs and PCDD and PCDF.

Some of the identified gaps in monitoring of POPs releases are lack of clear internal arrangement and reporting system in the country on POPs issues; lack of monitoring standards; limited capacity for monitoring of POP Pesticides within the existing institutions in the country. Few institutions, however, have a number of facilities and trained personnel that can facilitate some of the functions of monitoring of POPs.

There are few evidences on the effects of POP Pesticides to human and wildlife population in the country. However, recognizing that POPs have tendency to bioaccumulate in fatty tissues of living organisms, the following groups are considered to be most at risk from POPs: workers dealing with servicing of electrical equipment that are contaminated with PCBs and those containing PCB; people living around sites contaminated with POPs; communities in areas which POP Pesticides were used in the past; workers in shops (wholesalers and retailers) and in stores of POP Pesticides; general public who in one way or another consume contaminated products etc; children, women and the aged people; and workers in industries which use biomass as source of energy, pulp and paper, paints, disposal sites etc.

### **3.9.1 Introduction**

Article 11 of the Stockholm Convention specifies among others; that parties should encourage and/or undertake appropriate research, development, monitoring and cooperation pertaining to POPs and, where relevant to their alternatives and to candidate POPs.

The scope of monitoring of POPs chemicals includes the following: sources and releases of POPs into the environment; presence, levels and trends in humans and the environment; environmental transport, fate and transformation; effects on human health and the environment; as well as socio-economic and cultural impacts.

Monitoring needs to be continually undertaken in order to identify and track changes in ecological integrity and function. This will help to update existing information base and guide new monitoring activity, and make necessary changes to existing monitoring programmes.

Assessment of institutional and legal framework for the management of POPs was undertaken among others to determine the current capacity in monitoring of POPs releases and their impacts to the environment and human health. Specifically, the assessment focused on current priority POPs releases, monitoring standards, legal instruments and institutional capacity and experience in monitoring of POPs releases in Tanzania.

### **3.9.2 Declaration and Reporting of Priority Pollutant Releases**

Article 15 of the Convention requires Parties to report to the Conference of the Parties on the measures it has taken to implement the provisions of the Stockholm Convention and on the effectiveness of such measures in meeting the objectives of the Convention. Information to be reported include: statistical data on its total quantities of production, import and export of each of the chemicals listed in Annexes A and B or a reasonable estimate of such data as well as a list of the states from which it has imported each such substance and states to which it has exported to.

Tanzania as a Party to the Stockholm Convention is committed to undertake various interventions that are geared to minimize or prevent further releases of POPs. In a few cases some steps have already been taken that have resulted into significant reduction of releases of PCB and POP Pesticides. Currently there is no local production of electrical equipment, which use PCB oils. The ABB TANELEC Company based in Arusha that manufactures and services electrical equipment (transformers, capacitors, switch gears etc.) is producing non-PCB equipment. Of recent all POP Pesticides have been removed from the register of pesticides. The coordination and pesticides management has been strengthened. NPPAC has been constituted and has several sub-committees providing the necessary technical advice. One of the sub-committee is PARTS (Pesticides Approval and Registration Technical Sub-committee), which is responsible for advising on pesticides management and control, registration and approval of pesticides.

These obligations can be fulfilled effectively if there is regular monitoring of imports and exports. Effective monitoring system at national level will ease availability of data and information necessary for the implementation of the Convention obligation including: determination of the state of the environmental media and trends, determination of the effectiveness of measures undertaken to prevent further releases of POPs, determination of the extent of damage caused by POPs to human health and the environment.

According to the inventory of POPs in Tanzania the priority pollutant releases are grouped as follows:-

- a) **POP Pesticides:** Obsolete POP Pesticides stocks found included DDT (170 MT), Toxaphene (11.9), Dieldrin (2.0 MT), and Aldrin (3.5 MT) while the identified sites contaminated by POP Pesticides are Vikuge – Coast region, Korogwe – Tanga region, and Babati – Manyara region.
- b) **PCBs:** The main sources of PCBs are electrical transformers manufactured before 1986, oil circuit breakers and capacitors, switchgears and reactors. The sites observed to be heavily contaminated by PCBs and most of them being close to either water bodies and/or human settlements include TANESCO electrical workshop Ubungu, DAWASA Lower and Upper Ruvu Stations, Bukoba Sadelmi Store, Msamvu TANESCO sub station Morogoro, Kidatu Hydropower plant and switchyard, Mtera Hydropower plant, Mzakwe TANESCO sub station Dodoma, Zanzibar mtoni power substation, Zanzibar Weshu power plant, Nyumba ya Mungu power plant and Kikuletwa mini hydropower plant
- c) **PCDD and PCDF:** The mainly releases are from power generation plants, uncontrolled burning processes (e.g. dumpsites), waste incineration, mineral production, transport and ferrous and non-ferrous production. Potential sites contaminated by PCDD and PCDF include Tabata, Mtoni and Vingunguti dump sites in Dar-es-Salaam; Jumbi dump site in Zanzibar; Southern Paper Mills in Iringa; Tanzania Italian Petroleum Refinery (TIPER); Tanzania chemical Industries; Mwanza, Morogoro, Moshi and Lake Tanneries; and Kiltex and Sunguratex Textile industries

The government realises the need to take further efforts to prevent or minimize releases of POPs through adoption of BATs and BEPs. Such efforts cannot be realised without further support to strengthen capacities of institutions, which are dealing with monitoring, training and research on POPs. This calls for financial and technical support from the developed countries.

There is no clear internal arrangement and reporting system in the country on POPs issues.

### **3.9.3 Current Monitoring Standards and Capacity for Monitoring POPs Presence in the Environment**

#### **3.9.3.1 Monitoring Standards**

There are no monitoring standards. The problem is partly caused by lack of legal provision to demand monitoring be done. Monitoring standards are not covered in the existing law.

#### **3.9.3.2 Legal Requirement for Monitoring**

There exist several legislation that provide for environmental monitoring. These are Environment Management Act (2004); Plant Protection Act (1997) and Plant Protection Regulations (1999); National Environment Management Act (1983); Water Quality (utilization and control) Act of 1974 and its amendments of 1982, 1997 and 2000; Local Government Acts, No.7 and No. 8 of 1982 and its amendments; Occupation Safety and Health Authority Act (2003); Industrial and Consumer Chemicals (Management and Control) Act of 2003; and Sustainable Environmental Management Act (1996) of Zanzibar. However, due to weak enforcement, monitoring is not done.

#### **3.9.3.3 Institutional Capacity**

There is limited capacity for monitoring of POP Pesticides within the existing institutions in the country; but there is no capacity for monitoring of PCB, PCDD and PCDF. Institutions involved in monitoring of POPs releases are those responsible for policy-oriented research, environmental pollution standards and monitoring, chemicals management, training and research development and major owners of electrical equipment e.g. TANESCO and SFPC.

#### **3.9.3.4 Human Resource Base**

There is inadequate capacity to undertake regular monitoring of POPs releases in terms of expertise, finance and working tools. Technicians in these institutions require specialized training on POPs monitoring procedures and analysis, determination of extent of contamination, assessment of impacts, determination of effectiveness of the alternatives and establishment of national emission factors for PCDD and PCDF.

#### **3.9.3.5 Infrastructure**

There are few institutions however which have a number of facilities and trained personnel that can facilitate some of the functions of management of POPs, e.g. monitoring releases of PCB and undertaking analytical works. These are the Chief Government Chemist Laboratory Agency, Tropical Pesticides Research (TPRI), and the University of Dar Es Salaam. Some of the facilities might need to be updated to enable them to analyse trace values, e.g. in foods, soils, water, etc. Furthermore, training of staff

on specific management and control aspects of PCB might be of value. A list of available equipment for monitoring of POPs releases is shown in Table 3.20 pg 93.

### **3.9.3.6 Institutions**

The institutions involved in environmental management in the country can be categorized into crosscutting and sectoral mandates. Each of the categories assumes monitoring responsibilities at different coverage levels. Institutions with cross cutting mandates are VPO-DoE and NEMC. While institutions such as TPRI, GCLA, OSHA, TBS, THA, and Local Government Authorities have sectoral mandates in monitoring.

### **3.9.4(a) Background on Potential Sources of POPs Impacts**

The survey conducted in 2003 revealed the following potential sources of POPs:

- a) *POP Pesticides*: The main sources of POP Pesticides releases are agricultural crops from areas that may be highly contaminated and obsolete pesticides with POP characteristics. POP Pesticides have been used in the past up to 1990's although currently they are not registered for agricultural purposes. There exist substantial stockpiles of obsolete POP Pesticides. A total of 4 sites are possibly contaminated with POP Pesticides.
- b) *PCBs*: The main sources of PCB are electrical equipment (transformers, circuit breakers, capacitors and switchgears), which according to criteria used are suspected to contain PCB oil, confirmatory tests to establish concentration levels have not been performed. A total of 13 sites were identified to be heavily contaminated with oil suspected to contain PCBs, most of them being close to either water bodies and/or human settlements.
- c) *PCDD and PCDF*: These are mainly released from uncontrolled combustion process, hospital waste incineration and the household cooking and heating. A total of 7 sites are possibly contaminated with dioxins and furans.

The use of POPs chemicals and existence of sources of PCDD and PCDF implies that these substances may be present in soils, in ground water, wild animals, plants and humans. However their impact has not been determined.

### **3.9.4 (b) Evidence of Presence of POPs in the Environment, Food, Feed and Humans**

There are few evidences on the effects of POP Pesticides to human and wildlife population in the country. The existing evidence includes case studies, which were conducted in 1997 on the effects of organochlorines in birds and agro-ecosystem of maize. The studies showed low levels of residues of organochlorines in the range of 0.001-1.45 ng/g. Some preliminary studies conducted in 1995 in one of the areas with high agricultural activities included determination of the extent of dieldrin residue and its metabolites in the soil, which indicated a concentration of 0.3-0.9 ppb. In another study

undertaken in 2000 the levels of DDT in soil surrounding of one of the storage site of obsolete pesticides were very high showing concentrations of up to 282, 000mg/kg dry weight. However, capacity for regular monitoring of POPs is still inadequate.

### **3.9.5 Potential Risk Groups**

POPs have tendency to bioaccumulate in fatty tissues of living organisms. They also tend to bioconcentrate as you move up the food chain. It is well documented that women and children are mostly affected by POPs. Children get exposed to POPs directly or indirectly through their mothers. The effects of POPs to children include the interference with normal development.

Apparently, there are no detailed research and assessment undertaken to come up with the actual adverse effects of POPs. The most affected groups should be those people residing around the contaminated sites. The following groups are considered to be most at risk from POPs: -

- a) Workers of TANESCO, SFPC and industries dealing with servicing of electrical equipment that are contaminated with PCBs and those containing PCB;
- b) People around contaminated sites with transformer oils, POP Pesticides and Dioxins and Furans;
- c) Communities in areas which POP Pesticides were used in the past;
- d) Workers in shops (wholesalers and retailers) and in stores of POP Pesticides;
- e) The general public who in one way or another may consume contaminated products etc;
- f) Children, Women and the aged people; and
- g) Workers in industries, which use biomass as source of energy, pulp and paper, paints, disposal sites etc.

## **3.10 PUBLIC INFORMATION AND AWARENESS**

### **Summary**

The survey assessed the current national capacity to deal with issues of public information, education and awareness on POPs in accordance with Article 10 of the Stockholm Convention. This covered identification of mechanisms and tools available for the promotion of public information generation and dissemination and the educational and awareness programmes.

The survey revealed that there are several policy and legal instruments that promote public awareness and involvement in environmental protection issues. Several initiatives that demonstrated active public involvement were identified. These include Integrated Pest Management (IPM), Integrated Vector Management (IVM) and Integrated Pesticides and Pest Management (IPPM). Several information dissemination pathways exist that could be utilized for dissemination of POPs information. Some of these include print

media, radio; television; seminars/workshops/meetings; school curricula; and Environmental Clubs.

Some of the identified gaps include:- lack of database on POPs; weak information dissemination infrastructure; very limited awareness on POPs issue by key actors and the general public; lack of awareness programs specifically for POPs; inadequate capacity and experience to manage and monitor releases of POPs into the environment; lack of POPs management guidelines; and limited information on the available BATs/BEPs to minimize releases of POPs.

In view of the existing gaps, capacity building in information generation, storage, management and dissemination is very important for successful implementation of the Stockholm Convention.

### **3.10.1 Introduction**

The objective of the survey was to determine the current national capacity to deal with issues of public information, education and awareness on POPs, including determining mechanisms and tools available for the promotion of public information generation and dissemination and the educational and awareness programmes. The assessment was not limited to POPs aspects but covered environmental issues in general terms. Specific measures related to chemicals management were determined. However, in order to be able to establish actual capacity needs specific questions of the survey tools were devoted to addressing issues related to public information.

The existing information pathways were identified and assessed on basis of applicability and effectiveness. The assessment determined how the existing information pathways would be able to meet the requirements of the Stockholm Convention in particular those stipulated under Article 10.

The assessment found no available specific media for dissemination of POPs information. Hence general information dissemination pathways were examined to determine their effectiveness.

During the survey, stakeholders were asked to indicate the level of awareness or whether they are aware of POPs issue. Most showed lack of awareness on this matter. Consequently, Tanzania would need to build capacity in information generation and dissemination for the purpose of meeting her obligation under Article 10 of the Convention.

### **3.10.2 Overview of Public Information Policy/Practice Related to Environment**

The Government in collaboration with various stakeholders formulates relevant policies, legislation and guidelines to ensure public awareness and involvement in environmental protection issues.

The National Environmental Policy (1997) advocates for information dissemination, awareness and education as the basis for meaningful public participation to achieve sustainable environmental management. Paragraph 36 states that “The major responsibilities of government institutions and NGOs are to assist local communities become aware of their own situation and support them to become responsible for their own destiny. Local Communities will participate if they are persuaded that it is right and necessary to do so; when they have sufficient incentive, and the required knowledge and skills. Environmental education and awareness raising programmes shall be undertaken in order to promote informed opinion”

Some of the policy and legal instruments include National Environmental Policy (1997), National Environmental Policy for Zanzibar (1992), Plant Protection Act (1997), TPRI Act (1979), National Environment Management Act (1983), Sustainable Environment Management Act for Zanzibar (1996), Industrial and Consumer Chemicals (Management and Control) Act (2003), OSHA Act (2003) and other sectoral guidelines. With exception of the Environmental Management Act (2004) these instruments do not specifically address themselves to POPs, provisions on environmental awareness may be used for POPs, at least for the time being.

Other practices by Government and stakeholders in promoting environmental awareness and involvement include: provision of motivation schemes e.g. establishment of an annual Presidential Award, to best performing mining companies in environmental protection and issuance of environmental certificates to best performing municipality in Tanzania Mainland and companies for the case of Zanzibar.

### **3.10.3 Present Public Information Tools and Mechanisms**

Present public information tools and mechanisms that are in place include: publication materials such as brochures, newsletters, booklets, stickers, fliers, posters etc; radio programmes; television programmes; seminars/workshops/meetings; village/district environmental committees; commemoration of Local and International World Environment Day/ National Tree Planting Day/ Presidential Environmental Award e.g. Leadership and Excellence in Environmental Management in Mining; essay Competitions (especially for school children); school curricula; NGOs/ CBOs/Environmental Clubs; and drama/ songs/ traditional dances.

An environmental information centre has been established under the National Environment Management Council (NEMC), which provides services to various stakeholders in the country. More information centres need to be established. The plan is to establish 4 centres in Dar es Salaam and 3 in the regions. Research on POPs levels, effects and alternatives are important source of information to strengthen national information base for dissemination.

In Government budget and poverty alleviation initiatives, environment is considered a cross cutting issue which need to be integrated in sectoral initiatives. Hence issues of POPs need to be integrated in such initiatives.

A government website is in place under the Commission for Planning and Privatization which could be used to disseminate POPs information. In addition, the Vice President's Office plans to have a website which could serve for this purpose.

The EIA guidelines stipulates requirement for public review. One of the procedural requirements for EIA process is public participation. The public may comment on the adequacy of the Environmental Impact Statement (EIS) in terms of addressing their concerns and may raise questions that arise from information provided in the EIS. Normally the review involves putting up notices in newspapers, radio and public places on the intended projects. The public is given a reasonable time to react on the EIS. Their reactions are collected and are taken as inputs in making the final decision. For projects that have a strong public concern, a public hearing is conducted. This provides an extra opportunity for stakeholders to challenge a proposal with constructive exchange of information and ideas.

#### **3.10.4 Assessment of Environment as a Public Priority**

The protection of the environment is the responsibility of each and every Tanzanian, just as the quality of environment is a concern for each and all. It is widely recognized that interventions, which are likely to have positive impacts, are those, which enjoy the greatest support from grass roots.

The National Environmental Policy (1997) identifies the major responsibilities of government institutions and NGOs as to assist local communities become aware of their situation and support them to become responsible for their own destiny. It further recognizes that the fundamental prerequisite for achievement of sustainable development is broad public participation in decision-making particularly on environmental issues, which potentially affect the communities in which they live and work.

The Environmental Management Act (2004) provides for the right to the public to be timely informed and participate in decisions concerning the formulation of environmental policies, strategies, plans and programmes as well as in preparation of laws and regulations relating to the environment.

#### **3.10.5 Chemical Contaminant and Pollutant Release Public Information Programs**

At present there are no specific public information programmes for chemicals management. The existing public awareness programmes address environmental issues in general. With exception of the Industrial and Consumer Chemicals (Management and Control) Act, 2003 and the Environmental Management Act (2004) other relevant laws governing issues of POPs have little emphasis on public awareness. For example, Section 10 (h) states that one of the functions of the Chief Government Chemist, as the Registrar of chemicals is "to conduct public educational campaigns on the sound management of chemicals". Section 46 provides among others for immediate notification of the public and relevant authorities in cases of accidents and spills related to chemicals. In addition,

Section 48 (3) requires the GCLA to use some of its funds received to address issues of public awareness on safe handling of chemicals.

### **3.10.6 Relevant Case Studies of Public Involvement**

Examples of activities or programmes where the public were involved actively include:

- Integrated Pest Management (IPM) in Shinyanga region;
- Integrated Vector Management (IVM), Lushoto in Tanga region; and
- Integrated Pesticides and Pest Management (IPPM), Zanzibar.

Moreover, the EIA Guidelines provide for public involvement in project development through public hearing. Some examples of such projects in Tanzania include: Tulawaka Gold Project (2003) to develop a gold bearing ore with a total of approximately 500,000 ounces of gold in Biharamulo, Kagera; construction of Mtwara-Mbambabay Road (2003) entailing 850 km of all-weather road; development of mini-hydropower plant (2-3 MW) in Mufindi, Iringa along Luiga River (2002); and the mining of 300 tones per day of carbonatite in Iyunga and Iwambi (surface mines) in 2004. Experiences show that there has been a negative public response against initiatives to construct sanitary landfill in urban centers for fear of pollutant release to neighboring communities.

Also during development of environmental standards the public is given opportunity to comment on the content of the draft standards

### **3.10.7 Assessment of Existing Public Information and Awareness**

#### ***3.10.7.1 Capacity Gaps***

Several information dissemination pathways exist, however, the following gaps exist:

- (i) Lack of database on POPs;
- (ii) Weak information dissemination infrastructure;
- (iii) Very limited awareness on POPs issue by key actors and the general public;
- (iv) Lack of awareness programs specifically for POPs;
- (v) Inadequate capacity and experience to manage and monitor releases of POPs into the environment;
- (vi) Lack of POPs management guidelines; and
- (vii) Limited information on the available BATs/BEPs to minimize releases of POPs.

#### ***3.10.7.2 Examples of Public Information Products***

Since June 2002, four national stakeholders' workshops were organized. During these events the following public information products were realized:-

- (i) Minister's speeches;
- (ii) Briefings on project progress;
- (iii) Interviews by Media (radio, newspaper and TV);
- (iv) Newspaper articles; and

- (v) Spot radio announcements.

IPEN Arusha Declaration on the Elimination of POPs in Africa is another public information product. The Declaration was developed in July 2002 during the Skill share and Training Workshop on Ratifying and Implementing the Stockholm Convention in Africa, which was held in Arusha, Tanzania. The workshop was organised by the International POPs Elimination Network (IPEN) in collaboration with participating organisations. The Workshop was hosted by AGENDA for Environment and Responsible Development, an NGO that seeks to promote a culture of responsibility to the environment and for sustainable development among the general public of Tanzania. The workshop drew participants from eighteen (18) African countries.

The Government of Tanzania participated in the Sub-Regional Workshop on Implementation of the Stockholm Convention on POPs, which was held in Livingstone, Zambia from 25-27 November 2002. The workshop was organized by UNEP. During the workshop the following public information products were produced:

- (i) Statement by AGENDA representative;
- (ii) Brief report of the workshop.

The Government also participated in the Sub-regional Workshop on Chemicals Policy and Legislation with special reference to the reduction and elimination of Persistent Organic Pollutants that was held in Ghana from 24<sup>th</sup> to 28<sup>th</sup> September 2001 where a paper was presented regarding “Status of Chemicals Legislation in Tanzania with Reference to POPs”.

Furthermore a paper on “Tanzania Experience on Issues of Dioxins, Furans and PCBs” was presented during the Training Workshop for SADC Region on Dioxins, Furans and PCBs Inventories, which was held from 31<sup>st</sup> March to 4<sup>th</sup> April 2003, in Lusaka, Zambia.

### **3.10.7.3 Current Activities on Environmental Awareness**

Following are some of activities that have been undertaken in Tanzania on environmental information awareness.<sup>1</sup>

- (a) Newspapers
  - (i) Journalists Environmental Association of Tanzania (JET) does publish chemical management issues in most Tanzanian newspapers (Kiswahili and English). Feature articles, coverage of workshops/seminars/training, etc.; deliberations/recommendations in newspapers during sessions.
  - (ii) The Plant Health Services in the mainland publishes a newsletter (MKULIMA WA KISASA)
  - (iii) The Agricultural Research Commission of Zanzibar publishes monthly newsletter, the MKULIMA
  - (iv) Newsletters by TANESCO, NEMC, CPCT, and NGOs

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<sup>1</sup> National Profile for Assessment of the National Infrastructure for Managing Chemicals, 2002

- (b) Radio/TV programmes
- (i) JET has 15 minutes per week radio programme (JET na Mazingira) on environment and related issues. The programme is broadcasted by Radio Tanzania Dar es Salaam, which is heard in the whole country.
  - (ii) The Agricultural Research Commission of Zanzibar has 15-min radio programme weekly, “Kilimo Bora”.
  - (iii) The Department of Environment in Zanzibar has a Radio/TV programmes (MAZINGIRA YETU).
  - (iv) Mazingira Yangu Mazingira Yetu, a TV documentary on environmental issue produced by AGENDA.
  - (v) “Sayansi na Teknolojia” a TV documentary on science and technology produced by the Ministry of Science, Technology and Higher Education in collaboration with COSTECH.
  - (vi) ITV Programme called “Afya ya Jamii” which is broadcasted every Monday. It covers issues related to public health including environment and chemicals management issues.
  - (vii) Radio Tanzania Programme (Teknolojia) every Friday. Covers many issues including environment and chemicals management.
  - (viii) TANESCO radio programme “Sikilizeni Bwana Umeme”
  - (ix) SFPC radio programme “Huduma za Wateja”
- (c) Training programmes
- In TPRI - Pest Management Training is conducted for pesticide fumigators/pest controllers and retailers, 3 time a year addressing, legislation, safe use and handling of pesticides.
- (d) Exhibitions
- Trade Fairs e.g. Saba Saba and Nane Nane Farmers Day

### 3.10.8 Recommendations

Capacity building in information generation, storage, management and dissemination is very important for a successful implementation of the Stockholm Convention and the related chemical conventions and international processes such as SAICM. Therefore the following is recommended:-

- (a) Capacity building
  - (i) Improving information generation and disseminating infrastructure in key institutions;
  - (ii) Supporting regular review of POPs inventories; and
  - (iii) Establishment of expert networks and facilitation of information exchange activities at international, regional, sub-regional and national levels.
- (b) Database
  - (i) Establishment of a database on POPs and PIC; and

- (ii) Providing technical information for use as reference materials in government departments and agencies, academic and research institutions and NGOs.
- (c) Training
  - (i) Conducting training on database management;
  - (ii) Incorporation of POPs issues in school curricula; and
  - (iii) Conduct training on POPs and PIC issues to journalists, customs personnel, agriculture extension officers, NGO's and other key actors in awareness creation.
- (d) Awareness
  - (i) Establishing effective communication strategies for public information and awareness on POPs and other pollutants of concerns;
  - (ii) Improvement of existing information dissemination mechanisms.
  - (iii) Supporting development and dissemination of public information and awareness materials on POPs and other pollutants of concerns, in a common language; and
  - (iv) Supporting NGO's and professional associations dealing with awareness creation activities.

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## **4.0 STRATEGY AND ACTION PLAN ELEMENTS OF THE NATIONAL IMPLEMENTATION PLAN**

### **4.1 POLICY STATEMENT**

*Mindful* of the following key principles: -

- (i) Environment is the common heritage of present and future generations;
- (ii) Every person living in Tanzania shall have a stake and a duty to safeguard and enhance the environment and to inform the relevant authority of any activity and phenomenon that may affect the environment significantly;
- (iii) Adverse effects be prevented and minimised through long term integrated planning and coordination, integration and cooperation of efforts, which consider the entire environment as a whole entity; and
- (iv) The precautionary principle which requires that where there is risk of serious irreversible adverse effects occurring, a lack of scientific certainty should not prevent or impair the taking of precautionary measures to protect the environment.

Tanzania as a Party to the Stockholm Convention on Persistent Organic Pollutants and other related conventions such as the Rotterdam Convention on Prior Informed Consent Procedure on Certain Hazardous Chemicals and Pesticides in International Trade and the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal :-

- a) *Reiterates* its commitments to implement the Stockholm Convention and the related Conventions as well as international processes on chemicals management such as SAICM in order to safeguard the health of its people and the environment;
- b) *Commits* to undertake review of its policies and legislative framework relevant to the implementation of the Stockholm Convention and the related Conventions and international processes on chemicals management;
- c) *Takes full account* of the need to involve a wide range of stakeholders in the country for effective implementation of the Stockholm Convention and the related Conventions and international processes on chemicals management;
- d) *Determined* to reduce or eliminate releases of POPs and other pollutants as soon as practicable by implementing the NIP;

- e) *Determined* to achieve the milestones set in the National Implementation Plan including those agreed at national, subregional, regional and international levels on specific issues of POPs releases;
- f) *Aware* of the limited financial capacity of the country the NIP will be implemented according to the earmarked priorities;
- g) *Agrees* to cooperate with the international community in dealing with issues of POPs and other pollutants of concern in areas such as search for alternatives, monitoring releases of various pollutants, sharing of knowledge and experiences on issues of POPs and other toxic substances and wastes and information exchange on management of POPs and other toxic chemical substances;
- h) *Calls* for international assistance to bridge the financial gaps in order to accelerate implementation of desired actions.

Tanzania recognizes the international efforts and cooperation in protecting human health and the environment, and therefore is grateful to GEF for the financial support and to UNIDO and UNEP as implementing agencies for technical support throughout the development of NIP.

## **4.2 NIP IMPLEMENTATION STRATEGY**

This section gives a brief overview of POPs issue, NIP policy basis and implementation objectives, implementation principles, priorities and conditionality and milestones. It also addresses institutional/organisational arrangements and assignments of responsibilities, implementation approach and work plan summary and performance monitoring indicators/ implementation strategy review mechanisms.

### **4.2.1 Overview**

The environmental and health hazards caused by POPs are of worldwide concern. The initial list of POPs include Aldrin, Chlordane, DDT, Dieldrin, Endrin, Heptachlor, Hexachlorobenzene, Mirex, Toxaphene, Polychlorinated Biphenyls (PCBs), Polychlorinated Dibenzo – para – Dioxins (PCDD) and Polychlorinated dibenzo- Furans (PCDF). There is no documented evidence that Endrin and Mirex as insecticides and (HCB) as fungicides have ever been used in Tanzania. The hazards caused are due to their distinct properties, which include non-biodegradability, low solubility in water, high solubility in body fats causing bioaccumulation. Wildlife and human being at high level in the food chain are at higher risks due to biomagnifications tendency of POPs.

According to the preliminary results of the inventory of POPs conducted in 2003, Tanzania has several sources of POPs releases to the environment. The major sources of POPs include stockpiles of obsolete POP Pesticides and waste that were originally intended for plant protection and public health; oils used in electricity distribution

equipment and the contaminated equipment; and power generation and heating, uncontrolled combustion and waste incineration which releases PCDD and PCDF. Other sources of PCDD and PCDF are intended releases from industries that have closed business. Substantial amount of oil possibly containing PCBs (273 MT) is present in 418 electrical equipment both in use and not working. Some of the equipment are leaking. There are also 17.4 MT of obsolete POP Pesticides and 170.6 MT of DDT that are stored in various areas. These pose risks to human and environment through continuous leaks and spills. Thirty-four sites are possibly contaminated with PCBs. Four sites are likely to be contaminated with DDT, Aldrin and Toxaphene. Moreover, seven sites are potential sources of future releases of PCDD and PCDF.

There is limited institutional capacity for monitoring of POPs. The existing institutions are not specifically involved in POPs monitoring. They are established to deal with pesticides, research or environmental quality monitoring in general terms. These include several laboratory facilities with equipment for analysis of POPs. However these laboratories need upgrading. Other requirements include development of standards and monitoring protocols as well as specialized skills.

The assessment found no available specific media for dissemination of POPs information. Hence different existing pathways were assessed to determine their effectiveness in public information dissemination, education and awareness creation on POPs. Most of the stakeholders showed lack of awareness on POPs issue. Certainly, Tanzania would need to build capacity in information generation and dissemination for the purpose of meeting her obligation under Article 10 of the Convention. It is evident the success of these pathways will very much depend on the target audience. Multimedia pathways seem to be more effective as the majority of people might not be able to understand the complex scientific information of POPs available in literature.

In April 2004 Tanzania ratified the Stockholm Convention. In 2002 Tanzania was able to access financial support from GEF through UNIDO to assist in the development of National Implementation Plans (NIP) to meet her obligations under the Stockholm Convention on POPs. Due to the dangers of impacts of POPs to health and environment scientifically proved globally Tanzania reiterates its interest to address these problems in order to minimize further releases the current situation on POPs. The National Implementation Plan (NIP) defines Tanzania commitments to the Stockholm Convention. It elaborates a framework for action on a number of measures related to policy, regulatory institutions, development and technical interventions.

### **Policies**

The development of NIP is guided by the existing related national policies on environment, health, industry and agriculture. Moreover POPs are controlled by legislation on environmental management, pesticides, industrial and consumer chemicals and forestry. The existing sectoral policies include the National Environmental Policy (1997), Agriculture and Livestock Policy (1997), Health Policy (1990), Sustainable Industrial Development Policy (1996 - 2020) and Energy Policy (2002).

The National Environmental Policy (1997) focuses on preventing degradation of land, water, vegetation and air, which are crucial elements for life. The policy advocates for development and application of environmentally friendly pests control methods without specific reference to POPs. The policy underscores the need for promotion and application of environmentally friendly technologies such as recycling, reuse and safe waste disposal. In addition it emphasizes the importance of international cooperation to deal with transboundary environmental problems such as POPs.

With respect to the reduction and elimination of POPs the Health Policy (1990) is promoting research of safe alternatives to DDT for malaria vector control. DDT has not been used in disease vector control since 1960's. The alternatives being promoted include physical, chemical and biological control. The Sustainable Industrial Development Policy (1996 – 2020) promotes the reduction of toxic chemicals in form of discharges or emissions including POPs such as PCBs, PCDD and PCDF from industrial processes.

The National Energy Policy (2003) objectives are to ensure availability of reliable and affordable energy supplies and their use in a rational and sustainable manner in order to support national development goals. The policy therefore aims to establish an efficient energy production, procurement, transportation, distribution and end-use systems in an environmentally sound manner. The policy statements regarding environment, health and safety are: promoting environmental impact assessment as a requirement for all energy programmes and projects; promoting energy efficiency and conservation as a means towards cleaner production and pollution control; promoting development of alternative energy sources including renewable energies and wood fuel end-use efficient technologies to protect woodlands. Although there is no specific guidance provision on POPs in this policy, the above mentioned measures could result into decreased releases of PCDD and PCDF.

Cognizant of the importance of the Stockholm Convention the Government intends to review all relevant policies and laws in order to provide comprehensive guidance on minimization or elimination of POPs releases consistent with the requirements of this Convention.

#### **4.2.2 NIP Policy Basis and Implementation Objectives**

##### **Mandates for implementation of NIP**

The mandate for implementation of the NIP lies in the Vice President's Office, which at present is the Ministry responsible for environment in the country. The Vice President's Office through the Presidential instruments has oversight mandate on environmental matters in the country. VPO is responsible for environmental planning, coordination and monitoring, policy oriented research and monitoring the National Environmental Management Council activities. The National Environmental Policy (1997) is a framework policy that guides sectors on environmental management. It provides specific objectives at related sector for cross cutting issues. The Environmental Management Act (EMA), 2004 establishes environmental units in each sectoral Ministry and

environmental coordinator at local level. The Act provides functions of these units. Section 77 of EMA empowers the Minister to make regulations on POPs in consultation with relevant ministries including Ministry responsible for Health and Agriculture. Furthermore it empowers Director of Environment to prepare and oversee implementation of the National Implementation Plan for the Stockholm Convention. It further requires all sector ministries and local authorities to mainstream respective parts of the NIP into their policies, legislation, plans and programmes and submit annual reporting to VPO on the implementation progress.

### **The Government's Commitment in the POPs issue**

Tanzania is committed to implement the Stockholm Convention on Persistent Organic Pollutants in order to safeguard the health of its people and the environment. The implementation will involve among others the review of related policies and legislation and strengthening of institutional framework, coordination and the involvement of stakeholders. Moreover the government is committed to strengthen international cooperation to facilitate sharing of knowledge and experiences on POPs issues including the available feasible alternative technology, substitutes and other POPs mitigation approaches.

Since management of POPs involves a wide range of stakeholders the Government intends to establish a permanent mechanism to ensure coordinated implementation of NIP. A National Steering Committee under the Chairpersonship of the Permanent Secretary in the Vice President's Office shall be established.

The government's goal is to eliminate POPs as soon as practicable by implementing the NIP. However due to budget ceiling set by the Ministry of Finance, implementation of most of the earmarked activities will depend on availability of international assistance.

### **Objectives of the NIP Implementation Strategy**

The overall objective of the National Implementation strategy is to protect human health and the environment from impacts that are associated with the release of Persistent Organic Pollutants (POPs) through their reduction in use and eventual elimination.

The NIP is intended to achieve the following specific objectives:

- i) To demonstrate the commitment of the government to the objectives of the Stockholm Convention and to achieving compliance with the obligations assumed as a Party to it;
- ii) To present the information base and associated analysis supporting the development and implementation of effective Action Plans and Strategies to achieve reduction and elimination of POPs with associated improvement of environmental quality and human health;

- iii) To provide basis for monitoring the country's progress in addressing the POPs issue, and specifically the effectiveness of the actions it has committed to in reducing or eliminating POPs use and release to the environment;
- iv) To facilitate public awareness, education and participation in respect of the POPs issue and overall improvement in environmental and public health protection;
- v) To provide the operational and institutional framework for attraction of international assistance such as might be provided under the Stockholm Convention's permanent financial mechanism for actions on POPs; and
- vi) To promote synergies with other related Conventions and international processes on chemicals management.

In order to achieve these objectives, strategies to be employed include:-

- i) Develop and maintain database on POPs and their impacts;
- ii) Enhance understanding of POPs information at all levels;
- iii) Establish a register of stockpiles, wastes and contaminated sites;
- iv) Develop and implement public awareness creation and training programmes;
- v) Strengthen institutional capacity in relevant organizations in terms of human resources and working tools;
- vi) Strengthen involvement of NGOs, CBOs and independent sector in awareness activities on POPs and other toxic chemical pollutants;
- vii) Establish and maintain experts networking on POPs issues;
- viii) Establish and operationalize POPs monitoring schemes;
- ix) Promote regional and international cooperation and collaboration in relevant programmes;
- x) Review related policies, legislation and plans to mainstream POPs and PIC issues;
- xi) Establish sustainable funding mechanism for POPs activities and other related chemicals management programmes including economic incentive/disincentive packages;
- xii) Develop and implement management plans for POPs contaminated sites;
- xiii) Initiate studies on the development of local/regional emission factors for PCDD/PCDF;
- xiv) Strengthen research on alternatives to POPs and PIC chemicals; and
- xv) Promote transfer of feasible technologies for mitigation of releases of POPs and other toxic chemical pollutants.

### **4.2.3 Implementation Principles**

The following principles will be applied during implementation of the NIP:

- i) The public participation principle, which requires the involvement of the people in the development of plans and processes for the management of the environment;
- ii) Every person living in Tanzania shall have a stake and a duty to safeguard and enhance the environment and to inform the relevant authority of any activity and phenomenon that may affect the environment significantly;
- iii) The precautionary principle which requires that where there is risk of serious irreversible adverse effects occurring, a lack of scientific certainty should not prevent or impair the taking of precautionary measures to protect the environment;
- iv) The polluter pays principle, which requires that any person causing adverse effect on the environment shall be required to pay in full social and environmental costs of avoiding, mitigating, and or remedying those adverse effects;
- v) The right to clean and healthy environment shall include right for access by any citizen to the various public elements or segments of the environment for recreational, educational, health, spiritual and cultural purposes; and
- vi) Access to environmental information; which enables citizens to make informed personal choices and encourages improved performance by industry and government.

### **4.2.4 Priorities and Conditionality**

The following cross-cutting priorities have been identified which form strong basis for the Action Plans on specific controlled substances:-

Legal and institutional framework for management of POPs

- (i) Review of pollution control related policies and legislation for effective implementation of the Stockholm Convention and other related conventions and international processes on chemicals management;
- (ii) Strengthen institutional capacity of the government departments and other institutions involved in implementation of the Rotterdam and Stockholm Conventions and other related conventions and international processes on chemicals management;
- (iii) Strengthen enforcement of relevant legislation;
- (iv) Develop regulations on monitoring of POPs and other toxic chemical pollutants of concern;

- (v) Strengthen capacity of institutions responsible for coordination of monitoring of releases of POPs and other chemical pollutants of concern;
- (vi) Develop mechanisms to promote proper management of stockpiles of POP Pesticides and DDT, wastes and contaminated sites; and
- (vii) Establish coordination mechanism pertaining to PCDD/PCDF management.

#### Monitoring of POPs and other chemical pollutants of concern

- i) Develop monitoring systems on POP Pesticides and DDT and their impacts to human health and the environment;
- ii) Strengthen legislation enforcement mechanisms;
- iii) Establish monitoring standards and procedures/guidelines for POPs releases and procedure for assessment of impacts to human health and the environment; and
- iv) Establish schemes for monitoring, control and management of releases of POPs and other chemical pollutants as well as the contaminated sites

#### Technology for control of POPs releases

- i) Establish facilities for disposal of POPs wastes and contaminated equipment;
- ii) Establish clean up and remediation schemes of POPs contaminated sites and those which pose threat of further contamination;
- iii) Promote and encourage adoption of BATs and BEPs; and
- iv) Institute mechanism for PCDD/PCDF release control.

#### Public information, awareness and education

- i) Develop technical information on POPs and PIC chemicals for use as reference materials in government departments and agencies, academic and research institutions and NGOs;
- ii) Improve information dissemination infrastructure in key institutions;
- iii) Establish database on POPs; and
- iv) Develop programmes for raising awareness on POPs releases and their effects on human health and the environment.

Successful implementation of the NIP is subject to availability of financial and technical resources from both government budget allocations and external sources to support activities identified in the Action Plans. Moreover, strengthening of local skilled human resource base in POPs issues is important. The situation calls for further support from international community. It is assumed that there will be continuous political stability for the entire period of NIP implementation.

Tanzania being a SADC Member State is committed to phase out PCBs by 2010 as agreed in the sub region.

In addition, the country is implementing a Roll Back Malaria Programme, which intends to reintroduce DDT for malaria control in endemic areas for emergency situation In line with WHO Guidelines.

#### **4.2.5 Major Milestones**

The major milestones for NIP implementation include:-

- i) Submission of NIP to the Convention Secretariat by June 2006;
- ii) Strengthened POPs coordination on management of POPs and other chemical pollutants by 2009;
- iii) Increased use of substitutes and other alternative approaches to POP and PIC pesticides by 2012;
- iv) Safe disposal of POP pesticides and other pesticides waste operationalized by 2016;
- v) Improved PCB database by 2010;
- vi) Safe disposal of fluids and equipment containing or contaminated with PCBs operationalized by 2010;
- vii) Safe disposal of fluids and waste containing PCBs and equipment contaminated with PCBs by 2010;
- viii) Strengthened management and control of DDT by 2011;
- ix) Increased use of effective substitutes and other alternative approaches to DDT use in disease vector control by 2011;
- x) Safe disposal of DDT waste operationalized by 2016;
- xi) Established and strengthened Poison Centres by 2011;
- xii) Improved PCDD/PCDF database by 2012 involving development of national emission factors and periodic inventory modeling;
- xiii) Adopted BATs and BEPs in major sources of PCDD/PCDF by 2015;
- xiv) Established awareness creation programmes on management of contaminated sites by 2009;
- xv) Improved database of contaminated sites by 2011;
- xvi) Clean up and remediate sites contaminated by POPs operationalized by 2015;
- xvii) Enhanced capacity in information generation, storage, management, accessibility and dissemination by 2013;
- xviii) Established effective database on POPs by 2007;
- xix) Established and strengthened information centers by 2007;
- xx) Training, educational and awareness programmes on POPs operational by 2009;
- xxi) Improved research on effects of POPs and their alternatives by 2009;
- xxii) Strengthened monitoring capacity by 2012;
- xxiii) Enhanced inter-institutional reporting capacity by 2008;
- xxiv) Timely reporting according to the Convention obligations by 2007; and
- xxv) Updated NIP and its constituent Action Plans every 3 years commencing in 2009.

These milestones cover major actions geared to reduce or eliminate releases of POPs. Detailed actions are as contained in the Specific Action Plans provided in Chapter 4.

#### **4.2.6 Institutional/ Organizational Arrangements and Assignment of Responsibilities**

The implementation of the NIP will fully involve a wide range of stakeholders from government departments, academic and research institutions, public institutions, development partners, private sector and Non Governmental Organizations. The Vice President's Office will coordinate the overall implementation of the Action Plan. The implementation of specific activities under the Action Plan will be done under the coordination of the identified lead agency. A National Steering Committee composed of relevant stakeholders will be established to guide and monitor actual implementation of the Action Plans. The Committee will also regularly review implementation progress of the Action Plans. It will also be responsible for making policy decisions on matters that go beyond mandates of one institution or those, which attracts interests of many stakeholders. This body will therefore influence decision-making policies at sectoral level as well. A Technical Committee with members from relevant sectors/institutions will also be established in order to provide technical inputs and facilitate implementation of the Steering Committee decisions at various levels.

The Ministry responsible for Agriculture has the mandate on agricultural matters and therefore is responsible for management of POP Pesticides in the country. TPRI registers all pesticides and monitors importation and use. Collaborating institutions include NEMC, MoWLD, VPO, MALE - Zanzibar, UDSM, GCLA, professional associations and NGOs such as Crop Life – Tanzania, Envirocare and others. These will be involved in implementation of the NIP. Appropriate information dissemination mechanism need to be developed.

The Ministry responsible for Health will lead in management of DDT for public health purposes in collaboration with stakeholders involved in researches for alternative and dissemination of information and disposal of empty containers and other waste. Appropriate information dissemination mechanisms need to be developed. These institutions include NEMC, NIMR, NMCP, TPRI and VPO. The Ministry responsible for Health will collaborate with Ministry responsible for Agriculture in establishing registration procedures for DDT and monitoring DDT impacts.

The Ministry responsible for Energy will lead in PCBs management for the purpose of elimination of usage and facilitating disposal of PCBs waste. It will work in collaboration with institutions dealing with chemicals management including the Government Chemical Laboratory Agency, University of Dar es Salaam, NEMC, importers of transformer oils and the Focal Point of the Convention.

On matters of releases of PCDD and PCDF the VPO will lead. It will collaborate with all institutions that have responsibilities on these chemicals including those involved with

trade, forest management, industries and waste management. These include NEMC, MALE - Zanzibar, TBS, Ministry of Industry and Trade, MEM, TANESCO, SFPC, Private sector and NGOs including professional associations such as the Institution of Engineers, AGENDA and CPCT, institutions involved in education, research and development will play a key role in research on alternatives, training, monitoring levels of POPs and impacts.

NEMC will be leading on matters of clean up and remediation of contaminated sites, establishing disposal facilities for POPs wastes, monitoring impacts of POPs and information dissemination. NGOs will play a key role in awareness creation and dissemination of BATs and BEPs and alternatives of POPs.

#### **4.2.7 Implementation Approach and Work plan**

The NIP consists of short, medium and long term actions based on priorities of the country which include: strengthening legal and institutional framework for the management of POPs, establishing schemes for monitoring of POPs, promoting adoption of technologies that control release of POPs and promoting public information, awareness and education on POPs. Implementation of the NIP will involve many stakeholders hence multilateral approach will be adopted in implementation of the action plans. Implementation of specific activities will be lead by the lead agencies. To enable actors to effectively undertake NIP implementation, the following activities are critical:-

- i) Consultative meetings with key agencies on their roles and reporting requirements. Also exploring avenues for mobilization of resources through existing opportunities to mainstream NIP implementation in related plans, programmes and strategies.
- ii) Training and awareness programmes on various aspects of NIP.
- iii) Availing actors the necessary information in support of NIP implementation.
- iv) Availing actors the necessary working tools including regulations, guidelines, manuals and equipment.

The work plan for NIP implementation is provided in Tables 4.2 to 4.44 of this document. It is assumed that:-

- a) Sufficient resources would be secured internally or externally to facilitate implementation of action plans;
- b) Good governance would succeed in implementation of Action Plans in Tanzania at all levels.

#### **4.2.8 Performance Monitoring Indicators/Implementation Review Mechanisms**

It is a legal obligation to report on NIP implementation. Section 77 (4) of the Environmental Management Act 2004 requires sector ministries and local authorities to submit annual reports to the Focal Point on progress made in the implementation of the NIP. Depending on availability of financial resources a technical team of local or international experts will be involved to scrutinize the NIP implementation reports and provide recommendations for adoption by the Steering Committee.

The NIP implementation coordination office in collaboration with stakeholders will review and update Action Plan in every 3 years. The process for updating of Action Plan shall follow procedures indicated below:

- (i) Reviewing of progress reports of specific action plans;
- (ii) Collecting and reviewing stakeholders views through workshops, forums and targeted meetings, and project appraisals;
- (iii) Proposing alterations/changes on work plan;
- (iv) Reporting alterations/changes proposal to the Steering Committee for endorsement; and
- (v) Implementing changes.

The general performance monitoring indicators include:-

- (i) Number of activities implemented as scheduled in the action plans for the short term, medium term and long term;
- (ii) Number of reports submitted in accordance with the Convention obligations; and
- (iii) Specific performance monitoring indicators are provided for each activity in the respective action plans.

## **4.3 SUMMARY OF THE STRATEGIES AND ACTION PLANS: CLUSTERING OF COMMON ACTIVITIES**

### **4.3.1 Introduction**

The NIP consists of 10 different Action Plans addressing thematic issues that were developed in accordance with UNEP Guidelines on NIP Development (2002). The Action Plans cover aspects of Institutional and Regulatory Strengthening Measures, POP Pesticides, PCBs, DDT, PCDD/PCDF, Contaminated Sites, Information Exchange, Public Awareness, Monitoring and Reporting. The details of the specific Action Plans are provided in Section 4.4.

There is a possibility to combine ‘cross-cutting’ or rather common activities among the different Action Plans as a way of reducing the total cost and providing flexibility in funding possibilities for the implementation of the NIP. The possibilities refer to funding of individual Action Plans or clusters of common activities across different Action Plans such as training, awareness raising, information generation and dissemination and the review of policies and legislation. Hence the clustering of common activities provides an opportunity for the preparation of few comprehensive project proposals that can have greater impacts on a shorter period.

### **4.3.2 NIP Development Process**

The development of the NIP involved four phases, namely: establishment of coordination mechanism and process planning; establishment of POPs inventories and assessment of

national infrastructure capacity , priority assessment and objective setting, formulation of the NIP and its endorsement.

Phase I – planning and organization - involved appointment of the National Project Coordinator (NPC), procurement of office equipment, establishment of the National Coordinating Committee (NCC) and organization of an inception workshop in June 2002 to promote awareness and consensus building on the project workplan by key stakeholders. Members of the NCC were drawn from sectors of Environment, Health, Communication and Transport, Agriculture, Industry, Energy and the Local Government.

Phase II – inventory of POPs – involved identification and quantification of POPs releases from various sources , assessment of legal and institutional framework, assessment of management practices, monitoring capacity and experience, identification of contaminated sites and identification of public information, awareness and education tools and mechanisms. This resulted into country reports that were reviewed in a national consultative workshop held in September 2003. In 2004, another inventory of PCB and contaminated equipment through a SADC PCB Project supported by GEF through UNEP was undertaken in the whole country. The Environmental Council of Zambia coordinated the project. The results assisted to update the 2003 inventory findings of PCBs.

Phase III – priority assessment and objective setting - involved identification of priority areas as well as preliminary objectives and strategies (short, medium and long-term) for addressing gaps and deficiencies that were identified during inventories of POPs. Eight criteria were applied in the assessment of priority issues taking into account the POPs inventory findings and the requirements of the Stockholm Convention. These criteria include health impact, environmental impact, sustainability, monitoring of releases (Article 11), management of contaminated sites (Article 6), disposal facilities (Article 6), knowledge base (Article 10), and institutional cooperation and collaboration. Stakeholders in a National POPs Priority Validation Workshop organised in August 2003 reviewed the draft Country POPs Priority Assessment Report. Several technical meetings were organized in January 2004 to incorporate workshop comments and refine the report.

Phase IV – formulation of NIP and its endorsement – involved preparation of ToR and Service Contracts for NIP formulation, drafting of the NIP in accordance with UNEP Guidelines on NIP Development (2001) and training on Action Plan development provided by UNITAR which formed a forum for review of the draft NIP. The Draft NIP was also discussed in a National Consultative Meeting organized in March 2005 for a thorough review by stakeholders. The stakeholders endorsed the NIP. After the meeting two technical meetings were organized to incorporate comments from the consultative meeting, training session and UNITAR. As part of government approval process the National Coordinating Committee approved the NIP document in October 2005.

The NIP Development process involved local experts from government departments and agencies, academic and research institutions, NGOs and the private sector. The institutions from which the experts were sourced include Vice President's Office – Division of Environment; Ministry of Agriculture and Food Security; Ministry of

Industry and Trade; Tropical Pesticides Research Institute (TPRI); Government Chemist Laboratory Agency (GCLA); Ministry of Agriculture, Natural Resources, Environment and Cooperatives - Zanzibar; University of Dar es Salaam, University College of Lands and Architectural Studies; TANESCO; State Fuel and Power Corporation (SFPC)-Zanzibar and AGENDA .

This undertaking involved training of local experts in inventory of POPs and Action Plan development. The local experts and international experts facilitated the training. During NIP development, many stakeholders became aware of the Stockholm Convention and were sensitized to incorporate measures for the management of releases of POPs in the respective activities. Awareness creation was done through workshops and media programmes to government departments and agencies; hospitals; industries; business organizations; academic and research institutions; business associations which deal with agriculture, industry and commerce; other non-governmental organizations and the general public.

### **4.3.3 Common Activity Matrix**

the process of clustering common activities, was done by initially identifying common activities among the different Action Plans and grouping them. However, in order to have tangible scope and anticipated measurable impact, it was opted that a selected cluster of common activities should cover at least four Action Plans. The summary of the selected common activity clusters is presented in Table 4.1.

**Table 4.1:** Indicative clustering of common activities in different Action Plans

Common Activity	Action Plan	Specific Details	Unit Cost (US \$)	Sub-total (US \$)
1. Training	Institutional and Regulatory Strengthening Measures	<ul style="list-style-type: none"> <li>• Project management and enforcement of laws at central and local government levels</li> <li>• Training of 10 personnel abroad and conducting 3 training sessions of 30 people per annum in the country.</li> </ul>	5,000	1,379,000
	POP Pesticides	<ul style="list-style-type: none"> <li>• Risk assessment and risk management</li> </ul>	200,000	
	PCBs	<ul style="list-style-type: none"> <li>• PCB transport requirements</li> <li>• Develop and incorporate management of PCBs and contaminated sites modules into education curricula of TANESCO training college.</li> </ul>	30,000	
		<ul style="list-style-type: none"> <li>• PCB testing and laboratory analysis</li> </ul>	30,000	
			50,000	
			125,000	
	DDT	<ul style="list-style-type: none"> <li>• Identification of POPs characteristics, management of stockpiles and contaminated sites and proper storage</li> <li>• Carry out risk assessment and risk management</li> </ul>	30,000	
			30,000	
	PCDD/ PCDF	<ul style="list-style-type: none"> <li>• Assessment of training needs</li> <li>• Develop and implement training programmes involving relevant training institutions which meet performance criteria</li> <li>• Training of Trainers on reduction of PCDD/PCDF releases.</li> <li>• Conduct specialized training on BATs and BEPs to address major sources involving SMEs and other key actors.</li> </ul>	5,000	
			60,000	
		60,000		
		220,000		
Contaminated Sites	Monitoring of contaminated sites	42,000		
Information Exchange	POPs database development and management.	30,000		
Public	<ul style="list-style-type: none"> <li>• Training of primary and secondary schools' teachers and relevant</li> </ul>			

Common Activity	Action Plan	Specific Details	Unit Cost (US \$)	Sub-total (US \$)
	Information, Education and Awareness	education stakeholders on POPs issues <ul style="list-style-type: none"> <li>Developing training modules for academic and professional development programmes.</li> </ul>	100,000 500,000	
2. Reporting	Institutional and Regulatory Strengthening Measures	Preparation of NIP implementation report	24,000	388,500
	PCBs	Establishing reporting requirements to track movement of equipment containing PCBs .	10,000	
	PCDD/PCDF	<ul style="list-style-type: none"> <li>Preparation of implementation reports.</li> <li>Review of reporting procedures in line with convention requirements.</li> </ul>	20,000	
			5,000	
	Reporting	<ul style="list-style-type: none"> <li>Reporting needs assessment and development of reporting guidelines</li> <li>Preparing report on DDT and PCBs as per Convention requirements</li> <li>Review of relevant legislation to incorporate reporting obligations</li> <li>Establishing reporting requirements by support agencies</li> <li>Updating Focal Point website to incorporate POPs information</li> </ul>	10,000	
			20,000	
			60,000	
			20,000	
DDT	<ul style="list-style-type: none"> <li>Updating inventory information in terms of identity and quantity.</li> <li>Dissemination of Information.</li> </ul>	30,000		
		67,000		
PCDD/PCDF	Dissemination of Information.	62,500		
		60,000		

Common Activity	Action Plan	Specific Details	Unit Cost (US \$)	Sub-total (US \$)
3. Information Exchange	Information Exchange	<ul style="list-style-type: none"> <li>Operationalize Information Exchange mechanism.</li> </ul>	150,000	561,100
		<ul style="list-style-type: none"> <li>Upgrading Information Exchange system by putting down necessary infrastructure.</li> </ul>	10,000	
		<ul style="list-style-type: none"> <li>Designing Information Exchange packages at Departments of Environment.</li> </ul>	50,000	
		<ul style="list-style-type: none"> <li>Developing common procedure for information collection.</li> </ul>	30,000	
		<ul style="list-style-type: none"> <li>Maintaining update information databases.</li> </ul>	150,000	
	Public Awareness	<ul style="list-style-type: none"> <li>Establish/designate information centers and publicize (i.e regional libraries)</li> </ul>	100,000	
		<ul style="list-style-type: none"> <li>Arranging press conference once per year during commemoration of environment day</li> </ul>	500	
	Monitoring	Enhancing information access among R&D institutions and with information centers	600	
4. Development of technical and operational guidelines	POP Pesticides	<ul style="list-style-type: none"> <li>Promote use of alternatives to POP Pesticides</li> </ul>	10,000	
		<ul style="list-style-type: none"> <li>Risk assessment and risk management</li> </ul>	30,000	
		<ul style="list-style-type: none"> <li>Retail business performance and inspection procedures of POP Pesticides.</li> </ul>	30,000	
4. Development of technical and operational manuals (Contd...)	PCBs	<ul style="list-style-type: none"> <li>Management of PCBs and PCBs contaminated waste including storage requirements.</li> </ul>	20,000	
		<ul style="list-style-type: none"> <li>Transporting of PCBs and PCBs contaminated wastes.</li> </ul>	10,000	
		<ul style="list-style-type: none"> <li>Operation of PCBs treatment and disposal facilities.</li> </ul>	15,000	

Common Activity	Action Plan	Specific Details	Unit Cost (US \$)	Sub-total (US \$)
	DDT	• Inspection guidelines and procedures.	470,000	823,000
		• Risk assessment and risk management.	30,000	
		• DDT handling, storage and disposal.	30,000	
		• Use of alternatives to DDT.	10,000	
	PCDD/PCDF	• Control PCDD/PCDF releases.	100,000	
	• Information requirements to be provided by industries, facilities producing PCDD/PCDF to poison centers and from poison centers to other relevant authorities.	15,000		
	Contaminated Sites	Monitoring guidelines on sampling analysis and reporting.	18,000	
	Monitoring	Develop standards, procedures/Guidelines for sampling and analysis of POPs.	35,000	
5. Risk assessment	POP Pesticides	• Impacts of POP Pesticides and alternatives	500,000	3,365,000
		• Efficacy of alternatives to POP Pesticides	500,000	
		• Conduct risk assessment of substitutes to POP Pesticides	15,000	
	PCBs	• Conduct risk assessment for sites contaminated with PCBs	500,000	
		• Promote risk management involving identification of appropriate land use plans and delivery of alternative public services.	50,000	
	DDT	• Conduct risk assessment and risk management of DDT to human and environment	200,000	
		• Conduct risk assessment of alternatives to DDT.	600,000	
Contaminated Sites.	Undertake risk assessment to human and biota ecosystem of contaminated sites.	1,000,000		

Common Activity	Action Plan	Specific Details	Unit Cost (US \$)	Sub-total (US \$)
6. Awareness raising	Institutional and Regulatory Strengthening	• Stockholm Convention and NIP implementation	60,000	625,000
		• Disseminate popular version of policies, laws and Stockholm Convention	120,000	
	POP Pesticides	Promote awareness on use of alternatives in 10 regions annually.	150,000	
	PCBs	• Revise awareness programmes to include management of PCBs and contaminated sites.	30,000	
		• Undertake awareness raising activities on PCBs.	75,000	
	DDT	Promote safe use of DDT	60,000	
	PCDD/PCDF	Awareness on PCDD/PCDF mitigation measures.	60,000	
	Contaminated Sites	Develop and update existing awareness programmes.	30,000	
Information exchange	Establish network among awareness raising organizations.	15,000		
Public Awareness	Revise and develop public awareness programmes.	25,000		
7. Updating inventories	POP Pesticides	POP Pesticides wastes and contaminated materials (after ASP implementation)	70,000	307,500
	PCBs	• Equipment containing PCBs and PCB contaminated sites	20,000	
		• PCBs in Unsurveyed areas	50,000	
	DDT	DDT waste and contaminated materials (after ASP implementation)	67,500	
PCDD/PCDF	PCDD/PCDF releases	100,000		
8. Dissemination of Information	Institutional and Regional Strengthening.	New Development on POPs and COP decision.	20,000	1,280,000
		Popular versions of policies, law and Stockholm Convention.	120,000	
	POP Pesticides.	• Popular version of relevant laws.	15,000	

Common Activity	Action Plan	Specific Details	Unit Cost (US \$)	Sub-total (US \$)	
		<ul style="list-style-type: none"> <li>IPM &amp; IVM packages</li> </ul>	1,000,000		
	PCBs	Feasible options on disposal and remediation technologies.	20,000		
	DDT	<ul style="list-style-type: none"> <li>Popular version of relevant Laws.</li> <li>Impacts of DDT releases</li> </ul>	15,000 150,000		
	PCDD/PCDF	Best available techniques and best environment practices.	60,000		
	Public Awareness	Dissemination of research findings.	20,000		
9. Establishing or strengthening databases	PCBs	Establish and maintain a chemical hazard information database that is accessible by occupational health centres and emergency responders	10,000	1,105,000	
	PCDD/PCDF	<ul style="list-style-type: none"> <li>Establish and maintain a chemical hazard information database that is accessible by poison centres, emergency responders and other stakeholders</li> <li>Update and maintain information databases at relevant government departments</li> </ul>	30,000		
	Information Exchange		<ul style="list-style-type: none"> <li>Develop and maintain update information databases</li> </ul>		150,000
			<ul style="list-style-type: none"> <li>Support development and maintaining of reliable information databases at relevant sources</li> </ul>		800,000
	Monitoring		<ul style="list-style-type: none"> <li>Establishment of specific monitoring database at 13 relevant institutions</li> </ul>		45,000
			<ul style="list-style-type: none"> <li>Maintain database of research findings at relevant institutions</li> </ul>		20,000
Reporting		Establish database for POPs	50,000		
10. Capacity needs assessment	Institutional and Regulatory Strengthening	Institutional capacity on POPs management	5,000	60,000	

Common Activity	Action Plan	Specific Details	Unit Cost (US \$)	Sub-total (US \$)
	PCDD/PCDF	<ul style="list-style-type: none"> <li>Compliance and enforcement requirements</li> </ul>	10,000	
		<ul style="list-style-type: none"> <li>Training needs assessment</li> </ul>	5,000	
	PCBs	<ul style="list-style-type: none"> <li>Institutional capacity needs assessment</li> </ul>	5,000	
	Monitoring	<ul style="list-style-type: none"> <li>Monitoring of POPs in terms of levels as well as tracking movement of POPs products</li> </ul>	10,000	
	Reporting	Establishment of reporting mechanism	25,000	
11. Strengthening coordination	Institutional and Regulatory Strengthening Measures	<ul style="list-style-type: none"> <li>Meetings of the National Steering Committee and National Technical Committee for implementation of NIP</li> </ul>	20,000	345,000
		<ul style="list-style-type: none"> <li>Strengthening of National Coordination Units for POPs which deal with PCBs, POP Pesticides, DDT, PCDD and PCDF and POPs contaminated sites</li> </ul>	70,000	
	PCDD/PCDF	<ul style="list-style-type: none"> <li>Organisation of meetings of the National POPs Steering Committee and National Technical Committee</li> </ul>	70,000	
	Contaminated Sites	<ul style="list-style-type: none"> <li>Hold annual expert forums</li> </ul>	60,000	
	Information Exchange	<ul style="list-style-type: none"> <li>Strengthening of Information Exchange Office</li> </ul>	2,000	
		<ul style="list-style-type: none"> <li>Facilitating meetings of POPs Desk Officers from the relevant institutions</li> </ul>	14,000	
	Public awareness	<ul style="list-style-type: none"> <li>Organise expert group meetings (research and monitoring)</li> </ul>	84,000	
Reporting	Establish collaboration mechanism	25,000		

<b>Common Activity</b>	<b>Action Plan</b>	<b>Specific Details</b>	<b>Unit Cost (US \$)</b>	<b>Sub-total (US \$)</b>
12. Promote use of alternatives to POPs	PCBs	<ul style="list-style-type: none"> <li>Develop and implement investment programme to replace PCBs containing oils and equipment</li> </ul>	5,000,000*	10,510,000
	POP Pesticides	<ul style="list-style-type: none"> <li>Take measures to determine acceptability and socio-economic perceivness of alternatives to POP Pesticides</li> </ul>	200,000	
		<ul style="list-style-type: none"> <li>Prepare guidelines on use of alternatives to POP Pesticides</li> </ul>	10,000	
	DDT	<ul style="list-style-type: none"> <li>Initiate development of alternatives to DDT</li> </ul>	1,500,000	
		<ul style="list-style-type: none"> <li>Measure the acceptability and socio-economic perceivness of alternatives to DDT</li> <li>Prepare guidelines on use of alternatives to DDT</li> </ul>	200,000 10,000	
PCDD/PCDF	<ul style="list-style-type: none"> <li>Investment programme in BATs and BEPs</li> <li>Develop mechanism for transfer of BATs and BEPs</li> </ul>	2,000,000* 30,000		
13. Monitoring	POP Pesticides	<ul style="list-style-type: none"> <li>Assess efficacy of POP Pesticides and their alternatives</li> </ul>	500,000	1,885,000
	PCBs	<ul style="list-style-type: none"> <li>Provide facilities for PCBs monitoring and human health surveillance</li> </ul>	150,000	
		<ul style="list-style-type: none"> <li>Maintain an updated register of contaminated sites</li> </ul>	100,000	
	DDT	<ul style="list-style-type: none"> <li>Establish DDT monitoring schemes</li> </ul>	120,000	
	PCDD/PCDF	<ul style="list-style-type: none"> <li>Develop and implement compliance monitoring and enforcement of legislation</li> </ul>	60,000	
	Monitoring	Upgrading and accreditation of laboratories for monitoring of POPs	1,000,000	
Contaminated Sites	<ul style="list-style-type: none"> <li>Undertake needs assessment for monitoring of POPs in terms of levels as well as tracking movement of POPs products</li> </ul>	10,000		
	<ul style="list-style-type: none"> <li>Prepare and implement capacity building programme for monitoring of POPs products, levels and impacts</li> </ul>	45,000		

\*Actual financial resources required will depend on feasibility study

### **4.3.4 Funding**

It is anticipated that funding of the NIP will not only include external assistance but also government contribution in terms of budgetary allocations and in-kind contribution. In addition, where relevant and appropriate, targeted private industry will be mobilized to contribute incremental costs of the particular project.

## **4.4 DETAILED STRATEGIES AND ACTION PLAN ON INSTITUTIONAL AND REGULATORY STRENGTHENING MEASURES**

### **4.4.1 Background**

In 1940s the agricultural revolution led to research and selection for high yielding varieties and intensification of monoculture cropping systems. The high yielding varieties were extremely susceptible to pests. Monoculture cropping system coupled with the susceptible varieties to pests, developed high pest pressure that necessitated use of different chemicals (pesticides) for control to increase production and productivity. Continued pesticides use led to pests' resistance that led to the evolution of toxic and persistent pesticides like DDT, Aldrin, and Dieldrin, which were found to be cheap and highly effective. However, with technological advancement, many of these pesticides have been proven to be hazardous to man and the environment at large due to their high toxicity, bioaccumulation and magnification along the food chain and the environment. They travel long distance (thousands of Kilometers) from where they were used; they are not biodegradable and hence known as "Persistent Organic Pollutants (POPs)". These include DDT, Aldrin, Dieldrin, Chlordane, Heptachlor, Toxaphene, Hexachlorobenzene, Endrin, and Mirex.

Industrial development has added to the list of POPs through use of Polychlorinated Biphenyls (PCBs) for electric transformers and emissions that give PCDD and PCDF thus making a total of twelve known as the dirty dozen. The challenge is how to phase out these POPs and find suitable alternatives to be used for the same purpose.

It is well known that POPs are highly toxic substances causing an array of adverse effects, notably death, diseases, and birth defect among humans and animals. In this regard, Tanzania ratified the Stockholm Convention on POPs in April 2004. Tanzania is also a Party to a number of global and regional environmental treaties that are linked to POPs, such as the Basel Convention on the Transboundary Movement of Hazardous Wastes, the Bamako Convention on the Ban of import into Africa and the control of Transboundary Movement and Management of Hazardous Wastes within Africa, the Rotterdam Convention on Prior Informed Consent Procedures for Certain Hazardous Wastes and Pesticides in International Trade, Vienna Convention for the Protection of the ozone layer and the Montreal Protocol on substances that deplete the ozone layer.

## **4.4.2 Present National Institutional, Policy and Regulatory Framework**

Various sectoral policies and laws control use of pesticides and other toxic substances in Tanzania. Among the existing sectoral policies that are responsible for chemicals management include National Environmental Policy, Agriculture and Livestock Policy, Health Policy, Sustainable Industrial Development Policy and Energy Policy. Besides these policies there are also sectoral laws, regulations and guidelines that safeguard the management of chemicals in the country. These include Plant Protection Act of 1997, Tropical Pesticides Research Institute Act of 1979, Pesticides Control Regulations of 1984, the Industrial and Consumer Chemicals (Management and Control) Act of 2003 and the Environmental Management Act of 2004.

### **4.4.2.1 Existing Policies Related to POPs Management**

#### **a) Agricultural and Livestock Policy (1997)**

The Agricultural and Livestock Policy of 1997 recognizes the importance of environmental resources in agriculture development. The environmental policy is considered crucial in providing guidance for proper and balance use of natural resources and in defining sectoral responsibilities for sustainable development. Agricultural policy promotes application of Integrated Pest Management (IPM) through plant protection and agricultural extension services and agrochemicals registration and monitoring. Due to limited awareness on POPs issues at the time of policy development there is no specific consideration of POP Pesticides including elimination of their releases. Tanzania embarked on IPM programme since 1992. This has resulted in reduced use of pesticides.

#### **b) National Environmental Policy (1997)**

The National Environmental Policy of December 1997 provides a framework for environmental management issues for various sectors in order to achieve sustainable development. The Policy objectives include: to ensure sustainability, security, and equitable use of resources to meet the basic needs of the present and future generation, without degrading the environment or risking health or safety. It also focuses on preventing degradation of land, water, vegetation and air, which are crucial elements for life. The policy advocates for development and application of environmentally friendly pests control methods but there is no specific reference to POPs. The policy underscores the need for promotion and application of environmentally friendly technologies such as recycling, reuse and safe waste disposal. The environmental policy emphasizes the importance of international cooperation with regard to environmental transboundary issues.

#### **c) The Sustainable Industrial Development Policy (1996-2020)**

The Sustainable Industrial Development Policy (SIDP) gives a framework of broad guidelines on factors, which influence the direction of the country's industrialization process for a period of 25 years. The national goals, towards which the industrial sector will be geared, include human development and creation of employment opportunities,

economic transformation for achieving sustainable growth, external balance of payments, environmental sustainability and equitable development.

The policy promotes application of cleaner production technologies for the purpose of reduction and eventual elimination and/or discharges/emissions of toxic chemicals from industrial processes.

**d) National Energy Policy (2003)**

The National Energy Policy of 2003 objectives are to ensure availability of reliable and affordable energy supplies and their use in a rational and sustainable manner in order to support national development goals. The policy therefore aims to establish an efficient energy production, procurement, transportation, distribution and end-use systems in an environmentally sound manner. These measures can result into decreased releases of PCDD and PCDF. More measures are required to restrict importation and use of PCBs transformer oils promote proper management of PCBs and contaminated equipment and encourage reduction of PCDD/PCDF releases from power plants.

**e) Health Policy (1991)**

The main objective of this policy is to protect public health, curing diseases and promote human well-being and informed participation in primary environmental care. With respect to the reduction and elimination of POPs the policy is promoting research of safe alternatives of DDT for malaria vector control.

**4.4.2 Existing Legislation Related to POPs Management**

**a) The Plant Protection Act (1997)**

The old Plant Protection Legislation (Plant Protection Ordinance Cap. 133 of 1937, the Locust Ordinance Cap. 136 of 1949, The Tropical pesticides Research Institute Act of 1979 and Pesticides control Regulations of 1984) concentrated on the pest problems while health and environmental issues were not given equal weight. They controlled use of pesticides in the country. Pesticides registered for use included a number of POP Pesticides.

In 1997 the Plant Protection laws were merged into one principle legislation known as the Plant Protection Act of 1997. The law recognizes the health and environmental implications of improper management of pesticides as well as hazards of toxic pesticides. Sections 16(k) and 42(gg) of the Act provide for Prior Informed Consent (PIC) procedure on importation, exportation and use of plant protection substances according to the F AO code of Conduct on the Distribution and Use of Pesticides. There are plans to incorporate PIC and POPs provisions under the Plant Protection Regulations of 1999. In addition PPA is under review, among others to incorporate obligations under the Rotterdam and Stockholm Conventions.

Although there is no specific legislation for POPs in national legislation, Tanzania recognizes the problems associated with POPs and has started to take measures, which will result into reduction and eventually elimination of POP Pesticides. Pesticides with

characteristics of persistence are no longer imported for use in agriculture. For example up to 1999 the number of registered POP Pesticides went down to only three (Aldrin, Heptachlor, and Chlordane). To date (2005) there are no POP Pesticides registered.

DDT has been banned for use in agriculture since 1997 and currently is not in the list of registered pesticides in the country. However Tanzania intends to reintroduce DDT for restricted use in public health particularly for malaria vector controls if and when need be. Legal provisions to effect this would have to be incorporated in the relevant legislation.

Enforcers of the Plant Protection Act 1997 have all been gazetted and have been trained to perform their duties effectively and efficiently. POP Pesticides are among critical issues being addressed to ensure that they do not find their way into the country without following proper procedures.

#### **b) Industrial and Consumer Chemicals (Management and Control) Act (2003)**

The Industrial and Consumer Chemicals Act of 2003 provides for the management and control of the production, import, transport, export, storage, dealing and disposal of industrial and consumer chemicals in the country. The provisions include articles on registration, restrictions, prohibition and inspection. Articles included in the provisions for management of industrial and consumer chemicals are safe handling, chemical wastes, accidents, management of spills and contaminated sites and decommissioning of plants.

The Act establishes the Chemicals Management and Control Board, which is responsible for the management and control of all industrial and consumer chemicals in Tanzania. The Act under Chapter 30 (1-e), states that “Any chemical that is subject to action according to an international convention or treaty ratified in the United Republic, the board shall restrict, severely restrict, ban or phase out the use and handling of chemicals specified under the 8<sup>th</sup> schedule of the Act. PCBs have been included in the list of severely restricted/banned/eliminated chemicals in schedule 8 of the Act. The Act also covers DDT as a consumer chemical although it does not limit DDT use to public health

#### **c) Environmental Management Act (2004)**

The Act provides for legal and institutional framework for sustainable management of environment; principles for management, impact and risk assessments, prevention and control of pollution, waste management, environmental quality standards, public participation, compliance and enforcement; and basis for implementation of international instruments on environment. Also provides for mechanism for implementation of the National Environmental Policy; it repeals the National Environmental Management Act, 1983 and provides for continued existence of the National Environment Management Council; and the establishment of the National Environmental Fund.

Section 77 of the Act deals with the issues of POPs in detail. It has included the provisions of the Stockholm Convention on Persistent Organic Pollutants regarding

obligations of Parties in eliminating releases of POPs. It also provides for the implementation of the NIP by sectors and annual reporting on progress. The act gives powers to the Minister to make regulations regarding management of POPs releases.

#### ***4.4.2.3 Regulatory Control Measures Applicable to Hazardous Wastes***

Several policies and legislation are in place to address issues of pollution caused by both liquid and solid wastes. These policies include: The National Environmental Policy (1997), Water Policy (1991) and its amendments of 2002, Health Policy (1991) currently under review and Human Settlement Policy (2000). Key legislation includes the Public Health Ordinance (1954), Water Utilization (Control and Regulations) Act of 1974 and its amendment of 1981, 1988 and 2000, Plant Protection Act (1997) and its Regulation, Industrial and Consumer Chemicals (Management and Control) Act of 2003 and Local Government (District and Urban Authorities) Acts, No.7 and 8 of 1982.

Several efforts are on going on matters of waste management, these include: training in cleaner production concept and practices of industrialists that started way back in 1994; carrying out of the sustainable cities programme in five municipalities; out sourcing of solid waste collection in Dar es Salaam City, establishment of water and waste water authorities in certain urban centres, introducing cost sharing in waste management in Dar es Salaam, researches on waste treatment and disposal technologies and promotion of community based environmental sanitation projects.

The common disposal method currently used in the country is crude dumping at selected disposal sites. In this way some hazardous wastes find their way to these disposal sites. In most cases segregation of various categories of hazardous waste is not done because there are neither legal requirements nor standard procedures applicable for managing hazardous wastes. But even if there were, enforcement capacity is weak i.e personnel require specialized skills, working tools are not adequate and infrastructure for sound management of waste is lacking. Attracting investments in proper waste management schemes is a challenge.

#### ***4.4.2.4 Regulatory Control Measures Applicable to Contaminated Sites***

Plant Protection Regulations (1999) provides for management and immediate clean up of sites contaminated with pesticides. The Industrial and Consumer Chemicals (Management and Control) Act 2003 also has a provision for management and immediate clean up of sites contaminated with pesticides and industrial spills respectively. Additionally, the Acts require development of contingency plans and demand Environmental Impact Assessment (EIA) and dynamic risk assessment. Enforcement of PPR is weak. The Industrial and Consumer chemicals Act being new is yet to be operationalized. These Acts lack provisions for registration of contaminated sites and monitoring of POP releases from contaminated sites. There are no guidelines to facilitate clean-up and remediation of contaminated sites. The Environmental Management Act (2004) empowers the Minister to promulgate regulations, among others, on

compensations; clean-ups and emergency responses to hazardous substances released into the environment and clean up of inactive hazardous waste disposal sites (Section 77(5)).

### 4.4.3 Action Plan Implementation Strategy and Process

**Table 4.2:** Actions to strengthen coordination and cooperation mechanism amongst different institutions involved in management of POPs

Action	Expected Output	Indicators	Time Frame	Resources	Responsibility	Comments/Constraints
<b>Coordination Objective : Establish coordination amongst different institutions involved in POPs management by 2009</b>						
Establish and maintain National Steering Committee and National Technical Committee for implementation of NIP	Coordination and cooperation mechanisms amongst institutions strengthened	Formal appointment of committee members	2006-2009	20,000*	Depts of Env, NEMC, GCLA UDSM TPRI Sector Ministries NGOs/CBOs Private Sector	<ul style="list-style-type: none"> <li>• Seek budgetary allocation to service committee functioning</li> <li>• Local and External funding</li> </ul>
Strengthen the National Coordination Unit to coordinate NIP implementation by providing working tools and necessary training		National coordination unit in place	2006-2009	140,000*		
Prepare NIP implementation reports		Reports	2006-2009			
Disseminate new developments on POPs and COP decisions		Reports	2006-2009			

Action	Expected Output	Indicators	Time Frame	Resources	Responsibility	Comments/Constraints
Develop national positions on implementation of the Stockholm Convention and projections of such decisions at international, regional and sub-regional levels	National Position Statement	Reports	2006-2009	18,000	Dept of Env, National Steering Committee	<ul style="list-style-type: none"> <li>The relevant government departments, NGOs and the private sector need to participate in the development of positions on POPs issues.</li> <li>Local funding and External funding</li> </ul>
Participation of 5 representatives of key actors in related international and regional meetings each year	Exchange of experience	Number of persons attended relevant international and regional meetings	2006-2009	50,000	Depts of Env, NEMC and Sector Ministries	Local and External funding

**Table 4.3:** Actions to strengthen policies and legislation in relation to POPs management

Action	Expected Output	Indicators	Time Frame	Resources	Responsibility	Comments/Constraints
<b>Policy and Legislative Objective : Strengthen policies and legislation in relation to POPs management by 2010</b>						
Review 10 relevant policies and 10 pieces of legislation	Improved policies and legislation	Policies and Laws reviewed	2007-2009	600,000	NEMC, Depts of Env., GCLA, UDSM, TPRI, sector ministries, NGOs/CBOs, private sector	Local and External funding

Action	Expected Output	Indicators	Time Frame	Resources	Responsibility	Comments/Constraints
Create awareness of Parliamentarians and senior government officials on Stockholm Convention obligations and NIP implementation through targeted workshops, seminars, information packages and site visits	Enhanced understanding of the Convention and government efforts	Seminar reports	2007-2009	60,000	VPO, Sector Ministries	Local and External funding
Develop popular versions of policies, laws and the Stockholm Convention for dissemination to create public awareness		Popular versions of policies, laws and the Convention in place	2008-2010	120,000	VPO, MALE Sector Ministries, NGOs/CBOs private sector	Local and External funding
Regularly review National Profile on Chemicals	Improved chemicals management	Updated National Profile	2006-2008	45,000	MoH, POPs Technical Committee	Local and External funding

**Table 4.4:** Actions to enhance POPs management

Action	Expected Output	Indicators	Time Frame	Resources	Responsibility	Comments/Constraints
<b>Institutional Capacity Objective: Strengthen institutional capacity in POPs management by 2012</b>						
Undertake capacity needs assessment of relevant institutions	Enhanced institutional capacity	Needs assessment reports	2007	5,000	Dept of Envs NEMC, GCLA UDSM, TPRI	Local and External funding

<b>Action</b>	<b>Expected Output</b>	<b>Indicators</b>	<b>Time Frame</b>	<b>Resources</b>	<b>Responsibility</b>	<b>Comments/Constraints</b>
Provide necessary facilities/retooling including computers, POPs testing kits in 12 institutions in order to implement POPs compliance and monitoring activities		Facilities or working tolls at selected institutions	2007-2009	300,000	Sector Ministries NGOs/CBOs Private Sector	Local and External funding
Establish training programme on project management (planning, monitoring and evaluation) and enforcement of laws at central and local government levels	Enhanced management capacity	Training programmes developed and implemented	2007-2008	5,000	<b>Depts. of Env NEMC, GCLA, UDSM, TPRI</b> Sector Ministries NGOs/CBOs Private Sector	Local and External funding
Training of 10 personnel abroad and 3 training sessions of 30 people per annum			2007-2008	200,000		
Update Action Plans and NIP in 3 years interval it involves travel to collect data, consultations, consultancy work, publication and distribution of revised documents	Enhanced implementation of the Convention	Updated NIP	2009 -2012	300,000	<b>Depts of Envs, NEMC, GCLA, UDSM, TPRI, sector ministries, NGOs/CBOs, private sector</b>	Local and External funding
Establish and service POPs national expert network meetings	Exchange of technical information strengthened	Operational expert network	2007-2008	15,000	<b>Depts of Env, NEMC</b>	Local and external funding
Develop 2 project proposals per annum for NIP implementation	Enhanced implementation of the Convention	Implementable projects in place	2006 - 2012	300,000	<b>Depts of Env, sector ministries, development partners</b>	Local and External funding

**Table 4.5:** Actions to support review of related national strategies and action plans

Action	Expected Output	Indicators	Time Frame	Resources	Responsibility	Comments/Constraints
<b>Review Objective: To strengthen POPs management in relevant national strategies and action plans by 2008</b>						
Mainstream POPs issues in relevant national development strategies, action plans and programmes of relevant sectors including agriculture, health, environment, forest, local government and energy	Improved implementation of the Stockholm Convention	Reports	2006-2008	142,000	VPO, sector ministries	Local and External funding
				<b>Total</b>	<b>2,320,000</b>	

#### **4.4.4 Institutional Capacity strengthening Measures**

The main institutional capacity strengthening initiatives set out in the Action Plan include: strengthening permanent institution arrangements to support international obligations including related Conventions; regulatory administrative, technical support and enforcement strengthening; implementation/upgrading of the National Chemical and Pesticides Management and public information, education and awareness programme.

#### **4.4.5 Regulatory Development Initiative**

The only available related regulation is the Plant Protection Regulations (1999) though have limited provisions. These will be reviewed to incorporate provisions on POPs Pesticides management. The Environmental Management Act (2004) empowers the Minister responsible for environment to develop the necessary regulations.

#### **4.4.6 Organization**

A steering committee will be instituted during implementation phase of the NIP charged with the responsibility of providing policy guidance and overseeing implementation of the NIP. Further, a technical committee will be established to provide technical guidance on NIP implementation including review of project proposals, assessment of Action Plan implementation reports and review of the NIP.

### **4.5. ACTION PLAN FOR PRODUCTION, USE, STOCKPILES AND WASTES OF POP PESTICIDES - ANNEX A, PART 1 CHEMICALS**

#### **4.5.1 Objectives and Priorities of Action Plan**

The goal of the Action Plan is to ensure reduction and ultimate elimination of POP Pesticides and their releases so as to protect human health and environment.

The Action Plan addresses the identified gaps and deficiencies in order for Tanzania to meet the requirements of the Stockholm Convention in elimination of POP Pesticides releases. It also defines objectives, time bound activities and required resources (human and financial). The implementation of the Action Plan envisages the participation of a broad spectrum of stakeholders.

##### **4.5.1.1 Overall Objectives**

The overall objectives of the Action Plan are: .

- i) To build national capacities in POP Pesticides management in terms of manpower and infrastructure;

- ii) To raise stakeholders awareness on POP Pesticides hazards and management;
- iii) To minimize risks on environment and human health from POP Pesticides;
- iv) To promote environmentally sound technology for disposal of POP Pesticides wastes;
- v) To promote POP Pesticides networking;
- vi) To strengthen legal framework and enforcement mechanisms;
- vii) To promote research and development of alternatives to POP Pesticides; and
- viii) To develop mechanisms for promoting proper management of POP Pesticides stockpiles and the contaminated sites.

The overall objectives provide basis for identifying/formulating the specific objectives and actions needed to strengthen management and control of POP Pesticides consistent with Article 3 and 6 of the Stockholm Convention as well as articles 5, 6 and 10 of the Rotterdam Convention in the course of implementation of the Action Plan.

#### **4.5.1.2 Constraints**

By comparing the inventory findings with the Convention requirements and the available legislation, the following gaps and deficiencies were identified: -

- i) Inadequate legal provisions on POP Pesticides production, screening, importation, use and disposal of their waste. Also on identification, liability and management of contaminated sites;
- ii) Weak enforcement mechanisms, for example on disposal of waste;
- iii) The Plant Protection Act (1997) does not provide for the identification and quantification of stockpiles;
- iv) Lack of legal provision focusing on public awareness on health and environmental risks associated with POP Pesticides;
- v) There is no legal provision for monitoring of POP Pesticides release and their effects to human and environment;
- vi) There is no legal provisions focusing on environment, transport, fate and transformation;
- vii) Inadequate awareness of importers and custom officers on Pesticides importation requirements;
- viii) Inadequate information on the past production, use, import and export;
- ix) Lack of continuing education to update skills for evaluation of technical data submitted during registration of pesticides;
- x) Lack of specialized skills and analytical equipment for identification of undeclared pesticides ingredients and monitoring of POP Pesticides levels;
- xi) Inadequate training on pesticides inspectorate services;
- xii) Lack of guidelines on risk minimization procedures for handling, transportation, storage and disposal of obsolete stocks;
- xiii) Lack of national standards or guidelines for Maximum Residue Limits (MRLs) to assess exposure;

- xiv) Inadequate specialized skills, financial resources, equipment and working tools by respective institutions dealing with POP Pesticides;
- xv) Poor storage facilities and appropriate disposal facilities;
- xvi) Improper disposal of POP Pesticides empty containers;
- xvii) No studies on POP Pesticides risks on human health;
- xviii) Poor information exchange and data keeping;
- xix) Inadequate resources for dissemination of information on the viable alternatives;
- xx) Lack of resources to ascertain suitability of alternatives and assess their risks to human health and the environment;
- xxi) Inadequate resources to support preparation and execution of training and awareness raising programs;
- xxii) Lack of socio-economic and cultural studies on the acceptability and affordability of alternatives; and
- xxiii) Limited coverage of inventory of POP Pesticides.

#### **4.5.1.3 Prioritization**

The priority issues to be addressed include:

- i) Establishing environmentally sound technologies for disposal of PIC and POP Pesticides wastes;
- ii) Developing mechanisms to promote proper management and control of stocks, stockpiles of PIC and POP Pesticides, wastes and contaminated sites;
- iii) Strengthening legislation enforcement mechanisms;
- iv) Developing monitoring programs on POP Pesticides effects and their impacts to human health and the environment;
- v) Review of existing legislation in line with the Stockholm Convention requirements for POP Pesticides management;
- vi) Development of guidelines for POP Pesticides management;
- vii) Enhancing levels of awareness on risks of POP Pesticides;
- viii) Developing programs to promote the use of alternatives of POP Pesticides;
- ix) Strengthening capacity in POP pesticides management in terms of manpower and infrastructure; and
- x) Strengthening of international co-operation on exchange of technical information to improve scientific knowledge and skills in POP Pesticides management.

#### **4.5.2 Summary of POP Pesticides Production, Uses, Stockpiles, Wastes and Contaminated Sites**

The inventory revealed that at present there are no POP Pesticides registered in Tanzania. However, there are 17.4MT of obsolete stocks of POP Pesticides composed of Aldrin (3.5 MT), Dieldrin (2.0 MT) and Toxaphene (11.9 MT). Furthermore, the Plant Protection Act (1997) does not have specific provisions on management of POP Pesticides and their elimination. Additionally, this Act and its Regulations of 1999 stipulates restrictive requirements on registration of pesticides with POPs characteristics.

The gaps identified during the inventory include: insufficient funds for inspectorate services, insufficient trained inspectors and insufficient personnel with specialized skills for analysis of undeclared ingredients; deficiencies in the pesticide legislation leading to inadequate enforcement; lack of continued education to update skills required to evaluate technical data submitted for pesticides registration; inadequate programs to monitor effects of POP Pesticides to human health and the environment; inadequate awareness and educational programs on the risk of POP Pesticides to the general public; alternative to POP Pesticides are available although information on the efficacy and assessment of their impacts is inadequate.

There are sites contaminated with POP Pesticides in Tanzania, although the magnitude of contamination is not well known. The inventory records indicate four sites are highly contaminated with POP Pesticides and DDT. These are Korogwe (Tanga) Mtwara Township (Mtwara), Vikuge (Coast) and Babati (Manyara). With the exception of Korogwe and Vikuge the remained POP Pesticides contaminated sites are not stabilized thus posing risks of adverse effects to human health, water system and the environment. The actual risk assessment has not been done to ascertain the extent and magnitude of contamination in the respective sites.

#### **4.5.3 Environmental and Health Situation in Relation to POP Pesticides**

Since most most of the stockpiles stores in the country are located in towns near water bodies, there may be potential environmental and human health risks related to POP Pesticides. Communities in the surroundings of stores are exposed to releases of POP Pesticides through inhalation of toxic fumes and contact. There is need therefore to carryout a comprehensive assessment of the magnitude of the problem including the size of contaminated sites as well as related health and environmental hazards. This will form a solid base for the establishment of sound monitoring schemes.

#### **4.5.4 Proposed Regulatory Strengthening Measures for POP Pesticides**

The regulatory strengthening measures include reviewing of Plant Protection Act (1997) and it's Regulations (1999) and strengthening of enforcement mechanisms to promote safe POP Pesticides handling and disposal including the responsibility and liability on POP Pesticides wastes and their contaminated sites. Strengthening identification of pesticides with POPs characteristics, screening of candidate POP Pesticides and research and development of alternatives should be emphasized.

Other measures include strengthening of importation monitoring by the relevant institutions to prevent unnecessary stockpiling of pesticides, illegal trafficking, formulating of guidelines for the management of plant protection substances including their wastes and publicize them to all stakeholders. In addition, public information, education and awareness programmes as well as monitoring of adverse effects to human

health and the environment caused by POP Pesticides should be strengthened. There should be a legal requirement for public awareness creation and monitoring of impacts of POP Pesticides to human health and the environment.

Already the Environmental Management Act (2004) provides requirement for each sector ministry to undertake necessary legal and administrative measures so as to reduce or eliminate releases of intentionally produced POPs in its production, use, import, export and disposal in accordance with the provisions of the Stockholm Convention.

#### **4.5.5 Proposed Operational Measures for POP Pesticides Storage, Production, Handling, Use and Disposal**

The operational measures for POP Pesticides storage, production, handling, use and disposal should adhere to PP Act (1997) and its Regulations (1999) and proposed guidelines as shown in discussions on permits and guidelines on management of POP Pesticides.

##### ***4.5.5.1 Operational Measures for POP Pesticides Production, Handling, Storage, Use and Disposal***

POP Pesticides are controlled by the Plant Protection Act (1997) and Plant Protection Regulations (1999). The legislation stipulates requirements for registration, manufacturing/formulation, importation, sale, use, transportation and disposal of pesticides wastes and their empty containers. The power to implement the legislation has been vested to the Tropical Pesticides Research Institute (TPRI), the Plant Health Services (PHS) Department of the Ministry of Agriculture and Food Security and the Plant Protection Division of Zanzibar. Pesticides handlers and sellers are assessed for their competence and conditions of the premises for keeping and handling pesticides. Guidelines are required to operationalise legal provisions on handling, storage and disposal.

##### ***4.5.5.2 Permit Systems***

At present the Government issues permits for the registered and approved pesticides to the registrants or registered pesticides importers. Such permits include:

###### **a) Permit for importation**

Permit issuance is among suitable measures geared to promote sound management of POP Pesticides releases. Permits are issued after complying with the requirements set out in Section 19 of the Plant Protection Act (1997) and Sections 31(1) and 32(1) of the Plant Protection Regulations (1999). Importation of POP Pesticides shall be restricted for exempted uses in accordance with the provisions of the Stockholm Convention and the PIC procedures if deemed necessary.

#### **b) Permit for Handling and Storage**

Conditions of the permit for pesticides storage and handling are stipulated in Section 23 of PP Regulations (1999). It is required that storage premises be adequately equipped by facilities that will minimize hazards to human health, animals and the environment. In addition, the storage premises should preserve the original properties of the pesticides. Storekeeping and handling should be done by a technical personnel qualified and experienced in the handling of pesticides. Provision of appropriate personal protective gear/equipment to pesticides handlers is mandatory. Special permits system for POP Pesticides handling and storage shall be instituted.

#### **c) Permit for Transport**

Section 35(2) of PP Regulations (1999) stipulates conditions for transportation of pesticides. Pesticides should be transported in such a way that cannot easily get into contact with feed or foodstuffs. However, additional requirements as prerequisite for permit issuance need to be incorporated to stipulate qualification of pesticides transporter, vehicle description, and escort requirements. Moreover, provisions to require issuance of transport permit by the Registrar of Pesticides prior to transporting POP Pesticides need to be incorporated in the regulations.

#### **d) Permit for Disposal**

The competent authority is responsible for authorization of disposal of obsolete pesticides and empty pesticides containers. Prior to the issuance of the disposal permit, the applicant is required to lodge a formal request indicating type(s) and amount of obsolete pesticides and empty containers to be disposed of. However, technical guidelines need to be developed and disseminated to stakeholders to operationalize the permit system. It is recommended that the competent authority should liaise with ministry responsible for Environment in the process of issuing of disposal permit.

#### **4.5.5.3 Voluntary Agreements with Companies or Industry Groups**

The voluntary agreements with companies or industry groups showing commitment in phasing out POP Pesticides should be guided by the recommendation stipulated in the International Code of Conduct on the Distribution and Use of Pesticides. Furthermore, implementation of regional agreements and international conventions would guide policy and legislation review on transportation, handling and disposal of obsolete wastes. It is recommended that the competent authority in collaboration with the national focal point may coordinate the process.

#### **4.5.5.4 Application of Guidelines**

Guidelines on management of POP Pesticides shall be formulated and disseminated to all stakeholders. It is recommended that all pesticide dealers should follow the proposed guidelines in identification, decontamination, handling and storage, transportation and disposal of POP Pesticides:

**a) Guidelines for Identification**

The Competent Authority responsible for the implementation of Plant Protection Act (1997) and its Regulations (1999) should formulate guidelines geared to identify pesticides undeclared ingredients particularly POP Pesticides, adjuvant and solvents. The guidelines must provide for required specialized skills and appropriate analytical equipment.

**b) Guidelines for Decontamination**

The Plant Protection Regulations (1999) provides for prompt clean up and decontamination of a pesticides contaminated store. However, procedural guidelines for safe decontamination are not in place. It is recommended that NEMC in collaboration with the ministry responsible for environment, MAFs, PO-RALG and the private sector should formulate guidelines for decontamination of soils and other materials. The guidelines should include the appropriate BEPs and BATs.

**c) Guidelines for Handling and Storage**

Sections 23, 31(2) & (3) and 35 of the Plant Protection Regulations (1999) provide requirements for safe handling and storage of pesticides. However, guidelines to meet these requirements are not in place. It is recommended that the competent authority should prepare these guidelines that must include BEPs, good store management practices and use of personal protective equipment.

**d) Guidelines for Transport**

Section 35(2) of the Plant Protection Regulations (1999) requires safe transport of pesticides to avoid contamination of un-intended objects. The competent authority should formulate guidelines to operationalize the provisions. These must include qualification of pesticides transporter and driver, vehicle requirements, packaging, escort requirements and emergency preparedness.

**e) Guidelines for Disposal**

Section 37 of the PP Regulations (1999) requires farmers/users to procure pesticides just enough for the intended use or transfer the excess to another user to avoid accumulation of pesticides. The the ministry responsible for environment in collaboration with MAFs, NEMC, PO-RALG and the private sector need to develop guidelines on sound disposal of pesticides and empty containers. The guidelines must include procedures for risk assessment, risk management and the recommended BATs and BEPs.

**4.5.5.5 Plans for Final Disposal of POP Pesticides and Treatment of Contaminated Sites**

**(a) Plans for Final Treatment and Disposal of POP Pesticides**

The procedures for final disposal of POP Pesticides include confirmation of baseline inventory information, preparation of a final disposal work plan, which involve resources mobilization, collection, transportation, and disposal of wastes. Disposal of POP Pesticides has to be done in accordance with international requirements specifically environmentally sound management of hazardous wastes as stipulated in the Basel

Convention. Currently Tanzania cannot meet these requirements. Therefore the only possibility is shipment for disposal abroad. In future the action plan envisages development of low cost treatment and disposal facilities for waste containing POPs characteristics and other hazardous wastes.

At present, under the Africa Stockpiles Programme (ASP), which is expected to start in January 2006 Tanzania will be supported to dispose of 189 MT of stockpiles of POP Pesticides (including DDT) and other pesticides waste. Under this project measures to prevent further accumulation of POP Pesticides will be instituted. Review of the pesticides legislation is ongoing. Strengthening of enforcement through provision of necessary skills and working tools will improve management of POP Pesticides and put in place mechanism to prevent further accumulation of pesticides.

The Disposal plan shall be executed under the coordination of the ministry responsible for environment.

#### **(b) Plans for Treatment of Contaminated Sites**

At present there are no legal provisions for registration of POP Pesticides contaminated sites therefore the actual number of POP Pesticides contaminated sites and extent of contamination is not documented under the respective institutions. The plan for treatment of contaminated sites include identification of sites, undertaking of impact assessment, identification of competent and experienced firm for treatment processes, executing field operations and post monitoring of levels of contaminants and associated effects. Creation of public awareness to the community living close to contaminated sites is inevitable taking into account the absence of registration requirement at present.

It is further recommended that cost effective, efficient and affordable treatment methods be established and employed.

#### ***4.5.5.6 Programs for Development and Dissemination of Information on Substitutes and their Uses***

Programs for development and dissemination of information on substitutes shall incorporate design and execution, research on substitutes and application of substitutes. The competent authority shall undertake researches and publish research findings for public consumption. There should be guidelines on: -

- Tests for effectiveness to ascertain sustainability and desirable properties.
- Measure for acceptability and social-economic perceiveness.
- Risk assessment and risk management for substitutes.
- Awareness raising materials.
- Registration system to promote adoption of feasible biological pest control methods.
- Monitor effects of substitutes.

#### ***4.5.5.7 Programs for Dissemination of Information on substitutes and their uses***

Research finding on alternatives shall be disseminated through extension services and information packages such as newsletters, brochures, leaflets, radio and TV programmes.

### **4.5.6 Implementation of the Action Plan**

#### ***4.5.6.1 Action Plan and Strategies***

The Action Plan has been developed to address gaps and deficiencies identified and highlighted by the inventory findings. The Action Plan among others focuses on:

- (i) Capacity building of relevant organizations;
- (ii) Promotion of suitable substitutes and alternative techniques; and
- (iii) Strengthening control on management of POP Pesticides.

#### ***4.5.6.2 Organization***

The Ministry of Agriculture and Food Security has the mandate on agricultural matters and therefore is responsible for management of POP Pesticides in the country. TPRI registers all pesticides and monitors importation and use. Collaborating institutions include NEMC, MoWLD, VPO, MALE, UDMS, GCLA, professional associations and NGOs such as Crop Life – Tanzania, Envirocare, African Network for the Chemical Analysis of Pesticides and others. Appropriate information dissemination mechanism need to be developed.

#### ***4.5.6.3 Work Plan***

The work plan for implementation of the Action Plan is provided on Tables 4.6 to 4.8 based on a number of assumptions. These include:

- Availability of sufficient resources internally and externally for implementation of activities.
- Existence of good governance for implementation of Action Plan in Tanzania and among stakeholders.

#### ***4.5.6.4 Reporting and Monitoring***

The monitoring and reporting NIP implementation activities under the plan of action will be done by the Focal Point of the Stockholm Convention, currently the VPO. Independent organizations should participate in monitoring of specific activities and projects. Reports on monitoring operations should be available to all stakeholders and general public.

#### ***4.5.6.5 Plan Updating Mechanism***

The Focal Point in collaboration with stakeholders is responsible for review and updating the Action Plan in intervals of every 3 to 5 years. The process for updating of the Action Plan shall follow procedures indicated below:

- Review of progress in undertaking specific projects
- Gathering and review of stakeholders views through workshops, forums and targeted meetings, and project appraisals
- Proposing alterations/ changes on project implementation plans
- Reporting alterations/ changes proposed to the steering committee that will supervise the activities of NIP
- Implementing changes upon approval by responsible organ.

**Table 4.6:** Actions to strengthen legislation

Action	Expected Output	Indicators	Time Frame	Resources	Responsibility	Comments/Constraints
<b>Legislation Objective: To review legislation on pesticides management by 2009</b>						
Review existing legislation to incorporate provisions on importation, surveillance and management of POP Pesticides, registration of contaminated sites, responsibility and liability of owners of such sites and of wastes, monitoring of POP Pesticides and alternatives and environmental transport, fate and transformation	Stockholm Convention provisions incorporated into national laws	Reviewed version of the laws	2007-2009	100,000	Depts of Env., NEMC, TPRI, GCLA, MJCA, OSHA, MAFS	Local and external funding
Disseminate the popular versions of the law			2009	15,000		

**Table 4.7:** Actions for clean up and disposal of obsolete POP Pesticides stockpiles

Action	Expected Output	Indicators	Time Frame	Resources	Responsibility	Comments/Constraints
<b>Clean Up Objective: To operationalize disposal of POP Pesticides stockpiles and waste by 2016</b>						
Carry out researches on low cost methods of disposal	Environmentally sound technology for the disposal of obsolete POP Pesticides and wastes are in place	Research reports	2006+	230,000	Depts of Env., NEMC, TPRI, MAFS, GCLA, OSHA, UDSM, Private sector	External funding
Update baseline information on POP Pesticides stockpiles and waste in terms of identity, quantity and locations		Inventory reports	2010-2011	50,000		Local and external funding
Prepare a final detailed work plan for disposal operations		Work plan	2011	10,000		Local and external funding

Action	Expected Output	Indicators	Time Frame	Resources	Responsibility	Comments/Constraints
Conduct stakeholders forum for resources mobilization	Committed resources	Workshop proceedings	2011-2012	10,000	Depts of Env., NEMC, MAFS, OSHA, UDSM, Private sector and Development partners POPs Technical and Steering Committees	
Establish and procure lacking facilities (i.e. cranes, folk lifts, treatment or disposal facilities) and upgrade storage facilities including 50 existing storage facilities, involving identification of needs and training staff on proper utilization.	Enhanced capacity in management of POP Pesticides	Implementation report	2008-2011	1,500, 000		Local and external funding
Execute field operations which include collection, transportation and disposal of POP Pesticides	Stockpiles of POP Pesticides cleaned	Field operation reports	2012-2016*	600,000		Local and external funding

**\*Note:** This is a second disposal operation after completion of the Africa Stockpiles Project, which will take place from 2006-2011; actual cost will depend on amounts of waste and disposal technologies.

**Table 4.8:** Actions for building capacity in implementation of Stockholm Convention and Rotterdam Convention with regard to POP Pesticides management and control

Action	Expected Output	Indicators	Time Frame	Resources	Responsibility	Comments/Constraints
<b>Capacity Building Objective 1: To provide specialized skills on key staff by 2012</b>						
Conduct 1 training session of 40 key staff (DNA, inspectors, customs officers, extension services, storekeepers) annually on PIC procedure, identification of POPs characteristics, management of stockpiles and contaminated sites and proper storage	Capacity in human on POP Pesticides management built	- Training reports - No of Staff trained	2007-2008	40,000	Depts of Env., NEMC, <b>TPRI</b> , <b>MAFS</b> , GCLA, OSHA, MoH	Local and external funding
Conduct 1 training session annually for 40 people (DNA, Environmental, public health, Occupational health and safety officers, and representatives from academic and research institutions) on risk assessment and risk management	Capacity on risk assessment and risk management built	-Training reports -No of Staff trained	2007 - 2009	40,000	Depts of Env., NEMC, TPRI, <b>MAFS</b> , <b>GCLA</b> , OSHA, <b>UDSM</b> , SUA, UCLAS	Local and external funding
Prepare guidelines on risk assessment, risk management and disposal of waste involving consultancy and technical meetings	-Reduced risks to human health and environment	Guideline booklets available in 2 years	2007-2008	40,000	Depts of Env., <b>NEMC</b> , TPRI, <b>MAFS</b> , GCLA, OSHA, SUA	Local and external funding
Execute collaborative monitoring programme to assess impacts of POP Pesticides and their alternatives as well as the efficacy of alternatives.	-Enhanced capacity in management of POP Pesticides	Monitoring programme	2008-2012	500,000	Depts of Env., NEMC, <b>TPRI</b> , <b>MAFS</b> , GCLA, OSHA, <b>UDSM</b> , UCLAS, MALE	Local and external funding

Action	Expected Output	Indicators	Time Frame	Resources	Responsibility	Comments/Constraints
Develop and disseminate guidelines on PIC and POP Pesticides management including handling, storage, retail business and disposal POP Pesticides; it involves consultancy and technical meetings	Enhanced PIC and POP Pesticides management	Guidelines in place	2008-2009	30,000	Depts of Env., NEMC, <b>TPRI</b> , MAFS, GCLA, OSHA, MJCA, MALE, TCCIA and NGOs	Local and external funding
Strengthen POP Pesticides inspection mechanism involving preparation and dissemination of inspection guidelines and procedures, Provision of inspection tools, site visits and demonstrations		-Copies of inspection guidelines -Records of inspection reports on compliance	2007 -2009	470,000	Depts of Env., MAFS, <b>TPRI</b> , GCLA, OSHA, MALE	<ul style="list-style-type: none"> <li>Value depends on cost of inspection tools,</li> <li>Local and external funding</li> </ul>
<b>Capacity Building Objective 2: To promote use of POP Pesticides substitutes and alternatives by 2012</b>						
Test for effectiveness and ascertain sustainability and desirable properties of alternative products	Substitutes and alternatives to POP Pesticides are introduced, operationalized and used	Test/field reports	2010 - 2012	1,500,000	Depts of Env., <b>TPRI</b> , MAFS, MALE	Local and external funding
Develop and disseminate joint IPM and IVM packages in 5 regions	Reduced use of PIC and POP Pesticides	IPM&IVM Packages	2008 - 2010	1,000,000	Depts of Env., NEMC, TPRI, <b>MAFS</b> , MALE, NIMR, MOH	Local and external funding
Measure the acceptability and social-economic perceiveness	Alternatives of POP Pesticides operationalised	Study reports	2010 - 2012	200,000	Depts of Env., MALE, NEMC, TPRI, <b>MAFS</b> ,	Local and external funding

<b>Action</b>	<b>Expected Output</b>	<b>Indicators</b>	<b>Time Frame</b>	<b>Resources</b>	<b>Responsibility</b>	<b>Comments/Constraints</b>
Conduct risk assessment for substitutes to PIC and POP Pesticides	Protection of human health and environment	Reports of risk assessment	2012+	500,000	GCLA, OSHA, UDSM, UCLAS, SUA	Local and external funding
Prepare guidelines on use of alternatives	Operationalisation of alternatives	Set of copies of guidelines	2010-2011	10,000		Local funding
Conduct awareness raising activities on alternatives of PIC and POP Pesticides in 10 Regions annually involving seminars workshops and demonstrations at local level, for 3 years		No. of awareness raising materials	2012+	150,000		Local and external funding
<b>Total</b>				<b>6,995,000</b>		

## **4.5.7 Key Investment Requirements**

### ***4.5.7.1 Development of Facilities and Operational Capability for Transportation, Collection, Storage, Treatment and Disposal of POP Pesticides***

Presence of key facilities would enhance implementation plan for sound handling, storage, treatment and disposal of POP Pesticides. The facilities requirement should consider availability of:

- Disposal facility for environmentally sound destruction of stockpiles of POP Pesticides;
- All-weather passable roads and railway facility for collection and transport stockpiles;
- Intermediate storage facilities to ease collection process; and
- On site sound technology for contaminated sites treatment.

### ***4.5.7.2 Operationalization of Substitutes***

The development and subsequent use of substitutes to POP Pesticides is an entry point to safeguard human health and the environment. To achieve sustainable use of substitutes, involvement of wide range of stakeholders at the initial stage is of great importance. In order for the substitutes to be operational, the following steps are recommended:

- Analyze country situation on policy and legislation;
- Study comparative approaches for substitutes;
- Develop Action Plan;
- Initiate pilot case studies; and
- Launch a National implementation.

### ***4.5.7.3 Assessment of Human and Biota Impact***

For a sustainable assessment of human and biota impacts, it is recommended that:

- Establish national programs geared to undertake impact assessment on human health and the environment;
- Develop programs to be implemented in collaboration with partner institutions; and
- Establish database on records and reports of undertaken assessment.

### ***4.5.7.4 Information Dissemination on IPM to POP Pesticides Users***

Integrated Pest Management (IPM) provides a combined approach to manage pests and reduce dependence on POP Pesticides while maintaining high production level. There is retarded acceptance and subsequent implementation of IPM caused by low level of knowledge on the subject matter, inadequate information dissemination and initiatives on researching and promoting the use of substitutes. The information on IPM to POP Pesticides users should be disseminated as recommended hereunder:

- Review of existing policies and legislation to support IPM programs;
- Carry out inventory on existing IPM programs;
- Develop a database on IPM information;
- Promote and disseminate research findings; and

- Train extension staff and farmers on the principles of IPM.

**Table 4.9:** Cost estimates for key investment requirements for POP Pesticides

<b>Item</b>	<b>Unit cost (USD)</b>
1. Facilities and operational capability for collection, transportation, storage and disposal of stockpiles and contaminated materials	2,100,000
2. Operationalization of substitutes	2,500,000
3. Assessment of human and biota impact	500,000
<b>Total</b>	<b>5,100,000</b>

#### **4.5.8 Costs and Financing of Action Plan Implementation**

The estimated cost for the implementation of POP Pesticides is **USD 6,995,000** over a period of 2006 to 2011. Funds will be diversely sourced from internally and externally. The major internal sources of funds are the Government of Tanzania through treasury. Identified external funding sources include development partners like GEF, WB, professional NGOs, UN organizations such as UNEP-Chemicals, UNIDO, FAO and Government of developed countries.

### **4.6 ACTION PLAN FOR PRODUCTION, USE, IDENTIFICATION, LABELLING, REMOVAL, STORAGE AND DISPOSAL OF PCBs AND EQUIPMENT CONTAINING PCBs**

#### **4.6.1 Objectives and Priorities of the Action Plan**

The goal of the Action Plan is to enhance the protection of human health and the environment by reducing and eventually eliminating the use of PCBs.

The Action Plan gives scope and mechanism of managing PCBs: Reduction and eventual elimination of PCBs in Tanzania. The Action Plan addresses the identified gaps and deficiencies if Tanzania is to meet the requirements of the Stockholm Convention in the management of PCBs. It also defines objectives, time bound activities and required resources (human and financial). The implementation of the action plan envisages the participation of a broad spectrum of stakeholders. The Action Plan comprises the following typical elements of management of PCBs and equipment containing PCBs which include disposal of PCBs and wastes containing PCBs, monitoring of PCB releases, awareness and training on PCB, strengthening policies and legislation and improvement of information generation, exchange and dissemination.

#### **4.6.1.1 Overall Objectives**

The overall objectives of the Action Plan are:

- a) To develop a roadmap for reduction and eventual elimination of PCBs by **2010** as adopted by SADC countries, by promoting/effecting transition to sustainable alternatives products, providing access to, and transfer of, clean and environmentally sound alternative technologies/practices, facilitating environmentally sound disposal of stockpiles and waste;
- b) To facilitate the identification, assessments, (including risk assessments) and remediation of the sites affected by PCBs;
- c) To set up monitoring schemes for adverse effects and releases (new and those from contaminated sites) so as to identify required mitigation efforts needed to be put in place to ensure that the risk to human health and that of the environment is reduced;
- d) To implement comprehensive voluntary and regulatory systems for management and control of PCBs;
- e) To improve generation, exchange and dissemination of information on PCBs (effects, management options, etc.); and
- f) To regularly update inventory of PCBs.

The overall objectives provide basis for identifying/formulating the specific objectives and actions needed to strengthen management of PCBs in the course of implementation of the Action Plan.

#### **4.6.1.2 Constraints**

The PCBs management and control problem is complex. The PCB inventory revealed that equipment suspected to contain PCB are dispersed widely across the countryside, notably along electric power-line grids. Replacing all these equipment immediately would be impractical and expensive, especially for financially strapped developing countries like Tanzania. Transporting PCBs to treatment sites is a delicate job that risks leakage and additional pollution, and the safe destruction or containment of PCBs requires special measures and high-tech equipment. With current technologies and facilities, only limited amounts can be dealt with at a time. Thus the lasting solution can only be expected after concerted efforts sustained over a long time.

Other constraints include:

- a) Lack of destruction facilities to handle PCBs, possibly nationwide;
- b) Inadequate of existing capabilities, and capacity on management options related to leaks, and spill response, as well as the handling and storage of PCBs;
- c) Poor coordination of existing capabilities and management efforts; and
- d) Poor access to information on PCBs at levels;
- e) Inadequate programmes for raising awareness on PCBs and POPs in general;
- f) Insufficient schemes for monitoring, control and management of releases of PCBs and sites contaminated with PCBs;
- g) Non existence of cleanup and remediation schemes/efforts;

- h) The preliminary inventory which is the basis of the baseline information was deficient in area covered and lack of carrying confirmatory tests;
- i) Lack of facilities for disposal of PCBs;
- j) Existing legislation being non PCBs comprehensive will inherently have a weak mode and scope enforcement regime; and
- k) Weak financial capacity to invest in the use of alternatives and to dispose off safely and the existing stockpile.

#### **4.6.1.3 Prioritization**

The prioritization and eventual development of the PCBs objectives was based on the analysis of the gaps and deficiencies as revealed by the inventory results. The pertinent issues, in order of priority, are:

- a) Developing facilities for disposal of PCBs;
- b) Establishing legislation and enforcement regimes on PCBs;;
- c) Developing programmes for raising awareness on PCBs and POPs in general
- d) Establishing cleanup and remediation schemes/efforts;
- e) Updating inventory of stockpiles, products and articles in use and wastes consisting of, or containing or contaminated with PCBs;
- f) Strengthen institutional capacity to manage PCBs in an environmentally sound manner;
- g) Establishing schemes for monitoring, control and management of releases of PCBs and sites contaminated with PCBs; and
- h) Enhancement of information generation, access and dissemination.

#### **4.6.2 Summary of PCBs Production, Uses, Stockpiles, Wastes and Contamination**

The PCBs inventory covered use of PCBs in closed and semi-closed applications; it did not however cover the use of PCBs in open applications. In open applications, PCBs would be incorporated into a formulation, usually in small or very small amounts e.g. in paints and inks.

The inventory of PCBs in 2004 revealed 418 equipment containing 273 tones of oil suspected to contain PCB in Tanzania. Out of total equipment 354 are transformers referred as closed applications, i.e. those in which the PCBs are enclosed, and cannot escape during normal use, basically transformers, which are sealed pieces of electrical equipment.

In semi-closed (partially closed) applications, the PCB-containing oil is employed as a fluid, which might be circulated around the equipment for example, in switches and circuit breakers. The inventory revealed 57 circuit breakers and 4 switchgears are possibly contaminated with PCB. Out of total equipment, 216 transformers containing 93.4 metric tonnes of oil suspected to contain PCB and 17 oil circuit breakers are not in use hence classified as wastes.

### **4.6.3 PCBs-related Environmental and Health Situation**

PCBs have been demonstrated to cause cancer and other significant toxic effects in animals, including effects on the immune system, the reproductive system, the nervous system and the endocrine system. The body's regulation of all of these systems is complex and interrelated, as alterations in one system may have significant implications for the other regulatory systems of the body, it is not surprising that PCBs can exert a multitude of serious adverse health effects.

It is very important to note that the composition of PCB mixtures changes following their release into the environment. The types of PCBs that tend to bio-accumulate in fish and other animals and bind to sediments happen to be the most carcinogenic components of PCB mixtures. As a result, people who ingest PCB-contaminated fish or other animal products and contact PCB-contaminated sediment may be exposed to PCB mixtures that are even more toxic than the PCB mixtures contacted by workers and released into the environment.

PCBs are very persistent in soil and water. Also there is no known break down processes other than slow degradation by microbes. PCBs may be carried long distances in air. They can remain in air for approximately 10 days. In water, small amounts of the PCBs may remain dissolved, but the majority will settle into sediments by adhering to organic particles.

PCBs are a group of chemicals that contain many individual compounds with the same basic structure, known as congeners; 209 congeners are possible, but only about 130 are likely to occur in commercial products (IPCS 1993) which are mixtures.

Chronic (long-term) exposure to some PCB formulations by inhalation in humans results in respiratory tract symptoms, gastrointestinal effects, mild liver effects, and effects on the skin and eyes such as chloracne, skin rashes, and eye irritation. Their potential to bio-accumulate in fat, PCBs may build up in fish and marine mammals and can reach levels thousands of times higher than the levels in water.

Microbes degrade PCB molecules containing one, two or three atoms of chlorine relatively rapidly. Those with four atoms of chlorine degrade more slowly. The more highly chlorinated PCBs resist biodegradation.

### **4.6.4 Measures for Future PCBs Management**

PCBs present a different kind of challenge. PCBs can eventually be eliminated, but this will require additional funds and know-how.

For the PCBs management and control system to be successful, it must address both issues of PCBs, and sites contaminated with PCBs. Also sustainability measures must be entrenched in it. The minimum system requirements are:

- i) Availability of storage and destruction facilities to handle PCBs, possibly nationwide;

- ii) Regulations governing collection, transport, storage of PCBs are set and implemented;
- iii) Environmental quality objectives/standards for PCBs in air, water and soil, and jointly developing permanent objectives are set;
- iv) Improved coordination of existing emergency response capabilities, and evaluating existing training programmes related to spill response, as well as the handling and storage of PCBs;
- v) Increasing access to information on PCBs, both between jurisdictions and to the general public
- vi) Evaluating different options and timetables for the phase-out of remaining, authorized, PCB-filled equipment; and
- vii) Availability of specific cleaning, equipment retrofitting and refilling.

Management of PCBs involves management of both the PCB liquids and equipment, which contains them or may have contained them since other materials may also have been contaminated with PCBs.

Leakages from electrical equipment, both in-service and in storage, and at facilities where PCBs are handled and destroyed, can give rise to comparatively large quantities of soil and concrete contaminated with PCB. These can pose the same risks to human health and the environment as the PCBs themselves and therefore they need to be handled in the same way as PCBs even after they are removed from the contaminated sites.

If PCBs are to be eventually eliminated, any management and control options implemented must be sustained over a long time. Thus sustainability presents a unique challenge. The public needs to be engaged through education and awareness building; likewise stakeholders must be engaged to build political support for sustainable strategies, policies, and programs and take the first steps toward building deeper public understanding of sustainability principles and practices.

#### ***4.6.4.1 Legislation/regulation for Management of PCBs***

The Industrial and Consumer Chemicals (Management and Control) Act No. 3 of 2003 addresses some aspects of management of PCBs. It has provisions for safe handling of chemicals, chemical wastes, accidents, management of spills and contaminated sites and decommissioning of plants. The Act offers scope for reducing the risk of exposure but does not promote elimination of the use of PCBs.

The Environmental Management Act of 2004 provides a legal and institutional framework for sustainable management of the environment and outlines principles for among others: management, impact and risk assessment, prevention and control of pollution, waste management, environmental quality standards, and public participation.

Section 7 of the Act stipulates principles of environmental management, which include promotion of the enhancement, protection, conservation and management of the environment. The general principles of the environmental management are as given in Section 4 of the Act, that every person living in Tanzania shall have a right to a clean, safe and healthier

environment. The Act also prescribes in Section 76 requirements for the management of dangerous materials and processes and empowers the Minister to make regulations on the same.

The Environmental Management Act (EMA) (2004) prescribes specific requirements for the management and remediation of contaminated sites. Section 77(5) of the Act empowers the Minister to promulgate regulations, among others, for compensations, clean-ups and emergency response to hazardous substances released into the environment and clean-up of inactive hazardous waste disposal sites.

The Acts empowers Minister responsible for matters related to Chemicals Management and Control to make new regulations to cover any identified gaps or deficiencies in the implementation of the Act. This provision can be exploited to cover identified gaps without necessarily seeking amendment of the Act, which might take a long time. Further the draft Environmental Management Act of 2004 offers an umbrella regulation on environmental protection.

#### ***4.6.4.2 Permit Systems for Handling, Transport, Storage and Disposal***

Current management and control practices for PCBs do not require any permit for handling, transport or storage of PCBs. The Industrial and Consumers Chemicals (Management and Control) Act No. 3 of 2003 provides elaborate management and control of hazardous and highly hazardous chemicals, but does not include PCBs in the schedule of the highly hazardous/toxic chemical. It is possible to make a broader interpretation of the law to address the issues of management of PCBs. Although a better approach would be to amend the Regulations and include PCBs in the relevant Sections and include provisions that are specific to PCBs management.

#### ***4.6.4.3 Voluntary Agreements***

There are no existing voluntary agreements with companies or industry groups under which they commit to phase-out PCB-containing equipment or otherwise manage PCB-containing products/equipment. The implementation plan sets the basis for establishing administrative, procedural and technical guidelines on voluntary schemes. At present there are no voluntary agreements for which owners commit to phase-out PCB-containing equipment.

#### ***4.6.4.4 Application Guidelines or Standards for Management and Control of PCBs***

There are currently no local/national guidelines or standards for identification, handling, transport, storage, decontamination and disposal of PCB-containing products/equipment. In the course of implementing the action plan, these guidelines will be developed. In the interim, International documents like *Guidelines for the Identification of PCBs and Materials Containing PCBs* published by UNEP Chemicals are being used.

Promotion of voluntary agreements is also highly recommended. Voluntary environmental agreements or covenants are a form of co-regulation between industry and the regulatory authorities (government). The aim is to find inclusive and flexible mechanisms that put more

responsibility on the industry/business, but also leave leeway for individual solutions that could improve efficiency.

Covenants are thus policy management tools used by industry to meet national environmental goals established by the regulatory authorities. Covenants provide a concrete implementation program with clear goals and targets. Covenants are set through negotiations, industry and government and once agreed; give businesses/industry the role of determining how goals are met.

Covenants work with economic incentives as well as regulation, if necessary. They are not an alternative to regulation and they do not take precedence over existing law. However, once an industry creates an environmental plan that meets National Environmental Policy Plan targets, these companies are exempted from other regulations. Traditional command-and-control regulations are then imposed on those companies that choose not to sign the covenant for their industry.

The covenant process involves industries/businesses from the beginning, and lets them decide how targets will be met. Since the targets are specific, industrial/business leaders know exactly what is expected from them. There is no guesswork involved, since both parties are working from a mutual agenda during negotiations. The process allows companies to go beyond anticipating regulations, facilitating strategic long-term planning and investment.

With increasing environmental compliance costs and continuing environmental pressures, most industry will understand the benefits of long-term planning to improve environmental efficiency and to recover dollars spent on ineffective, short-term solutions. Since corporations are responsible for making profits, government must help create the incentives for long-term planning.

#### ***4.6.4.5 Plans for Final Treatment and Disposal of PCB-containing Waste***

The PCBs inventory revealed that equipment containing PCBs and PCBs waste are dispersed widely across the countryside. Additionally there will be new stockpiles created after equipment-containing PCBs are withdrawn from use. Replacing all of this equipment immediately would be impractical and expensive.

The approach proposed is for a quantity of PCB to be removed from equipment and consolidated for treatment or destruction at safer storage facilities. The consolidated stockpile will then be analyzed and depending on the PCB concentration a specific management option will be implemented.

For this purpose, any material whose PCB concentration is 500ppm or more, it will be regarded as a regulated “pure” PCB. Those between 50 and 500ppm are regulated PCB contaminated or medium concentrated PCB, 5 to 50ppm as potentially contaminated or low concentrated PCB; those with less than 5 ppm as non PCB.

Tanzania is a huge country with 945,234 km<sup>2</sup> area hence implies transporting the stockpiles to central storage and disposal facilities is likely to be time consuming and expensive. It would thus be important to refine and implement the following management options:

- a) Identification by analysis the content of PCBs in mineral oils and contaminated soils so as to select the right disposal option. It is important to ensure analyses and monitoring regimes are both uniform and consistent so that useful comparisons may be made over time and between different sites and facilities. PCB analyses must be performed by well-equipped laboratories in the country;
- b) Transformer oils with higher concentrations of PCBs, 500 ppm or above may be exported to a developed country, for proper disposal. This is permitted under the terms of the Basel Convention on the Control of Transboundary Movements of Hazardous Waste and their Disposal. The other option is to bring smaller-scale destruction facilities for the PCBs to consolidation points even in developing countries like Tanzania, and to operate them for relatively short periods to replace oil containing PCBs in equipment in use and destroy the accumulated wastes before moving to a new location, possibly in another country. The Fluidex (S.D. Myers) alkoxide-type treatment and the Base Catalyzed Dechlorination (BCD) process are both suitable for dilute PCB-in-oil solutions, are relocatable, and are relatively low in capital cost;
- c) A dechlorination process can treat medium PCBs concentrations. The resulting oil can then be locally incinerated in local rotary cement kilns provided they are equipped with pollution control facilities and pollution monitoring devices (e.g. for PCDD/PCDF);
- d) For low concentrations, incineration in local rotary cement kilns is feasible provided they are equipped with pollution control facilities and pollution monitoring devices (e.g. for PCDD/PCDF);
- e) Establishing effective monitoring schemes for PCDD/PCDF releases; and
- f) Establishing well designed disposal facilities for ashes.

#### ***4.6.4.6 Programmes for Development and Dissemination of Information***

The action plan provides for identification of training needs, development and implementation of several training programmes e.g. for researchers, disposal facility operators, for monitoring, etc.

The policy, procedures, regulations and guidelines will also provide regulatory and voluntary mechanism for reporting and reconciling data on use of products/equipment containing PCBs and waste stockpiles.

#### **4.6.5 Implementation of the Action Plan**

The Action Plan has been developed to address gaps and deficiencies identified and highlighted by the POPs inventory results. The work plan for implementation of the Action Plan is provided on Tables 4.10 to 4.14.

**Table 4.10:** Actions to promote disposal of PCBs oil and waste containing PCBs

Action	Expected Output	Indicators	Time Frame	Resources US \$	Responsibility	Comments/Constraints
<b>Disposal Objective 1: Put in place storage facilities for PCBs and PCB contaminated waste by 2010</b>						
Develop and implement guidelines on storage of stockpiles, products and articles in use and waste consisting of or containing or contaminated with PCBs. It involves consultancy and technical meetings	Storage infrastructure improved	Guidelines in place	2007	20,000	Depts of Env. GCLA, CPE, TANESCO, SFPC, NEMC	Local and External funding
Set up 6 zonal storage facilities		Storage facilities in place	2007 – 2009	600,000	Depts of Env., TANESCO, SFPC, GCLA, UDMS	Local and External funding
Decommission equipment containing PCB that are not in use or those with concentration above 50 ppm located in areas which are associated with production or processing of food or feed or those leaking and cannot be remedied	Improved waste management	Number of decommissioned equipment	2007 -2010			
<b>Disposal Objective 2: Institute safe transportation practices for PCBs and PCBs contaminated waste by 2007</b>						
Develop and implement guidelines for transporting PCBs and PCBs contaminated wastes	Capacity to implement Action plan enhanced	Guidelines in place	2006 – 2007	10,000	GCLA, DoE-Zanzibar, NEMC, TANESCO, SFPC, POPs Technical Committee	External funding

Action	Expected Output	Indicators	Time Frame	Resources US \$	Responsibility	Comments/Constraints
Conduct 1 training session annually for 40 people (Environmental Inspectors, Traffic Police, Local Government Authority, and other licensing agencies) on PCBs transport requirements		Training material, number of trained personnel	2006 – 2008	30,000	Depts of EnvZanzibar, GCLA, UDSM, POPs Technical Committee, TANESCO, SFPC, private companies	Local and external funding

Action	Expected Output	Indicators	Time Frame	Resources US \$	Responsibility	Comments/Constraints
<b>Disposal Objective 3: Set up disposal facilities and operationalize disposal of PCB wastes and contaminated materials by 2010</b>						
Develop and implement guidelines for operating a PCBs treatment/disposal facility	Disposal infrastructure improved	Guidelines in place	2006 – 2008	15,000	Depts of Env, GCLA, UDSM, NEMC	Local and external funding
Evaluate available PCBs treatment process technologies to establish feasible options		Reports in place	2007– 2008	5,000	Depts of Env, GCLA, UDSM, POPs Technical Committee	Local funding
Procure and install suitable PCBs treatment plant		Mobile treatment plant in place	2008– 2010	800,000	Depts of Env, TANESCO, SFPC	<ul style="list-style-type: none"> <li>• Cost will depend on selected technology</li> <li>• External funding</li> </ul>
Develop and implement PCBs Disposal reporting requirements		Reporting format and actual reports	2007 – 2008	2,000	Depts of Env, GCLA, UDSM, TANESCO, SFPC	Local funding

Execute field operations which include preparation of work plan, inventory verification, organisation of stakeholders meetings; collection, transportation and disposal of PCBs oils and contaminated materials	Disposal of oils and waste containing PCB accomplished	Field operation reports	2007 - 2010	2,000,000*		Local and external funding
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\* Actual cost will depend on amount of oil and equipment to be disposed of and actual costs of disposal operations

**Table 4.11: Actions to Enhance Monitoring of PCBs Releases**

Action	Expected Output	Indicators	Time Frame	Resources	Responsibility	Comments/Constraints
<b>Monitoring Objective: Establish monitoring schemes for PCBs releases and impacts by 2012</b>						
Provide test methods for PCBs testing	- Capacity to test and monitor PCBs in place	Standard testing methods in place	2006		TBS, Depts of Env, GCLA, UDSM, UCLAS, NEMC Government Chemist Laboratory –Zanz, Poison Centres	
Provide facilities for PCBs monitoring and human health surveillance.	- Status of PCB known	Monitoring facilities in place	2008-2010	150,000	Depts of Env, MoH, UDSM UCLAS, Poison Centres	Local and external funding
Accredit selected laboratories that have the capacity to undertake PCBs testing		Accreditation certificate for selected labs	2007 – 2009	150,000	TBS, Depts of Env, GCLA, UDSM, UCLAS, Government Chemist Laboratory – Zanz, Poison Centres	Local and external funding
Train laboratory staff to perform PCBs testing and analysis		Number of trained personnel	2008 – 2010	150,000	Chemistry Department – UDSM, DoE, GCLA, UDSM, Government Chemist Laboratory – Zanz, Poison Centres	Local and external funding

Action	Expected Output	Indicators	Time Frame	Resources	Responsibility	Comments/Constraints
Carry out periodic survey of equipment containing PCBs and PCBs contaminated sites		PCBs contaminated sites register in place	2007-2011	20,000	Depts of Env. <b>TANESCO, SFPC, NEMC, GCLA, UDSM</b>	Local and external funding
Carry out risk assessment of 33 sites contaminated with PCBs involving sample collection and analysis and consultancy	- Risks identified - Measures to reduce risks identified	Risk assessment reports	2008 - 2010	500,000	<b>NEMC, Ministry of Health, DoE, UDSM, MEM, TANESCO, SFPC</b>	Local and external funding
Maintain an updated register of sites contaminated with PCBs	Availability of information on contaminated sites	Contaminated sites register in place	2006-2007		<b>NEMC, Ministry of Health, DoE, UDSM, UCLAS, MEM, TANESCO, SFPC</b>	
Develop and implement guidelines regarding information requirements to be provided by owners of equipment containing PCB for assessment of effects to human health	Capacity to respond to PCBs poisoning enhanced	Guidelines in place	2010 – 2011	10,000	MoH, Depts of Env., <b>NEMC, UDSM, OSHA, DoE-Zanzibar</b>	Local funding
Develop and implement strategies for risk management involving identification of appropriate land use plans and delivery of alternative public services		Strategies in place	2008-2010	50,000	<b>NEMC, NLUC, sector ministries, UDSM, UCLAS, GCLA</b>	<ul style="list-style-type: none"> <li>• Actual cost depends on level of contamination and availability of feasible management options</li> <li>• Local and external funding</li> </ul>

Action	Expected Output	Indicators	Time Frame	Resources	Responsibility	Comments/Constraints
Establish and maintain a chemical hazard information database that is accessible by occupational health centres and emergency responders	Capacity to respond to PCBs poisoning enhanced	Database in place	2010 – 2011	10,000	Depts of Env, GCLA, UDSM, OSHA	Local funding

**Table 4.12:** Actions to promote awareness and training on hazards and management of PCBs

Action	Expected Output	Indicators	Time Frame	Resources US \$	Responsibility	Comments/Constraints
<b>Awareness Raising Objective: Update existing training and awareness programmes by 2009</b>						
Revise the awareness programmes implemented by relevant organizations so as to include management of PCBs and contaminated sites	Awareness on PCBs raised	Revised awareness programmes	2007 – 2008	17,000	NEMC, NGOs, Depts of Env. POPs Technical Committee, TANESCO, SFPC	Local and external funding
Conduct awareness raising activities on PCBs and roles of various actors such as owners of equipment, public, regulators and media		Awareness programme and implementation reports	2007	75,000	NEMC, Depts of Env., NGOs, POPs technical Committee, Training Institutions	Local and external funding
Develop and incorporate management of PCBs and contaminated sites awareness module into educational curricula	Knowledge on PCBs disseminated	Education curricula that contain management of contaminated sites Components	2008 – 2009	50,000	NGOs, NEMC, DoE-Zanzibar, Sector ministries, GCLA, POPs Technical Committee	Local and external funding

**Table 4.13:** Actions for strengthening management of PCBs

Action	Expected Output	Indicators	Time Frame	Resources USD	Responsibility	Comments/Constraints
<b>Institutional Objective 1: Strengthen management of fluids and equipment containing PCBs by 2011</b>						
Strengthen database management at respective organizations including owners of PCBs containing equipment which involves data collection, analysis and storage	Strengthen PCB reduction measures	Data base	2007	20,000	Depts of Env., UDSM, <b>GCLA</b> , NEMC, MEM, <b>TANESCO</b> , <b>SFPC</b> , private companies	Local and external funding
Provide workers with appropriate protective gears and	Reduce health risks	Number of Protective gears	2006	5,000	<b>TANESCO</b> , <b>SFPC</b> , Depts of Env, <b>GCLA</b> , UDSM	Local funding
Develop and implement code of conduct on handling of fluids and equipment containing PCBs, it involves consultancy and technical meetings	Enhanced capacity to manage equipment containing PCBs	Code of Conduct	2007	20,000	<b>TANESCO</b> , MEM, <b>SFPC</b> , Depts of Env., <b>GCLA</b> , OSHA, Government Chemist Laboratory – Zanz.	Local and external funding
Posting warning signs on the contaminated equipment and on sites		Warning signs in place	2006-2007	10,000	Depts of Env, <b>GCLA</b> , NEMC, OSHA <b>MEM TANESCO</b> , <b>SFPC</b> , Private companies	Local funding
Develop and implement comprehensive investment programme to replace PCBs containing oils and equipment in use and purchase retrofilling equipment for PCB oils		Investment programme in place and Progress reports	2007- 2011	5,000,000*	<b>Depts of Env</b> , MEM, <b>TANESCO</b> , <b>SFPC</b> , private companies	<ul style="list-style-type: none"> <li>Local and external funding</li> <li>Actual value depends on the number of units and size of equipment</li> </ul>
Establish reporting requirements for releases from equipment containing PCBs to track movement of such equipment	Enhanced information generation	Reporting format and actual reports	2006 – 2007	5,000	<b>Depts of Env</b> , <b>GCLA</b> , MEM, MIT, NEMC, <b>TANESCO</b> , <b>SFPC</b> , Private companies	Local funding

Action	Expected Output	Indicators	Time Frame	Resources USD	Responsibility	Comments/Constraints
Develop and implement voluntary agreements (Covenants)	Voluntary compliance	MoU	2007 – 2008	5,000	Depts of Env, MEM, TANESCO, SFPC, Private companies	Local funding
<b>Institutional Objective 2: Promote health surveillance of workers by 2008</b>						
Promote epidemiological survey of workers with regular contact with PCB oils, contaminated equipment or waste	Workers health monitored	No. of workers examined	2007- 2008	200,000	OSHA, TANESCO, SFPC, GCLA, Depts of Env, Government Chemist Laboratory – Zanz, Insurance Companies	Local and external funding
Promote health insurance package in all organization owning equipment and oil with PCB		Health insurance in place	2007-2008	5,000		Local funding
<b>Institutional Objective 3: Strengthen local research capacity on disposal and remediation technologies by 2012</b>						
Initiate local research for remediation and disposal technologies	Generation of feasible technological options	Number of research carried out	2008 - 2011	150,000	COSTECH, UCLAS, NEMC, Depts of Env., MSTHE, UDSM	Local funding and external funding
Promote adoption of feasible options it involves technical meetings and dissemination of findings	Enhanced capacity	Implementation reports	2011 - 2012	20,000		Local funding and external funding

\*The actual cost will be based on the feasibility study

**Table 4.14:** Actions for improvement of PCBs database by 2010

Action	Expected Output	Indicators	Time Frame	Resources	Responsibility	Comments/Constraints
<b>PCB Inventory Objective 1: Refine previous inventory data on PCBs by 2010</b>						
Review existing inventory findings to incorporate data from unsurveyed areas	To establish impact of Action plan	Inventory reports	2009-2010	50,000	Depts of Env., GCLA, UDSM, TANESCO, State	Local and external funding

<b>Action</b>	<b>Expected Output</b>	<b>Indicators</b>	<b>Time Frame</b>	<b>Resources</b>	<b>Responsibility</b>	<b>Comments/Constraints</b>
	implementation				Fuel and Power Corporation	
Carry out analysis of the samples to verify suspected equipment and classify and label equipment according to concentration levels	Status of PCB contamination levels	Analysis report	2006-2009	80,000	<b>Depts of Env., GCLA, UDSM, TANESCO, State Fuel and Power Corporation</b>	Local and External funding
			<b>Total</b>	<b>10,234,000</b>		

## **4.6.6 Key Investment Requirements**

The investment projects developed are in line with the management options that have been identified and fall under the following categories:

- a) Setting up of safe collection and storage facilities;
- b) Acquiring transport facilities for transporting PCBs to the safe storage facilities;
- c) Establishing safe treatment or destruction and disposal facilities;
- d) Setting up monitoring schemes;
- e) Replacement of PCBs equipment which have reached the end of their life; and
- f) Setting up special retrofilling equipment.

### ***4.6.6.1 Safe Collection and Storage facilities***

It is proposed that safe storage centers be set up/established. These will receive and consolidate wastes from all districts before being sent for final destruction.

### ***4.6.6.2 Transport facilities***

Special containerized transport facilities will be required for collecting wastes at storage sites and for transporting the waste to final destruction facilities.

### ***4.6.6.3 Treatment, Destruction and Disposal facilities***

There are several proven disposal options and some emerging technologies for treatment and/or disposal of PCBs. Several proven/commercial technologies for the destruction of PCBs are summarized in Annex III. Some emerging technologies that have yet to be commercialized are also presented in Annex III.

For the purpose of implementation of the action plan it is proposed that:

- a) High temperature incineration using local rotary kilns in cement plants be used for final destruction of low and medium concentration PCBs;
- b) The Base Catalyzed Dechlorination (BCD) process be used for treatment of medium concentration PCBs prior to destruction by incineration in local cement kilns;
- c) Bioremediation be used for remote contaminated sites; and
- d) The indirect thermal desorption process can be used contaminated sites near sensitive areas.

**Table 4.15:** Cost estimates for key investments in management of PCBs

	<b>Item</b>	<b>Unit Cost US\$</b>
1.	Procure mobile PCBs treatment plant	800,000
2.	Set up storage facilities	600,000
3.	Upgrade facilities for PCB monitoring and human health surveillance in 3 laboratories and accreditation of selected laboratories	300,000
4.	Assessment of human and biota impact	700,000
5.	Facilities and operational capability for disposal, collection and transportation of PCB oil and contaminated waste	2,000,000
6.	Replacement of PCBs containing oils and equipment	5,000,000
	<b>Grand Total</b>	<b>9,400,000</b>

#### **4.6.7 Costs and Financing of the Action Plan Implementation**

The cost of financing the Action Plan Implementation is estimated to be **US\$ 10,234,000** over a period of 2006 to 2011. This cost, however, does not include operating cost of treatment or disposal/destruction facility acquired. Funds will be diversely sourced internally and externally.

## **4.7 ACTION PLAN FOR PRODUCTION, USE, STOCKPILES AND WASTES OF DDT - ANNEX B CHEMICALS**

### **4.7.1 Objectives and Priorities of Action Plan**

The goal of the action plan is to eliminate release of DDT to the environment, hence safeguarding human health and environment from its adverse effects.

The Action Plan addresses the gaps and deficiencies identified in the preliminary inventory of DDT in Tanzania, in order to comply with the Stockholm Convention requirements in DDT management. The Plan defines objectives, time bound activities and the required resources. The Plan comprises the following typical elements of DDT management:- legislation, clean up and disposal of obsolete DDT stockpiles, capacity building and management of contaminated sites. The Plan also recognizes the compliance and enforcement requirements of the Rotterdam Convention.

#### **4.7.1.1 Overall Objectives**

The overall objectives of this Action Plan are:-

- i) To build national capacities in DDT management in terms of manpower and infrastructure;
- ii) To raise awareness to stakeholders on DDT;
- iii) To minimize risks on environment and human health from DDT;
- iv) To promote environmentally sound technology for disposal of DDT wastes;
- v) To promote DDT networking;
- vi) To strengthen legal framework and enforcement mechanisms;
- vii) To promote research and development of alternatives to DDT; and
- viii) To develop mechanisms for promoting management of stockpiles of DDT and contaminated sites.

The overall objectives provide basis for identifying/formulating specific objectives and actions consistent with article 3 and 6 of the Stockholm Convention as well as articles 5, 6 and 10 of the Rotterdam Convention; necessary for strengthening management and control of DDT use in the course of implementation of the Action Plan.

#### **4.7.1.2 Constraints**

By comparing the baseline situation as revealed in the inventory with the Convention requirements and available legislation, the major constraints are:

- i) Inadequate legal provision to control production, importation, use and screening
- ii) Unconfirmed requirements for the quantities to be used

- iii) Inadequate specialized skills, scarce financial resources and lack of working tools
- iv) Inadequate storage facilities
- v) Lack of sound disposal means
- vi) Continuous leaks and spills into the environment
- vii) Lack of public awareness on health and the environmental risks associated with exposure to obsolete DDT
- viii) No studies on environment and human health effects
- ix) Inadequate collaboration and coordination on information exchange and data keeping
- x) Poor documentation of data
- xi) Lack of resources to ascertain suitability of alternatives and risks to human health and the environment
- xii) Lack of sustainable funding mechanism

#### **4.7.1.3 Prioritization**

The identified issues for action ranked in order of priority, are as follows: -

- i) Development of mechanisms to promote proper management of stockpiles of DDT, wastes and contaminated sites;
- ii) Strengthening capacity in DDT management in terms of manpower and infrastructure;
- iii) Development of programs to promote research and use of alternatives to DDT;
- iv) Developing monitoring programs of DDT impacts to human health and the environment;
- v) Strengthening legislation enforcement mechanisms;
- vi) Establishing environmentally sound technologies to manage DDT wastes;
- vii) Enhancing levels of awareness on risks of DDT;
- viii) Reviewing legislation and guidelines for DDT management; and
- ix) Strengthening international co-operation on exchange of technical information to improve scientific knowledge and skills in DDT management.

## **4.7.2 Summary of DDT Production, Uses, Stockpiles, Wastes and Contaminated Sites**

### **4.7.2.1 Results of DDT Inventory**

DDT was registered and used in the past for the control of insect pests in agriculture and against malaria causing vectors. At present DDT is not registered and does not appear in the list of registered pesticides in Tanzania. Due to poor documentation by private owners and the Ministry of Agriculture and Food Security it was not possible to establish the quantities. Estimated figures of DDT use in maize and tobacco cultivation derived based

on application rate and size of farms from 1980 to 1990 shows that a total of 87,788 MT was used. DDT is no longer used in agriculture since 1997. It has been used for malaria and plague epidemics control only until 1980's. About 170,500kg of obsolete stock of DDT was registered in Mainland Tanzania and 150kg of DDT in Zanzibar. Alternatives of DDT for agriculture and malaria control are available. These include IPM and IVM techniques, carbamates (carbaryl), pyrethroids (Permethrin, Cypermethrin), natural pyrethrums and some organophosphates like fenitrothions. Detailed assessment on their efficacy, toxicity, affordability and acceptability is needed.

#### ***4.7.2.2 Main findings on Contaminated Sites***

The DDT contaminated sites identified were in Korogwe (Tanga region), Vikuge (Coast region), Babati (Manyara region) and Morogoro (Morogoro region). The contaminated sites have DDT stocks buried in pits or not properly sheltered. In some storage facilities consignments are stored close to water sources, which pose additional risk to a wider area. Most of these sites are not stabilized thus pose risks to human health, water and other ecological systems. There is lack of well-defined and coordinated programs on search for alternatives. The introduction and subsequent implementation of alternatives is constrained by lack of funds. The expected plan for phasing out DDT includes assessment of suitability, cost effectiveness and availability of alternatives.

#### **4.7.3 DDT Related Health and Environmental Situation**

The Ministry of Health plans to use DDT for indoor application under restricted use for control of malaria and plague vectors in areas prone to epidemics. Currently there are 25 districts prone to malaria epidemics in Tanzania. There are ongoing researches on alternatives to DDT for control of disease vectors, which among others focus on application of IPM and IVM methods. No detailed studies have been conducted to ascertain the extent and magnitude of contamination in areas heavily contaminated with DDT. The risk assessment to determine health and environmental impacts has not been done. These studies are critical.

#### **4.7.4 The Proposed Regulatory Strengthening Measures for DDT**

##### ***4.7.4.1 Legislation/regulations on Managing DDT and DDT Wastes***

There is an ongoing review of Plant Protection Act (1997) and its Regulations (1999) to strengthen enforcement mechanisms to ensure proper management of DDT including elaboration of responsibility and liability on wastes and their contaminated sites. Other measures include strengthening of importation monitoring by the relevant institutions to prevent unnecessary stockpiling of DDT, which are imported through donations or other arrangements. Formulation of guidelines for the management of DDT and their wastes and creation of awareness on DDT effects and the government interventions on elimination of DDT are important.

It is further proposed that provisions on the control and management of public health pesticides particularly DDT be adequately stipulated in Plant Protection Act (1997) and Public Health Act under formulation.

#### ***4.7.4.2 Strengthening of International Regulations on Pesticides***

The Government has ratified the related conventions that ensure support on management of pesticides to safeguarding human health and environment. These include Basel Convention and Rotterdam Convention. Of recent the government has also ratified the Stockholm Convention. The government is committed to meet its obligations under these Conventions. For effective implementation it will seek technical and financial support from development partners. It will also seek to strengthen cooperation with other developing countries in order to share information and experiences.

#### ***4.7.4.3 Regulations on Non-ownership of Stockpiles.***

It is proposed that in the review of the Plant Protection Act (1997) and the Plant Protection Regulation (1999) and other the related acts, should assign responsibilities of managing stockpiles should be assigned to the owner or owner's local representative/agent. The PP Regulations (1999) is subject for review to incorporate the liabilities on clean up of contaminated sites.

### **4.7.5 Operational measures for Future DDT Storage, Handling, Use, Reduction and Disposal**

The operational measures for future DDT storage, handling, use and disposal should adhere to legislative system and proposed guidelines hereunder.

#### ***4.7.5.1 DDT Handling, Storing and Disposal (Institutional and Regulatory Assessment)***

The Plant Protection Act (1997) and Plant Protection Regulations (1999) regulate DDT as a plant protection substance. Although it is no longer used in agriculture the legislation stipulates requirements for registration, manufacturing/formulation, importation, sale, use, transportation and disposal of pesticides wastes and their empty containers. The power to implement the legislation has been vested to the Tropical Pesticides Research Institute (TPRI) and the Plant Health Services (PHS) and Plant Protection Division of Tanzania Mainland and Zanzibar respectively. Pesticides handlers and sellers are assessed for their competence and conditions of the premises for keeping and handling pesticides. The Industrial and Consumer Chemicals Act (2003) stipulates similar requirements for DDT.

#### ***4.7.5.2 Permit Systems***

The permit issuance is among the measures geared to sound management of DDT. Permits should be issued after complying with the requirements set out in the existing

legislation. At present DDT is a non registered product, hence no permit is issued for DDT transportation, handling, storage and disposal. DDT has not been used for agriculture for the past 7 years while for malaria and plague control it has not been used since 1980's. Due to growing incidences of malaria Tanzania plans to reintroduce DDT in public health under restricted conditions as per Stockholm Convention requirements. Permit system would be instituted as follows:

**a) Permit for Handling and Storage**

There is no permit for DDT because it is a non-registered product. Section 23 of the PP Regulations (1999) provides conditions for permit issued for pesticides storage and handling. The conditions/requirements include provision of adequate equipment and facilities to minimize hazards to human, animals and the environment; need to preserve the original properties of the pesticides; use of protective gear/equipment; storekeeping and requirement to have qualified and experienced technical personnel in the handling of pesticides. Special permit system for DDT needs to be instituted.

**b) Permit for Transport**

According to Section 35(2)) of PP Regulations of 1999 pesticides should be transported in such a way that cannot easily get into contact with feed or foodstuffs. However, additional requirements for DDT transportation and escort need to be incorporated as prerequisite for issuing of permit. Also collaboration amongst relevant ministries needs strengthening. Provisions to require issuance of transport permit by the Registrar of Pesticides prior to transportation of DDT need to be incorporated in the regulations.

**c) Permit for Disposal**

According to the PP Regulations (1999) the Competent Authority is responsible for authorization of disposal of unwanted pesticides and empty pesticides containers. It is required however; prior to the issuance of the disposal permit, the applicant should lodge a formal request indicating type(s), amount and other necessary details. At present the procedure is not operational due to lack of disposal facility for pesticides wastes. Technical guidelines on this matter are lacking hence need to be developed to operationalize the permit system. Issuance of a disposal permit for DDT waste shall be done in consultation with the Minister responsible for Environment.

**4.7.5.3 Voluntary Agreements with Companies or Industry Groups**

DDT use will be restricted to public health only, particularly for malaria control in case of epidemics. Importation, handling, and use will be under the custody of Ministry of Health and Ministry of Agriculture and Food Security. Implementation of relevant regional agreements and international Conventions would guide policy and legislative review to ensure safe transportation, handling and disposal of obsolete wastes.

**4.7.5.4 Application of Guidelines**

Guidelines on management of DDT shall be formulated and disseminated to all stakeholders. It is recommended that all pesticide handlers/dealers should conform to the

proposed guidelines on matters related to identification, decontamination, handling and storage, transportation and disposal of DDT, as follows:

**a) Guidelines for Identification**

DDT as a plant protection substance is banned for use in agriculture. It can be used for public health purposes. The competent authority involving all stakeholders should formulate guidelines for identification of DDT formulations, undeclared ingredients, adjuvant and solvents. The guidelines must provide for the required specialized skills and appropriate analytical equipment.

**b) Guidelines for Decontamination**

The PP Regulations (1999) provides for prompt clean up and decontamination of pesticides contaminated store. However, procedural guidelines for safe decontamination are not in place. It is recommended that the Ministry responsible for Environment should formulate guidelines for decontamination.

**c) Guidelines for Handling and Storage**

Requirement for safe handling and storage of DDT is stipulated in Sections 23, 31(2) and (3) and 35 of the PP Regulations (1999). However, guidelines to meet these requirements are not in place. It is recommended that MOH in collaboration with TPRI and the ministry responsible for Agriculture should formulate guidelines on DDT handling and storage in line with the WHO Guidelines on the use of DDT.

**d) Guidelines for Transport**

Section 35(2) of the PP Regulations (1999) requires safe transport of pesticides; DDT included avoiding contamination of un-intended objects. However there are no guidelines to effect this requirement. The ministry responsible for agriculture in collaboration with relevant stakeholders should formulate guidelines to operationalize the provisions. These must include qualification of pesticide: transporters and drivers as relates to the mode of transportation, packaging, escort and emergency preparedness.

**e) Guidelines for Disposal**

The disposal of any pesticides is done in accordance with Section 37 of the PP Regulations (1999). The ministry responsible for environment in collaboration with relevant actors should develop guidelines on sound disposal of DDT and empty containers. The guidelines must include procedures for Risk Assessment, Risk Management and incorporation of recommended BATs and BEPs.

**4.7.5.5 *Plans for Final Treatment and Disposal of DDT and Clean up of Contaminated Sites***

Comprehensive assessment of sites contaminated with DDT is critical. This will form a solid base for the establishment of a sound-monitoring scheme. No assessment was done during this inventory to determine the extent of contamination; hence categorization of affected sites was based on visual assessment only. An integrated plan for disposal of

obsolete DDT is important in ensuring coordination of efforts and sharing of experiences among stakeholders.

**a) Plan for Final Disposal of DDT**

The procedures for final disposal of DDT will include verification of baseline inventory data, collection and transportation, shipping and disposal. In disposal operations the process is bound to comply with national legislation as well as international conventions for labeling and transportation of hazardous chemicals. Since DDT will be used in public health activities it is expected that wastes will be generated. A disposal plan will be formulated in conformity with NIP implementation. The current stockpiles will be handled under the umbrella of Africa Stockpiles Programme (ASP). The ASP aims at clearing stockpiles of obsolete pesticides through exportation to countries that have sound disposal facilities. The programme is set to begin early 2006.

The **disposal plan** shall abide to the following key steps:

- Undertaking of inventory to confirm baseline information in terms of identity and quantity;
- Preparation of a final detailed work plan for disposal operations; and
- Executing field operations which include collection, transportation and disposal of POP Pesticides

The plan for disposal shall be executed under the coordination of the Ministry responsible for Environment.

**b) Plan for Treatment of Contaminated Sites**

Plans have to be developed during NIP implementation. At present there are no legal provisions for registration of DDT contaminated sites. The actual number of DDT contaminated sites is not known. The plan for treatment of contaminated sites include identification of sites, undertaking of impact assessment, identification of technically competent and experienced firm for treatment processes and executing field operations and monitoring levels of contaminants and their effects. The cost effective, efficient and affordable treatment method will be established and employed. Different management options will be assessed based on the level of contamination and decontamination technology.

**4.7.5.6 Programs for Development of Substitutes and their Uses**

Programs for development of substitutes to DDT and dissemination of outreach information on the feasible substitutes need to contain the following main elements:-

- Tests for effectiveness and ascertaining sustainability and desirable properties
- Determination of acceptability and social-economic perceiveness
- Risk Assessment for the substitutes
- Preparation of Awareness raising materials
- Registration of feasible substitutes to promote their adoption.

#### ***4.7.5.7 Programs for Dissemination of Information on Substitutes and their Uses***

Research finding on alternatives shall be disseminated through extension services and information packages such as newsletters, brochures, leaflets, radio and TV programmes. The information may also be disseminated through drama and road shows, Internet, institutional libraries and other community-based information centers

#### ***4.7.5.8 Monitoring of Adverse Effects of DDT to Humans and the Environment***

Specific activities on monitoring effects of DDT to human and environment will be undertaken to generate first hand information and track changes. Monitoring will involve a wide range of experts drawn from key stakeholders.

### **4.7.6 Implementation of the Action Plan**

#### ***4.7.6.1 Strategies of Action Plan***

The strategies for the reduction of releases of DDT include:

- a) Development of the Management Plan for DDT
- b) Indoor spray for malaria control; and
- c) Promotion of alternative substances and methodologies such as IVM.

#### ***4.7.6.2 Organization***

The Ministry of Health will lead in management of DDT for public health purposes in collaboration with stakeholders involved in researches for alternative and dissemination of information. Appropriate information dissemination mechanisms need to be developed. These institutions include NEMC, NIMR, NMCP and TPRI. Non-governmental and private organizations will be involved in implementation of specific activities and projects.

#### ***4.7.6.3 Work Plan and Schedule***

The work plan for implementation of the Action Plan is provided on Tables 4.16 to 4.18. A number of assumptions were derived to facilitate the anticipated outcomes. These include:

- Availability of sufficient resources internally and externally for implementation of activities; and
- Existence of political stability and committed government support for implementation of Action Plan in Tanzania and among stakeholders.

**Table 4.16:** Actions to strengthen legislation

Action	Expected Output	Indicators	Time Frame	Resources US \$	Responsibility	Comments/Constraints
<b>Legislation objective: To review legislation on DDT management and strengthen enforcement by 2009</b>						
Review existing legislation to ensure that DDT use is restricted to disease vector control and incorporate provision on DDT management (importation, storage, use and waste disposal, identification of undeclared ingredients, screening of pesticides, risk assessment and management, responsibility and liability of owner of wastes and sites contaminated with DDT)	Legislation reviewed and updated	Copies of reviewed version in 3 years	2006-2007	100,000	<b>Depts of Env, MAFS, MoH, NEMC, GCLA</b>	Local funding
Disseminate the popular version of the laws			2008 - 2009	15,000	<b>Sector ministries, Depts of Env.</b>	
Strengthen DDT inspection mechanism involving preparation and dissemination of inspection guidelines and procedures, Provision of inspection tools, site visits and demonstrations	Enforcement mechanism strengthened	- Copies of inspection guidelines - Records of inspection reports on compliance	2007 - 2009	470,000	Depts of Env, MAFS, <b>MoH</b> , NEMC, GCLA	<ul style="list-style-type: none"> <li>• Value depends on cost of inspection tool</li> <li>• Local and external funding</li> </ul>

**Table 4.17:** Actions to promote clean up and disposal of obsolete DDT stockpiles

Action		Indicators	Time Frame	Resources US \$		Comments/Constraints
<b>Clean Up Objective: To operationalize disposal of DDT wastes and contaminated materials by 2016</b>						
Carry out researches on low cost methods of disposal	Environment ally sound disposal technologies in place	Research finding reports	2006+	67,500	Depts of Env, <b>NEMC</b> , TPRI, <b>MOH</b> , MoCT GCLA, OSHA	Local and external funding
Update inventory information on DDT in terms of identity and quantity		Inventory reports	2010-2011			
Execute field operations which include collection, transportation and disposal of obsolete stocks of DDT and contaminated materials		Reports of the quantities collected	2012-2016			

**Table 4.18:** Actions to build capacity in implementation of Stockholm and Rotterdam Conventions with regard to DDT management and control

Action	Expected Output	Indicators	Time Frame	Resources	Responsibility	Comments/Constraints
<b>Capacity building Objective 1: To provide specialized skills on key staff by 2012</b>						

<b>Action</b>	<b>Expected Output</b>	<b>Indicators</b>	<b>Time Frame</b>	<b>Resources</b>	<b>Responsibility</b>	<b>Comments/Constraints</b>
Conduct 1 training session annually of key staff (inspectors, customs officers, extension services, storekeepers) on identification of POPs characteristics, management of stockpiles and contaminated sites and proper storage	Capacity in human on DDT management built	-Training reports -No of Staff trained	2006-2008	30,000	Depts of Env., NEMC, TPRI, PHS, GCLA, OSHA, <b>MoH</b>	Local and external funding
Conduct 1 training session annually for 40 staff (Environmental, public health, Occupational health and safety officers, academic and research institutions) on risk assessment and management	Capacity on risk assessment and management built	-Training reports -No of Staff trained	2007 - 2009	30,000	Depts of Env., NEMC, TPRI, PHS, <b>GCLA</b> , OSHA, <b>UDSM</b> , UCLAS	Local and external funding
Formulate guidelines on risk assessment and management involving consultancy and technical meetings		Guidelines	2006-2007	30,000	Depts of Env., <b>NEMC, MOH</b> , TPRI, PHS, GCLA, OSHA	Local and external funding
Carry out risk assessment of DDT to human and environment involving consultancy, collection of samples and analysis		Implementation reports	2008-2012	400,000	Depts of Env., <b>NEMC, MOH</b> , TPRI, GCLA, OSHA	External funding
<b>Capacity Building Objective 2: To develop management plan for DDT by 2011</b>						
Establish lacking facilities and upgrade existing 26 storage facilities in epidemic zones involving, identification of needs and training staff on proper utilization,	Enhanced capacity in management of DDT	Record of facilities in 3 years	2008-2011	1,500, 000		Local and external funding

Action	Expected Output	Indicators	Time Frame	Resources	Responsibility	Comments/Constraints
Develop and disseminate guidelines on DDT handling, storage and disposal; involving consultancy and technical meetings		Guideline booklets available in 4 years	2007 - 2008	30,000	Depts of Env., NEMC, PHS, TPRI, MoH	Local and external funding
<b>Capacity Building Objective 3: To promote use of DDT substitutes and alternative techniques by 2011</b>						
Search and disseminate feasible alternatives for DDT	Alternatives of DDT operationalised	Implementation reports	2006+	1,500,000	MOH, TPRI, NEMC, NIMR, Depts. of Environment	Local and external funding
Measure the acceptability and socio-economic perceiveness		Increased demand	2007 - 2009	200,000		Local and external funding
Conduct Risk Assessment of alternatives and assess the need for continued use of DDT in Vector control	Protection of human health and environment	Risk assessment reports	2007-2011	600,000		Local and external funding
Prepare guidelines on use of alternatives		DDT needs assessment report				Guidelines
Conduct awareness raising activities on alternatives in 8 districts annually involving seminars, workshops and demonstrations for 3 years	Operationalisation of alternatives	Awareness programme and implementation reports	2007 - 2009	60,000		Local and external funding

Action	Expected Output	Indicators	Time Frame	Resources	Responsibility	Comments/Constraints
<b>Capacity Building Objective 4: To put in place monitoring schemes for DDT releases and impacts by 2011</b>						
Establish DDT monitoring schemes	Human and biota impact assessed	Monitoring schemes in place and Implementation reports	2008-2009	150,000	Depts of Env., NEMC, TPRI, PHS, GCLA, OSHA,UDSM, NGOs	External funding
Dissemination of information			2009 – 2011			Local and external funding
<b>Capacity Building Objective 5: To institute mechanism to reduce incidences of vector disease by 2011</b>						
Prepare and implement disease management strategies	Reduced vector diseases and reliance on DDT	Disease management strategy in place  Database on incidences of disease	2008-2010	230,000	MOH, NIMR, NEMC, Depts of Env. Municipal/City councils	Local and external funding
Initiate local level programmes in 10 districts in epidemic zones to address sanitation problems involving survey of sanitation profile in relation to incidences of disease vectors		Survey reports and Programmes in place	2010-2012			100,000
				<b>Total</b>	<b>5,522,500</b>	

#### ***4.7.6.4 Reporting and Monitoring***

The NIP coordination office will be responsible for the action plan implementation. Reports on monitoring operations should be available to all stakeholders and general public.

#### ***4.7.6.5 Mechanism for Review and Updating of the Action Plan***

The NIP coordination office shall review and update Action Plan in interval of every 3 years. The process for updating of Action Plan shall follow procedures indicated below;

- Review of progress reports of specific action;
- Collect and review stakeholders views through workshops, forums and targeted meetings, and project appraisals;
- Propose alterations/ changes on work plan;
- Report alterations/ changes proposal to the Steering Committee for endorsement; and
- Implement changes.

### **4.7.7 Key investments required for implementation of the action plan**

#### ***4.7.7.1 Capacity in Research on Alternatives***

The development and subsequent use of substitutes to DDT is an entry point to safeguard human health and the environment. In order for the substitutes to be operational, the following steps are recommended:

- Analyze country policies and legislation for adoption of substitutes and alternative techniques;
- Study comparative approaches for substitutes;
- Develop Action Plan for alternative of DDT;
- Initiate pilot case studies;
- Launch implementation; and
- Undertake monitoring of adverse effects on human health and environment.

#### ***4.7.7.2 Monitoring Capacity***

The monitoring capacity is important investment in implementation of the Action Plan. The capacity in monitoring should focus on tools, equipment and technology, which at present are not adequate.

**Table 4.19:** Cost estimates for key investment requirements for DDT management

	<b>Item</b>	<b>Unit Cost (US\$)</b>
1.	Research and promotion of use of feasible alternatives	2,300,000
2.	Assessment of human and biota impact	550,000
3.	Facilities and operational capability for collection, transportation storage and disposal of DDT and contaminated waste	1,567,500
	<b>Total</b>	<b>3,417,500</b>

#### **4.7.8 Costs and Financing of the Action Plan Implementation**

The cost of financing the Action Plan implementation is estimated to be **USD 5,522,500** over a period of 2005 to 2010. The funds required for implementation of activities will mainly originate from local sources as well as international funding agencies. For short term activities funds may be locally available.

### **4.8 ACTION PLAN FOR THE REDUCTION OF RELEASES FROM UNINTENTIONAL PRODUCTION OF POLYCHLORINATED DIBENZO-PARA-DIOXIN (PCDD) AND POLYCHLORINATED DIBENZOFURANS (PCDF)**

#### **4.8.1 Objectives and Priorities of Action Plan**

The goal of the Action Plan is to enhance the protection of human health and the environment by reducing or eliminating PCDD/PCDF releases.

The Action Plan provides a sound basis for managing releases of PCDD/PCDF in Tanzania. It is a framework within which stakeholders can play their appropriate roles in response to the goal of the Stockholm Convention on PCDD/PCDF, which is to eliminate or reduce to extent possible the releases of these chemicals. The Action Plan addresses gaps and deficiencies identified in the preliminary inventory of PCDD/PCDF, in Tanzania, in order to comply with the Stockholm Convention on POPs as required in Articles 5 and 7 of the Convention. The Plan defines and provides details on the following: goals, objectives, activities, responsibilities, timeframes and an indication of associated resources required for its implementation. The Plan comprises the following typical elements of chemicals management system: legislation, institutional matters, training, awareness raising and technical infrastructure.

#### **4.8.1.1 Overall Objectives**

The overall objectives of the Action Plan include:

- i) To devise an approach to provide for the elimination or where not possible reduction of PCDD and PCDF emissions by 2015;
- ii) To Ensure an integrated multi-stakeholder involvement approach which will be harmonised across the entire management cycle of PCDD and PCDF;
- iii) To provide avenue for accessing best available technologies;
- iv) To enhance availability of best environmental practices; and
- v) To promote continued alignment of *national policies and legislation* with international trends in the further development of the management of PCDD/PCDF.

The overall objective provides basis for identifying/formulating the specific objectives and actions needed to enhance reduction of PCDD/PCDF releases in the course of implementation of the Action Plan.

#### **4.8.1.2 Constraints**

By comparing the baseline situation with the Convention requirements and available legislation, the constraints are as follows;

- i) Policies and legislation do not address PCDD/PCDF issues;
- ii) Lack of national capacity in terms of personnel and infrastructure for the management of PCDD/PCDF releases;
- iii) Lack of awareness of PCDD/PCDF releases and their impacts to human health;
- iv) Lack of information that may be used to manage PCDD/PCDF releases; and
- v) Inadequate financial resources to support PCDD/PCDF management

#### **4.8.1.3 Prioritization**

The prioritization of PCDD/PCDF objectives was based on the analysis of the gaps and deficiencies as revealed by the inventory findings. Identified issues ranked in order of priority are as follows:

- (i) Establishing a coordination mechanism for management of PCDD/PCDF releases;
- (ii) Instituting mechanism for PCDD/PCDF management control;
- (iii) Promoting and encouraging adoption of BATs and BEPs;
- (iv) Promoting research on alternative materials/technologies
- (v) Formulating and implementing training programmes on PCDD/PCDF management;
- (vi) Establishing monitoring programmes on emissions of PCDD/PCDF;
- (vii) Searching and implementing practical measures to reduce or eliminate PCDD/PCDF at source;
- (viii) Assessing and effecting remedial measures/clean-up campaigns of areas suspected to be contaminated with PCDD/PCDF;

- (ix) Review of and formulation of policies /regulations on management of PCDD/PCDF inline with the Stockholm Convention;
- (x) Create public awareness on PCDD/PCDF sources and their effects on human health and the environment; and
- (xi) Carrying out further inventory in areas not covered in the previous inventory.

## 4.8.2 Current and Projected Releases of PCDD/PCDF

### 4.8.2.1 Current PCDD/PCDF Estimated Releases

During the survey, PCDD/PCDF releases data were collected for the following potential sources: Medical Waste Incineration; Iron and steel production and foundries; Fossil Fuel Power Plant; Biomass Power Plants; Household heating and cooking; Cement Production; Lime Production; Brick Production; Glass Production; Transport; and Uncontrolled combustion.

The survey established that there exist a number of potential PCDD/PCDF releases to air, water and land in Tanzania. More than 516 g TEQ/a and 248 g TEQ/a are released through air emissions and residues, respectively. More than 67.91 % of PCDD/PCDF releases in air are due to uncontrolled combustion process particularly in uncontrolled forests/grasslands/bush fires; and domestic waste burning which is the only identified activity releasing PCDD/PCDF on land. The calculation of emission is based on land area of 945,200 sq. km. (URT 2002) where wetlands cover 6 % and habitated area is 30%. The remaining 604.928 sq. km is occupied by forest (30 %) and grasslands (60 %). It is assumed that 10% of forestland is burned annually compared with 30% of annual grasslands/bush fires. Medical waste incineration processes contribute 23.4% of the emission mainly to air and negligible amount to residue. This is due to the fact that residues are estimated at 3% of total incinerated waste. Biomass power plants constitute 9.99% of the total emission to air. Table 4.20, shows a summary of releases.

**Table 4.20: Releases of PCDD/PCDF from different sources**

Category	Source categories	Annual release (g TEQ/a)				
		Air	Water	Land	Product	Residue
1	Waste Incineration	112.84	0	0	0	0.017
2	Ferrous and non-ferrous metal production	0.23	0	0	0	0.044
3	Power generation and heating	51.329098	0		0	0.306931
4	Production of Mineral Products	0.807	0	0	0	0.031009
5	Transport	0.599	0	0	0	0
6	Uncontrolled combustion processes	350.8838	0	181.443	0	248.070
7	Production of chemicals and consumer goods	0	0	0	0	0
8	Miscellaneous	0.00037	0	0	0	0
9	Disposal/land land filling	0	0	0	0	0
10	Identification of Potential Hot-Spot	NE	NE	NE	NE	NE
	<b>Total</b>	<b>516.689268</b>	<b>0</b>	<b>181.443</b>	<b>0</b>	<b>248.46894</b>

#### ***4.8.2.2 Projected PCDD/PCDF Releases***

Projection of PCDD/PCDF releases is as shown in Table 3.19. It is estimated that the releases of PCDD/PCDF would increase by 18.58% from 946.600208 (I-TEQ) (2003) to 5,675.314811 (I-TEQ) in 2030.

#### ***4.8.2.3 Future Works on Inventory***

There is need to conduct further studies to address the identified gaps and deficiencies and generate local emission factors which are relevant to national circumstances. Further, there is need to offer training to other inventory experts so as to assist in the generation of reliable baseline data.

### **4.8.3 Environmental and Health Risks Related to PCDD/PCDF**

Once released into the environment, PCDD and PCDF can be transported vast distances along air and ocean currents. Because of this globe trotting ability, PCDD and PCDF are global contaminants that can be found in the tissue, blood and breast milk of human beings in most countries of the world. In 1997, the International Agency for Research on Cancer (IARC) classified dioxin as the most toxic human carcinogens. It is associated with a wide range of other health impacts including: altered sexual development; male and female reproductive problems; suppression of the immune system; diabetes; organ toxicity; and effects on a wide range of hormones.

One of the most disturbing aspects of dioxin toxicity is the effect it can have on the developing foetus, which is far more susceptible than adults. Humans are exposed to dioxin mainly through the food chain, especially meat, fish and dairy products. Dioxin levels are generally higher in people living in industrialised countries, where they are already at - or near - the level where health effects may occur. However communities with a high fish or sea mammal diet, like the Indigenous Peoples of the Arctic, are also at a high risk from dioxin effects.

According to World Health Organisation figures, a piece of dioxin the size of a small grain of rice, if distributed equally and directly to people, is equivalent to the "allowable" yearly dose for one million people. As it travels throughout the global environment dioxin build-up - or bioaccumulates - and can take decades to break down. Dioxin dissolves easily in fats and as a result can build up in the fatty tissues of animals or humans. So animals with high fat contents, like humans, whales, polar bears or dolphins, are particularly susceptible to the build up of dioxin. As it travels up the food chain - if another animal, for instance - eats an animal with dioxin in its body tissue dioxin biomagnify, or multiply in concentration as it goes. So animals at the top of the food chain primarily - humans, polar bears and beluga whales - accumulates the highest levels of dioxin.

## 4.8.4 Measures for Reduction of PCDD/PCDF Formation and Releases

The PCDD/PCDF management comprises of both mandatory and discretionary elements i.e. legislation, institutional arrangement, training, awareness raising and technical infrastructure.

### 4.8.4.1 Policy, Legislation and Regulation Issues

Table 4.21 summarises strategies that may lead to the reduction of formation and releases of PCDD/PCDF.

**Table 4.21:** Policy and Legislative Issues

Issue	Strategy
Efficacy of existing policies and laws related to management of releases of PCDD/PCDF	Review and update policies and laws to incorporate provisions on the management of PCDD/PCDF
Test methods	<ul style="list-style-type: none"> <li>• Develop emission standards and monitoring schemes</li> <li>• Develop national emission factors</li> <li>• Develop monitoring scheme</li> <li>• Upgrade test laboratories</li> <li>• Accredite major laboratories</li> </ul>
Safety data sheets	Develop a mechanism for communication on PCDD/PCDF releases. This must be mandatory.
Overlap of jurisdiction	Streamline jurisdiction mandate of different departmental regulatory authorities to remove overlaps and duplication of activities
Incorporation of a rights-based approach	Right to know and right to clean and safe environment to be incorporated into law
Institutional co-ordination	Develop a structure for coordination
Compliance and enforcement	Strengthen enforcement agencies

### 4.8.4.2 Institutional

#### Other Institutional Issues

Several institutions have major roles to play in the management of PCDD/PCDF releases as shown in Table 4.22.

**Table 4.22:** Institutional issues to be addressed in the implementation of the Action Plan

Issue	Strategy
Capacities of existing institutional mechanisms in support of PCDD/PCDF management	<p>Strengthen</p> <ul style="list-style-type: none"> <li>• OSHA (in terms of occupational health and safety issues)</li> <li>• GCLA and some private/public labs (in terms of analytical methodologies for health related parameters)</li> <li>• OSHA and Municipal Councils (in terms of occupational health issues in the waste management)</li> <li>• DoE, NEMC, MNRT (Department of Forestry); MIT, Local Government Authorities and CPCT (in terms of mitigation of PCDD/PCDF releases and monitoring of impacts on the environment)</li> </ul>
Coordination	Establish and /or strengthen inter-ministerial technical committees, intergovernmental forum and technical committees under relevant government departments and other institutions
Co-ordination between governmental, non-governmental, business and consumer organisation	Establish mechanisms for effective co-ordination between governmental, non-governmental, business and communities and Public Interest Groups involved in raising public awareness about hazardous chemicals and environmental protection in general
Compliance and enforcement	Strengthen enforcement capabilities
Formalise and harmonise PCDD/PCDF Management information requirements	<ul style="list-style-type: none"> <li>• There is a need to make it mandatory reporting of specified information on PCDD/PCDF emissions including information for reporting to secretariat of the convention and that should be available in the public domain. Procedures for collecting storage and dissemination of information on PCDD/PCDF should be developed</li> <li>• Existing databases could either be updated and co-ordinated or one central database (one at GCLA) be upgraded and strengthened and should be accessible to all departments.</li> <li>• Government staff members will need to be capacitated to manage the database and to extract appropriate information for PCDD/PCDF Management compliance monitoring.</li> </ul>
Support for non-governmental implementing agencies	Facilitate/improvement of knowledge and skills and support NGOs activities
Emission standards	Support TBS's Technical Committees on Standards

## 4.8.5 Public Information and Awareness

### 4.8.5.1 Training and Research

The training requirements of the different target audiences include:

**Competent or Designated Authorities:** Staff members of Government Departments, who will be responsible for implementation and monitoring of the Action Plan will require training on all elements of PCDD/PCDF management and their impacts to environment and human health.

**Workplace:** Training needs to be provided on formation of PCDD/PCDF from industrial and combustion processes; and minimisation of releases through application of BATS and BEPs. Employers and workers need to know the hazards specific to the PCDD/PCDF as well as specific measures to mitigate them.

**Formal curricula:** It is necessary that training of PCDD/PCDF management to be incorporated in the formal training curricula.

**Communities and Public Interest Groups:** In most cases communities are not aware of the activities that result in PCDD/PCDF releases; and the health effects of the PCDD/PCDF. The Public interest Groups to be involved in awareness campaigns should be trained on the effects of PCDD/PCDF and measures to minimise them.

**Initiation of researches:** research programmes on PCDD/PCDF releases and their effects to human health and the environment shall be developed and implemented by the National Focal Point in collaboration with competent organizations. The research findings shall be published and disseminated for public use.

Table 4.23 summarises the recommended strategies for the training component of the Action Plan.

**Table 4.23:** Training and Research issues to be addressed by the Action Plan

Issue	Strategy
Training programmes	Develop training programmes commensurate to the needs of different target groups  Prepare tailor made short courses for practitioners
Professional development initiatives	Direct resources to support professional development programmes for workers working in PCDD/PCDF prone areas.
Research	Develop and implement research programmes on PCDD/PCDF releases, feasible alternatives and their impacts to human health.

<b>Issue</b>	<b>Strategy</b>
Capacity of NGOs that may be used in the training	Strengthen/support NGOs that are working on PCDD/PCDF issues

#### **4.8.5.2 Awareness Raising**

One key component to the successful implementation of the PCDD/PCDF management is to raise awareness of the stakeholders about the PCDD/PCDF Management and their impacts to the environment and human health and how to mitigate their releases. Appropriate awareness raising programmes, on PCDD/PCDF Management, should be implemented in all relevant sectors. This should be harmonised within the sectors and across the sectors to ensure that programmes reach all target audiences. Awareness raising programmes should also cover communities living close to the potentially emitting activities.

The strategies that are available to address the identified issues and their implications are tabulated in Table 4.24.

**Table 4.24:** Awareness raising strategies to manage PCDD/PCDF emissions

<b>Strategies</b>	<b>Implications and comments</b>
Create, Strengthen and extend existing awareness raising programmes to include PCDD/PCDF Management	<ul style="list-style-type: none"> <li>• The content of the awareness-raising programme will be dependent on the specific sector role and responsibilities. A range of mechanisms will be required to raise awareness to ensure that the information is accessible and comprehensible to all target audiences</li> <li>• Existing environmental management programmes will need to be revised to include relevant aspects of PCDD/PCDF management</li> <li>• Appropriate service providers will need to be identified to meet the increased levels of awareness required and to address all role players.</li> <li>• The effectiveness of the programmes implemented will have to be monitored and revised where necessary.</li> </ul>

<p>Establish and implement specific interventions, such as awareness raising, to assist community, shop floor stewards etc.</p>	<ul style="list-style-type: none"> <li>• Specific interventions and assistance will be required by other sectors to facilitate implementation of initiatives within the communities, especially to communities living close to contaminated sites.</li> <li>• For workers and shop floor stewards this could include introduction of hazard communication information into the educational curricula, extending chemical safety awareness programmes industry associations, labour federations, environmental organisations and CBOs.</li> </ul>
<p>Harmonise awareness raising within and along the value chain</p>	<ul style="list-style-type: none"> <li>• Mechanisms will need to be implemented to facilitate co-ordination of programmes within each sector and in the sectors along the product life cycle. This will ensure that all target audiences are addressed and where feasible co-ordinated cross-sectoral programmes are implemented.</li> </ul>

#### **4.8.6 Implementation of the Action Plan**

The Action Plan has been developed by addressing strategic initiatives such as Strengthening of Policies, legislation and institutional capacity, enhancing knowledge, skills and awareness on POPs among target groups and upgrading of technical infrastructure. Each initiative has been developed to a level of specific goals, objectives and activities. The Action Plan is provided in Tables 4.25 to 4.29.

**Table 4.25:** Actions for incorporation of PCDD/PCDF management in policies and legislation

Action	Expected Output	Indicators	Time Frame	Resources USD	Responsibility	Comments/Constraints
<b>Legislation Objective 1: Amend or promulgate Policies and legislation to ensure implementation of PCDD/PCDF Action Plan by 2009</b>						
Review relevant policies and legislation	Clear policies and legislation for effective management of PCDD/PCDF releases	Relevant provisions for management of PCDD/PCDF in relevant policies and legislation  Approved policies and enacted legislation	2006 -2009	100,000	<b>Depts of Env.,</b> Sector Ministries	<ul style="list-style-type: none"> <li>• Co-ordination between the different authorities will be necessary to ensure that the approach is comprehensive and consistent.</li> <li>• Criteria will need to be developed to ensure harmonization of laws and enhanced coordination of cross-cutting issues</li> <li>• Local and external funding</li> </ul>
<b>Legislation Objective 2: Develop national emission factors for PCDD/PCDF releases by 2012</b>						
Develop national emission factors for PCDD/PCDF releases	Improved baseline data	Emission factors approved	2009-2011	50,000	TBS, MIT, DoE, NEMC, <b>UDSM</b> UCLAS, MoH, PO-RALG and MALE	Local and external funding
Carry out periodic inventory modelling of PCDD/PCDF releases		Updated PCDD/PCDF inventory in place	2009-2012	100,000	<b>Depts of Env.,</b> TANESCO, SFPC, NEMC, UDSM, UCLAS, CPCT, MoH MIT, MNRT and Industries	Local and external funding

**Table 4.26:** Actions for incorporation of PCDD/PCDF Management Elements in Institutional Arrangements

Action	Expected Output	Indicators	Time Frame	Resources USD	Responsibility	Comments/Constraints
<b>Institutional Objective 1: Improve institutional capacity to manage PCDD/PCDF releases by 2009</b>						
Strengthen the National Coordination Unit to coordinate implementation of the Action Plan	Effective Coordination of PCDD/PDCF	National Coordination unit in place	2006-2009	100,000	Depts of Env., MAFS, MoH, NEMC, MIT, MALE, MNRT, PO-RALG, MoTC, MEM and CPCT	<ul style="list-style-type: none"> <li>• Coordination for all POPs management activities is envisaged</li> <li>• Local and external funding</li> </ul>
Establish and maintain National POPs Steering Committee and National POPs Technical Committee		Formal appointment of committee members	2006-2009	10,000		The composition of Technical Committee should be based purely on individual expertise.
Prepare implementation reports		Reports	2006-2008	20,000		Local and external funding
Review Action Plan periodically		Updated Action Plans	2009	20,000		Local funding
Review reporting procedures in line with Convention requirements	Enhanced implementation of the Convention obligations	Reporting procedures in place	2006-2007	5,000	Depts of Env., MoH, UDSM	Local funding
Mobilize appropriate budget allocation for implementation of the programme	Action plan implemented	Budget provisions	2008+	20,000	Depts of Env., PO-RALG and Sector Ministries	<ul style="list-style-type: none"> <li>• Make appropriate budget allocation for implementation of the programme for compliance monitoring and enforcement as part of the legislative process.</li> <li>• Local funding</li> </ul>

Action	Expected Output	Indicators	Time Frame	Resources USD	Responsibility	Comments/Constraints
<b>Institutional Objective 2: Incorporate PCDD/PCDF related control measures in national strategies, plans and programmes by 2007</b>						
Review national strategies, action plans and programmes	PCDD/PCDF emissions control measures in place	Updated strategies, action plans and programmes	2006-2007	20,000	Depts of Env., MAFS, MoH, LGAs, MIT	Local and external funding
Develop and implement PCDD/PCDF control programme covering waste management strategies		Reduced PCDD/PCDF emission levels	2006 - 2007	50,000	Depts of Env., MAFS, MoH, LGAs, MIT	<ul style="list-style-type: none"> <li>• Open burning of wastes is still being practiced</li> <li>• Capacity to handle waste is still low</li> <li>• Local and external funding</li> </ul>
<b>Institutional Objective 3: Build capacity on BATs and BEPs by 2012</b>						
Develop appropriate technical guidelines to control PCDD/PCDF releases for existing and new sources		Guidelines in place	2007	100,000	Depts of Env., MIT, UDSM, UCLS, MAFS, NEMC, COSTECH	<ul style="list-style-type: none"> <li>• Availability of BATs and BEPs to small and medium scale industries</li> <li>• Local and external funding</li> </ul>
Develop training manual and programmes and conduct training to cater for different role players (technicians and engineers for different sources)	BATs and BEPs for PCDD/PCDF implemented	Training programmes module	2007-2009	120,000	UDSM, UCLAS Depts of Env. CPCT, POPs Technical Committee, NGOs	Local and external funding
Conduct specialised training on BATs and BEPs in the country to address major sources		-Transfer mechanisms - Reports - Number of BATs and BEPs implemented	2008-2011	120,000	Depts of Env., MIT, UDSM, UCLAS, NEMC, MAFS	Local and external funding
Establish a mechanism for transfer of BATs and BEPs from outside and within			2007 -2010	30,000	Depts of Env., MIT, UDSM, UCLAS, CPCT, MEM, MNRT, MALE, MAFS	Local and external funding
Undertake research on BATs and BEPs including alternative materials and technology		Number of relevant researches undertaken	2010 –2015	100,000		External funding

<b>Institutional Objective 4: Facilitate implementation of appropriate BATs and BEPs by 2015</b>						
Identify feasible technological options for waste incineration and power generation and heating sub-sectors	Appropriate BATs and BEPs adopted	Feasible technical options	2010	5,000	Depts of Env., UDSM, MAFS, NEMC, COSTECH, MEM, MoH, MALE, MIT, Local Govt Authorities and Industries	Local and external funding
Prepare investment programme on BATs and BEPs for major sources (waste, power generating and heating and uncontrolled combustion)		Investment programmes operational	2011	60,000	Depts of Env., NEMC, COSTECH, MEM, MoH, MALE, MIT, Local Govt Authorities and Industries	Local and external funding
Implement investment programme for existing sources	Feasible BATs and BEPs options implemented		2011-2015	2,000,000*	Local Govt Authorities and Industries	External funding

\* Actual financial resources required will depend on feasibility studies

Action	Expected Output	Indicators	Time Frame	Resources US \$	Responsibility	Comments/Constraints
<b>Institutional Objective 5: Strengthen enforcement and compliance capacity by 2012</b>						
Carry out needs assessment to ensure compliance and enforcement requirements	Capacity to enforce legislation strengthened	Needs assessment report	2006	10,000	NEMC, Depts of Env. , MIT, MNTR, Sector Ministries	<ul style="list-style-type: none"> <li>All relevant government departments to undertake capacity needs assessment for meeting their requirement to ensure compliance and enforcement as part of their legislative amendments.</li> <li>Local and external funding</li> </ul>
Determine the PCDD/PCDF reduction elements relevant to each role player		Document of potential PCDD/PCDF reduction measures	2007	10,000	UDSM, Depts of Env.,	Local funding
Develop programme for compliance monitoring and enforcement of the regulations		Elaborate monitoring plan	2007	30,000	CPCT, NEMC, POPs Technical Committee, NEMC	<ul style="list-style-type: none"> <li>Develop programmes for compliance monitoring and enforcement of the emission standards. Ensure linkage to information management system (see section 4.6 on infrastructure development)</li> <li>Local funding</li> </ul>
Implement compliance monitoring and enforcement of legislation		Monitoring and enforcement reports	2008 - 2012	150,000	Depts of Env., NEMC, Sector Ministries	<ul style="list-style-type: none"> <li>Ensure adequate resources (human and financial) through ongoing training and capacity development (see sections 4.3 and 4.4) and adequate budget allocations to support activity</li> <li>Local and external funding</li> </ul>

Action	Expected Output	Indicators	Time Frame	Resources	Responsibility	Comments/Constraints
Implement and operationalize collaborative mechanism		Number of Voluntary initiatives	2008+	20,000	DoE, TCCIA, CPCT, MIT, UDSM	<ul style="list-style-type: none"> <li>• Ensure adequate budget allocations to support activity</li> <li>• Local and external funding</li> </ul>
<b>Institutional Objective 6: Strengthen sub-regional, regional and international cooperation in the management of PCDD/PCDF releases by 2010</b>						
Develop and harmonize position on POPs consistent with requirements of sub-regional, regional and international agreements	Harmonized approach in PCDD/PCDF reduction	Reports	2010	15,000	DoE, MIT, TBS, MoH	<ul style="list-style-type: none"> <li>• Through the Departments of Environment, National Technical Committee, contribute to the development of sub regional and regional and international positions regarding implementation of the elimination of PCDD/PCDF taking due cognisance of the requirements of Tanzania's major trading partners, i.e. EAC, SADC, NEPAD, AU</li> <li>• Local funding</li> </ul>

**Table 4.27:** Actions for incorporation of PCDD/PCDF management in training

Action	Expected Output	Indicators	Time Frame	Resources	Responsibility	Comments/Constraints
<b>Training Objective 1: Develop and implement training programme on PCDD/PDCDF by 2009</b>						
Assess training needs	Cost effective training on PCDD/PCDF issues in place	Needs assessment report	2006	5,000	UDSM, DoE, CPCT, NEMC, POPs Technical Committee	<ul style="list-style-type: none"> <li>Part of UDSM's functions</li> <li>Local funding</li> </ul>
Develop training programme targeting 4 key actors on PCDD/PCDF		List of institutions meeting criteria	2006 – 2007	10,000	UDSM, DoE, CPCT, NEMC POPs Technical Committee	Local and external funding
Implement training programme involving relevant training institutions which meet performance criteria	Suitable and effective training programmes in place	List of institutions associated with PCDD/PCDF releases; Pre-requisite list in place	2007 - 2008	50,000	UDSM, UCLAS, DoE, POPs Technical Committee	Local and external funding
Carry out regular monitoring and evaluation of training programmes		Monitoring and auditing reports	2007 – 2009	20,000	UDSM, UCLAS, Depts of Env., NEMC Technical Committee, NGOs	Local and external funding
Establish and implement special mechanisms to extend training to small and medium scale enterprises, CBOs, and rural community	Trained staff to assist SMEs to comply with requirements of the Convention	Training programmes for SMEs	2007 – 2008	100,000	NGOs, MIT, DoE, POPs Technical Committee, CPCT	<ul style="list-style-type: none"> <li>Financial and resource constraints identified in the Situation Analysis</li> <li>Local and external funding</li> </ul>

Action	Expected Output	Indicators	Time Frame	Resources	Responsibility	Comments/Constraints
Develop and incorporate PCDD/PCDF module into educational curricula	Enhanced understanding of the subject matter	Education curricula that contain PCDD/PCDF Components	2008 – 2009	250,000	NGOs; Depts of Env., Sector Ministries; <b>NEMC</b> ; Institute of Curriculum Development	Local and external funding

**Table 4.28:** Actions for incorporating PCDD/PCDF management in awareness raising

Action	Expected Output	Indicators	Time Frame	Resources	Responsibility	Comments/Constraints
<b>Awareness Raising Objective 1: Update existing awareness programmes to include management of the PCDD/PCDF by 2009</b>						
Develop PCDD/PCDF awareness programmes that are appropriate for each target audience	Awareness on PCDD/PCDF is built	Awareness programmes in place	2006 – 2007	30,000	NGOs; Depts of Env., Sector ministries, POPs Technical Committee	<ul style="list-style-type: none"> <li>Co-ordinate awareness raising activities for entire POPs to ensure cost effectiveness</li> <li>Local and external funding</li> </ul>
Develop a communication strategy that addresses different target audience	Knowledge and understanding of each target group is enhanced	Communication strategy in place	2006 – 2007	25,000	NGOs; Depts of Env., Sector ministries	Range of communications activities implemented along the value chain that addresses diverse nature of sector
Revise programmes implemented by existing awareness raising providers to include PCDD/PCDF issues		Revised awareness programmes	2006 – 2007	17,000	NGOs; Depts of Env., Sector ministries, POPs technical Committee	Local and external funding
Support existing service providers to include PCDD/PCDF issues in their activities	Consumers are aware of PCDD/PCDF	Capacity building reports	2006	150,000	NGOs; Depts of Env.	

Action	Expected Output	Indicators	Time Frame	Resources	Responsibility	Comments/Constraints
Mount awareness campaigns on implementation of the programme	impacts to their health	Implementation reports	2006-2009		Depts of Env.; <b>NEMC</b> , Sector Ministries; Local Government Authorities	Local and external funding

**Table 4.29:** Actions for strengthening technical infrastructure

Action	Expected Output	Indicators	Time Frame	Resources	Responsibility	Comments/Constraints
<b>Technical Infrastructure Objective 1: Upgrade testing facilities to cater for PCDD/PCDF monitoring in environment and in humans by 2012</b>						
Undertake survey of existing laboratory facilities	Capacity to test and monitor PCDD/PCDF is built	Survey report	2007	20,000	UCLAS, UDSM, TBS, GCLA, OSHA, HOSPITALS, MOH, TFDA <b>NEMC</b>	Local funding
Acquire facilities for PCDD/PCDF monitoring and for human health surveillance		Monitoring facilities in place	2009	150,000	<b>Depts of Env.</b> , GCLA, UDSM <b>MOH</b> , TFDA, OSHA	External funding
Accredit selected laboratories that have the capacity to undertake PCDD/PCDF testing		Accreditation certificate for selected labs	2007 – 2010		<b>Depts of Env.</b> , <b>TBS</b> , GCLA, UDSM, TFDA	<ul style="list-style-type: none"> <li>• Zonal accredited laboratories may be established</li> <li>• External funding</li> </ul>
Train laboratory staff to perform PCDD/PCDF testing		Training manual	2010 – 2012	30,000	<b>Chemistry Department and CPE - UDSM</b> , Depts of Env., GCLA	External funding

Action	Expected Output	Indicators	Time Frame	Resources	Responsibility	Comments/Constraints
<b>Technical Infrastructure Objective 2: Establish and strengthen poison centers by 2011</b>						
Develop a strategy for the upgrading of existing poisons centres	Capacity to respond to PCDD/PCDF poisoning in place	Strategy in place	2007 – 2008	10,000	MoH, Depts of Env.	<ul style="list-style-type: none"> <li>May consider to establish zonal poison centres to minimise costs of installation and running of the same</li> <li>Local and external funding</li> </ul>
Implement a strategy to develop 2 Zonal poison centers and upgrade existing center in Dar es Salaam		Improved poison centers	2010-2012	1,500,000	MoH, Depts of Env.	Local and external funding
Institute procedures for monitoring poisoning		Monitoring procedures in place	2010-2011	50,000	TFDA, Depts of Env., GCLA, POPs Technical Committee	Local and external funding
Develop and implement guidelines regarding information requirements to be provided by industries, facilities producing PCDD/PCDF to poison centres and from Poison Centres to other relevant authorities		Guidelines, Reporting format and actual reports in place	2010 – 2011	15,000	Depts of Env., GCLA, UDSM, TFDA, MIT	Local funding
Establish and maintain a chemical hazard information database that is accessible by poison centres and emergency responders and other stakeholders		Database in place	2010– 2011	30,000	VPO, NEMC, CPE-UDSM, MIT, MAFS, MALE	Local and external funding
<b>Technical Infrastructure Objective 3: Establish appropriate information management systems for PCDD/PCDF releases by 2010</b>						
Update and maintain information databases at relevant government departments	Information management system in place	Updated database in place	2007 – 2009	50,000	Depts of Env., NEMC, Sector ministries, LGA	Local and external funding
Harmonise and co-ordinate information collection and use between relevant government departments		Reports	2010 – 2011	5,000	NEMC, Depts of Env., Sector Ministries, LGA	Local funding
<b>Total</b>				<b>5,782,000</b>		

## 4.8.7 Key Investment Requirements

The requirements for the above mentioned investment projects are tabulated in Table 4.30.

**Table 4.30:** Investment project requirements for the PCDD/PCDF management plan

Need	Implications and comments
<i>Testing Facilities</i>	
Align test methods with good laboratory practices	<ul style="list-style-type: none"> <li>• Prescribed tests methods will have to be incorporated into the proposed PCDD/PCDF Management Code of Practice.</li> <li>• TBS to put in place test methods that meet the requirements for determination of the environmental and health hazards, e.g. a Code of Practice.</li> </ul>
International acceptance of test methods for analysing PCDD/PCDF	<ul style="list-style-type: none"> <li>• There will be a need to accredit some laboratories in Tanzania especially those needed for verification. Currently, there is no accredited laboratory in Tanzania for both environmental and health testing.</li> <li>• Appropriate facilities will have to be identified and assisted with accreditation.</li> </ul>
PCDD/PCDF Management testing to be undertaken by reliable facilities only	<ul style="list-style-type: none"> <li>• Facilities to undertake the PCDD/PCDF Management test will have to be used to ensure international acceptance of chemical classification. This requirement could be referenced in legislation to ensure a consistent approach.</li> <li>• Mechanisms will need to be established and implemented to monitor compliance.</li> </ul>
<i>Poison Centres</i>	
Maintenance of an up-to-date chemical hazard information database	<ul style="list-style-type: none"> <li>• Guidelines need to be developed regarding the industries and facilities producing PCDD/PCDF obligation to provide information on their releases. This requirement may need to be included in legislation to ensure that updated information is made available on an ongoing basis. Mechanisms would be required to monitor compliance.</li> <li>• Data and information collected will need to be stored on an information databases that can be accessed by relevant role players.</li> </ul>
Strengthen poison centres	<ul style="list-style-type: none"> <li>• In order to strengthen the capacity of the poisons facility, either the capacity of each centre could be strengthened or zonal centres could be established. The centre(s) could assist in monitoring the effectiveness of the implementation of the PCDD/PCDF Management.</li> <li>• The scope of the poison centre could be extended to respond to all incidents involving chemicals, e.g. chronic and epidemiological impacts.</li> </ul>

Assist small and medium scale enterprises in accessing chemical hazard information	<ul style="list-style-type: none"> <li>• Access to chemical information is largely Internet based. In general, larger companies have access to electronic information and are aware of the information that is available. Smaller companies may require assistance in accessing the data and its use.</li> </ul>
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#### 4.8.7.1 Investment Projects

##### *a) Technical Infrastructure*

The PCDD/PCDF Management will require technical capacity to analyse PCDD/PCDF emissions. The test methods for analysing PCDD/PCDF are available in standard analytical textbooks. However, the appropriate analytical instruments and standards are either not available or are not adequate.

Accreditation of laboratories, using common standards and practices is seen as the most effective way of ensuring that validation of results conducted in local laboratories is done. Accreditation of some laboratories may be essential.

The database that currently exists needs to be updated and maintained to include laboratory facilities that are reliable and later accredited to undertake PCDD/PCDF Management testing.

##### *b) Poison Centres*

Currently there are no reliably functioning poison centres and it is not a requirement for industries, power-producing plants to provide information to poison centres. Mechanisms need to be implemented to ensure that the relevant industries make appropriate information available to the poison centres with regard to the releases.

Mechanisms are required for the maintenance of an information management system that is appropriate to Tanzania and accessible to poison centres. The poison centres are currently operating under constrained resource conditions and would require strengthening in order to extend their role to facilitate the implementation of PCDD/PCDF Management and to respond to enquiries from stakeholders. Awareness needs to be raised within all sectors of the role of the poison centre in the implementation of the PCDD/PCDF Management plan and the information that can be obtained from them.

##### *c) Information Management Systems*

###### Constraints

- i) Data is stored at various Government Departments and Public and Private Institutions but there is no integration and co-ordination of the data;
- ii) The current information management systems for compliance monitoring at the Government Departments are generally poorly maintained and not regularly updated;

- iii) Each Government Department acquire information relevant to their function with no standard reporting requirement;

Therefore the National Implementation Plan intends:

- i) To establish a mechanism that will ensure that data is readily accessible, regularly updated and linked to other relevant government databases;
- ii) Build capacity in the relevant Government Departments in the generation and maintenance of information databases;
- iii) Collect reliable epidemiological data relevant to PCDD/PCDF and their the effects to human health; and
- iv) Build ICT capacity of relevant government departments for effective management of PCDD/PCDF. Specific assistance needs to be provided to small and medium scale enterprises in accessing information and its use in implementing PCDD/PCDF Management.

**Table 4.31:** Cost estimates for key investment requirements in PCDD/PDF management

	<b>Item</b>	<b>Unit Cost (US\$)</b>
1.	Upgrading of existing analytical instruments and accreditation of laboratories	150,000
2.	Reaserch for feasible BATs and BEPs	100,000
3.	Establish poison centers	1,530,000
4.	Develop and implement investment programme on feasible BATs and BEPs	2,000,000
	<b>Total</b>	<b>3,780,000</b>

#### **4.8.8 Costs and Financing of Action Plan implementation**

The cost of financing the Action plan implementation is estimated to be **US\$ 5,662,000 over** a period of 2006 to 2011. The funds required for implementation of activities will be diversely sourced from both internally and externally particularly from development partners. However, there is need for establishing sustainable funding mechanism where industries and facilities can get loans or other similar arrangements.

#### **4.9 STRATEGY FOR RELEASES FROM STOCKPILES AND WASTES: PESTICIDES, DDT, PCBs AND HCB (ANNEX A, B AND C CHEMICALS)**

This issue is treated under the Action Plan sections of the respective areas.

## **4.10 ACTION PLAN FOR IDENTIFICATION, CONTAINMENT AND CLEAN-UP OF CONTAMINATED SITES (ANNEX A, B AND C CHEMICALS)**

### **4.10.1 Objectives and Priorities of the Action Plan**

The main goal of the Action Plan is to enhance comprehensive management and control of contaminated sites in order to reduce and eventually eliminate POPs releases from contaminated sites.

The Action Plan addresses the identified gaps and deficiencies if Tanzania is to meet the requirements of the Stockholm Convention in the management of contaminated sites. It also defines objectives, time bound activities and required resources (human and financial). The implementation of the Action Plan envisages the participation of a broad spectrum of stakeholders.

#### **4.10.1.1 Overall Objectives**

The overall objectives of the Action Plan are:

- i) To promote clean up and remediation of POPs contaminated sites
- ii) To monitor and control POPs releases
- iii) To promote sound disposal of stockpiles and wastes
- iv) To strengthen legal requirements and capacity of relevant institutions
- v) To improve information generation, storage, access and dissemination
- vi) To promote public awareness on potential dangers and management of sites that are heavily contaminated with POPs

The overall objectives provides basis for formulating specific objectives and actions needed to enhance control of contamination of the environment and the management of contaminated sites during implementation of the Action Plan.

#### **4.10.1.2 Constraints**

By comparing the baseline situation of contaminated sites with the Convention requirements and available legislation, the identified gaps and deficiencies are as follows:

- i) Inadequate capacity in terms of specialized skills, remediation technology and financial resources;
- ii) Inadequate legal provision for management of sites contaminated with POPs;
- iii) Lack of schemes for monitoring and control of releases of all POPs;
- iv) No registration/registry of contaminated sites;
- v) Lack of contingency plan to address spillage of POPs;
- vi) Poor storage facilities;
- vii) Lack of appropriate disposal facilities and skilled personnel;
- viii) Continuous leak and spills of POP Pesticides into the environment;

- ix) Difficulties in enforcement of relevant legislation, particularly requirement to dispose waste after approval from authorities;
- x) Scanty awareness raising programmes; and
- xi) Lack of information centers.

#### **4.10.1.3 Prioritization**

In order to prevent POPs contamination and promote proper management of contaminated sites. The following priority measures arranged in order of importance need to be undertaken:

- i) Develop programmes for raising awareness on POPs, associated hazards and management issues;
- ii) Establish schemes for monitoring, control and management of releases of POPs and sites contaminated with POPs;
- iii) Establish clean up and remediation schemes;
- iv) Complete comprehensive inventory of contaminated sites to cover the entire country;
- v) Establish facilities for clean up and disposal of POPs which poses threat of further contamination;
- vi) Develop appropriate legal provisions and strengthen enforcement regimes on POPs;
- vii) Enhance information generation, access and dissemination;
- viii) Strengthen institutional capacity to handle POPs contaminated sites; and
- ix) Strengthen local research capacity on clean up and remediation technologies.

#### **4.10.2 POPs Contaminated Sites Identification Inventory**

The identification of sites that are contaminated with POPs was based on visual inspection and assessment during POPs inventory exercise in the country carried out in 2003. The contaminants considered were PCBs, POP Pesticides and PCDD/PCDF.

The inventory results showed the following national estimates:

- a) Thirty three (33) sites dispersed around the country are possibly contaminated with PCBs;
- b) Four (4) sites are contaminated with POP Pesticides (Korogwe, Vikuge, Babati and Mtwara storage sites);
- c) Eleven (11) sites are possibly contaminated with PCDD/PCDF: Southern Paper Mills (Mgololo), former Tanzania Italian Petroleum Refinery (TIPER), Tanzania Chemical Industries, Tanneries in Mwanza, Morogoro, Moshi and Lake Tanneries in Kibaha, Textile Industries e.g. Kiltex and Sungura Textile of Dar es Salaam and Vingunguti, Tabata and Jumbi waste disposal sites; and
- d) All sites contaminated with PCBs and POP pesticides are candidates for contamination with PCDD/PCDF.

This inventory results show that there is potential risk to human health and the environment especially as some of the sites are close to water sources or populations.

It is thus desirable to cleanup and remediate these contaminated sites and put in place a monitoring programme to watch releases. This would enable collection of data that would help to initiate subsequent management and control efforts on the basis of the information on release levels.

#### **4.10.3 Health, Environmental and Socio-Economic Assessment of Identified Contaminated Sites**

The sites in question are contaminated with POP Pesticides, PCBs and PCDDs/PCDFs. Health and environmental risks are based on their persistence and toxic properties, resistance to degradation, bio-accumulation and capacity to be transported, through air, water and migratory species, across international boundaries and deposited far from their place of release, where they accumulate in terrestrial and aquatic ecosystems. The potential adverse effects are diseases such as cancer and disorders of the immune system, the reproductive system and the nervous system of humans and animals. Such effects can only be ascertained through risk assessment and risk management and epidemiological studies, which as yet have not been conducted.

The socio-economic risks include loss of production due to illness, increased financial burden for medical bills and caring for the sick, poor food security due to loss of production. The actual costs might be difficult to quantify at this stage until a rigorous risk assessment and risk management exercise is carried out.

A pro-active approach would be to manage the contaminated sites through stabilisation to minimise releases and eventual clean up and remediation. As remediation works can be expensive, economic instruments as provided for in the Environmental Management Act (2004) could be applied. The economic instruments include incentives and financial measures such as subsidies, taxes, grants, etc. which can assist companies and individuals to meet environmental quality and standards. These however do not remove or subjugate the main principle of polluter pays for the remediation works. This requires any person causing adverse effects to the environment to pay in full social and environmental costs of avoiding, mitigating and or remedying those adverse effects.

#### **4.10.4 Prioritisation of Identified POPs Contaminated Sites for Action**

The prioritisation and eventual development of the objectives was based on the analysis of the gaps and deficiencies as revealed by the inventory results. The identified sites contaminated with PCBs and POP Pesticides were prioritized on the following basis (in order of priority):

- a) Heavily leaking or heavily contaminated site which are very close to sensitive areas (water sources, schools, hospitals, public, etc.): These were deemed to require immediate cleanup;
- b) Serious leaking or seriously contaminated sites: These were deemed to require mitigation measures e.g. stabilization;
- c) The rest of the contaminated sites: These are sites, which, could be tolerated, but could be mitigated if resources allowed;

Prioritization of PCDD/PCDF contaminated sites based on visual inspection was not possible.

#### **4.10.5 Proposed Legal and Regulatory Strengthening Measures on Financial Responsibility and Liability, and Standards for Clean-up and Releases**

##### ***4.10.5.1 Legal and Regulatory Regime***

POPs are partly regulated by the Industrial and Consumer Chemicals (Management and Control) Act No. 3 of 2004 for industrial POPs and the Plant Protection Act of 1997 for POP Pesticides. Further the Environmental Management Act of 2004 offers an umbrella regulation on environmental protection and management.

The Environmental Management Act of 2004 provides a legal and institutional framework for sustainable management of the environment and outlines principles for among others: management, impact and risk assessment, prevention and control of pollution, waste management, environmental quality standards, and public participation.

The objective of the Act (Section 7) is to provide for and promote the enhancement, protection, conservation and management of the environment. The general principles of the Environmental Management Act is as given in Section 4 of the Act, that every person living in Tanzania shall have a right to a clean, safe and healthier environment. The Act also prescribes (Section 75) requirements for the management of dangerous materials and processes.

The Industrial and Consumer Chemicals (Management and Control) Act and the Environmental Management Act both prescribe specific requirements for the management and remediation of contaminated sites. The Act provides for the responsible Minister to promote and provide economic instruments (incentives and financial measures such as subsidies, taxes, grants, etc.) for environmental management activities but also promulgate the principle of polluter pays: which requires any person causing adverse effects to the environment to pay in full social and environmental costs of avoiding, mitigating and or remedying those adverse effects.

##### ***4.10.5.2 Voluntary Agreement***

Promotion of voluntary agreements is also highly recommended. Voluntary environmental agreements or covenants are a form of co-regulation between industry and the regulatory authorities (government). The aim is to find inclusive and flexible mechanisms that put more responsibility on the industry/business, but also leave leeway for individual solutions that could improve efficiency.

Covenants are thus policy management tools used by industry to meet national environmental goals established by the regulatory authorities. Covenants provide a concrete implementation program with clear goals and targets. Covenants are set through negotiations between industry and government and once agreed; give businesses/industry the role of determining how goals are met.

There are no existing voluntary agreements with companies or industry groups under which they commit to remediate or otherwise manage POPs contaminated sites. The implementation plan sets the basis for establishing administrative, procedural and technical guidelines on voluntary schemes.

#### **4.10.6 Proposed Operational Measures Related to Assessment, Containment, Remediation and Monitoring**

It is proposed that all operational measures related to assessment, containment, remediation, and monitoring of contaminated sites be based on risk assessment and risk management. Risk assessment decision making incorporate social, economic, political, legal, technical and scientific issues throughout the decision-making process (planning, risk evaluation and management).

In the planning stage, stakeholder participation is important as it is here where goals are defined and set; resources are identified and sought, etc. During risk evaluation, site-specific risk assessment must be carried out, setting out site-specific remediation objectives, etc. In management (making risk management decisions), remediation options are identified, evaluated, costed: balancing human and environmental health protection, and setting up monitoring and auditing schemes.

##### ***4.10.6.1 Institutional and Regulatory Based Measures***

As a first step, national legal systems must be strengthened to address the identified gaps and deficiencies. The regulatory mechanism must provide a framework for identification of contaminated sites and subsequent monitoring e.g. by requiring owners of contaminated sites or sites likely to become contaminated to register their sites. Additionally, once a site has been registered, the owners could be required to monitor the sites and submit periodically specific data (as might be specified from time to time) by the regulatory organ.

The registration of contaminated sites is of prime importance due to a number of reasons:

- (a) The register will assist in preparation and provision of Risk Assessment and Risk evaluation plans. The information gathered from the contaminated sites could early address health and environmental risks of the surrounding population.
- (b) The register will assist in preparation of suitable and appropriate contingent plan of the affected area.
- (c) The register could also be a vital source of information on decontamination procedures in environmentally friendly ways.
- (d) The information in the register may assist in future development plans on location of projects and other development activities based on information in such register.

##### ***4.10.6.2 Remediation and Monitoring***

All sites that are possibly contaminated with POPs will need to be monitored so as to document the levels of releases and the risk associated with the releases. This will enable

stakeholders to prioritise resources for remediation and enforcing existing or future legislation on the management of contaminated sites. Remediation, costly as it might be must use methods and technology that can meet set environmental standards.

#### ***4.10.6.3 National Juridical Principles***

Contaminated sites pose serious risk to human health and the environment from the fact that leachates and releases of the contaminants from the sites can travel long distance and can contaminate water sources and ambient air and thus potentially affect a much bigger area through soil, water and air pollution. Therefore liabilities for contaminated sites should be treated accordingly.

To meet sustainable development requirements, the environmental management principles that ought to govern the management of contaminated sites are:

- (a) **Precautionary principle:** where a site is deemed to have the potential to cause adverse effects to human health and the environment and/or damage the environment, action must be taken to protect that environment without awaiting scientific proof of damage.
- (b) **Polluter pays:** the full costs associated with pollution (including monitoring, management, clean-up and supervision, social, etc.) should be met by the organization/individual responsible for pollution; and
- (c) **Pollution prevention:** immediate action should be taken at priority sites, which aim to reduce pollution at sources.

Different regulatory authorities are responsible for monitoring and examining compliance to the existing legislation and in promoting responsible care of the contaminated sites and prevention measures so as to reduce the number of new contaminated sites and the release severity from existing/identified contaminated sites.

#### ***4.10.6.4 Technical and Financial Resources***

To manage contaminated sites effectively, comprehensive schemes for monitoring of releases from the sites must be put in place.

Competent laboratories including the Government Chemist Laboratory Agency (GCLA) and Tertiary Institutions like the University of Dar es Salaam have equipment and well-trained staff that could form a base for carrying out initial monitoring. These institutions would need strengthened capacity to enable them to undertake monitoring of POPs levels in food, humans and the environment. Monitoring schemes invariably involve sampling and analysis of samples.

Monitoring of contaminated sites need to be maintained over long periods. In some cases, modelling releases from the contaminated sites, coupled with verification by sampled data would cut down costs of sampling and analysis.

Access to viable remediation technologies and monitoring of contaminated sites can be expensive and thus adequate financial resources are needed for successful interventions.

#### ***4.10.6.5 Development of A National Approach to POPs Contaminated Sites***

Most of the developmental policies are sectoral, the management and control of POPs is also a multidisciplinary undertaking. It is thus unrealistic to envisage a single department or office being capable of solving this monumental problem. In order to promote coordination and active participation of all stakeholders, appointing a POPs officer who can then be responsible for the day-to-day coordination of POPs management activities would be useful. This officer would also be the secretary of the inter-ministerial Technical Committee on the subject.

The prime functions of the coordination office would be to promote voluntary compliance to the local POPs specific legislation and requirements of the Conventions governing POPs. Obviously, other rules and regulations, which regulate the general use, handling and management of chemicals, would continue to function in line with the respective jurisdictions.

The POPs survey revealed that there is limited capacity and experience to manage contaminated sites so there is need to develop a national code of conduct for management of contaminated sites. The guideline must address issues of awareness (on POPs sources and their effects on human health and the environment), policies/regulations on management of POPs in line with the Stockholm Convention, promotion of regional and international cooperation for developing strategies geared towards managing POPs, monitoring procedures, remediation technologies, training, etc.

#### **4.10.7 Implementation of the Action Plan**

The Action Plan has been developed to address gaps and deficiencies identified and highlighted by the POPs inventory results. The Action Plan is shown in Tables 4.32 to 4.34

**Table 4.32:** Actions for strengthening enforcement of legislation on management of contaminated sites

Action	Expected Output	Indicators	Time Frame	Resources USD	Responsibility	Comments/Constraints
<b>Institutional Objective 1: Strengthen Capacity for the Implementation of the Action Plan by 2011</b>						
Set up the National Contaminated Sites Coordination Unit	Coordination mechanism in place	Coordination unit in place	2006-2007	30,000	NEMC	Activity to be supported from local and external funding
Hold annual experts forums of 3 days, for the first 5 years, involving 100 participants.	Networking enhanced	Minutes of the meetings	2007 - 2011	60,000	NEMC	
Develop programme for compliance monitoring and enforcement involving consultancy, technical meetings and stakeholder workshops	Capacity to enforce legislation developed	Elaborate monitoring plan	2007 - 2008	40,000	NEMC, Depts of Env., MIT, MAFS, MEM MoWLD, MALE, MoH, MoJCA	<ul style="list-style-type: none"> <li>• Ensure compliance with national Environmental Management Act and other relevant national laws. Develop linkage to information management system (see section on Monitoring)</li> <li>• Local and External funding</li> </ul>
Execute implementation of the programme		Monitoring and enforcement reports	2009-2011	30,000	NEMC, Depts of Env., MALE and sector ministries	<ul style="list-style-type: none"> <li>• Ensure adequate resources (human and financial) through training and capacity development activities (see sections on Monitoring, Public information Awareness and Education) and adequate budget allocations</li> <li>• Local and external funding</li> </ul>

Action	Expected Output	Indicators	Time Frame	Resources USD	Responsibility	Comments/Constraints
<b>Institutional Objective 2: Promote voluntary compliance with national laws by 2008</b>						
Develop and adopt voluntary agreements (Covenants) involving consultations with relevant organisations	Voluntary compliance	MoU	2006 – 2007	10,000	NEMC, Depts of Env.	Local funding
Monitor implementation of Covenants		Compliance reports	2008+	5,000	Depts of Env., TCCIA, sector ministries	Local funding

**Table 4.33:** Actions for promoting monitoring of contaminated sites

Action	Expected Output	Indicators	Time Frame	Resources USD	Responsibility	Comments/Constraints
<b>Monitoring Objective 1: Establish appropriate information management systems on contaminated sites for compliance monitoring by 2011</b>						
Develop monitoring guidelines on sampling, analysis and reporting	Having a monitoring scheme in place	Monitoring reports and guidelines	2007-2008	18,000	Depts of Env., NEMC, TPRI, PHS, GCLA, OSHA, UDMS, TBS	Local and external funding
Develop and implement monitoring programs		Progress reports and monitoring programmes	2009+	1,000,000		
Train experts on monitoring activities (sampling, analysis and reporting requirements)		A record of trained staffs	2008-2010	42,000		

<b>Action</b>	<b>Expected Output</b>	<b>Indicators</b>	<b>Time Frame</b>	<b>Resources USD</b>	<b>Responsibility</b>	<b>Comments/Constraints</b>
Harmonise and co-ordinate information collection and use between relevant government departments		Reports	2006 – 2010	10,000	<b>NEMC, Depts of Env., GCLA</b>	Local funding
<b>Monitoring Objective 2: Clean up and remediate contaminated sites by 2015</b>						
Carry out risk assessment (both human and biota ecosystem) of contaminated sites	Protection of human health and the environment	Risk assessment reports	2007-2008	1,000,000*	<b>Depts of Env., GCLA NEMC, MoH, UDSM, UCLAS, MALE, MAFS, TANESCO, SFPC, sector ministries, NGOs</b>	Local and external funding
Establish and maintain an updated register of contaminated sites, involving consultancy, technical meetings, site visits and mapping		Register of contaminated sites in place	2006-2007	50,000		Local and external funding
Establish appropriate land use management plans	Allocation of contaminated areas for appropriate use	Land use management plans	2008-2009	200,000	<b>NEMC, NLUC, sector ministries</b>	Local and external funding
Assess feasible treatment options and respective competent firms	Appropriate treatment options known	List of options	2008-2012	200,000	<b>NEMC, UDSM, POPs Technical Committee, MALE</b>	Local and external funding

<b>Action</b>	<b>Expected Output</b>	<b>Indicators</b>	<b>Time Frame</b>	<b>Resources USD</b>	<b>Responsibility</b>	<b>Comments/Constraints</b>
Clean up and remediate contaminated sites	Cleaned environment	Remediation technologies in place; Guidelines and workplan in place; No. of sites cleaned/remedied	2010 – 2015	5,000,000*	<b>NEMC, Depts of Env., POPs</b> Technical Committee, GCLA, UDSM, sector ministries	Local and external funding
<b>Monitoring Objective 3: Strengthen local research capacity on remediation technologies by 2009</b>						
Undertake research on remediation technologies		No. and type of research undertaken	2008-2010	360,000	UDSM, <b>NEMC</b> , TPRI, UCLAS, SUA	Local and external funding
Disseminate research results	Information exchange enhanced	Research reports	2010+	10,000	<b>UDSM</b> , NEMC, TPRI, UCLAS, SUA Depts of Env., Technical Committee, NGOs	Local funding

\* Actual financial requirement will depend on number of sites and extent of contamination

**Table 4.34:** Actions to promote awareness on management of contaminated sites

Action	Expected Output	Indicators	Time Frame	Resources	Responsibility	Comments/Constraints
<b>Awareness Raising Objective 1: Update existing awareness programmes to include relevant areas of the management of contaminated sites by 2009</b>						
Develop specific awareness programmes on contaminated sites and update existing ones implemented by service providers to incorporate management of contaminated sites; involving consultancy, meetings and stakeholders workshops	Minimise risks to health  Awareness on management of contaminated sites built	Educational programmes in place  Revised awareness programmes	2007 – 2008	30,000	NGOs, Depts of Env., <b>POPs Technical Committee</b> , <b>NEMC</b> , GCLA, sector ministries, TANESCO and SFPC	<ul style="list-style-type: none"> <li>• Co-ordinate with training element to ascertain the management of contaminated sites elements relevant to each role player in the value chain</li> <li>• Local funding</li> </ul>
Implement specific awareness programme		Implementation reports	2008-2009	100,000	<b>NEMC</b> , TANESCO, SFPC, sector ministries, GCLA, TBS	Local and external funding
				<b>Total</b>	<b>8,195,000</b>	

#### 4.10.8 Key Investment Requirements

The key investment requirements envisaged include:

- (a) Upgrading selected laboratories to achieve accreditation;
- (b) Upgrade of analytical instruments (GC, GC-MS) to meet requirements for the analysis of POPs mainly by procuring additional columns and standards;
- (c) Procurement of equipment for monitoring releases from contaminated sites;
- (d) Actual cost of clean up and remediation of selected contaminated site.

**Table 4.35:** Cost estimates for key investment requirements for management of POPs contaminated sites

	<b>Item</b>	<b>Unit Cost (US\$)</b>
1.	Risk assessment of contaminated sites	1,000,000
2.	Develop and implement monitoring programme of POPs levels in contaminated sites	1,000,000
2.	Research on remediation technologies	360,000
3.	Technology transfer for remediation of 47 POPs contaminated sites	5,200,000
	<b>Total</b>	<b>7,560,000</b>

#### 4.10.9 Costs and Financing of Action Plan Implementation

The cost of financing the Action Plan Implementation is estimated to be **US\$ 8,195,000** over a period of 2006 to 2011. The funds required for implementation of activities will be diversely sourced from both internally and externally particularly from development partners. However, there is need for establishing sustainable funding mechanism where industries and facilities can get loans or other similar arrangements.

### 4.11 STRATEGY FOR INFORMATION EXCHANGE

#### 4.11.1 Introduction

Article 9 of the Stockholm Convention emphasizes on the need for exchange of information in the successful implementation of the Convention. The Convention requires each Party to facilitate the exchange of information relevant to:

- (i) The reduction or elimination of the production, use and releases of persistent organic pollutants; and
- (ii) Alternatives to persistent organic pollutants, including information relating to their risks as well as their economic and social costs.

Tanzania being a Party to the Convention has the obligation of developing strategy to promote and facilitate information exchange on POPs. The strategy developed will enable Tanzania to exchange information with other Parties as well as the Secretariat on POPs' issues.

The strategy provides details on the objectives and priorities of the information exchange and the related policies and principles. Further more activities to be implemented are also provided.

#### **4.11.2 Objectives and Priorities of the Information Exchange**

The goal is to promote and facilitate information exchange at international, regional, sub-regional and national levels on POPs.

The Action Plan addresses the identified gaps and deficiencies if Tanzania is to meet the requirements of the Stockholm Convention in the promotion and facilitation of information exchange. It also defines objectives, time bound activities and required resources (human and financial). Implementation of the Action Plan envisages the participation of a broad spectrum of stakeholders.

##### ***4.11.2.1 Overall Objectives***

The overall objectives of this Action Plan are:-

- i) To establish information exchange mechanisms in order to facilitate collaboration and co-operation among key stakeholders and with other regional and international agencies/bodies/institutions; and
- ii) To improve information management infrastructure of key institutions.

The overall objectives provides basis for formulating specific objectives and actions needed to strengthen POPs information exchange infrastructure during implementation of the Action Plan.

##### ***4.11.2.2 Constraints***

By comparing the baseline situation with the Convention requirements and available legislation, the identified constraints were:

- a) Inadequate information exchange infrastructure in terms of specialized skills, funding and facilities in relevant institutions dealing with information generation, maintenance and dissemination regarding POPs releases;
- b) Unaccessible information at international level to the majority because of language and information technology barriers; and
- c) Lack of information base as reference material.

#### **4.11.2.3 Prioritization**

Based on the analysis of the baseline situation, the identified priority issues are the following:

- i) Improvement of information exchange infrastructure;
- ii) Building capacity in information generation, storage, management and dissemination on POPs;
- iii) Updating information exchange systems at the Focal Point;
- iv) Setting up a networking mechanism among key institutions;
- v) Improving coordination and dissemination of research findings; and
- vi) Improving accessibility to POPs information at international, regional and sub-regional levels.

### **4.11.3 Information Exchange Policies and Principles**

Tanzania being a Party to Rotterdam, Stockholm and Basel Conventions will adopt and follow principles of these Conventions. The NEP advocates for public participation in environment management. It requires that public be well informed in order to achieve sustainable use of environmental resources. Existing sectoral policies and legislation will be improved in accordance to the provision of the Stockholm Convention.

Provisions in the Plant Protection Act (1995) as amended in 1997, and the Industrial and Chemicals (Management and Control) Act (2003) will be identified and improved to handle POPs information exchange. The Environmental Mangement Act (2004) encourages improvement in delivery of public information.

Promotion of technology transfer will be facilitated through various means such as:

- a) Participation in international, regional and sub-regional courses, seminars, workshops and symposia.
- b) Participation in NEPAD, SADC and EAC, so these will serve as fora for information exchange.
- c) International newsletters on environment and health and their supplements, as well as cleaner production newsletters etc.

The National POPs Focal Point, which is the Division of Environment in the Vice President's Office, will be strengthened and facilitated so as to take up the overall coordinating role in information exchange at all levels.

Constraints or limitation in relation to information exchange policies and principles include:

- a) The weakness/inadequacy in information exchange infrastructure;
- b) Information at international and regional levels not easily accessible because of language and information technology barriers;

- c) Inadequate resources in terms of finance, technical capacity and specialized skills in the respective institutions dealing with information generation, maintenance and dissemination on POPs issues;
- d) Lack of financial resources to participate in the relevant courses, seminars and workshops; and
- e) Low awareness among different sectors may inhibit information exchange process.

#### **4.11.4 Information Exchange Actions to be implemented**

The Action Plan provided below identifies specific activities to be implemented so as to ensure access to and exchange of information at international, regional, sub-regional and national levels.

The Plan defines responsibilities, timeframes and an indication of associated resources required for its implementation. The Action Plan is provided in Table 4.36

**Table 4.36:** Actions to establish information exchange mechanisms

Action	Expected Output	Indicators	Time Frame	Resources US \$	Responsibility	Comments/Constraints
<b>Information Exchange Mechanism Objective 1: To establish information exchange capacity at national Focal Point by 2009</b>						
Designate information exchange officer at Focal Point	National POPs Focal Point strengthened	Information exchange officer appointed	2005		<b>Depts of Env.</b>	
Upgrade information exchange system by putting down necessary infrastructure		Computers e-mail, Internal Installed Officer in charge identified and trained	2006-2007	10,000	<b>Depts of Env.</b>	External funding
Design information exchange packages at Depts of Env.		Information packages	2006-2009	50,000	<b>Depts of Env., POPs</b>	Local and external Funding
Develop common procedures for information collection	Enhanced quality information	Procedures	2006-2007	30,000	Technical Committee	Local and external Funding
Develop and maintain update information databases	Informed information exchange	Data bases	2006-2007	150,000*	<b>Depts of Env.,</b> sector ministries, NGOs, private sector	Local and external Funding
Conduct training sessions of 30 people on POPs database management.	Knowledge on database management imparted	Database in place	2007	30,000	<b>NEMC,</b> sector ministries, MALE, TANESCO, SFPC, GCLA, TPRI, NIMR, Depts of Env., UDSM	Local and external funding

Action	Expected Output	Indicators	Time Frame	Resources US \$	Responsibility	Comments/Constraints
Support specialized studies for updating existing databases on contaminated sites, efficacy of DDT and alternatives and PCDD/PCDF emissions	Updated baseline information on POPs	Reports	2007-2009	200,000	Depts of Env., NEMC, MoH, POPs technical Committee	External funding
Facilitate participation of national experts in international meetings such as those of POPs Review committees.	Increased understanding of experts on the convention	Reports	2006-2009	18,000	Sector Ministries, NEMC, UDSM, NGOs	Local and external Funding
<b>Information Exchange Mechanism Objective 2: To establish information dissemination infrastructure by 2013</b>						
Identify relevant stakeholders for information exchange and assess training needs.	Capacity for information generation built within institutions and stakeholders	Programs Established in identified Institutions	2006	3,400	Depts of Env.	Local funding
Impart knowledge on information management skills to 7 key institutions			2006-2007	70,000	Depts of Env., NEMC TPRI, GCLA, Universities, Industries	Local and External funding
Sensitize research institutions and scientists on information exchange	Identified research programs	Types of information packages prepared; Research findings disseminated	2006-2007	1,200	Depts of Env., NEMC TPRI, GCLA, Universities, Industries	Local funding

Action	Expected Output	Indicators	Time Frame	Resources US \$	Responsibility	Comments/Constraints
Establish links between awareness raising organizations in each sector and identify feasible cross-sectoral cooperation	Enhanced outreach activities	Network of awareness raising organizations	2006	30,000*		Local and external funding
Support development and maintaining of reliable information databases at relevant sources	Enhanced access to reliable information	Information database created	2006-2009	800,000	NEMC, DoE-Zanzibar, sector ministries, NGOs	Local and external funding
Designate POPs Desk Officer in relevant 7 key institutions.	POPs Desk Officers established	POPs Desk Officers in place	2006		<b>Depts of Env.,</b> Relevant institutions	Local funding
Operationalize information exchange mechanism	Information exchange enhanced;  Enhanced awareness of stakeholders	Information shared	2007	150,000	<b>NEMC, VPO,</b> sector ministries, NGOs, <b>DoE-Zanzibar</b>	Local and external funding
Develop communication strategy on POPs and their feasible substitutes and alternative technologies	Enhanced exchange of information	Communication strategy in place	2007	50,000	<b>NEMC, CPCT,</b> Depts of Env., Sector ministries, NGOs	Local and external funding
Implement communication strategy		Progress reports	2008-2013	800,000		Local and external funding
Develop and acquire technical information as reference materials		Reference materials available	2009-2010	60,000	Depts of Env, Technical Committee	External funding

Action	Expected Output	Indicators	Time Frame	Resources US \$	Responsibility	Comments/Constraints
Support information network fora		Information network in place	2007-2009	200,000	Depts of Env., NEMC, Technical Committee members	Local and external funding
Develop and implement strategic interventions to address capacity needs of NGOs, CBOs, youth and women groups and private sector	Enhanced capacity needs of various stakeholders	Number of participating stakeholders groups Implementation reports	2007-2009	110,000	Depts of Env. NEMC, Sector Ministries	Local and external funding
Develop performance criteria to evaluate effectiveness of the strategy		Performance criteria in place	2006	25,000	NEMC, NGOs, Depts of Env., POPs Technical Committee	Local and external funding
Monitor effectiveness of the strategy		Monitoring reports	2006 – 2010	50,000	NEMC, NGOs, Depts of Env., Awareness raising organisations,	Local and external funding
			<b>Total</b>	<b>2,837,600</b>		

### 4.11.5 Key Investment Requirements

The key investment requirements are shown in table 4.37

**Table 4.37:** Cost estimates for key investment requirements for information exchange

	<b>Item</b>	<b>Unit Cost (US\$)</b>
1.	Development and maintenance of reliable databases at various sources	950,000
2.	Development and implementation of communication strategy	850,000
3.	Operationalise information exchange mechanism	150,000
	<b>Total</b>	<b>1,950,000</b>

### 4.11.6 Costs and Financing of Strategy Implementation

The cost of financing the Action Plan implementation is estimated at **USD 2,837,000**. The funds required for implementation of the strategy will basically originate from the following sources:

- National budget allocation
- National collaborators like TANESCO, SFPC, UDSM etc.
- International funding sources including multilateral, bilateral and private funding agencies.
- Existing programs under Basel and Rotterdam Conventions.

## 4.12 ACTION PLAN FOR PUBLIC AWARENESS

### 4.12.1 Introduction

Article 10 of the Stockholm Convention elaborates on the importance of public information; awareness and education in the successful implementation of the convention. Tanzania being a Party to the Convention is committed to promote and facilitate public information, awareness and education in line with the Stockholm Convention provisions as stipulated in Article 10 of the Convention.

The proposed Action Plan has been developed in order to build capacity in information generation and dissemination. The Plan serves as a framework within which all stakeholder groups can play their appropriate roles in information dissemination.

### **4.12.2 Objectives and Priorities of the Action Plan**

The goal of the Action Plan is to promote and facilitate public information, awareness and education on POPs issues.

The Action Plan addresses gaps and deficiencies related to public information awareness and education, which were revealed during NIP development. The Plan further defines and provides details on the following: goal, objectives, priorities and constraints applicable to public information; awareness and education: Activities, responsibilities, timeframes and an indication of associated resources required for its implementation are also provided in the Action Plan.

#### ***4.12.2.1 Overall Objectives***

The overall objectives of this Action Plan are the following:-

- a) To enhance broad-based public support and political will in the implementation of the NIP;
- b) To develop and encourage national programmes of education and public awareness on POPs targeted to a wide range of stakeholders; and
- c) To promote information exchange by strengthening information dissemination capacity of relevant institutions.

The overall objectives provide basis for formulating specific objectives and actions needed to is to promote and facilitate public information, awareness and education on POPs issues in the course of implementation of the Action Plan.

#### ***4.12.2.2 Constraints***

By comparing the baseline situation on public information, education and awareness with the Convention requirements and the available legislation, the identified constraints are;

- a) Existing information dissemination path ways lack focus on POPs;
- b) Information at international level is not easily accessible because of language and information technology barriers;
- c) Lack of POPs technical expertise in the media
- d) Inadequate training programmes and materials
- e) Inadequate resources in terms of specialized skills, finance and facilities in the respective institutions dealing with information generation, maintenance and dissemination on POPs issue;
- f) Limited coverage in most of the relevant policies and legislation regarding availability and accessibility of public information on POPs; and
- g) Lack of information base as reference material.

#### **4.12.2.3 Prioritization**

In order to achieve the goal of this Action Plan, priority will be on the following:

- a) Strengthening the Focal Point information dissemination infrastructure
- b) Improvement of information dissemination infrastructure in key institutions
- c) Development of educational materials on POPs
- d) Sensitizing Personnel and strengthen capacities in Information pathways on POPs issues.
- e) Development and availing technical information on POPs for use as reference materials in government departments and agencies, academic and research institutions, NGO's and private sector.
- f) Conducting training on POPs issue to media, customs personnel, agriculture extension officers, NGO's and other key actors in awareness creation.
- g) Involvement of NGOs/CBOs/cultural groups in POPs' outreach activities.
- h) Supporting development and dissemination of public information and awareness materials on POPs in a common and simple language.

#### **4.12.3 Information Dissemination and Awareness Policies and Principles**

The National Environmental Policy (NEP) recognizes that information dissemination, awareness and education are prerequisite ingredients for meaningful public participation, which is singled out as major vehicle for sustainable environmental management. In paragraph 36 the NEP states that "The major responsibilities of government institutions and NGOs are to assist local communities become aware of their own situation and support them to become responsible for their own destiny. Local communities will participate if they are persuaded that it is right and necessary to do so; when they have sufficient incentive, and the required knowledge and skills. Environmental education and awareness raising programmes shall be undertaken in order to promote informed opinion".

The Government in collaboration with various stakeholders has formulated sectoral policies, legislation and guidelines to ensure public awareness and involvement in environmental protection issues. Some of the policies and legal instruments include National Environmental Policy (1997) and Zanzibar (1992), Plant Protection Act (1997), National environmental Management Act (1983), Sustainable Environmental Management Act for Zanzibar (1996), Industrial and Consumer Chemicals (Management and control) Act (2003). There are provisions for enhancing environmental awareness in these policies, legislations and guidelines, which will be used for POPs issue. A typical example is Section 10 (h) of Industrial and Consumer Chemicals (Management and Control) Act (2003), which states that one of the function of the chief Government Chemist as the Registrar of Chemicals "is to conduct public education campaign on the sound management of chemicals". Section 46 provides among others for immediate notification of the public and relevant authorities in case of accidents and spills related to

chemicals. In addition section 48 (3) requires the GCLA to use some of its funds received to address issues of public awareness on safe handling of chemicals.

Constraints and limitations in relation to this section include:-

- Inadequate financial resources to organize public awareness programmes;
- Inadequate technical experts/skills in relevant sectors for information generation on POPs issues; and
- Slow review process of sectoral policies and legislations when changes are eminent.

#### **4.12.4 Public Information, Awareness and Education Programmes to be implemented**

Public Information, Awareness and Education programmes are essential for ensuring effective implementation of the Convention. Each player in the NIP implementation has to be aware of the Convention requirements and sufficiently acquire knowledge and skills to effectively participate in implementation of the NIP.

The Action Plan provided in Table 4.38 to 4.41 identifies national responses for building capacity in respect of undertaking formal education, public information dissemination and public awareness creation to enhance their participation in decision-making.

**Table 4.38:** Actions for improving information dissemination capacities

Action	Expected Output	Indicators	Time Frame	Resources US \$	Responsibility	Comments/Constraints
<b>Information Dissemination Objective: To strengthen information generation and dissemination by 2009</b>						
Harmonize and coordinate information management and use between various departments, involves installation of computers and internet	Coordinated information	Reports	2007-2008	20,000	<b>Depts of Env., NEMC, sector ministries, TANESCO, SFPC</b>	Local and external funding
Acquire technical information for dissemination		Textbooks, journals in place	2007-2009	240,000	<b>NEMC, Depts of Env., sector ministries</b>	External funding
Develop POPs Technical Information in common language including brochures, leaflets and newsletters	Increased understanding of POPs issues at all levels	Technical information	2007-2008	20,000	<b>Depts of Env., GCLA, TPRI, TANESCO, NEMC</b>	Local and external funding
Prepare special and targeted programs like seminars, workshops etc for NGOs, CBOs and media.	Workshops held	Target groups trained	2007-2008	11,000	<b>NEMC, NGOs, Sector ministries, DoE-Zanzibar</b>	Local funding
Prepare information packages to targeted groups (such as maintenance engineers in industries)	Information packages prepared	Prepared Manuals	2007	20,000	<b>NEMC, Depts of Env. Concerned Institutions, NGOs</b>	External funding

**Table 4.39:** Actions to update relevant policies and legislation to promote information exchange on POPs issue

Action	Expected Output	Indicators	Time Frame	Resources	Responsibility	Comments/Constraints
<b>Policy and Legislation Objective 1: To strengthen relevant policies and legislation by 2008</b>						
Review relevant policies and laws to incorporate public information, education and awareness provisions	Mandatory provision of public information, education and awareness on POPs	Policies and legislation reviewed	2007 - 2008	100,000	Depts of Env., POPs Technical Committee Depts of Env., NEMC, sector ministries	Local and external funding
Sensitize stakeholders from 10 different sectors on relevant policies and legislation, through 4 zonal workshops	Stakeholders awareness raised	Increased voluntary compliance	2008	50,000		Local and external funding

**Table 4.40:** Actions for promoting public awareness

Action	Expected Output	Indicators	Time Frame	Resources	Responsibility	Comments/Constraints
<b>Awareness Objective 1: To promote public awareness by 2009</b>						
Revise and develop public awareness programmes in collaboration with stakeholders	Public awareness raised	Number of supported awareness activities	2006-2007	50,000	Depts of Env., Sector ministries	Local and external funding

<b>Action</b>	<b>Expected Output</b>	<b>Indicators</b>	<b>Time Frame</b>	<b>Resources</b>	<b>Responsibility</b>	<b>Comments/Constraints</b>
Develop and implement strategic interventions to address capacity needs of NGOs, CBOs, youth and women groups and private sector and facilitate awareness raising activities	Capacity to undertake awareness campaigns enhanced	Implementation reports  Number of supported awareness activities  Network of awareness raising organisation	2007-2009	200,000	<b>Depts of Env.,</b> sector ministries NEMC, NGOs and other Awareness raising organisations	Local and external funding
Support media programs preparation (such as 4 radio Programs and 4 TV Programs) annually	Information pathways strengthened  Interventions on existing programs made	POPs media programs developed and updated	2007-2008	200,000	<b>Depts of Env.,</b> Sector ministries, NEMC, Academic and Research Institutions, NGOs	Local and external funding
Support awareness activities of institutions with related programs i.e. NEMC, MALE, GCLA, TPRI, TANESCO, SFPC etc	Implemented awareness programmes	Number of supported awareness activities	2006	300,000	<b>VPO-DoE,</b> Sector ministries NEMC, Sector ministries	External funding

Action	Expected Output	Indicators	Time Frame	Resources	Responsibility	Comments/Constraints
Establish/designate information centers and publicize them (i.e. regional libraries)	Information Centers established Regular press conferences Targeted groups sensitized	Centers for POPs information in place	2006-2007	100,000	Depts of Env., NEMC, sector Ministries, academic and Research Institutions	External funding
Arrange for press conference once per year during commemoration of environment day.		Agreed schedule	2007	500	VPO - DoE	Local funding

**Table 4.41:** Actions to incorporate POPs issues in schools and higher education institutions curricula.

Action	Expected Output	Indicators	Time Frame	Resources US \$	Responsibility	Comments/Constraints
<b>Mainstreaming Objective 1: To impart knowledge and skills on POPs to schools by 2009</b>						
Conduct 3 training sessions annually for 40 primary and secondary schools' teachers and relevant education stakeholders on POPs issues for 6 zones including Zanzibar.	Build capacity of teachers	Training reports No. of trainees	2007 -2009	100,000	Depts of Env., NEMC and Academic Institutions	Local and external funding

<b>Action</b>	<b>Expected Output</b>	<b>Indicators</b>	<b>Time Frame</b>	<b>Resources US \$</b>	<b>Responsibility</b>	<b>Comments/Constraints</b>
Development of educational materials on POPs and review of primary and secondary school curricular.	Mainstreaming POPs issues in school curricula	Educational materials developed	2007 -2008	100,000	Depts of Env., <b>NEMC</b> , Sector Ministries, NGOs Tanzania Institute of Education, UDSM, UCLAS, SUA NIMR, Sector ministries	Local and external funding
<b>Mainstreaming Objective 2: To incorporate POP issues in higher learning education by 2009</b>						
Develop training modules for academic and professional development programs		Training modules in place	2008-2009	500,000	<b>NEMC, UDSM, TIE</b> , Sector ministries, relevant training institutions, <b>NEMC, UDSM, TIE, POPs</b> Technical Committee	External funding
				<b>Total</b>	<b>2,011,500</b>	

#### 4.12.5 Key Investment Requirements

The key investment requirement is shown in Table 4.42

**Table 4.42:** Cost estimates for key investment requirements for public information, education and awareness

	<b>Item</b>	<b>Unit Cost (US\$)</b>
	Establishment/Designation of Information centres	100,000
	<b>Total</b>	<b>100,000</b>

#### 4.12.6 Costs and Financing of Strategy Implementation

The cost for financing this Action Plan is estimated at **USD 2,011,500**. The funds will originate mainly from the following sources:-

- Government budget allocation
- National collaborators like TANESCO, SFPC, UDSM etc.
- International funding sources including multilateral, bilateral and private funding agencies.
- Existing programs under Basel and Rotterdam Conventions.

### 4.13 STRATEGIES AND ACTION PLAN FOR MONITORING OF POPs LEVELS AND ELIMINATION

#### 4.13.1 Objectives and Priorities of Action Plan

The goal of the Action Plan is to create institutional capacity to monitor POPs levels in human and the environment.

The Action Plan addresses the identified gaps and deficiencies if Tanzania is to meet the requirements of the Stockholm Convention in the strengthening monitoring capacity of pops levels in human and the environment. It also defines objectives, time bound activities and required resources (human and financial). The implementation of the Action Plan envisages the participation of a broad spectrum of stakeholders.

##### 4.13.1.1 Overall Objectives

The overall objectives of this Action Plan are:-

- i) To strengthen capacity of institutions involved in monitoring POPs;

- ii) To create awareness to stakeholders such as the policy/decision makers research institutions and the general public on the Stockholm Convention, POP issues and the NIP;
- iii) To strengthen monitoring capacity of the relevant organizations and institutions involved in the monitoring of POPs releases, alternatives and their effects; and
- iv) To develop research programme on POPs alternatives and their effects to human and the environment.

The overall objectives provides basis for identifying specific objectives and actions required to enhance institutional capacity in monitoring of POPs levels in food, humans and the environment during implementation of the Action Plan.

#### **4.13.1.2 Constraints**

By comparing the baseline situation on monitoring aspects of POPs with the Convention requirements and the available legislation, the following constraints were identified:

- i) Limited institutional capacity in the monitoring of POPs;
- ii) Limited legal requirements for monitoring of POPs and their impacts in the existing relevant laws;
- iii) Lack of legal requirement for reporting POP matters to the Focal Point of the Stockholm Convention;
- iv) There is limited institutional capacity in terms of specialized skills, equipment and financial resources;
- v) Lack of standards and guidelines for monitoring POPs; and
- vi) Inadequate research on alternatives of POPs and their adverse effects to human health and the environment;

#### **4.13.1.3 Prioritization**

To achieve this goal priority will be on:-

- i) Strengthening institutional capacity for monitoring of POPs release and coordination;
- ii) Establishing monitoring standards, procedures and guidelines for POP releases and procedure for assessment of impacts to human health and the environment;
- iii) Developing regulations on monitoring of POPs;
- iv) Developing a comprehensive POPs monitoring program;
- v) Enhancing public awareness campaigns on POPs issue; and
- vi) Developing researches/studies on POPs and alternatives and their effects to human health and the environment particularly in areas, which are heavily contaminated, and those that have potential of being contaminated with POPs due to past and ongoing activities.

#### **4.13.2 Summary of POP Production, Uses, Stockpiles, Waste and Contamination**

The major sources of POPs Chemicals in Tanzania include imported POP Pesticides and PCBs. Currently there are no registered POP Pesticides in Tanzania for agricultural use. The quantity of obsolete POP Pesticides and DDT recorded during the inventory is 17.4 metric tonnes and 170.6 metric tonnes respectively. The inventory did not find any DDT in use. These obsolete stocks of POP Pesticides and DDT were originally intended for plant protection and for control of malaria vector disease (mosquitoes).

It is estimated that 273 metric tonnes of oils suspected to contain PCBs are present in 418 electrical equipment in use and those not in use. Out of total equipment, 216 transformers containing 93.4 metric tonnes of oil suspected to contain PCB and 17 oil circuit breakers are not in use hence classified as wastes.

There exist potential unintentional releases of PCDD/PCDF to air, water and land in Tanzania mainly from power generation and heating plants, uncontrolled burning processes, waste incineration, mineral production, and transport. The survey established that there exist a number of potential PCDD/PCDF releases to air, water and land in Tanzania. More than 516 g TEQ/a and 248 g TEQ/a are released through air emissions and residues, respectively. More than 67.91 % of PCDD/PCDF releases in air are due to uncontrolled combustion process particularly in uncontrolled forests and grasslands fires; and domestic waste burning which is the only identified activity releasing PCDD/PCDF on land. Other major sources are hospital waste and household cooking heating.

According to the inventory there is 33 surveyed sites are possibly contaminated with PCBs scattered in various places of the country. There are also 2 sites contaminated with POP Pesticides in Mtwara and Babati in Arusha and 2 sites contaminated with DDT in Korogwe in Tanga and Vikuge in Coast region. The identified sites possibly contaminated with PCDD and PCDF are eleven basically five types of industries that have closed business; these are chemical industries located in Dar es Salaam and Morogoro, petroleum refinery located in Dar es Salaam, tanneries located in Moshi, Morogoro and Mwanza regions paper mills located in Iringa region and textile industries located in Dar es Salaam. Other sites are Vingunguti and Jumbi municipal waste disposal sites located in Dar es Salaam and Zanzibar respectively. The determination of extent of sites potentially contaminated with PCDD/PCDF was not done.

The assessment of monitoring capacity on POPs release concluded that the responsibility for monitoring of POPs release is vested in institutions that are involved in pollution prevention and control, chemicals management, waste management and training and research development. However these lack specialized skills, equipment and financial resources to carry out regular monitoring of POPs levels and impacts to human health and the environment and studies/researches on POPs and their alternatives. Hence, no detailed assessment has been done for POPs risks to health and the environment in the country. The assessment also revealed that there is weak coordination of monitoring

activities amongst these institutions. There is a need therefore to strengthen institutional capacity.

During the assessment it was also noted that monitoring of POPs and their impacts is not provided for in the existing relevant laws. In addition there is no legal requirement for reporting POPs issue to the Focal Point of the Stockholm Convention. Furthermore there is lack of guidelines and standards for monitoring POPs. This calls for the review of the existing legislation and formulation of standards and guidelines in order to address monitoring and reporting on POPs issue.

Furthermore it was also learned that information for awareness creation is lacking. This is basic cause for the lack of monitoring.

#### **4.13.3 Measures for Monitoring Future POPs Levels and Elimination**

According to the assessment of monitoring capacity of POPs the following measures will be undertaken:-

- i) Institutional strengthening of POPs monitoring capacity;
- ii) Awareness raising on POP issues at all levels;
- iii) Review of existing policies/legislation, formulation of standards and guidelines to address POPs monitoring issues;
- iv) Monitoring of POPs levels in human and the environment;
- v) Coordination amongst institutions dealing with POPs monitoring; and
- vi) Carrying out studies/researches on alternatives and its effects to human health and the environment.

Currently there is weak coordination of monitoring activities on POPs in particular in the area of human health and the environment. Monitoring of POP levels and their elimination is a new area and thus there is literally no institutional capacity to monitor Dioxins, Furans and PCBs levels. In addition the awareness for general public is low. However there is a need to strengthen monitoring capacity of POPs levels and raise awareness on POP issues at all levels.

In future to effectively monitor POP levels and demonstrate their elimination the following actions should be initiated:

- i) Develop/ review legislation, related to monitoring of stockpiles, wastes, equipment and levels in the environment;
- ii) Strengthen national capacity and resources for monitoring of POPs; and
- iii) Develop national, regional and local institutional responsibilities for monitoring and data dissemination.

#### ***4.13.3.1 Legislation/Regulation to Monitor Stockpiles, Wastes, Equipment and Levels in the Environment***

Some of the existing sectoral laws provides for monitoring of environmental quality, in general terms. These include the Plant Protection Act (1997) and Plant Protection regulations (1999), which are responsible for the control and management of pesticides including POP Pesticides. Other legislation are the National Environment Management Act (1983), that provides for the monitoring of environmental pollution the Local Government Acts No 7 and No 8 of 1982 and its amendments cover sanitation, waste management and development of human settlements issues; The Industrial and Consumer Chemicals (Management and Control) Act of 2003 that provides for the management and control of the production, import, storage and disposal of industrial and consumer chemicals in the country. The Sustainable Environmental Management Act (1996) of Zanzibar provides a mandate to manage toxic chemicals. The Act enforces the establishment of chemicals management programmes in Zanzibar. Section 77 of the Environmental Management Act (2004) has provisions to address various matters related to the implementation of the Stockholm Convention on POPs.

The inventory has shown that there is no specific legislation requirement to monitor stockpiles, wastes, equipment and POP levels in the ambient environment. However EMA covers several aspects of the Stockholm convention requirements. Regulations on POPs need to be developed. Moreover relevant sectoral laws need review so as to incorporate issues of POPs monitoring.

#### ***4.13.3.2 Available National Capacities and Resources for Monitoring POPs***

Institutions involved in monitoring of POPs releases are those responsible for pesticides research, e.g. TPRI; environmental pollution standards and monitoring, e.g. NEMC and TBS; chemicals management, e. g. GCLA; training and research development e.g. Universities (UDSM and SUA) as shown in Annex II.

The assessment established that there are few institutions with a number of facilities and trained personnel that can undertake some of the functions of POPs management such as monitoring of PCB releases and analytical works. These include:- the Government Chemical Laboratory Agency (GCLA), Tropical Pesticide Research Institute (TPRI) and the University of Dar es Salaam. In addition Poison Centre and Occupational Safety and Health Authority can undertake study/research on health effects associated with POPs. There is limited institutional capacity for monitoring of POPs within the existing institutions in the country. There is inadequate capacity to undertake regular monitoring of POPs release in terms of expertise, working tools and financial resources. Personnel working in these institutions require specialized training on POPs monitoring procedures and analysis, determination of extent of contamination, assessment of impacts, determination of effectiveness of the alternatives and establishment of national emission factors for quantification of PCDD and PCDF. Some of the facilities might need to be updated to enable them analyse trace elements, e.g. in food, soils, water and air.

There is a need to have monitoring schemes in selected areas such as sites suspected to be contaminated with PCBs, workers in TANESCO and SFPC and those sites contaminated with PCDD and PCDF. Where both levels of POPs in humans and environment can be established and continuously monitored focus should be on workers (such as in TANESCO and SFPC), public (women and children), food and environmental media.

#### ***4.13.3.3 Development of National, Regional, Sub-regional and Local Institutional Responsibilities for Monitoring***

Tanzania as a member of SADC Sub Region has a responsibility to phase out PCBs by 2010. With additional skills and monitoring equipment existing laboratory facilities have the potential to provide POPs monitoring services in the Sub Region.

### **4.13.4 Implementation of the Action Plan**

#### ***4.13.4.1 Specific Objectives***

The following are specific objectives of the Action Plan:-

- (i) To develop monitoring capacity for POPs, alternatives and their effects;
- (ii) To sensitize stakeholders on need for their participation in POPs monitoring programmes; and
- (iii) To develop research programmes on POPs, alternatives and their effects to human health and the environment.

#### ***4.13.4.2 Strategies of Action Plan***

The following are strategies to implement the Action Plan:

- i) Establish coordination mechanism;
- ii) Enhance partnership amongst institutions involved in monitoring. of POPs;
- iii) Develop and implement awareness programme,
- iv) Establish information and data base;
- v) Establish information dissemination programme;
- vi) Enhance information exchange among stakeholders;
- vii) Improve availability and accessibility of public information;
- viii) Review relevant legislation;
- ix) Develop appropriate standards and procedures for POPs monitoring;
- x) Develop comprehensive POPs monitoring scheme;
- xi) Develop and implement monitoring programme;
- xii) Create public awareness on monitoring of POPs; and
- xiii) Establish training programme;

#### ***4.13.4.3 Organization***

The implementation of the Action Plan should fully involve all relevant stakeholders responsible for POPs management. VPO will coordinate the overall implementation of the Action Plan. The specific activities will be implemented under the coordination of the identified lead agency shown in the Action Plan. A Steering Committee composed of relevant stakeholders will be established. The Committee will regularly review implementation progress of the Action Plan. A Technical Committee with members from relevant sectors/institutions will also be established in order to advise and facilitate implementation of the Steering Committee decisions.

#### ***4.13.4.4 Overview of the Work plan and schedule***

The work plan and time frame for the implementation of the Action Plan is as indicated in Tables 4.43 to 4.44. In order to achieve expected outcomes it is assumed that adequate resources in terms of funds, institutional and human and equipment and continued government support will be available for the implementation of Action Plan.

#### ***4.13.4.5 Mechanism for reporting and monitoring implementation progress***

Mechanism for reporting will be established under the coordination of the Focal Point. The lead agencies in collaboration with respective sectors will implement specific activities and submit progress reports to the Focal Point. The Focal Point will compile the progress reports and organize Technical Committee Meetings to scrutinize the reports and provide recommendations for adoption by the Steering Committee.

**Table 4.43:** Actions for strengthening capacity of institutions responsible for coordination and monitoring of POPs

Action	Expected Output	Indicators	Time Frame	Resources (US \$)	Responsibility	Comments/Constraints
<b>Institutional Capacity Objective 1: To improve coordination mechanism and information exchange by 2013</b>						
Establish and facilitate two Expert Group meetings of 40 people for two days per annum to enhance coordination of research and monitoring activities	Harmonized monitoring activities	Proceedings of meetings	2007-2013	84,000	<b>Depts of Env., NEMC, Sector Ministries, PO-RALG, Academic and Research Institutions, NGOs, TANESCO, SFPC, Private Sector.</b>	Local and external funding
Enhance information access among R&D institutions and with information centers		Information access mechanism in place	2008+	600	<b>NEMC, VPO-DOE, Sector Ministries</b>	Local funding
<b>Institutional Capacity Objective 2: To strengthen monitoring capacity by 2012</b>						
Review relevant policies/legislation to incorporate monitoring of POPs	Monitoring capacity strengthened	Monitoring provisions in relevant policies/legislation in place	2006+	100,000	<b>Depts of Env. NEMC, GCLA, Sector Ministries, PO-RALGA</b>	<ul style="list-style-type: none"> <li>• Adequate allocation of funds</li> <li>• Local and external funding</li> </ul>
Undertake needs assessment for monitoring of POPs in terms of levels as well as tracking movement of POPs products		Needs assessment report	2007-2008	10,000	<b>NEMC, Depts of Env., UDSM, TPRI, PHS, MoH, GCLA,</b>	Local funding

Action	Expected Output	Indicators	Time Frame	Resources (US \$)	Responsibility	Comments/Constraints
Prepare and implement capacity building plan for monitoring of POPs products, levels and impacts including establishment of specific monitoring database at 13 relevant institutions		Capacity building plan, Database actual reports in place	2008 - 2012	45,000	NGOs	Local and external funding
Develop standards, procedures/guidelines for sampling and analysis of POPs		Standards and procedures/ guidelines in place	2007-2008	35,000	<b>DoE-Zanzibar, NEMC, GCLA, TBS, MoAFS, MIT, UDSM</b>	Local and external funding
Develop and implement strategy for the upgrading and accreditation of 5 laboratories for research and monitoring of POPs in food, environment and for human health surveillance		Strategy in place and Accredited Laboratories in place	2007-2010	1,000,000*	<b>NEMC, MoH, Dept of Env - Zanzibar, VPO TPRI, NIMR, GCLA, UDSM, UCLAS, TBS, MoWLD, TFNC TDFA</b>	External funding
Establish and implement comprehensive POPs monitoring programme involving strengthening of 4 inspectorate services and customs at 4 major entry points		Monitoring programme in place and Number of facilities and tools provided	2009-2010	2,000,000*	<b>NEMC, Sector Ministries TRA</b>	<ul style="list-style-type: none"> <li>• Availability of adequate funds</li> <li>• Local and external funding</li> </ul>
Develop monitoring mid year reports that involves site visits sampling and laboratory analysis		Reporting format established and Monitoring reports	2008-2011	32,000	<b>THA MoHA, NGOs, Private sector</b>	<ul style="list-style-type: none"> <li>• Local and external funding</li> </ul>

Action	Expected Output	Indicators	Time Frame	Resources (US \$)	Responsibility	Comments/Constraints
<b>Institutional Capacity Objective 3: Conduct training and promote awareness to relevant stakeholders by 2010</b>						
Establish and conduct specialized training Programme on monitoring of POPs (sampling, analysis as well as enforcement requirements)		Training programme in place	2008+	300,000	NEMC, UDSM, Depts of Env., Sectoral Ministries, MSTHE, , GCLA, SUA, TPRI, NGOs, Private sector.	Local and external funding
Promote awareness of the laboratories, inspectorate service and key departments on their role in POPs monitoring through 2 workshops and preparation of information packages		Workshop proceedings and information packages	2007 – 2010	18,000	Depts of Env., NEMC, GCLA, UDSM	Local and external funding

\* Actual financial requirements will depend on needs assessment

**Table 4.44:** Actions for development of researches on POPs and their alternatives and effects to human health and the environment

Action	Expected Output	Indicators	Time Frame	Resources	Responsibility	Comments/Constraints
<b>Research Objective 1: To study and generate information on behaviour of POPs and their alternatives by 2010</b>						
Develop research programme on POPs and their alternatives and effects involving two expert-meetings and consultancy	Improved availability of information on research/ studies on POPs, alternatives and their effects to human health and the environment	Needs assessment report and Research programme on POPs alternatives and their effects in place	2009-2010	35,000	Depts of Env., MALE, SFPC, NEMC, MoAFS, MoH, MEM, MNRT, TPRI, TANESCO, GCLA, PO-RALG, Academic and Research institutions	<ul style="list-style-type: none"> <li>All relevant institutions to be involved</li> <li>Local and external funding</li> </ul>
Implement research programme		Research programme implemented and progress reports	2010+	2,000,000*	DoE-Zanzibar, MoH, TPRI, MAFS, NEMC, OSHA, Academic and Research institutions i.e. UDSM, SUA, UCLAS, MUCHS, NIMR	External funding
Maintain database of research findings at relevant institutions		Data base in place	2007+	20,000	Depts of Env., NEMC, GCLA, UDSM	<ul style="list-style-type: none"> <li>Range of research data available in the country for all POPs</li> <li>Local and external funding</li> </ul>

<b>Action</b>	<b>Expected Output</b>	<b>Indicators</b>	<b>Time Frame</b>	<b>Resources</b>	<b>Responsibility</b>	<b>Comments/Constraints</b>
Disseminate research findings involving publication and distribution		Reduction/ elimination of POPs	2006-2010	100,000	<b>DoE-Zanzibar, NEMC, CPCT, Sectoral Ministries, PO-RALG</b>	Local and external funding
			<b>Total</b>	<b>5,779,600</b>		

\* Actual financial resource requirements depends on number of research proposal to be developed

### 4.13.5 Key Investment Requirements

The investment requirements include:

- i) Institutional Capacity Building support;
- ii) Technical support; and
- iii) Operational/maintenance costs of equipment.

#### **Institutional Capacity Building support**

The Institutional Capacity Building support will target:

- i) Focal Point;
- ii) Institutions responsible for monitoring of POPs and carrying out related research;
- iii) Establishment of reliable database on POPs monitoring; and
- iv) Capacity building in public awareness campaigns.

**Table 4.45:** Cost estimates for key investment requirements in monitoring of POPs and their alternatives

	<b>Item</b>	<b>Unit Cost (US\$)</b>
1.	Upgrading and accreditation of laboratories involved in research and monitoring of POP Pesticides in food, health and environment	1,000,000
2.	Establishing and implementing comprehensive POPs monitoring programme involving strengthening of 8 inspectorate services and customs offices	2,000,000
3.	Developing and Implementing research programme on POPs and their alternatives	2,035,000
	<b>Total</b>	<b>5,035,000</b>

### 4.13.6 Costs and Financing of Action Plan Implementation

The cost of financing the Action Plan Implementation is estimated to be **US\$ 5,779,600**. The funds required for the implementation of activities will mainly originate from the government budget, International funding Agencies/Organisations and stakeholder's resources.

## **4.14 STRATEGIES AND ACTION PLAN FOR REPORTING**

### **4.14.1 Objectives and Priorities of Action Plan**

The goal of the Action Plan is to build capacity for reporting on POPs information at international, regional, sub-regional and national levels.

The Action Plan addresses the identified gaps and deficiencies in the preliminary inventory of POPs releases in Tanzania, in order to comply with the Convention requirements (Article 15.) It also define objectives, time bound activities and the necessary resources.

#### **4.14.1.1 Overall Objectives**

The overall objectives of this Action Plan are to:

- i) Facilitate collection, storage, exchange and dissemination of information on POPs (effects, management options, available stocks etc);
- ii) Implement comprehensive voluntary and regulatory systems for reporting on POPs information;
- iii) Set up a national coordination modality of reporting on POPs information;

The overall objectives provides basis for identifying specific objectives and actions needed to enhance reporting capacity on POPs information by actors during implementation of the Action Plan.

#### **4.14.1.2 Constraints**

By comparing the baseline situation with the Convention requirements and available legislation, the identified constraints are;

- (i) Lack of guidelines and standards for monitoring and reporting on POPs;
- (ii) Limited institutional capacity in terms of specialized skills, equipment and financial resources;
- (iii) Low awareness of the general public;
- (iv) Weak inter-institutional reporting mechanism; and
- (v) Lack of provisions for reporting in the existing relevant legislations.

#### **4.14.1.3 Prioritization**

To achieve this goal, priority will be on building capacity in information generation; storage; management and dissemination; establishment of information exchange and collaboration mechanisms as well as to raise awareness on POPs.

The background for prioritization of the actions is based on the national priorities, health impacts, environmental impacts, socio-economic impacts, sustainability, Convention obligations, potential in implementing the Convention, ability to be implemented or enforceability and Donor interest.

#### **4.14.2 Summary of POPs Production, Uses, Imports and Exports**

Sources of POPs include imported POP Pesticides and PCBs. Currently there are no production, uses, import or export of POP Pesticides and DDT for any purpose. However, in the past, some of the POP Pesticides were being formulated in the country and were used in various pest control activities.

In the past, POP Pesticides were used in various pest control activities. It is estimated that a total of 350 metric tones were used between 1983 and 1990; and for DDT, a total of 87,687.5 metric tones and 16,642,480 Lts. were used in the same period.

There are about 273 metric tones of PCBs in electrical equipment in use and those not in uses suspected to contain PCBs. Out of total amount of oil 93.4 metric tonnes of oil is classified as waste.

There exists potential unintentional release of PCDD/PCDF to air, water and land in Tanzania mainly from domestic cooking and heating, uncontrolled forest and grassland fires and hospital waste incineration. More than 516 g TEQ/a and 248 g TEQ/a are released through air emissions and residues, respectively.

#### **4.14.3 Summary of Action Plan for Monitoring**

Institutions involved in monitoring of POPs releases are those responsible for pesticides and other pollutants research, including TPRI; GCLA; training and research development e. g. Universities (UDSM and SUA).

Currently, these institutions lack specialized skills, equipment and financial resources to carry out studies/research on POPs and their alternatives. There is also weak coordination of monitoring activities amongst these institutions. This makes availability of data difficult and sometimes not developed properly and not harmonized. This calls for the need to strengthen institutional capacity in terms of training, equipment and financial resources for effective monitoring of POPs release monitoring and assessment of their impacts. Also capacity building in data generation and management is required.

During the assessment it was also noted that monitoring of POPs and their impacts is not provided for in the existing relevant laws. In addition there is no legal requirement for reporting POPs issue to the Focal Point of the Stockholm Convention. Furthermore guidelines and standards for monitoring POPs are lacking. This calls for the need to review the existing legislation; and formulate standards and guidelines in order to address POPs monitoring and reporting issues.

Furthermore it was also learned that the national public information on POPs release and their impacts to human health and the environment is not accessible to the general public due to technical barriers including language and technological means. Also generation of information is weak in most of the institutions. Dissemination of the

available information is poor. This calls for the strengthening of generation, dissemination and management of information

So far there is no detailed research and assessment done for POPs risks to health and the environment due to lack of capacity and mechanisms for monitoring releases of POPs in the country. There is a need to carry out studies/research on effects of POPs to both health and the environment particularly in those identified areas which are heavily contaminated and those that have potential of being contaminated with POPs.

The inventory has shown that there is no specific legislation requirement to monitor stockpiles, wastes, equipment and POP levels in the ambient environment. However there is a need to develop/review existing relevant laws so as to incorporate issues of POP monitoring.

To effectively monitor POP levels the following actions should be initiated:

- i) Develop/ review legislation, related to monitoring of stockpiles, wastes, equipment and levels in the environment;
- ii) Strengthen national capacity and resources for monitoring of POPs; and
- iii) Develop national, regional and local institutional responsibilities for monitoring and data dissemination.

There is also a need to have monitoring schemes in selected areas such as sites suspected to be contaminated with PCBs, workers in TANESCO and SFPC and those sites contaminated with PCDD and PCDF. Personnel working in these institutions require specialized training on POPs monitoring procedures and analysis, determination of extent of contamination, assessment of impacts, determination of effectiveness of the alternatives and establishment of national emission factors for quantification of PCDD and PCDF. Some of the laboratory facilities might need to be updated to enable them analyze trace elements, e.g. in food, soils, water and air. In addition training of staff on specific management and control skills is essential.

#### **4.14.4 Measures for Reporting Future POPs Levels and Elimination**

Identified actions to meet Convention requirements on reporting include; ratification of the Convention, incorporation of the Stockholm Convention and the NIP in the legislation, review of PPA, and commissioning studies in selected areas for monitoring levels of POPs.

## **4.14.5 Implementation of the Action Plan**

### **4.14.5.1 Objectives**

The overall objective of the Action Plan is to create institutional capacity to report POPs levels in human and the environment. In order to achieve this goal the specific objectives are as follows: -

- i) To enhance inter-institutional reporting capacity;
- ii) To establish information generation, storage and dissemination capacity; and
- iii) To raise awareness on POPs.

### **4.14.5.2 Strategies of Action Plan**

The following are strategies to implement the Action Plan:

- i) Establish coordination mechanism;
- ii) Enhance partnership amongst institutions involved in reporting of POPs management;
- iii) Develop and implement awareness programme,
- iv) Establish information and data base;
- v) Establish information dissemination programme;
- vi) Enhance information exchange among stakeholders;
- vii) Improve availability and accessibility of public information;
- viii) Review relevant legislation to incorporate reporting requirements;
- ix) Develop appropriate reporting guidelines and procedures;
- x) Implement reporting programme; and
- xi) Establish steering and technical committee

### **4.14.5.3 Organization**

The implementation of the Action Plan shall involve all relevant stakeholders responsible for POPs management. VPO will coordinate the overall implementation of the Action Plan. The specific activities will be implemented under the coordination of the identified relevant sector/institution. A Steering Committee composed of relevant stakeholders shall be established. The Steering Committee will regularly review implementation progress of the Action Plan. A Technical Committee with members from relevant sectors/institutions will also be established in order to initiate the reporting, advice and facilitate the implementation of the Steering Committee decisions.

### **4.14.5.4 Overview of the Work plan and Schedule**

The work plan and time frame for the implementation of the Action Plan is as indicated in Tables 4.46. In order to achieve expected outcomes it is assumed that adequate

resources including funds, institutional, human, equipment and continued government support will be available in the country.

#### ***4.14.5.5 Mechanism for Reporting Progress***

VPO should coordinate the reporting of activities under the Action Plan. Respective sectors will implement specific activities and prepare ***quarterly*** progress report, which will be submitted, to VPO for compilation and consideration of the Technical and Steering Committees

**Table 4.46:** Actions to enhance inter-institutional reporting capacity

Action	Expected Output	Indicators	Time Frame	Resources	Responsibility	Comments/Constraints
<b>Reporting Capacity Objective 1: To strengthen reporting capacity of relevant institutions and National Focal Point by 2012</b>						
Establish reporting mechanism which involves needs assessment and development of necessary reporting guidelines		Capacity needs assessment report, guidelines and reporting mechanism in place	2006 to 2007	10,000	<b>Depts of Env.,</b> sector ministries, NEMC, NGOs, research and development institutions	Local and external funding
Prepare report on PCDD/PCDF DDT, and PCBs as per Convention requirements	Compliance with the Convention	Reports	2007 and - 2009	20,000	<b>Depts of Env.,</b> sector ministries, NEMC	Local and external funding
Review relevant legislation to incorporate reporting obligations	Mandatory reporting	Legal provisions on reporting in place	2006-2008	100,000	<b>Depts of Env.,</b> sector ministries, NGOs	Local and external funding
Establish database for POPs	Availability of data for reporting	Database established	2006+	50,000	<b>Depts of Env.,</b> sector ministries, development partners, NEMC	Local and external funding
Update Focal Point website to incorporate POPs information	Access to POPs information improved	Updated Website	2007-2011	30,000	<b>Depts of Env.,</b> sector ministries, UDSM, SUA, NGOs, NEMC	Local and external funding

<b>Action</b>	<b>Expected Output</b>	<b>Indicators</b>	<b>Time Frame</b>	<b>Resources</b>	<b>Responsibility</b>	<b>Comments/Constraints</b>
Establish reporting requirements by support agencies e.g. GCLA, occupational health centers regarding the number and type of enquiries received in order to monitor PCBs reduction Action Plan implementation		Reporting format and actual reports	2006 – 2007	25,000	<b>Depts of Envs</b> , GCLA, UDSM	Local funding
<b>Reporting Capacity Objective 2: To strengthen participation of stakeholders in reporting on POPs issue by 2008</b>						
Establish collaboration mechanisms (sharing of roles/responsibilities)	Sharing responsibility enhanced	Collaboration mechanisms identified and established	2006+	25,000	<b>Depts of Env.</b> , sector ministries, NGOs	<ul style="list-style-type: none"> <li>• Relevant institutions and the public collaborate in reporting activities</li> <li>• Local and external funding</li> </ul>
Conduct appropriate training of trainers to 120 people, 40 persons per annum		No. of trainees	2007-2008	50,000	<b>Depts of Env.</b> , sector ministries, NEMC, Research and development institutions and NGOs	Local and external funding
<b>Total</b>				<b>310,000</b>		

#### **4.14.6 Costs and Financing of Action Plan Implementation**

The financing cost of the Action Plan on Reporting is estimated to be **US\$ 310,000**. This cost does not include the operational costs of the IT facilities and the information centres. Funds will be solicited from internal and external sources.

# **ANNEXES**

**ANNEX I: STAKEHOLDERS IN POPs MANAGEMENT**

**ANNEXII: LABORATORY INFRASTRUCTURE FOR  
CHEMICAL ANALYSIS OF POPs**

**ANNEX III: BRIEF DESCRIPTION OF SELECTED  
TECHNOLOGIES FOR TREATMENT, DISPOSAL OR  
DESTRUCTION OF PCBs**

**ANNEX IV: GUIDELINES FOR THE IDENTIFICATION OF PCB-  
CONTAINING EQUIPMENT**

## ANNEX I

### STAKEHOLDERS IN POPs MANAGEMENT

Institution	Roles
i) Vice President's Office – Division of Environment	Coordination and monitoring of environmental activities, advisor on policy, legislative measures and international environmental agreements
ii) President's Office – Local Government Authorities	Policy implementation and enforcement of laws.
iii) Ministry of Agriculture, Livestock and Environment - Depts. of Environment and Agriculture, Zanzibar	Policy development and implementation, Planning and coordination of agriculture and environmental matters.
iv) Ministry of Transport and Communication	Policy development and implementation, planning and coordination of transport aspects.
v) Ministry of Water, Construction, Energy and Lands- Zanzibar	Policy development and implementation, Planning and coordination of Water, Construction, Energy and Lands matters.
vi) Ministry of Energy and Minerals	Policy development and implementation, Planning and coordination of energy matters.
vii) Ministry of Health	Policy development and implementation, planning and coordination of health issues.
viii) Ministry of Industry and Trade	Policy development and implementation, planning and coordination of industry and trade aspects.
ix) Ministry of Natural Resources and Tourism – Department of Forestry	Policy development and implementation, planning and coordination of forestry aspects.
x) Ministry of Home Affairs	Enforcement of Law and Order
xi) Ministry of Justice and Constitutional Affairs	Development of Legislation
xii) Ministry of Agriculture and Food Security- Department Plant Health Services	Policy development and implementation, planning and coordination of agriculture development aspects, regulation of plant protection substances and promotion of use of substitutes to POP Pesticides
xiii) Ministry of Water and Livestock Development	Policy development and implementation, planning and coordination of water and livestock development initiatives and monitoring of water quality.
xiv) NEMC	Environmental audit, review of Environmental Impact Assessment, enforcement of the national environmental quality standards, information dissemination and advisor on technical matters on environment
xv) NIMR	Medical research and advisor on related technical matters
xvi) GCLA	Advisor of government on matters of chemicals management, chemical analysis, coordination of

<b>Institution</b>	<b>Roles</b>
	industrial chemicals management, enforcement of Industrial and Consumer Chemicals Act and technical backstopping.
xvii) Tertiary Education institutions and Research	Training and research and technical backstopping
xviii) TANESCO and State Fuel and Power Cooperation of Zanzibar	Owner of most of the electrical equipment and sites that are contaminated with PCBs
xix) TBS	Development of standards
xx) TPRI	Research, registration and regulation of plant protection substances.
xxi) OSHA	Advisor of government on matters related to occupational health and safety at work places
xxii) Occupational health centres	Diagnosis of occupational health related diseases and treatment of the same
xxiii) Cleaner Production Centre of Tanzania	Training, demonstrations and awareness creation in pollution prevention and dissemination of information on sustainable production and consumption
xxiv) Tanzania Chamber of Commerce, Industries and Agriculture (TCCIA) and Confederation of Tanzania Industries (CTI)	Disseminate information and sensitize companies to adopt safer alternatives to POP chemicals
xxv) ABB-TANELEC	Production and servicing of transformers
xxvi) Manufacturing industries	Prevention of releases from industrial process
xxvii) Famers and Farmers association	Adoption of safer alternatives to POP Pesticides
xxviii) NGOs ( Envirocare, AGENDA, JET, Crop life (Tanzania) e.t.c)	Information dissemination and public sensitization on use of alternatives to POP chemicals
xxix) Media	Information dissemination and public sensitisation

## ANNEX II

### LABORATORY INFRASTRUCTURE FOR CHEMICAL ANALYSIS OF POPs

There are several institutions involved in environmental quality monitoring, research and development and setting of environmental standards. The list of laboratory facilities with capacity for POPs analysis is shown below.

Name/ description of Laboratory	Location	Equipment/Analytical Capabilities	Application GLP (yes/no)	Purpose
TBS	Dar es Salaam	HPLC(1)	Yes	Quality assurance and training
TPRI	Arusha	HPLC (2), GC (2)	Yes	Regulatory and quality assurance
GCLA	Dar es Salaam	HPLC (2), GC (2), GC - MS (1)	Yes	Regulatory and quality assurance
CHEMISTRY - UDSM	Dar es Salaam	HPLC (1), GC (2)	Yes	Training, research and public services (consultancy)
CPE, UDSM	Dar es Salaam	HPLC (1), GC (3), GC- MS (1)	Yes	Training, research and public services (consultancy)
TIRDO	Dar es salaam	HPLC	Yes	Research and public services
TFNC	Dar es Salaam	HPLC (2),	Yes	Research and quality assurance
SUA	Morogoro	HPLC	Yes	Training, research and public services (consultancy)

***Key to symbols in the table above***

Symbol	Description	Detector (as superscript)
HPLC	High Performance Liquid Chromatography	1= IR; 2=UV
GC	Gas Chromatography	1=FID; 2=ECD
GC-MS	Gas Chromatography – Mass Spectrometer	

**ANNEX III**  
**BRIEF DESCRIPTION OF SELECTED TECHNOLOGIES FOR**  
**TREATMENT OR DISPOSAL/DESTRUCTION OF PCBs**

**III(A): PROVEN TECHNOLOGIES FOR TREATMENT OR DISPOSAL/DESTRUCTION OF PCBs**

<b>Description of Technology</b>	<b>Process Performance</b>	<b>Benefits</b>	<b>Disadvantage</b>	<b>Comment</b>
<p><b>DESTRUCTION: HIGH TEMPERATURE INCINERATION</b></p> <p>Hazardous waste incinerators have a main chamber (also called the primary chamber) for burning PCBs and POPs such as unwanted and obsolete pesticides and a secondary chamber. The secondary chamber is used for extending the residence time for maximum destruction of the material and its thermal oxidation into gases and unburnable solids.</p> <p>The chemistry of incineration is the controlled high temperature oxidation of primarily organic compounds to produce carbon dioxide and water.</p>	<p>Well-managed incineration can destroy POPs with destruction and removal efficiency greater than 99.99 per cent. The temperature has to be &gt; 1500°C</p>	<p>Total destruction in proven system. Generally accepted technology by many nations. Long history of experience with management of HTI. Problem of hazardous chemicals with attendant liability problems is ended. No ongoing storage or contamination problems.</p>	<p>Dangerous air emissions if incinerator operation or design inadequate. Exhaust smoke can be dispersed to remote places. It might not be acceptable by people residing near the facility  Overall high cost.</p>	<p>Cement kilns must be improved to incorporate pollution prevention and monitoring</p>

Description of Technology	Process Performance	Benefits	Disadvantage	Comment
<p>There several incinerator types such as: Rotary kiln incinerators, Liquid injection incinerators, Static kiln incinerators, Fluidized bed incinerators and Cement kilns</p>				
<p><b>DECONTAMINATION of PCBs by DECHLORINATION</b></p> <p>The Base Catalyzed Dechlorination process (BCD) is a batch process operated in a series of stages and can treat wastes up to 10 % PCB. The key to the BCD process is the hydrogen donor with an oxidation potential low enough to produce nucleophilic hydrogen in the presence of base NAOH at low temperatures. Capacitors cannot be treated with this process and solvent washing is required for the transformer components.</p>	<p>The process has been shown to reduce contaminated soils from 10,000ppm to below detectable with two hours. For PCBs and contaminated transformer oils the BCD treatment process will typically reduce the contamination to below detection. Direct treatment of capacitors by the BCD process is not possible and solvent extraction is required.</p>	<ul style="list-style-type: none"> <li>• PCB and POPs destroyed in one step.</li> <li>• Simple process with very small emissions</li> <li>• Proven technology</li> <li>• Small facility footprint.</li> </ul> <p>Safety and Environmental Considerations: Potential to form PCDD and PCDF is very small and if formed then the BCD process will Dechlorinate. Also, emissions are low.</p>	<p>Must use solvent extraction with transformers and capacitors or other pre-treatment</p>	<p>Up to USD1000 per tonne PCB contaminated oils and up to USD 250 for contaminated soils. Low operating temperatures.</p>
<p><b>PCB Gone</b></p> <p>In service treatment of transformers is possible using dechlorination processes. A</p>	<p>With concentrations within transformer below 50,000 PPM the PCB gone process is</p>	<ul style="list-style-type: none"> <li>•For low contamination cost effective</li> </ul>	<ul style="list-style-type: none"> <li>•gaining approval for portable systems</li> <li>•not appropriate for pure</li> </ul>	

Description of Technology	Process Performance	Benefits	Disadvantage	Comment
<p>process developed by S D Myers called PCB Gone involves circulating the transformer fluid through a filtration system until the PCB concentrations are below the reclassification level. The PCB Gone process is very specific in the scheduled wastes it is able to treat, as it is designed to treat PCB contaminated transformer oils without the need to remove the transformer or take the transformer out of service.</p>	<p>quite effective and will reduce the PCB concentration to below 5ppm. Leaching can occur and the transformer may continue to require polishing for some time. Easy to set up and operate.</p>	<ul style="list-style-type: none"> <li>•Portable process</li> <li>•minimal air emissions</li> <li>•low temperature system</li> <li>•treats in service transformers</li> </ul>	<p>PCB transformers</p> <ul style="list-style-type: none"> <li>•not applicable for capacitors</li> <li>•collected PCB must still be destroyed</li> </ul>	
<p><b>PPM Process</b></p> <p>The process operates at ambient temperature and does not use flammable solvents; The process uses a complex organo-sodium reagent. The reagent is air and water sensitive and during reduction the process must be blanketed with nitrogen.</p>				
<p><b>DECONTAMINATION of PCBs by DESORPTION</b></p> <p>Thermal Desorption Performance</p>		<ul style="list-style-type: none"> <li>- Indirect heating</li> <li>- For soils very effective can handle full range of chlorinated</li> </ul>	<ul style="list-style-type: none"> <li>- Fixed large plant</li> <li>- Metal hydroxides from plant may need disposal. Off gas requires treatment</li> </ul>	

Description of Technology	Process Performance	Benefits	Disadvantage	Comment
<p>Generally low emissions and the process needs careful control to be effective. DRE's for PCB contaminated soils and dioxins is 6 nines. Does not use large amounts of excess air and operates under reduced pressure.</p>		<p>hydrocarbons, PCBs, POPs etc</p>		
<p><b>DESTRUCTION of PCBs by IN SITU VITRIFICATION</b></p> <p>In situ Vitrification (ISV) is a commercially available technology used for contaminated site remediation and waste treatment. It is a mobile, thermal treatment process that uses electricity to heat and melt contaminated soils, sludges and other earthen materials. The treatment results in the permanent destruction of organic contaminants and the permanent immobilization of inorganic contaminants within the high integrity vitreous product. ISV has been demonstrated to be effective in the treatment of all classes of contaminants including organics, heavy metals,</p>				

<b>Description of Technology</b>	<b>Process Performance</b>	<b>Benefits</b>	<b>Disadvantage</b>	<b>Comment</b>
radioactive material, and explosive compounds. The ISV process has been successfully used at full scale to treat a wide range of soils and wastes including contaminants such as pesticides, herbicides, dioxin, PCB's, arsenic, mercury, lead etc.				

### III(B): EMERGING TECHNOLOGIES FOR TREATMENT OR DISPOSAL/DESTRUCTION OF PCBS

These are new technologies that are yet to be proved.

#### a) **Bioremediation**

Bioremediation refers to the use of microorganisms to break down organic chemical compounds that contaminate soil. The key to the process is the identification of an appropriate organism to perform the bioremediation process. The effects of moisture content, temperature, oxygen levels, and food sources are required to be understood so that successful application can be achieved. In situ bioremediation treats the soil in place and eliminates the need to transfer the soil elsewhere for treatment. In situ remediation usually uses the indigenous bacteria and supplements with nutrient water to increase microbial rates. Ex situ technologies treat excavated soils under controlled conditions where temperature and moisture is managed. For sites without owners that have low levels of contamination this process can be very cost effective and after time very effective in cleaning contaminated sites. Generally unsuitable for heavily contaminated pesticide sites but will work on low levels of POPs and PCBs.

#### b) **Solidification and Stabilization**

These technologies rely on limiting the solubility or mobility of the toxic component in hazardous waste generally by physical containment. Five containment methods are used. Solidification by pozzolanic reactions, pozzolana-portland cements reactions, thermoplastic micro encapsulation, and macro encapsulation. The sorption process requires additional solid materials to take up free liquids.

#### c) **Soil Washing**

PCB and POPs and other particles that are adsorbed into the surface of particles can be leached from soil by caustic agents such as sodium hydroxide.

#### d) **Supercritical Water Oxidation**

This technology is a high temperature and pressure system that uses the properties of supercritical water in the destruction of organic compounds. The process is applicable to the treatment of a range of contaminants including acrolonitrile wastewater, pesticide wastewater, PCBs, halogenated aliphatics and aromatics. The process is established with a totally enclosed in a reactor. The oxidant is injected as required on a heat based transfer, thermal and kinetic considerations. The process results in the formation of disposable ash and releasable gases.

**e) Gasification**

This process uses a low-pressure steam at high temperatures and a thermo chemical reaction to vaporize and separate waste into their elemental components. A reduction process takes place in a reaction vessel, which is directly heated. A reductive process rather than combustion takes place. There is no reactor stack gas.

**f) Chemical Oxidation**

Hydrogen peroxide, potassium permanganate, Oxone (DuPont chemical), peroxydisulfate, ultraviolet activated hydrogen peroxide and ozone oxidation are all viable oxidants for the treatment of non-stockpile neutralents. Under appropriate operating conditions and with sufficient reagent, the organic compounds present in the neutralents can be expected to be mineralized with any of these oxidants. For chemical oxidation not activated by UV light, conventional process equipment and procedures are used. The reactions are carried out at 80-100°C at Atmospheric pressure in aqueous solutions. When an organic phase is present, vigorous agitation is necessary to suspend and disperse the organic materials in the aqueous phase.

**g) Electrochemical Oxidation**

At low temperature and atmospheric pressure, electrochemically-generated oxidants react with organochlorines to form carbon dioxide, water and inorganic ions. Has high destruction efficiencies all emissions and residues can be captured for assay and reprocessing, if needed. An electrochemical cell is used to generate oxidizing species at the anode in an acid solution, typically nitric acid. These oxidizers and the acid then attack any organic compounds, converting most of them to carbon dioxide, water and inorganic ions at low temperature (< 80 °C) and atmospheric pressure.

**h) Electrochemical oxidation - cerium**

The CerOx process is similar to the Ag(II) process except that it uses 0.8M Ce(IV) solution in 3M nitric acid at 100C to oxidize and destroy organic compounds. Unlike Ag(II), Ce(IV) is stable. The Ce is produced and regenerated by the electrolysis of Ce (III) in a bipolar electrochemical cell (T-cell). Carbon is converted to CO<sub>2</sub>; chlorine compounds are converted to elemental chlorine, which is scrubbed and converted to hypochlorite. CerOx uses few reactants; principally nitrate (recycled), nitric acid, and sodium hydroxide to treat off-gases. Biggest cost is for electricity to operate the electrolysis T-cells.

**i) Steam reforming**

The Steam Detoxification process involves very high temperature steam reforming (i.e. 1100 to 1500°C) to destroy hazardous wastes. Vent gases are carbon dioxide and water. Steam Detoxification consists of a two-step process, and is carried out in a Pyrolysis Detoxifier. The hydrocarbon component of the waste is first evaporated in a

first-stage waste feed evaporator unit and the vaporised gases are then mixed with superheated steam and fed into a "pyrolysis reactor" where they are further electrically heated under a slight vacuum. A carbon monoxide converter oxidises the detoxified gases and an activated carbon adsorber removes the last of the trace organics and metals.

### **Advantages and disadvantages of steam reforming**

<b>Advantages</b>	<b>Disadvantages</b>
<ul style="list-style-type: none"> <li>• As the reactor is heated electrically the gases are free of the fuel combustion particulates</li> <li>• Common to incinerator systems.</li> <li>• Small enough to readily fit into existing buildings;</li> <li>• Provide acceptable installation costs;</li> <li>• Destroy liquid solvents and their contaminants;</li> <li>• Destroy organic contaminants adsorbed onto activated carbon;</li> <li>• Destroy organics in the vapour phase;</li> <li>• Process continuous liquid feed streams;</li> <li>• Process drummed wastes without removal of drums;</li> <li>• Operate with a high temperature waste feed evaporator for solid organics;</li> <li>• Serve as part of a process to purify ground water; and reactivate vapour and liquid phase</li> </ul>	<ul style="list-style-type: none"> <li>• The process requires potentially elaborate gas treatment systems, and the overall system can be expected to be of similar complexity to the Eco Logic system</li> <li>• Some pretreatment required for solid wastes (shredding, grinding, desorption).</li> <li>• Some of the solid residues left over after the evaporation stage may require solidification and fixation before landfill disposal.</li> <li>• The high temperatures used in the process require specialised equipment and reactor materials. The process requires containment of potentially hazardous gases at high temperatures and therefore will require careful design and operation.</li> <li>• Mainly suitable to liquid and aqueous wastes.</li> </ul>

- Costs are estimated by the proponent at approximately half the average cost of incineration or landfill in the US.
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**j) Wet air oxidation**

The WAO process oxidizes and hydrolyzes organic contaminants in water at temperatures of 150- 315°C and pressures of 150 to 3150 psi, below the critical temperature of water and pressure (374°C and 3,204psia). If pure oxygen is used instead of air as the oxidizing agent, the gas volumes that must be managed are greatly reduced. Organic compounds containing carbon, hydrogen and oxygen are converted to CO<sub>2</sub>, H<sub>2</sub>O and short chain biodegradable compounds such as acetic acid and formaldehyde. Depending on reaction conditions, further biotreatment of residues may be necessary. Toxic heavy metals in the neutralent would have to be precipitated and filtered out prior to biotreatment. Sulphur containing organics are mineralized to sulfate ions in solution, Phosphorous to phosphate ions, chlorine to chloride ions, nitrogen to ammonium and nitrate ions and nitrogen and nitrous oxide gas, cyanides are converted to CO<sub>2</sub> and ammonium ions.

**k) Ball milling**

The Ball Milling process is a mechanical/chemical process, relying on the energy released at the point of collision between balls in a ball mill to activate a reaction between the waste and CaO (lime), breaking down the organochlorine compounds. By-products of the destruction of organochlorine compounds using CaO are generally of low toxicity and may include graphite, calcium chloride and calcium hydroxide. The process may be applied to concentrated forms of halogenated hydrocarbons such as PCBs and DDT. In the case of contaminated electrical components, the possibility exists to destroy the encapsulating container in the same process. Disperse wastes (e.g. contaminated soil) would preferably be concentrated by solvent extraction or a similar process prior to destruction within the ball mill treatment system.

**ANNEX IV**  
**GUIDELINES FOR THE IDENTIFICATION OF PCB-  
CONTAINING EQUIPMENT**

Reference: United Nations Environment Programme; Guidelines For The Identification of PCBs and Materials Containing PCBs; First Issue; August 1999 Prepared by UNEP Chemicals.