



**UNITED REPUBLIC OF TANZANIA
VICE PRESIDENT'S OFFICE**

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

SEPTEMBER, 2018

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For further information, please contact:

Makole Street,
LAPF Building,
7th Floor,
P.O.Box 2502
40406 Dodoma,
TANZANIA.

Phone : +255 262329006

Fax : +255 262329007

PREFACE

Persistent Organic Pollutants (POPs) present unique challenge as they persist in the environment, exhibit long-range transport properties, bioaccumulate in fat tissues of living organisms and pose risks to human health and the environment. In view of the global nature of the challenges posed by POPs, the Stockholm Convention on POPs was adopted at a Conference of Plenipotentiaries on 22 May, 2001 in Stockholm, Sweden. It 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 adverse effects of persistent organic pollutants.

The initial list of chemicals controlled under the Convention included 12 chemicals which were popularly referred to as the ‘dirty dozen’. However, during meetings of the Conference of the Parties in 2009, 2011, 2013 and 2015, additional 14 new chemicals were included in the list, making a total of 26 controlled chemicals as of now. The list consists of **Pesticides** (Aldrin, Dieldrin, DDT, Endrin, Chlordane, Hexachlorobenzene (HCB), Mirex, Toxaphene, Heptachlor, Alpha hexachlorocyclohexane, Beta hexachlorocyclohexane, Chlordecone, Pentachlorobenzene (PeCBz), Hexabromocyclododecane (HBCD), Technical Endosulfan and its related isomers, Pentachlorophenol (PCP) and its salts and esters and Lindane); **Industrial chemicals** (Polychlorinated Biphenyls (PCBs), Hexachlorobutadiene (HCBD), Hexabromobiphenyl, Hexabromodiphenyl ether and heptabromodiphenyl ether (homologues of commercial octabromodiphenyl ether), Hexachlorobenzene, Pentachlorobenzene (PeCBz), Perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOS-F), Polychlorinated naphthalenes (PCNs), Tetrabromodiphenyl ether and pentabromodiphenyl ether (homologues of commercial pentabromodiphenyl ether)); and **unintentionally produced by-product chemicals** (Polychlorinated *para*- dibenzodioxins (PCDD), Polychlorinated dibenzofurans (PCDF, Hexachlorobenzene (HCB), Polychlorinated Biphenyls (PCBs), Pentachlorobenzene (PeCBz) and Polychlorinated naphthalenes (PCNs)).

According to Article 7 of the Stockholm Convention, Parties have the obligation of developing, implementing and periodically reviewing and updating a National Implementation Plan on the Stockholm Convention on POPs. Tanzania completed and submitted its first NIP to the Secretariat of the Convention on 12 June, 2006. The updated NIP reviews the existing situation of both initial and new POPs, and elaborates priority actions to be undertaken in the management and control of POPs in the country. The implementation of the initial NIP had a number of achievements including disposal of about 1,000 metric tones of obsolete stockpiles of POP pesticides; reduced use of pesticides through promotion of Integrated Pest

Management (IPM) and Integrated Vector Management (IVM); training of about 300 staff of regulatory authorities; public awareness campaign reaching out about 15-20 percent of the total population; and increased engagement and involvement of CSOs in training and awareness initiatives. Furthermore, the national chemical regulatory capacity was strengthened through development of regulations and guidelines, control of imports and appointment of Chemical and Environmental Inspectors. However, several challenges remain including inadequate policy and regulatory framework; insufficient national capacity in terms of financial and human resources; lack of facilities for environmentally sound management of POPs; inadequate adoption of best practices and techniques; and low public awareness.

In view of these challenges and experience gained over the years, the updated NIP takes into account the aspirations and milestones charted out by national development frameworks particularly the National Strategy for Growth and Reduction of Poverty (NSGRP) of 2010 and the Tanzania's Development Vision 2025, both of which call for improvement of quality of life and social wellbeing. In addition, it aligns with the Sustainable Development Goals (SDGs) whose 9 out of 17 targets directly or indirectly addresses environmental sustainability. It also promotes synergies in domesticating related Conventions and international processes on chemicals and waste management so as to realize multiple benefits. In this regard, the implementation of the updated NIP will contribute to the national and global efforts of combating poverty and improve environmental quality.

In this context, the Government of the United Republic of Tanzania (URT) is determined to and shall make every effort to mobilize resources and encourage participation of all stakeholders including private sectors in addressing the challenges posed by POPs. Cognizant of the fact that environment is the common heritage for present and future generations, the Government of the URT welcomes support of local and international stakeholders in our ambition to achieve a POPs-free world.



Hon. January Yusuf Makamba (MP)

Minister of State, Vice President's Office Union Affairs and Environment

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The successful compilation of the updated National Implementation Plan (NIP) for the Stockholm Convention on Persistent Organic Pollutants (POPs) is a reflection of contribution and inputs by many individuals and institutions that deserve a vote of thanks.

I therefore wish to express our gratitude to the national team of experts which was involved in undertaking inventories and initial drafting of an updated NIP. The team was drawn from Ministry of Industry, Trade and Investments (MITI); Ministry of Health, Community Development, Gender, Elderls and Children (MHCDGEC); Ministry of Agriculture; Ministry of Livestock and Fisheries; Ministry of Lands, Water, Energy and Environment (Zanzibar); Ministry of Agriculture, Natural Resources, Livestock and Fisheries (Zanzibar); Vice President's Office – Division of Environment (VPO - DoE); Government Chemist Laboratory Authority (GCLA); National Environment Management Council (NEMC); Zanzibar Electricity Company (ZECO); Cleaner Production Centre of Tanzania (CPCT) and University of Dar es Salaam – College of Engineering and Technology (UDSM-CoET); Tropical Pesticides Research Institute (TPRI); Tanzania Electric Supply Company (TANESCO); Tanzania Revenue Authority (TRA); and AGENDA for Environment and Responsible Development (NGO).

I am particularly indebted to the National Coordinating Committee (NCC) for their guidance during the NIP review and update process. The members of the NCC were drawn from: Ministry of Agriculture; Ministry of Livestock and Fisheries; Ministry of Energy; Ministry of Minerals; Ministry of Lands, Water, Energy and Environment (Zanzibar); Ministry of Agriculture, Natural Resources, Livestock and Fisheries (Zanzibar); Ministry of Finance and Planning; Ministry of Industry, Trade and Investment; Ministry of Health, Community Development, Gender, Elders and Children; Ministry of Works, Transport and Communication; National Environment Management Council (NEMC); Tropical Pesticides Research Institute (TPRI); Cleaner Production Centre of Tanzania (CPCT), Tanzania Electric Supply Company (TANESCO) and AGENDA for Environment and Responsible Development.

I am thankful to all Staff from the Vice President's Office who made it possible. I also wish to acknowledge the Global Environment Facility (GEF) for the financial support on the Enabling Activities to Review and Update the National Implementation Plan for the Stockholm Convention on POPs. We appreciate the roles played by UNIDO as the Implementing Agency, including training on inventory of all listed Persistent Organic Pollutants, which served as the basis for the review and update of the first NIP (2006). We are specifically indebted to Dr. Roland Weber, International Consultant, for his technical guidance throughout the NIP update process.

Last but not least, we are thankful to all stakeholders, who cooperated and in one way or the other, contributed to this very important process of developing the updated

National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants (POPs).

The consideration you gave to this endeavour has facilitated an important step towards protecting health and the environment from adverse effects of POPs.

A handwritten signature in blue ink, appearing to read 'J. Malongo', written in a cursive style.

Eng. Joseph Kizito Malongo
Permanent Secretary, Vice President's Office

CONTENTS

PREFACE	iii
ACKNOWLEDGEMENTS	v
LIST OF ABBREVIATIONS	xx
EXECUTIVE SUMMARY	xxiv
CHAPTER ONE	1
INTRODUCTION	1
1.1 Purpose of the Tanzania National Implementation Plan	1
1.2 What are Persistent Organic Pollutants?.....	2
1.3 Overview of the listed Persistent Organic Pollutants.....	2
1.4 Sources of POPs in Tanzania.....	4
1.5 Provisions of the Stockholm Convention.....	5
1.6 Development of the National Implementation Plan	6
1.7 Assistance Received.....	7
CHAPTER TWO	8
COUNTRY BASELINE AND THE POPs ISSUE	8
2.1 COUNTRY PROFILE	8
2.1.1 Agriculture Sector.....	9
2.1.2 Industrial sector	9
2.1.3 Transport Services	10
2.1.4 Environmental resources	10
2.1.4.1 Forestry	10
2.1.4.2 Freshwater and marine resources	11
2.1.4.3 Livestock	11
2.1.4.4 Wildlife.....	12
2.1.4.5 Natural Gas	12
2.1.4.6 Minerals	12
2.1.4.7 Renewable energy sources	13
2.1.4.8 Land.....	13
2.1.4.9 Helium Gas	13
2.2 INSTITUTIONAL, POLICY AND REGULATORY FRAMEWORK	13
2.2.1 Policies related to POPs management.....	13
2.2.2 Regulatory framework	19
2.2.3 Institutional framework.....	21

2.3	ASSESSMENT OF THE POPs ISSUE IN THE COUNTRY	24
2.3.1	ASSESSMENT OF POPs PESTICIDES (ANNEX A, PART I CHEMICALS)	24
2.3.1.1	Summary	24
2.3.1.2	Introduction	25
2.3.1.3	Methodology	25
2.3.1.4	Findings	25
2.3.1.5	Conclusion.....	28
2.3.2	ASSESSMENT OF PCBs (ANNEX A, PART II CHEMICALS).....	29
2.3.2.1	Summary.....	29
2.3.2.2	Introduction	29
2.3.2.3	Methodology	30
2.3.2.4	Findings.....	30
2.3.2.5	Conclusions	35
2.3.3	ASSESSMENT OF POP-PBDES (ANNEX A, PART IV AND PART V CHEMICALS) AND HBB (ANNEX A, PART I CHEMICALS).....	35
2.3.3.1	Summary.....	35
2.3.3.2	Introduction	36
2.3.3.3	Inventory of PBDEs in the Transport Sector	36
2.3.3.4	Inventory of PBDEs in EEE/WEEE sector	43
2.3.3.5	Inventory of Stocks and Flows of EEE/WEEE	45
2.3.3.6	Findings	57
2.3.3.7	Conclusion on POP-PBDEs in EEE/WEEE and vehicles	58
2.3.4	ASSESSMENT OF DDT (ANNEX B, PART II CHEMICALS).....	59
2.3.4.1	Summary.....	59
2.3.4.2	Introduction	59
2.3.4.3	Methodology	59
2.3.4.4	Findings	60
2.3.4.5	Conclusion	63
2.3.5	ASSESSMENT OF PFOS, ITS SALTS AND PFOSF (ANNEX B, PART III CHEMICALS).....	63
2.3.5.1	Summary.....	63
2.3.5.2	Introduction	63
2.3.5.3	Methodology	64
2.3.5.4	Findings	65
2.3.5.5	Conclusions	71
2.3.6	ASSESSMENT OF RELEASES OF UNINTENTIONALLY PRODUCED CHEMICALS (ANNEX C CHEMICALS).....	72
2.3.6.1	Summary.....	72
2.3.6.2	Introduction	72
2.3.6.3	Methodology	73
2.3.6.4	Findings.....	73

2.3.6.5	Conclusion.....	89
2.3.7.	ASSESSMENT OF POPs IN TANZANIA ZANZIBAR.....	92
2.3.7.1	Summary.....	92
2.3.7.2	Introduction	92
2.3.7.3	Methodology	92
2.3.7.4	Findings.....	93
2.3.7.5	Conclusion.....	100
2.3.8	INFORMATION ON THE STATE OF KNOWLEDGE ON STOCKPILES, CONTAMINATED SITES AND WASTES, IDENTIFICATION, LIKELY NUMBERS, RELEVANT REGULATIONS, GUIDANCE, REMEDIATION MEASURES AND DATA ON RELEASES FROM SITES	101
2.3.8.1	Summary.....	101
2.3.8.2	Introduction	101
2.3.8.3	Methodology	101
2.3.8.4	Findings	102
2.3.8.5	Conclusion.....	104
2.3.9	SUMMARY OF FUTURE PRODUCTION, USE, AND RELEASES OF POPs – REQUIREMENTS FOR EXEMPTIONS	104
2.3.10	EXISTING PROGRAMMES FOR MONITORING RELEASES AND ENVIRONMENTAL AND HUMAN HEALTH IMPACTS, INCLUDING FINDINGS.....	109
2.3.10.1	Summary.....	109
2.3.10.2	Introduction	109
2.3.10.3	Current Monitoring Standards and Capacity for Monitoring POPs Presence in the Environment	110
2.3.10.4	Background on Potential Sources of POPs Impacts.....	111
2.3.10.5	Evidence POPs Impacted populations or environment, Food, Feed and Humans	111
2.3.10.6	Potential Risk Groups	112
2.3.11	CURRENT LEVEL OF INFORMATION, AWARENESS, AND EDUCATION AMONG TARGET GROUPS; EXISTING SYSTEMS TO COMMUNICATE SUCH INFORMATION TO THE VARIOUS GROUPS	112
2.3.11.1	Summary.....	112
2.3.11.2	Introduction	113
2.3.11.3	Methodology	113
2.3.11.4	Findings.....	113
2.3.11.5	Conclusion	118
2.3.12	MECHANISMS TO REPORT UNDER ARTICLE 15 ON MEASURES TAKEN TO IMPLEMENT THE PROVISIONS OF THE CONVENTION AND FOR INFORMATION EXCHANGE	

WITH OTHER PARTIES TO THE CONVENTION.....	118
2.3.13 RELEVANT ACTIVITIES OF NON-GOVERNMENTAL STAKEHOLDERS.....	119
2.3.14 OVERVIEW OF TECHNICAL INFRASTRUCTURE FOR POPS ASSESSMENT, MEASUREMENT, ANALYSIS, ALTERNATIVES AND PREVENTION MEASURES, MANAGEMENT, RESEARCH AND DEVELOPMENT – LINKAGE TO INTERNATIONAL PROGRAMMES AND PROJECTS.....	121
2.3.14.1 Summary.....	121
2.3.14.2 Introduction	121
2.3.14.3 Waste Management Facilities	122
2.3.14.4 Contaminated Site Remediation Capability.....	122
2.3.14.6 Health Monitoring Capability	125
2.3.14.7 Information Management Capacity	125
2.3.15 IDENTIFICATION OF IMPACTED POPULATIONS OR ENVIRONMENTS, ESTIMATED SCALE AND MAGNITUDE OF THREATS TO PUBLIC HEALTH AND ENVIRONMENTAL QUALITY, AND SOCIAL IMPLICATIONS FOR WORKERS AND LOCAL COMMUNITIES	127
2.3.15.1 Summary.....	127
2.3.15.2 Introduction	128
2.3.15.3 Impacted Populations	128
2.3.15.4 Environmental Monitoring.....	130
1.1.15 DETAILS OF ANY RELEVANT SYSTEM FOR THE ASSESSMENT AND LISTING OF NEW CHEMICALS	130
2.3.17 DETAILS OF ANY RELEVANT SYSTEM FOR THE ASSESSMENT AND REGULATION OF CHEMICALS ALREADY IN THE MARKET	131
CHAPTER THREE	133
STRATEGY AND ACTION PLAN ELEMENTS OF THE NATIONAL IMPLEMENTATION PLAN	133
3.1 Policy Statement.....	133
3.2 Implementation strategy.....	134
3.2.1 Priorities for POPs Management.....	134
3.2.2 Institutional Arrangement.....	137
3.2.3 Implementation Approach	138
3.3 ACTIVITIES, STRATEGIES AND ACTION PLANS.....	139
3.3.1 ACTIVITY: INSTITUTIONAL AND REGULATORY	

STRENGTHENING MEASURES	140
3.3.1.1 Identified Gaps	140
3.3.1.2 Main Objective.....	140
3.3.1.3 Priority Issues.....	140
3.3.1.4 Action Plan	140
3.3.2 Activity: Measures to reduce or eliminate releases from intentional production and use	144
3.3.3 ACTIVITY: PRODUCTION, IMPORT AND EXPORT, USE, STOCKPILES, AND WASTES OF ANNEX A POPs PESTICIDES (ANNEX A, PART I CHEMICALS) AND DDT	144
3.3.3.1 Identified Gaps	144
3.3.3.2 Objectives of the Action Plan.....	145
3.3.3.3 Priority Issues.....	145
3.3.3.4 Action Plan	145
3.3.4 ACTIVITY: PRODUCTION, IMPORT AND EXPORT, USE, IDENTIFICATION, LABELLING, REMOVAL, STORAGE, AND DISPOSAL OF PCBs AND EQUIPMENT CONTAINING PCBs (ANNEX A, PART II CHEMICALS)	149
3.3.4.1 Identified Gaps	149
3.3.4.2 Overall Objective	149
3.3.4.3 Priority Issues	149
3.3.4.4 Action Plan	150
3.3.5 ACTIVITY: PRODUCTION, IMPORT AND EXPORT, USE, STOCKPILES, AND WASTES OF HEXABDE AND HEPTABDE (ANNEX A, PART IV CHEMICALS) AND TETRABDE AND PENTABDE (ANNEX A, PART V CHEMICALS) (AND HBB, WHERE APPLICABLE (ANNEX A, PART I CHEMICALS)).....	154
3.3.5.1 Identified Gaps	154
3.3.5.2 Overall Objective	154
3.3.5.3 Priority Issues	154
3.3.5.4 Action Plan	155
3.3.6 ACTIVITY: PRODUCTION, IMPORT AND EXPORT, USE, STOCKPILES, AND WASTES OF DDT (ANNEX B, PART II CHEMICALS)	159
3.3.7 ACTIVITY: PRODUCTION, IMPORT AND EXPORT, USE, STOCKPILES, AND WASTES OF PFOS, ITS SALTS AND PFOF (ANNEX B, PART III CHEMICALS)	159
3.3.7.1 Identified Gaps	159
3.3.7.2 Overall Objective	159
3.3.7.3 Priority issues	159
3.3.7.4 Action Plan	159

3.3.8	ACTIVITY: REGISTER FOR SPECIFIC EXEMPTIONS AND THE CONTINUING NEED FOR EXEMPTIONS (ARTICLE 4).....	163
3.3.9	ACTION PLAN: MEASURES TO REDUCE RELEASES FROM UNINTENTIONAL PRODUCTION (ARTICLE 5)	164
3.3.9.1	Identified Gaps	164
3.3.9.2	Overall Objective	165
3.3.9.3	Priority Issues	165
3.3.9.4	Action Plan	165
3.3.10	Activity: Measures to reduce releases from stockpiles and wastes (Article 6).....	170
3.3.11	Strategy: Identification of stockpiles, articles in use and wastes	170
3.3.12	Activity: Manage stockpiles and appropriate measures for handling and disposal of articles in use.....	170
3.3.13	STRATEGY: IDENTIFICATION OF CONTAMINATED SITES (ANNEX A, B, AND C CHEMICALS) AND REMEDIATION IN AN ENVIRONMENTALLY SOUND MANNER	171
3.3.13.1	Identified Gaps	171
3.3.13.2	Objectives of the Action Plan.....	171
3.3.13.3	Priority Issues	172
3.3.13.4	Action Plan	172
3.3.14	ACTIVITY: FACILITATING OR UNDERTAKING INFORMATION EXCHANGE AND STAKEHOLDER INVOLVEMENT	176
3.3.14.1	Identified Gaps	176
3.3.14.2	Overall and specific objective.....	176
3.3.14.3	Priority Issues	176
3.3.14.4	Action Plan	176
3.3.15	ACTIVITY: PUBLIC AWARENESS, INFORMATION AND EDUCATION (ARTICLE 10).....	179
3.3.15.1	Identified Gaps	179
3.3.15.2	Overall and specific objectives.....	179
3.3.15.3	Priority Issues	179
3.3.15.4	Action Plan	179
3.3.16	ACTIVITY: EFFECTIVENESS EVALUATION (ARTICLE 16).....	183
3.3.17	ACTIVITY: REPORTING (ARTICLE 15)	183
3.3.18	ACTIVITY: RESEARCH, DEVELOPMENT AND MONITORING (ARTICLE 11)	186
3.3.18.1	Identified Gaps	186
3.3.18.2	Overall and specific objectives.....	187
3.3.18.3	Priority Issues.....	187
3.3.18.4	Action Plan	187

3.3.19	ACTIVITY: TECHNICAL AND FINANCIAL ASSISTANCE (ARTICLES 12 AND 13)	191
3.4	DEVELOPMENT AND CAPACITY-BUILDING PROPOSALS AND PRIORITIES	191
3.4.1	Defining Criteria.....	191
3.4.1.1	Common criteria	192
3.4.1.2	Specific criteria.....	193
3.4.2	Main Priority Issues.....	194
3.5	TIMETABLE FOR IMPLEMENTATION STRATEGY AND MEASURES OF SUCCESS	195
3.6	NIP IMPLEMENTATION STATUS	208
3.7	RESOURCE REQUIREMENTS	212

ANNEXES.....	215
ANNEX I: MEMBERS OF THE NATIONAL POPs COORDINATING COMMITTEE	215
ANNEX II: LIST OF EXPERTS INVOLVED IN THE INVENTORY	216
ANNEX III: LIST OF STAKEHOLDERS CONSULTED DURING POPs INVENTORY	217
ANNEX IV: LIST OF PARTICIPANTS DURING THE INCEPTION AND TRAINING WORKSHOP FOR UPDATING INVENTORY OF INITIAL AND NEW POPs, 11TH -14TH FEBRUARY, 2014, BLUE PEARL HOTEL, DAR ES SALAAM	229
ANNEX V: OF PARTICIPANTS DURING NATIONAL VALIDATION WORKSHOP ON INVENTORIES OF OLD AND NEW POPs, 25TH JUNE 2015, NATIONAL INSTITUTE FOR MEDICAL RESEARCH (NIMR), DAR ES SALAAM	231
ANNEX VI: LIST OF PARTICIPANTS DURING NATIONAL STAKEHOLDERS POPs PRIORITY VALIDATION WORKSHOP, 10TH NOVEMBER 2015, PEACOCK HOTEL, DAR ES SLAAM	234
ANNEX VII: LIST OF PARTICIPANTS DURING NATIONAL STAKEHOLDERS WORKSHOP FOR THE ENDORSEMENT OF REVISED NATIONAL IMPLEMENTATION PLAN (NIP) FOR THE IMPLEMENTATION OF THE STOCKHOLM CONVENTION ON POPs, 3 RD OCTOBER, 2016, SUA, MOROGORO.....	236
ANNEX VIII: LIST OF PARTICIPANTS DURING THE NATIONAL STEERING COMMITTEE MEETING, 18TH OCTOBER, 2016, NATIONAL INSTITUTE FOR MEDICAL RESEARCH (NIMR), DAR ES SALAAM	238

LIST OF TABLES

Table 1:	The 26 POPs listed in the Stockholm Convention as of October, 2015	3
Table 2:	Roles of various actors in POPs management.....	22
Table 3:	Results of AChE Testing (OP exposures) among sprayers in large scale farms.	28
Table 4:	Number of Partially Closed Units Surveyed and Suspected to Contain PCBs..	31
Table 5:	Number of Closed Units Surveyed and Suspected to Contain PCBs.....	31
Table 6:	Distribution by age of equipment suspected to contain PCBs.....	31
Table 7:	Distribution by power rating of equipment suspected to contain PCBs	31
Table 8:	Distribution by locations of equipment suspected to contain PCBs.....	31
Table 9:	List of contaminated sites.....	34
Table 10:	Basic Data & Estimations – Use	38
Table 11:	Amount of POPs-PBDEs in PUR foam of vehicles in current use in the inventory year	38
Table 12:	Basic Data and Estimations – Imports	39
Table 13:	Amount of POPs-PBDEs in PUR foam of Imported Vehicles in the inventory year.....	39
Table 14:	Basic Data & Estimations – ELV	40
Table 15:	Estimated number of end-of-life vehicles in Tanzania in 2010.....	40
Table 16:	Basic Data & Estimations – Accidents	41
Table 17:	Total number of end-of life vehicles in 2010.....	41
Table 18:	Amount of POPs-PBDEs in wastes from end-of-life vehicles disposed to landfills/dumps from 1980 until the inventory year.....	42
Table 20:	Estimate of POP-PBDE in CRT casings in Tanzania.....	44
Table 21:	Estimated POP-PBDEs in CRT imported computers and TVs in 2011	46
Table 22:	Estimated amount of EEE in stocks (categories 3 & 4) in Households.....	47
Table 23:	Total weight of EEE and WEEE (Category 3) in Households.....	47
Table 24:	Total Weight of EEE & WEEE (Category 4) Stocked in Households.....	48
Table 25:	Total polymer fractions and c-OctaBDE concentrations in relevant EEE categories	48
Table 26:	Total amount of c-Octa-BDE, Household level	49
Table 27:	Estimated weight of the existing ICT Equipment in 20 Institutions (19 Government & 1 UN Agency)	50

Table 28: Estimation of EEE in Stock in Government Institutions.....	50
Table 29: Total amount of c-Octa-BDE, Government Institutions level	51
Table 30: EEE Stockpiled in private Companies (Banks)	51
Table 31: Total amount of c-Octa-BDE in Private Institutions (Banks).....	52
Table 32: EEE Stockpiled in private Institutions: 3 Telecommunication companies	53
Table 33: Total amount of c-Octa-BDE in EEE: telecommunication companies.....	53
Table 34: Key data and assumptions used in estimating WEEE generated in 2011.....	55
Table 35: Estimates of c-OctaBDE in EEE entering the Waste Stream.....	55
Table 36: POP-PBDE Inventory 2011	56
Table 37: Results of AChE Testing (OP exposures) among sprayers in large scale farms.	61
Table 38: Concentrations of PFOS in various chemical formulas and products.....	65
Table 39: PFOS - related chemicals imported in the past 10 years.....	66
Table 40: Film Forming Foams in Stocks – Suppliers	68
Table 41: Film Forming Foams in Stocks – Professional Users	68
Table 42: Accidental Fire and Drill Sites.....	70
Table 43: Estimated PCDD and PCDF releases (2014).....	74
Table 44: Estimated PCDD and PCDF (2002).....	75
Table 45: Estimated PCDD/PCDF releases from medical waste incinerators.....	77
Table 46: Estimated PCDD/PCDF releases from ferrous and non-ferrous metal production.....	78
Table 47: List of thermal power plants in Tanzania.....	78
Table 48: Estimated releases of PCDD/PCDF from fossil fuel based power plants.....	79
Table 49: Estimated releases of PCDD/PCDF from biomass based power plants	80
Table 50: Estimated PCDD/PCDF releases from landfill gas combustion.....	80
Table 51: Estimated PCDD/PCDF releases from household heating and cooking using biomass	81
Table 52: Estimated PCDD/PCDF releases from household heating using fossil fuels ...	82
Table 53: Estimated PCDD/PCDF releases from cement production	82
Table 54: Estimated PCDD/PCDF releases from lime production	83
Table 55: Estimated PCDD/PCDF releases from glass production	83
Table 56: Estimated PCDD/PCDF releases from vehicles.....	84
Table 57: Estimated PCDD/PCDF releases from biomass combustion	85

Table 58: Estimated PCDD/PCDF releases from Waste burning and accidental fires.....	86
Table 59: Estimated PCDD/PCDF releases from pulp and paper production	87
Table 60: Estimated PCDD/PCDF releases from tobacco smoking.....	87
Table 61: Estimation of PCDD/PCDF from crematoria.....	88
Table 62: Estimation of PCDD/PCDF from waste disposal.....	88
Table 63: Estimation of PCDD/PCDF from waste water dumping	89
Table 64: Estimation of PCDD/PCDF from composting.....	89
Table 65: Comparison of release for the two inventories (i.e. year 2002 and 2014).....	91
Table 66: Estimated PCDD/PCDF releases from Municipal and Medical waste	94
incinerators in Zanzibar	
Table 67: Inventory findings of the new listed POPs	95
Table 68: Estimate of motor vehicles registered in Zanzibar, as well as POPs-PBDEs	95
amount (2013)	
Table 69: Information for calculating c-OctaBDE amount in CRTs in Zanzibar (Tier I).97	
Table 70: POP-PBDEs (kg) in CRT monitor (TV and computer) calculated by the	97
estimated CRT unit per capita	
Table 71: Summary of future production, use and releases of POPs in URT	107
Table 72: Laboratory Facilities for monitoring POPs releases	123
Table 73: Location of National Data.....	126
Table 74: Results of AChE Testing (OP exposures) among sprayers in large scale	129
farms	
Table 75: Priority actions to strengthen institutional and regulatory framework for	141
POPs management	
Table 76: Priority actions for enhancing management of POPs Pesticides and DDT	146
Table 77: Priority actions to reduce adverse effects from PCBs to health and the	151
environment.....	
Table 78: Priority Actions to ensure environmentally sound management of PBDEs....	156
Table 79: Priority Actions to safeguard human health and environment from adverse	160
effects of PFOS, its salts and PFOSE	
Table 80: Priority actions to minimize and prevent PCDD/PCDF releases from	166
unintended sources.....	
Table 81: Actions for strengthening management of contaminated sites.....	173
Table 82: Actions to establish information exchange mechanisms.....	177
Table 83: Priority actions to promote and facilitate public information, awareness	

and education on POPs issues	180
Table 84: Reporting requirements in accordance with the provisions of the Stockholm Convention.....	184
Table 85: Priority actions for strengthening capacity on research, development and monitoring of POPs	188
Table 86: List of common criteria used in the prioritization of POPs management issues	192
Table 87: list of specific criteria used in the prioritization of POPs management issues	193
Table 88: The workplan for implementation of the updated NIP.....	195
Table 89: Indicative resources required for NIP implementation (2017-2026).....	212

LIST OF FIGURES

Figure 1: Shares of GDP by economic activities at 2007 prices (<i>Source: NBS, 2016</i>).....	8
Figure 2: Distribution of CRT polymers at different levels.....	54
Figure 3: Distribution of sources of c-OctaBDE	56
Figure 4: Buried Endosulfan and DDT at Murbadaw wheat farms.....	61
Figure 5: Morogoro DDT contaminated site under UNIDO Project.....	62
Figure 6: Distribution of AFFF in Stocks among Respondents.....	69
Figure 7: PCDD and PCDF molecular structure.	72
Figure 8: Electrical and Electronic wastes [WEEE] in Zanzibar	96
Figure 9: Old Transformer at Mtoni Power Station	99
Figure 10: The ashes from Makunduchi Cottage Hospital.....	100

LIST OF ABBREVIATIONS

- AAS** Atomic Absorption Spectrophotometer
- AAT** Agrochemicals Association of Tanzania
- AChE** Acetylcholinesterase
- AFFF** Aqueous Film-Forming Foam
- AGENDA** AGENDA for Environment and Responsible Development (an NGO)
- AHF** Aviation Hydraulic Fluid
- ANCAP** African Network for the Chemical Analysis of Pesticides
- APCS** Air Pollution Control System
- ARU** Ardhi University
- ASP** Africa Stockpiles Program
- ASR** Automotive Shredder Residues
- ATI** Tanzania Insurance Regulatory Authority
- BAT** Best Available Techniques
- BEP** Best Environmental Practices
- BoS** Bureau of Statistics
- BoT** Bank of Tanzania
- CA** Carbamate
- CBOs** Community Based Organisation
- COSTECH** Commission for Science and Technology
- COP** Conference of Parties
- CPCT** Cleaner Production Centre of Tanzania
- CRT** Cathode Ray Tube
- CREFT** Chemical Risks Experts Foundation of Tanzania
- C-S** Carbon/Sulphur Analyser
- CSOs** Civil Society Organisations
- CTI** Confederation of Tanzania Industries
- DART** Dar es Salaam Rapid Transport
- DAWASA** Dar es Salaam Water and Sewerage Authority
- DDT** Dichloro diphenyl trichloroethane
- DoE** Division of Environment
- EEE** Electrical and electronic equipment
- EIA** Environmental Impact Assessment
- EIS** Environmental Impact Statement

ELV End of Life Vehicle
EMA Environmental Management Act
FAO Food and Agriculture Organisation
FBOs Faith Based Organizations
FFF Fire Fighting Foams
FTIR Fourier transform infrared spectroscopy
g Grams
GC Gas Chromatography
GC-MS Gas Chromatography – Mass Spectrometry
GCLA Government Chemist Laboratory Agency
GDP Gross Domestic Product
GEF Global Environment Facility
GTZ Gesellschaft für Technische Zusammenarbeit
HBB HBCD Hexabromobiphenyl Hexabromocyclododecane
HCB Hexachlorobenzene
HCBD HCH Hexachlorobutadiene Hexachlorocyclohexane
HPLC High Performance Liquid Chromatography
ICCA Industrial and Consumer Chemicals (Management and Control) Act
ICP Inductively Coupled Plasma
ILO International Labor Organization
IMTU International Medical and Technology University
IPM Integrated Pest Management
IPPM Integrated Pesticides and Pest Management
IPTL Independent Power (T) Ltd.
ITV Independent Television
JET Journalists Environmental Association of Tanzania
JNIA Julius Nyerere International Airport
kg Kilogram
kWe Kilo Watt Energy
kV Kilovolt
kVA Kilovolt Ampere
LPG Liquefied Natural Gas
LVEMP Lake Victoria Environment Management Programme
MNRT Ministry of Natural Resource and Tourism
MSDS Material Safety Data Sheet

- MW** Mega Watt
- MT** Metric Tonne
- MU** Microbiological unit
- NEMC** National Environment Management Council
- ND** Not Detected
- NGOs** Non Governmental Organisations
- NHC** National Housing Corporation
- NIMR** National Institute for Medical Research
- NIP** National Implementation Plan
- NPPA** National Plant Protection Advisory Committee
- OP** organophosphate
- OSHA** Occupational Health Safty and Health Authority
- PARTS** Pesticides Approval and Registration Technical Sub Committee
- PCBs** polychlorinated biphenyls
- PCDDs** Polychlorinated dibenzo-p-dioxins
- PCDFs** Polychlorinated dibenzofurans
- PCNs** **PCP** Polychlorinated naphthalenes
PeCBz Pentachlorophenol Pentachlorobenzene
- PHS** Plant Health Services
- PFOS** Perfluorooctane sulfonic acid
- PFOS-F** Perfluorooctane sulfonyl flouride
- PIC** Prior Informed Consent
- POPs** Persistent Organic Pollutants
- PUR** Polyurethane
- PVC** Polyvinyl Chloride
- RA** Radioactive Analyser
- SAICM** Strategic Approach for International Chemicals Management
- SBM** Single Bouy Moring
- SC** Stockholm Convention
- SUMATRA** Surface and Marine Transport Regulatory Authority
- TAA** Tanzania Airports Authority
- TCCIA** Tanzania Chambers of Commerce, Industries and Agriculture
- THA** Tanzania Harbours Authority
- TANESCO** Tanzania Electric Supply Company
- TAZARA** Tanzania and Zambia Railway Authority

TBS	Tanzania Bureau of Standards
TCAA	Tanzania Civil Aviation Authority
TCC	Tanzania Cigarette Company
TEQ	Toxic equivalent
TEACA	Tema Environmental Conservation Action
TFDA	Tanzania Food and Drugs Authority
TJ/a	Terra Joule per Annum
TPRI	Tropical Pesticides Research Institute
TRA	Tanzania Revenue Authority
TRL	Tanzania Railways Limited
TZS	Tanzania Shilling
UDSM	University of Dar es Salaam
UNEP	United Nations Environmental Programme
UNIDO	United Nations Industrial Development Organization
u-POPs	Unintentionally produced POPs
USA	United States of America
URT	United Republic of Tanzania
UV	Ultraviolet
UV/Vis	Ultraviolet–visible spectroscopy
VPO	Vice President’s Office
WB	World Bank
WEEE	Waste Electrical and electronic equipment
WHO	World Health Organisation
WSSD	World Summit on Sustainable Development
µg	Microgram
ZECO	Zanzibar Electricity Corporation
ZEMA	Zanzibar Environmental Management Authority
ZFDB	Zanzibar Food and Drug Board

EXECUTIVE SUMMARY

Introduction

The United Republic of Tanzania is a Party to the Stockholm Convention on Persistent Organic Pollutants (POPs) since 30th April, 2004. As one of the obligations of the Convention, Tanzania prepared and submitted its first National Implementation Plan (NIP) in June 2006. Following listing of new controlled chemicals under the Convention between 2009-2015, Parties are required to review and update their initial NIPs to accommodate these developments. In this context, Tanzania received financial and technical support from the Global Environment Facility (GEF) through the project on “Enabling Activities to Review and Update the National Implementation Plan for the implementation of the Stockholm Convention on POPs” to update its initial NIP.

Therefore, this document presents an updated NIP that was prepared through a rigorous consultative process that was undertaken from 2014 – 2016. The overall objective of the updated NIP is to assess existing situation and elaborate national commitment and priority interventions to protect human health and environment from risks posed by both initial and new POPs.

Objectives and Substantive Provisions of the Stockholm Convention

The Stockholm Convention on Persistent Organic Pollutants (POPs) was adopted on 22 May 2001 and entered into force on 17 May 2004. The main objective of the Convention is to take measures for the elimination or restriction or prevention of the production, import, export and use of all manufactured POPs and the continuous reduction to minimize the occurrence of these pollutants in the environment, including the elimination of emissions of unintentionally produced POPs. Currently, the Convention regulates a total of 26 chemicals (pesticides and industrial chemicals) and unintentionally produced chemicals.

Overview of the listed Persistent Organic Pollutants

The initial list of chemicals controlled under the Convention included 12 chemicals which were popularly referred to as the ‘dirty dozen’. However, during meetings of the Conference of the Parties in 2009, 2011 and 2015, additional 14 new chemicals were included in the list, totaling to 26 controlled chemicals as of now. The list consists of Pesticides (Aldrin, Dieldrin, DDT, Endrin, Chlordane, Hexachlorobenzene (HCB), Mirex, Toxaphene, Heptachlor, Alpha hexachlorocyclohexane, Beta hexachlorocyclohexane, Chlordecone, Pentachlorobenzene (PeCBz), Hexabromocyclododecane (HBCD), Technical Endosulfan and its related

isomers, Pentachlorophenol (PCP) and its salts and esters and Lindane); Industrial chemicals (Polychlorinated Biphenyls (PCBs), Hexachlorobutadiene (HCBD), Hexabromobiphenyl, Hexabromodiphenyl ether and heptabromodiphenyl ether (homologues of commercial octabromodiphenyl ether), Hexachlorobenzene, Pentachlorobenzene (PeCBz), Perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOS-F), Polychlorinated naphthalenes (PCNs), Tetrabromodiphenyl ether and pentabromodiphenyl ether (homologues of commercial pentabromodiphenyl ether)); and unintentionally produced by-product chemicals (Polychlorinated para-dibenzodioxins (PCDD), Polychlorinated dibenzofurans (PCDF, Hexachlorobenzene (HCB), Polychlorinated Biphenyls (PCBs), Pentachlorobenzene (PeCBz) and Polychlorinated naphthalenes (PCNs)).

Provisions of the Stockholm Convention

Article 3 prohibit and/or eliminate the production and use, as well as the import and export, of the intentionally produced POPs. It also restricts the production and use, as well as the import and export, of the unintentionally produced POPs.

Article 4 allows for the registration of specific exemptions for the production or use of listed POPs.

Article 5 provides for the reduction or elimination of releases from unintentionally produced u-POPs. It promotes the use of best available techniques and best environmental practices for preventing releases of POPs into the environment.

Article 6 require Parties to ensure that stockpiles and wastes consisting of, containing or contaminated with POPs are managed safely and in an environmentally sound manner. The Convention requires that such stockpiles and wastes be identified and managed to reduce or eliminate POPs releases from these sources. The Convention also requires that wastes containing POPs are transported across international boundaries taking into account relevant international rules, standards and guidelines.

Article 7 require Parties to develop and regularly review and update implementation plans.

Article 8 provides for detailed procedures for the listing of new POPs.

Other provisions of the Convention relate to the: information exchange (Article 9), public information, awareness and education (Article 10), research, development and monitoring (Article 11), technical assistance (Article 12), financial resources and mechanisms (Article 13), reporting (Article 15), effectiveness evaluation (Article 16) and non-compliance (Article 17).

NIP Development Process

As in the first NIP, revision and updating of Tanzania's NIP has been coordinated by the Division of Environment under the Vice President's Office in close collaboration with key stakeholders including government institutions, agencies, private sectors, academic and research institutions, NGOs, and Media.

The process of updating the NIP (2006) 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.

During inventory of initial and new 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 Project Steering Committee and the higher authorities in the Vice President's Office.

Current POPs management in Tanzania

The major sources of POPs in Tanzanian environment include obsolete stocks of POPs pesticides that were originally intended for plant protection and for control of malaria vector (mosquitoes); both regulated and illegally imported pesticides; PCBs containing oils used in electrical equipment (transformers, capacitors, oil circuit breakers, switchgears and reactors). Other sources of POPs particularly uPOPs include medical waste incineration; uncontrolled burning of Municipal wastes; and industrial processes such as mineral processing, power generation and heating. Major sources of PBDEs are transport sector and electrical and electronic equipment wastes. The major sources of PFOS include metal plating; paper and leather industries and fire fighting foams.

The survey conducted in the period 2014/15 shows that:

- a) A total of 1,040 metric tonnes of obsolete pesticides and associated waste from 135 sites in the country included heavily contaminated soil which were shipped for disposal in dedicated destruction facilities in the United Kingdom and Poland. No new stockpiles of POPs pesticides except at Murbadaw in Hanang wheat farms where about ten drums of DDT (mixture with endosulfan) are still buried;
- b) New listed POPs pesticides, which include chlordecone, alpha hexachlorocyclohexane, beta hexachlorocyclohexane, pentachlorobenzene and lindane, were not found;
- c) About 31 kg of Endosulfan was found in some shops in Zanzibar;
- d) There are about 149 MT of oils suspected to contain PCBs in 119 electrical equipment. Out of these, 22 transformers; 25 oil circuit breakers containing 12 tonnes of oil were out of use
- e) Products and articles containing POP-PBDEs are present in Tanzania in plastics from electrical and electronic equipment (EEE) and related waste (WEEE) estimated to 107 tonnes c-OctaBDE with listed hexa-BDE of 11.8 tonnes and hepta-BDE of 46.2 tonnes.
- f) The PFOS related insecticide *Sulfluramid* had never been registered for use in Tanzania. No use of PFOS or related substances were identified in metal plating, paper and leather industries. A total of 18 suppliers and professional users of FFF were identified, with whom a total of 57,045 Litres of AFFF were found, most of which had been purchased after 2010.
- g) Unintentionally produced POPs (u-POPs) i.e. (PCDDs, PCDFs and other u-POPs) are mainly produced from waste incineration (384 g TEQ/annum (71.4%)) followed by open burning with release of 100.8 g TEQ/annum (18.74%) and production of mineral processing release of 48.1 g TEQ/annum (8.1%). Within the incineration category the major emitter is the medical incineration which release about 383.96 (99.99% of waste incineration).

National Priorities

Based on the inventory findings and the obligation to comply with the requirements of the Stockholm Convention, the identified national priorities for addressing POPs in Tanzania are:

- i) Strengthening institutional and legal framework relevant to the control and management of POPs as well as chemicals and wastes;
- ii) Strengthening the capacity in monitoring of POPs in the environment and humans including the identification of sites potentially contaminated with POPs;
- iii) Minimization of unintentionally produced POPs (u-POPs) emissions from major sources in the country including medical waste incineration, open burning of municipal wastes and mineral processing;

- iv) Promoting adoption of environmentally sound technologies and practices including Best Available Techniques (BATs) and Best Environmental Practices (BEPs) on POPs;
- v) Strengthening capacity for generation, storage, management and dissemination of information on management of POPs in the country; and
- vi) Enhancing communication, education and public awareness as well as engagement and networking of stakeholders.

Updated Targets for Implementation

The timeframe for the implementation of the Updated NIP is 8 years (2018-2026). It identifies priority actions in the short, medium and the long-term. However, additional interventions may be incorporated during its implementation. The updated targets for implementation of each specific Action Plan are as follows:

Action Plan	Timeframe	Updated Target(s)
1. Institutional and Regulatory Strengthening Measures	2018-2026	<ul style="list-style-type: none"> • Effective policies, legislation and institutional capacity and coordination for NIP implementation by 2026
2. POP Pesticides and DDT	2018-2026	<ul style="list-style-type: none"> • Increased adoption of alternatives and sound management approaches on POP Pesticides and DDT including Integrated Vector Management (IVM) and Integrated Pest Management (IPM) by 2026
3. Polychlorinated Biphenyls (PCBs)	2018-2026	<ul style="list-style-type: none"> • Updated national inventory and database of stockpiles, products and articles in use and wastes consisting of, or containing or contaminated with PCBs by 2020; and • Safe disposal of fluids and waste containing PCBs and equipment contaminated with PCBs by 2026
4. Polybrominated Diphenyl Ethers (PBDEs)	2018-2026	<ul style="list-style-type: none"> • Updated national inventory and database of PBDEs by 2020; and • Improved technical and infrastructural capacity for monitoring and control of PBDEs by 2026
5. PFOS	2018-2026	<ul style="list-style-type: none"> • Updated national inventory of PFOS, its salts and PFOSE and alternatives used for PFOS by 2022; • National Phase-out Plan of PFOS Stockpiles and Wastes by 2026; • Strengthened capacity for the management and control of PBDE- containing goods by 2026; and • Adoption and application of appropriate BATs and BEPs in management of PFOS containing stocks by 2026.

Action Plan	Timeframe	Updated Target(s)
6. PCDDs/PCDFs	2018-2026	<ul style="list-style-type: none"> Established and strengthened Poison Centres by 2026; Updated national inventory of PCDDs/PCDFs and database by 2026; and Adopted BATs and BEPs in major sources of PCDD/PCDF by 2026.
7. Contaminated Sites	2018-2026	<ul style="list-style-type: none"> Updated national inventory and improved database of risk profile of POPs contaminated sites by 2026; and Monitoring programme and remediated sites contaminated by POPs operationalized by 2026.
8. Information Exchange and Stakeholder Involvement	2018-2026	<ul style="list-style-type: none"> Enhanced capacity and infrastructure for information generation, storage, management, accessibility and dissemination by 2026; and Enhanced capacity and engagement of various stakeholders (including NGOs, CBOs, youth and women groups and private sector) to support information exchange on POPs by 2026.
9. Public information, education and awareness	2018-2026	<ul style="list-style-type: none"> Established technical information and database on POPs for use as reference materials by all stakeholders by 2026; Designated and strengthened information centers (including regional libraries) by 2026; Training, educational and awareness programmes on POPs operational by 2026
10. Reporting	2018-2026	<ul style="list-style-type: none"> Enhanced inter-institutional reporting capacity by 2026; Timely reporting according to the Convention obligations by 2026; and Updated NIP and its respective Action Plans every 5 years
11. Research, Development and Monitoring	2018-2026	<ul style="list-style-type: none"> Improved research on public health impact of exposure to POPs and adoption of their alternatives by 2026; Strengthened monitoring capacity of POPs substances in air, water, food, living organisms and soil by 2026

Resource Requirements

The estimated cost for the implementation of NIP is **USD 29,325,000** over a period of 8 years from 2018 to 2026. The estimated budget for the Tanzania Mainland is about USD 23,460,000, about 80% of the total cost, whereas for Zanzibar amounts to about USD 8,865,000, equivalent to 20% of the total cost. The cost for each Action Plan can be summarized as follows:

Action Plan	Estimated Cost (USD)
1. Activity: Institutional and regulatory strengthening measures	1,825,000
2. Activity: Production, import and export, use, stockpiles, and wastes of POPs Pesticides and DDT	735,000
3. Activity: Production, import and export, use, identification, labeling, removal, storage, and disposal of PCBs and equipment containing PCBs	8,710,000
4. Activity: Production, import and export, use, identification, labelling, removal, storage, and disposal of PBDEs and equipment containing PBDEs	2,505,000
5. Activity: Production, import and export, use, stockpiles, and wastes of PFOS, its salts and PFOSE	2,680,000
6. Action plan: Measures to reduce releases from unintentional production	4,800,000
7. Strategy: Identification of contaminated sites and remediation in an environmentally sound manner	2,700,000
8. Activity: Facilitating or undertaking information exchange and stakeholder involvement	380,000
9. Activity: Public Awareness, Information and Education	1,190,000
10. Activity: Research, Development and Monitoring	3,800,000
GRAND TOTAL	29,325,000
	Tanzania Mainland: 23,460,000 Zanzibar: 8,865,000

CHAPTER ONE

INTRODUCTION

1.1 Purpose of the Tanzania National Implementation Plan

The Stockholm Convention (SC) on Persistent Organic Pollutants (POPs) is a global treaty signed by 151 States and regional economic integration organizations. It was adopted at a Conference of Plenipotentiaries on 22 May 2001 in Stockholm, Sweden. The convention entered into force on 17 May 2004, ninety (90) days after submission of the fiftieth instrument of ratification, acceptance, approval or accession in respect of the Convention. The objective of the Convention is to protect human health and the environment from toxic and hazardous POPs. Tanzania became a Party to the Convention in April 2004 and consequently submitted its first NIP in 2006.

Article 7 of the Stockholm Convention requires Parties to the Convention to develop and endeavour to put into practice a National Implementation Plan (NIP) setting out how they will implement their obligations under the Convention.

The NIP is intended to achieve the following objectives:

- i) To demonstrate commitment of the government to the objectives of the Stockholm Convention and 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; and
- 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; the Minamata Convention on Mercury; and the Strategic Action for International Chemicals Management.

Since the development of the first NIP in 2006, fourteen new POPs have been added into the Annex of the Convention, henceforth the Tanzania NIP is subject to updating and revision to address the new development. In this NIP the original POPs are addressed as well as the POPs listed at fifth and sixth Conference of Parties (COP).

1.2 What are Persistent Organic Pollutants?

POPs are a group of chemicals that are toxic, persist in the environment, bioaccumulate in fatty tissues and biomagnify through the food chain. In addition, POPs have the potential to be transported long distances and deposited far from their place of release, including in pristine environments such as the Arctic and Antarctic. It is believed that, POPs cause 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 (SC, 2001). POPs have been identified as priority chemicals for many years in the United Republic of Tanzania and the international community has called for actions to reduce and eliminate their production, use and release.

1.3 Overview of the listed Persistent Organic Pollutants

The Stockholm Convention currently focuses on reducing and eliminating releases

of 26 POPs which include the initial 12 POPs and 14 additional new POPs. Nine of the initial POPs listed in Annex A and are destined for elimination with specific time-limited exemptions. These include the agricultural chemicals such as aldrin, chlordane, dieldrin, endrin, heptachlor, mirex, and toxaphene, as well as the industrial chemicals hexachlorobenzene (HCB), and polychlorinated biphenyls (PCBs). POPs listed in Annex B are subject to restrictions on production and use, but eligible for specific exemptions for acceptable purposes. These include the pesticide DDT. Annex C contains POPs that are unintentionally produced, for example as industrial by products and combustion processes, such as polychlorinated dibenzo-p-dioxins, polychlorinated dibenzofurans, PCBs, and HCB. The newly listed POPs include chemicals added to the Convention in 2009 and 2011. These include: chlordecone, lindane, alpha hexachlorocyclohexane, betahexachlorocyclohexane, endosulfan, commercial pentabromodiphenyl ether, commercial octabromobiphenyl ether, hexabromobiphenyl, perfluorooctane sulfonic acid (PFOS), its salts, and perfluorooctane sulfonyl fluoride (PFOSF), and pentachlorobenzene. Three more POPs were added in 2013 and 2015 which are Hexabromocyclododecane (HBCD), Hexachlorobutadiene (HBCD), Pentachlorophenol (PCP) and its salts and esters, and Polychlorinated naphthalenes. **Table 1** provides the current list of POPs chemicals and their main use.

Table 1: The 26 POPs listed in the Stockholm Convention as of October, 2015

Chemical	Pesticide	Industrial Chemical	Unintentional by-products	Annex
1. Aldrin	X			A
2. Chlordane	X			A
3. Dieldrin	X			A
4. Endrin	X			A
5. Heptachlor	X			A
6. Hexachlorobenzene (HCB)	X	X	X	A, C
7. Mirex	X			A
8. Toxaphene (camphechlor)	X			A
9. Polychlorinated Biphenyls (PCBs)		X	X	A, C
10. Dichloro diphenyl trichloroethane (DDT)	X			B
11. Polychlorinated dibenzo-p-dioxins (PCDDs)			X	C
12. Polychlorinated dibenzofurans (PCDFs)			X	C
13. Alpha hexachlorocyclohexane	X		X	A
14. Beta hexachlorocyclohexane	X		X	A
15. Chlordecone	X			A

16. Hexabromobiphenyl		X		A
17. Hexabromodiphenyl ether and heptabromodiphenyl ether (homologues of commercial octabromodiphenyl ether)		X		A
18. Lindane	X			A
19. Pentachlorobenzene (PeCBz)	X	X	X	A, C
20. Perfluorooctane sulfonic acid (PFOS),, its salts and perfluorooctane sulfonyl fluoride (PFOS-F)		X		B
21. Tetrabromodiphenyl ether and pentabromodiphenyl ether (homologues of commercial pentabromodiphenyl ether)		X		A
22. Technical Endosulfan and its related isomers	X			A
23. Hexabromocyclododecane (HBCD)	X			A
24. Hexachlorobutadiene (HCBD)		X		A
25. Pentachlorophenol (PCP) and its salts and esters	X			A
26. Polychlorinated naphthalenes (PCNs)		X	X	A, C

1.4 Sources of POPs in Tanzania

The major sources of POPs Chemicals in Tanzanian environment include obsolete stocks of POPs pesticides that were originally intended for plant protection and for control of malaria vector (mosquitoes); both regulated and illegally imported pesticides. PCBs containing oils used in electrical equipment (transformers, capacitors, oil circuit breakers, switchgears and reactors). However, in 2012/13 Tanzania cleaned up a total of 1,040 metric tonnes of obsolete pesticides and associated waste from 135 sites in the country included heavily contaminated soil which were shipped for disposal in dedicated destruction facilities in the United Kingdom and Poland (ASP, 2005). Other stockpiles of POPs pesticides were collected and transported for disposal abroad by the Africa Stockpiles Program (ASP).

The survey that was carried out in 2014 identified the following:

- a) No new stockpiles of POPs pesticides except at Murbadaw in Hanang wheat farms where about ten drums of DDT (mixture with endosulfan) are still buried;
- b) New listed POPs pesticides, which include chlordecone, alpha hexachlorocyclohexane, beta hexachlorocyclohexane, pentachlorobenzene and lindane, were not found;
- c) Endosulfan was found in some shops in Zanzibar;
- d) There are about 140 MT of PCBs containing oils in various electrical equipment;
- e) Products and articles containing POP-PBDEs are present in Tanzania in plastics

- from electrical and electronic equipment (EEE) and related waste (WEEE) and in the transport sector primarily in PUR foam.
- f) The PFOS related insecticide *Sulfluramid* had never been registered for use in Tanzania. No use of PFOS or related substances were identified in metal plating, paper and leather industries. A total of 18 suppliers and professional users of FFF were identified, with whom a total of 57,045 Litres of AFFF were found, most of which had been purchased after 2010.
 - g) Unintentionally produced POPs (u-POPs) i.e. (PCDDs, PCDFs and other u-POPs) are mainly produced from waste incineration (384 g TEQ/annum (71.4%)) followed by opening burning with release of 100.8 g TEQ/annum (18.74%) and production of mineral processing release of 48.1 g TEQ/annum (8.1%). Within the incineration category the major emitter is the medical incineration which release about 383.96 (99.99% of waste incineration).

1.5 Provisions of the Stockholm Convention

The Stockholm Convention establishes a strong international framework for promoting global action on POPs, which are divided into three groups according to their mechanism of production and level of restriction. Nineteen of the intentionally produced chemicals are subject to a ban on production and use except where there are generic or specific exemptions (aldrin, poly-bromodiphenyl ether (hexa-, hepta-, tetra-, penta-), chlordane, chlordecone, dieldrin, endosulfan, endrin, heptachlor, hexabromobiphenyl, hexachlorobenzene (HCB), alpha and beta hexachlorocyclohexane (HCH), lindane (gamma hexachlorocyclohexane), mirex, pentachlorobenzene, perfluorooctanesulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOS-F), polychlorinated biphenyls (PCBs), toxaphene (also known as camphechlor)). In addition, the production and use of DDT is severely restricted.

Parties are required to take measures to reduce releases from the unintentional production of dioxins, PCBs, HCB and pentachlorobenzene (PeCBz) with the goal of their continuing minimization and, where feasible, ultimate elimination. The main tool for this is the development of source inventories and release estimates as well as plans for release reductions. The use of Best Available Techniques (BATs) to limit releases of unintentionally produced POPs from the major sources, as categorised in the Convention, is also required.

There are special provisions for those Parties with regulatory assessment schemes to both review existing chemicals for POP characteristics and to take regulatory measures to prevent the development, production and marketing of new substances with POP characteristics.

The Convention also makes provision for the identification and safe management

of stockpiles containing or consisting of POPs. Waste containing, consisting of or contaminated with POPs should be disposed of in such a way that the POP content is destroyed or irreversibly transformed.

Where this does not represent the environmentally preferable option or where the POP content is low, waste shall be otherwise disposed of in an environmentally sound manner. Disposal operations that may lead to the recovery or re-use of POPs are forbidden. The Convention recognises the particular needs of developing countries and specific provisions on technical assistance and financial resources and mechanisms are included in the general obligations.

1.6 Development of the National Implementation Plan

As in the first NIP, revision and updating of Tanzania's NIP has been undertaken by the Division of Environment under the Vice President's Office in close collaboration with the Minister for Agriculture; Ministry of Livestock and Fisheries; Ministry of Health, Community Development, Gender, Elders and Children; Government Chemist Laboratory Authority (GCLA); Ministry of Agriculture, Natural Resources Livestock and Fisheries (Zanzibar); Ministry of Lands, Water, Energy and Environment (Zanzibar); Ministry of Industry, Trade and Investment; National Environment Management Council (NEMC); University of Dar es Salaam (UDSM); Tanzania Revenue Authority (TRA) Tanzania Electric Supply Company (TANESCO); Zanzibar Electricity Corporation (ZECO); Tropical Pesticides Research Institute (TPRI); AGENDA for Environment and Responsible Development (AGENDA); and Cleaner Production Centre of Tanzania (CPCT).

The process for updating the 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 updating NIP has involved many stakeholders including those shown in Annex I. During inventory of initial and new 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 Project Steering Committee and the higher authorities in the Vice President's Office.

1.7 Assistance Received

Tanzania being among the developing countries and signatory to the Stockholm Convention received financial support from the Global Environment Facility (GEF) through the United Nations Industrial Development Organization (UNIDO) to assist in the reviewing and updating the NIP. The funding provided was US\$ 210,000.00 to cover partial cost for reviewing and updating the NIP and the same amount was provided as cost-sharing by the government institutions and NGOs.

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.

CHAPTER TWO

COUNTRY BASELINE AND THE POPs ISSUE

2.1 COUNTRY PROFILE

Projections based on the 2012 Population and Household census, indicates that in 2016, Tanzania had a population of about 50.1 million people, out of which 25.7 million (equivalent to 51.3%) are female and 24.4 million are male (equivalent to 48.7%) (NBS, 2017). Out of the total population, 48.7 million are from Tanzania Mainland and 1.4 million from Zanzibar. About 73.7% of the total population live in the rural areas, while 26.3 % live in the urban areas. The country's economy is agrarian with almost 70% of the population relying on agriculture.

In 2016, Tanzania's Gross Domestic Product (GDP) amounted to sh. 103,744,606 million at current market prices (NBS, 2017). With the estimated total population of Tanzania Mainland at 48.6 million people in 2016, based on growth rate of 2.7, the per capita income was TZS 2,131,299 compared to TZS 1,918,897 in 2015, equivalent to an increase of 11.1% in per capita income (NBS 2017). The 2016 shares of Domestic Product by Economic Activity at 2007 Prices were services 52.2%; agriculture, forest and fisheries 22.4%; industry and construction 25.4%; (NBS, 2017). **Figure 1.** presents the percentage shares of GDP by kind of economic activities at 2007 prices.

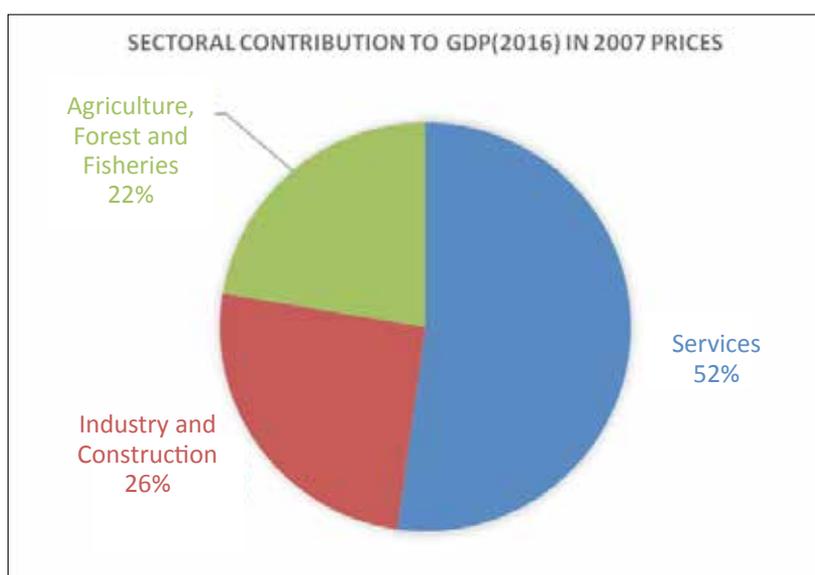


Figure 1: Shares of GDP by economic activities at 2007 prices (Source: NBS, 2016) The GDP grew by 7.0 % in 2016, the same rate as in 2015 (NBS 2016). The growth rate was mainly attributed to increase in industrial manufacturing, transportation and electricity production. of the country, which adversely affected a decrease in

agricultural production.

2.1.1 Agriculture Sector

The economy of Tanzania is mainly based on agriculture, which accounts for 29% of its GDP in 2014, provides 85% of exports, and accounts for 69.9% of the employed workforce. 16.4% of the land is arable, with 2.4% of the land planted with permanent crops. 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. Maize was the largest food crop (in terms of production) on the Tanzania mainland in 2013 (5.17 million tonnes), followed by cassava (1.94 million tonnes), sweet potatoes (1.88 million tonnes), beans (1.64 million tonnes), bananas (1.31 million tonnes), rice (1.31 million tonnes), and millet (1.04 million tonnes)-Sugar was the largest cash crop on the mainland in 2013 (296,679 tonnes), followed by cotton (241,198 tonnes), cashew nuts (126,000 tonnes), tobacco (86,877 tonnes), coffee (48,000 tonnes), sisal (37,368 tonnes), and tea (32,422 tonnes). Beef was the largest meat product on the mainland in 2013 (299,581 tonnes), followed by lamb/mutton (115,652 tonnes), chicken (87,408 tonnes), and pork (50,814 tonnes). 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, grapes, copra, cut flowers, fruits and vegetables.

2.1.2 Industrial sector

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 5.2% in 2015. 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

In the past, chemicals were imported into Tanzania according to the demand channelled 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 tonnes, while that of industrial chemicals is 210,250 metric tonnes. Tanzania also imports about 22,200 metric tonnes of consumer chemicals per annum (GCLA CHEMIS Database, 2014).

2.1.3 Transport Services

Tanzania has a road network of 86,472 km, out of which 12,786 km are trunk roads making links between regions and with neighbouring countries, 21,105 km of regional roads linking districts and major cities and 52,581 km of the road network are district roads linking district headquarters and villages. The railway transport system comprises of Tanzania Railways Limited (TRL) and Tanzania and Zambia Railway Authority (TAZARA) serving 14 of the 26 Regions of Tanzania Mainland. In addition, inland waterways transport services are operated in lakes Victoria, Tanganyika and Nyasa. Sea transport in Tanzania caters for transportation of passengers and goods mainly between the Mainland Tanzania and Zanzibar as well as the rest of the world. The Port of Dar es Salaam is one of the key entry points in Tanzania with an annual handling capacity of about 93% of Tanzania port traffic. Tanzania Mainland has a total of 368 aerodromes, out of which Tanzania Civil Aviation Authority (TCAA) is responsible for the management and development of 59 airports accounting for about 81.5% of air passenger traffic countrywide and 96.7% of all air cargo.

2.1.4 Environmental resources

Tanzania is endowed with various environmental resources which have significant contribution to the socio-economic development of the country. These resources, among others, include forests, water bodies, biodiversity, land, wildlife, wetlands, renewable energy sources, natural gas and minerals.

2.1.4.1 Forestry

The total forest area in Tanzania is 48 million ha (55% of the total land area), of which 93% of this is woodland and only 7% are classified as coastal forests, mangroves, humid montane forests and plantations. There are more than 20 million ha of the miombo ecosystem, 2 million hectares of montane forests and 115,000 hectares of mangrove forests. Industrial forest plantation in Tanzania covers about 150,000 ha, of which about 90,000 ha is under public ownership and about 60,000 ha is under the private sector. About 33% (28 million ha) of the land area is under legal protection (protected forests and wildlife reserves). The forestry sector accounts for 10% of foreign exchange earnings and over 90% of the fuel used both in rural and urban areas. The major products of the forest sector which are also exported are beeswax, honey, timber and timber products, mushrooms and to a lesser extent wildlife meat and animal trophies. Apart from its contribution of 6% to GDP, this sector provides rural energy, protecting watersheds, conserving soil and the environment.

Removal of woody vegetation, trees or shrubs in Tanzania is increasingly becoming a major threat to the environment. The Ministry of Natural Resource and Tourism estimated the deforestation rate to be about 372,000 ha per year (MNRT, 2016). It is

estimated substantive amount of unintentional production POPs mainly dioxin and furans are due to bush fires and open burning of solid wastes.

2.1.4.2 Freshwater and marine resources

Freshwater resources in the country include lakes, rivers, springs, man-made reservoirs, natural ponds and groundwater. Major lakes are Victoria, Tanganyika and Nyasa, while the minor ones are Rukwa, Manyara, Natron, Eyasi, Jipe and Chala. River systems that exist include Kagera, Ruvuma, Songwe, Rufiji, Malagarasi, Wami, Ruvu, Ruaha, Pangani and Mara. There is a wide range of important and valued marine species, including 150 species of corals, 80,000 species of invertebrates, 1,000 species of fishes, 5 species of marine turtles, 9 species of mangroves and many seabirds. Coral reefs are located along 600 km of the country's continental shelf, accommodating about 25% of all marine species and 65% of marine fish.

2.1.4.3 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. Official statistics show that there are 22.8 million cattle, 17.1 million goats and 9.2 million sheep. Other livestock kept in the country include 2.1 million pigs, 35.5 million indigenous poultry and 24.5 million improved chicken and other species.¹ About two-fifth of the livestock population is concentrated in Arusha, Shinyanga and Mwanza. The estimated production of livestock products such as meat, milk, and eggs increased between the year 2000/2001 and 2009/2010. Total meat production increased from 323,000 tonnes in 2000/2001 to 449,673 tonnes in 2009/2010, an increase of 39.2%. During the same period, milk production has increased from 814 million to 1.64 billion litres, an increase of 102% while in the same period egg production increased from 600 million to 2.9 billion eggs. During the period 1995 to 2008, annual meat production increased from 244,000 tonnes to 449,673 tonnes (6.5% per annum) while milk increased from 555 million litres to 1.64 billion litres (15.0% per annum), 70% of which was from the traditional sector. During the same period egg production increased from 600 million to 2.9 billion eggs equivalent to 29.5% increase per annum. Per capita consumption of meat and milk increased to 12 kg and 43 litres against the FAO recommended per capita consumption rates of 50 kg and 200 litres respectively. The estimated per capita consumption of milk and eggs increased from 22 litres and 19 in 2000/01 to 43 litres and 75 eggs respectively during the same period while 5.85 million pieces of hides and skins worth TZS 13.5 billion were collected. About 86% of the hides and skins were exported in raw form. These achievements indicate that, with concerted efforts a lot more can be achieved.

¹ Ministry of Agriculture, Livestock and Fisheries (MLAF) Budget Speech, 2014/2015

2.1.4.4 Wildlife

Tanzania is rich in different species of birds, plants, amphibians and reptiles. It has over 310 animal species and is the fourth in Africa with the highest number of animal species. It also accounts for about 20% of the species of Africa's large mammal population; endemic species of flora and fauna such as the Sanje Mangabey monkey (*Lophocebus kipunji*) in Udzungwa Mountains. The country has also over 1,100 species of birds, including nearly 100 species of hawks, eagles, vultures and owls. The biological diversity and degree of endemism consist of primates (20 species; 4 endemic), antelopes (34 species; 2 endemic), reptiles (290 species; 75 endemic), amphibians (40 endemic) and plants (around 11,000 species).

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 (Presidents Office – Planning Commission (PO-PC), 2003).

2.1.4.5 Natural Gas

Natural gas is an important economic resource used to generate electricity, thermal applications in industrial production, commerce and other socio-economic activities in the country. Natural gas reserve in the country is estimated to be over 57 trillion cubic feet. Gas fields have been discovered in Songo Songo, Mnazi Bay, Mkuranga, Kiliwani and Ntorya areas and in the deep sea off the coast of Tanzania and in Ruvu Basin Coast Region. Out of the seven discoveries, only two gas fields, Songo songo and Mnazi bay are under production. The gas is distributed to 37 local industries and institutions in Dar es Salaam City and is also being used to produce 594 MW of electricity representing about 64.8% of the total power supply in the country (TANESCO, 2015).

2.1.4.6 Minerals

Tanzania is endowed with mineral deposits of high economic potential (see Tanzania Geological Map). The minerals found in Tanzania include metallic minerals such as gold, iron, silver, copper, platinum, nickel and tin; gemstones such as diamonds, tanzanite, ruby, garnet, emerald, alexandrite and sapphire; industrial minerals such as kaolin, phosphate, lime, gypsum, diatomite, bentonite, vermiculite, salt and beach sand; building materials such as stone aggregates and sand; and energy minerals such as coal and uranium. Tanzania produces about 40 tonnes of gold and more than 600,000 carats of Tanzanite per year. It has a reserve of over 1.5 billion tonnes of coal, 45 million tonnes of iron ore and about 11 million tonnes of uranium.²

2 <https://mem.go.tz/mineral-sector>

2.1.4.7 Renewable energy sources

Tanzania is endowed with diverse renewable energy resources, ranging from biomass and hydropower to geothermal, solar and wind. Much of this potential has not been fully exploited. If properly utilised, such renewable resources would contribute significantly to Tanzania's energy supply, thus moving the country closer to achieving middle-income status, as envisioned in the Tanzania National Development Vision 2026. *Biogas* which has a potential of 165,000 households/installations in a 10-year time frame; and *geothermal* with an estimated potential of 650 MW. Other sources include *wind* where more than 120 windmills have been installed (equivalent to about 10 kWe); and *solar* whose potential for national power grid connection in the year 2026 is about 800 MW (African Development Bank, 2015).

2.1.4.8 Land

Tanzania possesses about 94,508,700 ha of territorial area, out of which nearly 89 million ha is dry land and the remaining is covered by water. About 44 million ha are classified as suitable for agricultural production, out of which about 24% is under cultivation. Land under medium and large-scale farming is 1.5 million ha while about 8.6 million ha is under smallholder farmers. It has been estimated that 61% of the total land area in Tanzania is degraded particularly in arid and semiarid areas including Dodoma, Shinyanga, Manyara, Singida, Simiyu, Geita and Kilimanjaro Regions (URT, 1999; URT, 2014b). Land degradation is attributed by insecure land tenure; over stocking and inappropriate cultivation techniques. Bush fires and burning of agricultural wastes and biomass contribute to the emissions of PCDD/PCDF and other unintentional POPs emissions.

2.1.4.9 Helium Gas

Tanzania has a reserve of about 1.5 billion m³ (approximately 54 billion cubic feet) of helium gas which is one of the world's biggest helium gas fields. The gas field contains over six times the world's current supply of the element.

2.2 INSTITUTIONAL, POLICY AND REGULATORY FRAMEWORK

2.2.1 Policies related to POPs management

There are various sectoral policies that are related to POPs management in both Tanzania Mainland and Zanzibar. These include National Environmental Policy (1997); Zanzibar Environmental Policy (2013); National Agriculture Policy (2013); Livestock Policy (2006); National Health Policy (2007); Sustainable Industrial Development Policy (1996 -2020); National Irrigation Policy (2010); National Energy Policy (2015); National Forestry Policy (2002); National Human Settlements Development Policy (2000) and National Land Policy (1995). Most of these policies

among others, address issues related to sustainability, security, and equitable use of resources so as to meet the basic needs of the present population without degrading the environment or risking health or safety. However none of them directly address the POPs issues.

a) National Environmental Policy (1997) and Zanzibar Environmental Policy (2013)

The National Environmental Policy of Tanzania Mainland (1997) (under review) provides overall guidance to sectoral policies on environmental management aspects in order to achieve sustainable development. Various sectoral policies are being reviewed to take into account the objectives of the national environmental policy.

The overall objective of Zanzibar Environmental Policy (2013) is to pave the way for the protection, conservation, restoration and management of Zanzibar's environmental resources, such that their capacity to sustain development and maintain the rich environmental endowment for the present and future generations is not impaired. The Policy advocates the need for strengthening environmental governance and intra and inter-sectoral coordination for effective environmental practices and law enforcement.

The policies advocate issues of environmentally sound management of chemicals. However, they do not have specific reference to POPs. There is a need also for the policies to guide on the sustainable production and consumption patterns and sustainable development goals (SDGs).

b) The National Agriculture Policy 2013 and Zanzibar Agricultural Sector Policy (2000)

The National Agriculture Policy (2013) aims, among others, to ensure agricultural practices that sustain the environment are promoted; and ensure production of quality products in order to improve competitiveness of agricultural products in the markets enhanced. The Policy recognizes that agriculture depends on environmental resources such as land, water, forest, air etc. The dynamic and complex interrelationship, which exists in the natural systems, may be affected due to poor land use practices, deforestation, overgrazing and poor crop management and cropping systems. This calls for cautious and judicious use of natural resources. The Policy emphasizes on sustainable agricultural practices such as Integrated Pest Management (IPM) and organic farming.

The overall goal of the Zanzibar Agricultural Sector Policy (2000) is to promote sustainable development of the agricultural sector for economic, social and

environmental benefits. The Policy recognizes that environmental degradation is an issue of major concern in agricultural development attributed to lack of public awareness on the preservation and conservation of environment and natural resources. Other attributed factors include the rate of population growth and density; and use of dangerous agro-chemicals and pesticides in agricultural activities. Moreover, other environmental issues highlighted in the policy include: sustainable fishing practices; control of destructive fishing gear; sustainable utilization of offshore resources; increasing environmental conservation awareness among fishermen and integrated coastal zone management.

c) The Livestock Policy 2006

The relevant objectives of the Policy are to ensure the environment is conserved for sustainable livestock production; and improve range management and utilization in order to support sustainable productivity of livestock and improvement of pastoral and agro-pastoral livelihood. In addition, the Policy aims to:

- i) Strengthen technical support services on environmental issues;
- ii) Promote proper land use planning for livestock production;
- iii) Strengthen inter-sectoral coordination on environmental issues;
- iv) Promote inventorisation, identification, protection, management and use of rangeland resources; and
- v) Strengthen technical support services on rangeland management.

This Policy has initiated steps for control emissions from uncontrolled bushfires, which are meant for generation of pastures for grazing livestock, as it causes environmental pollution including emission of PCDD/PCDFs though not directly stated. In addition to this focus, the policy may be reviewed to include identification and assessment to ensure that POPs and other contaminated sites are not used as rangeland.

d) National Irrigation Policy (2010)

The policy advocates to:-

- i) have irrigation systems which are economically viable, socially acceptable and environmentally sustainable,
- ii) ensure that environmental issues are addressed in all irrigation interventions in accordance with Environmental Management Act (EMA) 2004;
- iii) promote the use of treated waste water, recycled irrigation tail water and low quality water for irrigation, provided that relevant authorities certifies to have no effects on human, crops, livestock and ecosystem;
- iv) establish mechanism for pollution control in irrigated agriculture

The policy recognize the incorporation of environmental issues to reduce hazards especially health problems, pollution, etc. Though there is no direct link with old and new listed POPs, but because POPs are among pollutant material will be considered in the implementation of this policy.

e) The Sustainable Industrial Development Policy (SIDP) 1996-2020

The 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.

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 sensitisation 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 continual to 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 and/or discharges/emissions of toxic chemicals without specific reference to POPs released from industrial processes, carcinogenic, mutagenic or endocrine disrupting chemicals.

f) The Energy Policy (2003)

The objectives of the Policy 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 national energy policy, therefore, aims to establish an efficient energy production, procurement, transportation, distribution and end-use systems in an environmentally sound and sustainable manner. The policy covers electricity, petroleum, natural gas, renewable energy and coal.

In relation to environment, health and safety, the Policy aims to:

- i) Promote environmental impact assessment as a requirement for all energy programmes and projects.
- ii) Promote energy efficiency and conservation as a means towards cleaner production and pollution control measures.
- iii) Promote development of alternative energy sources including renewable energies and wood-fuel end-use efficient technologies to protect woodlands.
- iv) Promote disaster prevention, response plans, and introduce standards for exploration, production, conversion, transportation, distribution, storage, and fuel end-use.

g) National Health Policy (2007) and Zanzibar Health Policy (2011)

The main objectives of the National Health Policy (2007) is to improve the health and well being of all Tanzanians, with a focus on those most at risk, and encourage the health system to be more responsive to the needs of the people and, thus increase the life expectancy. Some of the relevant specific objectives include:

- i) Strengthening disposal and safe destruction systems of medical waste;
- ii) Formulating and review laws, regulations, guidelines, procedures and systems for control of food, medicines, cosmetics, chemicals, equipment, medical equipment and reagents; and
- iii) Strengthening monitoring and research into negative effects of food and medicine, cosmetics, chemicals and reagents.

The main objective of the Zanzibar Health Policy (2011) is to improve health services and social welfare of the people of Zanzibar. It aims to address a number of challenges including inappropriate handling of chemicals along their lifecycle; lack of formal management scheme for e-waste; inadequate management of healthcare waste; inadequate coverage of toilet facilities; environmental pollution; and inadequate provision of social services to the increasing population.

h) National Forestry Policy (1998) and Zanzibar Forest Policy (1996)

The objectives of the National Forest Policy (1998), among others, include to ensure

ecosystem stability through conservation of forest biodiversity, water catchments and soil fertility; and enhance national capacity to manage and develop the forest sector in collaboration with other stakeholders. Among the environmental concerns mentioned in the policy are repeated wildfires and illicit felling of trees, which contribute to loss of biodiversity. In order to address this problem, the policy states that biodiversity conservation and management will be included in the management plans for all protected forests. Involvement of local communities and other stakeholders in conservation and management will be encouraged through joint management agreements. The policy indirectly addresses emissions of dioxins and furans as it emphasizes the control of wildfire which is the main contributor in emitting these toxic gases.

The overall objective of the Zanzibar Forest Policy (1996) is to protect and conserve forest resources including wildlife, flora and fauna and enhances the role of forest resources in maintaining soil and water conservation. The Policy also puts emphasis on the conservation and development of the forest resources for present and future generations, and on the need for comprehensive and perpetual tree planting as well as public education.

i) National Human Settlements Development Policy (2000)

The objectives of the Policy are to improve the level of the provision of infrastructure and social services for sustainable human settlements development; and promote the environment of human settlement out of ecosystems from pollution, degradation and destruction in order to attain sustainable development.

The Policy recognizes the issue of management of all forms of wastes. It also notes the problem of environmental degradation and pollution caused by use of fuel-wood and charcoal as the main sources of energy in human settlements.

The Policy emphasizes on the need to ensure that human settlements are kept clean and that pollution effects of solid and liquid wastes do not endanger the health of residents; set environmental quality standards of emissions from industries, vehicles etc; and institute a mechanism for monitoring air pollution levels; and encourage the use of alternative, affordable and appropriate sources of energy.

j) Zanzibar Water Policy (2004)

The Policy recognizes the importance of environmental consideration in the development and implementation of water resources and sanitation management in the country. It clearly states that the development of water and sanitation programmes should be done in a way that is not harmful to the environment and that the utilization of water by one generation should not in any way adversely affect the

prospect of utilization by subsequent generations. The Policy pays special attention to the application of Environmental Impact Assessment (EIA) in water related projects; environmental monitoring and control; water security; water pollution; soil degradation; depletion of water resources; drinking water quality; waste disposal; hygiene; drainage and sanitation as requisite issues towards provisions and supply of potable water.

2.2.2 Regulatory framework

Existing Legislation related to POPs Management including the control of pollution arising from POPs are as follows:

- a) *The Environmental Management Act No. 20 of 2004 and Zanzibar Environmental Management Act, 2015*

The Environmental Management Act (EMA), 2004 provides for legal and institutional framework for sustainable management of environment in implementation of the National Environment Policy. The Act empowers the Minister responsible for Environment to prepare regulations for management of POPs. Regulations for management of general hazardous waste were prepared in 2009, however these regulations do not specifically address management of POPs. Each sector Ministry is required to take measures to reduce the total release derived from anthropogenic sources of unintentionally produced POPs. The Act furthermore tasks all relevant sector Ministries and Local Government Authorities to mainstream respective parts of the NIP into their policies, legislation, plans and programmes and submit annual reports to the Minister on progress made in implementation of the NIP.

The Zanzibar Environmental Management Act (2015) provides for the conservation, protection, enforcement and management of environment of Zanzibar and matters connected therewith and incidental thereto. Based on the section 57(1) of the Zanzibar Environmental Management Act, 2015, is “A person shall not handle or discharge or cause to be handled or discharged any hazardous substance except in accordance with Regulations made under this Act”. However, the Acts does not address specific the issues of POPs.

- b) *The Plant Protection Act No 13 of 1997*

This legislation domesticated some important aspects of some of the Multilateral Environmental Agreements (of which Tanzania is a Party) responsible for human health and environmental protection. Sections 16(k) and 42(g) of this Act provide for Prior Informed Consent (PIC) procedure on the importation, exportation and use of plant protection substances according to the framework of the International Code of Conduct on Pesticide Management. Section 17 (2f) provides for disposal/

neutralization of plant protection wastes/substances including pesticides. It spells out that the applicant for registration of a plant protection substance is required to give details of procedures for its proper disposal and neutralization to ensure safety of both human health and the environment. Regulation 37(1) spells out that unwanted pesticides and empty pesticides containers shall be disposed of after authorization has been given by the National Plant Protection Advisory Committee (NPPAC) and section 37 (2) stresses that the NPPAC shall recommend the method of disposal. Section 38 (a-b) emphasizes on the procurement of quantities according to requirements to minimize possibilities, which will compel to disposal of unwanted quantities of pesticides.

The Act was scheduled for revision since 2011/2012; currently the new law has reached at Cabinet Paper preparation stage.

c) Industrial and Consumer Chemicals (Management and Control) Act No 3 of 2003

The Industrial and Consumer Chemicals (Management and Control) Act (ICCA) 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 also provides for the registrar of chemicals to evaluate any incoming application of a new chemical for analysis registration, re-registration and cancellation of any existing registered product.

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. Under Section 30 (1-e), the Act underscores that “ subject to action according to an international convention or treaty ratified by the United Republic of Tanzania, the Board shall restrict, severely restrict, ban or phase out the use and handling of chemicals specified under the 8th Schedule of the Act. PCBs have been included in the list of severely restricted/banned/eliminated chemicals in the Eighth Schedule to the Act. Section 46 (1-12) provides for management of spills and contaminated sites. The Act has not been revised to capture management of new POPs, specifically provisions covering chemicals in articles and products.

d) The Occupational Health and Safety Act No. 5 of 2003 and Zanzibar Occupational Safety and Health act No.8 of 2005

The Occupational Health and Safety Act No. 5 of 2003 deals with health and welfare of persons at work in factories and other places of work; provides for protection of persons other than persons at work against hazards to health and safety arising out of or in connection with activities of persons at work. Other provisions of the Act include: - registration procedure for factories and workplaces; safety regarding construction and maintenance of machinery; prevention of fire; precaution with dangerous/hazardous materials; general precaution in handling of chemical substances; and offences and penalties. The Act deals with chemicals in general terms, but there is no specific reference to POPs.

The Zanzibar Occupational Safety and Health act No.8 of 2005 provides for the safety, health and welfare of persons at workplaces and to protect other persons against hazards to safety and health arising out of or in connection with activities at workplaces. The Act deals with chemicals in general terms, but lacks specific reference to POPs.

e) The Zanzibar Food, Drugs and Cosmetics Act No. 2 of 2006

The Act provides for the efficient and comprehensive regulation and control of food, drugs, medical devices, cosmetics, herbal drugs and poisons. It also establishes the Zanzibar Food and Drugs Board whose function is to regulate all matters relating to quality, safety of food, drugs, herbal drugs, medical devices, poisons and cosmetics.

f) The Zanzibar Public and Environmental Health Act no, 11 of 2012

The Act provides for the protection and management of public and environmental health risks and related matters.

2.2.3 Institutional framework

The Vice President's Office (VPO) is the National Focal Point of the Stockholm Convention. It has the overall mandate to oversee the implementation of the Convention. The National POPs Coordinating Committee has been established at the VPO to oversee the NIP project implementation to ensure high-level technical output.

Other institutions playing specific sectoral roles are as indicated in Table 2.

Some of these institutions have established coordination mechanism as required by the Rotterdam Convention and the Plant Protection Act. The arrangement is that there is coordination committee formed at the policy and technical levels to advice the Ministries of Health and Agriculture. In the case of industrial chemicals, the Industrial and Consumer Chemicals (Management and Control) Act 2003,

establishes a Technical Committee and an Emergency Response Committee which advise the Board, establishing also the functions and powers of the Committees. There is also limited information regarding the adverse effects of old and new listed POPs. This calls for support to build the capacity in terms of manpower, equipment, infrastructure for monitoring, research, training and adequate financial resources to manage and control POPs.

This is evident for instance, in the area of occupational health, where there are very few occupational health centers and therefore a serious deficit of specialized doctors in occupational health. At present there are less than ten doctors countrywide.

Moreover, institutions for research and training on POPs issues exist. Capacity to conduct training exist though need strengthening. There is also some capacity to initiate and develop scientific research in impacts of POPs and for search and promotion of viable alternatives to POPs. Such institutions include TPRI, GCLA, NIMR, SUA, University of Dar es Salaam, MUHAS, TBS, Forestry Research Institutes, and Institute of Marine Science, Cleaner Production Centre of Tanzania, Agricultural research institutes and livestock research institutes. Also there are a number of NGOs and civil society organizations with capacity on POPs including AGENDA, EVIROCARE, TAPOHE, LEAT, JET, IRTECO, CREFT, ANCAP and TPAWU. The institutional capacities in terms of infrastructure and equipment for monitoring, research and training are inadequate while personnel to cater for these needs require specialized training.

The National Profile to Assess Chemicals Management Infrastructure in Tanzania

The National Profile to Assess Chemicals Management Infrastructure in Tanzania was developed in 1997. It was reviewed in 1999 and 2002. The profile has no specific mention of POPs (both old and new) and needs to be reviewed, where also developments under SAICM and the necessary infrastructure to support implementation of The Rotterdam Convention will be captured.

Table 2: Roles of various actors in POPs management

Institution	Roles
1. Vice President's Office – Division of Environment	Policy development and implementation, environmental planning, coordination and monitoring and policy oriented research.
2. President's Office – Regional Administration and Local Government Authorities; and Ministry of Regional Administration and Special Departments (Zanzibar)	Policy implementation and enforcement of laws.

Institution	Roles
3. Ministry of Works, Communication and Transport	Policy development and implementation, planning and coordination of transport aspects.
4. Ministry of Energy and Minerals; and Ministry of Lands, Water, Energy and Environment (Zanzibar)	Policy development and implementation, Planning and coordination of energy matters.
5. Ministry of Health, Community Development, Gender, Elderly and Children ; and Ministry of Health (Zanzibar)	Policy development and implementation planning and coordination of health issues.
6. Ministry of Industry, Trade and Investment	Policy development and implementation, planning and coordination of industry, trade and investment aspects.
7. Ministry of Natural Resources and Tourism	Policy development and implementation, planning and coordination of forestry aspects.
8. Ministry of Home Affairs	Enforcement of Law and Order
9. Ministry of Justice and Constitutional Affairs	Development of Legislation
10. Ministry of Agriculture, Livestock and Fisheries; and Ministry of Agriculture, Natural Resources, Livestock and Fisheries (Zanzibar)	<ul style="list-style-type: none"> • Policy development and implementation, planning coordination of agriculture development aspects and • Regulation of plant protection substances management.
11. Ministry of Water and Irrigation; and Ministry of Lands, Water, Energy and Environment (Zanzibar)	Policy development and implementation, planning and coordination of water matters and monitoring of water quality.
12. National Environment Management Council (NEMC)	Advisor on policy and technical matters on environment and environmental monitoring. Enforcement of EMA
13. Government Chemist Laboratory Agency (GCLA)	Advisor of government on matters of chemicals management; chemical analysis; coordination of industrial chemicals management; enforcement of Industrial and Consumer Chemicals Act; and technical backstopping.
14. Academic and Research Institutions	Training and research and technical backstopping
15. Tanzania Electric Supply Company (TANESCO); and Zanzibar Electricity Corporation (ZECO)	Owner of most of the electrical equipment and sites that are contaminated with PCBs.
16. Tanzania Bureau of Standards (TBS); and Zanzibar Bureau of Standards (ZBS)	Development of standards
17. Tanzania Revenue Authority (TRA); and Zanzibar Revenue Board (ZRB)	Import custom control
18. Tropical Pesticide Research Institute (TPRI)	Research, control and regulation of plant protection substances.

Institution	Roles
19. Occupational Health Safety and Health Authority (OSHA)	Occupational Health and Safety management and control
20. Media	Information dissemination and public sensitisation
21. Occupational health centres	Diagnosis of occupational health related diseases and treatment of the same.
22. Consumers groups, Trade Unions and non-governmental organizations (NGOs)	Social surveys, Training, Public awareness, information dissemination

2.3 ASSESSMENT OF THE POPs ISSUE IN THE COUNTRY

2.3.1 ASSESSMENT OF POPs PESTICIDES (ANNEX A, PART I CHEMICALS)

2.3.1.1 Summary

This section examines the historical, current, and projected future production, use, import, and export; existing policy and regulatory framework; summary of available monitoring data (environment, food, humans) and health of POP Pesticides in the country.

Findings reveal that the initial POPs pesticides which were registered and used as insecticides in the Tanzania Mainland were Aldrin, Dieldrin, Heptachlor, DDT and Toxaphene. It was also found that Hexachlorobenzene as fungicide and Mirex, Chlordane and Endrin as insecticides; Alpha and Beta Hexachlorocyclohexane (HCH), Pentachlorobenzene, Chlordecone and Perfluorooctane Sulfonic Acid (PFOS) related pesticide have never been registered in Tanzania Mainland. However technical HCH contains 60-70% Alpha and Beta (HCH) and 5-12% HCH which could be a source of HCH isomers. In addition, the use of Aldrin, Dieldrin, Heptachlor and Toxaphene in the past resulted into accumulation of stockpiles. It was further learnt that in 2013 about 1,000 tonnes of obsolete stockpiles were repackaged and safely disposed of abroad through the Africa Stockpiles Program (ASP) leaving behind 14 contaminated sites countrywide in the areas where they were stored. Also, about ten (10) drums of obsolete stockpiles were identified at Murbadaw in Hanang (Manyara Region) wheat farms. These are suspected to be a mixture of Endosulfan and DDT.

The new POPs pesticides which were registered, imported and used in the URT were Lindane and Endosulfan. POP Pesticides have been cancelled from the current list of registered pesticides for use in Tanzania.

2.3.1.2 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 and high solubility in body fats causing the 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 whereas, new list includes Lindane and Alpha and Beta Hexachlorocyclohexane (HCH), Endosulfan, Pentachlorobenzene, Chlordecone, and the Perfluoro-Octane Sulfonic Acid (PFOS) related pesticide sulfluramide.

2.3.1.3 Methodology

A countrywide inventory was carried out from September - November, 2014 to assess presence in the market, stockpiles and contaminated materials of the initial and new listed POPs pesticides. The inventory aimed at gathering pertinent information for updating the first NIP, for Stockholm Convention developed in the URT in 2005. Due to limited financial resources, specifically selected representative regions were visited during an inventory of the initial and new POPs pesticides. The selected regions included Mbeya, Morogoro, Dar es Salaam, Coast, Mwanza, Shinyanga, Tabora, Singida, Arusha, Manyara and Tanga. The criteria used to identify regions and sites to be visited included: Intensive agricultural activities (anticipating of using large volumes of pesticides and hence, likelihood of existence of POPs pesticides); Large cities (presence of pesticides formulating plants, pesticides importers, pesticides sellers and existence of characteristic features of having high concentration of institutions/ministries responsible for the control and management of pesticides); Reports of the previous inventories of obsolete pesticides and major entry points for importation. Furthermore, those institutions and offices involved in the cycles of POP pesticides' use, control and management were consulted.

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

2.3.1.4 Findings

a) Existing Policy and Regulatory Framework

Pesticides in the Tanzania Mainland are regulated by the Plant Protection Act Number 5 of 1997 and being implemented by the Plant Protection Regulations of 1999 made under Section 42 (1) of the Act. The Plant Protection Act, 1997 and Plant Protection Regulations, 1999 came into force from 1st July, 2001.

Part III of Plant Protection Act, 1997 and Part II of the Plant Protection Regulations, 1999 provide requirements of regulating the entire life-cycle of pesticides, which includes manufacture/formulation, importation, registration, imports, sale and distribution, use, transportation and disposal. 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, Livestock and Fisheries.

POPs pesticides also are partly regulated by the Industrial and Consumer Chemicals (Management and Control) Act No. 3 of 2003. Further the Environmental Management Act (EMA) of 2004 offers an umbrella regulation on environmental protection and management.

The EMA of 2004 provides a legal and institutional framework for sustainable management of the environment and outlines principles for among others; management.

The Industrial and Consumer Chemicals (Management and Control) Act and the EMA both prescribe specific requirements for the management and remediation of contaminated sites. The Acts provides for the responsible Minister to promote 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.

b) Current and Projected Future Production, Use, Import, and Export of POPs pesticides

There are no present and projected future plans for the production, importation and use of old and new POPs pesticides such as Aldrin, Dieldrin, Heptachlor Hexachlorobenzene, Mirex, Chlordane and Toxaphene in the Tanzania Mainland.

The new POPs pesticides which were registered, imported and used in the URT were Lindane and Endosulfan. Lindane was used for the control of termites in the construction industries and endosulfan was used for the control of chewing and sucking insect pests in various crops. Alpha and Beta Hexachlorocyclohexane (HCH), Pentachlorobenzene, Chlordecone and the Perfluorooctane Sulfonic Acid (PFOS) related pesticide Sulfamide have never been registered or used in the Tanzania Mainland.

At the 24th Pesticides Approval and Registration Technical Sub Committee (PARTS) meeting held on 2nd to 6th December 2014 lindane and endosulfan were officially

deregistered. The deregistration decision considered a phasing out period up to end of year 2014 to avoid accumulation of stockpiles.

c) Import and Export of POP Pesticides

Tanzania used to import POP pesticides from different countries for various uses. Huge amounts of POP pesticides were imported above actual needs due to poor documentation system. The magnitude of the problem can be estimated retrospectively through presence of obsolete stockpile.

Tanzania imported 113,000 litres of Dieldrin in 1989, 50 kg of Aldrin/Dichlorvos, 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. In addition, Registrant of lindane has taken initiatives to inform the Registrar of Pesticides on stopping further importation of the product following ban of production of the product by the manufacturer based in India. However, 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.

d) Identified Stockpiles of POP Pesticides and POP Pesticides Waste

There were no stockpiles of the new and initial POPs pesticides found in the surveyed regions except at Murbadaw in Hanang (Manyara) wheat farms where about ten (10) drums suspected to be a mixture of Endosulfan and DDT are still buried.

e) Summary of available Monitoring Data (Environment, Food, Humans) And Health Impacts

i) Human Health Monitoring

Biological monitoring is being conducted in the large scale farms based on market compliance requirements in the Northern zone of Tanzania in Arusha and Kilimanjaro Regions.

Surveillance mainly involved monitoring of organophosphate (OP), and carbamate (CA) pesticide exposures (not listed as POPs) through Testmate OP Kit in the field. The three years results of Acetylcholinesterase (AChE) levels testing (indicating OP exposures) among sprayers in large scale farms of horticulture and coffee plantations in Arusha and Kilimanjaro regions were as shown in the **Table 3**.

Table 3: Results of AChE Testing (OP exposures) among sprayers in large scale farms

Period	Total Population Tested	Population With Acute Pesticides Poisoning	Percentage (%) of Exposure
January-December, 2010	268	71	26.5%
January-December, 2011	380	73	19.2%
January-December, 2012	383	108	28.2%

Source: TPRI, Arusha

ii) Environmental Monitoring

Some environmental monitoring data on POPs releases are collected for purposes of monitoring levels of environmental contamination by individual researchers and institutions. Others are being carried out through targeted projects such as the Tengeru and Morogoro POPs contaminated sites carried out by UNIDO/TPRI project.

f) POP Pesticides Contaminated Sites

There remained enormous POPs pesticides contaminated sites after the ASP project. ASP was aimed at identification, collection, clean up and eventual disposal of obsolete stocks of pesticides including POPs in the United Republic of Tanzania. During the implementation of the project (2005-2013), 600 tonnes highly contaminated soils were identified in 14 sites but could not be cleaned and disposed of due to limited resources. These were ranked into two groups as follows: **Highly contaminated sites** (Vikuge at Kibaha; Morogoro National Housing Cooperation (NHC) close to Railway station; PHS Tengeru in Arusha and Murbadaw wheat farms in Hanang) and **Moderately/ Low contaminated sites** (ACU-Arusha; TACRI Mbimba-Mbeya; Akeri garden-Arusha; Kyela valley food-Mbeya; Korogwe-Tanga; MBOCU-Mbozi; Geita Katundu; Geita Mwateroli; Mbarali Rice Farm-Mbeya; and KATC-Moshi).

2.3.1.5 Conclusion

Ten drums (totalling to approximately 2 tons) which are suspected to be a mixture of Endosulfan and DDT buried at Murbadaw in Hanang (Manyara) wheat farms need to be excavated and be safely disposed off. Further technical and financial support is needed for the decontamination of the identified fourteen (14) highly POPs contaminated sites in the country.

2.3.2 ASSESSMENT OF PCBs (ANNEX A, PART II CHEMICALS).

2.3.2.1 Summary

A PCB survey was conducted in 2014 covering 51 sites in 6 regions: Dar es Salaam, Morogoro, Mbeya, Arusha, Mwanza and Shinyanga, to update the 2003 and 2004 PCB surveys. The survey focused on power stations, storage sites, industries, water treatment plants and public service centers. The survey revealed that most of the formerly identified PCB equipment (>500 ppm) are still in place, however serious leakages needing urgent management measures were found at one site in Tanga. Many of the old equipment belonging to TANESCO and some stakeholders had been removed, and approximately 60% of the labels from the past inventories were not in place. There was also no comprehensive monitoring data for follow up. Where available, the data and labels still in place facilitated distinguishing equipment to be considered non- PCB. In general, there was no comprehensive information to facilitate identification of equipment with PCBs for Environmentally sound management. In this survey, 184 equipment were identified, among which 119 pieces contained 146 tonnes of oil potentially with PCBs. The *out of use* equipment which is potentially PCB contaminated waste weighed 56 tonnes and had 12 tonnes of oil. Follow up at 7 of the initially identified 14 potentially contaminated sites revealed that the equipment had been removed and replaced by new equipment. Since development of the first NIP, various training sessions were conducted for TANESCO personnel. The Industrial and Consumer Chemicals Act which has provisions governing management of chemicals and disposal of chemical wastes came into force in 2004. A poison centre has also been established at the GCLA, to provide a hazard information database that is accessible by occupational health centres, emergency responders and other stakeholders requiring information for chemical safety. Awareness of most stakeholders was found to be low, while PCB waste management and disposal facilities have not been established.

2.3.2.2 Introduction

Polychlorinated biphenyls (PCBs) are a group of synthetic organic chemicals that consist of 209 individual chlorinated biphenyl compounds (congeners) with varying harmful effects. PCBs have a wide variety of uses, including closed/semi-closed applications (in particular transformers, condensers and hydraulic oil) and open applications (e.g. paints, sealants, cutting oil).

PCBs were listed among chemicals for which action is taken within the scope of the Stockholm Convention (SC) on Persistent Organic Pollutants (2001), to which Tanzania is Party. The Convention currently has focused mainly on closed PCB applications (transformers and condensers) but open PCBs applications (e.g. paints, sealants, cutting oil) and unintentional formed PCBs are also covered in the frame of the Convention. The Convention addresses aspects of production, use, import,

export, release of by-products, stockpile management and disposal of an initial list of 12 POPs, which included PCBs. The POPs list has since been extended to include 14 new listed chemicals, the main objective of which is to protect human health and the environment.

2.3.2.3 *Methodology*

a) Identification of PCBs Containing Units

To identify units that might contain PCBs oil, information on the unit's nameplate was used, combined with information from the previous surveys carried out in 2003 and 2004. This sometimes included the name of the oil itself. Where there was no name or declaration of PCBs content, the oil density was calculated to establish status. Oil of density greater than 1000 kg/m³ was considered to contain PCBs oil, because PCBs oils are heavier than water. However this test can only describe PCBs oil but not PCBs contaminated oil and is not an appropriate test to discover PCBs contaminated oil. The year 1986 was cut off of manufacture and thus all units manufactured in 1986 or earlier were considered to contain PCBs oil.

b) Inventory update, 2014

The inventory of 2014 was mainly intended for updating the National Implementation Plan (2005), which was based on 2 PCBs surveys, in which PCB and potentially PCBs containing equipment were identified followed by kit testing for 234 samples of oil, and laboratory analysis for 64 samples of oil and 7 samples of soil. The UNEP guidelines on inventory of PCBs, reports and records from the past surveys were used, coupled with field observations.

2.3.2.4 *Findings*

a) Amount of oil suspected to contain PCBs

In the survey in 2014 efforts were mainly made to follow up and to survey equipment and sites fulfilling the criteria for being potentially PCBs containing or contaminated, respectively. Follow up was made of the old equipment which had been identified within the previously surveyed districts, from which some data was available. The available data was used for follow up, while new sites were included when identified. A total of 51 sites were surveyed, and follow up was also made through information from the National Utility company TANESCO officials. A total of 184 equipment were identified.

The numbers and types of potentially PCBs containing equipment surveyed in 2014 (after exclusion of equipment identified non-PCB from previous testing and analysis, are shown in **Table 4 and 5**.

Table 4: Number of Partially Closed Units Surveyed and Suspected to Contain PCBs

Equipment	Number of Units	Total weight of equipment [kg]	Oil mass [kg]	Total weight of metallic parts [kg]
Oil Circuit Breakers	29		**230	*12,783
Switch Gears	6		-	***7928

Note: *weight of 12 OCB **wt of oil in 4 OCB ***wt of 4 switchgears

- Data not available

Table 5: Number of Closed Units Surveyed and Suspected to Contain PCBs

Equipment	Number of Units	Total weight of equipment [kg]	Oil mass [kg]	Total weight of metallic parts [kg]
Transformers	84	-	*146,330	**706,826

* Data not available for 19 transformers **Data not available for 24 transformers

Data on distribution of equipment by age, power rating, and location is shown in **Table 6, Table 7 and Table 8**

Table 6: Distribution by age of equipment suspected to contain PCBs

Age	Type of Equipment		
	Transformer	Oil Circuit Breaker	Switch Gears
Before 1950	3	-	-
1951-1970	20	13	-
1971-1990	33	16	4
1991-2010	11	-	-

Note: Information on year of fabrication not available for 17TR

Table 7: Distribution by power rating of equipment suspected to contain PCBs

Power rating	Type of Equipment		
	Transformer	Oil Circuit Breaker	Rectifiers
Below 100 kVA	5	-	-
101-250 kVA	2	-	-
251-500 kVA	11		-
500-1000 kVA	4		
1001-2000 kVA	10	11	-
Above 2001 kVA	12	2	4

Data on distribution of electrical equipment suspected to contain PCBs by region is given in Table 8.

Table 8: Distribution by locations of equipment suspected to contain PCBs

Location	No. of Electrical equipment				Total Number of Equipment
	Transformers	Oil Circuit Breakers	Switch Gears	Rectifiers	
Arusha	2	-	-	-	2
Coast	4	-	-	-	4
Dar es Salaam	23	-	-	-	23
Mbeya	27	29	4	-	60
Morogoro	3		2	-	5
Mwanza	6	-	-	-	6
Tanga	19	-	-	-	19

b) Present Regulations Pertaining to PCBs

Key legislation which can address the issues of PCBs is discussed below:

i) The Environmental Management Act: EMA of (2004)

The EMA provides a legal and institutional framework for sustainable management of the environment. It outlines principles for environmental management of impacts; and covers provisions on impact and risk assessment; prevention of pollution; waste management; environmental quality standards and public participation. The Act empowers the Minister to make regulations on POPs, which include PCBs.

In the decade from the last inventory, the VPO which is the Ministry responsible for the Environment has conducted training and awareness activities, and established the following regulations and guidelines relevant to management and control of PCBs: Environmental Management (Hazardous Waste control and management) Regulations (2009) which adopt the Basel Convention Waste Streams, including PCBs containing/ contaminated wastes and National Guidelines on Management of POPs Contaminated Sites.

ii) The Industrial and Consumer Chemicals (Management and Control) Act of 2003 (ICCA)

The Act, which is implemented by the Ministry of Health, Gender, Community Development, Elderly and Children through the GCLA, addresses some of the aspects of POPs, specifically control of chemicals listed under Conventions ratified by the Government. In this context, PCBs are listed in the Eighth Schedule to the Act, while on the other hand oils are included in the Third Schedule to the Act rendering both subject to management and control. The Act has provisions for restrictions and phasing out of chemicals highly hazardous to health and to the environment, decommissioning of plants and facilities, and remediation and management of

contaminated sites..

c) Closed and partially-closed applications of PCB

The NIP covers both closed and semi closed application of PCBs. Closed applications are those in which the PCBs are enclosed, and cannot escape during normal use. The main examples are transformers, capacitors and switchgears, which are sealed pieces of electrical equipment. On the other hand, in partially-closed category, the PCB-containing oil is employed as a fluid, which might be circulated around the equipment for example, as a heat transfer fluid or as a hydraulic fluid, in pumps, or in circuit breakers. The movement implies the presence of joints and seals in the equipment, creating the possibility for these types of equipment can release small amounts of fluid during normal operation.

d) Open applications of PCBs

In open applications, the PCBs are generally incorporated into a formulation. Such products can be sealants, lubricants, adhesives, paints, inks, etc, where it becomes widely dispersed according to each application, and it is a big challenge to manage them. One solution to this problem is to ban the incorporation of PCBs in such products; which has already been done in most countries, although many products manufactured earlier may still be in use.

e) Wastes containing PCBs

From the survey data, all units that have been decommissioned or somehow declared to have been out of service are regarded as waste. Wastes containing oil suspected to contain PCBs include contaminated solids, obsolete/defective/decommissioned transformers, filters and residues from electrical equipment. A large portion of the equipment produced in the period when PCBs were used been phased out has over the past decade, while the rest are old and could be unserviceable within the next 5 years. Among the institutions with large amounts of potentially PCBs contaminated equipment are TANESCO and TAZARA.

The available management options for PCBs waste involve decontamination and destruction, and are applicable to electrical equipment (transformers, capacitors, oil circuit breakers, etc.), PCBs oil or waste oils and contaminated soils. The unit can either be removed from service, or the electrical oils can be replaced by a non-PCB substitute whilst the transformer is in operation. Decontamination is done in two ways: In the first case, complete decontamination leads to destruction of the transformer, with recovery of most metallic components. The second case is called “retrofilling” which involves removing oil, even while the transformer is in

service, and treating this oil in a closed circuit to destroy the PCB it contains. Several technologies exist for carrying out retrofilling.

f) Contaminated Sites

In the first 2 surveys, potentially contaminated sites were identified based on visual inspection and assessment. All sites with leaking units were considered to be sites that will potentially become contaminated in the future if mitigation measures were not instituted urgently.

The level of contamination was assessed following criteria set as follows: Leaking equipment or contaminated site, very close to sensitive sites (water sources, public places such as offices, residential or bus terminal, etc.) needs immediate mitigation- priority 1; Leaking equipment or contaminated site needs mitigation- priority 2; Contaminated sites will need mitigation- priority 3. These sites were followed up, and the situation found for the sites is presented in the **Table 9**.

A site with leaking PCB transformer was also found at Tanga.

Table 9: List of contaminated sites

Site	NIP Priority	Situation: 2014
1. Dar es Salaam City Centre (TANESCO) substation	3	Old equipment phased out – removed
2. Dar-es Salaam-JNIA	1	6 Transformers removed for disposal abroad in 2003
3. DAWASA Lower Ruvu-Bagamoyo	1	2 Transformers removed, new transformers installed
4. DAWASA Upper Ruvu-Mlandizi intake	1	2 Transformers in place; 2 disposed off
5. Gongo la Mboti Substation	3	1 Transformer in place, leaking
6. Morogoro Msamvu Sub-Station	2	Old equipment phased out removed
7. Mlandizi Sub-Station (TANESCO)	3	All (6) transformers removed, disposed of
8. MWATEX- Mwanza	3	6 out of 8 Transformers in place, 1 with minor spill
9. Nyumba ya Mungu	1	Transformer in Place
10. TANESCO Electrical Workshop Ubungo	1	All old transformers removed
11. Tumbi Sub-Station (TANESCO)	3	transformers\out of use, , oil & core removed
12. Ubungo 33 KV yard	3	All transformers removed

Site	NIP Priority	Situation: 2014
13. Ubungo Thermal Power Station	2	All transformers removed
14. Water Pump-Kibaha District	1	2 Transformers in place

g) Capacity and experience to monitor releases of PCBs in Tanzania

The capacity and experience to monitor releases of PCBs into the environment and to monitor and manage the associated adverse effects to health and the environment is still limited in Tanzania. This NIP reveals a very low level of awareness among most TANESCO staff and other stakeholders, from technicians to the management level. Handling of oils and equipment potentially containing PCBs is therefore poor. The level of awareness on potential effects of PCBs among the regulators, training and research institutions, and the public is generally low.

2.3.2.5 Conclusions

It is concluded that there is no comprehensive inventory of PCBs in Country. It is recommended that an inventory should be conducted, and an electronic database that will enable monitoring of all PCB sites and equipment be established. Testing and laboratory analysis of samples should be conducted. Also, urgent action should be taken to manage the leakage at the former TFC plant in Tanga, as well as securing and managing the existing PCBs contaminated sites. Also an assessment of the use of potentially PCB-contaminated waste oils and the potential relevance of open PCB applications should be done. There is need for formulation and review of national policies and regulations, and strengthening enforcement of the existing legislation to facilitate meeting the obligations in the SC. The media should be used for awareness programmes, and technical personnel trained. Strategies for assessing and phasing in sustainable alternatives are proposed to be established in the update of the PCB NIP for implementation of the Stockholm and Basel Conventions.

2.3.3 ASSESSMENT OF POP-PBDES (ANNEX A, PART IV AND PART V CHEMICALS) AND HBB (ANNEX A, PART I CHEMICALS)

2.3.3.1 Summary

In the transport sector where PBDEs were used in Polyurethane (PUR) foam, the total c-pentaBDE was estimated for the inventory year (2010), from the various life stages of vehicles, that is: imports, in use, End of Life Vehicles (ELV) and accident generated ELVs, and those generated from ELV in the previous years. to be 13.7 tonnes, while the total amount of PUR foam generated 37,600 T. The PUR foam and other plastic wastes from ELVs and the plastic from electronics are mainly disposed to landfills or dump sites, which can be considered potential contaminated

sites, which also pose environmental and health hazards mainly through leaching to water sources.

The amount of POP-PBDE in plastic from electrical and electronic equipment (EEE) and related waste (WEEE) were estimated for the inventory year 2011: The total c-OctaBDE in EEE was estimated to be 107 tonnes of which the listed HexaBDE (11%) is 11.8 tonnes and HeptaBDE (43%) is 46.2 tonnes. The largest share of this were stocks in households with total amount of c-OctaBDE in stock of 97.6 tonnes in 527,780 tonnes of EEE of categories 3 and 4 equipment with total polymer fraction of 106,300 tonnes.

2.3.3.2 Introduction

Polybrominated diphenyl ethers (PBDEs) are highly persistent in the environment, bioaccumulative and have a high potential for long-range environmental transport. These chemicals have been detected in humans and biota in all regions. There is evidence of harmful effects in humans and wildlife.

Polybrominated diphenylethers listed in the Stockholm Convention (POPs-PBDEs) were produced and used in the period from approximately 1975 to 2004 in the transport sector (cars, buses, trucks, trains, planes, and ships) in which polyurethane foams (PUR) were produced using PBDEs. Vehicles produced during this period were inventoried for POPs-PBDEs, as this sector is a large material flow of goods which ultimately becomes a large waste and recycling flow for recovery of materials and management of pollutants.

The inventory provides an overview of the amounts of POP-PBDEs and the Polymeric fractions and Polyurethane foam generated from end-of-life vehicles and from plastic of electrical and electronic equipment, which need to be managed in an Environmentally Sound Manner.

The transport sector (cars, buses, trucks, trains, planes, and ships) in which are polyurethane foams which were produced using PBDEs, is one of the large material flows of goods and ultimately becomes a large waste and recycling flow. The end-of-life management of the transport sector is a highly relevant material flow for the recovery of materials and for managing pollutants. Cars and other vehicles (trucks and buses) is the major portion of the transport sector containing the largest volume of POPs-PBDEs. The focus and methodology for the inventory was therefore centred on these vehicles.

POPs-PBDEs were produced and used in the period from approximately 1975 to 2004, only vehicles produced during this period were inventoried for POPs-PBDEs.

2.3.3.3 Inventory of PBDEs in the Transport Sector

a) Methodology

The information and data was collected and compiled from Government and non-governmental institutions including Tanzania Revenue Authority (TRA), Traffic Police, Surface and Marine Transport Regulatory Authority (SUMATRA), Tanzania Insurance Regulatory Authority (TIRA) and the Association of Tanzania Insurers (ATI). Also the basic formula from the *POPs-PBDEs Inventory Guidance Document* was used to calculate the POPs-PBDEs content of vehicles for the different categories (cars/trucks or buses) in different life cycle stages.

$$\text{Amount of POPs-PBDEs}_{\text{Vehicle category}} = \text{Number of vehicles}_{\text{category}} \text{ (manufactured 1975 to 2004)} \times \text{POPs-PBDEs}_{\text{category}} \times F_{\text{regional}}$$

Where:

- *Number of vehicles_{category}* is the number of vehicles (manufactured 1975-2004) present in a category (car or bus) calculated for the different life cycle stages.
- *Amount POPs-PBDEs_{category}* is the amount of POPs-PBDEs in an individual car or bus treated with POPs-PBDEs
- *F_{regional}* the regional factor of percentage of POPs-PBDEs impacted vehicles produced in a region.

a) Distribution

The distribution of vehicles by origin i.e. from US and other regions was estimated to be 0.26%: 99.74% respectively, while the ratio of old (produced before 2005) to new cars was estimated at 95 %: 5%, based on import statistics from the Tanzania Revenue Authority.

b) Recycling of polymers from end-of-life vehicles

No data on the recycling of polymers from end of life vehicles were available and thus are not included in this NIP.

b) Findings in vehicle inventory

i) POPs-PBDEs in Vehicles in Use and Stockpiled

The inventory was based on the national registration statistics, which were centralised since July 2003. In addition to the collection of available statistical data and reports, face to face interviews with the Customs, Insurance, Traffic Police and other experts were conducted. It was therefore possible to collect data on imported cars for 2010 and data on cumulative registration of vehicles 2005 up to 2010. However, for the

import data, the year of production was available for only about 70% of the vehicles. Therefore the inventory year was chosen to be 2010.

Vehicles in use represent a major stock of POPs-PBDEs and are important for planning of waste management of the transport sector.

Table 10: Basic Data & Estimations – Use

Registered vehicles 2010 = 879,721*	95% manufactured 1980 – 2004 = 835,735	Number of buses = 10.49 % x (835,735) = 87,669
Cars Manufactured in US = (0.26 % x 835,735) = 2,173	Cars manufactured in the other regions = 745,893	

*estimates

Quantity of PUR Foam	16 kg per Car/Truck	748,066 x 16kg = 11,969.056 T
	100 kg/ bus	87,669 x 100kg =8,766.900 T

The calculation of POPs-PBDEs in vehicles in current use was compiled according to the *UNEP POPs-PBDEs Inventory Guidance Document* (Table 5-1) as shown in **Table 11**.

Table 11: Amount of POPs-PBDEs in PUR foam of vehicles in current use in the inventory year

Number of cars/trucks (manufactured in USA before 2005)	Amount of c-PentaBDE per car/truck	Total amount POPs-PBDEs in cars in use manufactured in US
5-1a) 2,173	160 g per car	2173 x 0.16 kg x 0.5* = 173.84 kg
Number of cars/trucks in use (manufactured in other regions before 2005)	Amount of c-PentaBDE per car	Total amount POPs-PBDEs in cars in use (manufactured in regions other than US)
5-1b) 745,893	160 g per car	745893 x 0.16 kg x 0.05* = 5,967.14 kg
Number of buses in use (manufactured in US before 2005)	Amount of c-PentaBDE per bus	Total amount PBDEs in buses in use (manufactured in US)
5-1c) --	500 g per bus	No. of buses x 0.5 kg x 0.5* = _____ - - kg
Number of buses in use (manufactured in other regions before 2005)	Amount of c-PentaBDE per bus	Total amount POPs-PBDEs in cars in use (manufactured in regions other than US)
5-1d) 87,669	500 g per bus	87,669 x 0.5 kg x 0.05* = 2,191.72 kg

Total c-PentaBDE 5-1)	-	Sum of c-PentaBDE: 8,332.7 kg
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***UNEP Guidance Document**

Table 12: Basic Data and Estimations – Imports

• Vehicles imported in 2010, manufactured 1980 - 2005	49,686	• % of all imported vehicles	96.74
• Buses imported 2010 from USA	--	• Buses imported rest of the world	5,217
• Cars and trucks imported from USA	130	• Cars and trucks imported from other parts of the world	44,339
• % Vehicles from USA Vs Rest of world	0.26	• % Buses	10.49

Calculation of POPs-PBDEs in the import of vehicles was done according to Table 5-2 of the UNEP Guidance Document, as shown in

Table 13: Amount of POPs-PBDEs in PUR foam of Imported Vehicles in the inventory year

Number of imported cars/trucks (manufactured in USA before 2005)	Amount of c-PentaBDE per car/truck	Total amount POPs-PBDEs in cars imported from USA in 2010
5-2a) 130	160 g per car/truck	130 x 0.16 kg x 0.5*=10.4 kg POPs-PBDEs
Number of imported cars/trucks (manufactured in other regions before 2005)	Amount of c-PentaBDE per car/truck	Total amount POPs-PBDEs in cars imported in 2010 from regions other than USA
5-2b) 44339	160 g per car/truck	44339 x 0.16 kg x 0.05*=354.71 kg POP-PBDEs
Number of imported buses (manufactured in USA before 2005)	Amount of c-PentaBDE per bus	Total amount POPs-PBDEs in imported buses in use (manufactured in USA before 2005)
5-2c) --	500 g per bus	No. of buses x 0.5 kg x 0.5*= --kg POPs-PBDEs
Number of buses (manufactured before 2005 in regions other than USA)	Amount of c-PentaBDE per bus	Total amount POPs-PBDEs in imported buses in use (manufactured before 2005 in regions other than USA)
5-2d) 5,217	500 g per bus	5217 x 0.5 kg x 0.05*=130.42 kg POP-PBDEs

Total c-PentaBDE 5-2)	-	Sum of c-Penta-BDE: 495.53 kg
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Quantity of PUR Foam	16kg per Car/Truck	44,469 x 16kg = 711.504
	100kg/ bus	5,217 x 100kg = 521.700 T

ii) End of Life Vehicles (ELV) for the inventory year

The inventory of ELVs is an important consideration for waste management and for resource recovery. Data on the number of vehicles being scrapped could be derived from the number of vehicles whose registration was cancelled, however this data were not available. The number of end-of-life vehicles was then estimated by the number of total vehicles in use and their estimated life expectancy.

iii) Vehicles reaching end-of-life based on average life span

The average life span of a vehicle was estimated to be 8 years*. It was therefore estimated for this preliminary inventory that approximately 8% of the vehicle fleet (vehicles in use 2010 = 879,721) have entered end-of-life in 2010 which are 70,377 vehicles. Approximately 95% of these were produced before 2005 and therefore 66,858 vehicles were potentially impacted by POPs-PBDEs (see Table 14.).

Table 14: Basic Data & Estimations – ELV

• Estimated Life Span	8 years	• Vehicles entering end of life in the year: 8% (879,721)	70,377
• Vehicles produced before 2005: 95% (70,377)	66,858	• Distribution ratio Cars & Trucks: Buses	90% : 10%

Table 15: Estimated number of end-of-life vehicles in Tanzania in 2010

Vehicle type	Number
Cars and Trucks (90%)*	60,172
Buses (10%)	6,686
Total	66,858

*assuming same distribution nationally as in Dar es Salaam: DART Project 2007.

iv) End-of-life vehicles due to Accidents

About 24,665 vehicles were involved in accidents from January to December 2010 (3), out of which **40%** (9,866) are estimated to have been written – off. This number

was added to end-of-life vehicles and the total amount used for the inventory.

Table 16: Basic Data & Estimations – Accidents

Vehicle type	Number
Cars and Trucks (90%)*	8,438
Buses (10%)	937
Total	9,373

Table 17: Total number of end-of life vehicles in 2010

Vehicle type	Number
Cars and Trucks (90%)*	68,610
Buses (10%)	7,622
Total	76,232

The calculations of POPs-PBDEs from end-of-life vehicles were then compiled in accordance with table 5-3 of the *UNEP Guidance Document* (1).

v) POPs-PBDEs in Historically Disposed Wastes from Vehicles

In Tanzania, the wastes from ELV containing the POPs-PBDEs fraction (the Automotive Shredder Residues (ASR) or the seats and other polymer parts) have been and are mainly disposed to landfills or dump sites. These deposits can also be considered as contaminated sites, depending on how much was disposed there. There was a need to have inventory of the total amount of POPs-PBDEs-containing materials from end-of-life vehicles disposed to landfills/dumps from 1980 to the year 2010, however the data for this calculation were limited to cumulative registrations for the years 2005- 2009, from which estimates were made of ELVs.

Taking into consideration the exponential growth in importation of vehicles, it was the number of ELV possibly generated in the period 1985 to 2004 was estimated based on the ELVs from 2005- 2009. The total number of waste ELV potentially containing POP-PBDEs by the year 2010 was 425,600, with a total of 10,000 tonnes of PUR foam.

POPs-PBDEs in landfill/dumps from end-of-life vehicles were then calculated according to Table 5-4 of the *UNEP Guidance Document*, as shown in **Table 18**.

Table 18: Amount of POPs-PBDEs in wastes from end-of-life vehicles disposed to landfills/dumps from 1980 until the inventory year

Number of cars/trucks (manufactured in US before 2005) where wastes have been disposed.	Amount of c-PentaBDE per car/truck	Total amount of POPs-PBDEs in disposed wastes from cars/truck (manufactured in US before 2005) from 1980 to inventory year 2010
5-4a) 1106	160 g/car	1,106 x 0.16 kg x 0.5* = 88.48kg POPs-PBDEs
Number of cars/trucks (manufactured in other regions 2005) where wastes have been disposed.	Amount of c-PentaBDE per car/truck	Total amount of POPs-PBDEs in disposed wastes from cars/truck (manufactured outside the USA before 2005) from 1980 to inventory year 2010
5-4b) 381,934	160 g/car	381,934 x 0.16 kg x 0.05* = 3055.48kg POPs-PBDEs
Number of buses (manufactured in USA before 2004)	Amount of c-PentaBDE per bus	Total amount of POPs-PBDEs in disposed wastes from buses (manufactured in USA before 2005) from 1980 to inventory year 2010
5-4c) --	500 g per bus	No. of buses x 1 kg x 0.5* = -kg POP-PBDEs
Number of buses (manufactured in other regions before 2005)	Amount of c-PentaBDE per bus	Total amount of POPs-PBDEs in disposed wastes from cars/truck (manufactured outside the USA before 2005) from 1980 to inventory year 2010
5-4d) 42,560	500 g per bus	42,560 x 0.5 kg x 0.05* = 1064 kg POPs-PBDEs
Total c-PentaBDE 5-4)	-	Sum of c-PentaBDE: 4,207.48 kg

Quantity of PUR Foam	16kg per Car/Truck	383,040 x 16kg = 6,128.640
	100kg/ bus	42,560 x 100kg = 4,256.0 T

vi) Listed PBDEs in the Transport Sector

The relevant POPs-PBDEs homologues: TetraBDE, pentaBDE, hexaBDE and heptaBDE were calculated from the estimated amount of c-PentaBDE (or c-OctaBDE) by considering the percentages of homologues in the commercial mixtures as given in **Table 9** of the *UNEP* Guidance Document shown below.

Table 19: Recalculation of POPs-PBDEs* present in the transport sector (data from tables 5-1 to 5-4) to the listed POPs-PBDEs homologues (tetraBDE, pentaBDE, hexaBDE and heptaBDE) for the relevant life cycle stages

Distribution homologues c-PentaBDE	POPs-PBDEs in vehicles currently in use in inventory year 2010** (in kg)	POPs-PBDEs imported*** in vehicles in the inventory year 2010** (in kg)	POPs-PBDEs in end-of-life vehicles in the inventory year 2010** (in kg)	POPs-PBDEs disposed off in the past from the transport sector (in kg)
Inventoried POPs-PBDE*	PentaBDE (Table 5-1) 8,332.7	PentaBDE (Table 5-2) 495.53	PentaBDE (Table 5-3) 753.57	PentaBDE (Table 5-4) 4,207.48
tetraBDE (33%)	2,749.8	163.52	248.67	1,388.47
pentaBDE (58%)	4,832.9	287.41	437.07	2,440.34
hexaBDE (8%)	666.6	39.64	60.28	336.59
heptaBDE (0.5%)	41.66	2.48	3.77	21.03

2.3.3.4 Inventory of PBDEs in EEE/WEEE sector

The major amount of c-OctaBDE is found in the polymer fraction of casings from CRT computer and TV monitors produced before 2005, since production of c-OctaBDE stopped in 2004. These were therefore, the key target EEE/WEEE fractions addressed by the POP-PBDEs inventory. The inventory of POP-PBDEs in EEE/WEEE therefore focused on second-hand EEE imported in the inventory year and the previous years during which possibly POP- PBDEs - containing EEE/ WEEE were imported, as a base for estimating stocks; EEE in use and/or stored in the possession of consumers; EEE entering the waste stream (WEEE) and WEEE plastics sent for recycling from domestic WEEE, and imported WEEE polymer.

a) Methodology

Initially, Data from the country e-waste assessment report focusing on ICT equipment was used, for estimating the minimum POP- PBDE amounts in the Country. Penetration data (appliances/capita) of CRTs from a similar country in the region was used as recommended in the UNEP Guidance and the population in the country was used as shown below:

b) Calculation of c-OctaBDE in CRT devices

$$\text{MPBDE}(i) = \text{No of CRTs/capita Region} \times \text{population} \times 25 \text{ kg} \times 0.3 \times (0.00087 - 0.00254) = 0.17^* \times 44,000,000 \times 25 \text{ kg} \times 0.3 \times (0.00087 - 0.00254) = 48807 - 142494,$$

Where:

i) MPBDE(*i*) is the amount of POP-PBDEs (*i*) in [kg] (in Polymer (*k*) of

- electrical and electronic equipment (EEE) (*j*)
- ii) MEEE(*j*) is the amount of EEE (*j*) in [in tonnes] (imported, stockpiled or entering the waste stream)
- iii) fPolymer is the total polymer fraction in [weight-%]
- iv) CPBDE(*i*); Polymer is the content of the POP-PBDEs (*i*) in the total polymer fraction in [kg/tonne]

Of this amount, the plastic/polymer fraction (42%) is estimated to be **20,499 to 59,847 kg**. The respective range of amounts of POP-PBDEs (HeptaBDE and HexaBDE) according to their fractions in the c- OctaBDE given in the guidance was then calculated and the preliminary inventory results are shown in **Table 20**.

Table 20: Estimate of POP-PBDE in CRT casings in Tanzania

Homologues	Distribution homologues c- OctaBDE	Total c-OctaBDE (kg)
HexaBDE	11% x 48807	5,368.77
HeptaBDE	43% x 48807	20,987
c-OctaBDE	35% x 48807	17082.45
NonaBDE	10% x 48807	4880.7
DecaBDE-	1% x 48807	488.07
TOTAL		48,807

Homologues	Distribution homologues c- OctaBDE	Total c-OctaBDE (kg)
HexaBDE	11% x 142,494	15674.34
HeptaBDE	43% x 142,494	61,272.42
c-OctaBDE	35% x 142,494	49872.9
NonaBDE	10% x 142,494	14249.4
DecaBDE-	1% x 142,494	1424.94
TOTAL		142,494

The **Hexa-BDE** was found to be from **5369 to 15,674.34 kg** while the **Hepta-BDE** from **20,987 to 61,272.42 kg**.

c) Preliminary Inventory

The e-waste assessment (2) conducted in 2010 focused mainly on computers and other ICT equipment (WEEE category 3 and 4)*. The assessment addressed the three stages in the life cycle of EEE; imports of new and second hand, EEE stocks and EEE entering the waste stream, focusing mainly on computers and other ICT equipment.

Data from the additional investigations were used for calculations of inventories of EEE/WEEE in private companies.

The inventory year was chosen to be 2011, in view of the available data for the year, specifically the EEE/ WEEE study that had been conducted under UNIDO. In the case of appliances at Household level, data from a survey of 2009 were used, where extrapolations/estimates were made to 2011. In this inventory, no records of POP-PBDEs imports or use in the country were found. However, articles and products containing POP-PBDEs including EEE/WEEE were being imported into the country at an increasing rate.

In accordance to the Guidance, this inventory was conducted through estimating EEE/WEEE at household and institutional levels. The year 2011 was chosen as the inventory year.

2.3.3.5 *Inventory of Stocks and Flows of EEE/WEEE*

a) *Imports of New and Second-Hand EEE*

Statistical data on imports of ICT products into the country were drawn mainly from the Tanzania Revenue Authority (TRA) and UN-COMTRADE. The import data from both national and international databases did not distinguish between new and second-hand EEE, therefore a survey was conducted on selected distributors/retailers of computers to establish the share of second-hand products which was found to be 13%, mainly sold to households.

The estimation of POP-PBDEs in imported computers and TVs was therefore done using the following key data and assumptions from the country report:

- i) Imported computers (unit items) in 2011: 130,000;
- ii) Average wt per unit computer (kg) : 13;
- iii) Total wt of imported computers: 1,690,000kg;
- iv) Share of imported second hand computers: 13%; (219,700kg)
- v) Imported TVs (unit items) in 2009: 43145
- vi) Average wt per unit TVs : 25kg
- vii) Total wt of imported TVs: 1,078,626 kg;
- viii) Share of imported second-hand TVs: 13% (140,221kg)

The amount of total POP-PBDEs in EEE was then calculated as shown below.

$$MPBDE(i) = MEEE(j) \times f_{Polymer(k)} \times CPBDE(i); Polymer(k)$$

Where:

- i) $MPBDE(i)$ is the amount of POP-PBDEs (i) in [kg] (in Polymer (k) of

- electrical and electronic equipment (EEE) (*j*)
- ii) MEEE(*j*) is the amount of EEE (*j*) in [in tonnes] (imported, stockpiled or entering the waste stream)
- iii) fPolymer is the total polymer fraction in [weight-%]
- iv) CPBDE(*i*); Polymer is the content of the POP-PBDEs (*i*) in the total polymer fraction in [kg/tonne]

Table 21 shows the estimated POP-PBDEs in imported computers and TVs for the year 2011.

Table 21: Estimated POP-PBDEs in CRT imported computers and TVs in 2011

WEEE Category	Product	Amount of imported EEE (new + second hand) in 2011 (in tonnes) (a)	Share of second-hand EEE among the imports (%wt) (b)	Total polymer fraction in EEE (% wt) (c)	Content of c-OctaBDE in total polymer fraction of EEE (kg/tonne) (d)	Total amount of c-OctaBDE (a) x (b) x (c) x (d) (kg)
3	Personal Computers	1690	13% =219.7	42% 92.7T	0.225	20.76
4	TVs	1078.62	13% 140.22T	24% 33.65	0.15	5.05
126.35T						25. 81 kg

The polymer fraction of the EEE was estimated to be **126.35** Tonnes, while the total amount of c- OctaBDE in imported second hand TVs and Computers **25. 81 kg**.

b) EEE in Use or Stored at Consumer Level

The total stocked EEE in the country were estimated at three major consumer levels namely, the Government, private companies and private consumers (households).

i) Private Consumers (Households)

The stocked EEE in households was first estimated using penetration data of specific appliances from a country of similar development growth to Tanzania. The total weight of the EEE in category 3 and 4 was calculated by multiplying the penetration data by the average weight of the appliance and the population. The key data in Table 4-5 of the UNEP guidance manual was used where for personal computers a penetration rate of .17 was used. **Table 22** shows the estimated amount of EEE in stock.

Table 22: Estimated amount of EEE in stocks (categories 3 & 4) in Households

Type of Equipment	*Penetration Rate (no. per person)	Population (m)	Estimated wt (kg)	Total wt (Tonnes)
Personal Computer	0.17	44	9.9	74050
TV	0.2	44	31.6	278,080
Mobile Phone	0.72	44	0.1	3168
Radio/Hifi	0.28	44	10	123,200
Total				478,498 T

The minimum amount of EEE in stocks at the level of households (Categories 3 and 4) was estimated to be **478,498 Tonnes**.

Total weight of EEE & WEEE.

Data from a country e-waste study in which 24 households were surveyed were used to calculate the amount of stocked EEE and WEEE in households, by multiplying the weight of EEE per household by the national data of total households in the country. **Tables 23 and 24** show the results of the survey.

Table 23: Total weight of EEE and WEEE (Category 3) in Households

Equipment	No. of units per household	Estimated wt (kg)	Total wt per household (kg)	Total no. of households	Total wt in households (Tonnes)
Phones	0.33	1	0.33		2900
Mobile Phones	6.42	0.1	0.64		5760
Laptops	0.71	3.5	2.49		22,410
PCs	0.46	9.9	4.55		40,950
LCD monitor	0.04	4.7	0.18		1620
CRT monitors	0.08	14.1	1.13		10,170
Modems		0.29			
Printers	0.33	6.5	2.15		19,350
Copy machines		52			
TOTAL					9,000,000

The total weight of EEE and WEEE (Category 3) in Households was estimated to be **103,160 tonnes**.

Table 24: Total Weight of EEE & WEEE (Category 4) Stocked in Households

	No. of items per household	Estimated wt (kg)	Total wt per household (kg)	Total no. of households	Total wt in households (Tonnes)
Cameras			0.88		
DVD Players			1.25		
MP3 Players			0.21		
Radios	1.46	2	2.92		26,280
Stereo	0.17	10	1.67		15,030
TVs (CRT)	1.21	31.6	38.24		344,160
TV (Flat panel)	0.29	15	4.35		39,150
			Total	9,000,000	424,620 T

Total weight of EEE and WEEE (Category 4) in Households was estimated to be **424,620 Tonnes**.

Therefore, the total weight of EEE at Household level for Categories 3 & 4 equipment was **527,780 Tonnes**.

Calculation of POP- PBDEs Stocked in Households

Since the CRT casings (TVs and computer monitors) are expected to contain more than 50% of the total POP-PBDEs present in EEE, an initial assessment was conducted to estimate the major portion of POP-PBDEs in the EEE/ WEEE sector in the country using CRT monitor data. The POP-PBDEs content in CRT casings (TVs and computer monitors) was calculated taking into consideration the following additional data:

- Population of the country: **44 m**.
- Weight of the CRTs: **25 kg per device** (estimated average weight of a CRT monitor, either TV or PC monitor);
- Polymer content of CRT casings: **30%** ,
- A range of c-OctaBDE content: **0.87 - 2.54 kg/tonne**, for the polymers used in CRT casings (estimated average; see **Table 25 below**).

Table 25: Total polymer fractions and c-OctaBDE concentrations in relevant EEE categories

Relevant EEE	Total polymer fraction (mean)	c-OctaBDE content (mean) in plastics
	<i>f</i> Polymer [in % by weight]	<i>C-OctaBDE;Polymer</i> in [kg/Mton]*]
WEEE category 3 (without CRTs)	42%	0.225

CRT computer monitors	30%	2.54
WEEE category 4 (without CRTs)	24%	0.15
CRT-TV _s	30%	0.87

Reference data was taken from the Guidance document (1), and a range of c-OctaBDE in CRT devices was then calculated in accordance with the Guidance as shown below:

$$\text{MPBDE}(i) = [\text{Number of CRTs/capitaRegion}] \times \text{population} \times 25 \text{ kg} \times 0.3 \times [0.00087 \text{ to } 0.00254]$$

Where: MPBDE(i) is the amount of POP-PBDEs (i) in [kg] (in Polymer (k) of electrical and electronic equipment (EEE) (j))

The calculations are shown in **Table 26**.

Table 26: Total amount of c-Octa-BDE, Household level

WEEE Category	Product	Amount of stocked EEE (tonnes) in 2009 (a)	Total polymer fraction in EEE (% wt) (b)	Content of c-OctaBDE in total polymer fraction of EEE (kg/tonne)	Total amount of c-OctaBDE (kg) a x b x c
3	CRT monitors	10,170	30% 3051T	2.54	7749.54
4	CRT-TV _s	344,160	30% 103,248T	0.87	89,825.76
Total					97,575.3

Table 4-11 of UNEP Guidance (1).

The total polymer fraction at Household level was estimated to be **106,299 tonnes**, while the **corresponding** total amount of c-OctaBDE was found to be **97.6 tonnes**.

ii) EEE Stocked at Institutional and Corporate Consumers levels

The stocked EEE in surveyed Government institutions and private companies was estimated by using data collected from selected institutions and companies using questionnaires.

- **Government Institutions**

The amount of EEE stocked at Government Institutions were calculated as shown in

Tables 27 and 28.

Table 27: Estimated weight of the existing ICT Equipment in 20 Institutions (19 Government & 1 UN Agency)

Type of Equipment	Total Units	Unit/employee	Estimated Weight kg.	Total Wt	
				In Use	Not in Use
Desk top computers with CRT monitors,	1329	0.005	9.9	8197	4,960
Desk top computers with LCD monitors,	6852	0.107	9.9	63,202	4,633
Laptop computers	1450	0.02	3.5	4,900	175
Traditional CRT PC monitors	1344	0.02	14.1	11,731	7,219
Flat Screen (LCD) PC monitors	6863	0.107	4.7	30,028	2,228
Printers	4090	0.06	6.5	19,585	7,001
Mobile Phones	6		0.1	1	0
CRT TV monitors	89	0.001	31.6	2,781	32
Flat screen (LCD) TV monitors	139	0.002	7.3	1,015	0
				141,439	26,247

Data: Estimated number of Government employees; 400,000, Total employees in surveyed institutions: 63,966.

This data was used to calculate the amount of EEE in stock in Government Institutions, as shown in **Table 28**.

Table 28: Estimation of EEE in Stock in Government Institutions

	Estimated weight per unit kg (a)	Units / employee (b)	Total units of stocked EEE (c) = (b) x no. of employees (400,000)	Total Wt. of stocked EEE (T) (f) kg = (b) x (c)
Desk Top Computers with LCD	9.9	0.005	2000	19.8
Desk Top Computers with CRT monitor	9.9	0.107	42800	423.720
Lap Top Computers	3.5	0.02	8000	28.000
Traditional CRT) PC monitors	14.1	0.02	8000	112.800
Flat Screen (LCD) PC monitors	4.7	0.107	42800	201.160

Printers	6.5	0.06	24000	156.000
Mobile Phones	0.1			.0148
CRT TV monitors	31.6	0.001	400	12.640
Flat screen (LCD) monitors	15	0.002	800	12.000
			Total	966.12 Tonnes

EEE in stock in Government Institutions was estimated to be **966.12 Tonnes**. Calculation of the polymer fraction and c-OctaBDE in CRT monitors in Government institutions was estimated as shown in **Table 29**.

Table 29: Total amount of c-Octa-BDE, Government Institutions level

WEEE Category	Product	Amount of stocked EEE (tonnes) in 2011 (a)	Total polymer fraction in EEE (% wt) (b)	Content of c-OctaBDE in total polymer fraction of EEE (kg/tonne) w	Total amount of c-OctaBDE (kg) a x b x c
3	C R T monitors	112.80	30% 33.84T	2.54	85.95
4	CRT-TVs	12.64	30% 3.79 T	0.87	3.30
Total			37.63T		89.25 kg

The total polymer fraction of CRT monitors (TV and Computers) in Government Institutions was estimated to be **37.63T**, with a total c-OctaBDE content of **89.25kg**.

- **Private Institutions: Banks**

The amount of EEE stocked at Private institutions was calculated using data from the survey as shown in **Tables 30 and 31** for Banks, and **Table 32** for telecommunication companies.

Table 30: EEE Stockpiled in private Companies (Banks)

	Units (a) at 4 Banks	Estimated weight per unit kg (b)	Units / employee (5624) (d)	Total units of stocked EEE (e) = (d x no. employees) (11,210)	Total Wt. of stocked EEE (T) (f) kg= (b) x (e)
	Total Units				
Desk Top Computers	6060	9.9	1.07	11994.7	118.75

Lap Top Computers	550	3.5	0.1	1121	3.92
Traditional (CRT)PC monitors	90	14.1	0.02	224.2	3.16
Flat Screen (LCD) PC monitors	6293	4.7	1.12	12555.2	59.01
Printers	1029	6.5	0.18	2017.8	13.11
Mobile Phones	276	0.1	0.05	560.5	.06
CRT TV Monitors	110	31.6	0.02	224.2	7.08
Flat Screen (LCD) TV monitors	121	7.3	0.02	224.2	1.64
					206.73 (T)

Data: Total number of employees in surveyed institutions: 5624; estimated total number of bank employees in the Country: 11,210.

The total amount of EEE in stock in Banks was estimated to be **206.73 Tonnes**.

The polymer fraction of CRT monitors and thereafter the amount of c- OctaBDE was calculated as shown in Table 31 below.

Table 31: Total amount of c-Octa-BDE in Private Institutions (Banks)

WEEE Category	Product	Amount of stocked EEE (tonnes) in 2009 (a)	Total polymer fraction in EEE (% wt) (b)	Content of c-OctaBDE in total polymer fraction of EEE (kg/tonne) w	Total amount of c-OctaBDE (kg) a x b x c
3	CRT monitors	3.16	30% 1.08T	2.54	2.74
4	CRT-TVs	7.08	30% 2.12T	0.87	1.84
Total					4.58 kg

The polymer fraction of CRT monitors in banks was estimated to be **3.02 Tonnes**, with a content of c-Octa-BDE of **4.58 kg**.

Private Institutions: Telecommunication Companies

The total amount of EEE in stock in Telecommunication companies, the polymer fraction of CRT monitors and thereafter the amount of c- OctaBDE was calculated as shown in Table 32 below.

Table 32: EEE Stockpiled in private Institutions: 3 Telecommunication companies

	Units (a)	Estimated weight per unit kg (b)	Units / employee (d) 1800*	Total units of stocked EEE (e) = (d x no. employees) 5000*	Total Wt. of stocked EEE (T) (f) kg= (b) x (e)
	Total Units				
Desk Top Computers	340	9.9	0.18	900	8.910
Lap Top Computers	283	3.5	0.15	750	2.625
Traditional (CRT)PC monitors	20	14.1	0.01	50	.705
Flat Screen (LCD) PC monitors	320	4.7	0.17	850	3.995
Printers	93	6.5	0.05	250	1.625
Mobile Phones	95	0.1	0.05	250	.025
CRT TV Monitors	0	31.6	0	0	-
Flat Screen (LCD) TV monitors	10	7.3	0.01	50	.365
Total					18.22T

*Estimated Total number of employees in surveyed institutions: 1800; total number of employees in the Country: 5000 (15)

The amount of EEE in stock in telecommunication companies was estimated to be **18.22 tonnes**. The amount of c- OctaBDE in CRT- PC monitors was calculated as shown in **Table 33**.

Table 33: Total amount of c-Octa-BDE in EEE: telecommunication companies

WEEE Category	Product	Amount of stocked EEE (tonnes) in 2009 (a)	Total polymer fraction in EEE (% wt) (b)	Content of c-OctaBDE in total polymer fraction of EEE (kg/tonne) w	Total amount of c-OctaBDE (kg) a x b x c
3	C R T monitors	.705	30% .211T	2.54	.54
Total					0.54 kg

The polymer fraction and the amount of c-Octa-BDE in CRT monitors in telecommunication companies was estimated to be **.211T and 0.54kg**, respectively. Therefore, the total amount of EEE in stocks at private institutions was estimated

to be **224.95T**. The polymer fraction of CRT monitors (computers & TVs) was estimated to be **3.41T**, with a c-Octa-BDE content of **5.12 kg**.

Preliminary Inventory

The total amount of CRT polymer fraction and the POP-PBDEs in stocked CRT monitors in the country was then estimated as the total of stocks at the 3 levels that is Households, Government and Private Sector.

The total amount of c-Octa -PBDEs in stocks was estimated to be (97,575.3 + 89.25 + 5.12) kg that is **97.6 Tonnes**, and the distribution of polymers in CRT monitors is shown in **Figure 2**.

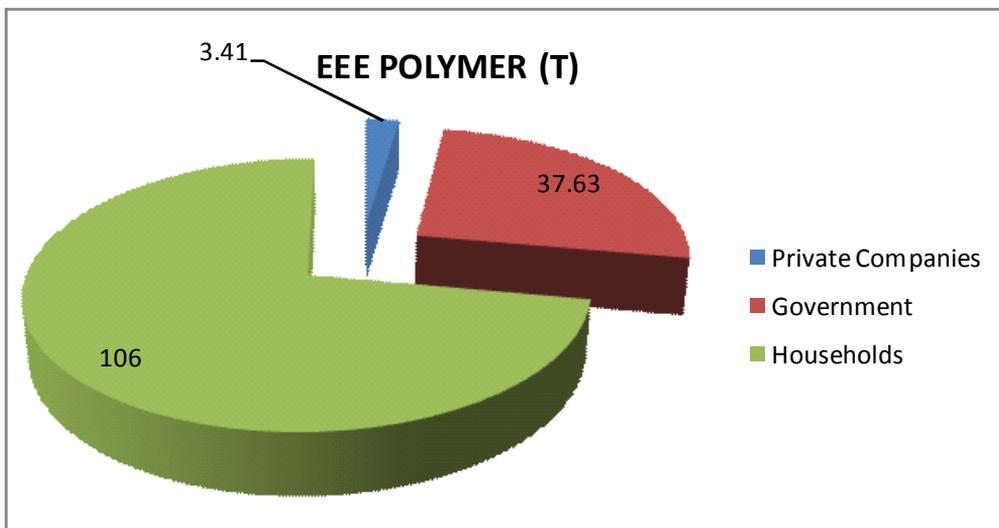


Figure 2: Distribution of CRT polymers at different levels

d) Listed PBDEs in the WEEE Sector

The EEE entering the waste stream or WEEE generated was calculated based on the following formula given in the guidance manual using the key data and assumptions shown in **Table 34**.

$$\text{WEEE generated per year} = \text{MEEE}(j)\text{stockpiled} / \text{lsEEE}(j)$$

Where

MEEE(j)stockpiled is the amount of EEE (j) stockpiled at the consumer [in tonnes]

lsEEE(j) is the average life span of the specific appliance (j) [in years] (combined time of being used and stored at the consumer)

Table 34: Key data and assumptions used in estimating WEEE generated in 2011

Data Description/Assumption	Value in Consumers		
	Households	Private Companies	Government Institutions
Stocked CRT computer monitors (tonnes)	10,170	3.16	112.8
Average life span of CRT computer monitors (yrs)	10	4	6
Therefore WEEE entering the waste stream from CRT computer monitors (tonnes)	1017	.79	18.8
Stocked CRT TV monitors (tonnes)	344,160	7.08	12.64
Average life span of CRT TV monitors (yrs)	10	4	6
Therefore WEEE entering the waste stream from CRT TV monitors (tonnes)	34,416	1.77	2.11

From these calculations, e-waste generated from CRT computers in 2011 was estimated to be **1035 tonnes**, and e-waste generated from CRT TV was estimated to be **34,420 tonnes**.

Therefore, a total of **35,455T of E- waste was generated from CRT monitors in 2011**.

The total amount of c-OctaBDE in EEE entering the waste stream was estimated as shown in **Table 35**.

Table 35: Estimates of c-OctaBDE in EEE entering the Waste Stream

WEEE Category	Product	Amount of WEEE generated in year 2011(tonnes) (a)	Total polymer fraction in EEE (% wt) (b)	Content of c-OctaBDE in total polymer fraction of EEE (kg/tonne) (c)	Total amount of c-OctaBDE (kg) $a \times b \times c$
3	C R T monitors	1035	30% 310T	2.54	788.67
4	CRT-TVs	34,420	30% 10,326T	0.87	8983.62
TOTAL		35,455T	10,636	Total amount of c-OctaBDE in EEE entering the waste stream (WEEE)	9772.29 kg

The polymer fraction of waste CRT monitors was estimated to be 10,636 Tonnes,

whose c-OctaBDE content was 9,772.29kg.

POP-PBDE Inventory, 2011

The POP-PBDEs (heptaBDE and hexaBDE) content in the c-OctaBDE were then calculated separately using the available data, for each stage (imports, in stocks and in use, wastes for the year and accumulated wastes) then totaled, as shown in **Table 36 and Figure 3**, according to the homologue content of c-OctaBDE, where the heptaBDE homologue is estimated as 43% and the HexaBDE as 11% (1).

Table 36: POP-PBDE Inventory 2011

Homologues/ Inventoried c-OctaBDE	Distribution in c-OctaBDE	POP-PBDEs in imports for inventory year 2011 (kg)	POP-PBDEs in stocks for inventory year 2011 (kg)	POP-PBDEs entering the waste stream (WEEE)for inventory year 2011 (kg)	POP-PBDEs in recycled polymers for inventory year 2011 (kg)	Total (K\z[g])
HexaBDE	11%	2.84	10,743.66	1,074.95	Na	11,821.45
HeptaBDE	43%	11.09	41,997.95	4,202.08	Na	46,211.12
c-OctaBDE**	35%	9.03	34,184.38	3,420.30	Na	37,613.71
NonaBDE**	10%	2.58	9,766.9	977.2	Na	10,746.68
DecaBDE-**	1%	.25	976.69	97.72	Na	10,74.66
TOTAL		25.81	97,669.67	9,772.29	Na	107,467.6

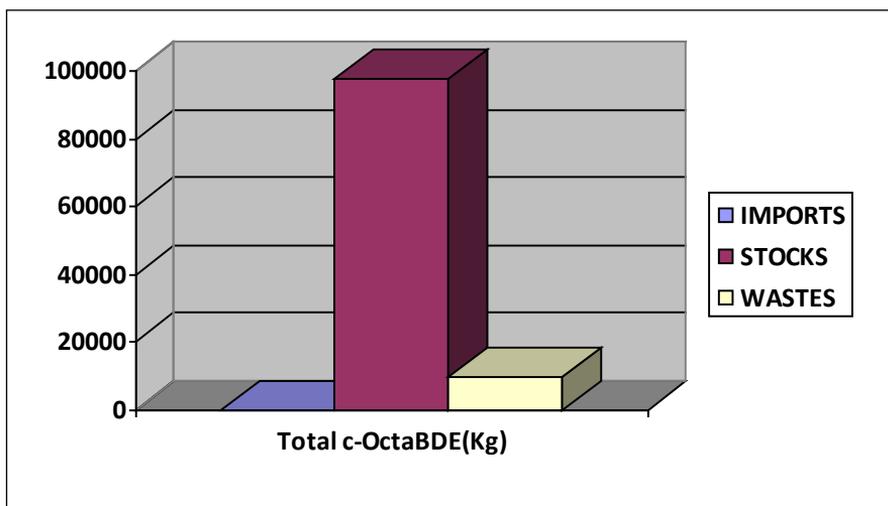


Figure 3: Distribution of sources of c-OctaBDE

2.3.3.6 Findings

The following are the findings of the inventories at the various levels:

- i) *Household level*: The total weight of EEE for categories 3 and 4 equipment: 527,780 tonnes, total polymer fraction at Household level: **106,299 tonnes**, while the total amount of c-OctaBDE in stock was **97,575.3 kg**;
- ii) *Imports*: the polymer fraction of the EEE was estimated to be **126.35 tonnes**, while a total amount of c- OctaBDE in imported second hand TVs and Computers was **25. 81 kg**;
- iii) *Government Institutions*: The polymer fraction of CRT monitors (TV and Computers) was estimated to be **37.63 tonnes**, while the total c-OctaBDE in was estimated to be **89.25 kg**;
- iv) *Private institutions*: the total amount of EEE in stock was estimated to be **224.95 tonnes**. The polymer fraction of CRT monitors (computers and TVs) was **3.41 tonnes**, with a c-Octa-BDE content of **5.12 kg**;
- v) *Waste*: The total e-waste generated from CRT TV and computer monitors was **35,455 tonnes**. The polymer fraction was **10,636 tonnes**, whose c-OctaBDE content was **9,772.29 kg**; and
- vi) *Inventory for 2011*: The total c-OctaBDE was estimated to be **107 tonnes** of which the listed **HexaBDE (11%) is 11.8 tonnes** and **HeptaBDE (43%) is 46.2 tonnes**.

The estimates of the inventory correlate with the levels estimated at the initial assessment. It is noted that most of the CRT monitors and therefore polymer were found at the Household level. In view of the accelerating rate of importation of EEE, the amount of wastes is expected to have increased, and many CRT monitors fallen into disuse by 2015.

Other findings of the inventory include the following:

- i) Several policies and strategies on EEE/WEEE management have been established in the country. However, there is currently no specific *comprehensive* policy specifically on EEE/WEEE;
- ii) The Extended producer responsibility approach could be taken, in line with the Polluter Pays Principle already embedded in the National Environmental Policy (1997);
- iii) Several studies on e-waste management have been carried out; however there is no comprehensive study;
- iv) There is a low level of awareness or appreciation of e-waste management as a major problem, therefore low priority is given to e-waste management

- issues;
- v) There is inadequate competence in e-waste management issues;
 - vi) The enforcement level of the existing environmental laws and regulations applicable to EEE/WEEE is not adequate; and
 - vii) Financial resources allocation on waste management including e-waste is inadequate.

2.3.3.7 Conclusion on POP-PBDEs in EEE/WEEE and vehicles

Products and articles containing POP-PBDEs are present in Tanzania in plastics from electrical and electronic equipment (EEE) and related waste (WEEE) and in the transport sector primarily in PUR foam.

The major amount of POP-PBDE is in plastic from electrical and electronic equipment (EEE) and related waste (WEEE) and was estimated to 107 tonnes c-OctaBDE with listed HexaBDE of 11.8 tonnes and HeptaBDE of 46.2 tonnes. The largest share of this were in stocks in households (c-OctaBDE in stock of 97.6 tonnes) in 527,780 tonnes of EEE of categories 3 and 4 equipment with total polymer fraction of 106,300 tonnes.

The total c-pentaBDE estimated in the inventory year (2010) from the various life stages of vehicles, that is: imports, in use, End of Life Vehicles (ELV) and accident generated ELVs, and those generated from ELV in the previous years was 13.7 tonnes. 8.3 tonnes POP-PBDEs are considered to be still in use within 20,700 tonnes of PUR foam. The total number of end-of-life vehicle potentially containing POP-PBDEs by the year 2010 was 425,600, containing 10,000 tonnes of PUR foam with an estimated amount of 4.2 tonnes POP-PBDEs.

The PUR foam and other plastic wastes from ELVs and the plastic from electronics are mainly disposed to landfills or dump sites, which can be considered potential contaminated sites. This poses a special risk of leaching and contamination of soils and water sources. In general, leachates are not regularly monitored in the country. The POPs- PBDE wastes and contaminated site require special management due to the PBDE content. The issue of PBDEs as POPs is a completely new subject to almost all stakeholders, and so there is need for awareness-raising, technical and institutional capacity building.

There is need for strategies for ESM of e-waste and control of the potential health and environmental risks including risks from PBDEs, heavy metals and other hazardous chemicals emanating from WEEE. This should be done parallel to efforts on raising awareness of all stakeholders on the potential risks from WEEE. Technical and infrastructural collaboration with partners is needed, in view of the limited capacity at the national level.

2.3.4 ASSESSMENT OF DDT (ANNEX B, PART II CHEMICALS)

2.3.4.1 *Summary*

About 110 MT of DDT stockpiles were collected and transported for disposal abroad by GTZ (DDT at Old Korogwe) and by the Africa Stockpiles Program (ASP) for other places.

The NIP established presence of DDT contaminated sites after the Africa Stockpiles Program (ASP) clean-up operations about ten buried drums of DDT at Murbadaw in Hanang wheat farms. The existing DDT contaminated sites include Korogwe, Vikuge at Kibaha, Morogoro National Housing Cooperation (NHC) close to Railways station, PHS Tengeru in Arusha and Murbadaw wheat farms in Hanang. The contaminated sites at Morogoro National Housing Cooperation (NHC) close to Railways station and PHS Tengeru in Arusha are currently under the UNIDO/TPRI project to determine levels of contamination.

2.3.4.2 *Introduction*

The strategy and scope of monitoring effects of DDT to human health and the environment requires skilled personnel and adequate and readily available funds. The monitoring of effects of DDT also requires a well-planned and committed inter-sectoral collaboration and a well-defined programme.

2.3.4.3 *Methodology*

A countrywide inventory was carried out in September - November, 2014 to assess presence in the market, stockpiles and contaminated sites and materials of DDT. The inventory was aimed at gathering information of DDT with a view of updating the initial NIP, 2005 for Stockholm Convention developed in the United Republic of Tanzania (URT).

Based on the meagre financial resources and time constraint, representative regions were specifically selected as follows: Mbeya, Morogoro, Dar es Salaam, Coast Regions, Mwanza, Shinyanga, Tabora, Singida, Arusha, Manyara and Tanga. The criteria used to identify regions and sites to be visited included: Intensive Agricultural activities (Anticipating of using large volumes of pesticides and hence, likelihood of existence of DDT; Large Cities (Presence of pesticides formulating plants, pesticides importers, pesticides sellers and existence of characteristic features of having high concentration of institutions/ministries responsible for the control and management of pesticides); Reports of the previous inventories of existences and status of DDT stockpiles, DDT contaminated sites and empty DDT containers and Major entry points for the importation.

DDT data were collected using checklist targeted to stakeholders who were responsible for the pesticides control and management. These included sellers, importers and formulators/re-packers. Other responsible institutions included regulators like Pesticides Inspectors, NEMC, and compliance assistance stakeholders like the Customs officials.

2.3.4.4 Findings

a) Policy and Regulatory Framework

Pesticides in the United Republic of Tanzania (URT) are regulated by the Plant Protection Act Number 5 of 1997 and being implemented by the Plant Protection Regulations of 1999 made under Section 42 (1) of the Plant Protection Act. Also, Persistent Organic Pollutants (POPs) including DDT are partly regulated by the Industrial and Consumer Chemicals (Management and Control) Act No. 3 of 2003. Furthermore, the Environmental Management Act of 2004 offers an umbrella regulation on environmental protection and management.

b) Current and Projected Future Production and Use

DDT was registered and used as an insecticide for the control of agricultural and public health pests in the United Republic of Tanzania before the year 1997. The use of DDT in the past resulted into accumulation of stockpiles and contaminated sites. Stockpiles of DDT have been repackaged and safely disposed of abroad through the Africa Stockpiles Program (ASP) leaving behind contaminated sites. However, there are no current and projected future plans for the production, and use of DDT in Tanzania.

c) Import and export of DDT

Although, there is still a debate on whether Tanzania should import DDT for the control of malaria vectors by the Ministry of Health, Community Development, Gender, Elderly and Children no exemption has been requested from SC. Exemption for the use of DDT in the control of malaria causing vectors by Party countries is provided in Annex B, Part II Chemicals of the Stockholm Convention on Persistent Organic Pollutants.

d) Identified Stockpiles of DDT and DDT waste

The inventory revealed no stockpiles of DDT except at Murbadaw in Hanang wheat farms where about ten drums of DDT are still buried (Figure 2). However, other stockpiles of DDT were collected and transported for disposal abroad by GTZ (DDT at Old Korogwe) and by the Africa Stockpiles Program (ASP) for other places.



Figure 4: Buried Endosulfan and DDT at Murbadaw wheat farms

e) Summary of Available Monitoring Data (Environment, Food, Humans) and Health Impacts

i) Human Health Monitoring

There are limited data on occupational pesticides exposure, particularly in the large scale farms in Arusha and Kilimanjaro. The three years results of AChE Testing (OP exposures) among sprayers in large scale farms of horticulture and Coffee plantations in Arusha and Kilimanjaro regions are as shown in the **Table 37**.

Table 37: Results of AChE Testing (OP exposures) among sprayers in large scale farms

Period	Total Population Tested	Population With Acute Pesticides Poisoning	Percentage (%) of Exposure
January-December, 2010	268	71	26.5
January-December, 2011	380	73	19.2
January-December, 2012	383	108	28.2

Source: TPRI, Arusha

ii) Environmental Monitoring

Currently there are no coordinated DDT environmental monitoring activities, apart from some few studies that have been carried out by individuals and institutions on POPs pesticides contaminated site.

f) DDT Contaminated Sites

Although there were two initiatives, one by GTZ and the other by Africa Stockpile Projects that removed obsolete stockpiles, there are still some DDT contaminated sites in Tanzania. The existing DDT contaminated sites include Korogwe, Vikuge at Kibaha, Morogoro National Housing Corporation (NHC) close to Railways station (Figure 3), PHS Department Tengeru in Arusha and Murbadaw wheat farm in Hanang.



Figure 5: Morogoro DDT contaminated site under UNIDO Project

g) Current Capacity and Experience in the Field of DDT

There is limited capacity for the management of DDT in the country in terms of trained personnel, laboratory facilities (for analysis) and in legislation compliance issues. 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.

2.3.4.5 Conclusion

There are no stockpiles of DDT after the Africa Stockpiles Program (ASP) cleanup operation. NIP records DDT contaminated sites which includes Korogwe, Vikuge at Kibaha, Morogoro National Housing Corporation (NHC) close to Railways station (Figure 3), PHS Department Tengeru in Arusha. There are also about ten drums of the claimed to be a mixture DDT and endosulfan buried at Murbadaw in Hanang wheat farms.

In the case for use of DDT, at present, there are no current and projected future plans for the production, and use of DDT in Tanzania and if need arises formal exemption procedures as per SC will prevail.

2.3.5 ASSESSMENT OF PFOS, ITS SALTS AND PFOSF (ANNEX B, PART III CHEMICALS)

2.3.5.1 Summary

The inventory revealed that the insecticide *Sulfluramid* had never been registered for use in Tanzania. No use of PFOS or related substances were identified in metal plating, paper and leather industries. A total of 18 suppliers and professional users of AFFF were identified, with whom a total of 57,045 Litres of AFFF were found, most of which had been purchased after 2010. The *Dr. Sthamer* Company whose products were found at 2 sites was found through literature to have produced PFOS containing AFFF in the past, and to have later moved to production of PFOS-free AFFF. A total of 13 sites potentially contaminated with PFOS through accidental fires and firefighting drills were identified. It was also found that the level of awareness of most stakeholders specifically on PFOS was very low or none.

Assessment of the other identified PFOS areas like synthetic carpets, oil and gas and paper industries should be undertaken. In addition, hazardous waste management practices and disposal facilities are not adequate, including PFOS containing articles and materials, thus posing risks to health and to the environment. There is therefore a need for technical and infrastructural capacity building for carrying out the necessary measures to ensure risks of PFOS and related substances to health and to the environment are minimized.

2.3.5.2 Introduction

Perfluorooctane sulphonic acid (PFOS), its salts, and Perfluorooctane Sulfonyl fluoride (PFOSF) were listed in Annex B of the Stockholm Convention in 2009. Parties must take measures to eliminate the production and use of PFOS, its salts, PFOSF and PFOS related chemicals as substances, in mixtures, and in articles containing these chemicals. Furthermore, Parties need to develop waste management schemes

to treat these in an environmentally sound manner. In general the production of PFOS, its salts, PFOSE and PFOS related chemicals as substances, in mixtures, and in articles containing these chemicals is only allowed for Parties if notified to the registers of Specific Exemptions and Acceptable purposes. Every four years, each Party that uses and/or produces these chemicals is obligated to report and submit information to the Conference of the Parties on the progress made to eliminate PFOS, its salts and PFOSE, in accordance with Article 15 of the Convention.

2.3.5.3 Methodology

Tanzania undertook to conduct the first inventory of PFOS as part of her NIP update process in September 2014. The NIP reveals that the insecticide *Sulfluramid* had never been registered for use in Tanzania. On the other hand, metal plating, paper and leather industries were surveyed, where there was no declaration or identification of use of PFOS or related substances. The Government Chemist Laboratory Agency also provided a list of several PFOS related chemicals, which had been imported by industries over the past 10 years.

The specific information sought included production, import and uses of PFOS and its related substances and presence of products and articles containing PFOS and its related substances on the consumer market, flows into the country of products and articles containing PFOS and its related substances and waste and disposal practices for products and articles containing PFOS and its related substances when they become wastes. The NIP also intends to document stockpiles, releases to the environment from point sources, potential contaminated sites and potential harmful exposure of humans and the environment.

The objective of the inventory was to obtain the information needed for the sound management of PFOS and its related substances, and implementation of the country obligations under the Stockholm Convention. This inventory did not include *minor uses* of PFOS [UNEP, 2012a] as no manufacturer was identified. Considering the limitations in allocated resources, the scope covered institutions and industries in seven 7 regions in Mainland Tanzania, with the relatively highest level of industrial/economic activities including Dar es Salaam, Morogoro, Arusha, Mbeya, Mwanza, Shinyanga and Tanga.

A detailed inventory was not possible for all sectors within the time and limited resources allocated for this project. Therefore, efforts were focused on assembling some initial inventory-related information in the specific sectors identified by stakeholders. The initial general assessment was conducted to achieve a preliminary list of PFOS-containing articles and products that could contain PFOS and its related substances; and preliminary list of retailers, suppliers of the identified articles and products and supply chain stakeholders. Thereafter, the inventory focused on Fire Fighting Foams considered highly relevant.

To guide the inventory, the UNEP Guidance document for inventories of PFOS was used. A team of 4 national experts established by the Vice President`s Office (VPO) were involved in this survey which took 5 months. Stakeholders identified PFOS inventory areas relevant to Tanzania, including among others the metal plating industry, aviation hydraulic fluids, and firefighting foams. During the inventory, efforts were made to gather basic information as to the presence and use of PFOS, and to identify stakeholders.

2.3.5.4 Findings

a) Concentrations of PFOS in various chemical formulas and products

The Guidance for the Inventory of Perfluorooctane Sulfonic Acid (PFOS) and Related Chemicals Listed under the Stockholm Convention on Persistent Organic Pollutants (2012) was used to conduct the inventory, where concentrations of PFOS in various chemical formulas and products are shown in **Table 38**.

Table 38: Concentrations of PFOS in various chemical formulas and products

Chemical formulas and products	Concentration of PFOS in chemical formula/product*	References
Aviation hydraulic fluids	0.05 – 0.1%	DEFRA 2004
Fire-fighting foam	0.5-1.5 % (Up to 6%)	DEFRA 2004
Textile formula/polymer	1.0-2.0%	(Posner et al 2011)
Impregnation formula for synthetic carpets	2-5 %	(Posner et al 2011)
Impregnation formula for leather	about 1%	UKEA 2004
Impregnation formula for paper and paperboard	About 1%	(Posner et al 2011)
Coatings	0.1-1%	UKEA 2004
Insecticide	0.01-0.1%	UNEP 2010b

Selection of relevant national sectors and other key stakeholders to be investigated was done guided by the lists provided in the Guidance. Likewise, the UNEP Guidance to imports (UNEP 2012b) was used to check with the National Chemicals Register at GCLA to discover if there had been any imports of PFOS or related substances. However, communication with stakeholders and collecting information was done through meetings, face to face, telephone interviews, letters, emails and filling Questionnaires (UNEP 2012a).

b) Policy and Regulatory Framework

There are some provisions currently in the Environmental Management Act (2004) and Regulations focusing on POPs, which may address some of the requirements for sound management of POPs.

The provisions in the Industrial and Consumer Chemicals (Management and Control) Act of 2003 (Cap 182) and Regulations (2012) on imports, exports, use and disposal of industrial and consumer chemicals may also be used to address some of the requirements for sound management of PFOS, specifically management and control of PFOS and related chemicals. The provisions currently in Cap 182 and Regulations (2012) do not directly address chemicals in articles and products. The Tanzania Food, Drugs and Cosmetics Act (2003) has provisions for regulating chemicals in cosmetics, where lists of chemicals banned from inclusion in cosmetics are issued as necessary.

c) Imports and Use of Chemicals, Products and Articles

At the National Chemicals Register (GCLA), it was found that some PFOS-related substances had been imported into the country by various companies over the past 10 years, including 3 Suppliers/distributors, 2 Pharmaceutical companies, and 1 cigarette processing, paint and Cement Company, respectively (**Table 39**). Information on dates or amounts imported was not available within the inventory period. List of the chemicals used in some industries which are known to use PFOS were also provided, including textiles, leather, metal plating and paper.

i) Industries

In the responses to questionnaires to the textile, leather, metal and paper industries, no PFOS related chemicals were acknowledged by stakeholders nor identified from lists provided. It was noted that generally PFOS is a new issue to most stakeholders, and so awareness and knowledge was very low.

Table 39: PFOS - related chemicals imported in the past 10 years

S/N	Chemical name	Trade name
	1-Octanesulfonyl Fluoride	FT-9; RM90
	Heptadecafluorooctanesulphonamide	FT-99
	1-Octanesulphonic Acid	HG-608
	1-Octanesulphonamide	FT-10;HG-605

	Propanoic acid	
	Benzene sulphonic acid	
	Benzoic Acid	
	1-Octanesulfonamide	HG-602
	Sulphonamide	

ii) Insecticides and Aviation Hydraulic Fluids (AHF)

According to the Tropical Pesticides Research Institute (TPRI), *sulfluramid* or other insecticides containing PFOS or its related substances have never been registered for use as pesticides in Tanzania. On the other hand, data obtained through the Tanzania Airports Authority (TAA) revealed two brands of AHF including Aeroshell fluids 31 and 41, and Brayco Micronic 756 (Castrol). The annual use ranged from 1 kg to 20 kg for the smaller airlines, and 80 kg for the larger ones, where about 20 kg of waste was generated annually.

iii) Fire-Fighting Foams

Most fire-fighting foams manufactured nowadays are without PFOS, which has been replaced by fluorochemical/ telomers based on a perfluorohexane (C6) chain. In spite of reduced production in many regions, there are still significant amounts of fire-fighting foams containing PFOS stored, and as fire-fighting foams have a long shelf life (10–20 years or longer). PFOS-containing fire-fighting foams may still be used for some time in actual accidental fires. In addition, some regions have reported that fire-fighting foams with PFOS are still manufactured in large quantities, and that they were phased in during the 1990s as an alternative to halons which are ozone depleting compounds.

In this context, fire-fighting foams containing PFOS, from the companies Tyco FS & BP, Ciba, Chemguard and 3M, may still be stored at professional users because of the long shelf life (UNEP 2012a). The inventory revealed that, potentially PFOS containing AFFF had surfactants listed as *fluorosurfactant, florisc component, fluoroalkyl surfactant or surfactant agent*. It could not be clarified if the active ingredient in these foams is PFOS.

d) FFF in Use/ Stored

The amount in storage at company premises varied widely among the professional users, from 2,000 to 30,000 Litres depending on the nature of the installations and

fire risks, while most of the suppliers generally had small amounts of less than 80 Litres. The total amount of FFF potentially containing PFOS and related substances reported to be in store or use was 500 Litres among the local suppliers; and 57, 947 Litres, among the professional users, as shown in **Table 40 and 41** and **Figure 6**

Table 40: Film Forming Foams in Stocks – Suppliers

SN	Product & codes	Ingredients/	Amount in Storage (L)	Supplier
	AQUEOUS FFF C301 MS C601 MS		40 80	Amerex corporation Company Trussville
	AFFF (6%) Chubb SA C601MS	<i>Fluoro surfactants-</i>	40	Chubb Fire Ltd. SA
	AFFF 6%	<i>Fluoro surfactants</i>		FIREX
	Firex (6%) AFFF	<i>Fluoro Protein Foam</i>	60. 100	Emirate Fire Fighting Equipment Factory
	AFFF	<i>Fluoro Protein Foam</i>	100	
	AFFF (3%)	Mixture- no single CAS No. applicable Contains <i>Fluoroalkyl surfactants</i>	80	Jewel Saf Fire Products Ltd.
	Firex 3% AFFF			FIREX
		TOTAL	500	

Table 41: Film Forming Foams in Stocks – Professional Users

Type of Installation*	Product & Codes	Ingredients/	Amount in Storage (L)	Year of purchase	Manufacturer / Supplier
1. OG	AMEREX 3% AFF FIREX 3% FX- AFFF	Fluorosurfactants	np		SOLBERG
2. OG	STHAMEX AFFF F-15	<i>Floric</i> components	1,402	1997	Dr. STHAMER. CO Hamburg
3. AP	6% AFFF	Fluorocarbon surfactants	4,525	2014	Emirate Fire Fighting Equipment Factory

4. AP	Foam AFFF		675	2014	National Fire Fighting, Dubai
5. AP	AFFF Film Foam NF ₆		2,170	2012	
6. AP	AFF 6	Fluorinated additives and surfactants	2,450	2013	Catranic Ltd (Dar es salaam-
7. OG	Chemiguard 3% AFFF C-303		11,600	2003, 2013	Chemiguard
8. P	AFFF 6%	Fluoroalkyl surfactants	8,000	2013	FIREX
	AFFF	Fluoroalkyl surfactants	np		Jewel Saf Fire Products Ltd
9. OG	ALCOSEAL	Fluoroprotein	26,900	2014	Angus Fire, UK
10. OG	STHAMEX AFFF 6%	Fluorosurfactant	225	2013	Dr. STHAMER
TOTAL					56,545L & 1.5T

*AP = Airport; OG = Oil/Gas; P = Port; np = data was not provided

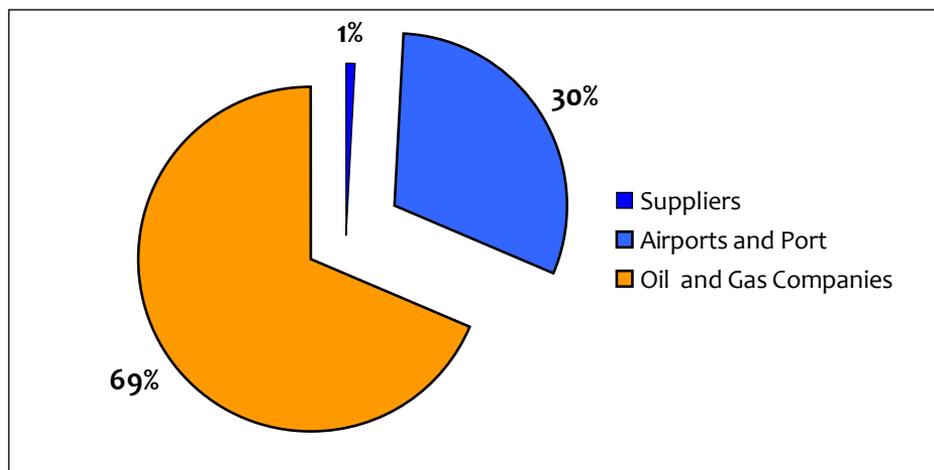


Figure 6: Distribution of AFFF in Stocks among Respondents

e) Use of FFF in fires and in drills

During the survey, 6 sites at which large fires had occurred over the past 20 years were identified. Records for the amount of FFF used were available for 3 sites only, a total of which was 3,720 Litres. The sites where large fires had occurred in the past and training grounds were considered potential PFOS- contaminated sites. These are listed with training / drill sites in **Table 42**.

Table 42: Accidental Fire and Drill Sites

SN	SITE	Location	ACTIVITY/INCIDENT	YEAR
	JNI Airport	Dar es salaam	Drills	Annually
	SI Airport	Mbeya	Drills	Annually
	Mwanza Airport	Mwanza	Drills	Annually
	Fire & Rescue Force Grounds	Dar es salaam	Drills	Annually
	IPTL Grounds	Dar es salaam	Drills	Annually
	Songo Songo Island		Drills	Annually
	IMTU Academy	Dar es salaam	Drills	Bi-Annually
	Access Academy	Dar es salaam	Drills	Bi- Annually
	SBM (Off shore)		Fire	1996
	Ubungo Fuel Farm	Dar es salaam	Fire	2004
	Tipper Tank Farm	Dar es salaam	Fire	1989
	Sadolin Paints	Dar es salaam	Fire	np
	<i>Jet Lumo</i>	Dar es salaam	Fire	np

np: Data was not provided

f) Historical, current and projected future production, use, import and export

In Tanzania, stakeholders handling or dealing in industrial or consumer chemicals are obliged to register with the Government Chemist Laboratory Agency (GCLA). This information is compiled in the National Database of Industrial and Consumer chemicals. The GCLA and the TRA were therefore consulted for information on imports of PFOS and related substances.

The *Guidance for the Control of the Import and Export of POPs* (UNEP, 2012b) was used as a reference for identification of and follow up of on imports of PFOS from the National Chemicals Database.

Questionnaires were also sent to industries including: metal, paper, leather, textiles, leather, carpets/ upholstery, oil & gas to investigate the chemicals used in their processes.

Articles or products on the market potentially containing PFOS and its related substances were identified by stakeholders. Information was also sought from the National Bureau of Statistics.

Information on imports and exports of products and articles potentially containing PFOS and salts (such as synthetic carpets, FFF, AHF) was requested from the Tanzania

Revenue Authority (TRA). The data provided within the limitations of the current inventory was in broad categories of products and did not provide sufficient detail to conclude on the presence of PFOS.

g) Capacity and Experience in Tanzania

Tanzania has over the years, built some capacity in chemicals management, however specific experience in the management of PFOS is a new area. There is no capacity and experience to monitor and to specifically manage releases of PFOS into the environment and the associated adverse effects to health and the environment. At the moment, monitoring of leachates and handling of wastes including articles potentially containing PFOS is poor, where sorting and efficiency specifically in the urban areas is less than 60%.

2.3.5.5 Conclusions

It is concluded that:

- Potentially PFOS containing articles and products like carpets and textiles, AHF & FFF respectively, have been in use in Tanzania.
- Also, some PFOS related chemicals have been imported by several industries in the past, while there is also chromium plating and other industrial activities where PFOS and related chemicals are possibly in use.
- Various sites all over the country are potentially contaminated with PFOS through the use of FFF in drills and accidental fires, and disposal of wastes.

In the aspect of capacity and experience, most stakeholders are not aware of PFOS, and so there is very limited capacity for monitoring PFOS presence and releases as well as adverse effects to human health and the environment, identification of PFOS containing imported articles and facilities for disposal of hazardous wastes including PFOS containing wastes.

The capacity for monitoring and remediation of POPs contaminated sites is also still very low. The current Environmental and Chemical legal instruments can partially address the requirements for sound management of PFOS, however new regulations under the same can be developed to adequately address the management and control of PFOS, including chemicals in articles and products.

Also, it was noted from literature that alternatives are available for many of the PFOS related substances, including AFFF, although none of the PFOS- free AFFF were identified in this survey. However, there is still some uncertainty in the area of AHFs.

Per- and polyfluorinated alkylated substances (PFAS) are a focal topic of SAICM and perfluorooctane acid (PFOA) is currently assessed in the POP Reviewing committee.

Therefore the topic of PFOS/PFOA and generally PFAS need to be more broadly addressed in future.

2.3.6 ASSESSMENT OF RELEASES OF UNINTENTIONALLY PRODUCED CHEMICALS (ANNEX C CHEMICALS)

2.3.6.1 Summary

According to the updated inventory for the inventory year 2014, unintentionally produced POPs (u-POPs) i.e. (PCDDs, PCDFs and other u-POPs) are mainly produced from waste incineration (384 g TEQ/annum (71.4%)) followed by open burning with release of 100.8 g TEQ/annum (18.74%) and production of mineral processing release of 48.1g TEQ/annum (8.1%). Within the incineration category the major emitter is the medical incineration which release about 383.963 (99.99%) of waste incineration category. The total release for the inventory year 2014 was estimated to 572 g TEQ. Also the baseline inventory from 2002 was updated with the UNEP toolkit from 2013 with a total amount of 967 g TEQ for 2002. Overall, the releases were reduced due to lower releases from open burning. An increased release were found in waste incinerators where releases increased from 113.4 g TEQ for 2002 to 385.9 g TEQ for 2014.

2.3.6.2 Introduction

Unintentionally produced POPs (u-POPs), which includes Polychlorinated dibenzo-para-dioxins (PCDDs) and Polychlorinated dibenzofurans (PCDFs), unintentional Polychlorinated biphenyls (PCBs), Hexachlorobenzenes (HCB) and Pentachlorobenzenes (PeCBz) and Polychlorinated naphthalenes (PCNs) are unintentionally produced from chemical, industrial and combustion processes. These emissions are environmental contaminants detectable in almost all compartments of the global ecosystem in trace amounts. The identified sources of PCDD/PCDF and other u-POPs in Tanzania are waste incineration; open burning; production of mineral products; ferrous and non-ferrous metal production; heat and power generation; and transportation; in order of significance.

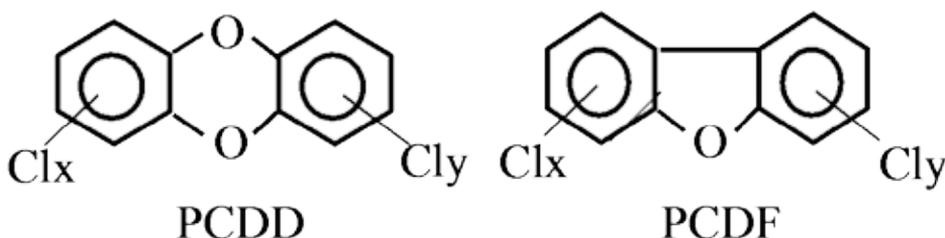


Figure 7: PCDD and PCDF molecular structure.

2.3.6.3 Methodology

The survey was carried out with the objective collecting data on uPOPs releases in Tanzania for the purpose of the updating the National Implementation Plan (NIP) of the United Republic of Tanzania for the Stockholm Convention (SC).

The NIP update focused on Polychlorinated dibenzo-p-dioxin (PCDD) and dibenzofurans (PCDF), unintentional Polychlorinated biphenyls (PCBs), Hexachlorobenzene (HCB) as well as new listed uPOPs Pentachlorobenzene (PeCBz). The field assessment involved administration of questionnaires (adapted from the UNEP Dioxin Toolkit) and physical verification of status of facilities. Additional data were collected from literature. Furthermore, where data was not available from literature, assumptions were made to estimate the activity data. Comparison of the current emissions with the recalculated emissions from the 2002 was made to assess the extent of implementation and effectiveness of the measures that have been put in place since the last National Implementation Plan or to assess the changes in emissions due to change of anthropogenic activities.

The contribution of Organochlorine chemicals to the total release could not be assessed in the NIP.

During the field assessment questionnaires (adapted from the UNEP Dioxin Toolkit 2013) were administered and physical verification of status of facilities was done. Additional data were collected from literature. Because of budget constraint, whole of Tanzania could not be covered. Interpolation of data was based on literature and expert judgement by the inventory team. Furthermore, where data was not available from literature, assumptions were made to estimate the activity rates. Comparison of the current emissions with the recalculated emissions from the 2002 assessment was made to assess the extent of implementation and effectiveness of the measures that have been put in place since the last National Implementation Plan or to assess the changes in emissions due to change of anthropogenic activities.

2.3.6.4 Findings

a) *Estimated PCDD/PCDF Releases*

The estimated PCDD/PCDF releases (g TEQ/annum) for 2014 as inventory year are compiled for the 10 source groups in **Table 43** and the updated PCDD/PCDF inventory from 2002 is compiled in **Table 44**.

Table 43: Estimated PCDD and PCDF releases (2014)

Source Groups		Annual Releases (g TEQ/a)				
Group		Air	Water	Land	Product	Residue
1	Waste Incineration	384.0	0.0	0.0	0.0	1.9
2	Ferrous and Non-Ferrous Metal Production	5.0	0.0	0.0	0.0	6.8
3	Heat and Power Generation	3.7	0.0	0.0	0.0	0.1
4	Production of Mineral Products	48.1	0.0	0.0	0.0	0.0
5	Transportation	1.2	0.0	0.0	0.0	0.0
6	Open Burning Processes	100.8	0.0	13.8	0.0	0.0
7	Production of Chemicals and Consumer Goods	0.0	0.1	0.0	0.0	0.1
8	Miscellaneous	0.0	0.0	0.0	0.0	0.0
9	Disposal	0.0	0.1	0.0	3.3	3.2
10	Identification of Potential Hot-Spots				0.0	0.0
1-10	Total	542.7	0.2	13.8	3.3	12.1
	Grand Total	572				

ND* = Not determined

It can be seen that the sectors that contribute significantly to releases of uPOPs into air, are for 2014 waste incineration with 384.0 g TEQ/a equivalent to 71.4% of total releases, open burning with 100.8 g TEQ/a equivalent to 18.74% and production of minerals with 48.1 g TEQ/a equivalent to 8.1%. Within the incineration category the major emitter is the medical waste incineration which release about 383.96 (99.99%). This may be attributed to the Ministry of Health's drive of installing incinerators in all District, Regional and Referral hospitals. Unfortunately the majority of the installed incinerators are either not working properly or are not appropriate for the medical waste incineration. Within the open burning, waste burning and accidental fires is the major contributing source category of uPOPs into air (63.73%).

In general the level of u-POPs emissions has gone down from 967 g TEQ/a for the 2002 baseline inventory to 572 g TEQ/a for the updated inventory in 2014 (a reduction of about 40.8%). The major releases of the 2014 inventory are different to the 2002 baseline assessment (table 28), in which it was established that the leading source groups were open burning with 495.6 g TEQ/a equivalent to 49.7% of total release, waste incineration with 112.8 g TEQ/a equivalent to 27.67% and power generation and heating 275.9 (g TEQ/a) equivalent to 11.32%, as shown in **Table 44**

Table 44: Estimated PCDD and PCDF (2002)

Group	Source Groups	Annual Releases (g TEQ/a)				
		Air	Water	Land	Product	Residue
1	Waste Incineration	112.8	0.0	0.0	0.0	0.6
2	Ferrous and Non-Ferrous Metal Production	0.2	0.0	0.0	0.0	0.0
3	Heat and Power Generation	275.9	0.0	0.0	0.0	0.0
4	Production of Mineral Products	5.0	0.0	0.0	0.0	0.0
5	Transportation	0.4	0.0	0.0	0.0	0.0
6	Open Burning Processes	495.6	0.0	73.0	0.0	0.0
7	Production of Chemicals and Consumer Goods	0.0	0.0	0.0	0.0	0.1
8	Miscellaneous	0.0	0.0	0.0	0.0	0.0
9	Disposal	0.0	0.0	0.0	3.3	0.0
10	Identification of Potential Hot-Spots				0.0	0.0
1-10	Total	890.0	0.0	73.0	3.4	0.6
	Grand Total	967				

There is serious lack of data and as such estimation was necessary. There was serious 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 uPOPs; lack of awareness of uPOPs; lack of Best Available Techniques (BATs) and Best Environmental Practices (BEPs); and lack of planned information dissemination strategy. The survey was not able to identify any intentional management practices or mitigation of POPs releases. However, some industries such as cement and lime industries, that have been modified even when the modification was not driven by the need to mitigate POPs release, have air pollution control systems, which could reduce the amount of uPOPs releases to the environment. Nevertheless their operational efficiency is not known.

In order to mitigate uPOPs in Tanzania medical waste incineration should be given a high priority. This could be done by introducing best waste management practices in hospitals and other health care facilities and reduction of PVC in the waste and in hospitals, which will reduce significantly the amount of waste for incineration. The second option could be to introduce well designed and well operated central treatment facilities in regions instead of having a multiplication of individual, inappropriate and /or poorly operated incinerators. The third recommendation is to improve awareness raising on the impacts of PCDD/PCDF and other uPOPs to

all potential emitters of the same. This will create the necessary concern for efficient operation which may reduce the release of PCDD/PCDF and other uPOPs.

b) 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.

Like in the previous assessment, incineration of municipal and hazardous waste, light-fraction shredder, incineration of sewage sludge, waste wood and biomass are still 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 done. Therefore estimation of releases from these categories was not done.

i) Waste Incineration

a) Medical waste incineration

Hospital wastes comprise majority of total hazardous wastes generated in the country. Medical wastes are either incinerated or in some cases are disposed of together with other municipal waste at selected disposal sites. The inventory that was carried out before NIP update found out that most of District Hospitals and all Regional and Referral Hospitals had combustion facilities, which are simply called incinerators. However, majority of these incinerators, particularly those at the District Hospital; do not have basic characteristics to qualify them as incinerators. The Muhimbili incinerator was found to have some air pollution control systems while others do not. As a way of extrapolation of the results it was assumed that all Regional referral hospitals generate roughly same amount of waste and the incinerators are of the same type with no or minimum Air Pollution Control System (APCS). There are 23 Regional Hospitals in Tanzania Mainland. It was also assumed the district hospitals generate on average the same amount of wastes and use same type of incinerators with no or minimum APCS.

In areas where there are larger incinerators (capacity of 10 tonnes per day) e.g., in Dar es Salaam, Mbeya, Bugando etc., the majority of large private hospitals are using these large incinerators. The waste incinerator in private and government health facilities especially in rural areas is considered small.

National estimated figure of releases of PCDD/PCDF from this sub-category is

shown in **Table 45**.

Table 45: Estimated PCDD/PCDF releases from medical waste incinerators

Source categories	Potential Release Route (µg TEQ/t)		Production t/a	g TEQ/a	
	Air	Fly Ash		Air	Fly Ash
Waste incineration					
Medical waste incineration			9,753	383.963	1.921
Uncontrolled batch combustion, no APCS	40,000	200	9,587	383.464	1.917
Controlled, batch, no or minimal APCS	3,000	20	166	0.499	0.003
Total	385.884				

The survey did not come across incinerators under the following categories: Combustion of animal carcasses, light fraction shredder waste incineration, sewage sludge incineration, municipal waste incineration; hazardous waste incineration; and waste wood and waste biomass incineration.

ii) Ferrous and Non- Ferrous Metal Production

a) Iron and steel production and foundries

The survey covered 8 steel mills out of 21 which is 36% of the steel mills. All surveyed mills use electric arc furnaces; however in the previous survey there were other steel mills, which used induction or cupola furnace to produce steel from scrap. 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. All of the surveyed industries are fitted with various flue gas treatment systems whose efficiency was not determined. For this reason, it is assumed that limited control measures are applied. **Table 6** shows estimated annual releases of PCDD/PCDF in Tanzania from this sub category.

b) Copper production

There is no primary copper production in Tanzania, however the survey identified that there is a company which is producing copper from scrap.

c) Lead production

Similarly there is no primary lead production in Tanzania. There are some companies

in Dar es Salaam which are producing lead from scrap containing Polyvinyl Chloride (PVC).

Table 46: Estimated PCDD/PCDF releases from ferrous and non-ferrous metal production

Source categories	Potential Release Route (µg TEQ/t)		Production t/a	g TEQ/a	
	Air	Residue		Air	Residue
Ferrous and Non-Ferrous Metal Production					
Iron and steel production plants and foundries					
Iron and steel plants			425,040	4	6
Dirty scrap, scrap preheating, limited controls	10	15	425,040	4.250	6.376
Copper production			657	0.526	0.4
Sec. Cu - Basic technology	800	630	657	0.526	0.414
Lead production			2,643	0.211	0
Lead production from scrap containing PVC	80	ND	2,643	0.211	0
Total			11.137		

iii) 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). **Table 47** shows a list of thermal power plants currently in operation in Tanzania. In the previous survey Kiwira was generating electricity using coal. However, this plant is not working for the time being. There are plans to start producing about 600MW power from coal at Mchuchuma. **Table 48** shows the estimated releases of PCDD/PCDF in Tanzania from this sub category.

Table 47: List of thermal power plants in Tanzania

Thermal power station	Location	Fuel type	Capacity (MW)	Year completed	Name of Owner	Notes
PAP Diesel Power Station	Dar es Salaam	Diesel	100	2002	PAP	Operational
Dodoma Thermal Power Station	Dodoma	Diesel	55	2011	Symbion Power Limited	Operational

Thermal power station	Location	Fuel type	Capacity (MW)	Year completed	Name of Owner	Notes
Arusha Thermal Power Station	Arusha	Diesel	50	2012	Symbion Power Limited	Operational
Ubungo I Thermal Power Station	Dar es Salaam	Natural Gas	100	2007	TANESCO	Operational
Ubungo II Thermal Power Station	Dar es Salaam	Natural Gas	120	2011	Symbion Power Limited ^[5]	Operational
Tegeta Thermal Power Station		Natural Gas	45	2011	TANESCO	Operational
Mtwara Thermal Power Station	Mtwara	Natural Gas	18		Wentworth Power Limited	Operational
Songas Thermal Power Station	Dar es Salaam	Natural Gas	180	2004	Songas Power Limited	Operational
Kinyerezi I Thermal Power Station	Kinyerezi	Natural gas	150	2014	TANESCO	Operational
Nyakato Diesel Power Station	Mahango	Heavy Fuel Oil	60	2013	TANESCO	Operational

Table 48: Estimated releases of PCDD/PCDF from fossil fuel based power plants

Source categories	Potential Release Route ($\mu\text{g TEQ/t}$)		TJ/a	g TEQ/a	
	Air	Residue		Air	Residue
Heat and Power Generation					
Fossil fuel power plants			10,183	0.005	
Heavy fuel fired power boilers	2.5		120	0.000	0
Light fuel oil/natural gas fired power boilers	0.5	ND	10,063	0.005	0
Total			0.005		

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. The industries that use biomass to generate power are Kilombero Sugar Company, Mtibwa Sugar Company, Kagera Sugar Company and Tanganyika Planting Company. Other companies that produce power from biomass include Tanzania Wattle Company, Mgololo Pulp and Paper Company and A-Z – Textile. Additional data was obtained from Tanzania Electric Supply Company (TANESCO) and from literature (particularly for Industries generating power and selling to

TANESCO). **Table 49** shows the estimated releases of PCDD/PCDF from biomass power generation in Tanzania.

Table 49: Estimated releases of PCDD/PCDF from biomass based power plants

Source categories	Potential Release Route ($\mu\text{g TEQ/t}$)		TJ/a	g TEQ/a	
	Air	Residue		Air	Residue
Biomass power plants			2,347	0.117	0.1
Clean wood fired power boilers	50	15	1,154	0.058	0.017
Straw fired boilers	50	70		0.000	0.000
Boilers fired with bagasse, rice husk etc.	50	50	1,194	0.060	0.060
Household heating and cooking - Biomass			97,692	3.517	0.0
Charcoal fired stoves	100	0.1	19,538.45	1.954	0.000
Open-fire (3-stone) stoves (virgin wood)	20	0.1	78,154	1.563	0.000
Simple stoves (virgin wood)	100	0.1			0.000
Domestic heating - Fossil fuels			156		0.0
Natural gas or LPG fired stoves	1.5		156		
Total			3.734		

c) Landfill and biogas combustion

The only known plant that was developed to use landfill gas to generate electricity was the Mtoni landfill gas to electricity plant in Dar es Salaam, which is flaring the landfill gas as the electricity generation part was not finally constructed. The other plant is the Hale Biogas to Electricity plant which is generating about 1MW.

50 shows the estimated releases of PCDD/PCDF from biogas plant in Tanzania.

Table 50: Estimated PCDD/PCDF releases from landfill gas combustion

Source categories	Potential Release Route ($\mu\text{g TEQ/t}$)		TJ/a	g TEQ/a	
	Air	Residue		Air	Residue
Landfill biogas combustion					
Biogas/landfill gas fired boilers, motors/turbines and flaring	8		32	0	
Total			0		

d) Household heating and cooking (biomass fuels)

It is estimated that 85% of the Tanzanians use fuel wood as a source of fuel (this also includes charcoal users). The annual per capital energy consumption estimates stands at 17.7 GJ. Based on 2012 National Census, the population of Tanzania is estimated at 44 Million. Using these figures, the estimates of national PCDD/PCDF releases from this subcategory were calculated and are shown in **Table 51**.

Table 51: Estimated PCDD/PCDF releases from household heating and cooking using biomass

Source categories	Potential Release Route (µg TEQ/t)		TJ/a	g TEQ/a	
	Air	Residue	2,347	Air	Residue
Biomass power plants			1,154	0.117	0.1
Clean wood fired power boilers	50			0.058	0.017
Straw fired boilers	50		1,194	0.000	0.000
Boilers fired with bagasse, rice husk etc.	50		97,692	0.060	0.060
Household heating and cooking - Biomass			19,538.45	3.517	0.0
Charcoal fired stoves	100		78,154	1.954	0.000
Open-fire (3-stone) stoves (virgin wood)	20			1.563	0.000
Simple stoves (virgin wood)	100		156	0.000	0.000
Domestic heating - Fossil fuels			156	0.000	0.0
Natural gas or LPG fired stoves	1.5			0.000	
Total			3.517		

e) Domestic heating using fossil fuels

A good number of Tanzanians still use fossil fuel (kerosene) for lighting and cooking. Amount of kerosene imported in Tanzania stands at about 189,681 tonnes per year. There are also household using liquefied petroleum gas (LPG) and natural gas. Use of coal in household is still insignificant probably due to lack of appropriate cookers to withstand high temperatures. **Table 52** shows the estimated releases of PCDD/PCDF from household fossil fuel burning in Tanzania.

Table 52: Estimated PCDD/PCDF releases from household heating using fossil fuels

Source categories	Potential Release Route (µg TEQ/t)		TJ/a	g TEQ/a	g TEQ/a
	Air	Residue		Air	Residue
Domestic heating - Fossil fuels					
Oil fired stoves (kerosene)	10		8,449	0.084	0.000
Natural gas or LPG fired stoves	1.5		156	0.000	0.000
Total			0.084		

iv) Mineral Industry

a) Cement production

Tanzania Portland Cement (Dar es Salaam), Mbeya Cement (Mbeya) and Tanga Cement (Tanga) were surveyed out of the total seven industries; however these represent about 90% of total cement produced. All cement plants in Tanzania employ dry process. Raw materials are calcium carbonate, silica, alumina and ferrous Oxide (redsoil), 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 which are operating at reasonable efficiencies. The kiln operates at 1400°C. Mbeya Cement Company uses coal from Kiwira coal mine as fuel in the manufacturing processes, while Tanga Cement uses industrial oil. According to the survey conducted in 2002, Tanzania Portland Cement was using industrial oil and currently it is using natural gas. **Table 53** shows estimated national PCDD/PCDF releases from cement production.

Table 53: Estimated PCDD/PCDF releases from cement production

Source categories	Air	Residue µg TEQ/t Ash	Production T/a	g TEQ/a	Residue g TEQ/a
Production of Mineral Products					
Cement kilns			9,611,111	48.056	
Shaft kilns	5	ND	9,611,111	48.056	
Total			48.056		

b) Lime production

Lime production consists of the burning of calcium and/or magnesium carbonate between 900 – 1500°C. All lime producing plants in the mainland were visited. The

total annual national production of lime is about 91,600 tonnes. The visited industry indicates that there is no proper air emission control system.

54 shows national estimates of PCDD/PCDF releases from this sub-category.

Table 54: Estimated PCDD/PCDF releases from lime production

	Air	Residue µg TEQ/t Ash	Production T/a	g TEQ/a	Residue g TEQ/a
Lime					
Cyclone/no dust control, contaminated or poor fuels	10		91,600	0.006	
			91,600	0.006	
Total	0.006				

c) Brick production

The inventory did not come across any commercial brick making facility. Kisarawe Brick Factory Company Ltd., which in the previous inventory was producing 156,240 tonnes of bricks per year from clay soil, is no longer working.

d) Glass production

Kioo Ltd., is still the sole glass producer in Tanzania, however its production has gone up to 47,664 tonnes of glass per year comparing to the 31,000 tonnes of glass per year that were produced by then. Glass is produced from sand, limestone, dolomite and soda. It has two furnaces operating at 950 - 1000°C, with air pollution control system. Although, there are air pollution system, their efficiencies is not known as such we have assumed the worst case scenario. **Table 55** shows estimated releases of PCDD/PCDF from glass production in the country.

Table 55: Estimated PCDD/PCDF releases from glass production

	Air	Residue µg TEQ/t Ash	Production T/a	g TEQ/a	Residue g TEQ/a
Glass			47,664	0.010	
Cyclone/no dust control, contaminated or poor fuels	0.2		47,664	0.010	
Good dust abatement	0.015				
Total	0.010				

e) *Ceramics production*

Currently there are no ceramic producing plants in the country.

f) *Asphalt mixing*

Currently there are no asphalt mixing plants.

v) **Transport**

Contrary to the 2002 inventory the data from TRA was segregated. **Table 56** shows estimated national releases of PCDD/PCDF from the transport sector. There are no vehicles using biodiesel. However, a small number is using compressed natural gas.

Table 56: Estimated PCDD/PCDF releases from vehicles

	Air	Residue µg TEQ/t Ash	Consumption T/a	g TEQ/a
Transport				
4-Stroke engines			1,046,597	0.105
Leaded fuel	2.2			0.000
Unleaded gasoline without catalyst	0.1		1,046,597	0.105
Unleaded gasoline with catalyst	0.001			0.000
Ethanol with catalyst	0.0007			0.000
2-Stroke engines			365,692	0.914
Leaded fuel	3.5			0.000
Unleaded fuel	2.5		365,692	0.914
Diesel engines			1,662,018	0.166
Regular Diesel	0.1		1,662,018	0.166
Total			1.185	

vi) **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. Total biomass was estimated from the publication by Kusekwa (2013),³ who gave the

3 <http://www.intechopen.com/books/new-developments-in-renewable-energy/biomass-conversion-to->

following figures Maize stalk and straw about 8 million tonnes; Rice husk and straw about 4.1 million tonnes; Wheat straw about 232,400 tonnes; Sisal bole and flume 46,080 tonnes; Bagasse is 447,030 tonnes. The amount of sugarcane burning was estimated using literature figure⁴ where it is estimated that about 80% of the “trash”, including straw, the tops, and green and dry leaves, are burned off. These components constitute 25% of the entire sugar cane stalk. The estimation of biomass burning was based on FAO publication,⁵ which approximate that on average of 11 million hectares burn annually (ranging between 8.5 and 12.9 million hectares). This corresponds to between nine and 14 % of Tanzania’s land area. It was assumed that the material lost in fire is estimated as 10 t/ha (forest) and 2.5 t/ha (grassland).

57 shows estimated national releases of PCDD/PCDF from uncontrolled biomass burning. The following data were not obtained. Agricultural residue burning in the field of cereal and other crops stubble, not impacted, accidental fires in vehicles (per vehicle) and open burning of wood (construction/demolition).

Table 57: Estimated PCDD/PCDF releases from biomass combustion

	Air	Land	Consumption T/a	Air g TEQ/a	Liquid g TEQ/a
Open Burning Processes					
Biomass burning			1,301,315	36.549	12.108
Agricultural residue burning in the field of cereal and other crops stubble, impacted, poor burning conditions	30	10	1,210,000	36.300	12.100
Sugarcane burning	4	0.05	52,500	0.210	0.003
Forest fires	1	0.15	38,583	0.039	0.006
Grassland and savannah fires	0.5	0.15	232	0.000	0.000
Waste burning and accidental fires			1,385,800	64.220	1.690
Fires at waste dumps (compacted, wet, high Corg content)	300	10	33800	10.140	0.338
Accidental fires in houses, factories	400	400		0.000	0.000
Open burning of domestic waste	40	1	1,352,000	54.080	1.352
Total	114.567				

b) *Waste burning and accidental fires*

It is assumed that the majority of the population living in rural areas produce very small amount of domestic waste. The major portion of solid waste is organic and is

energy-in-tanzania-a-critique

4 <https://sites.google.com/site/sugarcane/pm/pre-harvest-burning>

5 Sustainable Forest Management in a Changing Climate: A Fire Baseline for Tanzania. FAO Finland Forestry Programme – TANZANIA.

used in farms or as animal feed. The remaining portion containing inorganic waste materials is not burned instead they are buried. The World Bank estimates that about 16.9 million tonnes of waste is generated in urban centres in Tanzania and about 40% of these are collected for disposal at the dumpsite. The data on accidental fires in houses, factories, accidental fires in vehicles (per vehicle) and open burning of wood (construction /demolition) were not obtained. **Table 48** presents national estimates of PCDD/PCDF releases from uncontrolled waste burning.

Table 58: Estimated PCDD/PCDF releases from Waste burning and accidental fires.

	Air	Land	Consumption T/a	Air g TEQ/a	Liquid g TEQ/a
Open Burning Processes					
Waste burning and accidental fires			1,385,800	64.220	1.690
Fires at waste dumps (compacted, wet, high Corg content)	300	10	33800	10.140	0.338
Accidental fires in houses, factories	400	400		0.000	0.000
Open burning of domestic waste	40	1	1,352,000	54.080	1.352
Accidental fires in vehicles (per vehicle)	100	18		0.000	0.000
Open burning of wood (construction/demolition)	60	10		0.000	
Total	121.34				

vii) Production and Use of Chemicals and Consumer Goods

Tanzania is not a major producer of chemicals that are associated with PCDD/PCDF releases. Only pulp and paper manufacturing plants produce. Basically PCDD/PCDF are also created from a process that bleaches the wood pulp. Mgololo Pulp and paper mill is producing 13,255 tonnes per year. **Table 59** shows the amount of PCDD/PCDF emitted from pulp and paper. It should be noted that during the 2002 inventory, Mgololo Pulp and Paper Mill was not operating.

Table 59: Estimated PCDD/PCDF releases from pulp and paper production

	Potential Release Route ($\mu\text{g TEQ/t}$)				
	Air	Residue	Consumption T/a	Air g TEQ/a	Residue g TEQ/a
Production and Use of Chemicals and Consumer Goods					
Pulp and paper mills *				0.0	0.1
<i>Boilers (per ton Adt pulp)</i>			13,255	0.007	0.066
Recovery boilers fueled with black liquor	0.03	0.03		0.000	
Power boilers fuelled with sludge and/or biomass/bark	0.5	0.5	13,255	0.007	0.066
Power boilers fuelled with salt-laden wood	13	13		0.000	0.000
Total	0.073				

viii) Miscellaneous

a) Tobacco smoking

In 2014 the production of cigarette by the Tanzania Cigarette Company (TCC) stood at 5.8 billion sticks per year⁶ compared to the 3.7 billion cigarette sticks per year in 2003. 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 5.8 billion sticks are smoked locally. **Table 60** shows national estimates of PCDD/PCDF releases from cigarette smoking.

Table 60: Estimated PCDD/PCDF releases from tobacco smoking

	Potential Release Route ($\mu\text{g TEQ/t}$)				
	Air	Residue	Consumption T/a	Air g TEQ/a	Residue g TEQ/a
Tobacco smoking			5,220	0.0005	0.00052
Cigar (per million items)	0.3	0.3		0.000	0.000
Cigarette (per million items)	0.1	0.1	5,220	0.001	0.001
Total	0.00102				

b) Crematoria

6 Tanzania Tobacco Board

It was not possible to get actual statistics on the number of cremations per year. The literature figure of number of cremations in Tanzania is estimated at about 200 per year.

61 shows estimates of PCDD/PCDF from crematorium.

Table 61: Estimation of PCDD/PCDF from crematoria

	Potential Release Route ($\mu\text{g TEQ/t}$)				
	Air	Residue	Production T/a	Air g TEQ/a	Residue g TEQ/a
Crematoria			16	0.001	0.000
No control (per cremation)	90	ND	16	0.001	0.000
Medium control or open air cremations (per cremation)	10	2.5		0.000	0.001
Optimal control (per cremation)	0.4	2.5			
Total	0.001				

c) Disposal site

The waste generation was established from literature. It is estimated that about 16.9 tonnes per year of solid waste are generated.⁷ Assuming that 40% of the waste is collected, 5% of the remaining waste is burnt, 66% is buried and 24% is dumped in streets and storm water drainage.⁸

Table 62: Estimation of PCDD/PCDF from waste disposal

	Potential Release Route ($\mu\text{g TEQ/t}$)				
	Water	Residue	Production T/a	Water g TEQ/a	Residue g TEQ/a
Disposal					
Landfills, Waste Dumps and Landfill Mining			642,200	0.032	3.211
Hazardous wastes	5	NA		0.000	
Mixed wastes	0.5	50		0.000	0.000
Domestic wastes	0.05	5	642,200	0.032	3.211
Total	3.243				

d) Open wastewater dumping

7 http://siteresources.worldbank.org/INTUSWM/Resources/463617-1202332338898/MSWM_Dar-es-Salaam.pdf

8 Senzige et al (2014). "The potential for solid waste recycling in Urban Area of Tanzania: The case of Dar Es Salaam"

Table 63: Estimation of PCDD/PCDF from waste water dumping

	Potential Release Route ($\mu\text{g TEQ/t}$)		Production T/a	Water g TEQ/a	Residue g TEQ/a
	Water	Residue			
Open water dumping			119,380,807		0.000
Mixed domestic and industrial wastewater	0.005				0.000
Urban and peri-urban wastewater	0.0002	NA	119,380,807	0.024	0.000
Remote environments	0.0001			0.024	0.000
Total			0.024		

e) *Composting*

Table 64: Estimation of PCDD/PCDF from composting

	Potential Release Route ($\mu\text{g TEQ/t}$)			
	Product		Production T/a	Product g TEQ/a
Composting			669,240	33.462
Organic wastes separated from mixed wastes	50		669,240	33.462
Clean compost	5	NA		0.000
Total			33.62	

2.3.6.5 Conclusion

The quantities of dioxin and furan releases from all categories are summarized in **Table 44**. An estimated 572 g TEQ PCDD/PCDF was released into the environments of Tanzania in 2014. Medical waste incineration had the largest impact with an emission of 384 g TEQ/a, which is 71.4% of total emission. This was followed by open burning with an emission of 100.8 g TEQ/a, which is 18.74% of total emissions. Within the waste incineration category, medical waste incineration accounted for 99.99%. This may be attributed to the huge number of incinerator found in district and regional hospitals. These incinerators are not properly designed and operated as medical waste incinerators. Therefore it may be concluded; in order to control unintentional emissions the key sectors to be focused are medical waste incineration and open burning.

The releases to the 5 compartments/media – air, water, land, residues and products – were assessed. According to the toolkit approach, the main emission vectors were to

air (542.7 g; 94.9% of total releases) and land (13.8 g; 2.4% of total releases) followed releases to residue (12.1 g, 2.1% of total releases). However since PCDD/PCDF are semi-volatile compounds and can transgress from one media to another, the emission vectors only give an idea of the direct releases from the sources and not of the final contamination.

PCDD and PCDF release were more during the 2002 inventory as compared to the 2014 inventory. **Table 65** provide reasons for the differences.

Table 65: Comparison of release for the two inventories (i.e. year 2002 and 2014)

Group	Source Groups	Annual Releases (g TEQ/a) (2014)			Annual Releases (g TEQ/a) (2002)			Remarks	
		Air	Land	Product	Residue	Air	Land		Product
1	Waste Incineration	384.0	0.0	0.0	1.9	112.8	0.0	0.0	Majority of medical waste incinerators were not in place during initial inventory
2	Ferrous and Non-Ferrous Metal Production	5.0	0.0	0.0	6.8	0.2	0.0	0.0	
3	Heat and Power Generation	3.7	0.0	0.0	0.1	275.9	0.0	0.0	Kiwira Coal Power plant is no longer operating
4	Production of Mineral Products	48.1	0.0	0.0	0.0	5.0	0.0	0.0	
5	Transportation	1.2	0.0	0.0	0.0	0.4	0.0	0.0	
6	Open Burning Processes	100.8	13.8	0.0	0.0	495.6	0.0	73.0	There has been change in emission factors
7	Production of Chemicals and Consumer Goods	0.0	0.0	0.0	0.1	0.0	0.0	0.0	
8	Miscellaneous	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
9	Disposal	0.0	0.0	3.3	3.2	0.0	0.0	0.0	3.3
10	Identification of Potential Hot-Spots	0.0		0.0	0.0				0.0
1-10	Total	542.7	13.8	3.3	12.1	890.0	0.0	73.0	3.4
	Grand Total	572			967				

2.3.7. ASSESSMENT OF POPs IN TANZANIA ZANZIBAR

2.3.7.1 *Summary*

This section examines POPs and identifies stockpiles of initial and new POPs and their related wastes in Zanzibar. While Zanzibar is fast growing in terms of industry, commerce and tourism sectors, its link to influx of stocks containing POPs is derived from Electrical and Electronic Equipment (EEE) and related wastes (WEEE). A total of 16 transformers were identified to contain 9,380 litres of oils suspected to contain PCBs. Stocks of new POPs identified during inventory include Endosulfan (31 Litres) and PBDE estimated to be contained in imported second-hand vehicles.

In view of inadequate capacity for managing POPs in Zanzibar, there is a need to strengthen institutional capacity and coordination particularly in chemicals management including POPs, hazardous chemicals and other chemical wastes. Furthermore, institutional collaboration and partnership between Zanzibar and Tanzania Mainland needs to be enhanced for effective implementation of MEAs and achieving sustainable environmental management.

2.3.7.2 *Introduction*

Environmental management including POPs in Zanzibar is coordinated by the Department of Environment (DoE) which is under the Ministry of Lands, Water, Energy and Environment. The main function of DoE is to oversee environmental management issues in Zanzibar by articulating environmental policy and broad-based planning necessary for promotion, protection and conservation of environment. Other institutions whose functions and mandates have bearing on environmental management include, among others, Ministry of Agriculture, Natural Resource, Livestock and Fisheries; Zanzibar Electrical Corporation (ZECO), Zanzibar Food and Drugs Board (ZFDB); Zanzibar Chief Chemist Office; Ministry of Trade, Industries and Investment; and Office of the Chief Government Statistician (OCGS).

The Zanzibar Environmental Management Act No.3 of 2015 provides for institutional and legal framework for environmental management in Zanzibar. The Act contains provisions addressing chemicals and waste management, however, lacks specific reference to POPs.

2.3.7.3 *Methodology*

The inventory of initial and new POPs was carried out in Zanzibar from September to November, 2014. The objective of the inventory was to identify stockpiles of initial and new POPs and their related wastes in Zanzibar. A total of twenty four (24) sites and institutions were visited which were suspected to possess POPs (both public and private) in Unguja and Pemba Islands. Physical observations were done

to assess the existing situation, to establish baseline data in the study areas and to verify some of the information collected during interviews. Consultations with staff from responsible institutions/sites using open-ended checklist was carried out.

2.3.7 .4 Findings

a) Policy and Regulatory Framework

POPs in Zanzibar are regulated by several legislation which are: The Plant Protection Act of 1997 which focuses on plant protection and control of pests and is silent on agrochemicals; Zanzibar Environmental Management Act (2015) which provides for institutional and legal framework for control and management of environmental hazardous chemicals and wastes; and Zanzibar Food, Drugs and Cosmetics Act of 2006 which regulates all matters relating to quality, safety of food, drugs, herbal drugs, medical devices, poisons and cosmetics.

b) Production, Import, Export and Use of POPs and related chemicals

Literally, Zanzibar does not either produce or export POPs, but may import or use POPs related materials. Generally, import and export of goods in Zanzibar is regulated by Zanzibar Trading Act of 1989. Zanzibar Environmental Management Act, 2015 and Zanzibar Food, Drugs and Cosmetic Act of 2006 have also some provisions for controlling importation and exportation of hazardous waste and pesticides. With the current practice however, enforcement of all these Acts in respect to chemicals has not been very effective.

There are agencies which play important role in control of importation and exportation of plants and agrochemicals. ZFDB has stationed officers at the Port to facilitate the control of exportation and importation of foods, cosmetics and drugs. It has been difficult to establish export and import data for POPs as each organization has its own data collection system and standards. ZRB and Ministry of Trade in Zanzibar for example, have different data collection systems with different priorities. The inventory results are presented in **Table 66**.

c) PCDD/PCDF

The inventory found that almost all incinerators are not working. This intended to burn the wastes in open space. It is estimated that PCDD/PCDF releases 901,800 tonnes of municipal and 223.60 tonnes from different hospitals wastes are burned yearly, including wastes from Referrals Hospital like Mnazimmoja and Abdalla Mzee.

Table 66: Estimated PCDD/PCDF releases from Municipal and Medical waste incinerators in Zanzibar

Class	Source categories	Potential Release Route ($\mu\text{g TEQ/t}$)					Production					Annual release		
		Air	Water	Land	Product	Residue		t/a	g TEQ/a Air	g TEQ/a Water	g TEQ/a Land	g TEQ/a Product	g TEQ/a Fly ash	g TEQ/a Bottom Ash
						Fly Ash	Bottom Ash							
	Waste incineration													
	Municipal solid waste incineration						260	0.910	0	0	0	0.000	0.020	
1	Low technol. combustion, no APCS	3,500	NA	NA	NA	0	260	0.910	75			0.000	0.020	
2	Controlled comb., minimal APCS	350	NA	NA	NA	500	15	0.000	15			0.000	0.000	
3	Controlled comb., good APCS	30	NA	NA	NA	200	7	0.000	7			0.000	0.000	
4	High tech. combustion, sophisticated APCS	0.5	NA	NA	NA	15	1.5	0.000	1.5			0.000	0.000	
	Medical waste incineration						9	383.963			0	0.000	1.921	
1	Uncontrolled batch combustion, no APCS	40,000	NA	NA	NA	200	9,587	383.464	200			0.000	1.917	
2	Controlled, batch, no or minimal APCS	3,000	NA	NA	NA	20	166	0.499	20			0.000	0.003	
3	Controlled, batch comb., good APCS	525	NA	NA	NA	920	ND	0.000	ND			0.000	0.000	
4	High tech, continuous, sophisticated APCS	1	NA	NA	NA	150		0.000	150			0.000	0.000	
3	State-of-the-art, full APCS	5	NA	NA	NA	ND	ND	0.000	ND					
Waste Incineration							384.873	0	0	0	0	0.000	1.940	
													1.9	

d) POPs Pesticides

During the inventory only 31 Litres of Endosulfan were found in Kombeni and Mwembeladu private shops in Unguja (Table 67), and there was no information obtained about Lindane and HCH.

Table 67: Inventory findings of the new listed POPs

Location	Type of Institution	Name of POPs found	Amount (Lt)	Intended use	Packing Material	Storage condition	Remarks
Kombeni	Private shop	Endosulfan	16	Controlling of maize stem borer	Plastic bag	On the shelve	Not good-
Mwembeladu	Private shop	Endosulfan	15	Controlling of maize stem borer	Plastic bag	On the shelve	Not good-
TOTAL			31				

e) PolyBrominated Diphenyl Ethers (PBDEs)

i) PolyBrominated Diphenyl Ethers (PBDEs) in Transport sector

Transport sector contributes to a large extent the presence of PBDE Zanzibar. The data on registered cars, buses and trucks between 1980 and 2005 were available at the national level.

The POPs-PBDEs in imported vehicles in 2013 were calculated according to the POPs-PBDEs Inventory Guidance.

Table 68: Estimate of motor vehicles registered in Zanzibar, as well as POPs-PBDEs amount (2013)

Number of cars/trucks (originating from Asia)	Amount of c-PentaBDE (g per car/truck)	Total amount POPs-PBDEs in cars in use and formerly originating from Europe in 2010
Cars $84,668 * 0.98 = 82974.64$	160	$82974.64 * 0.16 * 0.05 = 663.80$
Truck $5107 * 0.98 = 5004.86$	160	$5004.86 * 0.16 * 0.05 = 40.04$
Mini-buses $4364 * 0.02 = 87.28$	160	$87.28 * 0.16 * 0.05 = 0.70$
Private hire and Taxi $17512 * 0.98 = 17161.76$	160	$17161.76 * 0.16 * 0.05 = 137.29$
Total POP-PBDEs		841.83kgs

NB: 0.98 is assumed vehicle percentage originated from Asia

0.02 is assumed vehicle percentage originated from Europe
160g/car is amount of c-PentaBDE per car/truck
0.05 is assumed emission factor from nearby country (Nigeria)

ii) Polybrominated Diphenyl Ethers (PBDEs) in Electrical and Electronic Waste

In Zanzibar the importation of used electrical and electronic equipment from industrialised counties increased during the last five years including in particular non-functioning waste electronic and electric equipment. These are imported from industrialised countries e.g. from Asia and Europe. In Zanzibar used equipment for reuse are of concern for the environmental and human health.

Apart from this, the Department of Environment conducted a study on Electrical and Electronic Equipment (EEE) in 2010, and the results showed that approximately two-thirds of all WEEE traders in Zanzibar were already dealing in importing and selling of mainly home appliances (TV sets, Refrigerators, Radios, Washing Machines, Computers and its accessories, Cookers, Washing Machines, Microwave ovens, etc.). Almost half of these WEEE items were ordered directly from overseas through relatives living in overseas, local agents and middlemen, and through authorized import-export dealers.



Figure 8: Electrical and Electronic wastes [WEEE] in Zanzibar

Table 69: Information for calculating c-OctaBDE amount in CRTs in Zanzibar (Tier I)

Indicator	Year	Value	Reference
Total population (millions)	2012	1.3	World Bank (2010)
Number of CRT units per capita	2013	0.01	(table 4-1) <i>PBDE Inventory Guidance</i>
Weight of CRT monitor (kg)		25	Section 4.2.1 <i>PBDE Inventory Guidance</i>
Amount of polymer fraction in CRT monitor (%)		30	(table 4-11) <i>PBDE Inventory Guidance</i>
Amount of c-OctaBDEs in CRT monitors average (kg/tonne)	2010 (EU)	0.89 to 2.54	(table 4-11) <i>PBDE Inventory Guidance</i>

$$M_{c\text{-OctaBDE}(i)} = \text{No of CRTs/capita}_{\text{Region}} \times \text{population} \times \text{weight of CRT} \times \% \text{ polymer/CRT} \times \text{c-OctaBDE content}$$

Table 70: POP-PBDEs (kg) in CRT monitor (TV and computer) calculated by the estimated CRT unit per capita

PBDEs in CRTs Zanzibar	c-OctaBDE	hexaBDE	heptaBDE
Amount (tonnes)	92 – 263	10 – 29	40 – 113

NB: The shares of POP-PBDE in c-OctaBDE are 11% hexaBDE and 43% heptaBDE respectively (table 2-2 in Nigeria POP-PBDE inventory Guidance⁸).

f) PFOS

Perfluorooctanesulfonic acid or perfluorooctane sulfonate (PFOS) is a man-made fluorosurfactant and global pollutant. PFOS was the key ingredient in Scotchgard, a fabric protector made and numerous stain repellents.

i) PFOS in Fire Fighting Foams

Currently (2015), there are 23 vehicles in Zanzibar that are used for firefighting, which are belong to Fire Fighting and Rescue Unit. The type of foam used is Aqueous Film Forming Foam (AFFF) while the powder is made from the types of stone grinded at Greece (graphic stone). At present, there are 4,000 kg of AFFF and no amount powder reported to be available in the Institution.

ii) PFOS in other applications

As far as Zanzibar survey on POPs is concerned no PFOS identified in any application apart from firefighting and rescue Unit. Unfortunately no data available on carpets and furniture treated with stained repellent.

g) *Pesticide stockpiles in Zanzibar*

Zanzibar conducted initial POPs inventory in 2005/6 that led to the preparation of POPs National implementation Plan. The implementation of that Plan however did not accomplish the disposal of POPs chemicals that were available at that time. When the African Stockpile Program (ASP) was initiated in December 2006 under NEMC, Zanzibar managed to conduct another inventory in 2008/9 to find sources and quantities of obsolete pesticides. After the ASP inventory program was ended, the collection and disposal of all identified materials, Zanzibar was assumed to be free from obsolete pesticides wastes pesticides wastes, about 2.5 tonnes of obsolete stockpiles were repackaged and safely disposed abroad.

h) *POPs contaminated sites*

i) Pesticide contaminated sites

Physical observation indicated that areas which had stockpiles of obsolete chemicals wastes including POPs such as Mahonda Sugar Factory, Kibokwa Agricultural Station, and Migombani Health warehouse in Unguja Island and Machomane Plant Protection Division in Pemba Island are now in good condition.

ii) PCB contaminated sites

Before the first inventory ZECO had so many areas contaminated with oil suspected to contain PCB. Because many of the different types of old transformers were leaking. Some of them were leaking very badly. But after the first inventory in 2004, ZECO took great effort to minimize the leakage of oil from the old transformers. By repairing and maintenance in those affected transformers, so it managed to avoid the leakage of oil almost in all transformers except few of them. On top of that ZECO also started to reduce using the high tension switch gears which are using transformer oil. Most of all new Circuit Breakers which were installed at Mtoni, 11KV & 33 KV are Vacuum and Gas SF6 type respectively. The dismantled old circuit breakers are no longer used, but still exist at Mtoni Power station. Either some of the big customers, such as some of the hotels also already started to use dry type transformers.

As a result transformers which are still leaking owned by ZECO remains very few one is located at Bambi Kilimo and still in use and another one is at Bwawani hotel and two transformers which are owned by the private company, COTEX factory which is located at Chumbuni is closed now, that means the transformers still exists but are not in use any more.



Figure 9: Old Transformer at Mtoni Power Station

iii) PFOS contaminated sites

Potential PFOS contaminated sites – in particular firefighting practice areas, according to the institution responsible for firefighting there is no area contaminated due to firefighting practices in Unguja and Pemba Islands.

iv) u-POPs contaminated sites

The reality shown in the side of u-POP sites visited during the inventory period, many areas used open burning system of wastes disposal, this include Hospitals and dumping sites, like Jumbi dumpsite, the ashes remain either in the pits or to the dumps areas, and the emission released, thus it is difficult for minimum period to observe any changes.



Figure 10: The ashes from Makunduchi Cottage Hospital

i) Awareness level and information dissemination

Level of public awareness on POPs is generally assumed to be low. Large populations of Zanzibar are not even aware of the literal meaning of POPs let alone their sources and their effect to health and environment. This situation leads to poor handling and misuse of chemicals particularly pesticides in many areas. It was observed during the field visit that officers and people who are working in POPs areas such as stores were not equipped with appropriate and proper protective gears due to limited awareness on POPs.

2.3.7.5 Conclusion

POPs pesticides identified during initial inventory amounting to 2.5 tonnes has been collected and disposed of through ASP. The amount of oil suspected containing PCBs are estimated to nearly 9,380 litres; the PBDE are estimated to 840 kg from transport sector and 92-263 kg from EEE/WEEE plastic. No PFOS identified in any application apart from firefighting and rescue Unit (4000 kg AFFF). The estimated PCDD/PCDF releases from municipal and medical waste incinerators in Zanzibar were relatively high estimated to 386.813 g TEQ/a.

It was also revealed that low public awareness on POPs and inadequate enforcement of existing legislation are hindering proper management of POPs and other chemicals of concern in Zanzibar.

2.3.8 INFORMATION ON THE STATE OF KNOWLEDGE ON STOCKPILES, CONTAMINATED SITES AND WASTES, IDENTIFICATION, LIKELY NUMBERS, RELEVANT REGULATIONS, GUIDANCE, REMEDIATION MEASURES AND DATA ON RELEASES FROM SITES

2.3.8.1 Summary

In this survey, three categories of POPs that have potential of causing contamination were considered; namely industrial POPs (PCBs, PBDEs and PFOS); POP Pesticides including DDT; and u-POPs (PCDD and PCDF). Historical information on possible application of POPs chemicals was used as an indication of presence of POPs contaminated sites. All sites with leaking units were considered to be sites that will potentially become contaminated in the future if mitigation measures were not instituted urgently. Furthermore, information from ASP project was used to identify the possible POPs contaminated sites.

The inventory revealed a range of stockpiles and five sites that are contaminated with DDT including Murbadaw in Hanang wheat farms in Babati region where about ten drums of DDT are buried; 14 sites possibly contaminated with PCBs and u-POPs; 13 sites are potentially contaminated with PFOS. 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.

2.3.8.2 Introduction

POPs have adverse effects on human health. Therefore, POP-contaminated sites need to be properly managed or remediated. Special attention is needed when a location that previously had industrial or agricultural activities could have potential contamination. For example, gas works and old electricity generating stations are likely to be contaminated with PCBs because PCBs were components of transformer fluids. These sites could be polluted by one of the POPs. Even when the POP-contaminated site is cleaned up to permissible levels, there is a possibility that impacts on people and the environment will have caused long-term health effects and environmental damage. It is vitally important to resolve the basic issues for POP-contaminated sites including their inventory, contaminated site discovery, and remediation.

2.3.8.3 Methodology

A systematic assessment of contaminated sites was not done. During survey, historical information on possible application of POPs chemicals was used as an indication of presence of POPs contaminated sites and stockpiles. All sites with leaking units

were considered to be sites that will potentially become contaminated in the future if mitigation measures were not instituted urgently. Furthermore, information from ASP project was used to identify the possible POPs contaminated sites.

2.3.8.4 Findings

a) DDT Stockpiles and Contaminated Sites

Obsolete stockpiles include:

- i) About 10 drums of obsolete stocks containing DDT and other pesticides are still buried at Murbadaw in Hanang wheat farms Manyara region.
- ii) Stockpiles of DDT were collected and transported for disposal abroad by GTZ (About 110 tonnes of DDT and upper surface of the cement concrete at Old Korogwe site were repacked by GTZ and incinerated in Germany) and by the Africa Stockpiles Program (ASP) for other places (about 200 tonnes of DDT from Vikuge were cleaned up;
- iii) 400 tonnes of DDT from Morogoro NHC were excavated during ASP operation and transported abroad for incineration).

The existing DDT contaminated sites include:

- i) Old Korogwe site close to Pangani River in Tanga Region, it has an environmental contamination of concrete surface of about 8 m x 3 m coverage. There is no assessment on the levels of DDT residues carried out on the soil, water and plants.
- ii) Vikuge at Kibaha, Coast Region was contaminated with DDT powder. The contamination covered approximately 150 m x 120 m and approximately 2 km from water course of river, it had an extent of contaminated groundwater.
- iii) Morogoro NHC close to Railways station in Morogoro Region. The coverage of contaminated site is about 100 m x 100 m and the highly contaminated area is about 30 m x 40 m.
- iv) Plant Health Service (PHS) Department Tengeru in Arusha, whereby pesticides in drums were kept outside the office and the Drums rusted and the contents, leaked to the soil.
- v) Murbadaw wheat farm in Hanang, Babati Region.

b) PCB Stockpile and Contaminated Sites

The following were observed:

- i) Most of the transformers which had been found with PCBs concentrations

above 500 ppm were still in place, where out of 13 transformers in the surveyed regions, 11 are still at their original places. Among these, 7 are still in use.

- ii) The 4 equipment with PCBs concentrations in the range 50- 500 ppm in the surveyed area were not in use.
- iii) All the 7 equipment with PCBs concentrations in the range 5 - 50 ppm were not in place.

It was assumed that most of the old equipment within the previously surveyed districts had been identified, from which some data was available. This was used for follow up, while new sites were included when identified. A total of 51 sites were surveyed, or follow up was made through information from TANESCO officials. A total of 184 units of equipment were identified.

The sites considered to be contaminated with PCB are shown in Table 9.

c) POPs PBDE Transport Stockpiles and Contaminated Sites

In Tanzania, the wastes from End of Life Vehicle (ELV) containing the POPs-PBDEs fraction (the Automotive Shredder Residues (ASR) or the seats and other polymer parts) have been and are mainly disposed to landfills or dump sites. These deposits can also be considered as contaminated sites, depending on how much was disposed there. However the data for this calculation were limited to cumulative registrations for the years 2005- 2009, from which estimates were made of ELVs as shown in 7.

POPs-PBDEs in landfill/dumps from end-of-life vehicles were then calculated according to Table 32 (table 5-4 of the *UNEP Guidance Document*), as shown in 8.

d) POPs PBDE EEE/WEEE Stockpile and Contaminated Sites

The Electrical and electronic equipment (EEE) entering the waste stream or Waste from Electrical and electronic equipment (WEEE) generated was calculated based on the following formula given in the guidance manual using the key data and assumptions shown.

$$\text{WEEE generated per year} = \text{MEEE}(j)\text{stockpiled} / \text{lsEEE}(j)$$

Where

MEEE(j)stockpiled is the amount of EEE (*j*) stockpiled at the consumer [in tonnes]

lsEEE(j) is the average life span of the specific appliance (*j*) [in years] (combined time of being used and stored at the consumer).

E-waste generated from Cathode Ray Tube (CRT) computers in 2011 was estimated

to be **1,035 tonnes**, and e-waste generated from CRT TV was estimated to be **34,420 tonnes**, making a total of **35,455 tonnes of E- waste generated from CRT monitors**.

The polymer fraction of waste CRT monitors was estimated to be 10,636 Tonnes, whose c-OctaBDE content was 9,772.29 kg

e) PFOS Stockpiles and Contaminated Sites

Information on potential sites contaminated with PFOS and its related substances was collected simultaneously focusing on sites where firefighting foams have been used and dump sites where PFOS containing materials such as synthetic carpets may have been disposed.

Local authorities responsible for collection and management of wastes were also consulted to follow up on disposal of articles such as worn out synthetic carpets.

The National Environment Management Council was consulted for information on recycling activities, where no records were found of stakeholders who had notified the Council or have been identified for recycling of synthetic carpets.

Various sites all over the country are potentially contaminated with PFOS through the use of FFF in drills and accidental fires, and disposal of wastes. Contaminated sites which included some of the sites where large accidental fires had occurred in the past and training grounds were identified. These have been listed in Table 41.

2.3.8.5 Conclusion

The inventory revealed a total of 32 sites that are contaminated with DDT, PCBs, u-POPs and PFOS. Notably, 10 drums of a mixture of DDT and Endosulfan were found buried at Murbadaw in Hanang wheat farms in Babati region. 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.

2.3.9 SUMMARY OF FUTURE PRODUCTION, USE, AND RELEASES OF POPs – REQUIREMENTS FOR EXEMPTIONS

The inventory has shown that no pesticides were produced in Tanzania. The initial POPs pesticides which were registered and used as insecticides in the United Republic of Tanzania were Aldrin, Dieldrin, Heptachlor and Toxaphene. Hexachlorobenzene as fungicide and Mirex, Chlordane and Endrin as insecticides have never been registered nor used in Tanzania. According to the applicable legislation, no future production or use of POPs pesticides is envisaged in the country.

The use of Aldrin, Dieldrin, Heptachlor and Toxaphene in the past resulted into

accumulation of stockpiles. The stockpiles have been repackaged and safely disposed of abroad through the Africa Stockpiles Program (ASP) leaving behind contaminated sites. There are no present and projected future plans for the production, importation and use of Aldrin, Dieldrin, Heptachlor and Toxaphene.

The new POPs pesticides which were registered, imported and used in the United Republic of Tanzania (URT) were lindane and endosulfan. Lindane was used for the control of termites in the construction industries and endosulfan was used for the control of chewing and sucking insect pests in various crops. Alpha and Beta Hexachlorocyclohexane (HCH), Pentachlorobenzene, Chlordecone and Perfluorooctane Sulfonic Acid (PFOS) related pesticide have never been registered in URT. At the 24th Pesticides Approval and Registration Technical Sub Committee (PARTS) meeting held on 2nd to 6th, December, 2014 lindane and endosulfan have been officially de-registered. Based on this de-registration decision, there are no present and projected future plans for the production, importation and use of lindane and endosulfan in URT.

Initial and new listed POPs pesticides like any other pesticides, are controlled by the Plant Protection Act, 1997 and the Plant Protection Regulations, 1999. There are no present and projected future plans for the production, importation and use of the initial and new listed POPs pesticides in Tanzania due to de-registration decision and on the restrictive requirement during registration and importation as set out in the Plant Protection Act No. 5 of 1997 and Plant Protection Regulations of 1999. Although there are no specific provision concerns regulating POPs pesticides, strict consideration during pesticides registration are being imposed. The United Republic of Tanzania is a Party to the Stockholm Convention therefore is committed in fulfilling her obligations.

Based on preliminary inventory it was established that no PCB mixtures have ever been nor are produced in Tanzania. According to applicable legislation, no production of any PCB or equipment containing PCB is envisaged. The preliminary inventory has shown that PCB fluids are still used in Tanzania mainly in closed systems (power production equipment). However, it should be noted that the PCB inventory developed within the framework of this project is only a preliminary inventory, which was limited by the duration of the project and financial resources available. Once a detailed PCB inventory is carried out reliable data on the use of PCB in Tanzania will be obtained, and only then it will be possible to estimate the future use of this chemical. However, legal and operational measures and activities envisaged under this NIP imply phasing out of the use of equipment containing or contaminated by PCB by 2026 at the latest, as required by the Convention. The use of PCB in open systems shall be subject to evaluation during the implementation of NIP.

According to UNEP Toolkit (2013), PCDD/PCDF emissions are followed by emissions of other unintentionally formed POPs, which can be eliminated or minimised by the same measures used to tackle the issue of PCDD/PCDF emissions. Therefore, as recommended by UNEP (2013), this preliminary inventory was focused on dioxins and furans only, as they make a sufficient basis for identification and prioritisation of sources of all chemicals referred to in Annex C (hexachlorobenzene, pentachlorobenzene, polychlorinated biphenyls).

Table 71 gives an overview of current and estimated production, use and release of POPs, and it is the result of a preliminary inventory of POPs in Tanzania. These values will be amended in the course of preparation of a detailed inventory.

Table 71: Summary of future production, use and releases of POPs in URT

Chemical Name	2014 (Basic Inventory)		2015		2020		2026		2030	
	Production	Use	Production	Use	Production	Use	Production	Use	Production	Use
Aldrin	0	0	0	0	0	0	0	0	0	0
Dieldrin	0	0	0	0	0	0	0	0	0	0
Endrin	0	0	0	0	0	0	0	0	0	0
Hexachlorobenzene,	0	0	0	0	0	0	0	0	0	0
α- hexachlorocyclohexanes	0	0	0	0	0	0	0	0	0	0
β- hexachlorocyclohexanes	0	0	0	0	0	0	0	0	0	0
γ- hexachlorocyclohexanes (Lindane)	0	0	0	0	0	0	0	0	0	0
Heptachlor	0	0	0	0	0	0	0	0	0	0
Chlordane	0	0	0	0	0	0	0	0	0	0
Chlordecone	0	0	0	0	0	0	0	0	0	0
Mirex	0	0	0	0	0	0	0	0	0	0
PCBs	<i>Not determined</i>	*	*	*	*	*	*	*	*	*
Toxaphene	0	0	0	0	0	0	0	0	0	0
Technical endosulfan and its isomers	0	0	0	0	0	0	0	0	0	0
DDT	0	0	0	0	0	0	0	0	0	0
c-octaBDE (tonnes)	0	37.61	*	*	*	*	*	*	*	*
NonaBDE (tonnes)	0	10.75	*	*	*	*	*	*	*	*
decaBDE (tonnes)	0	1.07	*	*	*	*	*	*	*	*
hexaBDE (tonnes)	0	11.82	*	*	*	*	*	*	*	*

heptaBDE (tonnes)	0	46.21	*	*	*	*	*	*	*	*	*	*	*
Hexabromobiphenyl (HBB)	<i>Not determined</i>												
Perfluorooctane sulfonate (PFOS) and their salts, Perfluorooctane sulfonyl fluoride (PFOS-F) (000 Litres)	57.05	*	*	*	*	*	*	*	*	*	*	*	*
Hexachlorobenzene (HCB)	<i>Not determined</i>	*	*	*	*	*	*	*	*	*	*	*	*
Pentachlorobenzene (PeCBz)	<i>Not determined</i>	*	*	*	*	*	*	*	*	*	*	*	*
Polychlorinated Dibenzo-p-dioxins (PCDD) and Polychlorinated dibenzofurans (PCDF) (g TEQ/a)	572	*	*	*	*	*	*	*	*	*	*	*	*

**To be determined*

2.3.10 EXISTING PROGRAMMES FOR MONITORING RELEASES AND ENVIRONMENTAL AND HUMAN HEALTH IMPACTS, INCLUDING FINDINGS

2.3.10.1 Summary

Tanzania does not have an established national monitoring programme specific for assessment of POPs in the environment. However, individuals and institutions have been conducting environmental monitoring for research purposes.

The existing POPs monitoring data in the country have been produced during the development of the first NIP from 2003 – 2005.

The survey, therefore identified gaps in monitoring of initial and new POPs releases including lack of clear internal arrangement and reporting system in the country on POPs issues; lack of POPs monitoring programme; lack of monitoring standards; limited capacity for monitoring of initial and new POP within the existing institutions in the country.

2.3.10.2 Introduction

According to Article 11 of the Stockholm Convention parties are required to 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 initial and new POPs 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; human health and the environment impacts; as well as socio-economic and cultural impacts.

Monitoring needs to be undertaken continuously 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.

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

2.3.10.3 Current Monitoring Standards and Capacity for Monitoring POPs Presence in the Environment

i) Monitoring Standards

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

ii) Legal Requirement for Monitoring

There exists 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 Act (2003); Industrial and Consumer Chemicals (Management and Control) Act of 2003; and Sustainable Environmental Management Act of Zanzibar (1996). However, due to weak enforcement, monitoring is not done properly.

iii) 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/PCDF, PBDE and PFOS. Institutions involved in monitoring of initial and new 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. Tanzania Electric Supply Company (TANESCO) and Zanzibar Electricity Company (ZECO).

iv) Human Resource Base

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

v) *Infrastructure*

There are few existing institutions which have a number of facilities and trained personnel that can facilitate some of the functions of management of initial and new POPs, e.g. monitoring releases of PCB and undertaking analytical works. These are the GCLA, 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, blood and milk etc. Furthermore, training of staff on specific management and control aspects of PCB might be of value.

vi) *Institutions*

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

2.3.10.4 *Background on Potential Sources of POPs Impacts*

The following are potential sources of POPs impacts:

- i) *POP Pesticides*: Main sources of POP pesticides impacts releases agricultural crops from areas that may be highly contaminated and obsolete pesticides with POP characteristics.
- ii) *PCBs*: Main sources of PCB impacts 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.
- iii) *PCDD and PCDF*: Potential sources of impacts include hospital waste incineration, uncontrolled open burning.
- iv) *PBDEs*: Potential sources of impacts are areas used to dispose electrical and electronic wastes and areas where such waste is burned in the open.
- v) *PFOS*: Sources of PFOS impacts include areas where fire fighting foams have been used with potential impact to ground water and possibly drinking water. Furthermore the potential use of PFOS in metal plating industry and aviation hydraulic fluids might lead to releases and exposure.

2.3.10.5 *Evidence POPs Impacted populations or 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 areas which were

conducted on the effects of organochlorines in living things and agro-ecosystem. The studies showed low levels of residues of organochlorines. Some studies conducted in the areas with high agricultural activities and storage sites for obsolete pesticides included determination of the levels of organochlorine residues and their metabolites in the soil, sediments, water and vegetation indicated concentrations. Most studies have been conducted by the Chemistry Department University of Dar es salaam. However, capacity for regular monitoring of POPs is still inadequate.

2.3.10.6 Potential Risk Groups

POPs have a tendency to bio-accumulate in fatty tissues of living organisms. They also tend to bio-concentrate 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, ZECO 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, Dioxins and Furan sources, PBDE and PFOS;
- 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 are operating waste incinerators and managing ashes, pulp and paper, paints, disposal sites etc.

2.3.11 CURRENT LEVEL OF INFORMATION, AWARENESS, AND EDUCATION AMONG TARGET GROUPS; EXISTING SYSTEMS TO COMMUNICATE SUCH INFORMATION TO THE VARIOUS GROUPS

2.3.11.1 Summary

There are several policy and legal instruments that promote public awareness and

involvement on issues related to environmental protection. Several initiatives that have involved public participation 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 groups.

Some of the identified gaps include:- inadequate database on initial and new POPs; weak information generation and dissemination infrastructure; limited awareness on POPs issue at all levels; lack of specific awareness programs 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 initial and new POPs.

However, to address the above existing gaps, capacity building in information generation, storage, management and dissemination is crucial for successful implementation of the Stockholm Convention.

2.3.11.2 Introduction

Article 9 of the Convention requires Parties to exchange information, facilitate public information, awareness and education (Article 10).

2.3.11.3 Methodology

During updating process of the NIP for Tanzania, awareness on public information activities on initial and new POPs was conducted to public at all levels through media, workshops, seminars and training programmes. Public information and awareness-raising on initial and new POPs will facilitate public participation, including the civil society and the private sector, business community, academia, government organizations at national and regional levels, legal and policy experts and local communities towards the sound management of POPs. The survey among others covered identification of mechanisms and tools available for the creation of public information generation and dissemination and the educational and awareness programmes. The assessment was not limited to POPs issues but covered also other environmental issues in general terms. Specific measures related to chemicals management were determined.

2.3.11.4 Findings

The survey revealed that there are several policy and legal instruments that promote public awareness and involvement on issues related to environmental protection. Several initiatives that have involved public participation 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 groups.

Some of the identified gaps include:- inadequate database on initial and new POPs; weak information generation and dissemination infrastructure; limited awareness on POPs issue at all levels; lack of specific awareness programs 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 initial and new POPs.

However, to address the above existing gaps, capacity building in information generation, storage, management and dissemination is crucial for successful implementation of the Stockholm Convention.

a) Overview of Public Information Policy and Regulatory Framework Related to Environmental Issues

There are relevant policies, legislation and guidelines to ensure public awareness and involvement in environmental protection issues. The National Environmental Policy (1997) advocates for public awareness information generation, dissemination and education as the most appropriate public participation to achieve sustainable environmental management. The Policy recognize that the major roles and responsibilities of government institutions and NGOs are to assist local communities to participate in the implementation of programmes, strategies and plans related to environmental protection in their respective localities. 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. Public awareness raising programmes and environmental education and shall be undertaken in order to promote informed opinion”

Some of the policy and legal instruments include: National Environmental Policy (1997); Zanzibar Environmental Policy (2013); Plant Protection Act (1997); TPRI Act (1979); Environment Management Act (2004); Zanzibar Environmental Management Act (2015); Industrial and Consumer Chemicals (Management and Control) Act (2003); Occupational Health and Safety Act (2003) and other sectoral guidelines. With exception of the Environmental Management Act (2004) these instruments do not specifically address themselves to initial and new POPs, provisions on environmental awareness may be used for both initial and new 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.

b) Public Information Tools and Mechanisms

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 has 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.

c) 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.

d) Assessment of Existing Public Information and Awareness

i) Capacity Gaps

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

- i) Lack of database on POPs;
- ii) Weak information dissemination infrastructure;
- iii) Low awareness on initial and new POPs at all levels;
- 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.

ii) Current Activities on Environmental Awareness

Following are some of activities that have been undertaken in Tanzania on environmental information awareness.⁹

(a) Newspapers

- (i) Journalists Environmental Association of Tanzania (JET) does publish chemical management issues in most Tanzanian newspapers (Kiswahili

⁹ *National Profile for Assessment of the National Infrastructure for Managing Chemicals, 2002*

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) Ministry of Agricultural, Natural Resources, Livestock and fisheries of Zanzibar publishes monthly newsletter, the MKULIMA; and

(iv) ; and

(v) Newsletters by TANESCO, NEMC, CPCT, and NGOs.

(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) Ministry of Agricultural, Natural Resources, Livestock and fisheries of Zanzibar has 15-min radio programme weekly, “Kilimo Bora”. The Department of Environment and Zanzibar Environment Management Authority (ZEMA) in Zanzibar has a Radio/TV programmes (MAZINGIRA YETU).

iii) Mazingira Yangu Mazingira Yetu, a TV documentary on environmental issue produced by AGENDA.

iv) “Sayansi na Tekinolojia” a TV documentary on science and technology produced by the Ministry of Science, Technology and Higher Education in collaboration with COSTECH.

v) ITV Programme called “Afya ya Jamii” which is broadcasted every Monday. It covers issues related to public health including environment and chemicals management issues.

vi) Radio Tanzania Programme (Tekinolojia) every Friday. Covers many issues including environment and chemicals management.

vii) TANESCO radio programme “Sikilizeni Bwana Umeme”

viii) ZECO 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.

ANCAP summer schools held after 1-2 years covering pesticide chemistry, analysis, toxicology etc,

(d) Exhibitions

Trade Fairs e.g. Saba Saba and Nane Nane Farmers Day

2.3.11.5 Conclusion

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

2.3.12 MECHANISMS TO REPORT UNDER ARTICLE 15 ON MEASURES TAKEN TO IMPLEMENT THE PROVISIONS OF THE CONVENTION AND FOR INFORMATION EXCHANGE WITH OTHER PARTIES TO THE CONVENTION

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.

Up to now Tanzania has delivered the first (31/07/2007) and second (16/01/2012) national reports pursuant to Art. 15 under the Stockholm Convention.

2.3.13 RELEVANT ACTIVITIES OF NON-GOVERNMENTAL STAKEHOLDERS

Civil Society Organisations-CSOs including Community Based Organisation (CBOs), Non-Governmental (NGOs) and Faith Based Organizations (FBOs) play a key role in the realization of the goals of the Stockholm Convention and other chemicals and waste related international agreements. In order to ensure success in the implementation of these Conventions the role that NGOs play is very important particularly with regard to advocacy and introduction.

a) Civil Society Organisations

The main NGO which are involved in NIP implementation activities includes:

- i) AGENDA Responsible for Environment and Development based in Dar es Salaam;
- ii) ENVIROCARE Tanzania in Dar es Salaam;
- iii) CREFT in Dar es Salaam
- iv) Crop Life of Tanzania
- v) TEACA- Tema Environmental Conservation Action based in Moshi Rural

b) Professional organizations

Professional organizations include:

- i) Cleaner Production Centre for Tanzania.(CPCT)
- ii) Confederation of Tanzania Industries (CTI)
- iii) Agrochemicals Association of Tanzania (AAT)
- iv) Tanzania Association of Women Leaders in Agriculture and Environment
- v) African Network for the chemical analysis of pesticides (ANCAP)

c) Intergovernmental Organizations

Tanzania interacts closely with intergovernmental organizations that are responsible for chemicals and waste related issues such as:-

- i) The United Nations Environment Programme (UNEP) which plays an active role in chemicals and waste management. UNEP have supported various programmes/ activities related to chemical and waste management in Tanzania.
- ii) The Food and Agriculture Organization (FAO). This is the principle agent covering pesticide use particularly with regard to the agricultural industry, which is its primary focus.
- iii) The International Labour Organization (ILO) steps in where issues of human health and in particular employee safety in work environments where POPs and other potentially harmful chemicals are exposed to the employees.
- iv) The World Health Organization (WHO) is mandated for the protection of human health. WHO has supported various programmes including carrying out research into eliminating health risks resulting from chemicals. In Tanzania WHO is involved in searching alternatives to POPs that are harmful to human health such as DDT. Working with these organizations is very important towards fulfilling country's obligations under the Stockholm Convention.

2.3.14 OVERVIEW OF TECHNICAL INFRASTRUCTURE FOR POPS ASSESSMENT, MEASUREMENT, ANALYSIS, ALTERNATIVES AND PREVENTION MEASURES, MANAGEMENT, RESEARCH AND DEVELOPMENT – LINKAGE TO INTERNATIONAL PROGRAMMES AND PROJECTS

2.3.14.1 Summary

This NIP assesses the technical infrastructure for POPs management releases with a view to protect human health and the environment.

POPs waste management facilities such as storage, transportation and disposal facilities are non-existent. Most of the previously existing stockpiles of POPs pesticides were disposed abroad by the Africa Stockpiles Program (ASP) with the exception of about ten drums suspected to be a mixture of Endosulfan and DDT still buried at Murbadaw in Hanang wheat farms. Generally, specialized services and facilities to manage remediation of POPs contaminated sites are not in place. Currently, Tanzania has inadequate capacity and mechanisms for monitoring releases of POPs to the environment whereas there is lack of capacity and experience for monitoring of PCDD and PCDF in the environment and humans. Apparently, there are no assessment undertaken to establish adverse effects of POPs in human health and there has been no continuous monitoring. Therefore, there is need for capacity building to strengthen the monitoring capacity for POPs assessment, measurement, analysis, alternatives and prevention measures, management, research and development.

2.3.14.2 Introduction

The 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.

There is limited capacity for monitoring of POP Pesticides and PCBs whereas for PCDD and PCDF is almost non-existent. 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.

A limited number of institutions cover POPS in their curricula, one of them is the Chemistry department UDSM which has courses on environmental chemistry covering POPs. There are institutions if given specialized training they can initiate and develop scientific research on 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 POPs issues is inadequate demanding financial and technical support.

2.3.14.3 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.

Most of the previously existing stockpiles of POPs pesticides were collected and transported for disposal abroad by the Africa Stockpiles Program (ASP). However, at Murbadaw in Hanang wheat farms there are about ten drums suspected to be a mixture of Endosulfan and DDT which are still buried. The Plant Protection Regulations (1999) attests that competent authority shall dispose of obsolete pesticides and their empty containers. This is yet to be operationalised through development of 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.

2.3.14.4 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.

2.3.14.5 Environmental Monitoring Capability

Literally, there is no capacity and experience for monitoring of PCDD and PCDF in the environment and humans. Adhoc monitoring through studies or projects has been undertaken in selected areas for other POPs. There has been no continuous

monitoring. The existing institutional 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 2**.

Table 72: Laboratory Facilities for monitoring POPs releases

Name/ description of Laboratory	Location	Equipment/Analytical Capabilities	Application GLP (yes/ no)	Purpose
AMU, UDSM	Dar es Salaam	GC	Yes	Training, research and public services (consultancy)
TPRI	Arusha	HPLC(2), GC(2), SP(1), AAS(1),UV/Vis)	Yes	Research and quality assurance
TBS	Dar es Salaam	AAS(1), HPLC(1), UV/V(1), MU(3), C-S Analyser(1)	Yes	Quality assurance and training
GCLA	Dar es Salaam, Mwanza, Mbeya	HPLC(2), AAS, GC(1), FTIR(1), IR(1), UV/Vis), MU(1), GC-MS, ICP, OSA (1), XRF	Yes	Regulatory and quality assurance
CH, UDSM	Dar es Salaam	HPLC(1), GC(1,2), AAS(1), FTIR(1), UV/V(1)	Yes	Training, research and public services (consultancy)
CPE, UDSM	Dar es Salaam	HPLC(1), GC(3), AAS(2,UV/Vis), C-S Analyser(1), GC-MS(1)	Yes	Training, research and public services (consultancy)
Geology, UDSM	Dar es Salaam	AAS(1), ICP	Yes	Training, research and public services (consultancy)
TFNC	Dar es Salaam	HPLC(2), SP(1), UV/Vis), MU(1), ELISA(1)	Yes	Research and quality assurance
SUA	Morogoro	UV/Vis), HPLC, SP, AAS, M	Yes	Training, research and public services (consultancy)
NRC	Arusha	RA(1)	Yes	Regulatory and quality assurance
Moshi Pesticide	Moshi	GC(1)	Yes	Quality assurance
Pharmacy Board	Dar es Salaam	HPLC(1), GC(1), FTIR(1), UV/V(1), MU(1)	Yes	Quality assurance

Name/ description of Laboratory	Location	Equipment/Analytical Capabilities	Application GLP (yes/ no)	Purpose
Water laboratories	Dar es Salaam			Regulatory and quality assurance
	Arusha			Regulatory and quality assurance
	Mwanza			Regulatory, quality assurance and research
ARDHI UNIVERSITY	Dar es Salaam	AAS(4),		Training and research
Geological survey laboratories	Dodoma			Research
SADC Mineral laboratory (SEAME)	Dar es Salaam	AAS, XRF		Quality assurance, research and training
NIMR	Dar es Salaam			Research

Key

Symbol	Description	Detector (as superscript)
HPLC	High Performance Liquid Chromatography	1= IR; 2=UV
GC	Gas Chromatography	1=FID; 2=ECD
SP	Spectrophotometer	
AAS	Atomic Absorption Spectrophotometer	1=Furnace; 2=Cold; 3= Hydride generation; 4=Graphite
FTIR	Fourier Transform Infra Red	
IR	Infra Red	
UV/Vis	Ultra Violet- visible	
C-S Analyser	Carbon-Sulphur Analyser	
MU	Microbiological unit	
RA	Radioactive Analyser	
GC-MS	Gas Chromatography – Mass Spectrometer	
ICP	Induced Coupled Plasma	
OSA	On Site Oil analyser	
XRF	X-Ray Diffraction Spectrometer	

2.3.14.6 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 especially 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.

2.3.14.7 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:

- i) 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;
- ii) Developing, facilitating and publicising the network for information bank in the country; and
- iii) 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 73**. 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 73: 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, GCLA	Custom offices and importers Permits	Public	Request or buy	Automated data, Reports, files
Chemical Use Statistics	Customs, TCCIA, CropLife Tanzania and CTI ,GCLA	User industries Registration	Public	Request	Reports Register
Transport statistics	BoS	Ministry of Works, Transport and Communication Transporters	Public	Request	Automated data , files
Industrial Accident Reports	OSHA GCLA	Inspectors, Industries, Workers	-do-	-do-	-do-
Transport accident reports	Ministry of Works, Transport & Communication and Ministry of Home Affairs GCLA	Public Inspection	-do-	-do-	-do-
Occupational Health Data (agricultural)	Plant Health Services	Ministry of Agriculture, Livestock and Fisheries TPRI, farmers, surveys	-do-	-do-	Files
Occupational Health Data (industrial)	OSHA and Ministry of Health, Community Development, Gender, Elderly and Children	Industries, workers, Inspectors, Ministry of health	-do-	-do-	Automated data, files
Poisoning Statistics	Ministry of Health, Community Development, Gender, Elderly and Children GCLA, Poisons centre and OSHA	Ministry of Home Affairs, Ministry of Health, Community Development, Gender, Elderly and Children and the Poisons centre	Public	-do-	Files

Type of Data	Location(s)	Data source	Who has access?	How to gain access	Format
Hazardous Waste and other waste Data	NEMC, ARU, City and Municipal Councils GCLA	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* GCLA	Industries and Ministries Registration	Public	Request	Automated data
Register of imports	Customs statistics dept., customs, and TRA GCLA	Importers, TRA, TPRI, TCCIA and CropLife Tanzania	Public	Request	Automated data, files database
Tanzania Standards	TBS	TBS Library	Public	Request	Standards
PIC Decisions	GCLA in Dar es Salaam and Zanzibar and TPRI	GCLA UNEP website	Public	Request	Files
Cleaner production Reports	CPCT, MITI, DoE and LVEMP	CP Assessment Reports, Project Reports	Public	Request	Reports

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

2.3.15 IDENTIFICATION OF IMPACTED POPULATIONS OR ENVIRONMENTS, ESTIMATED SCALE AND MAGNITUDE OF THREATS TO PUBLIC HEALTH AND ENVIRONMENTAL QUALITY, AND SOCIAL IMPLICATIONS FOR WORKERS AND LOCAL COMMUNITIES

2.3.15.1 Summary

The NIP evaluates the current capacity of the country in monitoring impacts of POPs to human health and the environment. It provides an overview of the current

priority POPs releases, and experience in monitoring of POPs releases in Tanzania.

According to the inventory of POPs conducted in 2015, the priority pollutant releases are POP Pesticides, PCBs, PBDEs, PFOS and PCDD and PCDF.

Some of the identified gaps in monitoring of POPs releases are inadequate 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 at risk from POPs exposure: 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.

2.3.15.2 Introduction

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.

2.3.15.3 Impacted Populations

Biological monitoring is being conducted in the large scale farms in Arusha and Kilimanjaro Regions in order to fulfil market compliance requirement and to provide advisory services on pesticide occupation. Surveillance mainly involved monitoring of organophosphate and carbamate (OP, CA) pesticide exposures through Testmate OP Kit in the field. From these monitoring activities, there emerging evidence that pesticides exposure to human health is occurring. POPs have not been assessed in

these studies since there is no current use of POPs pesticides.

The three years results of AChE Testing (OP exposures) among sprayers in large scale farms of horticulture and Coffee plantations in Arusha and Kilimanjaro regions are as shown in the **Table 74**.

Table 74: Results of AChE Testing (OP exposures) among sprayers in large scale farms

Period	Total Population Tested	Population With Acute Pesticides Poisoning	Percentage (%) of Exposure
January-December, 2010	268	71	26.5
January-December, 2011	380	73	19.2
January-December, 2012	383	108	28.2

Source: TPRI, Arusha

There exist, however, challenges that impend effective monitoring of health effects of POPs exposure. These challenges include;

- i) inadequate capacity of human expertise and meagre financial resources for carrying out comprehensive monitoring of pesticides exposures;
- ii) inadequate baseline data of the health effects caused by pesticides exposures and undefined communication linkages among responsible stakeholders; and
- iii) Health effects caused by pesticides exposures are rarely considered as priority at different administrative levels therefore are not mainstreamed in the development programs.

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 dealing with servicing of electrical equipment that are contaminated with PCBs and those containing PCBs;
- 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, operators of waste incinerators managing the ashes, pulp and paper, paints, disposal sites etc.

2.3.15.4 Environmental Monitoring

The capacity and experience to monitor releases of POPs into the environment and to monitor and manage the associated adverse effects to health and the environment is still limited in Tanzania. Some localized studies are being carried out for educational purposes by individuals or institutions like monitoring levels of environmental contamination at Vikuge DDT contaminated site. Some environmental monitoring is being carried out through targeted projects like at Tengeru POPs contaminated site by UNIDO/TPRI project.

Most of the areas formerly occupied by POPs stockpiles and their likelihood impacts have been identified and marked. The extent of their impacts to the populations in proximity and the entire environmental consequences are not adequately known.

1.1.15 DETAILS OF ANY RELEVANT SYSTEM FOR THE ASSESSMENT AND LISTING OF NEW CHEMICALS

The Plant Protection Act No. 5 of 1997 and the Plant Protection Regulations of 1999 provides for the pesticide registration process. The registration process also considers strictly the fulfilment of the requirement of Multilateral Environmental Agreements (MEAs) to which the United Republic of Tanzania is a Party. The registration of new pesticides proceeds in an interrelated sequence as follows:

- i) Evaluation of registration dossiers containing technical data (toxicological, environmental data and analytical methods) of the product intended for registration. The dossiers are submitted by registrants and are evaluated by experts in the office of the Registrar of Pesticides,
- ii) Carrying out bio-efficacy testing using samples submitted by registrants for ensuring that the product is effective to the intended purposes under local environmental conditions,
- iii) Approval or disapproval of the pesticides through existing legal committees (PARTS and NPPAC) by evaluating the registration dossiers and technical bio efficacy reports, and;
- iv) Publishing in an official gazette a list of approved pesticides for public use following existing legal procedures.

The capacities which are required for the purposes of improving performance and excellence in the pesticide registration process include:

- a) Additional capacities to carry out risk assessment of pesticides during bio-efficacy testing of pesticides. The risk assessment report which should include also the negative effect to the environment, human health and non-targeted species may be useful during approval consideration; and
- b) Additional and continuing specialized training in the field of assessment and evaluation of the regulatory toxicological and environmental data submitted

during registration. Training is aimed at building human capacity in order to avoid registering POPs pesticides

The Industrial and Consumer Chemicals Act No. 3 (2003) provides for the registration of chemicals, importers, exporters, transporters, storage, distributors, wholesalers and users of chemicals as well as related premises and facilities. The following are procedures for registering a chemical:

- i) Fill application form for registration of chemicals;
- ii) Attach Material Safety Data Sheet (MSDS), label and any other information as may be required;
- iii) Submit to the Registrar a sample of a chemical to be registered for analysis;
- iv) Payment of fees; and
- v) Submit dully filled-in application forms for approval consideration.

2.3.17 DETAILS OF ANY RELEVANT SYSTEM FOR THE ASSESSMENT AND REGULATION OF CHEMICALS ALREADY IN THE MARKET

In the previous Sub-section 2.3.16, a description of the approach in monitoring of chemicals which enter the market in the country was provided. The procedure described above also relates to chemicals which are already on the market.

The importation, manufacture and use of pesticides is regulated by the Ministry responsible for Agriculture through TPRI whose functions, among others, is to supervise and regulate the manufacture and formulation, importation, distribution, sale, use and disposal of pesticides in the country through registration, issuing of import certificate and regular inspection for the purpose of ensuring effectiveness of pesticides use in production of crops, fibres, and livestock and for the protection of public health and safety.

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. It has provisions for the registration, restrictions, prohibition and inspection of chemicals. The Government Chemist Laboratory Agency (GCLA) has the mandate of enforcing the Act.

The Environmental Management Act No. 20 of 2004 and Environmental Management Act No 3 of 2015 of Mainland Tanzania and Zanzibar, respectively provide for legal and institutional framework for sustainable management of the environment. They confer the role of enforcement to the National Environment Management Council (NEMC) in Mainland Tanzania and to the Zanzibar Environmental Management Authority (ZEMA) for Zanzibar. As of to date, a total of 21 regulations for Mainland

Tanzania and 4 for Zanzibar have been developed to facilitate implementation of the two Acts. Some of these Regulations include Solid Waste Management Regulations, 2009; and Hazardous Waste Management Regulations, 2009.

The Tanzania Food, Drugs and Cosmetics Act of 2003 and the Zanzibar Food, Drugs and Cosmetic Act, No 2 of 2006 provides for the control regarding drugs importation, distribution, use and dealing in drugs, medical devises or herbal drugs, clinical trial of drugs, drugs and poisons, prohibited drugs and cosmetics. Under these Acts, all importers, distributors and users dealing in drugs and cosmetics are required to register to the regulating authorities (Tanzania Food and Drugs Authority – TFDA and Zanzibar Food and Drugs Board respectively for Mainland Tanzania and Zanzibar) and apply for any import license before they are allowed to import registered products.

CHAPTER THREE

STRATEGY AND ACTION PLAN ELEMENTS OF THE NATIONAL IMPLEMENTATION PLAN

This Chapter has two major elements which are policy statement and the implementation strategy for the NIP. The implementation strategy sets out specific action plans or strategies to meet country's obligations of the Stockholm Convention.

3.1 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 Trans-boundary 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, sub-regional, regional and international levels on specific issues of management and control 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.

3.2 Implementation strategy

3.2.1 Priorities for POPs Management

Institutional and Regulatory Strengthening Measures

- a) Reviewing and updating policies and regulatory framework to address POPs;
- b) Reviewing institutional arrangement for management of POPs; and
- c) Enhancing capacity in information generation and dissemination

POP Pesticides and DDT

- a) Review and enforcement of pesticides legislation for managing POPs pesticide and DDT;
- b) Increase human capacity and improved laboratory infrastructure for managing POPs pesticides and DDT contaminated sites;
- c) Increase human capacity to assess negative impacts of alternatives to POPs Pesticides and DDT and improved mechanisms for developing, disseminating and scaling up Integrated Vector Management (IVM) and Integrated Pest Management (IPM) packages;
- d) Enhance institutional coordination on POPs pesticides and DDT exposure to human health monitoring and environmental contamination

- and information generation and dissemination; and
- e) Improve institutional coordination on human health monitoring and information generation and dissemination mechanisms.

PCBs

- 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.

PBDEs

- a) Strengthening capacity for monitoring and control of imports and exports of goods/equipment containing PBDEs;
- b) Monitoring levels of PBDE in various environmental compartments/media;
- c) Establishing sound management system for managing PBDE contaminated sites; and
- d) Enhancing awareness on management of PBDEs.

PFOS

- a) Strengthen institutional and regulatory framework on PFOS;
- b) Enhance human and technical infrastructure capacity for managing PFOS;
- c) Carrying out comprehensive national inventory on PFOS;
- d) Carry out training and awareness campaign on PFOS;
- e) Promote adoption and use of BATs and BEPs for ESM of PFOS; and
- f) Promote search and adoption of alternatives to PFOS.

Unintentionally Produced POPs (u-POPs)

- a) Sound Medical Waste Management including build capacity (human and technical) on sound medical waste management;
- b) Promote non-burn medical waste treatment technologies;
- c) Eliminate PVC-Products in medical materials;
- d) Develop regional – central treatment facility;

- e) Promote sound waste management for the municipal solid waste – using Resource Efficient and Cleaner Production (RECP) concepts;
- f) Conduct research on PCDD/PCDF sources and extent of contamination of the same in urban environment;
- g) Develop strategy to generate information and data in such areas as unintended waste burning and accidental fires; production and use of chemicals; and disposal/landfill;
- h) Develop capacity for monitoring of PCDD/PCDF;
- i) Awareness raising on: sources of PCDD/PCDF /impacts on health and environment, impacts of PCDD/PCDF and need for their elimination from municipal waste management; sound medical waste management; sound management of municipal waste);
- j) Develop/implement municipal solid waste management strategy/guidelines; and
- k) Promotion of BATs/BEPs for the reduction of PCDD/PCDF emissions to the environment.

Contaminated Sites

- a) Develop programmes for raising awareness on POPs, associated hazards and management issues;
- b) Establish schemes for monitoring, control and management of releases of POPs and sites contaminated with POPs;
- c) Establish clean up and remediation schemes;
- d) Complete comprehensive inventory of contaminated sites to cover the entire country;
- e) Establish facilities for clean-up and disposal of POPs which poses threat of further contamination;
- f) Develop appropriate legal provisions and strengthen enforcement regimes on POPs;
- g) Enhance information generation, access and dissemination;
- h) Strengthen institutional capacity to handle POPs contaminated sites; and
- i) Strengthen local research capacity on clean up and remediation technologies.

Information Exchange and Stakeholders Involvement

- a) Improvement of information exchange infrastructure;
- b) Building capacity in information generation, storage, management and dissemination on POPs;
- c) Updating information exchange systems at the Focal Point;
- d) Setting up a networking mechanism among key institutions;
- e) Improving coordination and dissemination of research findings; and
- f) Improving accessibility to POPs information at international, regional

and sub-regional levels.

Public Awareness, Information and Education

- a) Develop technical information and database on POPs for use as reference materials in government departments and agencies, academic and research institutions and NGOs;
- b) Improve information dissemination infrastructure in key institutions; and
- c) Develop programmes for raising awareness on POPs releases and their effects on human health and the environment.

Research, Development and Monitoring

- a) Strengthen capacity for monitoring of POPs substances in air, water, food, living organisms and soil;
- b) Carry out comprehensive national inventory and monitoring of areas potentially contaminated with POPs;
- c) Conduct risk assessment on public health impact of exposure to POPs;
- d) Develop programme and research to promote the use of alternative of POPs.
- e) Strengthen regional and international cooperation on exchange of technical information to improve scientific knowledge and skills in POPs management

3.2.2 Institutional Arrangement

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 is in place and will 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 is also in place and will 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.

Exemption for the use of DDT in the control of malaria causing vectors by Party countries is provided in Annex B, Part II Chemicals of the Stockholm Convention on Persistent Organic Pollutants. There no request which has been submitted at the Focal Point of MEAs in Tanzania for the use of DDT.

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.

3.2.3 Implementation Approach

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.

It is assumed that:-

- a) Sufficient resources would be secured internally or externally to facilitate implementation of action plans; and
- b) Good governance would succeed in implementation of Action Plans in Tanzania at all levels.

3.3 ACTIVITIES, STRATEGIES AND ACTION PLANS

This section comprehends the strategies and actions of the National Implementation Plan of Tanzania to meet the Convention's commitments, based on the country's situation according to the findings of in the Inventories and the intervention priorities that were determined.

The implementation matrix shows information about the planned activities, expected output, indicators of progress, deadlines (short term up to 5 years; medium term 5-10 years; and long term above 10 years), resources and responsible parties for implementing this Plan, which will be reviewed and updated every 5 years, and its progress will be evaluated. NIP contains the following Measures and Action Plans:-

- i) Measures to strengthen the national institutional capacity and the legal framework for POPs
- ii) management;
- iii) Action Plan for managing wastes and stockpiles of Pesticides POPs;
- iv) Action Plan for managing polychlorinated biphenyls (PCB);
- v) Action Plan for managing new POPs of industrial use (i.e. PBDE and PFOS);
- vi) Action Plan for the progressive reduction of unintentional POPs releases.

However, cross-cutting issues such as measures for contaminated sites, information generation and dissemination public awareness raising and education; and measures to improve the national analytical capacity, POPs monitoring, research, development and innovation have been addressed in the respective action plans.

3.3.1 ACTIVITY: INSTITUTIONAL AND REGULATORY STRENGTHENING MEASURES

3.3.1.1 Identified Gaps

By comparing the inventory findings with the Convention requirements and the available legislation, the following gaps and deficiencies were identified: -

- a) Low public awareness on management of POPs and other chemicals in their entire life cycle;
- b) Some existing relevant sector policies lack special focus/ attention to POPs;
- c) Lack of specific regulations for management of POPs and contaminated sites;
- d) Inadequate capacity to monitor POPs chemical life cycle;
- e) Lack of database for pesticides requirements per season and update register of waste and pollutant release and transfer register;
- f) Inadequate coordination mechanisms between different institutions dealing with management of POPs chemicals and wastes;
- g) Inadequate capacity on Environmentally Sound Management of POPs and other chemicals and their wastes and management of contaminated sites; and
- h) Inadequate trained and gazetted inspectors and other law enforcers for effective enforcement of relevant legislation.

3.3.1.2 Main Objective

The main objective of this Action Plan is to strengthen institutional and regulatory framework for POPs management in the country.

3.3.1.3 Priority Issues

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:

- a) Reviewing and updating policies and regulatory framework to address POPs;
- b) Reviewing institutional arrangement for management of POPs; and
- c) Enhancing capacity in information generation and dissemination

3.3.1.4 Action Plan

The Action Plan has been developed to address gaps and deficiencies identified and highlighted by the POPs inventory results and is provided in Table 75.

Table 75: Priority actions to strengthen institutional and regulatory framework for POPs management

Activities	Expected outputs and timeframe	Indicators of progress	Means of verification	Resources (USD)	Responsible
Specific Objective 1: Harmonizing institutional and regulatory framework on implementation of POPs management in line with Stockholm Convention					
1. Review and update policies and legislation related to POPs management including development of POPs regulations	Updated policies and legislation (within 1-10 years)	Copies of updated policies and legislations in place	List of reviewed policies and legislations covering initial and new POPs	80,000	PO-RALG, MoHCDGEC, MoH-Zanzibar, MALF, MITI, VPO-DoE, DoE-Zanzibar, NEMC, ZEMA, MANRLF-Zanzibar, GCLA, TPRI, ME, Higher learning Institutions (UDSM, SUA, MUHAS, SUZA etc) , NGOs
2. Conduct training/ education and advocacy campaigns and programmes on POPs to cover all stakeholder groups	Increased knowledge and skills awareness on POPs management on all levels (within 1-10 years)	Number of personnel trained on POPs	Reports on training and published training materials	150,000	PO-RALG, MoHCDGEC, MoH-Zanzibar, MALF, MITI, VPO-DoE, DoE-Zanzibar, NEMC, ZEMA, MANRLF-Zanzibar, GCLA, TPRI, MEM Higher learning Institutions (UDSM, SUA, MUHAS, SUZA etc) , NGOs
3. Review and implement the existing Draft National Guidelines for Management of POPs and Contaminated Sites	POPs guidelines prepared and implemented (within 1-2 years)	Guidelines in place.	Number of guidelines prepared	40,000	VPO, DoE-Zanzibar, MALF, MANRLF-Zanzibar, GCLA, NEMC, ZEMA, NGOs, OSHA, Higher learning Institutions
Specific Objective 2: Strengthening institutional capacity on chemicals and waste management					

Activities	Expected outputs and timeframe	Indicators of progress	Means of verification	Resources (USD)	Responsible
1. Establish and maintain a register of POPs (old and new) used, transported, emitted or stored and contaminated sites and their effects to human health and the extent of pollution caused to water, soil, plants, animals and air;	POPs and their contaminated sites register established and updated (within 1-5 years)	List of new, old POPs and contaminated sites Copies of updated registers	Register books, Reports of registered POPs (database) and contaminated sites.	75,000	PO-RALG, MoH-Zanzibar, MoHCDGEC, MAF, MANRLF-Zanzibar, MITI, VPO-DoE, DoE-Zanzibar, NEMC, ZEMA, GCLA, TPRI, MEM, TRA, Higher learning Institutions (UDSM, SUA, MUHAS, SUZA etc) , NGOs
2. Establish and/or strengthen environmental sections/units in each Sector Ministry and LGAs to enable implementation and monitoring of the Chemical Conventions and other MEAs	Environmental Section established and operational (within 5 years)	Number of Environmental Section Established and operational	Reports on the established sections	240,000	PO-RALG, MoRASD-Zanzibar, VPO-DoE, DoE-Zanzibar, Sector Ministries
3. Develop and regularly review training programme and conduct training to Regulatory Authorities for effective enforcement of the existing legal framework	Trained human resources on POPs management (within 10 years)	Number of trained human resources	Reports on trained human resources	560,000	PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, MAF, MITI, VPO-DoE, DoE-Zanzibar, NEMC, ZEMA, GCLA, TPRI, MEM, Higher learning Institutions (UDSM, SUA, MUHAS, SUZA etc) , NGOs
4. Update National Profile to assess chemicals management infrastructure	Updated profile (within 5 years)	Updated national profile in place	Reports	200,000	GCLA, VPO-DoE, DoE-Zanzibar, NEMC, ZEMA, OSHA, TPRI, Research and academic institutions

Activities	Expected outputs and timeframe	Indicators of progress	Means of verification	Resources (USD)	Responsible
Specific Objective 3 : Enhancing capacity on information generation and dissemination on POPs					
1. Assess POPs awareness needs of various stakeholders and prepare National Communication Strategy on POPs and chemicals in general	Information and knowledge/ Awareness gap identified in line ministries and other stakeholders (within 5 years)	List of line ministries and other stake holders assessed	Assessment reports	100,000	PO-RALG, MoRASD-Zanzibar, VPO-DoE, DoE-Zanzibar, Sector Ministries, Higher learning institutions, NGOs
2. Prepare and disseminate awareness materials and conduct awareness campaigns on POPs chemicals and their comparative benefits to human health and the environment)	<ul style="list-style-type: none"> Awareness materials on POPs and its management prepared and disseminated in 7 zones (within 5 years) POPs campaign conducted at least once in each 7 zones and Zanzibar (within 5 years) 	<ul style="list-style-type: none"> List of awareness materials on POPs prepared Awareness campaign materials developed 	<ul style="list-style-type: none"> Reports of awareness materials on POPs prepared and disseminated Campaign reports 	380,000	PO-RALG, MoRASD-Zanzibar, VPO-DoE, DoE-Zanzibar, Sector ministries, Higher learning institutions, CSOs
SUB-TOTAL (1)				1,825,000	

3.3.2 Activity: Measures to reduce or eliminate releases from intentional production and use

This Action Plan was not elaborated separately, as it is contained under the following respective Action Plans:

- Section 3.3.3: Production, import and export, use, stockpiles and wastes of POPs pesticides (Annex A, Part I);
- Section 3.3.4: Production, import and export, use, identification, labelling, removal, storage and disposal of polychlorinated biphenyls (PCBs) and equipment containing PCBs (Annex A, Part II);
- Section 3.3.5: Production, import and export, use, stockpiles and wastes hexaBDE and heptaBDE (Annex A, Part IV) and tetraBDE and pentaBDE (Annex Part V) and HBB, where applicable (Annex A, Part I); and
- Section 3.3.7: Production, import and export, use, stockpiles and wastes PFOS, its salts and PFOSF (Annex B, Part III).

3.3.3 ACTIVITY: PRODUCTION, IMPORT AND EXPORT, USE, STOCKPILES, AND WASTES OF ANNEX A POPs PESTICIDES (ANNEX A, PART I CHEMICALS) AND DDT

3.3.3.1 Identified Gaps

By comparing the inventory findings with the Convention requirements and the available legislation, the following gaps and deficiencies were identified: -

- i) Lack of specific provision in the pesticide law for managing and control of POPs pesticides and DDT coupled by weak enforcement;
- ii) Undetermined concentration levels of POPs pesticides and DDT contaminated sites;
- iii) Inadequate infrastructures/facilities for the carrying out analysis to determine levels of concentration and manage POPs pesticides and DDT contaminated sites,
- iv) Inadequate human capacity for the carrying out analysis and remediation measures of POPs pesticides and DDT contaminated sites;
- v) Inadequate capacity of developing/promoting use of alternative pesticides for POPs pesticides and DDT and for assessing their negative impacts to non-target and beneficial organisms;
- vi) Inadequate capacity regarding developing Integrated Pest Management (IPM) and Integrated Vector Management (IVM) packages and scaling up mechanisms as a first line tool for the control of pests or diseases of crops;

- vii) Inadequate awareness creation programs for curbing illegal trade of pesticides including initial and new listed POPs pesticides and DDT;
- viii) Inadequate coordinated and effective health and environmental effects monitoring programs of POPs pesticides and DDT; and
- ix) Inadequate information generation, access and dissemination mechanisms through Chemical Information Exchange Network (CIEN) website.

3.3.3.2 *Objectives of the Action Plan*

The overall goal of setting out Action Plan is to ensure reduction and ultimate elimination of POP Pesticides and DDT and manage their contaminated sites so as to protect human health and the environment.

3.3.3.3 *Priority Issues*

- i) Review and enforcement of pesticides legislation for managing POPs pesticide and DDT;
- ii) Increase human capacity and improved laboratory infrastructure for managing POPs pesticides and DDT contaminated sites;
- iii) Increase human capacity to assess negative impacts of alternatives to POPs Pesticides and DDT and improved mechanisms for developing, disseminating and scaling up Integrated Vector Management (IVM) and Integrated Pest Management (IPM) packages;
- iv) Enhance institutional coordination on POPs pesticides and DDT exposure to human health monitoring and environmental contamination and information generation and dissemination; and
- v) Improve institutional coordination on human health monitoring and information generation and dissemination mechanisms.

3.3.3.4 *Action Plan*

The Action Plan has been developed to address gaps and deficiencies identified and highlighted by the POPs inventory results and is provided in **Table 76**.

Table 76: Priority actions for enhancing management of POPs Pesticides and DDT

Activities	Expected Output and timeframe	Indicators Of Progress	Means Of Verification	Resources (USD)	Responsible
Specific Objective 1: Reviewing and enforcing the legislation for managing POPs Pesticide and DDT					
Review legislation on pesticides and incorporate relevant provisions of the Stockholm Convention related to management of POPs Pesticides and DDT	<ul style="list-style-type: none"> Updated pesticide legislation (within 1-2 years) 	<ul style="list-style-type: none"> Updated pesticide legislation in place 	Copies of reviewed version of the pesticides legislation	15,000	VPO – DOE, DoE-Zanzibar, MoJCA, TPRI, MAF, MANRLF-Zanzibar, GCLA, OSHA
Develop and implement training programme for Regulatory Authorities	<ul style="list-style-type: none"> Training program developed (within 1-2 years) Training conducted (within 1-5 years) 	<ul style="list-style-type: none"> Training programme in place Training reports available 	Copies of training programme and reports	15,000	TPRI, VPO-DoE, MANRLF-Zanzibar, DoE-Zanzibar, MAF, GCLA, OSHA,
Specific Objective 2: Improving Human Capacity and Laboratory Infrastructure For Managing POPs Pesticides and DDT Contaminated Sites					
Carryout human capacity needs assessment and provide training for management of POPs pesticides and DDT contaminated sites	<ul style="list-style-type: none"> Capacity needs assessment report (within 2-3 years) Trained personnel (within 5 years) 	<ul style="list-style-type: none"> Capacity needs assessment report in place Training reports of trained and skilled personnel 	<ul style="list-style-type: none"> Training reports Database of trained and skilled personnel 	20,000	VPO – DOE, DoE-Zanzibar, UDSM, SUZA, TPRI, NEMC, ZEMA, MAF, MANRLF-Zanzibar, GCLA, OSHA,
Carry out laboratory infrastructure needs assessment and prepared investment plan to meet the needs for ESM of POPs	<ul style="list-style-type: none"> Laboratory infrastructure needs assessment report (within 5 years) Investment plan (within 5 years) 	<ul style="list-style-type: none"> Laboratory needs assessment report in place Investment plan in place 	<ul style="list-style-type: none"> Assessment report Investment plan 	20,000	TPRI, UDSM, SUZA, GCLA, VPO-DOE, DoE-Zanzibar, NEMC, ZEMA, MA, MANRLF-Zanzibar, OSHA,

Activities	Expected Output and timeframe	Indicators Of Progress	Means Of Verification	Resources (USD)	Responsible
Specific Objective 3: Increasing the adoption of safe alternatives to POPs Pesticides and DDT					
Promote research and adoption of alternatives to POPs Pesticides and DDT	<ul style="list-style-type: none"> Alternative pesticides identified (within 10 years) 	<ul style="list-style-type: none"> List of alternative pesticides of POPs pesticides and DDT 	<ul style="list-style-type: none"> Research reports Progress reports 	100,000	TPRI, VPO - DOE, DoE-Zanzibar, MAMANRLF-Zanzibar, GCLA, OSHA, Academic and Research institutions
Develop and disseminate awareness materials for raising awareness on the availability and use of alternatives to POPs pesticides and DDT	<ul style="list-style-type: none"> Awareness raising materials developed and disseminated (within 5 years) 	<ul style="list-style-type: none"> A w a r e n e s s materials developed 	<ul style="list-style-type: none"> Awareness materials Reports 	50,000	
Develop crop specific Integrated Vector Management (IVM) and Integrated Pest Management (IPM) packages based on requirement	<ul style="list-style-type: none"> Developed crop specific IVM and IPM packages (within 5 years) Scaling up IVM and IPM packages (within 5 years) 	<ul style="list-style-type: none"> Database of crop specific IVM and IPM packages 	<ul style="list-style-type: none"> Database in place Progress reports 	15,000	MA, MANRLF-Zanzibar, TPRI, VPO-DoE, DoE-Zanzibar, GCLA, OSHA,
Specific Objective 4: Enhancing Institutional Coordination on Human Health Monitoring and Information Generation and Dissemination					

Activities	Expected Output and timeframe	Indicators Of Progress	Means Of Verification	Resources (USD)	Responsible
Carry out human capacity needs assessment and provide training on monitoring human health exposures of POPs pesticides and DDT and environmental contamination	<ul style="list-style-type: none"> Capacity assessment (within 3 years) Trained personnel (within 5 years) 	<ul style="list-style-type: none"> assessment report training reports 	<ul style="list-style-type: none"> assessment report in place training reports list of trainees 	100,000	TPRI, UDSM, SUZA, VPO-DoE, DoE-Zanzibar, MA, MANRLF-Zanzibar, GCLA, OSHA, NEMC, ZEMA, Academic and Research institutions
Carry out studies on human health exposure of POPs pesticides and DDT and levels of environmental contamination	<ul style="list-style-type: none"> study reports on human health exposure (within 10 years) study reports on levels of environmental contamination (within 5 years) 	<ul style="list-style-type: none"> study reports 	<ul style="list-style-type: none"> study reports in place 	250,000	
Develop and disseminate awareness materials on human health exposure of POPs pesticides and DDT	<ul style="list-style-type: none"> Awareness materials (within 2 years) 	<ul style="list-style-type: none"> List and types of awareness materials 	<ul style="list-style-type: none"> Awareness materials in place 	50,000	
Strengthen inter-institutional coordination mechanisms on POPs (National POPs Coordinating Committee; National Environmental Advisory Committee; collaboration between VPO-DoE and DoE-Zanzibar)	<ul style="list-style-type: none"> Meetings reports (within 5 years) Signed Memorandum of Understanding (MoU) (within 5 years) Information shared (within 5 years) Joint programmes and projects (within 10 years) 	<ul style="list-style-type: none"> Meeting reports List and type of information shared List and type of Joint programmes and projects 	<ul style="list-style-type: none"> Meeting reports and information shared in place Signed MoU in place Joint programmes and projects established 	100,000	VPO-DOE, DoE-Zanzibar, TPRI, MALF, MANRLF-Zanzibar, GCLA, OSHA, NEMC, ZEMA
SUB-TOTAL (2)				735,000	

3.3.4 ACTIVITY: PRODUCTION, IMPORT AND EXPORT, USE, IDENTIFICATION, LABELLING, REMOVAL, STORAGE, AND DISPOSAL OF PCBs AND EQUIPMENT CONTAINING PCBs (ANNEX A, PART II CHEMICALS)

3.3.4.1 Identified Gaps

Several gaps were identified in the management and control of PCBs, and so in meeting obligations to the SC. These included among others:

- i) There is no comprehensive national inventory of PCBs, and follow up/ monitoring of previously identified equipment and sites;
- ii) facilities for handling of oils and equipment containing PCBs are inadequate, while disposal facilities have not been established;
- iii) There is inadequate legislation and enforcement of existing legislation on control and management of PCBs; there are currently no specific regulations on PCBs;
- iv) There is low awareness on PCBs and their health and environmental risks, and on POPs in general among handlers and stakeholders;
- v) There is inadequate monitoring and control of releases of PCBs and sites contaminated with PCBs; and
- vi) There is no database or information generation and dissemination scheme for stakeholders.

3.3.4.2 Overall Objective

The overall objective of the Action Plan is to enhance the protection of human health and the environment by reducing and eventually eliminating the use of PCBs.

3.3.4.3 Priority Issues

- i) Developing facilities for disposal of PCBs;
- ii) Establishing legislation and enforcement regimes on PCBs;
- iii) Developing programmes for raising awareness on PCBs and POPs in general
- iv) Establishing cleanup and remediation schemes/efforts;
- v) Updating inventory of stockpiles, products and articles in use and wastes consisting of, or containing or contaminated with PCBs;
- vi) Strengthen institutional capacity to manage PCBs in an environmentally sound manner;
- vii) Establishing schemes for monitoring, control and management of releases of PCBs and sites contaminated with PCBs; and
- viii) Enhancement of information generation, access and dissemination.

3.3.4.4 *Action Plan*

The Action Plan has been developed to address gaps and deficiencies identified and highlighted by the POPs inventory results and is provided in **Table 77**.

Table 77: Priority actions to reduce adverse effects from PCBs to health and the environment

Activities	Expected Outcomes and timeframe	Indicators of Progress	Means of Verification	Resources (USD)	Responsible
Specific Objective 1: Controlling and managing PCBs oils and containing equipment					
Establish facilities for collection, management and disposal of PCB equipment and oils	Facilities for collection, management and disposal of PCB equipment and oils established (within 10 years)	List and number of facilities	<ul style="list-style-type: none"> Type and number of facilities 	2,000,000	PORALG, VPO, DoE-Zanzibar, MEM, MLWEE-Zanzibar, TANESCO, ZECO, GCLA, NEMC, ZEMA and Academic and Research Institutions
Conduct comprehensive national inventory of PCBs (including identification of contaminated sites, field testing and laboratory analysis)	National inventory report (within 5 years)	<ul style="list-style-type: none"> Inventory report List and number of contaminated sites 	<ul style="list-style-type: none"> Report 	550,000	PORALG, VPO, DoE-Zanzibar, MEM, MLWEE-Zanzibar, TANESCO, ZECO, GCLA, NEMC, ZEMA, Academic and Research Institutions
Identify and promote adoption of BATs and BEPs to PCBs	Report on alternatives and promoted technologies to PCBs (within 5 years)	<ul style="list-style-type: none"> Report on alternatives to PCBs List and number of alternatives adopted 	<ul style="list-style-type: none"> Reports 	100,000	VPO-DoE, DoE-Zanzibar, MEM, MLWEE-Zanzibar, VPO-DoE, DoE-Zanzibar, MEM, MLWEE-Zanzibar, TANESCO, ZECO, Academic and Research Institutions and COSTECH

Activities	Expected Outputs and timeframe	Indicators of Progress	Means of Verification	Resources (USD)	Responsible
Review relevant legislation on PCBs to incorporate requirements of the Stockholm Convention	Updated legislation	legislation updated	Updated Legislation in place I	150,000	Ministry of Justice and Constitution, VPO, DoE-Zanzibar, wMLWEE-Zanzibar, TANESCO, ZECO and GCLA
Strengthen enforcement of legislation and implementation of guidelines on PCBs management	Legislation enforced and guidelines on PCBs implemented (within 5 years)	Legislation and guidelines on PCBs management enforced	Reports	300,000	Ministry of Justice and Constitution, VPO, DoE-Zanzibar, ME, MLWEE-Zanzibar, GCLA, MITI, TRA, TBS, ZBS, ZRB, TANESCO and ZECO
Identify training needs and carry out training for monitoring, analysis and management of PCBs	<ul style="list-style-type: none"> Training needs report (within 5 years) Trained personnel (within 5 years) 	Reports in place	Reports	1,000,000	VPO-DoE, DoE-Zanzibar, ME, MLWEE-Zanzibar, VPO-DoE, DoE-Zanzibar, MEM, MLWEE-Zanzibar, TANESCO, ZECO, Academic and Research Institutions and COSTECH
Carryout needs assessment and procure equipment for monitoring, analysis and management of PCBs	<ul style="list-style-type: none"> Needs assessment report (within 3 years) Equipment procured (within 10 years) 	number and type of equipment	Reports	2,000,000	VPO-DoE, DoE-Zanzibar, MEM, MLWEE-Zanzibar, GCLA, MITI, TRA, ZRB, TANESCO and ZECO
Specific Objective 2: Raising public awareness on PCB					

Activities	Expected Outcomes and timeframe	Indicators of Progress	Means of Verification	Resources (USD)	Responsible
Develop awareness information and materials and conduct awareness campaigns on management of PCBs to key stakeholders and the public	Availability of awareness information and materials (within 5 years)	<ul style="list-style-type: none"> Number and type of awareness materials Number of trainees 	Publications	100,000	VPO-DoE, DoE-Zanzibar, MEM, MLWEE-Zanzibar, TANESCO, ZECO, GCLA, NEMC, ZEMA Media and CSOs
Specific Objective 3: Soundly manage the PCB contaminated sites					
Develop a comprehensive plan for monitoring, control and management of PCB releases and contaminated sites	Plan for monitoring, control and management of PCB releases and contaminated sites developed (within 3 years)	Plan in place	Plan document	10,000	VPO, DoE-Zanzibar, MEM, MLWEE-Zanzibar, TANESCO, ZECO, GCLA, Academia/Research Institutions, COSTECH
Demonstrate appropriate clean up and remediation schemes of contaminated sites	2-4 appropriate clean up and remediation schemes of contaminated sites demonstrated (within 10 years)	Number of sites demonstrated	Report	500,000	VPO, DoE-Zanzibar, MEM, MLWEE-Zanzibar, TANESCO, ZECO, GCLA, NEMC, ZEMA, Academic and Research institutions
Implement clean up and remediation schemes of all remaining contaminated sites	80% of PCB contaminated sites are cleaned and remediated (within 10 years)	List and number of sites remediated	Reports	2,000,000	MEM, MLWEE-Zanzibar, TANESCO, ZECO, GCLA, NEMC, ZEMA, Academic and research institutions
SUB-TOTAL (3)				8,125,000	

3.3.5 ACTIVITY: PRODUCTION, IMPORT AND EXPORT, USE, STOCKPILES, AND WASTES OF HEXABDE AND HEPTABDE (ANNEX A, PART IV CHEMICALS) AND TETRABDE AND PENTABDE (ANNEX A, PART V CHEMICALS) (AND HBB, WHERE APPLICABLE (ANNEX A, PART I CHEMICALS))

3.3.5.1 Identified Gaps

By comparing the inventory findings with the Convention requirements and the available legislation, the following gaps and deficiencies were identified: -

- i) PBDEs are chemicals in articles, and are newly listed POPs, and so awareness of PBDEs and the potential risks to health and the environment are not known among stakeholders and the general public;
- ii) The current regulatory framework for chemicals is not adequate for management and control of PBDEs;
- iii) The technical and infrastructural capacity for monitoring and control of imports and exports of PBDE is also inadequate;
- iv) Levels of PBDE in various environmental/ biological compartments such as in leachates from dumpsites are not known, in general PBDE contaminated sites are yet to be identified;
- v) Potentially -PBDE-containing articles and materials and wastes are not managed soundly;
- vi) Lack of comprehensive national inventory of PBDEs associated with EEE and WEEE; and
- vii) Lack of distinction between new and second hand products in the import/export register.

3.3.5.2 Overall Objective

The overall objective of the Action Plan is to minimize health and environmental risks associated with PBDEs by reducing and eventually eliminating the use of equipment containing or contaminated with PBDEs and ensure environmentally sound management of PBDEs.

3.3.5.3 Priority Issues

- i) Strengthening capacity for monitoring and control of imports and exports of goods/equipment containing PBDEs;
- ii) Monitoring levels of PBDE in various environmental compartments/media;
- iii) Establishing sound management system for managing PBDE contaminated sites; and
- iv) Enhancing awareness on management of PBDEs.

3.3.5.4 *Action Plan*

The Action Plan has been developed to address gaps and deficiencies identified and highlighted by the POPs inventory results and is provided in **Table 78**.

Table 78: Priority Actions to ensure environmentally sound management of PBDEs

Activities	Expected Outputs and timeframe	Indicator	Means of Verification	Resources (USD)	Responsible
Specific Objective 1: Enhancing regulatory framework for PBDE					
Review relevant legislation and Regulations to incorporate management and control of PBDEs	Updated legislation (within 3 years)	Updated Legislation	Legislation Document	100,000	MoJCA, VPO-DoE, DoE-Zanzibar, NEMC, ZEMA, GCLA, TRA, ZRB, TCRA, TBS, ZBS,
Develop training programme and conduct training to Regulatory Authorities on the control and management of PBDE containing waste categories	<ul style="list-style-type: none"> • Training programme (within 3 years) • Trained personnel (within 5 years) 	<ul style="list-style-type: none"> • Training programme document • Number of trainees 	Reports	250,000	VPO, DoE-Zanzibar, NEMC, ZEMA, GCLA, TRA, ZRB, TCRA, TBS, ZBS,
Specific Objective 2: Improving capacity for monitoring and control of imports and exports of PBDE/ goods					
Establish a data register on imported and exported equipment and goods containing PBDEs	Register (within 5 years)	<ul style="list-style-type: none"> • Register • Number and type of statistical data 	Reports	50,000	VPO-DoE, DoE-Zanzibar, NEMC, ZEMA, GCLA, TRA, ZRB, TCRA, TBS, ZBS,
Procure equipment for rapid detection of the presence of PBDEs in EEE, vehicles and furniture	20 XRF Equipment procured (within 10 years)	Number and type of equipment	Reports	1,000,000	VPO, DoE-Zanzibar, NEMC, ZEMA, GCLA, TRA, ZRB, TCRA, TBS, ZBS,
Develop inspection guidelines for equipment on market that may contain PBDEs	Inspection guidelines (within 5 years)	Guidelines	Reports	20,000	VPO, DoE-Zanzibar, NEMC, ZEMA, GCLA, TRA, ZRB, TCRA, TBS, ZBS,
Specific Objective 3: Monitoring the levels of PBDE in various environmental compartments/media					

Activities	Expected Outputs and timeframe	Indicator	Means of Verification	Resources (USD)	Responsible
Develop and implement national monitoring framework for PBDEs and other POPs in general	Monitoring framework document (within 5 years)	Monitoring framework	Reports	50,000	VPO-DoE, DoE-Zanzibar, NEMC, ZEMA, GCLA, TRA, ZRB, TCRA, TBS, ZBS, SUMATRA, ZMA, MoWTC, MIC-Zanzibar
Develop training program and conduct training to Regulatory Authorities and other key stakeholders on monitoring of PBDEs in various environmental media	Training program (within 3 years) Trained personnel (within 5 years)	<ul style="list-style-type: none"> • Training programme • List of trainees • Training reports 	Reports	35,000	VPO-DoE, DoE-Zanzibar, NEMC, ZEMA, GCLA, TRA, ZRB, TCRA, TBS, ZBS, SUMATRA, ZMA, MoWTC, MIC-Zanzibar
Conduct regular monitoring of PBDEs in articles and products; humans; wildlife and cattle; fish; plants and other relevant media	Data on PBDE levels in the environment (within 5 years)	Monitoring reports	Reports	250,000	VPO-DoE, DoE-Zanzibar, NEMC, ZEMA, GCLA, TRA, ZRB, TCRA, TBS, ZBS, SUMATRA, ZMA, MoWTC, MIC-Zanzibar
Develop and maintain database on POP-PBDEs to include risk profile on contaminated sites	Database developed and operational (within 10 years)	Database in place	Reports	250,000	VPO-DoE, DoE-Zanzibar, NEMC, ZEMA, GCLA, TRA, ZRB, TCRA, TBS, ZBS, SUMATRA, MoWTC, MIC-Zanzibar
Specific Objective 4: Implementing sound management practices of PBDE containing materials/articles/ wastes and contaminated sites					

Activities	Expected Outputs and timeframe	Indicator	Means of Verification	Resources (USD)	Responsible
Identify and assess priority contaminated sites and potential remediation needs (including dumps/sites/landfills) and conduct regular monitoring of PBDEs	Report on the remediation needs of contaminated sites (within 5 years)	<ul style="list-style-type: none"> Database Monitoring reports 	Reports	250,000	VPO-DoE, DoE-Zanzibar, NEMC, ZEMA, MoH-Zanzibar, MoHCDGEC, GCLA, PO-RALG, MoRASD-Zanzibar, Academic and research institutions
Assess current management practices and options for ESM of PBDE-containing materials/articles/WEEE plastic and promote the implementation of BAT/BEP for the recycling and ESM waste disposal of articles containing POP-PBDEs	Assessment Report (within years)	Assessment Report	Report	100,000	VPO-DoE, DoE-Zanzibar, NEMC, ZEMA, MoH-Zanzibar, MoHCDGEC, GCLA, PO-RALG, MoRASD-Zanzibar, Academic and research institutions
Develop material flow analysis (MFA) and substance flow analysis of PBDE-containing materials	MFA report (within 5 years)	MFA report	Reports	50,000	VPO-DoE, DoE-Zanzibar, NEMC, ZEMA, MoH-Zanzibar, MoHCDGEC, GCLA, PO-RALG, MoRASD-Zanzibar, Academic and research institutions
Specific Objective 5: Raising awareness of stakeholders on PBDE					
Develop and disseminate awareness materials and conduct awareness campaign on adverse effects and ESM of PBDEs and alternatives to PBDEs	<p>Awareness materials (within 1-2 years)</p> <p>Awareness campaigns (within 5 years)</p>	<ul style="list-style-type: none"> Awareness materials Awareness reports 	<ul style="list-style-type: none"> Number and type of awareness materials Reports 	100,000	VPO-DoE, DoE-Zanzibar, NEMC, ZEMA, MoH-Zanzibar, MoHCDGEC, GCLA, PO-RALG, MoRASD-Zanzibar, Academic and research institutions, CSOs, Media
SUB-TOTAL (4)				2,005,000	

3.3.6 ACTIVITY: PRODUCTION, IMPORT AND EXPORT, USE, STOCKPILES, AND WASTES OF DDT (ANNEX B, PART II CHEMICALS)

This Action Plan was not prepared separately, as it is contained in the *Section 3.3.3: Production, import and export, use, stockpiles and wastes of POPs Pesticides (Annex A, Part I)*.

3.3.7 ACTIVITY: PRODUCTION, IMPORT AND EXPORT, USE, STOCKPILES, AND WASTES OF PFOS, ITS SALTS AND PFOSE (ANNEX B, PART III CHEMICALS)

3.3.7.1 Identified Gaps

By comparing the inventory findings with the Convention requirements and the available legislation, the following gaps and deficiencies were identified: -

- i) PFOS and PFOS- containing goods have not been identified;
- ii) Current regulatory framework for management and control of chemicals inadequate for comprehensive control and management of PFOS;
- iii) A major portion of stakeholders not aware of PFOS and the risks to health and the environment;
- iv) Stockpiles, sites and wastes containing PFOS are soundly disposed of indiscriminately;
- v) Sites contaminated with PFOS are not managed and controlled/ monitored; and
- vi) There is inadequate technical and infrastructural capacity for management and monitoring PFOs releases.

3.3.7.2 Overall Objective

The overall objective of the Action Plan is to eliminate release of PFOS, its salts and PFOSE to the environment, hence safeguarding human health and environment from its adverse effects.

3.3.7.3 Priority issues

- i) Strengthen institutional and regulatory framework on PFOS;
- ii) Enhance human and technical infrastructure capacity for managing PFOS;
- iii) Carrying out comprehensive national inventory on PFOS;
- iv) Carry out training and awareness campaign on PFOS;
- v) Promote adoption and use of BATs and BEPs for ESM of PFOS; and
- vi) Promote search and adoption of alternatives to PFOS.

3.3.7.4 Action Plan

The Action Plan has been developed to address gaps and deficiencies identified and highlighted by the POPs inventory results and is provided in **Table 79**.

Table 79: Priority Actions to safeguard human health and environment from adverse effects of PFOS, its salts and PFOSE

Activities	Expected Output and timeframe	Indicator	Means of Verification	Resources (USD)	Responsible
Specific Objective 1 : Identifying PFOS and PFOSE- containing goods					
Conduct comprehensive national inventory of PFOS, its salts and PFOSE and alternatives used for PFOS	Inventory report (within 5 years)	Inventory report	Reports	100,000	VPO-DoE, MITI, DoE-Zanzibar, NEMC, ZEMA, MoH-Zanzibar, MoHCDGEC, GCLA, PO-RALG, MoRASD-Zanzibar, TRA, ZRB, Academic and research institutions, CSOs and Media
Specific Objective 2: Strengthening Regulatory Framework for management and control of PFOS					
Review and update relevant legislation and regulations to incorporate management and control of PFOS, its salts and PFOSE	Updated legislation and regulations (within 5 years)	Updated legislation and regulations	Reports	200,000	MoJCA, VPO-DoE, DoE-Zanzibar, NEMC, ZEMA, MoH-Zanzibar, MoHCDGEC, GCLA, PO-RALG, MoRASD-Zanzibar, Academic and research institutions
Develop training programme and conduct training to Regulatory Authorities and key stakeholders on the control and management of PFOS	<ul style="list-style-type: none"> • Training programme (within 2 years) • Training materials (within 5 years) • Trained personnel (within 5 years) 	<ul style="list-style-type: none"> • Training programme • Training materials • Number of trainees • Training reports 	Reports	200,000	VPO-DoE, DoE-Zanzibar, NEMC, ZEMA, MoH-Zanzibar, MoHCDGEC, GCLA, PO-RALG, MoRASD-Zanzibar, Academic and research institutions, CSOs and Media
Specific Objective 3: Raising stakeholders' awareness on PFOS					

Activities	Expected Output and timeframe	Indicator	Means of Verification	Resources (USD)	Responsible
Develop awareness materials and conduct awareness campaign on environmental and human health effects of PFOS to the public, as well as on switching to safer alternatives	<ul style="list-style-type: none"> Awareness materials (within 5 years) Awareness campaigns (within 5 years) 	<ul style="list-style-type: none"> Awareness materials Awareness reports 	<ul style="list-style-type: none"> Number and type of awareness materials Reports 	150,000	VPO-DoE, DoE-Zanzibar, NEMC, ZEMA, MoH-Zanzibar, MoHCDGEC, GCLA, PO-RALG, MoRASD-Zanzibar, Academic and research institutions, CSOs and Media
Specific Objective 4 : Managing appropriately the stockpiles and wastes containing PFOS					
Develop national phase-out plan of PFOS stockpiles and wastes	Phase-out plan (within 5 years)	Phase-out plan	Phase-out plan	50,000	VPO-DoE, DoE-Zanzibar, NEMC, ZEMA, MoH-Zanzibar, MoHCDGEC, GCLA, PO-RALG, MoRASD-Zanzibar, Academic and research institutions
Identify, test and promote adoption and application of appropriate BAT/ BEP for management of PFOS containing stocks	BATs and BEPs framework for PFOS (within 5 years)	BATs and BEPs framework	Reports	200,000	VPO-DoE, DoE-Zanzibar, NEMC, ZEMA, MoH-Zanzibar, MoHCDGEC, GCLA, PO-RALG, MoRASD-Zanzibar, Academic and research institutions, CSOs, Media
Specific Objective 5: Enhancing the capacity for management and monitoring PFOS releases					
Equip laboratories for monitoring of PFOS	Laboratories equipment for monitoring of PFOS releases (within 10 years)	<ul style="list-style-type: none"> Number of equipment procured Number of laboratories equipped 	Type and list of equipment	500,000	GCLA, VPO-DoE, DoE-Zanzibar, NEMC, ZEMA, MoH-Zanzibar, MoHCDGEC, and Academic and research institutions

Activities	Expected Output and timeframe	Indicator	Means of Verification	Resources (USD)	Responsible
Monitor releases of PFOS from municipal landfills (including groundwater, surface water and biota)	Levels of PFOS in the environment (within 10 years)	Number and type of data on levels of PFOS in the environment	Reports	300,000	GCLA, NEMC, ZEMA, MoH-Zanzibar, MoHCDGEC, GCLA, PO-RALG, MoRASD-Zanzibar, Academic and research institutions, CSOs
Specific Objective 6: Managing and controlling the sites contaminated with PFOS					
Identify, develop risk profile and create database on PFOS contaminated sites	Database on PFOS contaminated sites (within 5 years)	List and profile of contaminated sites	Reports	180,000	VPO-DoE, DoE-Zanzibar, NEMC, ZEMA, GCLA, TBS, ZBS, Academic and research institutions
Conduct monitoring of PFOS contaminated sites	Database on levels and trends of PFOS in contaminated sites (within 10 years)	Database on contaminated sites	Reports	300,000	VPO-DoE, DoE-Zanzibar, NEMC, ZEMA, GCLA, TBS, ZBS
Identify, test and promote adoption and application of appropriate BAT/BEP for ESM of PFOS contaminated sites	Appropriate BAT/BEP for ESM of PFOS contaminated sites identified	List and type of BATs/BEPs tested, adopted and applied	Reports	500,000	VPO-DoE, DoE-Zanzibar, NEMC, ZEMA, academic and research institutions
SUB-TOTAL (5)				2,520,000	

3.3.8 ACTIVITY: REGISTER FOR SPECIFIC EXEMPTIONS AND THE CONTINUING NEED FOR EXEMPTIONS (ARTICLE 4)

The Stockholm Convention enables Parties to register for special exemptions and permission for acceptable usage for production or usage of certain POPs listed under Annexes A and B (table 1: Chemicals that are on the Stockholm Convention list) when alternatives for them do not yet exist or are not available. The goal is to enable enough time for the Parties to take measures for the reduction or elimination of POPs from deliberate production and usage. For that purpose, the Secretariat established Registers for the identification of Parties which have special exemptions and permission for acceptable usage of chemicals listed under Annexes A and B.

Special exemptions expire five years from the date of coming into force of the Convention for a certain chemical, unless the Party provides an earlier date of the expiry of the exemption when applying for exemptions or when it is pursuant to Paragraph 7 of Article 4 where an exemption is approved, along with adherence to the provisions from Articles 4, 22 and 25 of the Convention. Acceptable use has no set expiry date, unless the Conference of Parties determines otherwise.

The amendments to Annexes A and B, whereby the list of chemicals limited by the Stockholm Convention was extended to hexabromodiphenyl ether, heptabromodiphenyl ether, lindane, perfluorooctanesulfonic acid, its salts, perfluorooctanesulfonyl fluoride, tetrabromodiphenyl ether and pentabromodiphenyl ether came into force on 26 August 2010.

The Convention also enables the registering of POPs in objects of use, i.e. in chemicals which appear as ingredients of a product which is being produced or was already in use before or on the date of that commitment coming into force in regards to those chemicals.

Tanzania will submit the following requests to the Secretariat of the Convention for entry into the Registers and Lists which are kept by the Secretariat:

- In the Register of Specific Exemptions of DDT (Paragraph 1 of part II of annex B) which provides for specific provisions for restricted use of DDT in disease vector malaria control, Tanzania may reintroduce DDT for malaria control in endemic areas for emergency situation in line with WHO Guidelines.
- In the List of objects in use (note (ii), part I of Annexes A and B), Tanzania needs to list:
 - Fire-fighting foams, because even though fire-fighting foams which contain PFOS are not produced in Tanzania, the preliminary

- inventory has shown that there are still fire-fighting foams which may contain PFOS in usage and in supplies;
- Consumer products such as textiles, including carpets, upholstery, paper and packaging, coatings, and industrial and household cleaning products which may contain PFOS and its related components, which were imported and are still being imported into Tanzania;
 - Objects which may contain PBDEs (pentaBDE and octaBDE) like electronic equipment and automobiles which were imported and are still being imported into Tanzania.
- In the Register of Special Exemptions (Paragraph 1 of Article 4), Tanzania needs to submit:
 - Hexabromodiphenyl ether and heptabromodiphenyl ether – usage in accordance with Part IV of Annex A;
 - Tetrabromodiphenyl ether and pentabromodiphenyl ether – usage in accordance with Part V of Annex A.;
 - Perfluorooctanesulfonic acid, its salts and perfluorooctanesulfonyl fluoride for usage in processes of industrial and decorative plating because of the lack of economically acceptable alternatives.
 - In the Register of Acceptable Usage of PFOS, its Salts and PFOSF (Paragraph 1, Part III of Annex B), Tanzania needs to list the usage of these substances for the following activities:
 - for processing photographs;
 - for photoresists or anti-reflecting coating in photolithography processes;
 - for photographic coatings which are applied to films, paper or printing plates;
 - as a tool for engraving for compound semiconductors and ceramic filters;
 - as a tool for the suppression of clouding in the process of non-decorative plating in closed systems;
 - as fire-fighting foams; and
 - for hydraulic fluids in aviation.

3.3.9 ACTION PLAN: MEASURES TO REDUCE RELEASES FROM UNINTENTIONAL PRODUCTION (ARTICLE 5)

3.3.9.1 Identified Gaps

By comparing the inventory findings with the Convention requirements and the available legislation, the following gaps and deficiencies were identified: -

- i) Limited data;
- ii) Limited information in such areas as unintended waste burning and accidental fires; production and use of chemicals; and disposal/landfill;
- iii) Inadequate capacity and experience for monitoring releases of u-POPs;
- iv) Very low awareness of u-POPs;
- v) Very limited application of Best Available Techniques (BATs) and Best Environmental Practices (BEPs);and
- vi) Limited planned information dissemination strategy.

3.3.9.2 Overall Objective

The overall objective of the Action Plan is to minimize and prevent PCDD/PCDF releases from unintended sources.

3.3.9.3 Priority Issues

- i) Sound Medical Waste Management including build capacity (human and technical) on sound medical waste management;
- ii) Promote non-burn medical waste treatment technologies;
- iii) Eliminate PVC-Products in medical materials;
- iv) Develop regional – central treatment facility;
- v) Promote sound waste management for the municipal solid waste – using Resource Efficient and Cleaner Production (RECP) concepts;
- vi) Conduct research on PCDD/PCDF sources and extent of contamination of the same in urban environment;
- vii) Develop strategy to generate information and data in such areas as unintended waste burning and accidental fires; production and use of chemicals; and disposal/landfill;
- viii) Develop capacity for monitoring of PCDD/PCDF;
- ix) Awareness raising on: sources of PCDD/PCDF /impacts on health and environment, impacts of PCDD/PCDF and need for their elimination from municipal waste management; sound medical waste management; sound management of municipal waste);
- x) Develop/implement municipal solid waste management strategy/guidelines; and
- xi) Promotion of BATs/BEPs for the reduction of PCDD/PCDF emissions to the environment.

3.3.9.4 Action Plan

The Action Plan has been developed to address gaps and deficiencies identified and highlighted by the POPs inventory results and is provided in **Table 80**.

Table 80: Priority actions to minimize and prevent PCDD/PCDF releases from unintended sources

Activities	Expected outputs and timeframe	Indicators of progress	Means of verification	Resources (USD)	Responsible Party
Specific Objective 1: Minimization of PCDD/PCDF releases from medical waste management activities					
Develop awareness raising materials and conduct awareness campaigns on PCDD/PCDF at all levels with emphasis on health and medical practitioners	Awareness materials (within 3 years)	<ul style="list-style-type: none"> Awareness materials List of personnel provided with awareness 	Reports	200,000	VPO-DoE, DoE-Zanzibar, MoHCDGEC, MoH-Zanzibar, Referral Hospitals, Regional / District Hospitals, Private Hospitals, NEMC, ZEMA, LGAs, CSOs and Media
Strengthen monitoring and enforcement mechanisms of laws and regulations	Improved compliance (within 5 years)	<ul style="list-style-type: none"> List of laws and regulations implemented 	Enforcement report	150,000	NEMC, ZEMA, LGAs, MoHCDGEC, MoH-Zanzibar, Referral Hospitals, Regional / District Hospitals, Private Hospitals
Train medical personnel on sound medical waste management along cleaner production concepts	Trained medical personnel (within 5 years)	Training reports	Training reports	50,000	VPO-DoE, DoE-Zanzibar, MoHCDGEC, MoH-Zanzibar, Referral Hospitals, Regional / District Hospitals, Private Hospitals, NEMC, ZEMA and LGAs
Rollout BATs and BEPs in hospitals and medical facilities	BATs and BEPs are implemented in referral hospitals (within 10 years)	Implementation reports	Implementation reports	250,000	VPO-DoE, DoE-Zanzibar, MoHCDGEC, MoH-Zanzibar, Referral Hospitals, Regional / District Hospitals, Private Hospitals, NEMC, ZEMA and LGAs
Specific Objective 2: Minimization of PCDD/PCDF releases from municipal waste management (including waste burning)					

Activities	Expected outputs and timeframe	Indicators of progress	Means of verification	Resources (USD)	Responsible Party
Develop awareness raising materials and conduct awareness campaigns to all stakeholders involved in municipal waste management on sources of PCDD/PCDF and reduction measures	<ul style="list-style-type: none"> Awareness materials developed (within 1 year) 80% of Municipalities and 50% of small towns are provided with awareness raising materials (within 5 years) 	<ul style="list-style-type: none"> Awareness raising materials List of personnel provided with awareness 	Survey reports	50,000	VPO, DoE-Zanzibar, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, CSOs, Media
Strengthen enforcement mechanisms of City, Municipality, Town by-laws	<ul style="list-style-type: none"> Improved compliance (within 5 years) 	<ul style="list-style-type: none"> List of legislations implemented 	Reports	150,000	PO-RALG, MoRASD-Zanzibar, NEMC, ZEMA, CSOs
Finalize and implement National Waste Management Strategy and Action Plan	<ul style="list-style-type: none"> Strategy developed (within 2 years) Equipment and facilities procured (within 10 years) 	<ul style="list-style-type: none"> Waste management strategy 	Strategy in place Implementation reports	1,000,000	VPO, DoE-Zanzibar, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA
Identify and promoted adoption and application of BAT and BEP in municipal waste management	<ul style="list-style-type: none"> List of BAT and BEPs documented 	<ul style="list-style-type: none"> List of BATs and BEPs 	Reports	1,000,000	VPO, DoE-Zanzibar, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, CPCT
Specific Objective 3: Minimization of PCDD/PCDF releases from open burning and accidental fires					

Activities	Expected outputs and timeframe	Indicators of progress	Means of verification	Resources (USD)	Responsible Party
Develop and implement national strategy to mitigate open burning and accidental fires	National strategy developed (within 5 years)	Strategy	Published strategy	300,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MAF, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA
Conduct awareness raising campaigns of the general public on sources of PCDD/PCDF (focusing on open burning and accidental fires)/ impacts of health and environmental impacts of the same and need for their elimination	Improved awareness of key stakeholders (within 5 years)	Awareness raising materials	Survey reports	300,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MAF, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, CSOs, Media
Specific Objective 4: Strengthening the capacity to monitor and enforce on releases of PCDD/PCDF					
Establish capacity needs of relevant institutions for monitoring PCDD/PCDF and procure monitoring equipment	<ul style="list-style-type: none"> Capacity needs for monitoring PCDD/PCDF established (by year 5) Equipment for monitoring procured (by year 7) 	Report on capacity needs List of equipment procures	Reports and equipment procured	1,000,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MAF, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, Research and academic institutions

Activities	Expected outputs and timeframe	Indicators of progress	Means of verification	Resources (USD)	Responsible Party
Develop training programme and conduct training to relevant institutions in PCDD/PCDF monitoring	Relevant staff are trained (by year 7)	List of trained staff	Training reports	200,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MAF, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, Research and academic institutions
Conduct annual monitoring of PCDD/PCDF releases	<ul style="list-style-type: none"> Data on PCDD/PCDF from impacted food and feed (within 5 years) Data on PCDD/PCDF releases from other sources (within 5 years) 	Data base on PCDD/PCDF	Monitoring reports	150,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MAF, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, Research and academic institutions
SUB-TOTAL (6)				4,800,000	

3.3.10 Activity: Measures to reduce releases from stockpiles and wastes (Article 6)

This action plan was not elaborated separately, as it is contained in the following sections/action plans:

- i) Section 3.3.3: Production, import and export, use, stockpiles and wastes of POPs pesticides (Annex A, Part I);
- ii) Section 3.3.4: Production, import and export, use, identification, labelling, removal, storage and disposal of polychlorinated biphenyls (PCBs) and equipment containing PCBs (Annex A, Part II);
- iii) Section 3.3.5: Production, import and export, use, stockpiles and wastes of hexaBDE and heptaBDE (Annex A, Part IV) and tetraBDE and pentaBDE (Annex A, Part V) and HBB, where applicable (Annex A, Part I); and
- iv) Section 3.3.7: Production, import and export, use, stockpiles and wastes of PFOS, its salts and PFOSE (Annex B, Part III).

3.3.11 Strategy: Identification of stockpiles, articles in use and wastes

The strategy for identification of stockpiles, articles in use and wastes was not elaborated separately, as it is contained in the following sections/action plans:

- i) Section 3.3.3: Production, import and export, use, stockpiles and wastes of POPs pesticides (Annex A, Part I);
- ii) Section 3.3.4: Production, import and export, use, identification, labelling, removal, storage and disposal of polychlorinated biphenyls (PCBs) and equipment containing PCBs (Annex A, Part II);
- iii) Section 3.3.5: Production, import and export, use, stockpiles and wastes of hexaBDE and heptaBDE (Annex A, Part IV) and tetraBDE and pentaBDE (Annex A, Part V) and HBB, where applicable (Annex A, Part I); and
- iv) Section 3.3.7: Production, import and export, use, stockpiles and wastes of PFOS, its salts and PFOSE (Annex B, Part III).

3.3.12 Activity: Manage stockpiles and appropriate measures for handling and disposal of articles in use

This Action Plan was not elaborated separately, as it is contained in the following sections/action plans:

- i) Section 3.3.3: Production, import and export, use, stockpiles and wastes of POPs pesticides (Annex A, Part I);

- ii) Section 3.3.4: Production, import and export, use, identification, labelling, removal, storage and disposal of polychlorinated biphenyls (PCBs) and equipment containing PCBs (Annex A, Part II);
- iii) Section 3.3.5: Production, import and export, use, stockpiles and wastes of hexaBDE and heptaBDE (Annex A, Part IV) and tetraBDE and pentaBDE (Annex A, Part V) and HBB, where applicable (Annex A, Part I); and
- iv) Section 3.3.7: Production, import and export, use, stockpiles and wastes of PFOS, its salts and PFOSF (Annex B, Part III).

3.3.13 STRATEGY: IDENTIFICATION OF CONTAMINATED SITES (ANNEX A, B, AND C CHEMICALS) AND REMEDIATION IN AN ENVIRONMENTALLY SOUND MANNER

3.3.13.1 Identified Gaps

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.

3.3.13.2 Objectives 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 specific 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

3.3.13.3 Priority Issues

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.

3.3.13.4 Action Plan

The Action Plan has been developed to address gaps and deficiencies identified and highlighted by the POPs inventory results and is provided in **Table 81**.

Table 81: Actions for strengthening management of contaminated sites

Action	Expected Output and timeframe	Indicators	Means of verification	Resources (USD)	Responsibility
Specific Objective 1: Establishing a management system for contaminated sites					
Establish and maintain a register for POPs contaminated sites	POPs contaminated sites register established and maintained (within 1-5 years)	List of contaminated sites	<ul style="list-style-type: none"> Register/ database Reports of registered contaminated sites. 	250,000	PO-RALG, MoH-Zanzibar, MoHCDGEC, MALF, MANRLF-Zanzibar, MITI, VPO-DoE, DoE-Zanzibar, NEMC, ZEMA, GCLA, TPRI, MEM, Higher learning Institutions (UDSM, SUA, MUHAS, SUZA etc) , NGOs, TRA
Update relevant legislation and regulations to incorporate control and management of contaminated sites	Updated legislation and regulations in place (within 5 years)	Updated legislation and regulations	Reports	150,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MALF, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, Research and academic institutions
Develop monitoring standards and guidelines on sampling, analysis and reporting	Monitoring standards and guidelines developed (within 5 years)	Monitoring standards and guidelines	Reports	20,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MALF, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, Research and academic institutions

Action	Expected Output and timeframe	Indicators	Means of verification	Resources (USD)	Responsibility
Develop and implement monitoring programme for contaminated sites	Monitoring programme implemented (within 10 years)	Monitoring programme Implementation reports	Reports;	1,000,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MALF, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, Research and academic institutions
Develop training programme and conduct training to experts on monitoring activities (sampling, analysis and reporting requirements)	Training programme and trained personnel (within 10 years)	Training programme Number of trainees	Reports	50,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MALF, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, Research and academic institutions
Specific Objective 2: Cleaning-up and remediate contaminated sites					
Carry out risk assessment (both human and biota ecosystem) and include information in the register of contaminated sites	Risk assessment report and register of contaminated sites in place (within 10 years)	Risk assessment reports Register of contaminated sites	Risk assessment reports Updated Register of prioritized contaminate sites	100,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MALE, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, Research and academic institutions

Action	Expected Output and timeframe	Indicators	Means of verification	Resources (USD)	Responsibility
Assess feasible treatment options and carry out remediation of contaminated sites	Assessment report and remediated sites in place (within 10 years)	Assessment report Number of Remediated sites	Assessment report Remediated sites	1,000,000 ¹	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MALE, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, Research and academic institutions
Establish appropriate land use management plans for the contaminated sites	Allocation of remediated areas for appropriate use (within 10 years)	Land use management plans	Land use management plans	50,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MALE, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, Research and academic institutions
Specific Objective 3: Updating existing awareness programmes to include management of contaminated sites					
Develop and implement specific awareness programmes on contaminated sites	Awareness programme in place and campaigns conducted (within 5 years)	Awareness programmes in place Number of people provided awareness	Awareness programme in place Awareness materials and reports	80,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MALE, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, Research and academic institutions, CSOs and Media
SUB-TOTAL (7)				2,450,000	

3.3.14 ACTIVITY: FACILITATING OR UNDERTAKING INFORMATION EXCHANGE AND STAKEHOLDER INVOLVEMENT

3.3.14.1 Identified Gaps

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) Inaccessible information at international level to the majority because of language and information technology barriers; and
- c) Lack of information base as reference material.

3.3.14.2 Overall and specific objective

The overall objective of the Action Plan is to promote and facilitate information exchange at international, regional, sub-regional and national levels on POPs. The specific objectives of this Action Plan are:-

- To enhance information exchange capacity of the POPs National Focal Point;
- To establish information exchange mechanisms to facilitate collaboration and co-operation among key stakeholders and with other regional and international agencies/bodies/institutions; and
- To improve information management infrastructure of key institutions.

3.3.14.3 Priority Issues

- 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.

3.3.14.4 Action Plan

The Action Plan has been developed to address gaps and deficiencies identified and highlighted by the POPs inventory results and is provided in **Table 82**.

Table 82: Actions to establish information exchange mechanisms

Action	Expected Output and timeframe	Indicators	Means of verification	Resources (USD)	Responsible
Specific Objective 1: Establishing information exchange capacity at the National Focal Point					
Improve mechanism of exchange of information about POPs with National Focal Point (including common procedures for information collection and exchange)	Information exchange mechanism improved (within 1-2 years)	Information exchange	Reports	10,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MALE, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, Research and academic institutions
Strengthen the system for exchange of information between civil society, government and institutions that are designated as competent and responsible for the implementation of the Stockholm Convention	Informed information exchange network strengthened (within 1-3 years)	Data base	Reports	50,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MALE, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, Research and academic institutions
Collect, update and process data sent by the competent authorities, and transmit them to the Convention Secretariat within the reporting obligations	National reporting improved (within 1-2 years)	National reports	Reports	10,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MALE, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, Research and academic institutions
Specific Objective 2: Establishing information dissemination infrastructure					

Action	Expected Output and timeframe	Indicators	Means of verification	Resources (USD)	Responsible
Sensitize research institutions and scientists on information exchange	Relevant research information readily available (within 5 years)	Types of information packages prepared; Research findings disseminated	Reports	10,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MALE, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, Research and academic institutions
Support development and maintaining of reliable information databases at relevant sources	Database developed (within 1-2 years)	Database created	Reports	100,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MALE, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, Research and academic institutions
Collect, acquire, store and manage technical information as reference materials	Reference portal developed (within 5 years)	Reference materials available	Reports	100,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MALE, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, Research and academic institutions
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 to support information exchange (by year 5)	Number of participating stakeholders groups Implementation reports	Reports	100,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MALE, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, Research and academic institutions
SUB-TOTAL (8)				380,000	

3.3.15 ACTIVITY: PUBLIC AWARENESS, INFORMATION AND EDUCATION (ARTICLE 10)

3.3.15.1 Identified Gaps

By comparing the baseline situation on public information, education and awareness with the Convention requirements and the available legislation, the identified constraints are;

- i) Existing information dissemination path ways have limited focus on POPs;
- ii) Information available from international sources is not easily accessible because of language and information technology barriers to the general public;
- iii) Inadequate POPs technical expertise in the media;
- iv) Inadequate training programmes and materials on POPs issues;
- v) Inadequate resources in terms of specialized skills, finance and facilities in the respective institutions dealing with information generation, maintenance and dissemination on POPs issue;
- vi) Limited coverage in most of the relevant policies and legislation regarding availability and accessibility of public information on POPs; and
- vii) Fragmented and scanty baseline data and information on POPs.

3.3.15.2 Overall and specific objectives

The overall objective of the Action Plan is to promote and facilitate public information, awareness and education on POPs issues. The specific objectives of this Action Plan are the following:-

- i) To enhance broad-based political and public support in the implementation of the NIP;
- ii) To develop and implement national programmes of education and public awareness on POPs targeted to a wide range of stakeholders; and
- iii) To facilitate information packaging according to the needs of the targeted user;
- iv) To promote information exchange by strengthening information sharing capacity of relevant stakeholders.

3.3.15.3 Priority Issues

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

3.3.15.4 Action Plan

The Action Plan has been developed to address gaps and deficiencies identified and highlighted by the POPs inventory results and is provided in **Table 83**.

Table 83: Priority actions to promote and facilitate public information, awareness and education on POPs issues

Action	Expected Output and timeframe	Indicators	Means of verification	Resources (USD)	Responsible
Specific Objective 1: Strengthening awareness and outreach					
Prepare and implement special and targeted awareness programs like seminars, workshops etc for NGOs, CBOs and media.	Awareness programme developed (by year 3)	Awareness programme	Reports	15,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MAF, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, Research and academic institutions
Prepare and disseminate information packages to targeted groups (such as maintenance engineers in industries)	Information packages prepared (by year 5)	Information packages	Reports	20,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MAF, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, Research and academic institutions
Specific Objective 2: Promoting public awareness on POPs and other hazardous chemicals					
Revise and develop public awareness programmes in collaboration with stakeholders	Public awareness programme developed (within 1-3 years)	Awareness programme	Reports	350,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MAF, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, Research and academic institutions

Action	Expected Output and timeframe	Indicators	Means of verification	Resources (USD)	Responsible
Support preparation and implementation of media programmes	Media programmes developed and disseminated (by year 5)	Media programme	Reports	200,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MAF, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, Research and academic institutions
Support awareness activities of institutions with related programs (i.e. NEMC, ZEMA, MLWEE-Zanzibar, GCLA, TPRI, TANESCO and ZECO)	Awareness activities implemented (by year 5)	Awareness activities	Reports	300,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MAF, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, Research and academic institutions
Designate and publicize information centers (such as regional libraries)	Information Centres established (by year 5)	Number of POPs Information Centres	Reports	100,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MAF, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, Research and academic institutions
Arrange for press conference during commemoration of the World Environment Day.	Public sensitized on POPs (within 3-5 years)	Press conference	Reports	5,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MAF, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, Research and academic institutions
Specific Objective 3: Imparting knowledge and skills on POPs and other hazardous chemicals to schools					

Action	Expected Output and timeframe	Indicators	Means of verification	Resources (USD)	Responsible
Conduct 3 training sessions annually for 40 primary and secondary schools' teachers and relevant education stakeholders on POPs and other hazardous chemical issues for 6 zones including Zanzibar.	Teachers trained on POPs (within 5 years)	Training reports Number of trainees	Reports	100,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MALF, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, Research and academic institutions
Develop training modules for academic and professional development programs	Training modules developed (within 5 years)	Training modules in place	Reports	100,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MALF, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, Research and academic institutions
SUB-TOTAL (9)				990,000	

3.3.16 ACTIVITY: EFFECTIVENESS EVALUATION (ARTICLE 16)

The Secretariat of the Stockholm Convention has established a framework for evaluating the effectiveness of the implementation of the Convention in accordance with Article 16 of the Convention. The framework encompasses issues such as the purpose of the effectiveness evaluation; arrangements for conducting the effectiveness evaluation; elements and indicators for the effectiveness evaluation; limitations of the effectiveness evaluation; and terms of reference for an effectiveness evaluation committee.

The purpose of the effectiveness evaluation is to assess whether the Convention has succeeded in achieving its objectives of protecting human health and the environment against POPs substances; and to determine the effectiveness of the specific measures taken to implement the Convention in achieving this objective; and to identify ways to improve the effectiveness of the Convention.

The Convention Secretariat conducts effectiveness evaluation on the basis of:

- National implementation plans submitted to the Convention Secretariat in accordance with Article 15,
- Information on non-compliance with the provisions of the Convention in accordance with Article 17,
- Regional monitoring plans.

The first cycle of evaluation for the period of six years which was supposed to take place between 2010 and 2017 is underway. At its eighth meeting to be held in 2017, the Conference of the Parties will consider the effectiveness evaluation reports on all element and the recommendations of the effectiveness evaluation committee for future evaluation procedures ..

In order to provide data to the Conference of the Parties on the monitoring of the presence of the chemicals listed under Annexes A, B and C and their allocation, the Vice President's Office, following consultation with the Ministry responsible for Environment - Zanzibar, will report to the Secretariat of the Stockholm Convention in accordance with **Section 3.3.17**.

3.3.17 ACTIVITY: REPORTING (ARTICLE 15)

In accordance with the requirements of the Stockholm Convention, each Party is required to designate a national focal point for communication and reporting of information through the

Convention Secretariat relevant to the reduction or elimination of the production, use and release of POPs and alternatives to POPs, including information relating to their risks as well as to their economic and social costs.

The Vice President’s Office – Division of Environment serves as the National Focal Point for the Stockholm Convention and other related MEAs whose responsibilities include liaising and communicating with the Secretariat of the Stockholm Convention.

Table 84 provides an overview of the reporting requirements in accordance with the provisions of the Stockholm Convention.

Table 84: Reporting requirements in accordance with the provisions of the Stockholm Convention

Requirement of the Convention	Description	Timeframe
Article 5, Paragraph (a) (v): Measures to reduce or eliminate releases from unintentional production (Annex C)	Requires an overview of the strategies and their effectiveness in reducing or eliminating releases from unintentional production. The overviews need to be included in the reports submitted pursuant to Article 15 of the Convention.	Every 5 years
Article 15: Reporting	<p>Each Party shall 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. Each Party shall provide to the Secretariat:</p> <ul style="list-style-type: none"> • Statistical data on its total quantities of production, import and export of each of the chemicals listed in Annex A and Annex B; and • To the extent practicable, a list of the States from which it has imported each such substance and the States to which it has exported each such substance. 	To be decided by the Conference of the Parties

Requirement of the Convention	Description	Timeframe
Article 16: Effectiveness evaluation	<p>The Conference of the Parties shall, at its first meeting, initiate the establishment of arrangements to provide itself with comparable monitoring data on the presence of the chemicals listed in Annexes A, B and C as well as their regional and global environmental transport.</p> <p>The evaluation shall be conducted on the basis of available scientific, environmental, technical and economic information, including:</p> <ul style="list-style-type: none"> • Reports and other monitoring information provided pursuant to paragraph 2 of Article 16 (results of the monitoring activities on a regional and global basis); • National reports submitted pursuant to Article 15; and • Non-compliance information provided pursuant to the procedures established under Article 17 	Commencing four years after the date of entry into force of the Convention, and periodically thereafter
Annex A, Part II, Paragraph (g)	Each party shall provide a report every five years on progress in eliminating polychlorinated biphenyls and submit it to the Conference of the Parties pursuant to Article 15.	Every 5 years
Annex A, Part IV, Paragraph 2 and Annex A, Part V, Paragraph 2	At its sixth ordinary meeting and at every second ordinary meeting thereafter, the Conference of the Parties shall evaluate the progress that Parties have made towards achieving their ultimate objective of elimination of Hexabromodiphenyl Ether and Heptabromodiphenyl Ether contained in articles and review the continued need for this specific exemption. This specific exemption shall in any case expire at the latest in 2030.	Every 4 years (according to the Effectiveness Evaluation Framework of the Stockholm Convention)
Annex B, Part II, Paragraph 4	Each Party that uses DDT shall provide to the Convention Secretariat information on the amount used, the conditions of such use and its relevance to that Party's disease management strategy, in a format to be decided by the Conference of the Parties in consultation with the World Health Organization.	Every 3 years

Requirement of the Convention	Description	Timeframe
Annex B, Part III, Paragraph 3	Each Party that uses and/or produces these chemicals shall report on progress made to eliminate PFOS, its salts and PFOSF and submit information on such progress to the Conference of the Parties pursuant to and in the process of reporting under Article 15 of the Convention.	Every 4 years

Government Ministries, Departments and Agencies (MDAs) and LGA Departments with mandates in the following areas: Environment; Health; Agriculture; Education; Water; Forestry; Energy; Mining; Finance; Industry and Customs are responsible for collecting all relevant data indicated in Table 69, within their jurisdiction, essential for the development of periodic reports in accordance with the provisions of the Stockholm Convention.

Information will be submitted to the Vice President’s Office, which will prepare periodic reports and submit these to the Secretariat of the Stockholm Convention. In order to establish a clearly defined mechanism for submission of data/information, Vice President’s Office, in collaboration relevant MDAs as well as LGAs, will develop the Procedure for Reporting on POPs to the National Focal Point.

The Vice President’s Office, as the focal point for the Stockholm Convention, will:

- i) Collect all information needed to develop reports by MDAs, LGAs and other stakeholders during the implementation of the NIP;
- ii) Analyse the received data, and prepare comprehensive periodic reports as required
- iii) by the Convention;
- iv) Submit the periodic reports to relevant national and international institutions, organizations and agencies; and
- v) Submit the periodic reports in accordance with the specified reporting format by the Secretariat of the Stockholm Convention.

3.3.18 ACTIVITY: RESEARCH, DEVELOPMENT AND MONITORING (ARTICLE 11)

3.3.18.1 Identified Gaps

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) There is limited institutional capacity in terms of specialized skills, equipment and financial resources;
- iv) Lack of standards and guidelines for monitoring POPs; and
- v) Inadequate research on alternatives of POPs and their adverse effects to human health and the environment.

3.3.18.2 Overall and specific objectives

The overall objective of the Action Plan is to create institutional capacity to monitor POPs levels in human and the environment. The specific objectives of this Action Plan are:-

- a) To strengthen capacity of institutions involved in monitoring POPs;
- b) 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;
- c) To strengthen monitoring capacity of the relevant organizations and institutions involved in the monitoring of POPs releases, alternatives and their effects; and
- d) To develop research programme on POPs alternatives and their effects to human and the environment.

3.3.18.3 Priority Issues

- i) Strengthen capacity for monitoring of POPs substances in air, water, food, living organisms and soil;
- ii) Carry out comprehensive national inventory and monitoring of areas potentially contaminated with POPs;
- iii) Conduct risk assessment on public health impact of exposure to POPs;
- iv) Develop programme and research to promote the use of alternative of POPs.
- v) Strengthen regional and international cooperation on exchange of technical information to improve scientific knowledge and skills in POPs management

3.3.18.4 Action Plan

The Action Plan has been developed to address gaps and deficiencies identified and highlighted by the POPs inventory results and is provided in **Table 85**.

Table 85: Priority actions for strengthening capacity on research, development and monitoring of POPs

Action	Expected Output and time frame	Indicators	Means of verification	Resources (USD)	Responsible
Specific Objective 1: Strengthening monitoring capacity of POPs in the environment					
Undertake needs assessment, develop and implement National Capacity Building Plan for Monitoring of POPs (including levels of POPs and tracking of products/ goods containing POPs)	Needs assessment report prepared and implemented (within 10 years)	<ul style="list-style-type: none"> Needs assessment report Implementation reports 	Reports	500,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MALE, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, Research and academic institutions
Review and adopt standards, procedures/guidelines for sampling and analysis of POPs	Standards, procedures and guidelines in place (within 5 years)	Standards and procedures/ guidelines in place	Reports	50,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MALE, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, Research and academic institutions
Develop and implement accreditation programme of laboratories for research and monitoring of POPs in food, environment and for human health surveillance	Accredited laboratories in place (within 8 years)	Accredited Laboratories in place	Reports	50,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MALE, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, Research and academic institutions

Action	Expected Output and time frame	Indicators	Means of verification	Resources (USD)	Responsible
Develop and implement comprehensive National POPs Monitoring Programme	Monitoring programme developed and implemented (within 10 years)	<ul style="list-style-type: none"> Monitoring programme Number of monitoring tools and equipment 	Reports	2,000,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MALE, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, Research and academic institutions
Conduct risk assessment on impacts of POPs exposure to human health and the environment	Annual risk assessment reports prepared (within 10 years)	Risk assessment reports	Reports	400,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MALE, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA and Research and academic institutions
Specific Objective 2: Improving the coordination, information exchange and research on POPs and their alternatives					
Develop and implement national research agenda on chemicals including POPs and their alternatives and effects	National research agenda developed and implemented (within 10 years)	National Research agenda in place	Reports	600,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MALE, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, Research and academic institutions

Action	Expected Output and time frame	Indicators	Means of verification	Resources (USD)	Responsible
Strengthen and maintain database of research findings at relevant institutions	Database developed (within 5 years)	Data base in place	Database	100,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MALF, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, Research and academic institutions
Establish Annual National Environmental Forum to facilitate dissemination of relevant research findings and sharing of environmental information	Annual forum organized	<ul style="list-style-type: none"> Number of fora 	<ul style="list-style-type: none"> Proceedings 	100,000	VPO-DoE, DoE-Zanzibar, MNRT, MANRLF-Zanzibar, MALF, PO-RALG, MoRASD-Zanzibar, MoH-Zanzibar, MoHCDGEC, LGAs, NEMC, ZEMA, Research and academic institutions
SUB-TOTAL (10)				3,800,000	

3.3.19 ACTIVITY: TECHNICAL AND FINANCIAL ASSISTANCE (ARTICLES 12 AND 13)

Considering that Tanzania is a developing country, technical and financial assistance is of key importance for the successful implementation of the Stockholm Convention. In regards to that, it is necessary for Tanzania to try to access as much funding as possible, under favourable conditions. Most of the foreign funds are necessary for the creation of a detailed inventory, final disposal of POPs, monitoring, and technical assistance and the transfer of technology. External funding can be obtained not only in the form of favourable loans and donations, but also in the form of equipment and the transfer of knowledge.

International financial resources are required for Tanzania mostly for the following areas:

- i) Conducting a comprehensive national inventory of POPs including their entire lifecycle (PCBs, PBDEs, u-POPs, PFOS, POPs Pesticides and DDT);
- ii) Monitoring and risk assessment of the impacts of POPs on human health and the environment;
- iii) Conducting a comprehensive survey of POPs contaminated sites and carrying out remediation of the priority sites;
- iv) Phasing-out POPs including those that are still being used in various applications coupled with the introduction of BATs and BEPs;
- v) Development of plans for the adoption of alternatives to POPs coupled with the introduction of BATs and BEPs;
- vi) Transfer of knowledge, skills and competencies to institutions responsible for the monitoring of POPs;
- vii) Implementation of BATs and BEPs measures for the reduction of unintentionally produced POPs in the environment;
- viii) Acquisition of equipment/technology for the quick detection of the presence of PBDEs in goods including EEE, furniture and vehicles (such as *sliding spark spectroscopy*); and
- ix) Organisation of various training and awareness programmes for Regulatory Authorities, technologists in the industry and technicians.

3.4 DEVELOPMENT AND CAPACITY-BUILDING PROPOSALS AND PRIORITIES

3.4.1 Defining Criteria

The multi-criteria approach was adopted in national priority setting where a set of factors upon which different measures to address the POPs problems that were identified can be assessed to determine significance of any particular measure. The basis for the proposed criteria reflects issues of concern for Tanzania with respect

to the Stockholm Convention obligations and sustainable development. These are: public health, socio-economic development, sustainability of interventions, technology improvement, environmental protection and relevance to Convention obligations.

3.4.1.1 Common criteria

The applied criteria are as indicated in **Table 86**.

Table 86: List of common criteria used in the prioritization of POPs management issues

Criteria	Sub-criteria
a) What are the potential environmental impacts?	i) Quantity of chemical used ii) Evidence of existence of obsolete stocks of chemicals iii) Evidence of contamination in environmental media iv) Evidence of contaminated equipment
b) What are the potential health impacts?	i) Potential to cause severe health effects ii) Frequency of exposure iii) Potential to contaminate food iv) Potential to cause accidental poisoning
c) Evidence of sustainability	i) Evidence of national capacity ii) Improvement in public awareness
d) Monitoring of releases	i) Improvement of releases/leakages of POPs ii) Enhance awareness iii) Guidance in planning and decision making
e) Knowledge base	i) Enhanced awareness in POPs ii) Reduced public health risks iii) Enhance environmental conservation iv) Cooperation among stakeholders v) Entrench sustainability
f) Management of contaminated sites	i) Reduction of risks to public health ii) Enhanced environmental conservation iii) Contribute to poverty reduction iv) Change in productivity v) Improvement of technology
g) Disposal facilities	i) Institutions involved ii) Analysis of their capacity iii) Areas of improvement
h) Institutional cooperation and collaboration	i) Types of cooperation required ii) Institutions involved iii) How effective is the collaboration iv) Frequency of collaboration

3.4.1.2 Specific criteria

In addition to the above-mentioned criteria, some other criteria of relevance to a particular issue were applied. These are indicated in **Table 87**.

Table 87: list of specific criteria used in the prioritization of POPs management issues

Criteria	Sub-criteria
a) Convention obligations	i) Justification to timely phase out ii) Compliance to reporting obligations iii) Compliance to other convention requirements
b) Ability to be Implemented and/or enforceability	i) Existence of relevant legislation ii) Awareness of law enforcers iii) Institutional capacity
c) National priorities	i) Presence of political will ii) Policy support iii) Government budget allocation
d) Socio economic impacts	i) Change of quality of life ii) Change in productivity iii) Poverty reduction
e) Management of POPs releases	i) Evidence of stakeholder's commitment ii) Existence of legislation on control of releases iii) Existence of contaminated sites iv) Efforts on cleaned up or remediation of contaminated sites v) Efforts to prevent further releases
f) Technology	i) Evidence of availability of alternative technology ii) Is the alternative technology effective? iii) Is the alternative technology affordable? iv) Is the alternative technology acceptable?
g) Regional and international cooperation	Accessibility to information from regional or international bodies Experiences in other parts of the world Access to international support Availability of shared resources/facility
h) Access to baseline information	i) Types of baseline information needed to be shared ii) Improvement in information exchange
i) Donors interest	i) Accessibility of technical and financial support ii) Accessibility to technology advances iii) Experiences and lessons

3.4.2 Main Priority Issues

The main priority issues are grouped in 4 major areas. These are as follows:

- a) Legal and institutional framework for management of POPs
 - i) Review of pollution control related policies and legislation for effective implementation of the Stockholm Convention;
 - ii) Strengthen institutional capacity of the government departments and other institutions involved in implementation of the Rotterdam and Stockholm Conventions;
 - iii) Strengthen enforcement of relevant legislation;
 - iv) Develop regulations on monitoring of POPs;
 - v) Strengthen capacity of institutions responsible for coordination of monitoring of POPs releases;
 - vi) Develop mechanisms to promote proper management of stockpiles of POPs, wastes and contaminated sites; and
 - vii) Establish coordination mechanism pertaining to POPs management.

- b) Monitoring of POPs
 - i) Develop monitoring systems on POPs and their impacts to human health and the environment;
 - ii) Establish monitoring standards and procedures/guidelines for POPs releases and procedure for assessment of impacts to human health and the environment; and
 - iii) Establish schemes for monitoring, control and management of releases of POPs and contaminated sites

- c) 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 u-POPs release control.
 - v) Improved overall waste management scheme

- d) Public information, awareness and education
 - i) Develop technical information on POPs for use as reference materials in government departments and agencies, academic and research institutions and CSOs;
 - 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.

3.5 TIMETABLE FOR IMPLEMENTATION STRATEGY AND MEASURES OF SUCCESS

Table 88: The workplan for implementation of the updated NIP

ACTIVITY	TIME FRAME									
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
ACTIONS TO STRENGTHEN INSTITUTIONAL AND REGULATORY FRAMEWORK FOR POPS MANAGEMENT										
Specific Objective 1: Harmonizing institutional and regulatory framework on implementation of POPs management in line with Stockholm Convention										
1. Review and update policies and legislation related to POPs management including development of POPs regulations										
2. Conduct training/education and advocacy campaigns and programmes on POPs to cover all stakeholder groups										
3. Review and implement the existing Draft National Guidelines for Management of POPs and Contaminated Sites										
Specific Objective 2: Strengthening institutional capacity on chemicals and waste management										
1. Establish and maintain a register of POPs (old and new) used, transported, emitted or stored and contaminated sites and their effects to human health and the extent of pollution caused to water, soil, plants, animals and air										
2. Establish and/or strengthen environmental sections/units in each Sector Ministry and LGAs to enable implementation and monitoring of the Chemical Conventions and other MEAs										
3. Develop and regularly review training programme and conduct training to Regulatory Authorities for effective enforcement of the existing legal framework										
4. Update National Profile to assess chemicals management infrastructure										

ACTIVITY	TIME FRAME									
	2017	2018	2019	2020	2021	2022	2023	2024	2026	
Specific Objective 3 : Enhancing capacity on information generation and dissemination on POPs										
1. Assess POPs awareness needs of various stakeholders and prepare National Communication Strategy on POPs and chemicals in general										
2. Prepare and disseminate awareness materials and conduct awareness campaigns on POPs chemicals and their comparative benefits to human health and the environment)										
ACTIONS FOR ENHANCING MANAGEMENT OF POPS PESTICIDES AND DDT										
Specific Objective 1: Reviewing and enforcing the legislation for managing POPs Pesticide and DDT										
1. Review legislation on pesticides and incorporate relevant provisions of the Stockholm Convention related to management of POPs Pesticides and DDT										
2. Develop and implement training programme for Regulatory Authorities										
Specific Objective 2: Improving Human Capacity and Laboratory Infrastructure For Managing POPs Pesticides and DDT Contaminated Sites										
1. Carryout human capacity needs assessment and provide training for management of POPs pesticides and DDT contaminated sites										
2. Carry out laboratory infrastructure needs assessment and prepared investment plan to meet the needs for ESM of POPs										
Specific Objective 3: Increasing the adoption of safe alternatives to POPs Pesticides and DDT										

ACTIVITY	TIME FRAME								
	2017	2018	2019	2020	2021	2022	2023	2024	2026
1. Promote research and adoption of alternatives to POPs Pesticides and DDT									
2. Develop and disseminate awareness materials for raising awareness on the availability and use of alternatives to POPs pesticides and DDT									
3. Develop crop specific Integrated Vector Management (IVM) and Integrated Pest Management (IPM) packages based on requirement									
Specific Objective 4: Enhancing Institutional Coordination on Human Health Monitoring and Information Generation and Dissemination									
1. Carry out human capacity needs assessment and provide training on monitoring human health exposures of POPs pesticides and DDT and environmental contamination									
2. Carry out studies on human health exposure of POPs pesticides and DDT and levels of environmental contamination									
3. Develop and disseminate awareness materials on human health exposure of POPs pesticides and DDT									
4. Strengthen inter-institutional coordination mechanisms on POPs (National POPs Coordinating Committee; National Environmental Advisory Committee; collaboration between VPO-DoE and DoE-Zanzibar)									
ACTIONS TO REDUCE ADVERSE EFFECTS FROM PCBs TO HEALTH AND THE ENVIRONMENT									
Specific Objective 1: Controlling and managing PCBs oils and containing equipment									

ACTIVITY	TIME FRAME								
	2017	2018	2019	2020	2021	2022	2023	2024	2026
1. Establish facilities for collection, management and disposal of PCB equipment and oils									
2. Conduct comprehensive national inventory of PCBs (including identification of contaminated sites, field testing and laboratory analysis)									
3. Identify and promote adoption of BATs and BEPs to PCBs									
4. Review relevant legislation on PCBs to incorporate requirements of the Stockholm Convention									
5. Strengthen enforcement of legislation and implementation of guidelines on PCBs management									
6. Identify training needs and carry out training for monitoring, analysis and management of PCBs									
7. Carryout needs assessment and procure equipment for monitoring, analysis and management of PCBs									
Specific Objective 2: Raising public awareness on PCB									
1. Develop awareness information and materials and conduct awareness campaigns on management of PCBs to key stakeholders and the public									
2. Develop a comprehensive plan for monitoring, control and management of PCB releases and contaminated sites									
3. Demonstrate appropriate clean up and remediation schemes of contaminated sites									
4. Implement clean up and remediation schemes of all remaining contaminated sites									

ACTIVITY	TIME FRAME								
	2017	2018	2019	2020	2021	2022	2023	2024	2026
ACTIONS TO ENSURE ENVIRONMENTALLY SOUND MANAGEMENT OF PBDEs									
Specific Objective 1: Enhancing regulatory framework for PBDEs									
1. Review relevant legislation and Regulations to incorporate management and control of PBDEs									
2. Develop training programme and conduct training to Regulatory Authorities on the control and management of PBDE containing waste categories									
Specific Objective 2: Improving capacity for monitoring and control of imports and exports of PBDE/ goods									
1. Establish a data register on imported and exported equipment and goods containing PBDEs									
2. Procure equipment for rapid detection of the presence of PBDEs in EEE, vehicles and furniture									
3. Develop inspection guidelines for equipment on market that may contain PBDEs									
Specific Objective 3: Monitoring the levels of PBDE in various environmental compartments/media									
1. Develop and implement national monitoring framework for PBDEs and other POPs in general									
2. Develop training program and conduct training to Regulatory Authorities and other key stakeholders on monitoring of PBDEs in various environmental media									
3. Conduct regular monitoring of PBDEs in articles and products; humans; wildlife and cattle; fish; plants and other relevant media									

ACTIVITY	TIME FRAME								
	2017	2018	2019	2020	2021	2022	2023	2024	2026
4. Develop and maintain database on POP-PBDEs to include risk profile on contaminated sites									
Specific Objective 4: Implementing sound management practices of PBDE containing materials/articles/ wastes and contaminated sites									
1. Identify and assess priority contaminated sites and potential remediation needs (including dumpsites/landfills) and conduct regular monitoring of PBDEs									
2. Assess current management practices and options for ESM of PBDE-containing materials/articles/WEEE plastic and promote the implementation of BAT/BEP for the recycling and ESM waste disposal of articles containing POP-PBDEs									
3. Develop material flow analysis (MFA) and substance flow analysis of PBDE-containing materials									
Specific Objective 5: Raising awareness of stakeholders on PBDEs									
1. Develop and disseminate awareness materials and conduct awareness campaign on adverse effects and ESM of PBDEs and alternatives to PBDEs									
ACTIONS TO SAFEGUARD HUMAN HEALTH AND ENVIRONMENT FROM ADVERSE EFFECTS OF PFOS, ITS SALTS AND PFOS-F									
Specific Objective 1 : Identifying PFOS and PFOS- containing goods									
1. Conduct comprehensive national inventory of PFOS, its salts and PFOSF and alternatives used for PFOS									
Specific Objective 2: Strengthening Regulatory Framework for management and control of PFOS									

ACTIVITY	TIME FRAME									
	2017	2018	2019	2020	2021	2022	2023	2024	2026	
1. Review and update relevant legislation and regulations to incorporate management and control of PFOS, its salts and PFOSE										
2. Develop training programme and conduct training to Regulatory Authorities and key stakeholders on the control and management of PFOS										
Specific Objective 3: Raising stakeholders' awareness on PFOS										
1. Develop awareness materials and conduct awareness campaign on environmental and human health effects of PFOS to the public, as well as on switching to safer alternatives										
Specific Objective 4 : Managing appropriately the stockpiles and wastes containing PFOS										
1. Develop national phase-out plan of PFOS stockpiles and wastes										
2. Identify, test and promote adoption and application of appropriate BAT/ BEP for management of PFOS containing stocks										
Specific Objective 5: Enhancing the capacity for management and monitoring PFOS releases										
1. Equip laboratories for monitoring of PFOS										
2. Monitor releases of PFOS from municipal landfills (including groundwater, surface water and biota)										
Specific Objective 6: Managing and controlling the sites contaminated with PFOS										

ACTIVITY	TIME FRAME								
	2017	2018	2019	2020	2021	2022	2023	2024	2026
1. Identify, develop risk profile and create database on PFOS contaminated sites									
2. Conduct monitoring of PFOS contaminated sites									
3. Identify, test and promote adoption and application of appropriate BAT/BEP for ESM of PFOS contaminated sites									
ACTIONS TO MINIMIZE AND PREVENT PCDD/PCDF RELEASES FROM UNINTENDED SOURCES									
Specific Objective 1: Minimization of PCDD/PCDF releases from medical waste management activities									
1. Develop awareness raising materials and conduct awareness campaigns on PCDD/PCDF at all levels with emphasis on health and medical practitioners									
2. Strengthen monitoring and enforcement mechanisms of laws and regulations									
3. Train medical personnel on sound medical waste management along cleaner production concepts									
4. Rollout BATs and BEPs in hospitals and medical facilities									
Specific Objective 2: Minimization of PCDD/PCDF releases from municipal waste management (including waste burning)									
1. Develop awareness raising materials and conduct awareness campaigns to all stakeholders involved in municipal waste management on sources of PCDD/PCDF and reduction measures									
2. Strengthen enforcement mechanisms of City, Municipality, Town by-laws									

ACTIVITY	TIME FRAME								
	2017	2018	2019	2020	2021	2022	2023	2024	2026
3. Finalize and implement National Waste Management Strategy and Action Plan									
4. Identify and promoted adoption and application of BAT and BEP in municipal waste management									
Specific Objective 3: Minimization of PCDD/PCDF releases from open burning and accidental fires									
1. Develop and implement national strategy to mitigate open burning and accidental fires									
2. Conduct awareness raising campaigns of the general public on sources of PCDD/PCDF (focusing on open burning and accidental fires)/ impacts of health and environmental impacts of the same and need for their elimination									
Specific Objective 4: Strengthening the capacity to monitor and enforce on releases of PCDD/PCDF									
1. Establish capacity needs of relevant institutions for monitoring PCDD/PCDF and procure monitoring equipment									
2. Develop training programme and conduct training to relevant institutions in PCDD/PCDF monitoring									
3. Conduct annual monitoring of PCDD/PCDF releases									
ACTIONS FOR STRENGTHENING MANAGEMENT OF CONTAMINATED SITES									
Specific Objective 1: Establishing a management system for contaminated sites									
1. Establish and maintain a register for POPs contaminated sites									
2. Update relevant legislation and regulations to incorporate control and management of contaminated sites									

ACTIVITY	TIME FRAME									
	2017	2018	2019	2020	2021	2022	2023	2024	2026	
3. Develop monitoring standards and guidelines on sampling, analysis and reporting										
4. Develop and implement monitoring programme for contaminated sites										
5. Develop training programme and conduct training to experts on monitoring activities (sampling, analysis and reporting requirements)										
Specific Objective 2: Cleaning-up and remediate contaminated sites										
1. Carry out risk assessment (both human and biota ecosystem) and include information in the register of contaminated sites										
2. Assess feasible treatment options and carry out remediation of contaminated sites										
3. Establish appropriate land use management plans for the contaminated sites										
Specific Objective 3: Updating existing awareness programmes to include management of contaminated sites										
1. Develop and implement specific awareness programmes on contaminated sites										
ACTIONS TO ESTABLISH INFORMATION EXCHANGE MECHANISMS										
Specific Objective 1: Establishing information exchange capacity at the National Focal Point										
1. Improve mechanism of exchange of information about POPs with National Focal Point (including common procedures for information collection and exchange)										

ACTIVITY	TIME FRAME									
	2017	2018	2019	2020	2021	2022	2023	2024	2026	
2. Strengthen the system for exchange of information between civil society, government and institutions that are designated as competent and responsible for the implementation of the Stockholm Convention										
3. Collect, update and process data sent by the competent authorities, and transmit them to the Convention Secretariat within the reporting obligations										
Specific Objective 2: Establishing information dissemination infrastructure										
1. Sensitize research institutions and scientists on information exchange										
2. Support development and maintaining of reliable information databases at relevant sources										
3. Collect, acquire, store and manage technical information as reference materials										
4. Develop and implement strategic interventions to address capacity needs of NGOs, CBOs, youth and women groups and private sector										
ACTIONS TO PROMOTE AND FACILITATE PUBLIC INFORMATION, AWARENESS AND EDUCATION ON POPS ISSUES										
Specific Objective 1: Strengthening awareness and outreach										
1. Prepare and implement special and targeted awareness programs like seminars, workshops etc for NGOs, CBOs and media.										

ACTIVITY	TIME FRAME								
	2017	2018	2019	2020	2021	2022	2023	2024	2026
2. Prepare and disseminate information packages to targeted groups (such as maintenance engineers in industries)									
Specific Objective 2: Promoting public awareness on POPs and other hazardous chemicals									
1. Revise and develop public awareness programmes in collaboration with stakeholders									
2. Support preparation and implementation of media programmes									
3. Support awareness activities of institutions with related programs (i.e. NEMC, ZEMA, MLWEE-Zanzibar, GCLA, TPRI, TANESCO and ZECO)									
4. Designate and publicize information centres (such as regional libraries)									
5. Arrange for press conference during commemoration of the World Environment Day.									
Specific Objective 3: Imparting knowledge and skills on POPs and other hazardous chemicals to schools									
1. Conduct 3 training sessions annually for 40 primary and secondary schools' teachers and relevant education stakeholders on POPs and other hazardous chemical issues for 6 zones including Zanzibar.									
2. Develop training modules for academic and professional development programs									
ACTIONS FOR STRENGTHENING CAPACITY ON RESEARCH, DEVELOPMENT AND MONITORING OF POPS									

ACTIVITY	TIME FRAME									
	2017	2018	2019	2020	2021	2022	2023	2024	2026	
Specific Objective 1: Strengthening monitoring capacity of POPs in the environment										
1. Undertake needs assessment, develop and implement National Capacity Building Plan for Monitoring of POPs (including levels of POPs and tracking of products/goods containing POPs)										
2. Review and adopt standards, procedures/guidelines for sampling and analysis of POPs										
3. Develop and implement accreditation programme of laboratories for research and monitoring of POPs in food, environment and for human health surveillance										
4. Develop and implement comprehensive National POPs Monitoring Programme										
5. Conduct risk assessment on impacts of POPs exposure to human health and the environment										
Specific Objective 2: Improving the coordination, information exchange and research on POPs and their alternatives										
1. Develop and implement national research agenda on chemicals including POPs and their alternatives and effects										
2. Strengthen and maintain database of research findings at relevant institutions										
3. Establish Annual National Environmental Forum to facilitate dissemination of relevant research findings and sharing of environmental information										

3.6 NIP IMPLEMENTATION STATUS

A summary on the status of implementation of the Stockholm Convention in Tanzania is as follows:

Article 3: Measures to reduce or eliminate releases from intentional production and use

- i) *Promulgation and enforcement of the Environmental Management Act (2004)*: The Act has provisions on hazardous waste, toxic chemicals and Persistent Organic Pollutants (POPs).
- ii) Tanzania does not import chemicals under annexes (A) and (B), not even for the purpose of sound elimination from the environment or for any other purpose allowed.
- iii) Environmental Management (Hazardous Waste Control and Management) Regulations, 2009 have been formulated for the control hazardous waste substances POPs included.
- iv) Hazardous Waste Management Guidelines have been developed for the safe handling of hazardous substances including POPs
- v) *Implementation of Integrated Pest Management (IPM)*: The Ministry of Agriculture, Livestock and Fisheries 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 in different areas. This has resulted in reduced use of pesticides use in cotton by 50%.
- vi) Tanzania has officially de-registered Lindane and Endosulfan importation and use at the 24th Pesticides Approval and Registration Technical Sub Committee (PARTS) meeting held on 2nd to 6th December 2014.

Article 4: Register of specified exemptions:

- i) There is no record of specified exemptions because of the absolute ban concerning all the chemicals under annexes (A).

Article 5: Measures to reduce or eliminate unintentional production

- i) National Cleaner Production Strategy (2007) has been developed and its implementation is on-going in which more than 70 industries have been involved in implementing cleaner technologies and techniques.

Article 6: Measures to reduce or eliminate releases from stockpiles and unwanted wastes

Through the ASP, about 1,000 tonnes of obsolete stocks of POPs Pesticides and contaminated soil were collected and sent abroad for disposal in 2013.

Article 7: Implementation plans

- i) Tanzania completed the initial NIP and submitted to the Secretariat of the Stockholm Convention on 12 June 2006.
- ii) Tanzania has also developed an updated NIP

Article 8: Listing Chemicals in Annexes (A), (B) and (C)

- i) Tanzania has not submitted any proposal to the Secretariat for listing a chemical in Annexes A, B and/or C. However, based on the submission by other parties and evaluation thereafter by respective Committee, the country has supported listing of the new POPs from 2009.

Article 9: Information Exchange

- i) The Vice President's Office is the designated National Focal Point for the exchange of information related to the Convention, particularly on the reduction or elimination of the production, use and release of persistent organic pollutants and alternatives to persistent organic pollutants, including information relating to their risks as well as to their economic and social costs. The Focal Point Parties has been exchanging the required information to the Secretariat.

Article 10: Public information, awareness and education

- i) National Environment Communication Strategy is in place.
- ii) Awareness campaigns on management of POPs targeting different stakeholder groups have been conducted over the years through workshops, seminars, international and national events such as Commemorations of World Environment Day, Commemoration of Farmers Day (*Nane Nane Day*). Trained technicians of power utility firms in PCBs management;
- iii) Trained Municipal and District Council personnels on Best Available Techniques (BATs) and Best Environmental Practices (BEPs for management of PCDD/PCDF releases;
- iv) Trained environmental inspectors and other law enforcement bodies on POP issues;
- v) NGOs including AGENDA, Envirocare, TAPoHE and IRTECO trained

over 1,000 people including extension officers, researchers, laboratory scientists/technicians, post graduate students, primary and secondary school teachers, community based organizations on toxicology, health and environmental effects of toxic pesticides and alternatives between 2004 and 2016.

- vi) NGOs developed and disseminated information awareness materials including print [brochures, posters, leaflets] and electronic, radio, TV. Also AGENDA is managing an East Africa chemical management [SAICM] stakeholder's e-mail list serve for information sharing/exchange on chemicals and wastes. The list comprises government agencies, private sector, research and academia, private sector, media, NGOs and individuals. ANCAP held two major International conferences, eleven summer schools and eight regional symposia on pesticides. One of the symposium was specific for DDT.
- vii) Identified and developed database on POPs contaminated sites;
- viii) Developed guidelines on PCBs and management of contaminated sites;
- ix) The VPO-DoE and GCLA developed and disseminated of awareness materials on POPs [brochures and posters] on POPs pesticides, industrial POPs, u-POPs, and wastes.
- x) Awareness creation workshops on the health effects of POPs to medical practitioners and poison centres have been conducted;

Article 11: Research, development and monitoring

Article 11 requires that Parties facilitate and encourage research, development and monitoring of POPs on their sources, releases, transport levels and trends and effects in humans and environment and support international obligations aimed at research, data collection and monitoring. Tanzania has:-

- i) Conducted studies to determine the extent of sites contaminated by POPs Pesticides in Vikuge, Tengeru and Morogoro in Coast, Arusha and Morogoro Regions respectively. A number of other Government Departments and agencies, including Department of Public Health (e.g. Environmental Health, National Institute of Medical Research (NIMR) National Malaria Research Programme have significant research portfolios on chemicals including POPs and information will be further strengthened to utilize information gathered on POPs alternatives. Ifakara Health Institute (IHI) has conducted research on malaria including hosting malaria vector research group in Africa; providing new insights on vector ecology, developing and testing new control methods, and providing surveillance on malaria transmission. IHI has also done research on malaria vaccine trials as well as studies to test the effectiveness of drugs and diagnostics. .
- ii) Tropical Pesticides Research Institute (TPRI) supported in conducting research on alternatives to pesticides over years including POPs pesticides.

- iii) NGOs such as AGENDA, ENVIROCARE, TAPOHE, IRTECO have conducted monitoring on pesticide use and community monitoring

The Government will:

- i) Continue to support scientific researches to underpin policy development on POPs; and
- ii) Enhance environmental monitoring.

Article 12: Technical assistance

The Convention require Parties to recognize that rendering of timely and appropriate technical assistance in response to requests from developing country Parties and Parties with economies in transition is essential to the successful implementation of this Convention. The Parties shall also cooperate to provide timely and appropriate technical assistance to developing country Parties and Parties with economies in transition, to assist them, taking into account their particular needs, to develop and strengthen their capacity to implement their obligations under this Convention.

Tanzania has received technical assistance on various implementation aspects including training on inventory, toolkit and preparation and review of the NIP. Technical support received from UNIDO, UNEP, UNDP and UNITAR.

Article 13: Resources and financial mechanisms:

- i) Tanzania has received a number of financial support from GEF, UNEP, UNIDO, UNITAR, WHO, Sida, EU, GTZ, UNDP, Switzerland to support chemical and waste related activities

Article 15: Reporting

- ii) First national report on implementation of the Stockholm Convention was submitted to the Secretariat on 31 July 2007; while the second national report was submitted on 16 January 2012.

Article 16: Effectiveness evaluation

According to the Convention, effective evaluation shall be conducted on the basis of available scientific, environmental, technical and economic information, including reports and other monitoring information.

The Conference of the Parties decided at its first meeting that the national reports shall be submitted every four years. In order to enable the interpretation and comparison of trends, it is important that Parties complete their national reports

in a timely and accurate manner. Each Party designates an Official Contact Point who has the authority to submit a national report to the Secretariat. The first six-year evaluation cycle takes place between 2010 and 2017. At its eighth meeting, the Conference of the Parties will consider the effectiveness evaluation report on all elements, and the recommendations of the effectiveness evaluation committee for future evaluation procedures.

3.7 RESOURCE REQUIREMENTS

The estimate of resource requirements is based on cost assessment in specific action plans and strategies. **Table 89** provides the overall overview of funds necessary for NIP implementation.

Table 89: Indicative resources required for NIP implementation (2017-2026)

Action Plan	Estimated Resource Requirements (USD)	Comments
1.1.1 ACTIVITY: INSTITUTIONAL AND REGULATORY STRENGTHENING MEASURES	Sub-total (1): 1,825,000 Tanzania Mainland:1,420,00 Zanzibar:355,000	
1.1.3 ACTIVITY: PRODUCTION, IMPORT AND EXPORT, USE, STOCKPILES, AND WASTES OF ANNEX A POPs PESTICIDES (ANNEX A, PART I CHEMICALS) AND DDT	Sub-total (2): 735,000 Tanzania Mainland:588,000 Zanzibar:147,000	
1.1.4 ACTIVITY: PRODUCTION, IMPORT AND EXPORT, USE, IDENTIFICATION, LABELLING, REMOVAL, STORAGE, AND DISPOSAL OF PCBs AND EQUIPMENT CONTAINING PCBs (ANNEX A, PART II CHEMICALS)	Sub-total (3): 8,710,000 Tanzania Mainland:6,500,000 Zanzibar:1,625,000	Total estimated funding for implementation of this action plan does not include costs for replacement of equipment and its disposal, as well as costs of establishment of temporary hazardous waste storage sites.
1.1.5 ACTIVITY: PRODUCTION, IMPORT AND EXPORT, USE, STOCKPILES, AND WASTES OF HEXABDE AND HEPTABDE (ANNEX A, PART IV CHEMICALS) AND TETRABDE AND PENTABDE (ANNEX A, PART V CHEMICALS) (AND HBB, WHERE APPLICABLE (ANNEX A, PART I CHEMICALS))	Sub-total (4): 2,505,000 Tanzania Mainland: 1,604,000 Zanzibar:401,000	

Action Plan	Estimated Resource Requirements (USD)	Comments
1.1.7 ACTIVITY: PRODUCTION, IMPORT AND EXPORT, USE, STOCKPILES, AND WASTES OF PFOS, ITS SALTS AND PFOSE (ANNEX B, PART III CHEMICALS)	Sub-total (5): 2,680,000 Tanzania Mainland: 2,076,000 Zanzibar: 519,000	
1.1.9 ACTION PLAN: MEASURES TO REDUCE RELEASES FROM UNINTENTIONAL PRODUCTION (ARTICLE 5)	Sub-total (6): 4,800,000 Tanzania Mainland:2,040,000 Zanzibar:510,000	
1.1.13 STRATEGY: IDENTIFICATION OF CONTAMINATED SITES (ANNEX A, B, AND C CHEMICALS) AND REMEDIATION IN AN ENVIRONMENTALLY SOUND MANNER	Sub-total (7): 2,700,000 Tanzania Mainland:1,960,000 Zanzibar:490,000	Implementation costs do not include rehabilitation of priority sites contaminated by POPs.
1.1.14 ACTIVITY: FACILITATING OR UNDERTAKING INFORMATION EXCHANGE AND STAKEHOLDER INVOLVEMENT	Sub-total (8): 380,000 Tanzania Mainland:304,000 Zanzibar:76,000	
1.1.15 ACTIVITY: PUBLIC AWARENESS, INFORMATION AND EDUCATION (ARTICLE 10)	Sub-total (9): 1,190,000 Tanzania Mainland:792,000 Zanzibar:198,000	
1.1.18 ACTIVITY: RESEARCH, DEVELOPMENT AND MONITORING (ARTICLE 11)	Sub-total (10): 3,800,000 Tanzania Mainland: 3,040,000 Zanzibar:760,000	
GRAND TOTAL	32,325,000 Tanzania Mainland: 23,460,000 Zanzibar: 8,865,000	

Activities that have not been costed in Action Plans and Strategies, and which represent significant costs are indicated in **Table 89** under the Comments

column. It will be possible to estimate these costs during NIP implementation, once specific activities have been implemented. It is worth noting that Tanzania does not have sufficient funding for the implementation of planned activities and therefore additional financial support would be sought from international financing mechanisms and bodies of the Stockholm Convention, per articles 12 and 13 of the Convention.

ANNEXES

ANNEX I: MEMBERS OF THE NATIONAL POPs COORDINATING COMMITTEE

Name	Institution
1. Mr. Mbarak M. Abdulwakil	Vice President's Office
2. Mr. Richard Muyungi	Vice President's Office
3. Ms. Magdalena Mtenga	Vice President's Office
4. Ms. Shakwanande R. Natai	Ministry of Agriculture, Livestock and Fisheries
5. Ms. Winnifrida Mrema,	Ministry of Energy and Minerals
6. Mr. Haidar B. Machano	Ministry of Lands, Water, Energy and Environment (Zanzibar)
7. Mr. Khamis M. Khamis	Ministry of Agricultural, Natural Resources, Livestock and Fisheries (Zanzibar)
8. Mr. Emmanuel David	Ministry of Finance and Planning
9. Ms. Genoveva Kilabuko	Ministry of Industry, Trade and Investment
10. Ms. Anne Sekiete	Ministry of Health, Community Development, Gender, Elderly and Children
11. Mr. Uledi Musa	Ministry of Works, Transport and Communication
12. Dr. Epiphania Kimaro	Tropical Pesticides Research Institute
13. Mr. Alfred Msokwa	National Environment Management Council (NEMC)
14. Ms. Anna Magashi	Cleaner Production Centre of Tanzania (CPCT)
15. Mr. Hamdur R. Mansur	Tanzania Electric Supply Company
16. Prof. Jamidu Katima	AGENDA

ANNEX II: LIST OF EXPERTS INVOLVED IN THE INVENTORY

S/N	NAME	INSTITUTION
	Mr. Issaria Mangalili	Vice President's Office – Department of Environment
	Mrs. Rogathe Kisanga	Vice President's Office – Department of Environment
	Mr. Daniel Sagata	Vice President's Office – Department of Environment
	Ms. Mgeni Khamisi	Zanzibar Environmental Management Authority (ZEMA)
	Mr. Hamisi M. Hamisi	Ministry of Agriculture, Natural Resources, Livestock and Fisheries – Plant Protection Department – Zanzibar
	Mr. Haidari Bakari	Ministry of Lands, Water Energy and Environment (Zanzibar)
	Mr. Haji A. Haji	Zanzibar Electricity Company (ZECO)
	Ms. Josephine Kalima	Government Chemist Laboratory Agency (GCLA)
	Mr. Damian Gasana	Ministry of Agriculture, Livestock and Fisheries (MALF)
	Mr. Prosper Makundi	Ministry of Agriculture, Livestock and Fisheries (MALF)
	Ms. Genoveva Kilabuko	Ministry of Industry, Trade and Investments (MITI)
	Ms. Anne Sekiete	Ministry of Health, Community Development, Gender, Elderly and Children (MHCdGEC)
	Mr. George J. Ngoso	Tanzania Revenue Authority (TRA)
	Eng. Amon Gamba	Tanzania Eclectic Supply Company (TANESCO)
	Prof. J. H. Y. Katima	AGENDA for Environment and Responsible Development
	Mr. Silvani Mng'anya	AGENDA for Environment and Responsible Development
	Mr. Noel Mirwatu	Cleaner Production Centre of Tanzania (CPCT)
	Mr. Habibu. Mkalanga	Tropical Pesticides Research Institute (TPRI)
	Mr. Arnold C. Kisiraga	National Environment Management Council (NEMC)

ANNEX III: LIST OF STAKEHOLDERS CONSULTED DURING POPs INVENTORY

S/N	INSTITUTION/ COMPANY	CONTACT PERSON AND DESIGNATION	CONTACTS: TELEPHONE/ ADDRESS/ E-MAIL
S01: Institutional and Legal Framework			
	Tanzania Electric Supply Company (TANESCO)	Eng. Mosha T. Izahaki – Manager Transmission Substations	TANESCO Ltd, Head Office, Umeme Park, Morogoro Rd, Ubungo, P.O. Box 9024, Dar es Salaam. Tel: +255 22 245 1203 Mob: 0784 422 425 Email: info@tanESCO.co.tz Website: www.tanESCO.co.tz
		Mr. John Lazimah - Principal Environmental Engineer	TANESCO Ltd Head Office, Morogoro Rd, Ubungo 8 th floor, Environmental section Mob: 0754 522 834
		Mr. Hamis Dobi – Principal Land Surveyor	TANESCO Head Office, Morogoro Rd, Ubungo 8 th floor, Environmental section Mob: 0755 446 385
	Tropical Pesticide Research Institute (TPRI)	Mr. Samwel Mmari – Technician Inspector	TPRI Dar es Salaam Office, Tanzania Bureau of Standards building, Morogoro Rd, Ubungo. Mob: 0713 407206
	Ministry of Agriculture, Livestock and Fisheries (MALF)	Mr. Diomedes Pastory Kalisa - Incharge of Chemical Management Section, Plant Health Services Section	Ministry of Agriculture, Livestock and Fisheries, Plant Health Services Department, P.O. Box 9071, Dar es Salaam. Tel: +255 22 28 65 642 Mob: 0755 660 507 Email: dkmuganyi2@gmail.com
	Ministry of Industry, Trade and Investments (MITI)	Kamara Gombe - Industrial Engineer	Ministry of Industry, Trade and Investments, P.O. Box 9503, Dar es Salaam. Tel: +255 22 218 28 42 Mob: 0712 658 529 E-mail: caropendo@yahoo.com caropelyimo@gmail.com
		Caroline V. Lyimo – Industrial Engineer	
		Mr. Deodatus T. Ndunguru – Director of Industry	

S/N	INSTITUTION/ COMPANY	CONTACT PERSON AND DESIGNATION	CONTACTS: TELEPHONE/ ADDRESS/ E-MAIL
	Ministry of Energy and Minerals (MEM)	John F Kitonga Environmental Section	Permanent Secretary, Ministry of Energy and Minerals, 754/33 Samora Avenue, P. O. Box 2000, Dar es Salaam. Tel:+255 22 2117156 – 9 Fax: +255 22 2120799 Email: info@mem.go.tz Website: webmaster@mem.go.tz
	Ministry of Health, Community Development, Gender, Elderly and Children,	Mr. Honest Anicetus – Acting ADEHS	Permanent Secretary, Ministry of Health, Community Development, Gender, Elderly and Children, 6 Samora Machel Avenue, 11478 Dar es Salaam, Tanzania.
			Phone: +255-22-2120261 Fax: +255-22-2139951 Website: www.moh.go.tz E-mail: ps@moh.go.tz ahonest2000@yahoo.com
	Government Chemist Laboratory Agency (GCLA)	Mr. Sabanitho Mtega - Director of Chemicals Management	Chief Government Chemist & Registrar of Industrial and Consumer Chemicals, Government Chemist Laboratory Agency, P.O. Box 164, Dar es Salaam. +255 22 2113383/4 Mob: + 255 755 078 077 Email: Sabanitho.mtega@gcla.go.tz Website: www.gcla.go.tz
	Muhimbili University of Health and Allied Sciences (MUHAS)	Dr Vera Ngowi – Senior Lecturer and head of department school of Public health	School of Public Health and Social Sciences, P.O. Box 65015, Dar es Salaam. E-mail: vera.ngowi@gmail.com diph@muhas.ac.tz Direct: 022 2153371, Telephone:022 2150302-6, Ext. 222

S/N	INSTITUTION/ COMPANY	CONTACT PERSON AND DESIGNATION	CONTACTS: TELEPHONE/ ADDRESS/ E-MAIL
	AGENDA for Environment and Responsible Development (AGENDA)	Ms. Dorah Swai –Senior Programme officer	Executive Secretary, AGENDA for Environment and Responsible Development, Sinza B, Plot No 545, Mashujaa Street, Sinza Palestina, P.O. Box 77266, Dar es Salaam. Tel: +255 22 2461052 Fax: +255 22 2461054 Email: agenda@agenda-tz.org
	Journalists' Environmental Association of Tanzania (JET)	Ms. Flora Nzema	Journalists' Environmental Association of Tanzania (JET) Bagamoyo Road Junction of Chanika- Dar es Salaam, P.O. Box 15674, Dar es Salaam. Telephone: +255 0737 200330 Mob: +255 754 263965 E-mail: jetassociation@gmail.com Website: www.jettanz.com
	Dar es Salaam City Council (DCC)	Protas Masasi Membe – Head of Waste Management Mr. Richard Kichere – Dump Manager	City Director, Dar es Salaam City Council, Morogoro/ Sokoine Drive, P.O. Box 9084, DAR ES SALAAM. TEL.:255-22-2123551/6 FAX: 255-22-2125589 E-mail: cd@dcc.go.tz Website: www.dcc.go.tz
	Vice President's Office - Division of Environment (VPO-DoE)	Dr. Julius Ningu - Director of Environment Ms. Magdalena Mtenga – Assistant Director of Environment	Vice President's Office, Division of Environment, 6 Albert Luthuli Street, P.O. Box 5380, 11406 Dar Es Salaam. Tel: +255 22 2113857/2116995 Mob: +255 754 467 301 Email: magejohn@yahoo.com , magemtenga@hotmail.com , Website: http://www.vpo.go.tz

S/N	INSTITUTION/ COMPANY	CONTACT PERSON AND DESIGNATION	CONTACTS: TELEPHONE/ ADDRESS/ E-MAIL
	National Environment Management Council (NEMC)	Dr. Robert Ntakumulenga – Director for Environmental Compliance and Enforcement	Director General, National Environmental Management Council (NEMC), Regent Estate Plot No. 29/30, P.O. Box 63154, Dar es Salaam. Tel: +255 22 2774852/4889 Mob: +255 784 526 470 Fax: +255 22 277 4901 Email: ntakumulenga@gmail.com Website: http://www.nemc.or.tz/
	Occupational Safety and Health Authority (OSHA)	Mr. Joshua Matiko - Acting Chief Executive Officer (CEO)	OSHA Headquarter, Mahakama road, P.O. Box 519, Dar es Salaam. Email: tarime@yahoo.com Website: www.osha.go.tz Mob: 0754 295437 Tel: 022 2760548 Fax: 022 2760552
S02: PCBs			
	Tan Pac Tissue Ltd.	Mr K. Prashant Electrician	P.O. Box 21359, Dar es Salaam. Mob: +255 786 000750/ Tel: 22 2700890
	The Guardian, Mikocheni	Mr. P. Masinga Electrician	Dar es Salaam Tel: 022-2700146
	MMI Steel Mills Ltd, Mikocheni,	N. Singh Technician	P.O. Box 3030, Dar es Salaam. Mob: 0774 200100
	Coca Cola Kwanza Ltd Mikocheni Area,	Mr Lusona Mabalika Automation Engineer	P.O. Box 7813, Dar es Salaam. Mob: +255 784 266661
	**IPTL Power Plant,	Mr. Hamza Mboga Safety Officer	P.O. Box 75635, Dar es Salaam. Mob: +255 736 502133
	Tanzania Portland Cement Co. Ltd Wazo Hill	Mr. Khalfan Kassim Electrical Engineer	P.O. Box 1950, Dar es Salaam. Tel: 255670541-
	Sea Cliff	Mr. Krishna Maintenance & Supplies Electrician	Mob: +255 767 998755

S/N	INSTITUTION/ COMPANY	CONTACT PERSON AND DESIGNATION	CONTACTS: TELEPHONE/ ADDRESS/ E-MAIL
	Golden Tulip	Mr K. Sarudani GM	P.O. Box 20200, Dar es Salaam. Tel: 2600288/ 2601443
	**Ubungo Electrical workshop Tanesco Head Quarters	Mr. Mansur, Manager, Environment Mr. Mhongole Mr. Amon Gamba, Senior Engineer	Mob: +255 767 433466
	**Ubungo Electrical workshop Tanesco Head Quarters	Mr. Amon Gamba, Senior Engineer	Mob: +255 767 433466
	**Ubungo Control Centre	Mr. Amon Gamba, Senior Engineer	Tanesco Ubungo
	Tanzania Steel Pipes	Elly Bohella HRO, Sixmund Masanja Engineer	P.O. Box 5476, Dar es salaam. Tel: 255 22-2450475 Email: ufi@cats-net.com
	DAWASA, Upper Ruvu Water intake	Kibaha Area Manager	Kibaha
	**Tanesco Ilala		
	**Sokoine Sub Substation	Mr. Amon Gamba, Senior Engineer	
	**Tazara Sub Station	Mr. John Kamakundi In Charge, Electrical Equipment	Mob: 0744 053784
	Gongo la Mboti Substation	Mr. Amon Gamba, Senior Engineer	
	TAZARA Workshops	Eng. T. Kayani Workshops Manager Mr. B. Kabulwa Ag. Works Engineer	
	MWATEX P.O. Box 1344 Mwanza	Mr. Kaijage Admin. Officer	Email: Mwatex2001@yahoo.com
	TANESCO Regional Office P.O. Box 38 Mbeya.	A. Maganga Regional Manager. Mr. Temu (Mains engineer)	Tel: 2503691, 2504358. Fax: 2504358. Mob: 0744 267943

S/N	INSTITUTION/ COMPANY	CONTACT PERSON AND DESIGNATION	CONTACTS: TELEPHONE/ ADDRESS/ E-MAIL
	TANESCO Regional Office P.O. Box 38 Mbeya.	Mr. A. Mwakibete	
	Kiwira Coal Mine	Mr. Amon Gamba, Senior Engineer	
	Tanesco Tukuyu		
	Mbeya Farm Implements		
	TANESCO Regional Office, Sub Station, P.O. Box 98 Morogoro	Mr. Maclean Mbonile Mr. Ibwe Mr. Ntiba	Tel: 023-2603501; Mob: 0744-823093 Fax: 023-2603515
	TANESCO Msamvu, Sub Station, P.O. Box 98 Morogoro	Mr. Maclean Mbonile Mr. Ibwe Mr. Ntiba	Tel: 023-2604028
	Abood Seed	Mr. Amon Gamba, Senior Engineer , TANESCO	
	Abood Soap	Mr. Amon Gamba, Senior Engineer	
	Tanga		
	TANESCO, Regional Office,	Mr. Richard Malukula Mains Engineer	Mob: +255 748 403707
	Hale	Mr. Richard Malukula Mains Engineer	
	Hale	Mr. Richard Malukula Mains Engineer	
	Nyumba ya Mungu	Mr. Richard Malukula Mains Engineer	
S03: uPOPs			
	Ilala Municipality	Municipal Director Attn: Mr. Pearson P. Kabantega Waste Management Officer	P.O. Box 200950, Dar es Salaam.
	Kinondoni Municipality	Municipal Director Attn: Mr. Msangi, Mohamed Municipal Env. Management Officer Mob: 0784814859	P.O. Box 31902, Dar es Salaam.

S/N	INSTITUTION/ COMPANY	CONTACT PERSON AND DESIGNATION	CONTACTS: TELEPHONE/ ADDRESS/ E-MAIL
	Temeke Municipality	Municipal Director Attn: Mr. Ally Hatibu Head of Dept. of Waste and Environment	P.O. Box 45232, Dar es Salaam.
	Muhimbili Hospital	Mr. John Mrema Environmental Engineer	P.O. Box 65000, Dar es Salaam. Mob: 0715/0754-494078 Email: jmrema18@yahoo.com
	Bagamoyo District Hospital	Mr. Ludimila H. Mgalula Health Officer	P.O. Box, Pwani. Mob: 0713319356/0786193839 Email: mmgalula@gmail.com
	Kibaha Regional Hospital (Tumbi)	Health Officer	P.O. Box 30041, Pwani.
	Mwananyamala Referral Hospital	Mr. Sifa Issa Mgaya Health Officer	P.O. Box 61665, Dar es Salaam. Mob: 07543 16387 Email: sifamgaya@yahoo.com
	Amana Referral Hospital	Mr. Ally Kasembe Environmental Health Officer	P.O.Box 25411, Dar es Salaam. Mob: 0714 208308 Email: kasembeally@yahoo.com
	Temeke Referral Hospital	Mr. Isaac Nombo Health Officer	P.O.Box , Dar es Salaam. Mob: 0715 051050
	Hurbert Kairuki Hospital	Emmi Masiga Hospital Administrator	P.O. Box , Dar es Salaam, Mob: 0714 221577
	Aghakhan Hospital	Reema Shah Safety Officer	P.O.Box , Dar es Salaam. Mob: 0682126405 Email: reema.shah@akhst.org
	Kisarawe District Hospital	Mr. Jackson Mwaga Health Officer	P.O.Box , Pwani. Mob: 0714 005420
	Dar es Saalam abattoirs (Vingunguti Abattoir)	Mr. Philemon Beleko Owner & vice chairman of the abattoir	P.O. Box , Dar es Salaam. Mob: 0763 320610
	Steel Masters Ltd	General Manager	P.O. Box 1364, Dar es Salaam.
	Aluminum Africa Ltd	Ashish Mistry	P.O. Box 2070, Dar es Salaam.

S/N	INSTITUTION/ COMPANY	CONTACT PERSON AND DESIGNATION	CONTACTS: TELEPHONE/ ADDRESS/ E-MAIL
	MM Integrated Still Mill	Mr. Hamisi Migra Furnace In charge	Mikocheni B, Light-Industrial Estate, P.O. Box 3030, Dar Es Salaam. Mob: 0716 997489
	Kamal steel Ltd	Ajay Jha Production Manager	P.O. Box 10392, Dar es Salaam. Mob: 0767 620753
	QUAIM Steel	Mr. Hajan A. Rizri CEO	108-Mwakalinga road, Chang'ombe Light-Industrial, P.O. Box, Dar Es Salaam. Mob: 0713230160
	Ok Plast Ltd	Mr. Gregory Vincent Finance/IT Manager	P.O. Box 8812, Dar es Salaam. Mob: 0754 375028 Email: Gregory.vincent@okplast.com
	TANESCO Headquarters	Eng. Hamdun R. Mansur Manager Environment Attn: Eng. Bulugu A. Patric Thermal Generation Department	P.O. Box 9024, Dar es Salaam. Mob: 0787 932316/ 0712 932316 Email: ahmed.bulugu@tanesco.co.tz
	Independent Power (T) Ltd (IPTL)	Mr. Naresh Kumar Plant Manager	P.O. Box 77173, Dar es Salaam. Mob: 0736502133 Email: naresh@iptl.co.tz
	TaTEDO	Mary Swai Project Manager	P.O. Box, Dar es Salaam. Mob: 0713 549802 Email: mary.swai@tatedo.org
	SONGAS	Mr. Jonnes Masalla Environmental Coordinator	P.O. Box 6342, Dar es Salaam. Mob: 0787 555067
	Tanzania Portland Cement (TPCC)	Mr. Vijay Singh Production Manager	P.O. Box 1950, Dar es Salaam. Mob: 0785 670703
	Kioo Ltd	Mr. Kain Patrick HR Manager	P.O. Box 9273, Dar es Salaam. Email: in@kiooglass.com
	Ministry of Transport	Eng. Sekei Deputy Director Environment	P.O. Box 11476, Dar es Salaam.

S/N	INSTITUTION/ COMPANY	CONTACT PERSON AND DESIGNATION	CONTACTS: TELEPHONE/ ADDRESS/ E-MAIL
	Tanzania Revenue Authority	Commissioner for Customs and Exercise	P.O. Box 9053, Dar es Salaam.
	Bureau of Statistics	Director of Statistics and Operations	P.O. Box 11992, Dar es Salaam.
	TAZARA	Mr. Hussein H. Jumbe Senior Operation Officer Equipment	P.O. Box 2834, Dar es Salaam.
	TANPAK TISSUE LTD	Mr. Mehul Shah Operations Executive	Mikocheni B, light- industrial area P.O. Box Dar es Salaam Tel: 022-2773901/3 Email: operations@tanpacktissue.com
	Plasco Ltd	Mr. Mithun R. Pillai Production Manager	Mbozi Road, Chang'ombe industrial area P.O. Box, Dar es Salaam. Tel: 022-2860751 Email: mithun.pillai@plasco.co.tz
	East African Cables	Eng. Lubasha Malengea Maintenance Manager	P.O. Box 508, Dar es Salaam. Mob: 0754 283552
	SILA Africa Ltd (Simba Plastic Ltd)	Mr. Athuman Hussein Production Manager	P.O. Box 11078, Dar es Salaam. Mob: 0784 800071 Email: athumani@silaafrica.com
	Lake Trading Company (Kibaha Tannery)	Mr. Alawi Abdulla Al-Beiti Tannery Manager	P.O. Box 744, Dar es Salaam. Mob: 0754 319136 Email: alawi-albeiti@hotmail.co.uk
	Urafiki Textile Mills	Mr. Thomas P. Mushi Production Manager	P.O. Box, Dar es Salaam. Mob: 0713 300755
S04: PFOS and its Salts			
	The Director Division of Environment VPO	Dr. Ningu Ms. M. Mtenga	P. O. Box 5380, Dar es salaam. Tel: + 255 22 2113857, Email: ps@vpo.go.tz
	The Chief Government Chemist	Prof. S. Manyele GCLA	P.O. Box 164, Dar es salaam. Tel: +255 22-2113320 Email: cgc@gcla.go.tz

S/N	INSTITUTION/ COMPANY	CONTACT PERSON AND DESIGNATION	CONTACTS: TELEPHONE/ ADDRESS/ E-MAIL
	MMI Steel Mills Ltd, Mikocheni	Mr V. Madhwaraj Production Manager	P.O. Box 3030, Dar es Salaam. Tel: 022-2771309 Fax: 022-2775426
	Kamal Steel	Mr. Ajay Jha General Manager	Mob: 0767 620753 Email: info@kamalsteel.com
	Aluminium Africa	Mr. Ashish Mistry General Manager	
	Steel Masters	Mr. Rab Babu Administrator	P.O. Box 1364, Dar es salaam.
	Ok Plast	Mr. Gregory Vincent Manager, Finance	Tel: 022-2844223 022-2843181
	Urafiki- Friendship Textile Mill Dar es salaam	Mr. Thomas Paul Mushi Production Manager	Mob: 0713 300755
	Tanesco Head Quarters	Mr Mansur, Manager, Environment Mr. Amon Gamba -Senior Engineer	
	Tanzania Airports Authority (T.A.A) Julius Nyerere International Airport	Mr Prosper P.K.B Tesha General Manager, Mr. Timanywa ,Manager	Tel: 022-2842402
	Tanzania Airports Authority (T.A.A) Mwanza Airport	Mr. Hamidu A. Nguya, Station Officer, Fire & Rescue Force	Tel: 0754-294682
	Tanzania Airports Authority (T.A.A) Mbeya International Airport	Ms. Joyce Kasebele, Environmental Management Officer	Tel: 022-2842402
	Tanzania Airports Authority (T.A.A) Bukoba Airport	Mr. Julius K. Mlungwana. Airport Manager	Tel: 028-2220311
	Tanzania Petroleum Development Corporation	Dr. E. Lekei Ag. Director General Mr. Alex Ilemesa Directorate of upstream	Tel: 022-22200104
	Tropical Pesticides Research Institute	Mr. H. Mkalanga Ag. Registrar	P.O. Box 3024, Arusha.
	Government Chemist Laboratory Agency	Prof. S, Manyele Chief Government Chemist	

S/N	INSTITUTION/ COMPANY	CONTACT PERSON AND DESIGNATION	CONTACTS: TELEPHONE/ ADDRESS/ E-MAIL
	Tanzania Ports Authority Fire & Safety Department	Mr. Johnson Ndege Principal Fire And Safety Officer	Tel: 02116254
	Tanzania Airports Authority (T.A.A) Mwanza Airport	Mr. Julius Msofe Electrical Technician Mr. D.S Malongo Airport Manager	P.O. Box 8, Mwanza.
	Pan African Energy	Mr. Richard Msumule Mr. Baraka Sentory Health, safety and environment officer	P. o. Box, Dar es Salaam. Tel: 022-2138737
	SONGAS	Mr. Moses Mgeni SHE Coordinator	P.o. Box, Dar es salaam
	OPHIR E.A. Ventures Ltd	Doug Rycroft Asset General Manager, Tanzania	Tel: +255 22 221 5500
	DOMINION Tanzania Ltd	Doug Rycroft, Asset General Manager,	Tel: +255 22 2602531
	BG Tanzania Ltd.	MD, Mtwara	
	Halliburton	HSE, OysterBay, Dar esalaam	
	IPTL Ltd.	Mr. Naresh Yadav, Plant Manager Mr. Hamza Mboga, SHE	P.O. Box 75635, Dar es Salaam. Tel: 022-2650747
	ORYX Gas	Kurasini,	Dar es salaam
	ORYX Oil	Kurasini,	Dar es salaam
	Dodsal Hydrocarbons & Power (T) PVT Ltd (DHPT)	Mr.Dave Durant	Tel: +255 22 2199 406
	Sakson Drilling & Oil Services	Mr. M. Eldardiry, QHSE Director	Email: HSSE@dodsalresources.com
	PUMA Energy	Mr. Blasio Menchi, HSE	Mob: +255 786 180480
	BEACH Petroleum	Managing Director	
	LUGUMI Enterprises	Managing Director, Fire Fighting	Tel: 022-2133980
	Crestod Enterprises Ltd	Mr. Odunga Managing Director	Mob: 0715 001356 Dar es salaam
	Qualitizers Investment Company Ltd	Francis T. Kasambala Managing Director	Mob: 0767 009898 Dar es salaam

S/N	INSTITUTION/ COMPANY	CONTACT PERSON AND DESIGNATION	CONTACTS: TELEPHONE/ ADDRESS/ E-MAIL
	Mudope Timber & General Supplies Ltd	Mr. Ephrem Tonya Director of Business.	Mob: 0754 989785
	Fire & Rescue Force	Mr. Jesuald S. Ikonko Commander Special Zone Fire And Rescue	Tel: 114 Mob: 0766 728034 Dar es salaam
	Lugoda Fire Masters	Mr. Ephrem Tonya Director of Business.	Mob: 0719 088563 Dar es salaam
	Symbion (T) Ltd.	Eng. Moses Mwandenga SHE Coord	Dar es salaam
	Ilala Municipality	Municipal Director Attn: Mr. Pearson P. Kabantega Waste Management Officer	P.O. Box 200950, Dar es Salaam.
	Kinondoni Municipality	Municipal Director Attn: Mr. Msangi, Mohamed Municipal Env. Management Officer	P.O. Box 31902, Dar es Salaam. Mob: 0716 413458/ 0784 814859
	Temeke Municipality	Municipal DirectorAttn: Mr. Ally Hatibu Head of Dept. of Waste and Environment	P.O. Box 45232, Dar es Salaam.
	Tan Pac Tissue Ltd.	Mr Thomas DAS Paper Technician Mr, Mehul Shah Operations Executive	P.O. Box 21359, Dar es Salaam. Tel: 022-2700163 Fax: 022-2700890 Tel: 0222773901
	Tanzanian Air Services Dar es Salaam	Mr. John D. Samaras	Tel: +255 222843131
	Coastal Travels	Mr. Thomas Minja	Tel: +255 222843171 Dar es salaam
	ZANTAS Air Services	Mr. Mohamed Kabezi	Dar es salaam
	AURIC Air	Mr. Abdulla Essack	Mob: +255 783723274 Email: abdulla@auric.com Dar es salaam
	Everett Aviation Limited G.M.	Mr. Tony Macharia	Tel : +255 222190800 Email: Tanzania.ops@everettaviation.com Dar es salaam

ANNEX IV: LIST OF PARTICIPANTS DURING THE INCEPTION AND TRAINING WORKSHOP FOR UPDATING INVENTORY OF INITIAL AND NEW POPs, 11TH -14TH FEBRUARY, 2014, BLUE PEARL HOTEL, DAR ES SALAAM

S/N	NAME	INSTITUTION	CONTACTS
1	Mr. Sazi B. Salula	Vice President's Office	ps@vpo.go.tz
2	Dr. Julius Ningu	Vice President's Office – Division of Environment	jkningu@yahoo.com 0715 733904
3	Ms. Magdalena Mtenga	Vice President's Office – Division of Environment	magejohn@yahoo.com 0754 467301
4	Prof. Jamidu Katima	University of Dar es Salaam	jkatima@katima.org 0787 717102
5	Mr. Issa Musa Nyashilu	Vice President's Office – Division of Environment	nyashilu1979@gmail.com 0769 978 546
6	Mr. Daniel Sagata	Vice President's Office – Division of Environment	dsagata1@gmail.com 0688 431391
7	Ms. Martha Ngalowera	Vice President's Office – Division of Environment	stinatheo@yahoo.com 0784 589 610
8	Mr .Noel Mirwatu	Cleaner Production Centre of Tanzania (CPCT)	Williamnoel35@yahoo.com 0712 033 475
9	Ms. Rose Julius	AGENDA for Environment and Responsible Development	jro199@yahoo.co.uk 0712 746 374
10	Mr. Arnold Kisipaga	National Environment Management Council (NEMC)	akisiraga@hotmail.com 0784 608 877
11	Mr. Alfred Msokwa	National Environment Management Council (NEMC)	amsokwa@yahoo.com 0784 598 007
12	Ms. Genoveva Kilabuko	Ministry of Industry, Trade and Investments (MITI)	genovevakilabuko@yahoo.com 0754 465 659
13	Ms. Erlinda Galvan	UNIDO, Vienna	e.galvan@unido.org
14	Dr. Roland Weber	UNIDO, German	roland.weber.10@web.de +49-174-712-5593
15	Mr. Habib Mkalanga	Tropical Pesticides Research Institute (TPRI)	hmkalanga@yahoo.com 0714 715 096
16	Ms. Rogathe Kisanga	Vice President's Office – Division of Environment	rogathe2002@yahoo.com 0754 363 288
17	Mr. Dafa Frank	Confederation of Tanzania Industries (CTI)	cti@cti.co.tz 0652 352 052

S/N	NAME	INSTITUTION	CONTACTS
18	Mr. Haji A. Haji	Zanzibar Electricity Company (ZECO)	hajijames57@hotmail.com 0777 842 722
19	Ms. Jacqueline Mwenda	TIRDO	jamwendwa@hotmail.com 0756 636 636
20	Ms. Nassra Hussein	Tanzania Bureau of Standards (TBS)	nasrayassir@yahoo.com
21	Mr. Prosper Makundi	Ministry of Agriculture, Livestock and Fisheries	makundi.prosper99@gmail.com 0754 200 142
22	Ms. Euphrasia Shayo	ENVIROCARE	eushacq@yahoo.com 0754 272 285
23	Mr. Yusuph Kamote	Tanzania Electric Supply Company (TANESCO)	yusufraja2000@yahoo.com 0713 252 423
24	Dr. E. Masanja	University of Dar es Salaam	emasanja@gmail.com 0655 282 328
25	Ms. Evelyn Mkokoi	Vice President's Office	emkokoi@yahoo.com 0713 197438
26	Mr. Haidar B. Machano	Ministry of Agriculture, Natural Resources – Zanzibar	0773 105 978
27	Mr. Gasana R. D	Ministry of Agriculture, Livestock and Fisheries (MALF)	0784 410 184
28	Mr. Emmanuel David	Ministry of Finance and Planning	emmanueldavid362@yahoo.com edavid@mof.go.tz 0786 983 500
29	Mr. Jerome W. Mathew	Occupational Safety and Health Authority (OSHA)	jeromethew@hotmail.com 0713 078 882
30	Mr. George J. Ngoso	Tanzania Revenue Authority (TRA)	gejohn@tra.go.tz 0756 407 407
31	Mr. Fredrick Salukele	Ardhi University	Fredrick.salukele@gmail.com 0715 400 480
32	Ms. Josephine Kalima	Government Chemist Laboratory Agency (GCLA)	josephinekalima@gcla.go.tz

ANNEX V: LIST OF PARTICIPANTS DURING NATIONAL VALIDATION WORKSHOP ON INVENTORIES OF OLD AND NEW POPs, 25TH JUNE 2015, NATIONAL INSTITUTE FOR MEDICAL RESEARCH (NIMR), DAR ES SALAAM

S/N	NAME	INSTITUTION	CONTACTS
	Eng. Angelina Madete	Deputy Permanent Secretary, Vice President's Office – Division of Environment	nzula2007@gmail.com
	Ms. Magdalena Mtenga	Vice President's Office – Division of Environment	magejohn@yahoo.com 0754 467301
	Mr. Issaria Mangalili	Vice President's Office – Division of Environment	imangalili@yahoo.co.uk 0718 612474
	Ms. Rogathe Kisanga	Vice President's Office – Division of Environment	rogathe2002@yahoo.com 0754 363288
	Ms. Zainab Kuhanwa	Vice President's Office – Division of Environment	zaikuhanwa@yahoo.com 0713 238703
	Mr. John D. Ikombe	Vice President's Office - Division of Environment	jdikombe@yahoo.com 0755 870295
	Ms. Grace Mkinga	Vice President's Office - Division of Environment	0653 375757
	Ms. Lulu Mussa	Vice President's Office - Division of Environment	lulumussa@yahoo.com 0754 567291
	Mr.Said Athumani	Vice President's Office – Division of Environment	saidathumani@gmail.com 0719 428892
	Mr. Enock Sanga	Vice President's Office – Division of Environment	enock.sanga@yahoo.com 0753 326234
	Mr. Haidar B. Machano	Ministry of Lands, Water Energy and Environment (Zanzibar)	haidar.machano@yahoo.com 0773 105978
	Ms. Anne Sekiete	Ministry of Health, Community Development, Gender, Elderly and Children	annesekiye@yahoo.com 0786 915727
	Mr. Ephraim Mushi	Ministry of Energy and Minerals	ejmushi@gmail.com 0752 024337
	Mr. Kungulu Kasongi	Ministry of Energy and Minerals	kkasongi@yahoo.com
	Mr. Yusuph A. Muya	Ministry of Works, Transport and Communication	yusmuya@gmail.com 0715 805556

S/N	NAME	INSTITUTION	CONTACTS
	Mr. Christopher Mgifi	Ministry of Industry, Trade and Investments	christopher.mgifi@mit.go.tz 0713/0783 041478
	Mr. Marco Mihambo	Ministry of Education, Science and Technology	marco.mihambo88@gmail.com
	Mr. Alfred Msokwa	National Environment Management Council (NEMC)	amsokwa@yahoo.com 0784 598007
	Mr. Arnold Kisiraga	National Environment Management Council (NEMC)	akisiraga@hotmail.com 0784 608877
	Mr. Fikiri Mtandika	Tanzania Electric Supply Company (TANESCO)	mtandikaf@gmail.com 0717 017197
	Mr. Haji A. Haji	Zanzibar Electricity Company (ZECO)	hajiame57@hotmail.com 0777 842722
	Mr. Khamis M. Khamis	Ministry of Agriculture, Natural Resources, Livestock and Fisheries - Zanzibar	khamisppd@yahoo.com 0773 210264
	Ms. Yolanda Mbatia	National Institute for Medical Research (NIMR)	yolanda.mbatia@gmail.com 0787 926452
	Mr. Gasana R. Damian	Ministry of Agriculture, Livestock and Fisheries	gasanadamian@yahoo.com 0762 787336
	Ms. Euphrasia Shayo	Envirocare	pushacq@yahoo.com 0754 272285
	Ms. Kalima, Josephine	Government Chemist Laboratory Agency (GCLA)	josephinekalima@yahoo.com 0715 605178
	Mr. Ernest Zayumba	Ministry of Health, Community Development, Gender, Elderly and Children	zayumbae@gmail.com 0718 944650
	Dr. Charles Kihampa	Ardhi University	kihampa@aru.ac.tz 0783 665000/0713 269069
	Dr. John A.M. Mahugija	University of Dar es Salaam	P.O. Box 35061 johnmahugija@yahoo.com 0719 971971/0766 971971

S/N	NAME	INSTITUTION	CONTACTS
	Prof. Jamidu Y. H. Katima	University of Dar es Salaam	P.O. Box 35131 DSM jkatima@katima.org 0787 717102
	Mr. Silvani Mng'anya	AGENDA	semnganya@gmail.com 0713 226568/0762986953
	Mr. Habib Mkalanga	Topical Pesticides Research Institute (TPRI)	hmkalanga@yahoo.com 0714 715096
	Mr. Dafa Frank	Confederation of Tanzania Industries (CTI)	dafafrank@cti.co.tz 0652 352052
	Ms. Salome G. Killo	Vice President's Office – Division of Environment	0754 758114
	Mr. Alex Ntandu	Vice President's Office – Division of Environment	0682 762388

**ANNEX VI: LIST OF PARTICIPANTS DURING NATIONAL
STAKEHOLDERS POPs PRIORITY VALIDATION
WORKSHOP, 10TH NOVEMBER 2015, PEACOCK HOTEL,
DAR ES SLAAM**

S/ No	NAME	INSTITUTION	CONTACTS
	Dr. Julius K. Ningu	Vice President's Office – Division of Environment	jkningu@yahoo.com
	Ms. Magdalena Mtenga	Vice President's Office – Division of Environment	magejohn@yahoo.com 0754 467301
	Mr. Issaria Mangalili	Vice President's Office – Division of Environment	issariam@gmail.com 0718 612474
	Eng. Amon Gamba	Tanzania Electric Supply Company (TANESCO)	amongamba@tanESCO.co.tz
	Ms. Anne Sekiete	Ministry of Health, Community Development, Gender, Elderly and Children	annesekiete@yahoo.com
	Ms. Josephine Kalima	Government Chemist Laboratory Agency (GCLA)	josephinekalima@gcla.go.tz
	Mr. Gasana Damian	Ministry of Agriculture, Livestock and Fisheries	gasanadamian@yahoo.com
	Mr Daniel Sagata	Vice President's Office – Division of Environment	0688 431391 dsagata1@gmail.com
	Mr. Haidar B. Machano	Ministry of Lands, Water Energy and Environment (Zanzibar)	0773 105978 haidar.machano@yahoo.com
	Ms. Mgeni Khamis	Zanzibar Environmental Management Authority (ZEMA)	mgeni2020@yahoo.com
	Mr. Haji A. Haji	Zanzibar Electricity Company (ZECO)	hajiame57@hotmail.com
	Mr. Khamis Mohamed Khamis	Ministry of Agriculture, Natural Resources, Livestock and Fisheries - Zanzibar	khamisppa@yahoo.com
	Mr. George John Ngoso	Tanzania Revenue Authority (Customs and Excise)	gejohn@tra.go.tz or gngoso@gmail.com
	Mr. Anold C. Kisiraga	National Environment Management Council (NEMC)	akisiraga@hotmail.com
	Mr. Prosper U. Makundi	Ministry of Agriculture, Livestock and Fisheries	makundi.prosper99@gmail.com

S/ No	NAME	INSTITUTION	CONTACTS
	Ms. Zainab Kuhanwa	Vice President's Office – Division of Environment	0713 238703 zaikuhanwa@yahoo.com
	Mr. Silvani Mng'anya	AGENDA	0762 986953 semnganya@gmail.com
	Ms. Geneveva Kilabuko	Ministry of Industry, Trade and Investments	0754 465659 genovevakilabuko@yahoo.com
	Mr. Marco Mihambo	Ministry of Education, Science and Technology	marcomahamba88@gmail.com
	Mr. Noel Mirwatu	CPCT	cpct@arscp.org or williamnoel35@yahoo.com
	Mr. Victor Akim	UNIDO – Dar es Salaam	vakim@unido.org
	Ms. Monica Sapanjo	Vice President's Office – IO	iorchmnso@yahoo.com
	Ms. Rogathe D. Kisanga	Vice President's Office – Division of Environment	rogathe2002@yahoo.com
	Prof. Jamidu Katima	University of Dar es Salaam	0787 717102
	Ms Oliver Mutagaywa	Vice President's Office – Division of Environment	0713 488172
	Mr. Peter Kinyongo	Vice President's Office – Division of Environment	0715 358222
	Eng. Ephraim Mushi	Ministry of Energy and Minerals	0752 024337
	Ms. Neema Tindamanyire	Mommission for Science and Technology (COSTECH)	0767 147947
	Dr. Hamis M. Malebo	National Institute for Medical Research (NIMR)	0762 377387
	Ms. Euphrasia Shayo	ENVIROCARE	0754 272285
	Mr. Alex Ntandu	Vice President's Office – Division of Environment	0759 408038
	Mr. Ali O. Khalfan	Vice President's Office – Division of Environment	0772 800842
	Mr. Sanny Magoti	Vice President's Office – Division of Environment	0787 518666
	Mr. John D. Ikombe	Vice President's Office – Division of Environment	jkikombe@yahoo.com

**ANNEX VII: LIST OF PARTICIPANTS DURING NATIONAL
STAKEHOLDERS WORKSHOP FOR THE ENDORSEMENT
OF REVISED NATIONAL IMPLEMENTATION PLAN (NIP)
FOR THE IMPLEMENTATION OF THE STOCKHOLM
CONVENTION ON POPs, 3RD OCTOBER, 2016, SUA,
MOROGORO**

S/No	NAME	INSTITUTION	CONTACTS
	Ms. Magdalena Mtenga	Vice President's Office – Division of Environment	magejohn@yahoo.com 0754 467301
	Mr. Issaria Mangalili	Vice President's Office – Division of Environment	imangalili@yahoo.co.uk 0718 612474
	Ms. Rogathe Kisanga	Vice President's Office – Division of Environment	rogathe2002@yahoo.com 0754 363288
	Mr. John D. Ikombe	Vice President's Office	jdikombe@yahoo.com 0755 870295
	Mr. Said Athumani	Vice President's Office – Division of Environment	saidathumani@gmail.com 0719 428892
	Ms. Anne Sekiete	Ministry of Health, Community Development, Gender, Elderly and Children	annesekiete@yahoo.com 0786 915727
	Mr. Marco Mihambo	Ministry of Education, Science and Technology	marco.mihambo88@gmail. com
	Mr. Alfred Msokwa	National Environment Management Council (NEMC)	amsokwa@yahoo.com 0784 598007
	Mr. Haji A. Haji	Zanzibar Electricity Company (ZECO)	hajiame57@hotmail.com 0777 842722
	Mr. Khamis M. Khamis	Ministry of Agriculture, Natural Resources, Livestock and Fisheries - Zanzibar	khamisppd@yahoo.com 0773 210264
	Nassir T. Ali	Ministry of Lands, Water, Energy and Environment- Zanzibar	0773 245398 nassirtahir@gmail.com
	Mgeni M. Khamisi	Zanzibar Environmental Management Authority (ZEMA)	0777 465539 mgeni2020@yahoo.com
	Mr. Gasana. R. Damian	Ministry of Agriculture, Livestock and Fisheries	gasanadamian@yahoo.com 0762 787336
	Ms. Euphrasia Shayo	Envirocare	eushacq@yahoo.com 0754 272285
	Ms. Kalima, Josephine	Government Chemist Laboratory Agency (GCLA)	josephinekalima@yahoo. com 0715 605178

S/No	NAME	INSTITUTION	CONTACTS
	Dr. John A.M. Mahugija	University of Dar es Salaam – Chemistry Department	P.O. Box 35061 johnmahugija@yahoo.com 0719 971971/0766 971971
	Mr. Silvani Mng'anya	AGENDA	semnganya@gmail.com 0713 226568/0762986953
	Mr. Perege Gumbo	Confederation of Tanzania Industry (CTI)	pgumbo@cti.co.tz 0652 352052
	Mr. Alex Ntandu	Vice President's Office	0682 762388
	Fatuma Nandule	Tanzania Revenue Authority (TRA)	0714 612067 fnandule@tra.go.tz
	Calister P. Imeda	National Institute for Medical Research (NIMR)	0656 843455 Calister_imed@yahoo.com
	Seleboni John	Ministry of Natural Resources and Tourism	0752 545087 selebonijohn@yahoo.com
	Elizabeth E. Massawe	Ministry of Works, Transport and Communication	0768 466749 Elizabeth.massawe@uchukuzi.go.tz
	Prosper Makundi	Ministry of Agriculture, Livestock and Fisheries – Environment Management Unit	0714 200142 makundi.prosper@gmail.com
	Genoviva Kilabuko	Ministry of Industry, Trade and Investments (MITI)	0781 465659 genovevakilabuko@yahoo.com
	Winnifrida Mrema	Ministry of Energy and Minerals (MEM)	0716 171745 wsmrema@gmail.com
	Dr. Gerald Kafuku	Tanzania Commission for Science and Technology (COSTECH)	0766 604977 kafukugm@gmail.com
	Prof. D.N. Kimaro	Sokoine University of Agriculture (SUA)	0754 575321 didas_kimaro@yahoo.com
	Jeniva Olengeile	VPO - DoE	0759 020727 olengeilejeniva@yahoo.com
	Mwanahawa Mdelele	VPO	0716 386520 mwanahawamdelele@yahoo.com
	Stephen Biduda	VPO	0656 063676 Stephen.biduda@vpo.go.tz

ANNEX VIII: LIST OF PARTICIPANTS DURING THE NATIONAL STEERING COMMITTEE MEETING, 18TH OCTOBER, 2016, NATIONAL INSTITUTE FOR MEDICAL RESEARCH (NIMR), DAR ES SALAAM

S/ No	NAME	INSTITUTION	CONTACTS
MEMBERS OF THE STEERING COMMITTEE			
	Dr. Islam S. Salum	Ministry of Agriculture, Natural Resources, Livestock and Fisheries - ZANZIBAR	banumchenga@gmail.com 0776 116 693
	Ms. Magdalena Mtenga	Vice President's Office – Division of Environment	magejohn@yahoo.com 0754 467301
	Mr. Silvani Mng'anya	AGENDA	semnganya@gmail.com 0713 226568/0762986953
	Eng. Hamdun R. Mansuli	Tanzania Electrical Supply Company (TANESCO)	hamdun.mansur@tanESCO.co.tz 0713 562 622
	Mr. Victor Akim	UNIDO	v.akim@unido.org 0754 788 562
	Mr. Haidar B. Machano	Zanzibar Environmental Management Authority (ZEMA)	hbm444333@gmail.com 0773 105978
	Ms. Winifrida Mrema	Ministry of Energy and Minerals (MEM)	wsmrema@gmail.com 0716 177 145
	Ms. Anne Sekiete	Ministry of Health, Community Development, Gender, Elders and Children (MoHCDGEC)	annesekiete@yahoo.com 0786 915727
	Mr. Emmanuel David	Ministry of Finance and Planning	edavid@mof.go.tz 0767 983 500
	Eng. Peter Nyang'ombe	Ministry of Industries, Trade and Investments (MITI)	premaster2005@yahoo.ca 0756 141 179
	Mr. Alfred Msokwa	National Environment Management Council (NEMC)	amsokwa@yahoo.com 0784 598007
	Mr. Prosper Makundi	Ministry of Agriculture, Livestock and Fisheries (MALF)	makundi.prosper99@gmail.com 0754 200 142
	Dr. Epiphania Kimaro	Tropical Pesticides Research Institute (TPRI)	kimaro_epi@yahoo.com 0754 892 678

S/ No	NAME	INSTITUTION	CONTACTS
	Anna Magashi	Cleaner Production Centre of Tanzania (CPCT)	anmagashi@yahoo.com 0754 686 793
	Ms. Elizabeth Massawe	Ministry of Works, Transport and Communication (MoWTC)	elizabeth.massawe@Uchukuzi.go.tz 0768 466 749
INATTENDANCE			
	Mr. Damian Gasana	Ministry of Agriculture, Livestock and Fisheries (MALF)	gasanadamian@yahoo.com 0762 787336
	Ms. Kalima, Josephine	Government Chemist Laboratory Agency (GCLA)	josephinekalima@yahoo.com 0715 605178
	Ms. Adelaida Tillya	Vice President's Office – Division of Environment	adetillya@yahoo.com 0767 265 100
	Mr. John D. Ikombe	Vice President's Office	jdikombe@yahoo.com 0755 870295
	Mr. Is Haqa	Vice President's Office Division of Environment	bnyusuph@gmail.com 0715 547 282
	Mr. Stephen Biduda	Vice President's Office	0656 063 676
	Ms. Prisca Marcelli	Vice President's Office	marcelli@yahoo.com 0713 576 710
	Mr. Alex Ntandu	Vice President's Office	0682 762388
SECRETARIAT			
	Mr. Issaria Mangalili	Vice President's Office – Division of Environment	imangalili@yahoo.co.uk 0718 612474
	Ms. Rogathe Kisanga	Vice President's Office – Division of Environment	rogathe2002@yahoo.com 0754 363288
	Mr. Said Athumani	Vice President's Office – Division of Environment	saidathumani@gmail.com 0719 428892
	Ms. Jeniva Olengeile	Vice President's Office – Division of Environment	olengeilejeniva@yahoo.com 0759 020 727

