Government of Zimbabwe

National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants for Zimbabwe

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Ministry of Environment
and Natural Resources
Management

GEF

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National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants for Zimbabwe 2013.

Copies of this document are available from:

Ministry of Environment and Natural Resources Management
11th Floor, Kaguvi Building
Corner Fourth Street/ Central Avenue
P. Bag 7753, Causeway
Harare
Zimbabwe

Tel: +263 4 701861-3
Fax: +263 4 252673

Foreword

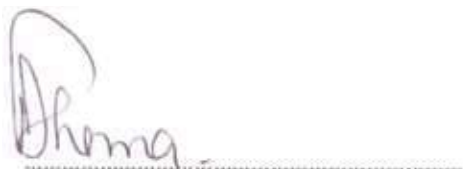
The Government of Zimbabwe places great importance on environmental issues, as we believe in looking after the environment today for the benefit of future generations. It is for that reason that we have prepared this National Implementation Plan (NIP) for the Stockholm Convention, to enable us to meet our obligations under the Convention. The Stockholm Convention aims to protect human health and the environment from Persistent Organic Pollutants (POPs), and requires parties to take the necessary measures leading to the reduction and ultimate elimination of POPs.

As a nation, we have signed and ratified the Stockholm Convention (ratification on 3rd March 2012), which is an indicator of our commitment to ridding our nation of POPs. Preparing this National Implementation Plan further demonstrates our willingness to actively take part in reducing the production and use of POPs. The National Implementation Plan identifies Zimbabwe's priority issues in terms of POPs, and also sets out action plans for addressing the priority issues. Implementing the action plans should therefore result in effectively solving Zimbabwe's problems which pertain to POPs.

This National Implementation Plan was prepared over a two year period under a project that was coordinated by the Ministry of Environment and Natural Resources Management. Stakeholder involvement in the project was very high, as shown by the fact that a multi-stakeholder POPs National Coordinating Committee actively provided advice and guidance for the successful implementation of the project. Many of the activities for preparing this NIP were also carried out by various task teams whose members were drawn from the various stakeholders. The Government of Zimbabwe wishes to thank the members of the National Coordinating Committee and the various task teams involved in the preparation of this NIP, for the sterling work they put into the process.

The preparation of this NIP was financed by the Global Environment Facility (GEF), through the United Nations Environment Programme (UNEP). During the process, UNEP also provided a lot of technical expertise on how best to come up with this final product. The Zimbabwe Government would therefore like to express its sincere gratitude to the Global Environment Facility and the United Nations Environment Programme for providing the resources to produce this NIP.

Now that Zimbabwe has produced its National Implementation Plan, the next stage is implementing the action plans herein. We will seek funding for implementing the action plans from both the local and international donor communities, and we believe with the cooperation that we have witnessed in the preparation of this NIP, the implementation should be a smooth flowing exercise.



Hon. F. D. C. Nhema (MP)
Minister of Environment and Natural Resources Management

Executive Summary

The National Implementation Plan (NIP) has been produced as a guiding document of how Zimbabwe will meet its obligations under the Stockholm Convention on Persistent Organic Pollutants (POPs). The NIP, which is a requirement under Article 7 of the Convention, identifies Zimbabwe's priority issues concerning POPs, and sets out action plans for addressing the priority issues.

The Stockholm Convention

The Stockholm Convention (SC) is a global treaty that aims to protect human health and the environment from a group of highly toxic chemicals known as Persistent Organic Pollutants (POPs). POPs are toxic to both humans and the environment and they bioaccumulate in the fatty tissues of living organisms, persist in the environment for long periods before breaking down into less harmful substances and can travel long distances from where they were originally produced. POPs can be pesticides, industrial chemicals or unintentionally-produced bi-products of combustion and other processes. The Stockholm Convention requires parties to take measures aimed at reducing and ultimately eliminating the production and use of POPs. The Convention also requires each party to produce a National Implementation Plan detailing how the party will meet its obligations under the Stockholm Convention.

The NIP Development Process

The production of Zimbabwe's NIP was coordinated by the Ministry of Environment and Natural Resources Management. Guidance and advice for the project were provided by a multi-stakeholder National Coordinating Committee (NCC). Many of the activities were carried out by task teams drawn from various stakeholders. The development of the NIP involved establishment of POPs inventories, assessment of infrastructure for the management of POPs, identification of POPs priorities, setting of objectives for addressing the priorities, formulating the NIP and development of specific action plans for meeting the objectives. The NIP is structured into three chapters, which are the introductory chapter giving background information on the NIP, the second chapter which is an assessment of Zimbabwe's baseline information, including an assessment of POPs in Zimbabwe, and the third chapter which outlines the prioritized issues and the action plans for addressing the priority issues.

The Zimbabwean Profile

Zimbabwe is a landlocked country with a population of 12.97 million as at 2012. It is a sovereign state with a democratic government, and is headed by an Executive President. The country is divided into 10 provinces. Agriculture and mining are the backbone of the country's economy. The main environmental concerns are deforestation, land degradation due to illegal mining activities, soil erosion, poor waste management practices, and pollution.

Regulatory Mechanisms for Chemicals and Environmental Management

Zimbabwe has a robust legislative environment for addressing general environmental management issues, but falls short when it comes to addressing specific POPs issues. The main pieces of legislation for environmental management in general, and POPs in particular, are the Environmental Management Act which provides for the management of general waste, hazardous waste and hazardous substances; the Fertilizer, Farm Feeds and Remedies Act which provides for the registration of pesticides, and the Factories and Works Act which provides for the regulation of conditions of work in the factories. These legal instruments are often not as effective as they could be due to lack of awareness of their existence in certain cases, and insufficient enforcement.

Non-Regulatory Instruments for Chemicals and Environmental Management

There are also non-regulatory mechanisms for environmental and chemicals management. These include environmentally sound technologies (formerly known as, and encompassing Cleaner Production), which employ resource use efficiency to reduce waste, recover materials for reuse, and reduce the emissions of certain chemicals. Other voluntary environmental management mechanisms include systems certification schemes like ISO 14001 offered by the national standards body, Standards Association of Zimbabwe. The ISO 14001 Environmental Management System certification is especially useful in terms of PCBs management, as all those organizations seeking certification are required to know and record the PCB status of their electrical equipment, specifically power transformers and capacitors. The non-regulatory instruments are often not very effective because the high costs of putting up environmentally sound technologies deter a lot of industries, and some stakeholders are also unaware of their existence (as in the case of using Integrated Pest Management (IPM) and Integrated Vector Management (IVM) to replace pesticides).

Relevant International Conventions to which Zimbabwe is party

Zimbabwe is party to a number of chemicals management related conventions, which include the Stockholm Convention on Persistent Organic Pollutants¸ the Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal, the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, and the Bamako Convention on the Ban of the Importation into Africa of Hazardous Waste. The country is also a party to the Vienna Convention¸ the Montreal Protocol, the United Nations Framework Convention on Climate Change, the Kyoto Protocol and ILO Convention 170. For most of the Conventions, an office has been established in the relevant Ministry for administering issues pertaining to the Convention. In some cases, the requirements of the Conventions have been enshrined in local legislation, such as the Vienna Convention through the ban of CFC emitting substances. In many cases, however, the requirements of the Convention have not yet been enshrined in local legislation, such as the sound management of PCBs and U-POPs, hence enforcement of the Convention requirements at a local level poses a challenge.

Roles and Responsibilities of Different Players in Chemicals Management

There are many different players, both Governmental and Non-Governmental, who play important roles in ensuring sound chemicals management. The Governmental Ministries and departments include the Ministry of Health and Child Welfare in malaria control and chemical analysis of various substances; the Ministry of Agriculture, Mechanization and Irrigation Development in pesticides registration, analysis of pesticides residues and control of animal pests and diseases; Environmental Management Agency which oversees the management of hazardous substances, hazardous waste and general waste and runs an analytical laboratory; the Zimbabwe Electricity Supply Authority which generates and provides electricity for the nation, and thus manages the majority of transformers in the country; the National Social Security Authority which oversees occupational safety and health issues for workers in Zimbabwe; the Zimbabwe Revenue Authority which monitors products that are imported into country; and the Zimbabwe National Statistical Agency which compiles statistical data for Zimbabwe covering a wide range of thematic areas, including import and export data, employment data, and chemicals usage data.

The Non-Governmental Organizations include the Business Council for Sustainable Development Zimbabwe which encourages commitment by industry to environmentally sustainable business practices; the Standards Association of Zimbabwe which facilitates the development of national standards and encourages their implementation and also offers laboratory services and systems certification; the Confederation of Zimbabwe Industries which acts as the representative voice for the manufacturing industry; the Consumer Council of Zimbabwe which aims to protect consumers; CropLife which encourages its members (who are distributors of pesticides) to uphold FAO principles

on the distribution and use of pesticides; various universities which provide human and technical resources for supporting environmental monitoring and research; the Scientific and Industrial Research and Development Centre which carries out research into agricultural production, looks into issues of food security, and also houses the Cleaner Production Centre; the Drug and Toxicology Information Service which carries out research, advocacy and awareness raising on chemicals management; and the GEF-Small Grants Programme which is raising awareness on POPs in communities.

Assessment of POPs in Zimbabwe

Assessment with respect to POPs Pesticides

POPs pesticides have never been formulated in Zimbabwe, and they are all banned. Historically POPs pesticides such as dieldrin were used for tsetse control and in agriculture. In spite of the ban on POPs pesticides, the use of certain pesticides still occurs, though, especially chlordane which has been observed on supermarket shelves being sold as a household ant killer. Lindane and endosulfan, which are new POPs, have been imported into the country in recent years. The registration of pesticides is done by the Ministry of Agriculture, Mechanization and Irrigation Development.

Assessment with respect to DDT

Historically, DDT was used to control tsetse fly and agricultural pests before it was banned. Now, Zimbabwe allows only the Ministry of Health and Child Welfare to carry out indoor residual spraying (IRS) with DDT for malaria vector control. The Ministry of Health and Child Welfare requires about 140 tonnes of the pesticide per annum, although the exact volumes imported vary from year to year depending on availability of funds. The DDT is strictly sprayed indoors in malaria-endemic areas, and there are about 22 districts (out of a total of 59 districts in Zimbabwe) where this is done. The protocol for the use of DDT is tightly controlled to protect human health, animals, plants as well as the general environment.

In terms of determining quantities of POPs pesticides available in Zimbabwe, a preliminary inventory was carried out in 2011-2012. The inventory targeted all obsolete pesticides, regardless of whether they are POPs or not. The inventory gave an estimate quantity of 100 tonnes of obsolete pesticides requiring destruction, the bulk of which is constituted by empty methyl bromide containers and contaminated agricultural equipment. The figure is very much a preliminary estimate, as only a small percentage of the country was covered during the inventory exercise. The inventory also revealed that obsolete pesticide storage facilities in the country are often very poorly maintained.

Assessment with respect to PCBs

PCBs have never been produced in Zimbabwe¸ but PCB-contaminated transformers continue to be used in the country. Import of PCB-contaminated equipment most likely occurs, as there is no law compelling importers of electrical equipment to determine the PCB status of their equipment.

A PCB inventory was carried out in 2011, in which 505 transformers were tested for PCB contamination, of which 39 were found to be PCB contaminated. The ages of the contaminated transformers ranged from those manufactured in 1936, to some manufactured in 2007. Several pure PCB capacitors were also noted during the field inventory exercise, particularly at mineral processing operations. No pure PCB transformers were noted during the field visits, but they are expected to be present in the country.

The Zimbabwe Electricity Transmission and Distribution Company, ZETDC, which owns the majority of transformers in Zimbabwe, owns about 39,000 transformers, while the Zimbabwe Power Company and other private companies own about 3,000 transformers, giving Zimbabwe about 42,000 transformers. The sample size of transformers that were tested for PCBs was therefore quite

small due to budgetary constraints (about 1.3 % of the total number). There is thus need to carry out a more comprehensive and detailed PCB inventory. The inventory was, however, very useful in that it showed that PCB contamination is not limited to the pre-1980 transformers, as had been expected, but even those manufactured in 2007 (more than 20 years after the manufacture of PCBs was discontinued) were found to be contaminated.

Assessment with respect to Unintentionally-produced POPs (U-POPs)

A survey was carried out in 2011-2012 to determine the amounts of U-POPs (dioxins and furans) released from the different sources. It was observed that the biggest sources of dioxin release are, in descending order, burning of waste, biomass burning, medical waste incineration, fossil fuel power plants, sewage treatment and metal production.

Current Level of Information, Awareness and Education

The level of awareness among members of the public, on POPs and general pesticide management issues in Zimbabwe, is very low. During the PCB inventory it was observed that awareness of PCB issues even among those who work with transformer oil is very low, as some workers would desist from wearing the appropriate Personal Protective Equipment (PPE) when dealing with transformer oil because they "were so used to it". Although there are various programmes to raise awareness on general environmental issues, awareness raising on POPs issues is very low.

Overview of Technical Infrastructure for POPs Assessment

An assessment of the capacity of Zimbabwean laboratories to analyze for POPs was carried out. It was discovered that generally, the Zimbabwean laboratories do have the capacity to test for POPs pesticides and pesticide residues, but in many cases, the analytical instruments are outdated and need to be upgraded. There are at least three known laboratories with the capacity to test for PCBs. There are no laboratories with the capacity to analyze air samples for dioxins.

Identification of Impacted Populations

There have been a few studies to determine the impact of POPs on humans and the environment in Zimbabwe. Those on humans have mostly been carried out by the University of Zimbabwe Medical School, and include studies on the residues of organochlorine pesticides in human milk from mothers living in greater Harare; assessment of environmental pollution by PCBs, DDT and its metabolites using human milk of mothers in Zimbabwe; and an evaluation of DDT and DDT residues in human breast milk in the Kariba Valley of Zimbabwe. It has generally been observed that concentrations of DDT are high in the breast milk of mothers who live in malaria endemic areas, but DDT is present even in the milk of mothers who live in areas where DDT has never been applied.

Studies have also been carried out to evaluate the impact of pesticides that were sprayed for tsetse control, on wildlife. Results indicate that DDT seemed to be both bioaccumulating and biomagnifying in the Kariba area, and levels were generally high compared to areas which were not sprayed for tsetse control.

Prioritized POPs Issues

After assessment of POPs, priority issues of concern were identified, and objectives for addressing the priority issues were set. There were six categories of priorities and objectives, namely general chemicals management priorities, obsolete pesticide specific priorities, DDT-specific priorities, PCBs-specific priorities, U-POPs specific priorities and New POPs-specific priorities. After setting objectives, specific action plans for achieving the objectives were set.

Specific Action plans for General Chemicals Management Issues

The following action plans (which were subsequently developed into projects) for addressing general chemicals management issues were set. Implementing these action plans will put in place a sound framework for improving POPS management in Zimbabwe.

Project	Approximate Duration	Approximate Cost in USD
Establishment and development of POPs risk monitoring and evaluation for POPs risks to human health and the environment	Two years	1,300,000
Reviewing current legislation on hazardous chemicals	Three years	50,000
Development and implementation of effective communications strategy to raise POPs awareness at all levels	Development within 1 year, Implementation to be ongoing	150,000
Development of a national hazardous chemicals management policy	One year	10,000
Upgrading 25% of national analytical laboratories	Three years	5,000,000
Total		**6,520,000**

Specific Action Plans to Address Obsolete Pesticides Issues

The following action plans for addressing obsolete pesticide issues were set:

Project	Approximate Duration	Approximate Cost in USD
Raising public awareness on POPs and pesticide management issues	Three years	400,000
Establishing and implementing a monitoring programme to monitor and evaluate impact of awareness raising	Two years	60,000
Conducting a full scale national inventory of obsolete pesticides	One year	1,900,000
Establishment of central obsolete pesticides storage areas	Two years	500,000
Implementation of sound environmental management of obsolete pesticides through safeguarding, clean-up of contaminated sites & disposal of obsolete pesticide and associated materials	Three years	3,000,000
Strengthening policy and regulatory regimes related to pesticide management at country level	Three years	600,000
Building capacity for sound pest and pesticide management, including the incorporation of IPM	Two years	300,000
Clearing all POPs from supermarket shelves	Nine months	160,000
Creation of a Central Pesticides Management Database	One year	15,000
Total		**6,935,000**

Specific Action Plans to Address DDT Usage
The following action plans for addressing obsolete pesticide issues were set:

Project	Approximate Duration	Approximate Cost in USD
Building capacity for the promotion and application of alternatives to DDT in vector management, focusing on gradually phasing out DDT use in vector management	Two years	300,000
Participating in a regional project to promote and demonstrate alternatives to DDT in vector management	Five years	1,000,000
Total		**1,300,000**

Specific Action Plans to Address PCBs Issues
The following action plans for addressing PCBs issues were set:

Project	Approximate Duration	Approximate Cost in USD
Developing and implementing a comprehensive awareness programme on PCBs and their associated risks	Two years	1,384,000
Establishment and implementation of a monitoring programme to monitor and evaluate impact of awareness programmes	Two years	60,000
Conducting a comprehensive/ full scale national inventory of PCB-containing or contaminated equipment and oil	Two years	435,000
Exploring the most feasible option for PCB destruction in Zimbabwe or in the region and preparing for a PCB disposal programme (or participating in a regional PCB project)	Three years	1,250,000
Establishment of provincial temporary PCB-storage sites (transfer stations)	Three years	200,000
Strengthening the policy and legal framework for PCB management, to include the prohibition of the importation, exportation, manufacturing, use and sale of PCB-contaminated equipment and oils	Three years	200,000
Total		**3,529,000**

Specific Action Plans to Address U-POPs Issues

The following action plans for addressing U-POPs issues were set:

Project	Approximate Duration	Approximate Cost in USD
Improvement of hazardous waste management	Five years	1,500,000
Improvement of waste management in the country	Five years	3,000,000
Reduction of the hectarage burnt by veld fires by 10% annually	Three years	50,000
Reduction of the emissions of fossil fuel power stations by 5% annually	Three years	3,000,000
Adoption by all health facilities, of BEP in their incinerators and evaluation of the option to adopt BAT where feasible, at the same time assessing alternative treatments and possibly implementing those in pilot projects	Five years	3,000,000
Implementation of BEP and evaluation of the options to adopt BAT where feasible, by 50% of those industries which contribute most highly to dioxin formation	Five years	3,000,000
Assessment of consumption of clay by pregnant woman and other population groups and monitoring of the related clay quarries	Two years	50,000
Conducting an inventory of all POPs- and hazardous chemicals- contaminated sites	Two years	400,000
Total		**14,000,000**

Specific Action Plans for Addressing New POPs

It was decided that Zimbabwe would focus on E-waste under new POPs, as it contains brominated flame retardants, most of which have been listed under new POPs. Zimbabwe would also participate in a regional project to update the NIP and include all the new POPs. The action plans below will be carried out to address the new POPs.

Project	Approximate Duration and Timing	Approximate Cost in USD
Development and promotion of sound / sustainable E-Waste management	Five years	5,100,000
Participating in a regional project to up-date this NIP in order to include all new POPs	Two years	200,000
Total		**5,300,000**

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List of Acronyms

BAT	Best Available Techniques
BCSDZ	Business Council for Sustainable Development Zimbabwe
BEP	Best Environmental Practices
CCZ	Consumer Council of Zimbabwe
CFCs	Chlorofluorocarbons
COMESA	Common Market for Eastern and Southern Africa
CP	Cleaner Production
CSO	Central Statistical Office
CZI	Confederation of Zimbabwe Industries
DaTIS	Drug and Toxicology Information Service
EHO	Environmental Health Officer
EMA	Environmental Management Agency
EMAL	Environmental Management Agency Laboratory
FAO	Food and Agricultural Organization
FFRI	Fertilizer, Farm Feeds and Remedies Institute
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHS	Globally Harmonized System
IAEA	International Atomic Energy Agency
ICDS	Inter-Censal Demographic Survey
IDC	Industrial Development Corporation
IES	Institute of Environmental Studies
ILO	International Labour Organization
IMF	International Monetary Fund
IPM	Integrated Pest Management
IRS	Indoor Residual Spraying
ITN	Insecticide Treated Net
IVM	Integrated Vector Management
MCAZ	Medicines Control Authority of Zimbabwe
MEA	Multilateral Environmental Agreement
MENRM	Ministry of Environment and Natural Resources Management
MoHCW	Ministry of Health and Child Welfare
MSTD	Ministry of Science and Technology Development
NCC	National Coordinating Committee
NEAP	National Environmental Action Plan
NERP	National Economic Revival Programme
NGO	Non Governmental Organisation
NIP	National Implementation Plan (for the Stockholm Convention)
NMCP	National Malaria Control Programme
NOCZIM	National Oil Company of Zimbabwe
NSSA	National Social Security Authority
OHSAS	Occupational Health and Safety Assessment Series
OSH	Occupational Safety and Health
OSHEMAC	Occupational, Safety, Health and Environmental Managers Course
PAH	Polycyclic Aromatic Hydrocarbon
PCBs	Polychlorinated Biphenyls
PCDD	Polychlorinated dibenzo-p-dioxins
PCDF	Polychlorinated dibenzofurans

PCU	Project Coordination Unit
POPs	Persistent Organic Pollutants
PPCE	Personal Protective Clothing and Equipment
PPE	Personal Protective Equipment
RCZ	Research Council of Zimbabwe
SABONET	Southern African Botanical Diversity Network
SADC	Southern African Development Community
SAZ	Standards Association of Zimbabwe
SC	Stockholm Convention
SIRDC	Scientific and Industrial Research and Development Centre
SME	Small to Medium-scale Enterprise
TEQ	Toxic Equivalent
TRB	Tobacco Research Board
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization
UNITAR	United Nations Institute for Training and Research
U-POPs	Unintentionally Produced Persistent Organic Pollutants
WTO	World Trade Organization
ZCTU	Zimbabwe Congress of Trade Unions
ZDHS	Zimbabwe Demographic and Health Survey
ZESA	Zimbabwe Electricity Supply Authority
ZETDC	Zimbabwe Electricity Transmission and Distribution Company
ZFTU	Zimbabwe Federation of Trade Unions
ZIMRA	Zimbabwe Revenue Authority
ZIMSTAT	Zimbabwe National Statistics Agency
ZINWA	Zimbabwe National Water Authority
ZPC	Zimbabwe Power Company

CHAPTER 1: INTRODUCTION

1.1 Objective of the National Implementation Plan

This National Implementation Plan (NIP) has been produced as a guiding document which spells out how Zimbabwe will meet its obligations under the Stockholm Convention on Persistent Organic Pollutants. The NIP, which is a requirement under Article 7 of the Convention, identifies Zimbabwe's priority issues concerning POPs, and sets out action plans for addressing the priority issues.

1.2 The Stockholm Convention

The Stockholm Convention (SC) is a global treaty that aims to protect human health and the environment from a group of highly toxic chemicals known as Persistent Organic Pollutants (POPs). POPs are defined as having the following properties:

- Persistence: POPs persist in the environment for long periods of time. They resist physical, chemical and biological degradation. Therefore once POPs enter the environment they can remain there for many years.

- Bioaccumulation: POPS are lipophilic; meaning they easily dissolve in fats. They therefore accumulate in fatty tissues of living organisms to concentrations higher than that in surrounding environments.

- Subject to long range transport: POPS are chemical pollutants that can travel long distances in the environment (up to thousands of kilometres) and can cause problems in areas far from where the chemical originally entered the environment. POPs are mainly transported over long distances on air currents, in water or by migratory species.

- Toxicity to both humans and wildlife: POPs are known to have adverse effects on humans and the environment, and their effects on humans include cancer, allergies, hypersensitivity, and damage to the nervous, reproductive and immune systems.

POPs can be grouped into three classes, namely pesticides, industrial chemicals and unintentionally-produced POPs (also known as U-POPs which arise primarily as a result of combustion of chlorine or other halogen-containing wastes). There is therefore a wide range of sources of POPs, and the potential for human or environmental exposure is very high.

Because of the global nature of the POPs problems, the world's governments joined forces in tackling the issue of POPs, and in May 2001, adopted the Stockholm Convention. The Convention came into force in May 2004.

The Convention requires parties to eliminate the production and use of all intentionally produced POPs (listed under Annex A of the SC, and they include industrial chemicals and most POPs pesticides), restrict the use of certain chemicals (listed under Annex B and these include DDT), and reduce and eliminate the release of unintentionally produced POPs (listed under Annex C and these include polychlorinated dibenzo-p-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF)).

When the Stockholm Convention was first adopted in 2001, 12 chemicals (referred to as the "Dirty Dozen") were listed as POPs. Since then, 10 more chemicals have been added, giving a total of 22 chemicals which are listed in the SC as POPs. The full list of the 22 POPs is shown in Table 1.

Table 1: The full list of POPs

Annex A Chemicals – intentionally produced POPs whose production and use must be eliminated	Annex B Chemicals – chemicals for which restricted use is allowed	Annex C Chemicals – unintentionally produced chemicals whose release must be minimized and ultimately eliminated
Pesticides • Aldrin • Chlordane • Chlordecone • Dieldrin • Endrin • Heptochlor • Hexachlorobenzene (HCB) • Mirex • Toxaphene • Alpha hexachlorocyclohexane • Beta hexachlorocyclohexane • Lindane • Pentachlorobenzene • Endosulfan Industrial chemicals • Polychlorinated biphenyls (PCB) • Hexabromobiphenyl • Hexabromodiphenyl ether and heptabromodiphenyl ether • Pentachlorobenzene • Tetrabromodiphenyl ether and Pentabromodiphenyl ether	Pesticides • DDT Industrial Chemicals • Perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride	• Polychlorinated dibenzo-p-dioxins (PCDD) – also referred to as just dioxins • Polychlorinated dibenzofurans (PCDF) – also referred to as just furans • Hexachlorobenzene (HCB) • Pentachlorobenzene • Polychlorinated biphenyls (PCB)

1.2.1 Requirements of the Stockholm Convention

The requirements of the Stockholm Convention, which this National Implementation Plan addresses, are summarized below:

Article 3 deals with measures to reduce or eliminate releases from intentional production and use

of POPs. It requires Parties to:

- prohibit and/or take the legal and administrative measures necessary to eliminate the production, use, import and export of Annex A chemicals and
- Restrict the production and use of Annex B chemicals.

Article 4 establishes a Register of specific exemptions for the purpose of identifying the Parties that have specific exemptions listed in Annex A or Annex B. It does not provide for exemptions which may be exercised by all Parties. The Register includes:

- A list of the types of specific exemptions reproduced from Annex A and Annex B;
- A list of the Parties that have a specific exemption listed under Annex A or Annex B; and
- A list of the expiry dates for each registered specific exemption.

Article 5 deals with measures to reduce or eliminate releases from unintentional production. It requires each Party to take measures to reduce the total releases derived from anthropogenic sources of each of the chemicals listed in Annex C, with the goal of their continuing minimization and, where feasible, ultimate elimination. The measures to be taken include

- Developing and implementing an action plan designed to identify, characterize and address the release of the chemicals listed in Annex C;
- Promoting the application of available, feasible and practical measures that can expeditiously achieve a realistic and meaningful level of release reduction or source elimination;
- Promoting the development and use of substitute or modified materials, products and processes to prevent the formation and release of the chemicals listed in Annex C, and
- Promoting, in accordance with its action plan, the use of best available techniques and best environmental practices for both existing sources, and new sources.

Article 6 deals with measures to reduce or eliminate releases from stockpiles and wastes. It requires Parties to:

- Develop appropriate strategies for identifying stockpiles consisting of or containing chemicals listed either in Annex A or Annex B, as well as products and articles in use and wastes consisting of, containing or contaminated with a chemical listed in Annex A, B or C;
- Identify, to the extent practicable, stockpiles consisting of or containing chemicals listed either in Annex A or Annex B on the basis of the strategies referred to above;
- Manage stockpiles, as appropriate, in a safe, efficient and environmentally sound manner;
- Take appropriate measures so that such wastes, including products and articles upon becoming wastes, are handled, collected, transported and stored in an environmentally sound manner, and also disposed of in the most appropriate manner.

Article 7 requires each party to produce a National Implementation Plan (NIP), which details how the party will implement the provisions of the Convention. The requirements of the National Implementation Plan are described further under 1.2.2 in this document.

Article 8 deals with the listing of the chemicals under the different annexes. It makes provision for each party to submit proposals for listing a chemical in a particular annex.

Article 9 deals with information exchange and requires each party to facilitate or undertake the exchange of information relevant to:

- The reduction or elimination of the production, use and release of persistent organic pollutants;
- Alternatives to persistent organic pollutants, including information relating to their risks as well as to their economic and social costs.

Article 10 on public awareness, information and education, requires parties to promote and facilitate awareness among policy and decision makers with regard to POPs. Parties should ensure that all available information on POPs is made available to the public and the information is kept up to date. In pursuance of this article, parties should ensure that appropriate education programmes are put in place for groups such as women, children and the least educated, as well as for workers, scientists, educators and technical and managerial personnel.

Article 11 on Research, development and monitoring, requires Parties to undertake appropriate research, development, monitoring and cooperation pertaining to persistent organic pollutants and, where relevant, to their alternatives and to candidate persistent organic pollutants, including on their:

- Sources and releases into the environment;
- Presence, levels and trends in humans and the environment;
- Environmental transport, fate and transformation;
- Effects on human health and the environment;
- Socio-economic and cultural impacts;
- Release reduction and/or elimination;

The results of such research, development and monitoring activities should be made available to the public.

Other articles in the Convention deal with technical assistance issues, financial resources and mechanisms, reporting, effectiveness evaluation, non-compliance and settlement of disputes, among other issues.

1.2.2 Requirements of the National Implementation Plan (NIP)

The Stockholm Convention requires each party to produce, within two years of its entry into force for the country, a National Implementation Plan (NIP). The requirements of Article 7 are stated in Box 1.

Box 1: Article 7 of the Stockholm Convention

ARTICLE 7
Implementation Plans

1. Each party shall:
   a.Develop and endeavour to implement a plan for the implementation of its obligations under this Convention;
   b.Transmit its implementation plan to the Conference of Parties within two years of the date on which this Convention enters into force for it; and
   c.Review and update, as appropriate, its implementation plan on a periodic basis and in a manner to be specified by a decision of the Conference of the Parties
2. The Parties shall, where appropriate, cooperate directly or through global, regional and sub-regional organizations, and consult their national stakeholders, including women's groups and groups involved in the health of children, in order to facilitate the development, implementation and updating of their implementation plans.
3. The Parties shall endeavour to utilize and, where necessary, establish the means to integrate national implementation plans for persistent organic pollutants in their sustainable development strategies where appropriate.

Development of a NIP by a country demonstrates its willingness to implement its obligations under the Convention; hence Zimbabwe has shown its commitment to meeting its obligations. The NIP will allow Zimbabwe to fulfill three fundamental objectives, namely:

i) national implementation of the Stockholm Convention;
ii) compliance with reporting and related requirements of the Convention;
iii) strengthening its capacity to manage POPs and similarly hazardous chemicals.

1.2.3 The NIP Compilation Process in Zimbabwe

The NIP compilation process for Zimbabwe was coordinated by the Ministry of Environment and Natural Resources Management, which is the focal point for the Stockholm Convention. The process involved five key stages, which included setting up coordinating mechanisms, establishing POPs inventories and assessing infrastructure, identifying priorities and setting objectives, formulating the NIP and action plans on specific POPs, and endorsing the NIP.

Setting up Coordinating Mechanisms

The Ministry of Environment and Natural Resources Management (MENRM), as the executing agency, established the POPs Project Coordinating Unit (PCU) consisting of a Project Manager and Project Assistant in September 2010, which was responsible for project execution. MENRM also set up a National Coordinating Committee (NCC) in January 2011 comprising of relevant Government Departments, and other key POPs stakeholders. The purpose of the 26-member NCC was to oversee the project and provide functional guidance for the project implementation. The NCC was composed of members from the following organizations:

- Ministry of Environment and Natural Resources Management;
- Ministry of Health and Child Welfare;
- Ministry of Agriculture, Mechanization and Irrigation Development;
- Ministry of Media and Information;
- Ministry of Justice and Legal Affairs;
- Ministry of Science and Technology Development;
- Environmental Management Agency;
- Zimbabwe Electricity Supply Authority;
- City of Harare;
- Zimbabwe Revenue Authority;
- Standards Association of Zimbabwe;
- Zimbabwe National Statistics Agency;
- Scientific and Industrial Research and Development Centre;
- National Social Security Authority;
- Business Council for Sustainable Development Zimbabwe;
- University of Zimbabwe Chemistry Department;
- Environment Africa (an NGO); and
- Friends of the Environment (an NGO).

The detailed list, including the names of the NCC members, is attached to this document as Annex 1.

Establishing POPs Inventories and Assessment of Infrastructure

The inventories were conducted by Inventory Task Teams. Three Inventory Task Teams were set up – one for PCBs, one for Unintentionally-Produced POPs (U-POPs), and the third for Obsolete Pesticides. These were trained by international experts on how to conduct inventories between May and July 2011, and they conducted inventories in 2011 and 2012. The assessment of infrastructure was conducted by Task Teams set up from the National Coordinating Committee, and they assessed

the infrastructure for the management of chemicals, including POPs, a process that resulted in the development of a document entitled "The National Profile for the Management of Chemicals, Including POPs, for Zimbabwe". Both the inventories and the National Profile document were endorsed at national stakeholder workshops.

Identifying priorities and setting objectives

The POPs inventories and infrastructure assessment identified POPs issues of concern, and these issues were prioritized by major POPs stakeholders at a Prioritization and Objective Setting Workshop in August 2012. Objectives were set for addressing the priority issues, and endorsed by the NCC. The full list of those who were involved in the inventories, priority setting and action planning is attached to this document as Annex 2.

Formulating the NIP and action plans on specific POPs

A NIP Planning Workshop was held for major POPs stakeholders in September 2012, to set up task teams responsible for developing specific action plans. The task teams drew up specific action plans for the identified POPs objectives, and these were submitted to the PCU, which drafted the NIP, and circulated it for stakeholder input.

Endorsing the NIP

The NIP was endorsed at a national stakeholder workshop which was held on 09 April 2013. The workshop was attended by 64 participants. The list of participants at the NIP Endorsement Workshop is attached to this document as Annex 3.

1.2.4 Scope of the NIP

This NIP was endorsed in April 2013, hence the information contained herein is for up to April 2013. In terms of content, the NIP mostly covers the 12 POPs that were originally listed under the Stockholm Convention in 2001. However, it also makes minor reference to some of the new POPs, but does not go into much detail.

1.2.5 Structure of the NIP

The NIP document has three Chapters, namely:

- Chapter 1, the Introduction, which gives background information on the Stockholm Convention, the purpose of the NIP, and the methodology that was followed for the NIP development process in Zimbabwe;
- Chapter 2, on Country Baseline Information, which gives an overview of the country profile in terms of geography, population, political structure, economy, as well as an assessment of POPs in Zimbabwe.
- Chapter 3, on Action Plans, which gives an overview of the priority POPs issues identified for Zimbabwe, and describes the action plans developed for addressing the priority issues.

CHAPTER 2: COUNTRY BASELINE INFORMATION

2.1 The Zimbabwe Profile

2.1.1 Geography

Zimbabwe is a land locked country located in the Southern part of Africa. The country is situated between latitudes 15° 30" and 22° 30" south of the equator and between longitudes 25° and 33° 10'' east of the Greenwich Meridian. Mozambique borders it to the east, South Africa to the south, Botswana to the west and Zambia to the north and north-west.

Zimbabwe has a total land area of approximately 390 757 square kilometres and is divided into ten administrative provinces as shown on Figure 1.

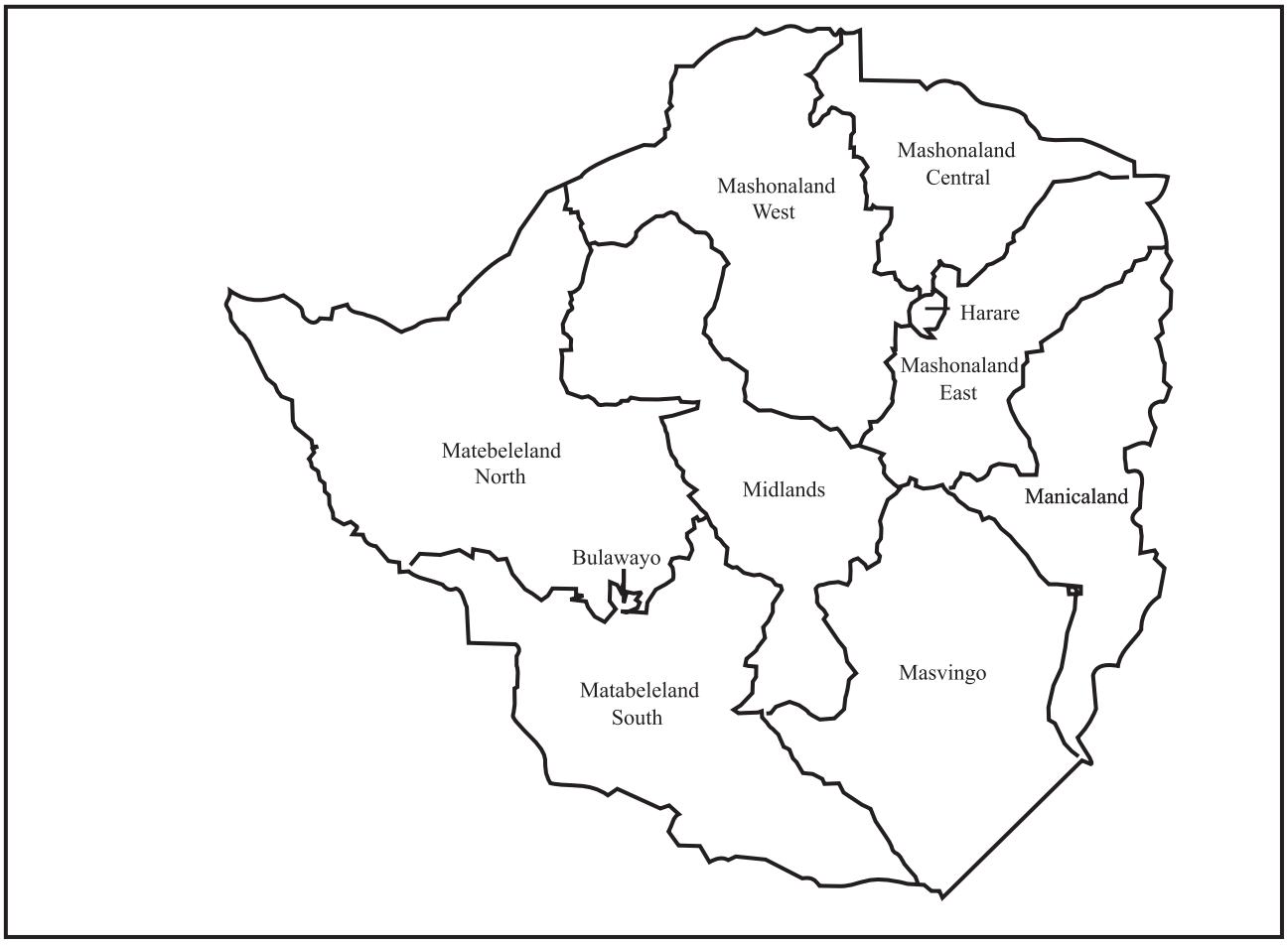

Figure 1: Administrative Provinces of Zimbabwe

Source: CSO (2000), Compendium of Statistics

The country has twelve national parks, one transfrontier park (Trans Zambezi National Park) and other protected areas. Zimbabwe's forests, national parks and wildlife estates account for more than 5 million hectares of land, while the potentially arable land accounts for 8.6 million hectares of land. The flora in the country is dry miombo woodland, with mopane woodland and other woodland types dominating while serpentine grasslands are found in the Great Dyke. Montane forest interspersed amongst high-altitude grasslands and heath is found in the Eastern Highlands (SABONET, 2002).

2.1.2 Population

In terms of demographic analysis, Zimbabwe conducts a national census every 10 years, with the last national census having been held in 2012. In between the censuses, Inter-Censal Demographic Surveys, as well as Demographic and Health Surveys are carried out. At the time of writing this NIP, a preliminary report for the 2012 Census had been produced. Reference will therefore be made to that preliminary report where applicable, but for information that is not in the preliminary report, reference will be made to the most recent appropriate source of the information.

The 2012 Population Census indicated the population to be 12.97 million (Zimstat, 2012). This was composed of 6.23 million males and 6.74 million females, giving a male: female ration of 48:52. The population constituted about 3.1 million households, averaging 4.2 persons per household. The population density is 33 persons per square kilometer. The current average annual population growth rate is 1.1 %, implying that the population will double in about 70 years. Table 2 presents population growth rates compiled from the population censuses, while Table 3 shows the distribution of the population by sex, number of households and average household size for the 2012 census.

Table 2: Population size and annual rate of increase in the population, Zimbabwe 1901-2012

Year	Population ('000)	Annual growth rate (Percent)
1901	713	-
1911	907	2.4
1921	1,147	2.4
1931	1,464	2.5
1941	2,006	3.2
1951	2,829	3.5
1961	3,969	3.5
1969	5,134	3.3
1982	7,608	3
1992	10,412	3.1
2002	11,632	1.1
2012	12,974	1.1

(Sources: CSO, 2002 and Zimstat, 2012)

Table 3: Distribution of Population by Sex, Sex Ratio, Number of Households and Average Household Size by province - 2012

Province	Population				Sex	Households		
	Males	Females	Total	Percent	Ratio	Number	Percent	Average Size
Bulawayo	304446	351229	655675	5.1	87	176092	5.4	3.9
Manicaland	831762	923238	1755000	13.5	90	416871	13.6	4.2
Mashonaland Central	559702	580238	1139940	8.8	96	270617	8.8	4.2
Mashonaland East	648207	688852	1337059	10.3	94	329717	10.7	4.1
Mashonaland West	721218	728720	1449938	11.2	99	336262	10.9	4.3
Matabeleland North	359173	384698	743871	5.7	95	163966	5.3	3.8
Matabeleland South	328009	357037	685046	5.3	92	156424	5.1	4.4
Midlands	779233	843243	1622476	12.5	92	362109	11.8	4.5
Masvingo	691350	795254	1486604	11.5	87	341197	11.1	4.4
Harare	1011831	1086368	2098199	16.2	93	531967	17.3	3.9
TOTAL	**6234931**	**6738877**	**12973808**	**100**	**93**	**3076222**	**100**	**4.2**

(Source: Zimstat, 2012)

According to the 2008 Zimbabwe Inter-Censal Demographic Survey (ICDS) (CSO, 2008), persons of African ethnic origin made up almost the entire population while about 1 percent was accounted for by European and Asiatic and mixed ethnic origin. Citizens of Zimbabwe constituted nearly the whole population (about 98%) and slightly more than 1 percent were citizens of other countries. Citizens of Mozambique and Malawi constituted the bulk of non-Zimbabwean citizens. The majority of the population (about 65 percent) lived in the rural areas.

In 2008, life expectancy was 43 years for both sexes (CSO, 2008). The fertility rate was 3.3 children per woman. In 2008, information on housing conditions in the country showed that 69% of households lived in their own dwelling units either as owners or purchasers while 13% were lodgers. The remaining 18% was accounted by other forms of tenure status such as tenants, tied accommodation and parent/guardian/relative's house. It was also noted that 77% of the households in the country used wood as a source of energy for cooking and lighting, while about 32% used either paraffin or electricity and less than 1% used gas, coal and other forms of energy.

In Zimbabwe, a person who has completed at least grade three is considered as literate. The percentage of population by school attendance for the years 1992, 1997 and 1999 shows literacy rates as 67.4%, 72.6% and 72.4%, respectively, for both sexes (CSO, 2001). The females attending school compared to the males were lower for all the three years. The female rates were 64.9%, 70.1% and 70.0 while those for the males were 70%, 75.1% and 74.8% for the respective years. The data is based on the 5-19 years age group.

The majority of the population has grade seven and ordinary level as their highest level of education completed. The number of persons with no level of education completed decreased from about 1.9 million in 1992 to about 1.4 million in 1999. The number of those with graduate/post graduate level as the highest level of education completed rose from about 35,000 to about 63,000.

2.1.3 Political Structure

Zimbabwe is a sovereign state with a democratic government. It gained independence from Britain in 1980. It is headed by an Executive President. There are three tiers of government, which are the national government; the provincial and metropolitan councils; and the local authorities.

Zimbabwe has ten provinces, namely Bulawayo, Harare, Manicaland, Mashonaland Central, Mashonaland East, Mashonaland West, Matabeleland North, Matabeleland South, Masvingo and Midlands. Harare (the capital city) and Bulawayo (the second largest city), are essentially urban provinces while the rest are mixed. The provinces are partitioned into districts, which are further divided into constituencies that have a representative in the Parliament.

English is the official language used as the medium of communication. There are two major vernacular languages, namely Shona and Ndebele. However, there are 13 other official languages which include Chewa, Chibarwe, Kalanga, Koisan, Nambya, Ndau, Shangani, sign language, Sotho, Tonga, Tswana, Venda, and Xhosa, giving a total of 16 official languages in Zimbabwe. People in Matabeleland North, Matabeleland South and Bulawayo provinces and about half of Midlands province mainly speak Ndebele while Shona is dominantly spoken in the rest of the country's provinces.

2.1.4 The Economy

The Zimbabwean economy was on a continuous decline over the 10 years from 1999 to 2008 due to both internal and external factors. On the external front drought conditions afflicted the southern African region during the period 2001-2003. That had a negative bearing on real output growth trends in the country given the direct impact of agro related output. The drought-related output costs were, however, inflated by the transitional costs of the land reform programme (such as the economic sanctions), that was accelerated in 2000.

The key policy milestone in 2003 was the launch of the National Economic Revival Programme (NERP), on 19 February 2003, with a key emphasis on re-igniting market oriented economics. NERP was meant to address the shortcomings of the Economic Structural Adjustment Programme (1990 -1995), the Zimbabwe Programme for Economic and Social Transformation (1996 – 2000) and the Millennium Economic Revival Programme (2000- 2002) geared at reviving the economy. However, the NERP failed to meet the severity of macroeconomic instability and key deliverables such as the exchange rate remained in abeyance contrary to the agreed quarterly reviews set in the programme. Inflation also rose significantly during the period, from 220.9% in February peaking at 619.5% in November and closing the year at 598.7%, to account for an annual average inflation of 365% in 2003. Between 2004 and 2008, the inflation rate continued to escalate, such that by early 2008 it was in the six digit zone.

Mounting economic instability, characterized by hyperinflation and acute foreign currency shortages, severely strained productive capacity and procurement of energy, predominantly fuel and electricity. The local currency, the Zimbabwe dollar, was revalued three times. The exchange rate of the United States dollar against the local currency had to be addressed for a pronounced accounting system. The United States dollar exchange rate to the Zimbabwe dollar was pegged at 1:1 000 in August 2006, and then 1: 10 000 000 000 in August 2008 and reached 1: 1 000 000 000 000 by January 2009. Thereafter, the country started using a multi currency system and the economy got into a recovery path propelled by the country's rich mineral resource deposits and its already existing infrastructure. The introduction of the multi currency system at the beginning of 2009 enabled the

economic players to operate at the same level using mainly the United States dollar and the South African Rand.

In the year 2011 the Medium Term Plans (MTP) presented by the Ministry of Finance called for the government to have a budget cut off of non-productive public expenditure, limitation of public travel expenses as well as suspension of the supplementary budget expenditure which had been a norm for the past years. All ministries were to operate on a shoe-string budget but still produce good essential service delivery as well as prime goods.

2.1.4.1 Zimbabwe's GDP for 2009 - 2011

In 2009 using the Income Approach, Gross Domestic Product (GDP) was at US$ 5 207 758 915 at basic prices and standing at US$ 5 858 351 994 at market prices with no subsidies on production. After factoring in net income from abroad, Gross National Income was estimated at US $ 5 774 778 165. Using the Production approach, the 3 sectors which contributed significant percentages to GDP were Agriculture, Hunting, Fishing and Forestry, followed by Manufacturing, and then Transport and Communication with respective contributions of 17%, 15% and 14%. Figure 2 shows the contribution of various sectors to GDP in 2009.

The government heavily financed the agriculture sector as it had taken a downward trend up to the year 2008. Many public transporters were registered and thus made the transport sector to have a good contribution as well. Construction had a low contribution to GDP of 0.5% because of the FIFA World Cup in South Africa in 2010, among other factors, which caused migration of specialized construction labour and equipment. Other factors were the high cost of construction that prevailed during the period.

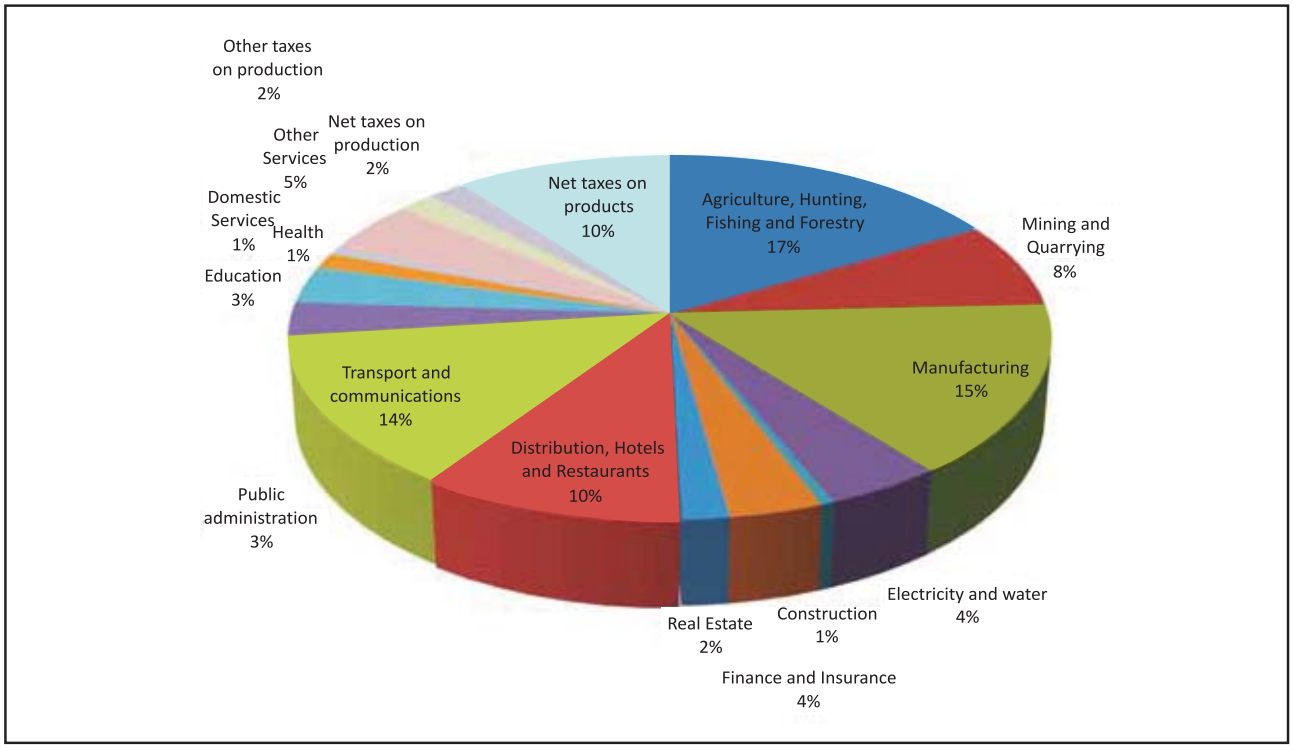

Figure 2 Contribution of various sectors to GDP in 2009

(Source: ZIMSTAT (October 2012) Quarterly Digest of Statistics)

Since 2009, the economic outlook seems to be improving, as indicated by the increase in GDP from 2009 to 2011. Figure 3 shows the GDP at current prices over that period.

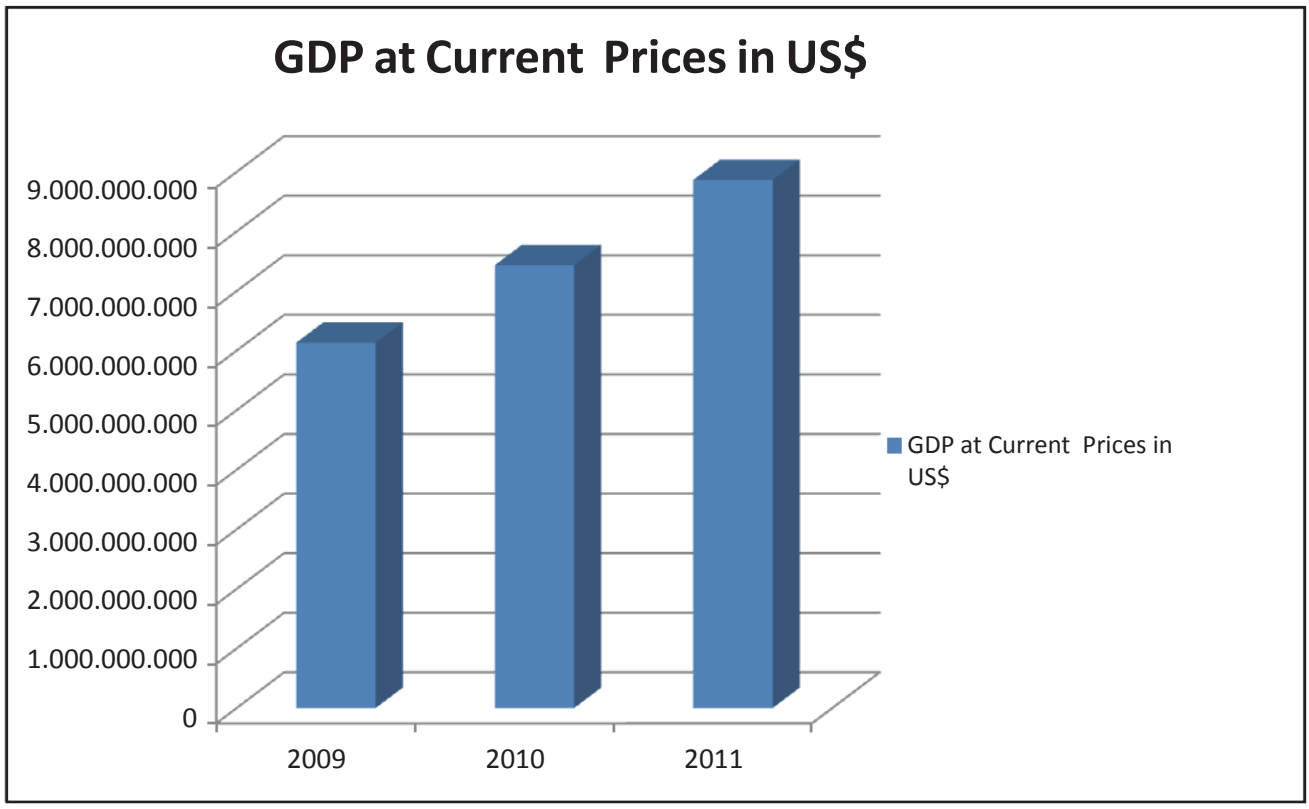

Figure 3 showing GDP at current prices for the years 2009 to 2011

(Source: ZIMSTAT (October 2012) Quarterly Digest of Statistics)

2.1.4.2 Agricultural Sector

Agriculture, from which a large proportion of the population derives its livelihood, is the predominant sector of the Zimbabwean economy. The principal cash crops are tobacco, maize, cotton, coffee, sugar, wheat, soybeans, paprika and groundnuts. Livestock production focusing mainly on beef and dairy cattle, pigs and poultry, is also an economically important agricultural activity. The value of crop sales to marketing authorities for the years 2009-2011 is shown in Table 4.

Table 4: Value of Crop Sales to/through Marketing Authorities in US$

Major Crops	Value of Crop sales to/through Marketing Authorities in US$ by year		
	2009	2010	2011
Maize	16,816,635	67,359,050	59,605,150
Groundnuts (unshelled)	129,870	211,500	211,500
Sorghum	17,850	22,770	20,240
Soya beans	242,760	9,873,600	5,495,100
Sugar Beans	146,250	28,800	6,874,774
Rapoko /Millet	1,350	990	440
Coffee			962,400
Wheat	7,999,200	11,509,734	1,137,506
Cotton		270,000	249,904
Flue-cured tobacco	174,542	355,572,326	361,448,679
Burley tobacco	248	666,304	522,140
Sunflower	24,750	6,490	660

(Source: Zimstat (2012) - October 2012 Quarterly Digest of Statistics)

Zimbabwe is divided into five agro-ecological regions, known as Natural Regions. The classifications into the different regions are based on rainfall regime, soil type and vegetation, among other factors (Vincent and Thomas, 1960). Natural Regions 1-3 are suitable for intensive crop and livestock production, while the remaining two regions are suitable for ranching and minimal crop production. Figure 4 shows the distribution of the natural regions, while Table 5 describes their characteristics and farming systems.

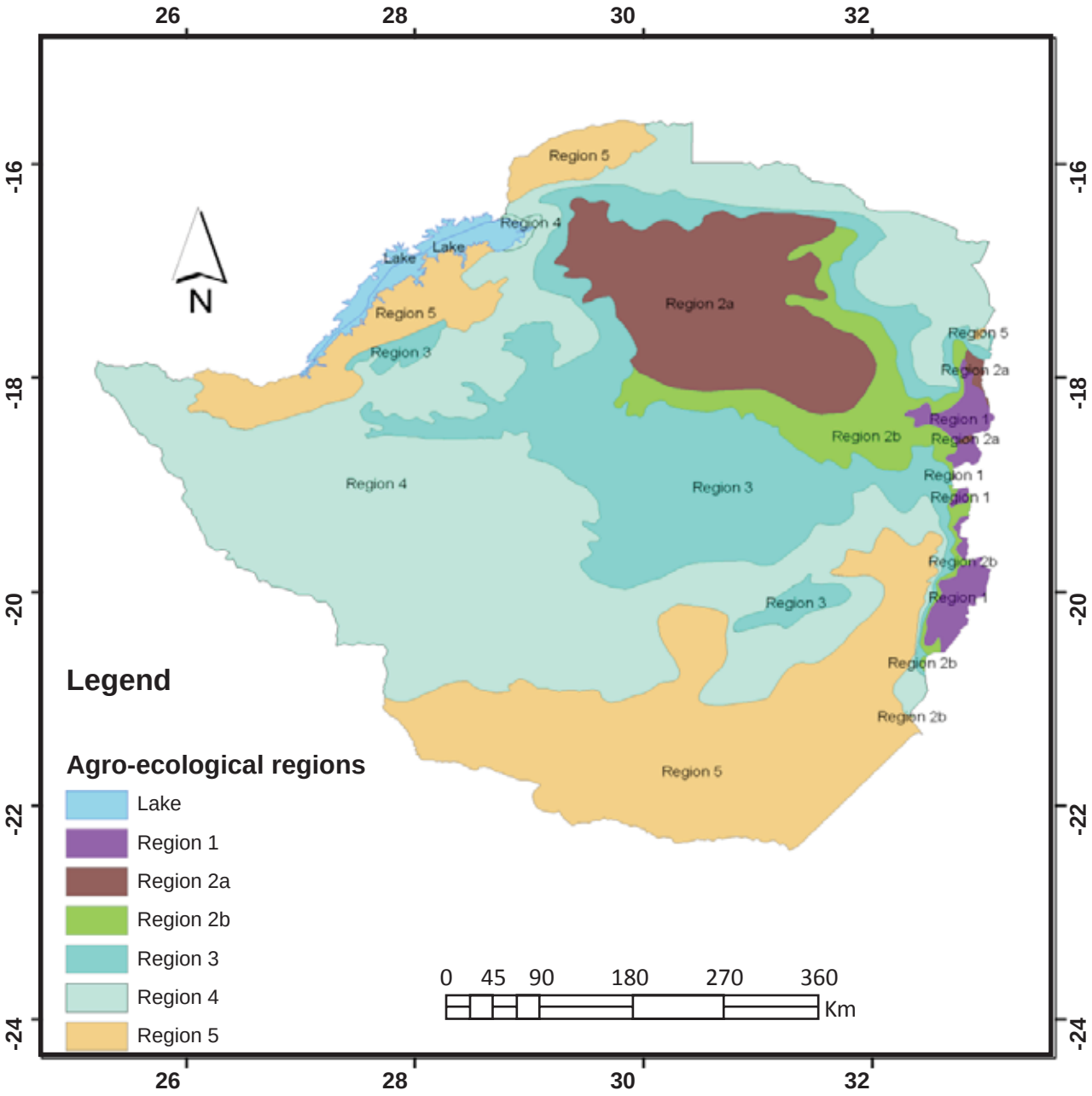

Figure 4: Distribution of the Agro-ecological regions

Table 5: Agro-ecological Regions of Zimbabwe

	REGION 1: SPECIALIZED AND DIVERSIFIED FARMING	**REGION 2:** INTENSIVE FARMING	**REGION 3:** SEMI-INTENSIVE FARMING	**REGION 4:** SEMI-EXTENSIVE FARMING	**REGION 5:** EXTENSIVE FARMING
Rain	More than 1 000 mm per annum in areas lying below 1 700 m altitude and more than 900 mm per annum at greater altitudes.	750-1 000 mm per annum. In parts of the region. Crop yields in certain years are affected by relatively short rainy seasons or dry spells during the season.	650-800 mm per annum. Fairly severe mid-season dry spells.	450-650 mm per annum. Periodic seasonal drought. Severe dry spells even during the rainy season.	Too low and erratic for production of even drought resistant fodder and grain crops.
Production	Forestry and production of fruit and intensive livestock. In frost free areas tea, coffee, macadamia nuts and other plantation crops.	Crops and intensive livestock production	Livestock production together with fodder crops and cash crops. Marginal production of maize, tobacco and cotton.	Livestock production, drought-resistant crops.	Extensive cattle ranching or game ranching.
Area	7 000 km2 (less than 2% of the total area of Zimbabwe)	58 600 km2 (15% of the total land area of Zimbabwe).	72 900 km2 (19% of the total land area in Zimbabwe).	147 800 km2 (38% of the total area of Zimbabwe).	104 400 km2 (27% of the total land area of Zimbabwe).

Source: CSO (2000), Compendium of Statistics.

The farming systems in Zimbabwe are Large Scale Commercial Farming (LSCF), Small Scale Commercial Farming (SSCF), A1 and A2 Resttlement, old resettlement, communal farming, urban and peri-urban farming, and state farms. The area under LSCF has decreased from 15.5 million hectares in 1980, to 3,4 million hectares in 2010, due to the land reform programme (Scoones et al, 2011)

2.1.5 Environmental Overview

Zimbabwe is well-endowed with natural resources which include wildlife and mineral resources. The main environmental concerns are deforestation, land degradation due to illegal mining activities, soil erosion, poor waste management practices, and pollution.

2.2 Regulatory, Policy and Institutional Framework for Environmental Management, Including POPs issues

2.2.1 Current Legislation and Regulations Addressing POPs

Currently there exists a fairly robust legislative environment for addressing general environmental management issues. The different pieces of legislation are shown in Table 6. Although the legislation is quite thorough in addressing general environmental management issues, it falls short when it comes to specific POPs, as described later in the document.

Table 6: Summary of legislation addressing environmental management issues, with particular reference to POPs

Relevant Act /Statutory Instrument	Areas covered	Government Department responsible for enforcement
Environmental Management Act (Chapter 20:27)	• Provides for the management of general waste, hazardous waste and hazardous substances • Employs Polluter-Pays-Principle	Environmental Management Agency
Statutory Instrument 12 of 2007 - Hazardous Substances, Pesticides and Toxic Substances Regulations	• Regulates and controls the use, sale, transporting, manufacturing, importing and storage of hazardous substances • Provides the list of the chemicals considered to be hazardous substances and classifies them	Environmental Management Agency
Statutory Instrument 72 of 2009 - Air Pollution Control Regulations	• The regulations set ambient and emission standards	Environmental Management Agency
Fertilizer, Farm Feeds and Remedies Act (Chapter 18:12)	• Deals with registration of pesticides in Zimbabwe	Ministry of Agriculture, Mechanization and Irrigation Development
The Factories and Works Act (Chapter 14:08)	• Provides for the registration and control of factories, the regulation of conditions of work in factories, supervision of the use of machinery, precautions against accidents to persons employed on structural work	Ministry of Labour and Social Services
Statutory Instrument 68 of 1990 on Accident Prevention and Workers Scheme	• Provides for the duties of the employers with respect to creating a safe and healthy work environment for workers • Provides for the duties of manufacturers in respect of substances liable to cause risk to the safety and health of workers	Ministry of Labour and Social Services - National Social Security Authority

2.2.1.1 The Environmental Management Act (Chapter 20:27)

The main piece of legislation governing environmental management in Zimbabwe is the Environmental Management Act (Chapter 20:27), which was enacted in 2002. The Act provides for the sustainable management of natural resources and protection of the environment, as well as the prevention of pollution and environmental degradation.

The Act is administered by the Environmental Management Agency, which is a parastatal under the Ministry of Environment and Natural Resources Management. In terms of general environmental rights and principles, the Act accords every person in Zimbabwe the right to a clean environment that is not harmful to health; the right to access environmental information; and the right to protect the environment for the benefit of present and future generations and to participate in the implementation of the promulgation of reasonable legislative, policy and other measures that prevent pollution and environmental degradation.

Although the Act does not make reference to most POPs specifically, it does however provide for the management of general waste, hazardous waste and hazardous substances. The Act sets standards for waste in Zimbabwe and also provides for the management of general waste. The Act makes use of the Polluter Pays Principle, requiring polluters to pay for cleaning up the environment.

The Act prohibits the discharge of hazardous substances, chemicals and materials or oil into the environment. In particular, Statutory Instrument 12 of 2007 on Hazardous Substances, Pesticides and Toxic Substances Regulations, regulates and controls the use, selling, transporting, manufacturing, importing and storage of hazardous substances. It provides the list of the chemicals considered to be hazardous substances and classifies them.

Under the same Environmental Management Act is the Air Pollution Control Regulations, which is Statutory Instrument 72 of 2009. The regulations set ambient and emission standards and provide for the monitoring and control of emissions from mining, stone crushing, cement production, grinding and processing of asbestos.

The Environmental Management Act, together with its associated regulations, acts as a starting point for POPs management, but its failure to address specific issues pertaining to PCBs, dioxins and furans poses a big challenge in the management of these POPs.

For instance, there is no legislation that requires new transformers coming into the country to be tested for PCBs. This will invariably make it difficult to reduce the levels of PCBs in the country. The theft of transformer oil is also quite rampant, and there is need to make this a high level crime, carrying very stiff penalties. The issue of PCDD/PCDF (dioxins and furans) being released from burning of waste is also not being addressed sufficiently, as the burning of waste as a means of managing waste is so rampant, implying that any laws prohibiting burning of waste are not being enforced strictly enough.

2.2.1.2 Fertilizer, Farm Feeds and Remedies Act (Chapter 18:12)

This Act is the current piece of legislation dealing with registration of pesticides in Zimbabwe, and it is administered by the Ministry of Agriculture, Mechanization and Irrigation Development. The Pesticides Registration process is described in Section 2.3.1.3.

2.2.1.3 The Factories and Works Act (Chapter 14:08)

This provides for the registration and control of factories, the regulation of conditions of work in factories, supervision of the use of machinery, precautions against accident to persons employed on

structural work and for matters incidental to the foregoing.

2.2.2 Non Regulatory Mechanisms for Managing Hazardous Chemicals, Particularly POPs

Zimbabwe uses a few non-regulatory methods to manage hazardous chemical risks. These approaches include voluntary actions such as negotiated agreements for testing, safer work practices, or termination of the sale or use of a chemical or product. Voluntary methods are chemical-user determined. A combination of voluntary actions and regulations are sometimes used especially in industry.

Environmentally Sound Technologies (formerly known as, and encompassing Cleaner Production)
Some industries are opting for cleaner production technologies as a way of pollution prevention and promotion of safer, non-toxic substitutes. The cleaner production concept of increasing resource use efficiency to reduce waste and recover materials for reuse is helping to reduce the emissions of certain chemicals.

Some successes with the Cleaner Production Centre in industry have been as a result of the different companies' direct initiatives to adhere to the green economy by implementing Cleaner Production technologies. The main focus is on resource efficiency since raw materials costs are proving quite costly and the enforcement of the Environmental Management Act is causing industry to try and address their environmental challenges. The advantage of companies implementing Cleaner Production has been that the Environmental Management Agency acknowledges efforts put towards this initiative and gives the company time to implement the cleaner production options before it shuts down the establishment. Industry in Zimbabwe has also embarked on Cleaner Production as a result of a desire to expand into global markets where 'going green' is critical to acceptance by both suppliers and consumers.

ISO 14001 Environmental Management Systems
The other voluntary environmental management mechanisms include systems certification schemes like ISO 14001 offered by the national standards body, Standards Association of Zimbabwe. The ISO 14001 Environmental Management System certification is especially useful in terms of PCBs management, as all those organizations seeking certification are required to document the PCB status of their electrical equipment, specifically power transformers and capacitors.

Reasons for Failure of Regulatory and Non-Regulatory Instruments in Achieving Desired Results

a. Lack of Awareness
One reason why implementation of both the regulatory and non-regulatory instruments for the management of hazardous chemicals is rather weak, is due to lack of awareness on the part of the public. The majority of the public is generally unaware of both the legal requirements pertaining to hazardous chemicals management, and the non-regulatory mechanisms that can be employed to reduce the risks associated with hazardous chemicals management. Information dissemination would therefore be a valuable tool for educating people about the legal requirements for chemicals management, as well as other non-regulatory tools that they can use to reduce the risks associated with hazardous chemicals. It is recommended that workshops, seminars, and any other awareness programmes be implemented to raise national awareness on hazardous chemicals and their management. The preparation, development and adoption of manuals to be used at different levels of the education curriculum is also recommended as this will ensure that chemical issues are tackled from an early stage of human development.

Particular attention should also be paid on use -reduction strategies and increased use of Integrated Pest Management. Zimbabweans need to change their pest control practices to make significant reductions in use of synthetic chemical pesticides.

b. Cost of Setting Up Environmentally Sound Technologies

Generally, though, non-regulatory instruments are not effective at the moment, because of the high cost (to industry) of setting up interventions for chemical management and disposal of chemical wastes (in the form of production line modifications or change of operating systems). The cost by far surpasses adherence to the polluter pays principle which has punitive fines in comparison, hence industries prefer to pollute and pay.

2.2.3 International Commitments and Obligations

Zimbabwe is party to a number of chemicals management related conventions, which include the Stockholm Convention on Persistent Organic Pollutants¸ the Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal, the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, and the Bamako Convention on the Ban of the Importation into Africa of Hazardous Waste. The country is also a party to the Vienna Convention¸ the Montreal Protocol, the United Nations Framework Convention on Climate Change and the Kyoto Protocol.

Besides the chemicals related convention, Zimbabwe is party to the Convention on Biological Diversity, the Convention on International Trade in Endangered Species and the United Nations Convention to Combat Desertification, among others. For most of these Conventions, an office has been established in the relevant Ministry responsible for administering issues pertaining to the Convention.

Zimbabwe has also ratified ILO Convention 170 concerning Safety in the Use of Chemicals at Work. The implementation of this Convention is being overseen by the Ministry of Labour and Social Welfare through its National Social Security Authority.

Local legislation such as the Environmental Management Act attempts to incorporate the requirements of some international environmental conventions, such as the Montreal Protocol and Vienna Convention (through air pollution control and ban of CFC emitting substances), the Bamako Convention (through restrictions and bans on importing unregulated chemical substances), the Convention on Biological Diversity and the Convention on International Trade in Endangered species of Wild Flora and Fauna (through protecting wildlife and plant life).

One major challenge to the implementation of the chemicals management related Conventions (namely the Stockholm Convention, the Basel Convention, the Rotterdam Convention and the Bamako Convention) is that in most cases, the requirements of the Conventions have not yet been enshrined in local legislation, hence enforcement of the Convention requirements at a local level is difficult.

2.2.4 Roles and Responsibilities of Organizations and Stakeholders Involved in POPs and Chemicals Management in Zimbabwe

Although there are not many players involved in the management of POPs in Zimbabwe, the number of players involved in management of chemicals in general in Zimbabwe is quite high. Table 7 summarizes the different players, both governmental and non-governmental, and the roles they play in chemicals management, and where appropriate, their roles (or potential roles) in POPs management.

Table 7 showing roles of different organisations in hazardous chemicals management

Organization	Role in management of hazardous chemicals in general and possibly POPs where applicable
Government Ministries, Departments, Parastatals, Academia and Research Institutions	
Ministry of Health and Child Welfare (Department of Epidemiology and Disease Control – National Malaria Control Programme)	Responsible for Indoor Residual Spraying of DDT for malaria control
Ministry of Health and Child Welfare (Government Analyst Laboratory)	• Offers chemical and microbiological analyses of various samples – food, water, forensic, chemical, industrial • Enforces maximum limits for pesticides residues in food • Monitors limits on maximum contamination levels for chemicals in drinking water
Ministry of Agriculture, Mechanisation and Irrigation Development (Department of Research Services – Fertilizer, Farm Feeds and Remedies Institute)	• Responsible for pesticides registration and issuance of export and import permits • Responsible for analysis of pesticides for registration purposes • Responsible for analysis of pesticide residues in agricultural produce
Ministry of Agriculture, Mechanisation and Irrigation Development (Department of Livestock and Veterinary Services)	• Responsible for the prevention, control and eradication of animal pests and diseases (this department uses a lot of pesticides particularly for tsetse control, and historically used DDT)
Environmental Management Agency (under the Ministry of Environment and Natural Resources Management)	• Oversees the management of hazardous substances, hazardous waste and general waste • Responsible for monitoring and control of air quality • Runs a laboratory which carries out inorganic, organic and microbiological analyses
Zimbabwe Electricity Supply Authority (under the Ministry of Energy and Power Development)	• Generates and provides electricity for the nation, and is thus responsible for the management of the majority of transformers in Zimbabwe
National Social Security Authority (under the Ministry of Labour and Social Services)	• Oversees occupational safety and health issues for workers in Zimbabwe
Zimbabwe Revenue Authority – ZIMRA (under the Ministry of Finance)	• Monitors products that are imported into the country, and enforces controls on behalf of different Ministries
Zimbabwe National Statistics Agency - ZIMSTAT (under the Ministry of Finance)	• Compiles statistical data for Zimbabwe, covering a wide range of thematic areas, including import and export data, employment data, chemicals usage data
Ministry of Science and Technology Development	• Responsible for adoption and adaptation of relevant modern technologies for reducing and eliminating hazardous chemicals
Research Council of Zimbabwe	• Is mandated to promote, direct, supervise and coordinate research; it advises Government on issues of research for sustainable development whilst providing a forum for interaction and discussion for the mutual benefit of Government, academia and industrialists

Organization	Role in management of hazardous chemicals in general and possibly POPs where applicable
National Biotechnology Authority	• regulates the manipulation of organisms using modern biotechnology (a powerful tool which can be harnessed in environmental management to clean air, water and polluted soil)
National Authorities, Universities, Research Institutes And Private Laboratories	• The 13 universities in Zimbabwe offer the human resources as well as technical infrastructure that can support environmental assessment, monitoring and scientific research
Institute of Environmental Studies	• This non-faculty unit within the University of Zimbabwe provides a platform for environmental research and education, advisory services and networking on environmental issues
Scientific and Industrial Research and Development Centre (SIRDC)	• Provides technical and consultancy services to industry • Houses the Cleaner Production Centre that assists industrialists to lower or eliminate the production of toxic wastes by modifying production processes • Carries out research into agriculture production and food science • Looks into issues of food and nutrition security
Drug and Toxicology Information Service	Carries out research, awareness raising and advocacy on chemicals management
Industry and NGOs	
Business Council for Sustainable Development Zimbabwe (BCSDZ)	• Aims to encourage commitment by industry to environmentally sustainable business practices
Standards Association of Zimbabwe (SAZ)	• Facilitates the development of national standards and encourages their implementation • Has published standards on air and water quality, waste water, environmental management, hazardous waste management and vehicle emissions national standards. • Offers standards based services, namely standards requirements training, laboratory facilities (including chemicals, and food technology), third party product and systems (including environmental and OHSAS) certification
Confederation of Zimbabwe Industries (CZI)	• Has membership composed of industrialists including manufacturers of various commodities, and aims to be the representative voice for the manufacturing industry
Consumer Council of Zimbabwe (CCZ)	• Aims to protect consumers, protect manufacturing standards and improve consumer awareness through education
CropLife	• Has membership that comprises distributors of pesticides, and encourages its members to uphold FAO principles on the distribution and use of pesticides
GEF-Small Grants Programme	• This programme funds different environmental projects, which in the past have included projects to raise awareness on POPs among communities

2.2.4.1 Detailed Roles of Ministries, Government Departments, Parastatals, Academia and Research Institutions

a. The Ministry of Health and Child Welfare

This Ministry houses the Department of Epidemiology and Disease Control, under which the National Malaria Control Programme (NMCP) falls. The NMCP is responsible for controlling malaria through Indoor Residual Spraying (IRS) of DDT in malaria-prone areas.

The Government Analyst Laboratory, which is a department within the same Ministry of Health and Child Welfare, offers chemical and microbiological analyses of various samples (Food, Water, Forensic, Chemical and Industrial) as a service to the ministry, sister ministries, parastatals and private concerns. The laboratory administers the Food and Food Standards Act in cooperation with the Department of Environmental Public Health. It enforces, among other functions, maximum limits for pesticide residues in food. It monitors limits on maximum contamination levels for chemicals in drinking water. The laboratory is the National Focal Point for CODEX Alimentarius.

b. Ministry of Agriculture, Mechanization and Irrigation Development.

This Ministry houses the Department of Research Services, which plays a critical role in pesticides management through its Fertilizer, Farm Feeds and Remedies Institute (FFRI). FFRI is responsible for registration of pesticides and issuance of export and import permits through the process described in Section 2.3.1.3. The same Institute is also responsible for analysis of pesticide residues in agricultural produce.

The same Ministry houses the Department of Livestock and Veterinary Services, which is mandated to provide a sustainable livestock and veterinary service in response to clients' and cooperating partner needs. It does this through regulatory and technical activities for the prevention, control and eradication of specified animal diseases and pests. It thus promotes livestock production, welfare and veterinary public health thereby ensuring a viable and internationally competitive Zimbabwean livestock industry. This Department is thus heavily involved in chemicals management through its pesticide management programmes. Historically, the Department used DDT for tsetse control, but this was discontinued after DDT use was restricted to malaria vector control.

c. Environmental Management Agency

This parastatal, which falls under the Ministry of Environment and Natural Resources Management, is responsible for overseeing environmental management issues in the country. It conducts investigations and inspections on any matters concerning environmental degradation and pollution. It develops standards on air, water, effluent and solid waste.

The Hazardous Substances Unit within the Environmental Management Agency's Environment Protection Department administers the Hazardous Substances, Pesticides and Toxic Substances Regulations, Statutory Instrument 12 of 2007. The Unit seeks to establish monitoring points at all ports of entry.

The Air Pollution Control Unit, within the same Environment Protection Department, is responsible for the administration of the Atmospheric Pollution Control Regulations, SI 72 of 2009. The Unit manages this by drafting regulations and setting ambient and emission standards/guidelines for acceptable levels of air pollution, enforcement of existing statutes and guidelines, promoting cleaner production technologies and the installation of air pollution abatement equipment, stack emission

sampling and monitoring ambient levels of SOx, NOx, POx, VOC etc. The Unit provides advice to local authorities in the implementation of Smoke Control regulation, measurement of grit smoke, fly ash and gaseous pollutants from boiler and incinerators and indoor air pollution control including proper use and installation of domestic stoves. They monitor and control emissions from mining, stone crushing, cement production, grinding and processing of asbestos.

The Environmental Management Agency also runs a multi-million dollar laboratory. It provides services such as analyses, research, treatment studies, training and environmental quality information. It has six main laboratories: biology and microbiology, two for Wet Chemical and Effluents, Instrumental, Organics, and Teaching Laboratory with five ancillary rooms serving these laboratories on the ground floor. The laboratory customers are industries such as municipalities, mining industry, agricultural industry, environmental engineering consultants and individuals. The laboratory also collaborates with local institutions such as the Institute of Water and Sanitation Development and other laboratories on training programmes and inter-laboratory comparisons.

The Environmental Management Agency Laboratory (EMAL) recognizes its responsibility as provider of laboratory testing services. To this end, the EMAL has developed and documented a Management System to better satisfy the needs of its customers and to improve management of the organisation. The Management System is in accordance with the international standard ISO/IEC 17025, 2005 and will conform to the requirements of the Environmental Management Act.

d. Ministry of Energy and Power Development

This Ministry has the mandate to provide an enabling environment where adequate, reliable and affordable sustainable energy is made available to all. The Ministry has a number of departments, and the key department in terms of POPs management is the Department of Power Development, under which the national electricity utility, the Zimbabwe Electricity Supply Authority (ZESA) falls.

ZESA has four subsidiary companies, namely:

- The Zimbabwe Power Company (ZPC), responsible for power generation. ZPC operates five power stations (one being a hydro-electric power station, and the other four being thermal power stations, whose emissions contain PCDD/PCDF)
- The Zimbabwe Electricity Transmission and Distribution Company (ZETDC), responsible for the transmission and distribution of power
- ZESA Enterprises, responsible for manufacture and repair of transformers and other equipment used in the transmission and distribution of power
- Powertel, responsible for telecommunications

ZESA owns the majority of transformers in Zimbabwe, hence it is likely that ZESA holds the majority of PCBs in the country.

e. Ministry of Labour and Social Services

The Ministry of Labour and Social Services through the National Social Security Authority (NSSA), promotes occupational safety and health in the workplace. The ministry is mandated to deal with labour administration including occupational safety and health and social security, which aspects it has delegated to its agency NSSA for implementation.

f. Zimbabwe Revenue Authority (ZIMRA)

This parastatal is responsible for monitoring products that are imported into the country, and enforces controls on behalf of different Ministries. It therefore plays a very major role in determining what comes into the country.

g. Zimbabwe National Statistics Agency (ZIMSTAT)

This parastatal is responsible for compiling statistical data for Zimbabwe. The statistical data covers a wide range of thematic areas, including import and export data, employment data, chemicals usage data and economic data.

h. Ministry of Science and Technology Development (MSTD)

The MSTD is responsible for the adoption and adaptation of relevant modern technologies, which technologies can be used for reducing and eliminating hazardous chemicals such as POPS. The MSTD encourages science-based decision making for POPs reduction and elimination, and can foster systems of decision making and environmental management that are based on strong science and communication. The gap between scientists and decision makers can be bridged by creating effective interface between the two communities.

i. The Research Council of Zimbabwe (RCZ)

The RCZ, which falls under MSTD, is mandated to promote, direct, supervise and co-ordinate research. RCZ has created a research database that informs on research developments by Zimbabwean researchers within Zimbabwe and beyond its borders so as to promote research and publicise Zimbabwean research at a global scale. RCZ is responsible for advising Government on issues of research for sustainable development whilst providing a forum for interaction and discussion for the mutual benefit of Government, academia and industrialists. It also gives grants and awards. RCZ has collaborative linkages with organisations such as The Academy of Sciences for the Developing World (TWAS), International Council for Science (ICSU), United Nations Programmes and the ICSU Regional Office for Africa, which keep the it abreast with international developments.

j. National Biotechnology Authority

The National Biotechnology Authority of Zimbabwe (NBA) is an executing agency of the MSTD. It is a Research and Development (R&D) institute mandated to develop Zimbabwe through both conventional and cutting-edge biotechnologies. NBA regulates the manipulation of organisms using modern biotechnology (a powerful tool which can be harnessed in environmental management to clean air, water and polluted soil). It can also be applied in producing bio-energy and replacing harmful chemicals in the environment with biodegradable substitutes, for instance through modifying bacteria to clean up oil spills.

k. National Authorities, Universities, Research Institutes And Private Laboratories

There are thirteen universities in Zimbabwe, nine being state universities, and the other four being privately owned. The Universities are tertiary institutions providing academic studies for undergraduate and graduate programmes. The majority of universities offer the human resources as well as technical infrastructure that can support environmental assessment, monitoring and scientific research.

l. The Institute of Environmental Studies (IES)
This institute is a non-faculty unit within the University of Zimbabwe. It provides a platform for environmental research and education, advisory services and networking on environmental issues.

m. Scientific and Industrial Research and Development Centre (SIRDC)
This institution is in touch with industry in general and the chemical industry in particular. SIRDC provides both technical and consultancy services to industry. The Environmental Sciences Institute in SIRDC is responsible for environmental issues. Also housed in the SIRDC is the Cleaner Production Centre. The centre provides consultancy services that enable industrialists to lower or eliminate the production of toxic wastes by modifying their production processes.

There are also two institutes in the SIRDC that look into agriculture production and food science, namely the Biotechnology Research Institute and the Food and Biomedical Research Institute. The Food and Nutrition Council at SIRDC looks into issues of food and nutrition security from the producers right up to the consumers. Currently they are working on a policy document which tries to bring out the holistic nature of food and nutrition, how it is multi-sectoral and hence this also includes issues to do with what type of chemicals (pesticides) are used in food production etc.

n. Drug & Toxicology Information Service (DaTIS)
This organization carries out a lot of research, awareness raising, and advocacy on chemical management. It is a unit within the Medical School, University of Zimbabwe in the School of Pharmacy.

2.2.4.2 Detailed Roles of Industry and NGOs

Institutions and organisations outside government have, in relation to the management of chemicals, adopted a broad based approach. Initiatives include advocacy, awareness raising, capacity building, monitoring, data collection and scientific research. In some instances, these institutions and organisations do not have legal mandates to enforce what they believe in. The institutions and organisations vary in this category, ranging from professional and industrial organisations to NGOs and individuals. The following are some of the organisations involved in chemicals management issues:

a. Business Council for Sustainable Development Zimbabwe (BCSDZ)
This organization is a grouping of business people who share common concerns over environmental and sustainable development issues. The organization aims to encourage a commitment by business towards sustainable development, involving the three interlinked pillars of economic growth, ecological balance and social progress.

b. Standards Association of Zimbabwe (SAZ)
SAZ is the national standards body of Zimbabwe and represents the country in regional (SADC, COMESA) and international (International Organization for Standardization, International Electro-technical Commission) standardization activities.

SAZ facilitates the development of national standards and encourages their implementation in order to enhance Zimbabwe's competitiveness and safeguard the welfare of communities. SAZ's standards development activities are stakeholder driven and its technical committees (TCs) are drawn from

manufacturers, trade associations, government departments, consumer organizations, educational, research, professional and testing institutions.

Through its TCs, it has published standards on air and water quality, waste water, environmental management, hazardous waste management, and motor vehicle exhaust emissions testing methods. SAZ is currently facilitating the development of the vehicle emissions national standards. SAZ also offers standards-based services, namely standards requirements training, laboratory facilities (including chemicals, and food technology), and third party product and systems (including environmental and OHSAS) certification.

c. Confederation of Zimbabwe Industries (CZI)

This organisation has membership composed of industrialists, including manufacturers of various commodities. It aims to be the representational voice for the manufacturing industry.

d. Consumer Council of Zimbabwe (CCZ)

This organisation aims to protect consumers, protect manufacturing standards, and improve consumer awareness through education. It also aims to settle disputes between consumers and suppliers.

e. Zimbabwe Farmers Union

This organisation is the biggest farmers' interest organization in Zimbabwe, representing over a million farming households. It draws its membership from communal, resettlement, small- scale, peri-urban plot holders and emergent large-scale commercial farmers. It aims to promote and advance farmers' interests and welfare through representation, networking, information dissemination, capacity building, formation of commercially viable enterprises, and mobilization of resources and members.

f. CropLife Zimbabwe

This organisation, which is a member of CropLife International, encourages its members to uphold FAO principles on the distribution and use of pesticides.

g. UNDP Africa 2000 Network – GEF Small Grants Programme

This programme funds environmental projects in different thematic areas, such as Persistent Organic Pollutants and Climate Change. The POPs projects include awareness raising on POPs issues, as well as promoting organic farming practices for the elimination of POPs.

<u>Summary of Work Carried Out by Various Institutions in Chemicals Management</u>

The various organizations, both Governmental and non-Governmental, play a wide range of roles in chemicals management. They have the potential to do even more, if there is increased coordination between the different players, particularly in the sphere of information exchange and dissemination.

The research sector and tertiary institutions have shown a keen interest in the management of chemicals in the environment. Such output has been assisted by easy access to specialised equipment and literature at the institutions. Furthermore various individuals are involved in regional and international programmes related to chemicals management. However, the wealth of information that is generated by these institutions is not readily available for use by the ordinary person in Zimbabwe because it is not packaged appropriately. A lot needs to be done in order to translate and communicate the information to ordinary Zimbabweans.

Also, the data from these institutions is not easily available to users as there are not many fora for information exchange. On an ad-hoc basis, these organizations may request meetings with relevant Government departments to present their findings or inform Government about their activities, but this is really done on an ad-hoc basis, and is therefore not a reliable mechanism for information dissemination.

Generally, NGOs have directed most of their efforts to socio-economic issues such as poverty reduction and alleviation programmes. Only a few NGOs are actively involved in environmental issues and even fewer address issues of chemicals management. Limited awareness on, and the specialised nature of the chemicals management arena, together with the heavy reliance on scientific data and equipment, are some of the reasons for the disproportionate public interest.

Although the information exchange platforms are weak, when it comes to decision making, NGOs and industrial organisations all play a role in Government decision-making pertaining to chemicals management, as most decision making processes involve the participation of stakeholders through workshops, and inclusion on steering committees. This enables these sectors to contribute their views at these stakeholder workshops, and in the steering / coordinating committee meetings.

2.3 Assessment of POPs in Zimbabwe

2.3.1 Assessment with respect to Annex A, Part 1 Chemicals (POPs Pesticides)

2.3.1.1 Production

There are a number of pesticide manufacturing companies, but they mostly formulate pesticides, and do not synthesize the pesticides. There is no formulation of POPs pesticides in Zimbabwe, and all POPs have been banned.

2.3.1.2 Use and Imports

The use of POPs pesticides has been discontinued as they have been banned in Zimbabwe. Historically, before they were banned, they were widely used in Zimbabwe for agriculture, industry, household and veterinary purposes. Examples of the historical uses include:

Chlordane

- Agriculture: Chlordane was used in tobacco farming as a pesticide. Data available with importers and distributors of chlordane showed a decline in quantities imported up to 2003 as a result of the ban of the use of chlordane in tobacco.
- Construction Industry: Chlordane was used as a termiticide in building foundations and as an additive to plywood adhesives.
- Household: Chlordane was used as an ant kill.

Hexachlorobenzene

- Pesticide Manufacturing: Hexachlorobenzene was used as a solvent in pesticides.

Dieldrin

- Tsetse control: Dieldrin was used for tsetse control between 1962 and 1967 (Mpofu, 1987).

Dieldrin was also used extensively in agriculture.

Endosulfan

- Tsetse control: Endosulfan was used for aerial spraying in tsetse control in the 1980s.

Table 8 shows a profile of POPs Pesticides usage and imports in recent years.

Table 8: Profile of Imports and Usage of POPs Pesticides

CHEMICAL	SPECIFIC USE(S)	QUANTITIES IMPORTED IN RECENT YEARS (and year last imported)
Aldrin	Insecticide	Nil
Chlordane	1.Insecticide 2. Termiticide 3.Additive to plywood adhesives 4.Tobbacco farming	20 000 Litres (2003)
Dieldrin	Insecticide	Nil
Endrin	None	Nil
Heptachlor	Insecticide	Nil
Hexachlorobenzene	-solvent in pesticide	Not known
Mirex	Insecticide	Nil
Toxaphene	Insecticide	Nil
Lindane	Insecticide	4 tonnes (2007)
Endusolfan	Insecticide	7,640 litres (2011)

In the period between 1960 and 1990, POPs pesticides were readily available to members of the public, and many instances of poisoning involving POPs pesticides were recorded. Table 9 shows some of the pesticides (both POPs and non-POPs) that were encountered in cases of acute poisoning during the period mentioned.

Table 9: Pesticides Encountered in Poisoning Incidents between 1960 and 1990

Pesticide Period	60-64	65-69	70-74	75-79	80-84	85-89	90
Aldicarb (C)						X	
Aldrin (OC)	X	X	X			X	
Arsenic Compounds (AS)	X	X	X				
Altrazine (TZN)						X	X
Bromophos Ethyl (OP)				X	X	X	X
Carbaryl (C)			X	X	X	X	X
Carbofuran (C)						X	
Chordan (OC)						X	X
Chlorpyripos (OP)						X	
Cyanides (CN)	X	X	X	X			
Dementon-F-5-methyl (metasystox) (OP)						X	X
Diazinon (OP)		X	X	X	X	X	X
Dicrotophos (OP)				X	X	X	
Dieldrin (OC)	X	X	X	X		X	
Dimethoate (OP)		X	X	X	X	X	X
Dioxathion (OP)		X	X	X	X	X	X
Endosulphan (OC)		X	X	X	X	X	X
Endrin (OC)	X	X					
Ethyl Dibromide (EDB)	X	X	X				
Fenitrothion (OP)			X	X	X		X
Gama Bensene (GB)	X	X	X			X	X
Malathion (OP)	X	X	X	X		X	X
Monocrotophos (OP)			X	X		X	X
Parathion OP	X	X	X	X	X	X	X
Parathion -methyl (OP)						X	X
Phosdrin -(mevinphos) (OP)						X	
Telodrin (OC)						X	
Toxaphene (TP)	X	X	X	X			
Triazophos (OP)						X	
Warfarin (ACOA)						X	

(Source: WHO, 1992)

2.3.1.3 Registration of Pesticides

Registration of pesticides is carried out by the Pesticides Registrar in the Ministry of Agriculture, Mechanization and Irrigation Development as provided for by the Fertilizers, Farm Feeds and Remedies Act (18:12) of 1996. Only registered Zimbabwean companies are allowed to register and import pesticides.

The process of registration involves identification of the manufacturer of the pesticide, who will provide a Letter of Authorization to the Pesticides Registrar, giving the Registrar the permission to register the local distributor (local company) using the manufacturer's information. The applicant (local company) must also submit a dossier containing draft Zimbabwean labels, material safety data sheets, toxicological data, sworn statement of product content and certificate of active ingredient analysis of pesticide sample (one from the manufacturer and a Zimbabwean one from Fertilizers, Farm Feeds and Remedies Institute or the Tobacco Research Board). Efficacy field trials data from trials conducted in Zimbabwe should also be submitted. The duration of efficacy field trials is one season for generics and three consecutive seasons for non-generics. Additional field efficacy data from countries with climatic conditions similar to Zimbabwe may also be provided where available. Evidence of product registration in the country of origin is also required. It is worthy to note that pesticides are to be sourced from the manufacturer only and not traders.

The pesticides registration process for Zimbabwe is therefore quite rigorous and should achieve its goal of ensuring safe and efficient use of pesticides in the interest of the user, the farmer, the consumer and the general public.

However, while registration of pesticides is mandatory and is carried out by all registered pesticides manufacturers, it has been observed that there are many informal players who are formulating and / or packaging pesticides in their backyards often using banned substances, thereby circumventing the formal registration process. These unregistered pesticides are sold on the streets, and of late, some unlabelled pesticides have been discovered on the shelves of registered retailers. This disturbing trend is putting the public at risk of exposure to highly dangerous pesticides.

2.3.1.4 Obsolete Pesticide Stocks and Associated Materials

A preliminary inventory was carried out to determine the quantities and locations of obsolete pesticides and associated materials (particularly empty containers) in Zimbabwe. The inventory targeted all obsolete pesticides and associated materials, regardless of whether they were POPs or not. One reason for targeting all obsolete pesticides is that in some stores, the pesticides have missing labels, making it impossible to tell whether the pesticide is a POP or not, so it was more appropriate to just target all obsolete pesticides. The inventory gave an estimate quantity of 100 tonnes of obsolete pesticides and associated materials requiring destruction. Empty methyl bromide containers and contaminated agricultural equipment constituted the bulk of these obsolete stocks.

The figure, however, is very much a preliminary estimate, as only a small percentage of the country was covered. The inventory also pointed out that obsolete pesticide storage facilities in the country are often very poorly maintained, as shown in Figure 5.

Figure 5 showing a very deplorable obsolete pesticide storage site
(Source: MENRM, 2012 Report on Inventory of Obsolete Pesticides for Zimbabwe 2011)

2.3.2 Assessment with respect to Annex B Chemicals (DDT)

Historical Usage of DDT

Historically, DDT was used for tsetse control in Zimbabwe during the period 1968 – 1990 before it was banned for this purpose. It used to be applied in three districts of Zimbabwe, namely Gokwe, Kariba and Hurungwe. It was last used for this purpose in 1985, and has been replaced by the pyrethroid Deltamethrin. The volumes of DDT applied in ground spraying operations for tsetse control during that time are shown in Table 10.

Table 10: Quantities of DDT used in ground spraying operations for tsetse control in Zimbabwe, 1968 to 1990

Year	Area treated (sq. km.)	DDT used (tonnes)	(kg per sq. km)
1968	12,401	205	16.5
1969	8,238	148	17.9
1970	9,302	142	15.2
1971	7,897	146	18.5
1972	10,877	236	21.7
1973	10,585	252	23.8
1974	8,167	225	27.6
1975	9,150	233	25.5
1976	8,454	246	29.1
1977	Disruption due to war	-	-
1978	"	-	-
1979	"	-	-
1980	5,246	177	33.7
1981	9,465	334	36.1
1982	6,324	282	33.9
1983	7,864	267	34.0
1984	8,901	247	27.7
1985	4,812	175	36.3
1986	6,742	222	32.9
1987	7,716	211	31.0
1988	2,838	88	31.0
1989	1,187	44	37.1
1990	213	12	56.3
Total (1968 – 90)		**3,892**	
Average	**7,319**	**195**	**29.3**

(Source: Annual reports of the Tsetse and Trypanosomiasis Control Branch)[1]

DDT was also extensively used in agriculture prior to 1983, (the year in which it was banned for this purpose). During that pre-1983 period before its ban, DDT was used for controlling agricultural pests such as maize stalk borer *(Busseola fusca)*, cotton cutworm *(Agrotis spp)* and cotton bollworm *(Heliothis spp)*. There is also evidence that DDT was used as an insecticide to control pests of stored grain (Chikuni & Nhachi, 1996).

[1] Cited by Chadenga V on: http://www.fao.org/docrep/004/T0599E/T0599E08.htm

Current Usage of DDT

Malaria in Zimbabwe

Although DDT has been banned for agricultural use and tsetse control, its use is now restricted for Indoor Residual Spraying (IRS) to control the malaria mosquito. Malaria is a major public health problem in Zimbabwe. It is the third most common cause of morbidity and mortality, coming after HIV/AIDS and tuberculosis. Annually, close to 1.5 million cases of malaria are reported, and an average of 1000 people die from it .

Malaria is prevalent in the low lying areas of Zimbabwe, with transmission being generally unstable and seasonal. Malaria transmission occurs in 45 districts (out of a total of 59 districts in the country). Figure 6 shows Zimbabwe's malaria stratification as at 2002, while Figure 7 shows Zimbabwe's malaria incidence rates as at 2011.

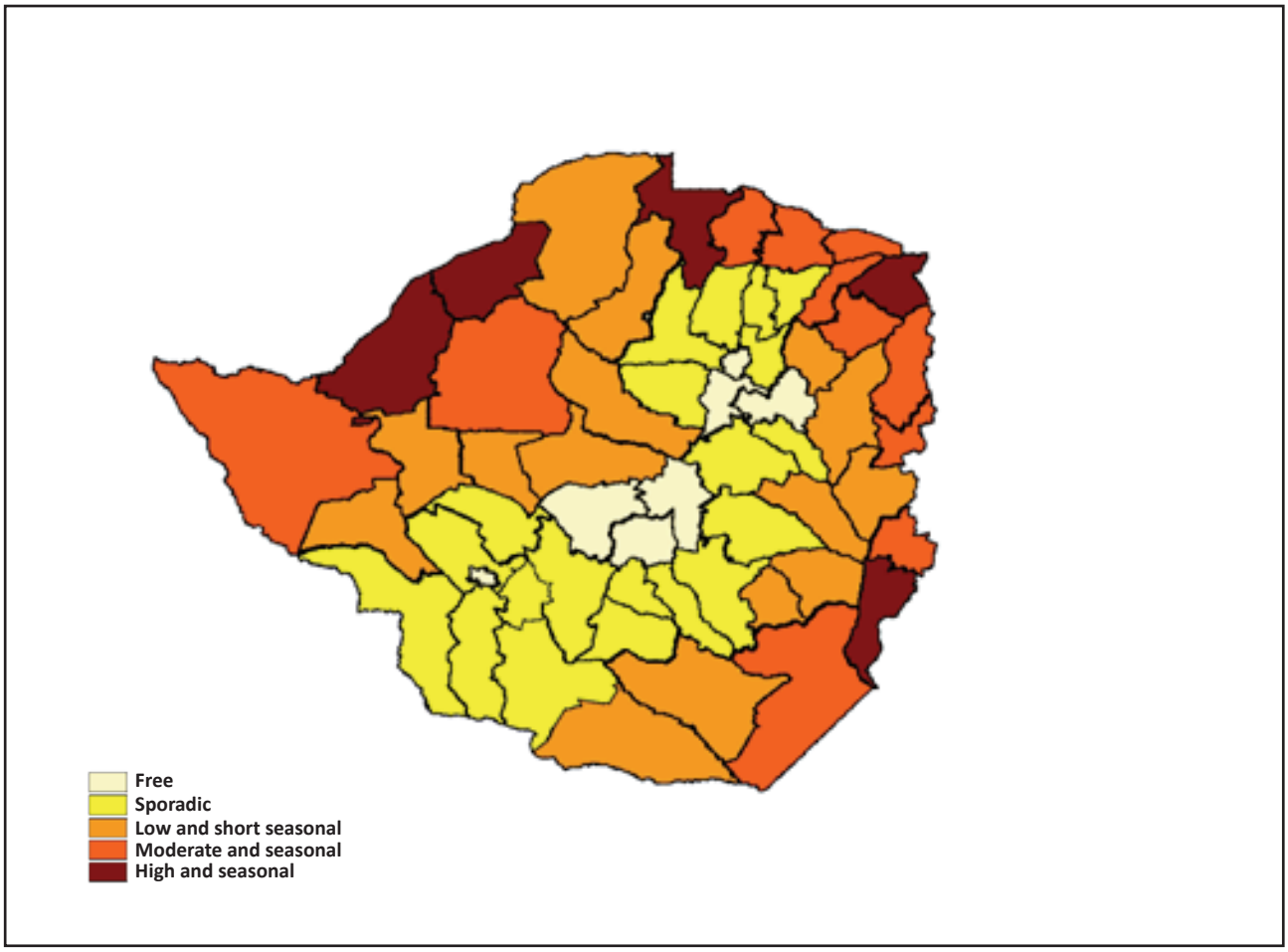

Figure 6 showing Zimbabwe malaria stratification 2002

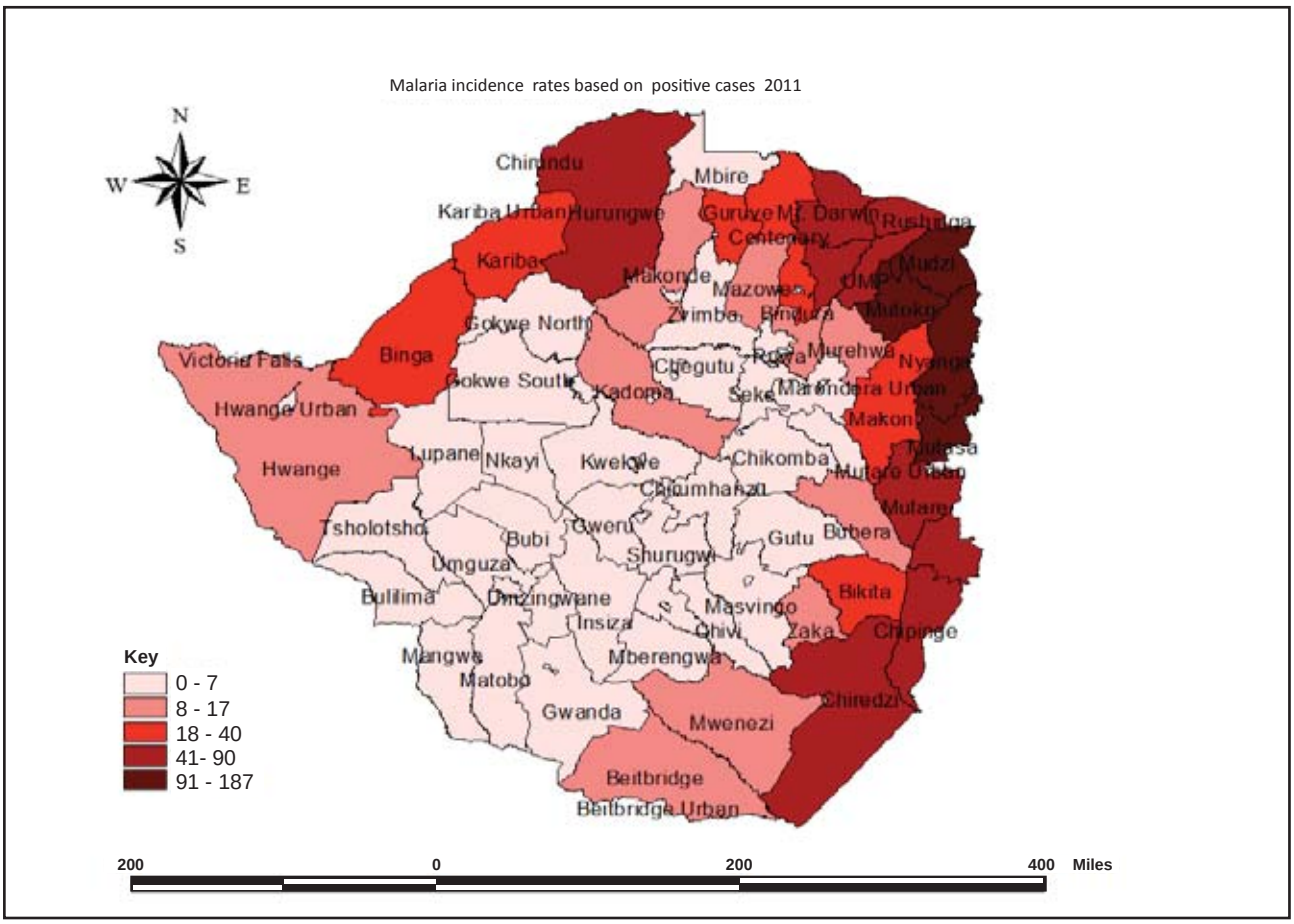

Figure 7 showing Zimbabwe's malaria incidence rates as at 2011

The primary species of the malaria parasite is *Plasmodium falciparum* which accounts for 97% of confirmed cases. The main vector mosquito is *Anopheles arabiensis.* Most malaria control programmes target the vector mosquito, through the use of Long Lasting Insecticidal Nets (LLINs) and Indoor Residual Spraying (IRS). The LLINs are treated with pyrethroids, while DDT is used for IRS.

Usage of DDT for Malaria Control

In 2006, the World Health Organization (WHO) issued a position statement promoting the use of indoor residual spraying (IRS) with DDT for malaria vector control. Zimbabwe concurred because of the great burden of malaria as well as relatively short residual effect of other groups of insecticides used to control the vector mosquitoes.

So far, DDT has been identified as one of the most effective pesticides for controlling the malaria mosquito, hence the reason for its continued use. The Ministry of Health and Child Welfare requires about 140 tonnes of the pesticide for its IRS programme per annum, although the exact volumes imported vary from year to year, depending on availability of funds. Table 11 shows the volumes of DDT used between 2005 – 2009.

Table 11: Quantities of DDT used for malaria control between 2005 and 2009

Year	Tonnes of DDT used for malaria control
2005	108
2006	61
2007	44
2008	97
2009	61

(Source: WHO, 2011)

The DDT is sprayed in malaria-endemic areas, and there are 22 districts, (out of a total of 59 districts in Zimbabwe), where DDT is sprayed. These include Bulilima, Mangwe, Beitbridge, Matobo, Gwanda, Hwange, Binga, Lupane, Tsholotsho, Mberengwa, Gokwe North, Gokwe South, Mwenezi, Chiredzi, Chipinge, Kariba, Uzumba-Maramba-Pfungwe, Mudzi, Mbire, Centenary, Rushinga and Mt Darwin.

The DDT is bought from an Indian company, Hindustan Insecticides Limited, which has a distributor in Zimbabwe, Nets for Africa. Funds for purchasing the DDT are supplied by the Global Fund, through UNDP, Zimbabwe. Nets for Africa is currently the only distributor of the chemical in Zimbabwe. One pesticide manufacturer, Chemplex, imported the DDT about five years ago and packaged and distributed to Ministry of Health and Child Welfare. The company only did this for one season, and they are now saddled with approximately two tonnes of the packaging waste, which they need to dispose of.

The protocol for the use of DDT by MoHCW is very tightly controlled, such that chances of leakages are slim. The DDT packaging waste is sent to a local company, Hwange Colliery Company Limited, which is believed to incinerate DDT waste at sufficient temperature with adequate residence time as well as mixing of combustion gases and waste or fuel feed. The incinerator is said to have facilities for complete or good combustion practices including management of the "3 Ts"- time of residence, temperature and turbulence, and sufficient oxygen (O_2) to allow complete oxidation. It will, however, be necessary to determine the efficiency of these facilities.

MoHCW goes to great lengths to ensure occupational safety of the spray operators. Spray operators are drawn from the community, trained on spraying techniques, and are supplied with the appropriate Personal Protective Clothing and Equipment (PPCE). MoHCW also reduces exposure of these workers by employing spray operators on a contract basis for one season only. Such spray operators may only be contracted again after three or four seasons. This ensures that occupational exposure for the spray operators is minimal.

2.3.3 Assessment with respect to Annex A, Part II Chemicals - Polychlorinated Biphenyls (PCBs)

An inventory was carried out in order to determine the amount of PCBs in Zimbabwe. The inventory focussed only on PCBs in electrical equipment, which are found in three categories – the pure PCB transformers, the PCB capacitors, and the PCB-contaminated oil transformers. Although the PCB inventory attempted to quantify the amount of PCBs in Zimbabwe in terms of the three categories, the main focus was on PCB- contaminated oil transformers, which are expected to make up the bulk of contaminated equipment requiring destruction. (From studies elsewhere in the world, it has been noted that the quantities of PCBs from the other two categories – pure PCB transformers and PCB

capacitors – are fairly small in comparison to the PCB-contaminated oil transformers, and hence can often be exported abroad for destruction).

The inventory process was conducted on a small part of the country, since it was not possible to cover the whole country all at the same time due to budgetary constraints.

The owners of transformers in Zimbabwe can be split into four general categories, namely
- The utility sector (the major owner),
- Big industries with own power generation
- Other industries with their own transformers (but no power generation)
- Companies that repair transformers or scrap them.

2.3.3.1 Utility sector in Zimbabwe

There is one power utility in Zimbabwe, the Zimbabwe Electricity Supply Authority (ZESA). Zesa has four subsidiary companies, namely:
- The Zimbabwe Power Company (ZPC), responsible for power generation. ZPC operates five power stations (one being a hydro-electric power station, and the other four being thermal power stations)
- The Zimbabwe Electricity Transmission and Distribution Company (ZETDC), responsible for the transmission and distribution of power
- ZESA Enterprises, responsible for manufacture and repair of transformers and other equipment used in the transmission and distribution of power
- Powertel, responsible for telecommunications

During the inventory it was noted that ZETDC, which owns the majority of transformers in Zimbabwe, has approximately 39,000 transformers, of which approximately 400 are transmission transformers and 38,600 are distribution transformers. There are about 3,000 other transformers owned by ZPC and other private companies bringing the total number of transformers to about 42,000. The transformers in Zimbabwe range in age from those manufactured in the 1930s to some manufactured as late as 2011.

During the field inventory exercise, oil samples were collected and analysed for PCBs from a total of 505 transformers. Of these samples, 39 were found to be PCB contaminated, representing an approximate 8% contamination level of transformers in Zimbabwe. A transformer is said to be PCB-contaminated if it has an Askarel (PCB) concentration greater than or equal to 50 parts per million (ppm).

The ages of the contaminated transformers ranged from those manufactured in 1936, to some manufactured in 2007. Several pure PCB capacitors were also noted during the field inventory exercise, particularly at mineral processing operations. No pure PCB transformers were noted during the field visits, but they are expected to be present in the country. The properties of the contaminated transformers are described in Table 12. As will be noted on the table, information for some of the transformers is missing. This is due to the fact that the name plates on some of the transformers were missing, or were unclear, hence some of the information could not be captured.

Table 12: Summary Description of Contaminated Transformers

Manufacturer	Year of Manufacture	Power	HV/LV (kV)	Cooling type	Total Weight	Liquid Weight/ Volume	Chloride Reading	PCB (Askarel) Concentration in ppm	Sector
									National Electricity Utility -Transmission and Distribution
C.A. Parsons and Co.	1984	300 KVA	3.3/0.4 kv	onan	2,700 kg	900 kg	57.9	73.4	Private Company
Alstom	2001			onan	800 kg	290 kg	39.1	50	National Electricity Utility -Transmission and Distribution
							163	206	National Electricity Utility -Transmission and Distribution
South Wales	1977	500 KVA	11/0.4 kv	onan	2,727 kg	822 L	52.4	66.4	National Electricity Utility -Transmission and Distribution
First electric Central Africa Ltd		500 KVA	11/0.4 kv	onan	7,000 lbs (3,181 kg)	222 gal	49.8	63.1	National Electricity Utility -Transmission and Distribution
Bonar, Longman and Co.		500 KVA	11/0.4 kv	onan	1,470 kg	195 gal	58.9	64.5	National Electricity Utility -Transmission and Distribution
Constructions Electriques Du Centtre (Celduc)	1981	500 KVA	10.5 /0.64 kv	onan	1,920 kg	1020 L	52.5	66.6	National Electricity Utility -Power generation
Celduc	1981	500 KVA	10.5 /0.64 kv	onan	1,920 kg	385 kg	295	374	National Electricity Utility -Power generation
Celduc	1981	500 KVA	10.5 /0.64 kv	onan	1,920 kg	385 kg	162	206	National Electricity Utility -Power generation
English Electric IDD	1936	35,500 KVA		onan	57,000 kg	2,600 gal	40.5	51.3	National Electricity Utility -Power generation

Manufacturer	Year of Manufacture	Power	HV/LV (kV)	Cooling type	Total Weight	Liquid Weight/ Volume	Chloride Reading	PCB (Askarel) Concentration in ppm	Sector
Bonar Long	1954	300 KVA		onan	2,260 kg	145 gal	53.2	67.5	National Electricity Utility -Power generation
	1959	1000 KVA	33/11 kv	on	11,189 lbs (5,085 kg)	3,645 lbs (1,657 kg)	49	62.1	Mining / Mineral Processing
	1953	500 KVA	33/0.55 kv	on	4,562 kg	1,430 kg	39.9	50.6	Mining / Mineral Processing
		1000 KVA	33/3.3 kv	on	15,480 lbs (7,036 kg)	4,919 lbs (2,236 kg)	45.2	57.3	Mining / Mineral Processing
	1981	1000 KVA	11/0.525 kv	onan	3,630 kg	890 kg	76	96.3	Mining / Mineral Processing
Stromberg (Finland)	1989	5 MVA	33/12 kv	onan	11,000 kg	2,550 kg	50.8	64.3	National Electricity Utility -Transmission and Distribution
Mecco	1971	25 KVA	11/0.4 kv	onan	920 lbs (418 kg)	26	63.6	68	National Electricity Utility -Transmission and Distribution
South Wales		1000 KVA	11.5/0.55 kv	onan	8373 lbs (4,033 kg)	1,137 L	117	148	Mining / Mineral Processing
South Wales	1972	200 KVA	11/0.4 kv	onan	1,430 kg	479 kg	45.5	57.7	National Electricity Utility -Transmission and Distribution
Nical	2008	100 KVA	0.55/0.38				62.9	79.7	Mining / Mineral Processing
South Wales	1981	50 KVA	11/0.4 kv	o.n	495 kg	182 kg	48.5	61.4	National Electricity Utility -Transmission and Distribution

Manufacturer	Year of Manufacture	Power	HV/LV (kV)	Cooling type	Total Weight	Liquid Weight/ Volume	Chloride Reading	PCB (Askarel) Concentration in ppm	Sector
Shandong Dachi elctric (China)	2007	1000 KVA	11/0.4 kv	onan	2,740 kg		169	239	National Electricity Utility -Transmission and Distribution
	1995		0.55/0.38 kv		1190	460 L	43.4	55	Mining / Mineral Processing
Dimako	2007	100 KVA	0.55/0.4 kv	onan	850kg	290 L	177	225	Mining / Mineral Processing
Mecco	1974	25 KVA	11/0.4 kv	onan	920 lbs (418 kg)	29 gal	49.1	62.2	National Electricity Utility -Transmission and Distribution
South Wales						2,414 lbs (1,096 kg) /282 gal	72	91.3	Mining / Mineral Processing
Nical						3,440 L / 2,954 kg		73.6	Mining / Mineral Processing
South Wales						348 kg		164	Mining / Mineral Processing
							68	86.2	Mining / Mineral Processing
Electricity Supply Commission Southern Rhodesia							56	70.9	Mining / Mineral Processing
Nical	2002	1000 KVA	11/0.55 kv	onan	3655	785 / 915L	408	518 / 504	Mining / Mineral Processing
South Wales	1970	1000 KVA	11/0.55 kv	onan	8114 lbs (3,688 kg)	2017 lbs (917 kg)		600	Mining / Mineral Processing

Manufacturer	Year of Manufacture	Power	HV/LV (kV)	Cooling type	Total Weight	Liquid Weight/ Volume	Chloride Reading	PCB (Askarel) Concentration in ppm	Sector
Nical	2002	1000 kKVA	11/2.2 kv	onan	3690	796		475	Mining / Mineral Processing
	1966	50 KVA	2.2/3.8 kv	onan	1,287	50 gal	114	Te	Mining / Mineral Processing
	1990	7500 KVA	33/11 kv	onan	15,140	3,500 kg	43.8	55.5	
				onan			43.1	54.6	Mining / Mineral Processing
	1970	1000 KVA	11/2.2 kv	onan	8114 lbs (3,688 kg)	2071 L	50.5	66.6	Mining / Mineral Processing
						73.94	51.2	64.9	Mining / Mineral Processing

(Source: MENRM, 2012 – PCB Inventory Report for Zimbabwe 2011)

Due to the limited budget, a very small sample size of about 1.2% of the total number of transformers in Zimbabwe was used, and a random sampling method was used to collect the samples. The 8 % PCB contamination rate that was obtained was therefore not totally conclusive due to the small sample size and the sampling methodology. A more detailed inventory, which makes use of a stratified random sampling procedure, would need to be carried out in order to ensure the production of an accurate inventory on the PCB contamination status for Zimbabwe.

The inventory was, however, very useful in that it showed that PCB contamination is not limited to the pre-1980 transformers, as had been expected, but even those with a manufacture year of 2007 (more than 20 years after the manufacture of PCBs had been discontinued) could still be contaminated. This suggests that PCB cross-contamination could be occurring possibly during servicing of transformers. The inventory again showed that contamination is not limited to the smaller distribution transformers as had been expected, but even the big transmission transformers (in this case a 57-tonne transformer was found to be contaminated).

The inventory also showed that in a number of instances, decommissioned transformers and capacitors were stored poorly, and there was a lot of leakage of oil into the bare soil. It can thus be concluded that poor storage of decommissioned electrical equipment which contains oil is leading to environmental contamination by oil which could very possibly be PCB contaminated.

Other Uses of Transformer Oil in Zimbabwe

There is a lot of transformer oil theft in Zimbabwe. When questioned on what they use it for, the culprits indicated that it is sold and used for the following:

- as a coolant for welding machines,
- it is mixed with diesel to increase the quantity of diesel,
- it is also sold as cheap cooking oil.

Members of the public are therefore at a very high risk of exposure, particularly given the fact that it is sold as cheap cooking oil to unsuspecting members of the public.

2.3.4 Assessment of Releases from Unintentional Productions of Annex C Chemicals – Unintentionally Produced POPs (U-POPs)

2.3.4.1 Composition of U-POPs Emission Sources in Zimbabwe

A survey was carried out in 2011-2012 to determine the amounts of U-POPs released from the different sources. The UNEP Toolkit (2005 version) was used to calculate the estimated amounts released. The major sources of PCDD/PCDF release in Zimbabwe are summarised in Table 13. The unit of measurement used is grams of toxic equivalent per annum (g TEQ/annum), which is a measure of the amount of PCDD/PCDF released from the particular process.

Table 13: Summary of U-POPs Emissions in Zimbabwe, by Sector

Source Categories	Annual Releases (g TEQ/annum)						
	Media						
	Air	Water	Land	Products	Residues	Total	% of total emission
1. Waste Incineration							
a. Medical Waste Incineration	2.1				0.01	2.1	0.61
2. Ferrous and Non-Ferrous Metal Production							
a. Iron and Steel production	0.023				0.012	0.035	0.010
b. Aluminium production	0.093				0.12	0.21	0.061
3. Power Generation and Heating							
a. Fossil Fuel Power Plants	0.60				0.84	1.4	0.41
4. Mineral Production							
a. Cement Production	0.038						
5. Transport							
a. 4-stroke petrol engines	0.041					0.041	0.012
b. Diesel Engines	0.078					0.078	0.023
6. Uncontrolled Combustion / open Burning Processes							
a. Biomass Burning	32		24			56	16
b. Waste Burning (Domestic and Landfill)	150		130			280	82
c. Accidental Fires in houses, factories and vehicles	0.59		0.57			1.2	0.35
7. Production and Use of chemicals and Consumer Goods							
8. Miscellaneous							
a. Dry Cleaning					0.00054	0.00054	0.000
d. Tobacco Smoking	0.00029					0.00029	0.000
9. Disposal							
a. Landfill Leachate		0.00022			0.043	0.043	0.013
b. Sewage Treatment		0.27				0.27	0.079
Total	**186**	**0.27**	**155**		**1.0**	**342**	
% of total	54	0.08	45		0.29	100	100

(Source: MENRM, 2012 – U-POPs Inventory Report for Zimbabwe 2012)

Burning of waste (both at the domestic level and at landfills) accounts for 82 % of the releases of U-POPs in Zimbabwe. Biomass burning (veld fires and burning of agricultural residues) accounts for 16 % of releases, medical waste incineration accounts for 0.62 %, accidental fires in houses, cars and factories account for 0.35%, and fossil fuel power plants accounts for 0.41%. Other significant sources are aluminium production (0.062%) and sewage treatment (0.079%).

About 54% of releases are made to the air, while 45 % are made to land, and 0.29 % of releases are to residues. Since the air as a medium moves the furthest, it can be assumed that the location of PCDD/PCDF is spread throughout the country, and exposure for the public is fairly high, even for those who are far from where the PCDD/PCDF are released.

Analysis of U-POPs Releases by Sector

Main Category 1 – Waste Incineration

Medical Waste Incineration contributes a significant amount of PCDD/PCDF release of 2.1 g TEQ/annum. This activity takes place at most hospitals throughout the country, implying that people in the proximity of the incinerators can become exposed to these PCDD/PCDF releases, especially considering that they are released into the air.

There is no incineration of municipal solid waste in Zimbabwe. Solid waste is often burned in the open. There is no incineration of hazardous waste in Zimbabwe either. Some may be burnt in the open unscrupulously, but there are no statistics to support this, hence the amount of PCDD/PCDF release from this sub-category could not be ascertained.

Main Category 2 – Ferrous and Non- Ferrous Metal Production

Although Zimbabwe has a huge iron and steel production facility, ZISCOSTEEL (the Zimbabwe Iron and Steel Company), at the time of the inventory (year 2011 - 2012), the giant steelmaker was not producing. No data could be collected pertaining to the operations of this industry; hence the contribution of PCDD/PCDF release from this industry could not be ascertained. The facility is expected to start operating again in the very near future.

The aluminium industry contributed a moderate amount of PCDD/PCDF, at 0.21 g TEQ/annum. The data on aluminium production was obtained from a secondary aluminium producer.

The contribution made by the ferrochrome industry was fairly low, at 0.035 g TEQ/annum. This could be attributed to the fact that the larger producer has a good pollution abatement system in place; hence the release of PCDD/PCDF was lower than it could have been.

Main Category 3 - Power Generation and Heating

Fossil Fuel Power Plants

Zimbabwe has four fossil fuel power plants which generate electricity for the nation. In all these power plants, bituminous coal is used to generate electric power. The calorific value of bituminous coal ranges between 24MJ/kg and 33MJ/kg. For the purpose of this calculation, an average calorific value of 28.5MJ/kg for bituminous coal was used. The fossil fuel power plants contribute a significant amount of PCDD/PCDF (1.4 g TEQ/annum).

Household heating and cooking

The use of wood fuel for cooking is very common in Zimbabwe, and wood is used by the majority of people in the rural areas of Zimbabwe where about 65 % of the population live. The use of wood fuel is also quite common in the urban areas at times, as power cuts are quite common. The 2008 Inter-Censal Demographic Survey showed that 77% of Zimbabwean households use wood for cooking. Specific data on the estimated total amount of wood fuel burned for this purpose could not be obtained, but it is expected that a very large percentage of the population is exposed to emissions (PAHs, fine particles and possibly U-POPs) from this source.

Domestic heating (fossil fuels)
The use of fossil fuels for domestic heating takes place on a very minute scale in Zimbabwe; hence data on this activity was not collected.

Main Category 4 - Mineral Production

Cement Production
There are three major cement manufacturing plants in Zimbabwe, which all use the dry process. The contribution of cement plants to PCDD / PCDF release was found to be fairly low (0.038 g TEQ/ annum). This was most likely due to the process type used (dry process with low emission factors). Also, the pollution abatement technologies at all plants were appropriate.

Brick Production
The total number of bricks produced in Zimbabwe in 2011 (according to the Zimbabwe National Statistics Agency) was 255,614,667, which is approximately 226,120 tonnes. The total emission of PCDD/PCDF from this activity was estimated to be 0.046 g TEQ/annum.

The PCDD/PCDF releases were calculated based on data received from the registered brick making establishments. There are, however, numerous unregistered brick making establishments throughout the country, as brick making is a fairly brisk business, and is a major source of income for a number of informal producers and traders. The calculated emissions are therefore an underestimation of what is present in the country.

While some of the bigger registered establishments use coal for making bricks, the smaller unregistered establishments usually use wood, and in some cases may even use treated waste wood. These small scale establishments often operate in the residential areas, hence there is a high risk of PCDD/PCDF and other release (PAHs and particles) exposure for the residents living in the vicinity of these establishments.

Main Category 5 – Transport

The transport sector contributes a fairly low percentage of the total PCDD/PCDF releases in Zimbabwe (0.12 g TEQ/annum, which is 0.035% of the total release). The people who are most likely to be at risk from these emissions (along with the associated PAH and particle releases) are the urban population, where the majority of vehicles are concentrated. The number of vehicles in the country is increasing, implying that the contribution of the transport sector to the release of PCDD/PCDF and other releases is expected to increase.

Main Category 6 – Uncontrolled Combustion / Open Burning Processes

This category contributes the highest sources of PCDD/PCDF by far, weighing in at a combined total of 98% of total releases. Burning of waste (both domestic and in landfills) contributes 82% (280 g TEQ) of all PCDD/PCDF releases in the country. The waste is un-segregated, and is composed of plastic, paper, leather, textiles, bottles, kitchen waste, garden waste, e-waste and other hazardous waste. The potential for PCDD/PCDF release from burning of this mixed waste is therefore very high. Biomass burning (veld fires and burning of agricultural residues) contributes 16% (56g TEQ).

Burning of waste in residential areas is a common practice especially in areas where waste may not be collected on a regular basis. In many cases local authorities are unable to collect all the waste that is produced, hence the residents end up burning the waste, usually in their backyards. Many

residents actually believe that burning of waste is an acceptable method of managing waste despite the several awareness raising programmes that have been conducted in attempting to educate them otherwise. The residents may also dump the uncollected waste in open spaces close to their homes, and burning of these small illegal dumps is quite common. The fact that this practice takes place in the residential areas means that a large percentage of the population is exposed to the emissions of PCDD/PCDF and other toxic releases.

When the local authority manages to collect the waste, it is dumped at the municipal landfills, and many of the landfills are just formalized dumpsites. Landfill fires are quite common at these dumpsites, since there is no collection of landfill gas. The landfill fires can go on for weeks, exposing residents in the vicinity to PCDD/PCDF releases. Poor waste management is therefore one of the biggest environmental problems affecting Zimbabwe, and it will need to be addressed in order to reduce the exposure of the general populace to PCDD/PCDF, other releases and the toxic ashes scattered all over the country.

The application of the waste management hierarchy has not yet taken off among the general public. It is mainly practiced by those organizations that have management systems such ISO 14001 and ISO 9001 in place.

Veld fires are also very common, and occur throughout the country, particularly in the dry windy season, resulting in an even greater dispersion of PCDD/PCDF and other emissions. The magnitude of the problem is quite high, considering that statistics reveal that a total of 713,770 hectares were burned in 2011, which is approximately 2% of the total land area of 39,075,700 hectares for Zimbabwe. It is therefore imperative that measures to control and reduce the incidence of veld fires be employed, if the releases of PCDD/PCDF are to be reduced.

The releases of PCDD/PCDF from agricultural residue burning were calculated from the burning of sugar cane leaves before harvesting the sugar cane for sugar production.

Main Category 7 – Production and Use of Chemicals and Consumer Goods

Pulp and Paper Mills

The pulp and paper industry in Zimbabwe is currently very depressed, with the major companies being out of operation at present. No data on this activity was therefore available from the sector.

Textile plants

The Zimbabwe textile industry has become so depressed in Zimbabwe over the last few years (due to imports of cheap clothing), that no data was collected from this industry, as it was seen to be insignificant.

Leather Plants

The leather industry has also become very depressed (having declined by 91% over the last decade. No data was available from this sector.

Main Category 8 – Miscellaneous

Dry cleaning

In Zimbabwe, the majority of dry cleaners handle normal and not heavy duty textiles (99.99% normal), hence the emissions of PCDD/PCDF into the dry cleaning residues are much lower than they would have been if heavy duty textiles were used. Calculations of PCDD/PCDF releases from

dry cleaning gave an estimated 0.00054 g TEQ/annum of PCDD/PCDF. Although the overall figure appears fairly low, it becomes significant in that the dry cleaning residues are disposed of in the municipal sewer system, where they are discharged back into the environment after treatment. The general populace thus becomes exposed to this source of PCDD/PCDF and other pollutants including perchloroethene used in dry cleaning.

Tobacco Smoking

In Zimbabwe in 2011, approximately 2.95 billion cigarettes were sold, which translates to 2,650 tonnes of tobacco since one cigarette contains about 0.9 g of tobacco. The emission of PCDD/PCDF from cigarette smoking was calculated to be about 0.0003 g TEQ /annum. This is also a relatively low emission value, and it can be assumed that the smokers and their families are most at risk from this source of PCDD/PCDF and the much higher amount of PAHs.

Main Category 9 – Disposal / Landfill

Landfill Leachate

The amount of leachate outflow in Harare was estimated to be approximately 933,400 L per annum. Calculating the PCDD/PCDF emissions from the leachate outflow gave an estimated 0.043 g TEQ /annum for the whole country. This is a moderate release of PCDD/PCDF, a situation which is exacerbated by the fact that none of the landfills in Zimbabwe are lined thereby resulting in all the leachate flowing to join the groundwater system. This puts quite a lot of people at risk of exposure from pollution release from landfills, since groundwater is a source of water for many people in Zimbabwe. However, currently no studies have been carried out to determine the length of the contaminant plumes emanating from the landfills, hence the exact impact of PCDD/PCDF and other release from leachates and ground water contamination cannot be determined.

Sewage / Sewage treatment

In Harare, the amount of sewage outflow from the treatment works is 70,810 ML per annum. This outflow is basically domestic and industrial sewage treated together, and there is sludge removal. Calculations of PCDD/PCDF releases for the whole country based on this gave an approximate value of 0.27 g TEQ /annum. This figure is quite high, and again a lot of people, especially urban dwellers are at risk of exposure since the treated sewage is discharged into water bodies from which a number of municipalities draw their drinking water.

Composting

This activity is carried out on a very small scale in Zimbabwe, hence its contribution to PCDD/PCDF emissions can be assumed to be negligible.

Waste Oil Disposal

This activity is also carried out on a very small scale in Zimbabwe, hence its contribution to PCDD/PCDF emissions can be assumed to be negligible. However, most of the waste oil is re-used and producers sell it off. Those who buy used oil use it for firing furnaces and making pesticides. The possibility of PCDD/PCDF release from the use of waste oil to furnaces is quite high if PCB containing oil is used, and there is need to identify exact industries that practise this as a start to ensure reduction of the emissions.

Main Category 10 – Hot Spots

Production sites of chlorinated organics

In Zimbabwe, there is no production of chlorinated organics, chlorine, or chlorinated phenols.

However there are a number of pesticide formulation companies which are currently operating and have been operating in the past. The related formulation areas and related landfills can be considered a hotspot for pesticides and associated PCDD/PCDF contamination.

Timber manufacture and treatment sites

Timber manufacture and treatment is common in Manicaland province of Zimbabwe. There are three major companies that grow timber, but the number of those that treat timber is much higher, since many smaller companies buy from the major growers and treat the timber on their own. The majority of those that treat poles use creosote, but lately this has been becoming difficult to obtain, so some of the companies are turning to the use of Chromated Copper Arsenate (CCA) for treating poles. The timber industry is growing, going by increasing quantities of timber treated in recent years (in 2011- 60,791 m3 of treated poles were produced, in 2012- 33,718m3 were produced, in 2009 - 10,279 m3 were produced. There is thus a likelihood that the timber treatment sites could be contamination hotspots and the problem could get worse judging by the increasing volumes of treated timber.

Since in history some pentachlorophenol (PCP) might have been used for timber treatment, these areas can be considered as possibly contaminated.

PCB containing equipment

The preliminary PCB inventory conducted in Zimbabwe in 2011 did not identify any pure PCB transformers, although a number of PCB capacitors were identified. A lot of storage sites for transformers exist, though these were very poorly kept, and there was a lot of oil leaking into the ground. Since the PCB status of the transformers was not always known, storage sites for transformers appear to be a high risk area in terms of PCDD/PCDF and PCB contamination with potential of further emissions.

Dumps of waste/residues from categories 1 – 9

In Zimbabwe, industrial and domestic waste are usually dumped together at municipal dumpsites, hence the ordinary municipal dumpsites are potential hotspots for PCDD/PCDF. Table 14 describes the composition of the industrial waste that was received by the City of Harare in 2010.

Table 14: Composition of Industrial Waste Received by City of Harare in 2010

INDUSTRY	LITRES-000	TONNES	CONSTITUENTS OF WASTE
Metal – Plating and fabrication	-	149.65	Cyanides, Acids, Pickling Wastes, Cr-compounds, Alkalis, Sludge from wastewater treatment
Leather/Tannery ,Textile And miscellaneous electrical & electronic goods	-	2131	Cr-compounds, Acid/Alkaline shavings, fats, sludge, solvents, paint. Sodium Chloride Cu, Hg, Pb, Se, Cl- Hydrocarbons.
Chemical manufacturing inorganic &organic	304.6	4345.6	Waste fertilizers, pesticides herbicides Acids ,Solvents, paint, ink, dye, pigments ,Zinc, Alkalis, Asbestos ,Batteries, Plastic , Rubber , Latex, Thermal Waste, glass and light tubes As, Cd, Cu, Cr, Hg, Pb, Se.
Pulp & paper, printing	-	4	Sulphate waste, de-inking residue, glue & adhesive wastes. Alkalis reducing agents, , Solvents, paper sludge
Food Industry	2331	521.85	Contaminated processed foods, spoiled beverages spend grain (beverage man) flour, spoiled meats vegetables and fruit, sludge from settling tanks and effluent treatment works fats, obsolete Food preservatives and other additives.
Domestic home and personal	1417.61	155.7	Waxes, Lotions, soaps fats dyes, hair products plastics detergents cleaning compounds
Soap Manufacturing & edible Oils	4078.4	645.2	Fats, Oil, Sludge, alkalis, Acids Soaps, Sludge from effluent treatment Works, Gum, Oily water
Health Institutions	100.25	99.86	Pharmaceutical wastes, expired drugs. Organics & heavy metal (As, Hg)

(Source: City of Harare Health Department – 2010 Annual Report)

From the composition of the waste, it can be easily seen that the local authority municipal landfill is a hotspot for PCDD/PCDF release.

However, some of the waste produced is not accounted for at the landfill because of illegal dumping carried out throughout the city. Waste is disposed of into sewers and on open land in secluded areas as industry avoids paying disposal tariffs to the Local Authority. This therefore means that there are several unknown hotspots throughout the urban areas from which PCDD/PCDF release is likely to occur.

Sites of relevant accidents

Sites of relevant accidents with generation of PCDD/PCDF, such as large scale fires of industries or larger constructions are registered by the fire fighting services. Chemical accidents that occur within factory premises, however, are not so well monitored, since the onus is on the factory owner to report. If the owner does not report to the authorities, they have no way of knowing, hence the potential hotspots are not easily known. However since Zimbabwe does not have chemical industries producing chlorinated organics there is a minor risk of relevant accidents with high PCDD/PCDF release within the chemical industries.

Kaolin or Ball Clay Sites

Ball clay and kaolinic clays in different regions in the world can contain PCDD/PCDF with a specific PCDD dominated pattern (Ferrario et al, 2007; Horii et al, 2011). Kaolin samples from Africa have also been found to contain elevated levels of PCDD (Reeuwijk et al, 2013). Studies also show that the relatively high levels of PCDD/PCDF in human milk samples from Congo and Ivory Coast are due to the use of the clay during pregnancy. Other countries with low contaminated clays seem not to have a relevant impact from this practice. In Zimbabwe clay is also used during pregnancy. PCDD/PCDF in ball/kaolinic clays, in particular from quarries where clays are used for human consumption or as animal feed additive, will therefore need to be evaluated.

2.3.5 Current Level of Information, Awareness and Education

Currently the level of awareness on POPs issues and general chemicals management among the general public in Zimbabwe is low. Although several organizations are involved in efforts to raise awareness, these programmes have not managed to reach the majority of the population, and there is need for concerted efforts in order to raise the level of public awareness on POPs issues.

Awareness pertaining to POPs pesticides and general pesticides management is very low, as indicated by the way in which users often handle the pesticides. Empty pesticide containers are not treated as hazardous waste, and it is very common to find empty plastic pesticide containers having been rinsed out and being used for water storage in the home. Cases of people using unlabelled pesticides are also quite common, with some unlabelled pesticides being sold on the streets illegally. Although some of these pesticides may not be POPs, the fact that the general public do not know what to look for when purchasing pesticides means that they could easily become exposed to POPs and other highly hazardous pesticides unknowingly.

The majority of the general public have no idea what PCBs are, and are actually unaware that transformer oil poses any danger to anyone. During the PCB inventory, it was particularly disconcerting to come across workers who work with transformer oil, who would handle the transformer oil with bare hands, and refuse to use the appropriate PPE because they were “so used to handling the transformer oil”, as shown in Figure 8. This showed that workers who handle transformer oil are at a very high risk of exposure to PCBs due to lack of awareness. The high incidence of transformer oil theft implies that there is quite a vibrant market for the product, and so this again indicates a lack of awareness on the dangers of PCBs.

Figure 8 showing a seasoned worker handling transformer oil with bare hands
(Source: MENRM, 2012 PCB Inventory Report for Zimbabwe 2011)

Awareness on the dangers of Unintentionally-Produced POPs (U-POPs) including PCDD/PCDF is almost nonexistent in Zimbabwe, as shown by the rampant way in which people burn waste as a method of managing it. While the public is generally aware of the harmful effects of industrial emissions, they are unaware of the harmful nature of PCDD/PCDF and other U-POPs.

The lack of awareness of POPs issues in particular and environmental issues in general does not mean to say that the responsible authorities are doing nothing to educate the public. A lot is being done by various organizations, both Government and Non-Government, to educate the public, as shown in the following paragraphs.

Government Ministries' and Departments' Efforts to Educate the Public

- **The Ministry of Environment and Natural Resources Management**, together with one of its parastatals, the Environmental Management Agency are at the forefront of providing environmental education to the general public through vehicles such as environmental awareness fairs, radio programmes and road shows. The environmental education programmes are aimed at raising awareness on, among other things, sound waste management and preventing veld fires. The Ministry further houses the POPs Office, which provides information to the public on POPs issues through radio programmes and presentation at sector specific workshops and conferences.

- **The Environmental Management Agency** also enforces the Hazardous Substances, Pesticides and Other Toxic Substances Regulations. These regulations require that manufacturers, importers and transporters of hazardous materials should provide detailed labeling with hazardous warning symbols, composition, precautions, first aid, compatibility, warranty and directions for use and disposal. In addition, the labeling should give information on where emergency help and advice regarding the hazardous load can be obtained when a vehicle containing such hazardous substances is in transit.

- **The Ministry of Health and Child Welfare** maintains a key position in informing the public of the dangers involved in the use and handling of chemicals. This is done through production and distribution of hazardous substances warning symbols posters, in conjunction with UNICEF, to public institutions and work places where the potential danger exists.

- **Agricultural Technical and Extension Services (Agritex)** – This Department in the Ministry of Agriculture, Mechanization and Irrigation Development plays a key role in educating farmers on issues of agrochemicals usage.

- **The National Social Security Authority (NSSA)** – This parastatal promotes occupational safety and health in all industries including those dealing with hazardous chemicals. In carrying out this mandate, the main focus is to protect workers' safety and health.

  Some of the promotional programmes carried out by NSSA include:-

- Conducting annual occupational safety and health conferences, workshops and seminars, drawing participants from industry and the public service, including managers and chief executives. This is one platform where safe use of chemicals is promoted.
- Company-specific teach-ins (safety talks) on various OSH topics are discussed with specific company workers.
- Surveys and risk assessments of workplaces, pointing out hazards and risks associated with workplace hazards including hazardous chemicals.
- Training on a diverse range of OSH topics, key among them being chemical safety and health management.
- Providing guidance on the implementation of occupational safety and health management systems (OSHMS), which systems should provide effective protection for workers against workplace hazards including hazardous chemicals.
- Providing occupational health services to monitor workers' health against workplace exposures including hazardous chemicals.
- Disseminating OSH information including that dealing with hazardous chemicals, through publication of the On-Guard magazine, pamphlets, posters, conferences, workshops and seminars etc.

  NSSA also conducts an 8 week training course on Occupational Safety, Health and Environmental Management Course (OSHEMAC), which course includes aspects of safety in the use of chemicals. The target group for this course is industry personnel dealing with OSH issues.

- **Scientific and Industrial Research and Development Centre (SIRDC)**
  SIRDC is a Government research institution that has a staff compliment of research scientists who are highly qualified in various disciplines of industrial development. Of particular relevance to this section is the Environmental Sciences Institute which, among some of its disciplines, addresses the issue of Cleaner Production (CP). The Institute provides researched production

technologies (which minimize hazardous waste products) to industry. It also raises awareness through training of both management and shop floor workers.

Non Governmental Organizations (NGOs) Efforts to Educate the Public

- **Labour Organizations**
  The Zimbabwe Congress of Trade Unions (ZCTU), the Zimbabwe Federation of Trade Unions (ZFTU) and the Zimbabwe Chemicals and Plastics Allied Workers Union (which is an affiliate of ZCTU), have Occupational Health and Safety Departments which conduct awareness workshops, seminars and exhibitions for workers in chemical industries and the farming sector. Chemical and agro-chemical management is among the issues addressed during the awareness-raising sessions.

- **Standards Association of Zimbabwe(SAZ)**
  SAZ is the national standards body of Zimbabwe and represents the country in regional (SADC, COMESA) and international (International Organization for Standardization, International Electrotechnical Commission) standardization activities.

  SAZ facilitates the development of national standards and encourages their implementation in order to enhance Zimbabwe's competitiveness and safeguard the welfare of communities. So far, SAZ has published standards on air and water quality, waste water, hazardous waste management, environmental management, and motor vehicle exhaust emissions testing methods.

- **The Business Council for Sustainable Development Zimbabwe (BCSDZ)**
  BCSDZ holds periodic thematic workshops and annual conferences that draw participants from Industry, Government Departments, NGOs, Local Authorities and experts in various fields.

- **The Confederation of Zimbabwe Industries (CZI)**
  CZI has within its membership, organizations that raise awareness to the general public on the safe handling of hazardous substances by providing well documented labeling on containers.

- **Consumer Council of Zimbabwe (CCZ)**
  CCZ provides representatives on many technical committees in order to ensure that the standards produced are not technical barriers to trade and do not compromise the health and safety of consumers. CCZ plays a pivotal role in awareness campaigns which promote the safety of consumers.

- **Zimbabwe Environmental Law Association (ZELA)**
  ZELA is involved in providing awareness through workshops and seminars to community based groups addressing legal provisions for safe environment.

- **CropLife** offers technical advice on the safe use, handling and potential hazards associated with particular agro-chemicals.

- Various farming associations and organizations such as the Tobacco Research Board (TRB), Cotton Growers Association, Coffee Growers Association, Livestock Producers Association etc publish newsletters targeted for their membership that are informative on the current and new formulations of agro–chemicals.

- **The Global Environmental Facility Small Grants Programme** (GEF-SGP) is one programme that is raising awareness on POPs among communities, in addition to promoting organic farming.

- **Practical Action Southern Africa** is raising awareness on sound waste management for communities, thus educating the public on reduction of PCDD/PCDF that would have been released through waste burning.

- **Fambidzanai Training Institute** provides training to rural and urban farming groups on permaculture, organic farming and natural pest and disease management.

- **Education and Training Institutions**
  Chemical safety issues are included in the curriculum of Tertiary and Higher Learning Institutions such as Universities, Agricultural Training Colleges and Polytechnics. All students/ researchers working in Laboratories are given basic knowledge on chemical safety before performing any tests.

- **Electronic Media – The National Broadcaster (Zimbabwe Broadcasting Corporation)**
  The National Broadcaster, to a limited extent, covers aspects of chemical management on both television and radio, by inviting experts to farming programmes such as Talking Farming and Murimi Wanhasi/Umilimi Wanamhla. The experts address matters of national interest involving environmental issues. Other programmes where experts are featured include the radio programme "Our Environment". Generally, though, events are reported as they happen.

- **National Newspapers**
  There are a number of daily papers such as the Herald, Chronicle, Daily News, Newsday and weekly papers such as the Sunday Mail and Sunday News, the Financial Gazette and the Independent which have very wide readership. These only report events as they happen and do not have dedicated columns covering environmental issues. However, Zimpapers publishes a weekly paper, The New Farmer, that targets newly resettled farmers and the general public. This weekly publication covers aspects of environmental issues as well agro-chemical management.

Potential of Existing Awareness Raising Structures to Raise POPs Awareness

As can be noted from the aforementioned, there is a lot of potential to raise public awareness on POPs and other chemical issues, from the structures that already exist. All that is required is to strengthen these structures in order to ensure that the target audience gets the message and the message sticks!

2.3.6 Overview of Technical Infrastructure for POPs Assessment, Measurement, Analysis, Alternatives and Prevention Measures, Management, Research and Development

Zimbabwe has many analytical laboratories which have the capacity to analyze for pesticides including POPs. There are at least 11 laboratories which have Gas Chromatographs (GCs) which can be used to analyse for pesticides. These include research labs, Government labs, and university labs. In many cases, the GCs are old and there is a need to upgrade. There are currently three laboratories which have Gas Chromatograph-Mass Spectrometers, which instruments are more appropriate especially for analysing unknown substances. The technical infrastructure to analyse for pesticides in the country is thus available – it just needs upgrading.

For PCB analysis, there are machines in Zimbabwe which can analyse oil samples to test for the

presence of PCBs. At least three organizations, which include the Ministry of Environment and Natural Resources Management, as well as the power utility ZETDC, have the capacity to analyse samples for PCBs.

There are no laboratories in Zimbabwe with the capacity to analyse air samples for PCDD/PCDF. The U-POPs Inventory was carried out using the UNEP Toolkit which estimates releases of PCDD/PCDF using developed emission factors.

2.3.6.1 Overview of the Laboratory Equipment in Zimbabwe

An overview of the laboratory equipment in Zimbabwe is given in Table 15:

Table 15: Overview of Equipment Available for Chemicals Analyses in Zimbabwe

Laboratory/Organization	Location	Type of equipment available
Scientific and Industrial Research and Development Centre Laboratories	Harare	Gas Chromatograph, High Performance Liquid Chromatograph, Atomic Absorption/Emission Spectrometer, Ultra Violet – Visible Spectrometer, Ion Chromatograph
Medicines Control Authority of Zimbabwe	Harare	Gas Chromatograph, High Performance Liquid Chromatograph, Atomic Absorption/Emission Spectrometer, Infra Red/Fourier Transform Infra Red Spectrometer, Climatic Chamber, UV-Visible Spectrometer, Gas Chromatograph – Mass Spectrometer, Karl- Fischer Unit, Polarimeter
Forensic Science Laboratory		Gas Chromatograph, High Performance Liquid Chromatograph, Fourier Transform Infra Red Spectrometer
Zimlabs	Harare	Atomic Absorption/Emission Spectrometer, Ultra Violet – Visible Spectrometer
Tobacco Research Board Laboratory	Harare	Gas Chromatograph, High Performance Liquid Chromatograph, Atomic Absorption/Emission Spectrometer, Ion Chromatograph, Infra Red Spectrometer, Ultra Violet – Visible Spectrometer Gas Chromatograph – Mass Spectrometer
Environmental Management Agency Laboratory (EMAL)	Harare	Absorption/Emission Spectrometer, Gas Chromatograph, Ion Chromatograph, UV-Visible Spectrometer, Ion Analyzer, Liquid Scintillation Analyzer, Turbidimeter, Tritium Enhancement Cooler
Standards Association of Zimbabwe Laboratories	Harare	Absorption/Emission Spectrometer, Viscometer, Gas Chromatograph, Karl Fischer Unit, UV – Visible Spectrometer, Infra Red Spectrometer, High Performance Liquid Chromatograph
National University of Science and Technology	Bulawayo	Absorption/Emission Spectrometer, Gas Chromatograph, Ion Electrophoresis Analyzer
Department of Research and Specialist Services Laboratory	Harare	Gas Chromatograph, High Performance Liquid Chromatograph, Atomic Absorption/Emission Spectrometer, Ultra Violet – Visible Spectrometer
University of Zimbabwe Laboratories	Harare	Gas Chromatograph, High Performance Liquid Chromatograph, Atomic Absorption/Emission Spectrometer (GF, HG &VG), Ion Chromatograph, Polarographic Analyzer, Infra Red Spectrometer, Ultra Violet – Visible Spectrometer, Gravimetric Thermal Analyzer, X - ray Fluorescence, Ion Chromatograph, Nuclear Magnetic Resonance, Gas Chromatograph – Mass Spectrometer
Midlands State University Laboratories	Gweru	Gas Chromatograph, High Performance Liquid Chromatograph, Atomic Absorption/Emission Spectrometer
Government Analyst Labs.	Harare	Gas Chromatograph, Atomic Absorption Spectrometer, UV-Vis, FTIR.
ZETDC Laboratory	Harare	PCB Analyzer, Karlfischer (for analyzing moisture content in transformer oil), Gas Chromatograph
Veterinary Laboratories	Harare	No instruments in operational condition

(Source MENRM, 2011 National Profile for the Management of Chemicals in Zimbabwe Including POPs)

2.3.6.2 Monitoring of substances for POPs

In Zimbabwe, there have been very few programmes for monitoring POPs pesticides in different media, especially food for the local markets. Very little has been done in monitoring of foods at markets and stalls for pesticide and toxic residues. Lack of facilities and equipment for other chemical analysis hinders proper chemical identification and exposure risks. There is need to strengthen laboratory facilities in the country to deal with these issues.

However, testing of chemical residues in foods is done especially for the export market, where foods like soya beans, fruits and fruit juices are tested for different pesticide residues according to the requirements of the importing countries. Other chemicals that are tested for in foods are heavy metals, although some are not being analyzed currently because of lack of equipment, although the expertise is available.

Testing of substances that are coming into the country is a challenge (except for Ozone Depleting Substances - ODSs), since the laboratories that are competent in providing analytical services are far from the ports of entry of chemicals into Zimbabwe. The Zimbabwe Revenue Authority (ZIMRA) and the Environment Management Agency which coordinate the assessment of chemicals that come into Zimbabwe, do not have sufficient equipment to conduct all requisite tests. There is need to purchase equipment and apparatus for assessing chemicals at strategic locations in the whole of Zimbabwe, and also construct and maintain laboratories.

2.3.6.3 Issues pertaining to the running of the laboratories

It has been observed that the laboratories adhere to analytical protocols as American Water Works Association (AWWA), Association of Analytical Communities (AOAC), ANWA, CODEX Alimentarius and British Pharmacoepia for their analyses. In addition they also use some adapted methods from scientifically respectable publications like Merck, ACE, etc.

Although the laboratories appear well equipped, a considerable number of machines are old and manually operated, thus they need to be upgraded. Maintenance service is often difficult to get, and due to difficulties in acquiring spare parts, most service providers are unwilling to enter into service charters with instrument buyers and users, thus reliable service of machines and instruments cannot be guaranteed. The unavailability of up-to-date working standards is also a major hindrance in conducting chemical analysis. At the moment there are no apparent national programmes to improve on the laboratories, which situation will make the monitoring of POPs a challenge for the nation.

One major shortfall which contributes to the inability of laboratories to perform to their maximum potential is the lack of refresher courses and continuous training in instrument use for the instrument users. Another glaring weakness is the failure of the laboratories to retain qualified staff, as the current staff turnover is unsustainable. The major issue in this regard is uncompetitive remuneration and professionals are leaving in large numbers to take up posts abroad.

Although there are some inter-laboratory exchange programmes within the country, there is little cooperation among countries in the region. It cannot be ruled out that individual laboratories may probably have some linkages to external laboratories as private arrangements. There is hope though that at least some informal contact in the region may become the norm since most countries are parties or signatories to various international conventions.

Analyzing the distribution of the laboratories shows that most of them are concentrated in the capital city, and other centres outside Harare are not catered for. There is need to have the laboratories decentralized at least to the other major centres where chemical usage is on a large scale especially in agriculture and industry, in areas such as Bulawayo, Kwekwe, Mutare and Masvingo. To begin with, each one of these centres could start off with one fully equipped laboratory (comprising at least a gas chromatograph, a high performance liquid chromatograph, an infra red spectrometer, atomic absorption/emission spectrometer and a uv-visible spectrometer). This decentralization would relieve the pressure and congestion of Harare where currently bulk of analytical work (over 90%) is carried out. As a starting point, the barest minimum number of laboratories would be seventeen (including the existing ones) – these would just cover the needs of the nation.

During the assessment of infrastructure, it was noted that all the laboratories are equipped with desk computers and have access to internet. The computer systems are based at each individual government institution but the computers are not interlinked. Each institution is rather unique at operational level and the generated information is not shared between laboratories. This causes the laboratories to act as isolated units, which often compromises the ability of key Government departments to acquire chemicals management information in a timely manner. There is thus a need to establish some intranet services between government laboratories so as to make chemicals management easier at all levels. An electronic national database for chemicals should be compiled and the private laboratories and private sector may also avail their profiles to the national database – sufficient guarantees should be made so that all information submitted shall be confidentially handled.

It was also noted that most laboratories are not accredited, which makes it difficult for the laboratories to compete on an international scale. Generally, all the laboratories need to be accredited, as is the trend worldwide so that the results from the Zimbabwean laboratories can gain international recognition. Accreditation basically implies that an institution abides by certain agreed and certified protocols of carrying out analyses. Most laboratories indicated they wish to be accredited but are being hampered by a lack of funding to carry out the lengthy process.

2.3.7 Identification of Impacted Populations

There have been a few studies on the impact of POPs on humans and the environment in Zimbabwe. These have mostly been carried out by the University of Zimbabwe Medical School, and include studies on the residues of organochlorine pesticides in human milk from mothers living in greater Harare; assessment of environmental pollution by PCBs, DDT and its metabolites using human milk of mothers in Zimbabwe (Chikuni et al, 1997a); and an evaluation of DDT and DDT residues in human breast milk in the Kariba Valley of Zimbabwe (Chikuni et al, 1997b). It has generally been observed that concentrations of DDT are high in the breast milk of mothers who live in malaria endemic areas, but DDT is present even in the milk of mothers who live in areas where DDT has never been applied.

A major study on occupational exposure to DDT was carried out on DDT spray operators over the three-year period 1988-90 (Nhachi et al, 1996). DDT spray operators who sprayed DDT in homes of villagers in malaria endemic areas were screened for DDT exposure over the spraying period. A significant number of those screened (48.9%), showed evidence of toxic exposure to DDT. There has been no screening of spray operators in recent years due to budgetary constraints.

Several surveys have also been carried out to evaluate the impact of pesticides that were sprayed for tsetse control, on wildlife. These include the study carried out by Phelps and Billings (1972), in which animal tissue (which included crocodile eggs, embryo and abdominal fat, bird liver and abdominal

fat and water buck liver) was analyzed for pesticides. The study confirmed the build-up of DDT in lakes as well as the terrestrial environment. A more recent study by Kubus and Berg (1991) was carried out to confirm the link between tsetse control sprays with levels of pesticides in Kariba. The study was carried out by analyzing fish, mussels, snails, prawn and birds from different localities, and results indicated that DDT seemed to be both bioaccumulating and biomagnifying in Lake Kariba, and levels were generally high compared to Mazvikadei Dam and Lake Chivero which are outside the tsetse and malaria control areas.

Most studies to determine impact of POPs on humans were carried out more than 20 years ago, and little has been done in recent years. There is need to do more and dedicate resources for assessing the impact of POPs on various sectors of the Zimbabwean society, in order to have tangible facts about the exact severity of the problem. Some of the expected impacted populations who would need to be monitored for the presence of POPs in their bodies include:

- Populations living in the areas where indoor residual spraying of DDT is carried out
- Populations living in areas where DDT was sprayed for the control of tsetse
- Spray operators who conduct the actual spraying of DDT in malaria endemic areas
- Populations living in intensive agricultural areas where POPs pesticides may have been used
- People who have worked for pesticide companies
- People working in the power utility, particularly those who handle transformer oil
- Informal waste traders, particularly those who handle waste at landfills / waste dumps
- The ordinary population, since many people have been exposed to PCDD/PCDF emission through burning. Burning of waste is more rampant and more concentrated in the urban areas; hence the urban population is expected to be more exposed to these emissions than their rural counterparts.

CHAPTER 3: STRATEGIES AND ELEMENTS OF ACTION PLANS OF THE NIP

Zimbabwe has signed and ratified the Stockholm Convention on Persistent Organic Pollutants. As a Party to the Convention, it has to meet several obligations under the Convention, all aimed at reducing and ultimately eliminating usage and / or production of POPs. The ratification of the Convention by the Government shows its high level of commitment towards contributing to the creation of a POPs-free world.

The preparation of this NIP further demonstrates the Government's commitment to ensuring sound management of POPs in Zimbabwe. The NIP will serve as a roadmap for the best strategy to follow in effectively addressing issues of POPs, since it identifies the key POPs issues which need to be addressed, and also comes up with specific action plans for addressing the key issues through consultative stakeholder driven processes.

3.1 Preparation of the NIP

As has been mentioned in the introduction to this document, the NIP development process involved conducting inventories of POPs, assessing national infrastructure for the management of chemicals in general, setting priorities and objectives for addressing key POPs issues of concern, and coming up with specific action plans for achieving the objectives.

The findings from the inventories and the assessment of infrastructure identified key issues of concern, which were then prioritized. Priority Setting was conducted by a team of key stakeholders and experts in POPs issues. The issues that had been identified were prioritized according to two criteria, namely the potential for the issue to result in human exposure to POPs, and the potential for the issue to result in exposure of the environment to POPs. At the same time, objectives for addressing the prioritized issues were also set. Action Plans for achieving the objectives were then prepared, from which project proposals were developed. The implementation of these projects will form the basis for implementing the NIP.

3.2 Implementation of the NIP

The NIP will be implemented by various stakeholders, but most of the projects will be coordinated by the Ministry of Environment and Natural Resources Management, with guidance from the POPs National Coordinating Committee. The projects that are to be implemented as part of the NIP will require funding, which is to be sought from both local and international donors.

Monitoring and Evaluation (M and E) of the NIP implementation will be undertaken in order to determine the level of achievement of the set objectives and measure the impact of the activities. M and E will be carried out by MENRM, the NCC and the donors.

3.3 Prioritized POPs issues

During the assessment process, it was noted that in addition to the specific POPs issues to be addressed, there are general chemicals management issues that need to be addressed first in order

to put in place a conducive environment for sound POPs management. Addressing the general chemicals management issues will ensure a sound foundation for effectively addressing the specific POPs issues. The general chemicals management issues were prioritized separately and the other categories of POPs, namely, Pesticides Issues, DDT Issues, PCBs Issues, Unintentionally Produced POPs (U-POPs) Issues and New POPs Issues were also prioritized separately.

The prioritized issues are listed below, in descending order for each category.

General Chemicals Management Priorities

a. The need to conduct more research on the impact of industrial and agricultural activities on human health and the environment, and the need to analyze for POPs and other chemicals in various media;
b. Pollution from industries – both formal and informal;
c. Lack of awareness on POPs issues;
d. Lack of harmonization of general chemicals management issues;
e. Poor technical infrastructure for managing chemicals;
f. Difficulty in accessing chemicals management information; and
g. Need for improved implementation of GHS in Zimbabwe.

Pesticide Specific Priorities

a. Lack of awareness on the dangers of pesticides;
b. Presence of obsolete pesticides and associated materials in Zimbabwe, compounded by lack of knowledge among policy makers about the exact quantities and locations of these;
c. Poor management of pesticide waste;
d. Poor storage of obsolete pesticides;
e. Continued reliance on pesticides without use of other non-regulatory pest management intervention; and
f. Presence of POPs pesticides in local shops.

DDT Specific Issues

a. Lack of awareness concerning alternatives to DDT use for vector management

PCB Specific Priorities

a. Lack of awareness on the dangers of PCBs leading to high risk of exposure;
b. Presence of PCBs in sampled transformers, and lack of knowledge among the policy makers about the exact quantities and locations of PCBs in Zimbabwe;
c. Lack of knowledge on the ability of existing facilities to destroy PCBs;
d. Poor storage of non-working transformers, including PCB-contaminated ones; and
e. Absence of PCB-specific legislation.

U-POPs-Specific Priorities

a. Poor general waste management;
b. Poor hazardous waste management;
c. High incidence of veld fires leading to release of high levels of PCDD/PCDF;
d. High levels of emissions from Fossil Fuel Power Plants;
e. High levels of emissions from hospital incinerators (burners);
f. High levels of emissions from industries; and
g. Lack of information on contaminated sites in Zimbabwe.

New POPs- Specific Priorities

a. Improper management of e-waste (which contains Brominated Flame Retardants including certain polybrominated diphenylethers (PBDEs), which have now been listed as POPs in the Stockholm Convention).

3.4 Specific Action Plans

Action plans were developed to address the prioritized issues, at the same time meeting the requirements of the Stockholm Convention. In presenting these action plans for the three POPs categories (Pesticides, PCBs and U-POPs), reference will be made to the relevant articles in the Stockholm Convention.

3.4.1 Specific Action Plans to Address General Chemicals Management Issues

These Specific Action Plans have been developed in order to create a conductive environment for sound POPs management. Implementation of these general chemicals management action plans will meet the requirements of the Stockholm Convention under Article 10 on Public Information, Awareness and Education and Article 11 on Research, Development and Monitoring. These two articles are detailed in Boxes 2 and 3.

Box 2: Article 10 of the Stockholm Convention on Public Information, Awareness and Education

ARTICLE 10

Public information, awareness and education

1. Each Party shall, within its capabilities, promote and facilitate:
   (i) Awareness among its policy and decision makers with regard to persistent organic pollutants;
   (ii) Provision to the public of all available information on persistent organic pollutants, taking into account paragraph 5 of Article 9;
   (iii) Development and implementation, especially for women, children and the least educated, of educational and public awareness programmes on persistent organic pollutants, as well as on their health and environmental effects and on their alternatives;
   (iv)Public participation in addressing persistent organic pollutants and their health and environmental effects and in developing adequate responses, including opportunities for providing input at the national level regarding implementation of this Convention;
   (v) Training of workers, scientists, educators and technical and managerial personnel;
   (vi) Development and exchange of educational and public awareness materials at the national and international levels; and
   (vii) Development and implementation of education and training programmes at the national and international levels.
2. Each Party shall, within its capabilities, ensure that the public has access to the public information referred to in paragraph 1 and that the information is kept up-to-date.
3. Each Party shall, within its capabilities, encourage industry and professional users to promote and facilitate the provision of the information referred to in paragraph 1 at the national level and, as appropriate, sub-regional, regional and global levels.
4. In providing information on persistent organic pollutants and their alternatives, Parties may use safety data sheets, reports, mass media and other means of communication, and may establish information centres at national and regional levels.
5. Each Party shall give sympathetic consideration to developing mechanisms, such as pollutant release and transfer registers, for the collection and dissemination of information on estimates of the annual quantities of the chemicals listed in Annex A, B or C that are released or disposed of.

Box 3: Article 11 of the Stockholm Convention on Research, Development and Monitoring

ARTICLE 11

Research, development and monitoring

1. The Parties shall, within their capabilities, at the national and international levels, encourage and/or undertake appropriate research, development, monitoring and cooperation pertaining to persistent organic pollutants and, where relevant, to their alternatives and to candidate persistent organic pollutants, including on their:
   (i)Sources and releases into the environment;
   (ii)Presence, levels and trends in humans and the environment;
   (iii)Environmental transport, fate and transformation;
   (iv)Effects on human health and the environment;
   (v)Socio-economic and cultural impacts;
   (vi)Release reduction and/or elimination; and
   (vii)Harmonized methodologies for making inventories of generating sources and analytical techniques for the measurement of releases.
2. In undertaking action under paragraph 1, the Parties shall, within their capabilities:
   (a)Support and further develop, as appropriate, international programmes, networks and organizations aimed at defining, conducting, assessing and financing research, data collection and monitoring, taking into account the need to minimize duplication of effort;
   (b)Support national and international efforts to strengthen national scientific and technical research capabilities, particularly in developing countries and countries with economies in transition, and to promote access to, and the exchange of, data and analyses;
   (c)Take into account the concerns and needs, particularly in the field of financial and technical resources, of developing countries and countries with economies in transition and cooperate in improving their capability to participate in the efforts referred to in subparagraphs (a) and (b);
   (d)Undertake research work geared towards alleviating the effects of persistent organic pollutants on reproductive health;
   (e)Make the results of their research, development and monitoring activities referred to in this paragraph accessible to the public on a timely and regular basis; and
   (f)Encourage and/or undertake cooperation with regard to storage and maintenance of information generated from research, development and monitoring.

Issues of public awareness and research (which are described under Articles 10 and 11 in Boxes 2 and 3 respectively), were identified as being critical issues which need to be addressed in order to effectively deal with the problem of POPs. The following objectives and action plans are meant to address these issues, so that a sound framework for improving chemicals management issues can be put in place.

3.4.1.1 Objective: To establish and develop POPs risk monitoring and evaluation for POPs risks to human health and the environment in three years

It was noted that there is insufficient data on the impacts of agricultural and industrial activities on human health; hence it is difficult to know the exact effects of POPs on human health and the environment in Zimbabwe. There is also insufficient analysis of POPs residues in various media. It is therefore imperative to conduct more research on the magnitude of POPs impacts in Zimbabwe. This will give a clearer picture of Zimbabwe's status quo pertaining to POPs. This objective will also address Article 11 of the Stockholm Convention.

The following activities will be carried out in order to achieve the said objective:

a. Develop the capacity of national laboratories to test for inert ingredients in food products;
b. Conduct analyses on food samples to monitor for pesticide and toxic residue;
c. Conduct research and document findings of effects of POPs on human health in the country, taking into account the following groups:

- Populations living in the areas where indoor residual spraying of DDT is carried out
- Populations living in areas where DDT was sprayed for the vector control of tsetse
- Spray operators who conduct the actual spraying of DDT in malaria endemic areas
- Populations living in intensive agricultural areas where POPs pesticides may have been used
- People who have worked for pesticide companies
- People working in the power utility, particularly those who handle transformer oil
- Informal waste traders, particularly those who handle waste at landfills / waste dumps
- The ordinary population, since many people have been exposed to PCDD/PCDF emission through burning

d. Conduct further research and document findings of effects of POPs on flora and fauna in the country;
e. Aim for international cooperation to support these activities.

3.4.1.2 Objective: To review current legislation on hazardous chemicals within three years

It has been observed that many industries are not putting in place pollution abatement technologies and are continuing to pollute by their activities. This leads to continued unabated release of chemical contaminants, including POPs, into the environment. The industries seem to find it cheaper to pollute and pay, than pay the cost of putting up pollution abatement technologies. It is thus necessary to revisit the legislation and ensure that fines for pollution become so punitive that industries find it cheaper to put in place pollution abatement than to pay pollution fines.

It was also observed that monitoring of pollution applies mostly to the formal sector, yet there is a very vibrant informal sector which also contributes highly to pollution. The National Social Security Authority (NSSA), which is responsible for monitoring safety in the workplace, has also been targeting only the formal sector, and neglecting the informal sector. NSSA needs to start monitoring the activities of the informal sector.

Concern has also been raised that there seems to be no mechanism for compensating people who may have been affected by POPs. It was thus noted that there is need to include such issues in legislation.

The following activities will be conducted in order to achieve the said objective:

a. Start a cleaner technologies programme with polluting industries to reduce releases from industry by using Best Environmental Practice approaches (e.g. energy saving, resource saving, recovery of materials, substitution of critical chemicals by better alternatives).
b. Conduct stakeholder consultations on proposed punitive fines on pollution release.
c. Incorporate proposed fines into legislation.
d. Incorporate mechanisms for compensating people who have been affected by POPs, into hazardous substances legislation.
e. Revise relevant legislation pertaining to NSSA operations to include monitoring of the informal sector.

3.4.1.3 Objective: To develop and implement an effective communications strategy to raise POPs awareness at all levels within one year

There is lack of awareness on dangers of POPs and hazardous chemicals in general among members of the public, with the majority of the population actually being unaware of their existence. The public is also not aware of which chemicals are banned in the country, as this information is not readily available.

For those who might be seeking information on chemicals management issues, it is often difficult to access information, with Government Departments being reluctant to provide information. It is therefore necessary that mechanisms for accessing non-classified information be put in place. This particular objective will also address Article 10 of the Convention. Although this action plan has been put forward as a general chemicals management issue, sector-specific awareness raising action plans will also be implemented.

The awareness on POPs and hazardous chemicals will be integrated in the larger frame on education on sustainable consumption. On the other hand the topic of POPs and hazardous chemicals will be used and elaborated to show the need for more sustainable consumption.

The following activities will be conducted in order to achieve the said objective:

a. Develop a comprehensive awareness raising programme for POPs, hazardous chemical substances and sustainable consumption. The awareness raising programme should also include information on which chemicals are banned in the country.
b. Integrate POPs awareness raising into general awareness raising on hazardous chemicals and possibly link it to the awareness component of future GHS implementation.
c. Implement the awareness raising programme.
d. Put in place ways of accessing non-classified information.

3.4.1.4 Objective: To develop a national hazardous chemicals management policy in one year

There is a general lack of harmonization in the enforcement of legislation pertaining to hazardous chemicals management, and as a result, there is a lot of illegal movement of hazardous chemical products into the country. The lack of harmonization is exacerbated by the fact that currently there is no forum where stakeholders involved in issues of hazardous chemicals management can meet to discuss issues of concern, or carry out information exchange. This can lead to either gaps in legislation enforcement, or to duplication of efforts resulting in wasted resources.

The following activities will be conducted to achieve the objective:

a. Develop an inventory of all the hazardous chemicals in use in the country.
b. Develop a database of all the hazardous chemicals users in the country.
c. Carry out a situational analysis on the responsibilities of different government ministries on chemicals management.
d. Implement GHS in Zimbabwe.
e. Define specific areas of jurisdiction of government arms in chemicals management.
f. Set up a national committee on chemicals management.
g. Develop a hazardous chemicals management policy.
h. Develop a hazardous chemicals management standard which should be linked with the hazardous chemicals management policy in (g.) above.

3.4.1.5 Objective: To upgrade at least 25% of National Analytical Laboratories within three years

Zimbabwe has several laboratories which are not being used to their maximum potential because in many cases the equipment is outdated. There is need to upgrade these laboratories to world class standards, in order to be able to conduct the necessary monitoring and research of POPs issues. It is proposed that for a start, at least 25 % of the laboratories should be upgraded. This objective will address Article 11 of the Convention, as it will set the basis for carrying out research and monitoring.

The following activities will need to be carried out in order to achieve the said objective:

a. Conduct a detailed inventory of all laboratories in Zimbabwe.
b. Prioritize the laboratories to be upgraded, depending on agreed criteria.
c. Obtain funding for the process, and ensure that the relevant upgrades are carried out.

The projects corresponding to the improved general chemicals management issues are summarized in Table 16.

Table 16: Summary of Projects for General Chemicals Management

Project	Approximate Duration and Timing	Approximate Cost in USD
Establishment and development of POPs risk monitoring and evaluation for POPs risks to human health and the environment	Two years	1,300,000
Reviewing current legislation on hazardous chemicals	Three years	50,000
Development and implementation of effective communications strategy to raise POPs awareness at all levels	Development within 1 year, Implementation to be ongoing	150,000
Development of a national hazardous chemicals management policy	One year	20,000
Upgrading 25% of national analytical laboratories	Three years	5,000,000
Total		**6,520,000**

3.4.2 Specific Action Plans to Address Obsolete Pesticides

These action plans, while addressing Zimbabwe's pesticide-specific issues, also specifically fulfill the requirements of Articles 3, 6, 10 and 11 of the Stockholm Convention. Articles 3 and 6 are presented in Boxes 4 and 5.

Box 4: Article 3 of the Stockholm Convention on Measures to reduce or eliminate releases from intentional production and use

ARTICLE 3

Measures to reduce or eliminate releases from intentional production and use

1. Each Party shall:
   (a) Prohibit and/or take the legal and administrative measures necessary to eliminate:
   (i) Its production and use of the chemicals listed in Annex A subject to the provisions of that Annex; and
   (ii) Its import and export of the chemicals listed in Annex A in accordance with the provisions of paragraph 2; and
   (b) Restrict its production and use of the chemicals listed in Annex B in accordance with the provisions of that Annex.

2. Each Party shall take measures to ensure:
   (a)That a chemical listed in Annex A or Annex B is imported only:
      (i)For the purpose of environmentally sound disposal as set forth in paragraph 1 (d) of Article 6; or
      (ii)For a use or purpose which is permitted for that Party under Annex A or Annex B;
   (b)That a chemical listed in Annex A for which any production or use specific exemption is in effect or a chemical listed in Annex B for which any production or use specific exemption or acceptable purpose is in effect, taking into account any relevant provisions in existing international prior informed consent instruments, is exported only:
      (i)For the purpose of environmentally sound disposal as set forth in paragraph 1 (d) of Article 6;
      (ii)To a Party which is permitted to use that chemical under Annex A or Annex B; or
      (iii)To a State not Party to this Convention which has provided an annual certification to the exporting Party. Such certification shall specify the intended use of the chemical and include a statement that, with respect to that chemical, the importing State is committed to:
   a.Protect human health and the environment by taking the necessary measures to minimize or prevent releases;
   b.Comply with the provisions of paragraph 1 of Article 6; and
   c.Comply, where appropriate, with the provisions of paragraph 2 of Part II of Annex B.
   The certification shall also include any appropriate supporting documentation, such as legislation, regulatory instruments, or administrative or policy guidelines. The exporting Party shall transmit the certification to the Secretariat within sixty days of receipt.
   (c)That a chemical listed in Annex A, for which production and use specific exemptions are no longer in effect for any Party, is not exported from it except for the purpose of environmentally sound disposal as set forth in paragraph 1 (d) of Article 6;
   (d)For the purposes of this paragraph, the term “State not Party to this Convention” shall include, with respect to a particular chemical, a State or regional economic integration organization that has not agreed to be bound by the Convention with respect to that chemical.

3. Each Party that has one or more regulatory and assessment schemes for new pesticides or new industrial chemicals shall take measures to regulate with the aim of preventing the production and use of new pesticides or new industrial chemicals which, taking into consideration the criteria in paragraph 1 of Annex D, exhibit the characteristics of persistent organic pollutants.

4. Each Party that has one or more regulatory and assessment schemes for pesticides or industrial chemicals shall, where appropriate, take into consideration within these schemes the criteria in paragraph 1 of Annex D when conducting assessments of pesticides or industrial chemicals currently in use.

5. Except as otherwise provided in this Convention, paragraphs 1 and 2 shall not apply to quantities of a chemical to be used for laboratory-scale research or as a reference standard.

6. Any Party that has a specific exemption in accordance with Annex A or a specific exemption or an acceptable purpose in accordance with Annex B shall take appropriate measures to ensure that any production or use under such exemption or purpose is carried out in a manner that prevents or minimizes human exposure and release into the environment. For exempted uses or acceptable purposes that involve intentional release into the environment under conditions of normal use, such release shall be to the minimum extent necessary, taking into account any applicable standards and guidelines.

Box 5: Article 6 of the Stockholm Convention on measures to reduce or eliminate releases from stockpiles and wastes

ARTICLE 6

Measures to reduce or eliminate releases from stockpiles and wastes

1. In order to ensure that stockpiles consisting of or containing chemicals listed either in Annex A or Annex B and wastes, including products and articles upon becoming wastes, consisting of, containing or contaminated with a chemical listed in Annex A, B or C, are managed in a manner protective of human health and the environment, each Party shall:

   (a) Develop appropriate strategies for identifying:
   (i) Stockpiles consisting of or containing chemicals listed either in Annex A or Annex B; and
   (ii) Products and articles in use and wastes consisting of, containing or contaminated with a chemical listed in Annex A, B or C;

   (b) Identify, to the extent practicable, stockpiles consisting of or containing chemicals listed either in Annex A or Annex B on the basis of the strategies referred to in subparagraph (a);

   (c) Manage stockpiles, as appropriate, in a safe, efficient and environmentally sound manner. Stockpiles of chemicals listed either in Annex A or Annex B, after they are no longer allowed to be used according to any specific exemption specified in Annex A or any specific exemption or acceptable purpose specified in Annex B, except stockpiles which are allowed to be exported according to paragraph 2 of Article 3, shall be deemed to be waste and shall be managed in accordance with subparagraph (d);

   (d) Take appropriate measures so that such wastes, including products and articles upon becoming wastes, are:
   (i) Handled, collected, transported and stored in an environmentally sound manner;
   (ii) Disposed of in such a way that the persistent organic pollutant content is destroyed or irreversibly transformed so that they do not exhibit the characteristics of persistent organic pollutants or otherwise disposed of in an environmentally sound manner when destruction or irreversible transformation does not represent the environmentally preferable option or the persistent organic pollutant content is low, taking into account international rules, standards, and guidelines, including those that may be developed pursuant to paragraph 2, and relevant global and regional regimes governing the management of hazardous wastes;
   (iii) Not permitted to be subjected to disposal operations that may lead to recovery, recycling, reclamation, direct reuse or alternative uses of persistent organic pollutants; and
   (iv) Not transported across international boundaries without taking into account relevant international rules, standards and guidelines;

   (e) Endeavour to develop appropriate strategies for identifying sites contaminated by chemicals listed in Annex A, B or C; if remediation of those sites is undertaken it shall be performed in an environmentally sound manner.

2. The Conference of the Parties shall cooperate closely with the appropriate bodies of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal to, inter alia:

   (a) Establish levels of destruction and irreversible transformation necessary to ensure that the characteristics of persistent organic pollutants as specified in paragraph 1 of Annex D are not exhibited;

   (b) Determine what they consider to be the methods that constitute environmentally sound disposal referred to above; and

   (c) Work to establish, as appropriate, the concentration levels of the chemicals listed in Annexes A, B and C in order to define the low persistent organic pollutant content referred to in paragraph 1 (d)(ii).

The action plans for obsolete and POPs pesticides are meant to ensure that the production and use of these are reduced and eventually eliminated, (Article 3), stockpiles and wastes are managed in an environmentally sustainable manner (Article 6), awareness of these issues is raised (Article 10), and relevant research is carried out (Article 11). The objectives and action plans given below give details of how that will be done.

3.4.2.1 Objective: To raise public awareness on POPs and pesticide management issues in three years

The level of awareness on issues of pesticides is very low, especially among members of the public, who are the major users of pesticides. The majority of people are actually unaware of the existence of POPs, hence they are at risk of exposure to POPs. It is thus critical that rigorous awareness raising on POPs issues be carried out for the various sectors of society. In order to meet this objective, the following activities will be carried out:

a. Conduct inception of the awareness programme at national level, inviting experts from relevant stakeholders.
b. Conduct baseline survey to establish current gaps and research regarding POP awareness.
c. Produce curriculum and users training manuals on issues which include management of obsolete pesticides and containers, community based monitoring for pesticide poisoning, judicious use of pesticides, role of registration to combat illegal trading, importation and use of non-registered pesticides, use of PPE.
d. Develop and strengthen training capacity in relevant sectors.
e. Develop and dispatch relevant training material – fliers, posters, clothing materials, training manuals, syllabi, radio/TV programmes, establish POPs column in the print media, start POPs periodic newsletter.
f. Create a website with up to date information.
g. Conduct exchange visits to countries with established POPs communication systems.

3.4.2.2 Objective: To establish and implement monitoring programme to monitor and evaluate impact of awareness programmes in two years

It is all very well to conduct awareness raising programmes, but it is even more important to test the efficacy of the programmes, and see if they are achieving the desired results. If this is not done, there is always a danger that resources might be wasted on a programme that will fail to achieve the desired results.

In order to ensure that monitoring and evaluation of the awareness programmes is conducted, the following activities will be carried out:

a. Develop pesticides awareness monitoring programme.
b. Conduct baseline survey based on suitable indicators.
c. Implement the monitoring programme.

3.4.2.3 Objective: To conduct a full scale national inventory of obsolete pesticides, associated equipment, materials and soils in one year

During the NIP development process, preliminary inventories were conducted. These inventories were very preliminary, and covered a small portion of the country. They gave a rough idea of the quantities of obsolete pesticides, but there is need to get more accurate picture of what actually exists. It is thus imperative that a full scale inventory be carried out in order to give a true picture of what is available. This exercise should be preceded by a massive inventory awareness raising programme, so that holders of obsolete pesticide stocks come forward willingly, as this will make the whole inventory process much easier.

In order to carry out a successful inventory, the following activities will need to be carried out:

a. Conduct massive inventory awareness raising programme.
b. Conduct Training of Trainers refresher courses.
c. Conduct a detailed obsolete pesticides inventory.
d. Obtain a complete list of sites with obsolete pesticides to be repacked, hotspots and contaminated soil to be remediated.
e. Prepare a tailor made site clean-up plan for each contaminated site, with the help of consultant.

3.4.2.4 Objective: To establish at most 8 proper storage facilities for obsolete pesticides in strategic locations prior to final disposal in two years

Currently holders of obsolete pesticides face a mammoth challenge of storing these pesticides, as the pesticides take up valuable storage space. Some unscrupulous people have even been known to dispose of these obsolete stocks in an improper manner, in order to escape the burden of having to "waste" valuable space by keeping the obsolete stocks. A significant number of those who are keeping obsolete stocks are doing so under unacceptable conditions, which results in a very high risk of exposure. It is proposed that central stores be established, (one in each province), where obsolete pesticides can be kept under proper conditions, while awaiting final disposal.

In order to achieve this objective, the following activities are proposed:

a. Establish the location and quantities of obsolete pesticides.
b. Mobilize expertise and construct appropriate storage facilities.

c. Collect and store all obsolete pesticides.
d. Establish periodical collection system.
e. Establish system for managing the obsolete pesticides.

3.4.2.5 Objective: To implement sound environmental management of obsolete pesticides and contaminated areas through safeguarding, clean-up of contaminated sites & disposal of obsolete pesticide stocks and associated materials in three years

The goal of the Stockholm Convention is to ensure the ultimate elimination of unintentionally produced POPs, and so while there is need to establish central storage sites where the obsolete pesticides will be safely housed while awaiting final disposal, the need to dispose of them remains. This action plan is meant to ensure that disposal of the obsolete stocks takes place.

The following activities will be conducted in order to achieve the objective:
a. Prioritize areas to be cleaned up / safeguarded based on the inventory findings.
b. Conduct safeguarding and /or clean up as appropriate.
c. Organize with the relevant authorities for inclusion on regional obsolete pesticides destruction programmes.

3.4.2.6 Objective: To strengthen policy and regulatory regimes related to pesticide management at country level in three years

There are several issues that need to be amended in the local pesticides legislation, in order to improve management of POPs and obsolete pesticides. These include clarifying roles and responsibilities of players involved in pesticides management (such as who should conduct inspections of pesticide management / usage), and domesticating the requirements of the pesticides-related Conventions. Amendment of legislation can take a long time, so it is proposed that policy be developed first, which can give guidance, while the relevant legislation is being amended.

The following activities will be conducted in order to achieve the objective:

a. Review pesticides legislation and identify gaps and areas for improvement, to include clarification of roles and responsibilities in pesticides management, domestication of the conventions and highlighting of synergies in implementing them. This should be done with maximum stakeholder participation.
b. Develop pesticides management policy, which takes into account legislative gaps.
c. Amend legislation to include the identified improvements.

3.4.2.7 Objective: To build capacity for sound pest and pesticide management in two years

The use of pesticides in Zimbabwe is popular, and the use of technologies such as Integrated Pest Management (IPM) is very low. There is need to promote the use of IPM in Zimbabwe in order to reduce dependency on pesticides.

In order to meet the said objective, the following activities will be undertaken:
a. Establish a national inter-sectoral IPM Steering Committee from relevant stakeholders.
b. Identify areas requiring capacity building for environmentally friendly pest management.

c. Select and test IPM tools.
d. Approve IPM tools and finalize plan for implementation.
e. Conduct training for relevant groups on the IPM tools.
f. Implement IPM tools.
g. Conduct monitoring and evaluation to determine uptake of technology.

3.4.2.8 Objective: To clear all POPs from supermarket shelves in nine months

It has been observed that some POPs such as chlordane are still available in supermarkets. This could most likely be due to lack of awareness on the part of the sellers that they are selling a banned product, as well as lack of enforcement of the relevant legislation prohibiting the sale of the POPs. It is thus necessary to enforce the relevant legislation by removing the POPs, and also raise awareness among traders on the ban of these POP.

In order to achieve the said objective, the following activities will be carried out:
a. Conduct baseline survey to identify which shops (supermarkets, hardware and agro-dealer shops) have POPs.
b. Conduct actual collection of the POPs.
c. Conduct Data capturing of the final results.
d. Conduct training for supermarkets, hardware and agro-dealer shops to raise awareness on POPs.

3.4.2.9 Objective: To create a central pesticide management database in one year

One of the major concerns that was raised during the NIP development process was that there are a lot of grey areas pertaining to who is supposed to do what in terms of hazardous chemicals and pesticide management. People often end up breaking the law because they may be ignorant of where they are supposed to get assistance on various issues. It is imperative that information on the exact roles of different organizations involved in pesticides management be availed to the public, hence the need for the creation of a pesticide management database.

In order to achieve the said objective, the following activities will be carried out:
a. Conduct desktop survey to identify roles of each organization in pesticide management.
b. Create a pesticide management database which will include all the pesticides in Zimbabwe and their registration status, as well as the defined roles for each organization involved in pesticides management. The database will be accessible to the public.

The projects corresponding to the Obsolete Pesticides management are summarized in Table 17.

Table 17: Summary of Projects for Obsolete Pesticides Management

No.	Project	Approximate Duration	Approximate Cost in USD
1.	Raising public awareness on POPs and pesticide management issues	Three years	400,000
2.	Establishing and implementing monitoring programme to monitor and evaluate impact of awareness raising	Two years	60,000
3.	Conducting a full scale national inventory of obsolete pesticides	One year	1,900,000
4.	Establishment of central obsolete pesticides storage areas	Two years	500,000
5.	Implementation of sound environmental management of obsolete pesticides and contaminated areas through safeguarding, clean-up of contaminated sites & disposal of obsolete pesticide stocks and associated materials	Three years	3,000,000
6.	Strengthening policy and regulatory regimes related to pesticide management at country level	Three years	600,000
7.	Building capacity for sound pest and pesticide management, including the use of IPM	Two years	300,000
8.	Clearing all POPs from supermarket shelves	Nine months	160,000
9.	Creation of a Central Pesticides Management Database	One year	15,000
	Total		**6,935,000**

3.4.3 Specific Action Plans to Address DDT Usage

The Stockholm Convention requires member countries to come up with alternatives to the use of DDT as stated in Annex B, Part II, Paragraph 5 (a) (ii) of the Convention, (shown in Box 6).

Box 6: Requirement from the Stockholm Convention to identify alternatives to DDT

Annex B, Part II...

5. With the goal of reducing and ultimately eliminating the use of DDT, the Conference of the Parties shall encourage:

(a) Each Party using DDT to develop and implement an action plan as part of the implementation plan specified in Article 7. That action plan shall include:

(i) Development of regulatory and other mechanisms to ensure that DDT use is restricted to disease vector control;

(ii) Implementation of suitable alternative products, methods and strategies, including resistance management strategies to ensure the continuing effectiveness of these alternatives;

(iii) Measures to strengthen health care and to reduce the incidence of the disease.

As there are already other programmes that are addressing the requirements of Paragraph 5 (a) (i) and (iii), this NIP will only deal with Paragraph 5 (a) (ii), which is shown in bold in Box 6.

Objectives for addressing the issue of DDT usage are as follows:

3.4.3.1 Objective: To build capacity for the promotion and application of alternatives to DDT in vector management, focusing on gradually phasing out DDT use in vector management

This objective is similar to the general one for pesticide management, but differs in that this one will focus on Integrated Vector Management, rather than Integrated Pest Management. In order to meet the said objective, the following activities will be undertaken:

a. Establish a national inter-sectoral IVM Steering Committee from relevant stakeholders.
b. Identify areas requiring capacity building for environmentally friendly pest management.
c. Select and test IVM tools.
d. Approve IVM tools and finalize plan for implementation.
e. Conduct training for relevant groups on the IVM tools.
f. Implement IVM tools.
g. Conduct monitoring and evaluation to determine uptake of technology.

3.4.3.2 Objective: To participate in a regional project to promote and demonstrate alternatives to DDT in vector management

A regional project aimed at promoting and demonstrating alternatives to DDT in vector management is on the cards, and Zimbabwe will take the necessary steps to ensure inclusion in the project. This will be done through the following activities:

a. Fulfill the necessary requirements for inclusion in the regional project.
b. Set up implementing mechanisms for taking part in the regional project.
c. Participate fully in the regional project.

The action plans for addressing the need to find alternatives to DDT are summarized in Table 18.

Table 18: Summary of Projects to Address DDT Usage

	Project	Approximate Duration and Timing	Approximate Cost in USD
1.	Building capacity for the promotion and application of alternatives to DDT in vector management, focusing on gradually phasing out DDT use in vector management	Two years	300,000
2.	Participating in a regional project to promote and demonstrate alternatives to DDT in vector management	Five years	1,000,000
	Total		**1,300,000**

3.4.4 Specific Action Plans to Address PCBs Issues

These action plans are similar to those for pesticides, described in 3.4.2, in that while addressing Zimbabwe's PCB-specific issues, they also specifically fulfill the requirements of Articles 3, 6, 10 and 11 of the Stockholm Convention. These articles have already been presented in Boxes 2-5.

3.4.4.1 Objective: To develop and implement a comprehensive awareness programme on PCBs and their associated risks in two years

One of the major issues concerning PCBs is the lack of awareness of the dangers involved with PCBs, both among users of transformer oil (in which PCBs are most commonly found) and also among members of the public. There is need for intensive awareness raising programmes to be carried out among different groups.

The following activities will be conducted in order to achieve the said objective:

a. Conduct Inception of the awareness programme at national level, inviting experts from relevant stakeholders.
b. Conduct baseline survey to establish current gaps and research regarding PCB awareness.
c. Produce curriculum and users training manuals on PCB issues.
d. Develop and strengthen training capacity in relevant sectors.
e. Develop and dispatch relevant training material which will include
    i. A one day media workshop on PCBs,
    ii. Production of pre-recorded adverts on electronic media,
    iii. Hosting talk shows on radio and TV,
    iv. Conducting awareness meetings on targeted stakeholder companies (e.g. mines, ZESA etc,
    v. Production of DVDs, poster & fliers on PCBs for distribution to target companies
    vi. Advertising on electronic and ordinary erected billboards,
    vii. Development of a website on PCBs linked to MENRM
    viii. Preparation of awareness activities for the education sector
    f. Create a website with up to date information.
    g. Conduct exchange visits to countries with established POPs communication systems.

3.4.4.2 Objective: To establish and implement monitoring programme to monitor and evaluate impact of awareness programmes in two years

As in the case of the pesticides awareness programme, it will be necessary to test the efficacy of the awareness raising programmes through monitoring and evaluation, and see if they are achieving the desired results. In order to ensure that monitoring and evaluation of the awareness programmes is carried out, the following activities will be carried out:

a. Develop PCBs awareness monitoring programme.
b. Conduct baseline survey based on suitable indicators.
c. Implement the monitoring programme.

3.4.4.3 To conduct a comprehensive/ full scale national inventory of PCB containing or contaminated equipment and oil in two years

The preliminary PCB inventory gave an idea of the extent of PCB contamination in the country, but it

was not conclusive, mainly because it was done on a very small scale due to inadequate resources. There is need to carry out a more detailed inventory exercise, which will cover the whole country and will be representative of the whole spectrum of PCB-equipment owners.

The following activities will be conducted in order to achieve the said objective:

a. Conduct Training of Trainers Refresher courses.
b. Purchase sampling kits, and other equipment for sampling and testing of oil samples.
c. Prepare statistically robust sampling methods.
d. Set up and deploy inventory teams.
e. Conduct detailed PCB inventory.

3.4.4.4 Objective: To explore the most feasible option for PCB destruction in Zimbabwe or in the region and prepare for a PCB disposal programme (or participate in a regional PCB project) in three years

Cement kilns are used worldwide for the destruction of PCBs, as their operating conditions enable them to achieve the required conditions of temperature, turbulence and time under which PCBs can be destroyed without resulting in the formation of dioxins. Zimbabwe has a number of cement kilns which could be used for this purpose, but before this can be done, it will be necessary to conduct test runs of the PCB destruction efficiency of any proposed cement plant, while gas emissions are monitored. As the test runs are known to be expensive, it is proposed that a specific action plan for investigating the feasibility of using one of Zimbabwe's cement kilns for PCB destruction be carried out. If the implementation of this action plan identifies Zimbabwe as having the potential to destroy PCBs, it could save the country millions of dollars which would otherwise have been used to ship PCB containing equipment to other countries for disposal.

The following activities will be conducted in order to achieve the said objective:
a. Identify companies with potential to destroy PCB equipment/oil.
b. Get information about capacity of identified companies, to include EIA.
c. Conduct monitored test runs under strict control of the Ministry of Environment and Natural Resources Management.

3.4.4.5 Objective: To designate regional temporary storage sites (also referred to as transfer stations) for PCBs-containing equipment and oils with specific facilities to minimize further human and environmental exposure pending final destruction, in three years

The PCB inventory showed that a significant number of decommissioned transformers, some of which could be PCB-contaminated are poorly stored, resulting in contamination of the surrounding environment. There is need to designate temporary, well managed storage sites (also referred to as transfer stations), where PCB-contaminated equipment can be stored while awaiting proper disposal at a later stage.

The following activities will be conducted in order to achieve the said objective:
a. Identify regional storage sites, one per province.
b. Come up with the design for the storage site / transfer station. Guidelines for the construction of the transfer stations are available in the Hazardous Waste Management Standard ZWS 806.
c. Construct provincial storage sites / transfer stations.

d. Transport contaminated equipment to designated storage sites / transfer stations for storage
e. Manage the transfer stations in line with internationally accepted practices.

3.4.4.6 Objective: To strengthen the policy and legal framework for PCB management, resulting in the prohibition of the importation, exportation, manufacturing, use and sale of PCB-contaminated equipment and oils in three years

Currently Zimbabwe has environmental management legislation which deals with hazardous substances and hazardous wastes, but does not adequately deal with PCBs. There is need to review the legislation and amend it to include PCB-specific issues. Since amendment of legislation takes a long time, it will be necessary to produce a policy in the interim, which can guide owners and users of PCB equipment and oils on the best way of managing the equipment and oils in the interim.

The following activities will be conducted in order to achieve the said objective:
a. Review legislation pertaining to PCBs and identify gaps and areas for improvement. This should be done with maximum stakeholder participation.
b. Develop PCBs management policy, which takes into account legislative gaps.
c. Amend legislation to include the identified amendments.

The projects corresponding to the PCBs management issues are summarized in Table 19.

Table 19: Summary of Projects for PCBs Management

	Project	Approximate Duration and Timing	Approximate Cost in USD
1.	Developing and implementing a comprehensive awareness programme on PCBs and their associated risks	two years	1,384,000
2.	Establishment and implementation of monitoring programme to monitor and evaluate impact of awareness programmes	Two years	60,000
3.	Conducting a comprehensive/ full scale national inventory of PCB containing or contaminated equipment and oil	Two years	435,000
4.	Exploring the most feasible option for PCB destruction in Zimbabwe or in the region and prepare for a PCB disposal programme (or participate in a regional PCB project)	three years	1,250,000
5.	Establishment of provincial temporary PCB-storage sites (transfer stations)	Three years	200,000
6.	Strengthening the policy and legal framework for PCB management, to include the prohibition of the importation, exportation, manufacturing, use and sale of PCB-contaminated equipment and oils	3 years	200,000
	Total		**3,529,000**

3.4.5 Specific Action Plans to Address U-POPs Issues

The U-POPs specific action plans are meant to address Article 5 of the Stockholm Convention, which calls for measures to reduce or eliminate releases from unintentional production. The requirements of Article 5 are shown in Box 7.

Box 7: Article 5 of the Stockholm Convention on measures to reduce or eliminate releases from unintentional production

ARTICLE 5

Measures to reduce or eliminate releases from unintentional production

Each Party shall at a minimum take the following measures to reduce the total releases derived from anthropogenic sources of each of the chemicals listed in Annex C, with the goal of their continuing minimization and, where feasible, ultimate elimination:

(a) Develop an action plan or, where appropriate, a regional or subregional action plan within two years of the date of entry into force of this Convention for it, and subsequently implement it as part of its implementation plan specified in Article 7, designed to identify, characterize and address the release of the chemicals listed in Annex C and to facilitate implementation of subparagraphs (b) to (e). The action plan shall include the following elements:

(i) An evaluation of current and projected releases, including the development and maintenance of source inventories and release estimates, taking into consideration the source categories identified in Annex C;

(ii) An evaluation of the efficacy of the laws and policies of the Party relating to the management of such releases;

(iii) Strategies to meet the obligations of this paragraph, taking into account the evaluations in (i) and (ii);

(iv) Steps to promote education and training with regard to, and awareness of, those strategies;

(v) A review every five years of those strategies and of their success in meeting the obligations of this paragraph; such reviews shall be included in reports submitted pursuant to Article 15;

(vi) A schedule for implementation of the action plan, including for the strategies and measures identified therein;

(b) Promote the application of available, feasible and practical measures that can expeditiously achieve a realistic and meaningful level of release reduction or source elimination;

(c) Promote the development and, where it deems appropriate, require the use of substitute or modified materials, products and processes to prevent the formation and release of the chemicals listed in Annex C, taking into consideration the general guidance on prevention and release reduction measures in Annex C and guidelines to be adopted by decision of the Conference of the Parties;

(d) Promote and, in accordance with the implementation schedule of its action plan, require the use of best available techniques for new sources within source categories which a Party has identified as warranting such action in its action plan, with a particular initial focus on source categories identified in Part II of Annex C. In any case, the requirement to use best available techniques for new sources in the categories listed in Part II of that Annex shall be phased in as soon as practicable but no later than four years after the entry into force of the Convention for that Party. For the identified categories, Parties shall promote the use of best environmental practices. When applying

best available techniques and best environmental practices, Parties should take into consideration the general guidance on prevention and release reduction measures in that Annex and guidelines on best available techniques and best environmental practices to be adopted by decision of the Conference of the Parties;

(e) Promote, in accordance with its action plan, the use of best available techniques and best environmental practices:

(i) For existing sources, within the source categories listed in Part II of Annex C and within source categories such as those in Part III of that Annex; and

(ii) For new sources, within source categories such as those listed in Part III of Annex C which a Party has not addressed under subparagraph (d).
When applying best available techniques and best environmental practices, Parties should take into consideration the general guidance on prevention and release reduction measures in Annex C and guidelines on best available techniques and best environmental practices to be adopted by decision of the Conference of the Parties;

(f) For the purposes of this paragraph and Annex C:

(i) "Best available techniques" means the most effective and advanced stage in the development of activities and their methods of operation which indicate the practical suitability of particular techniques for providing in principle the basis for release limitations designed to prevent and, where that is not practicable, generally to reduce releases of chemicals listed in Part I of Annex C and their impact on the environment as a whole. In this regard:

(ii) "Techniques" includes both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned;

(iii) "Available" techniques means those techniques that are accessible to the operator and that are developed on a scale that allows implementation in the relevant industrial sector, under economically and technically viable conditions, taking into consideration the costs and advantages; and

(iv) "Best" means most effective in achieving a high general level of protection of the environment as a whole;

(v) "Best environmental practices" means the application of the most appropriate combination of environmental control measures and strategies;

(vi) "New source" means any source of which the construction or substantial modification is commenced at least one year after the date of:
a. Entry into force of this Convention for the Party concerned; or
b. Entry into force for the Party concerned of an amendment to Annex C where the source becomes subject to the provisions of this Convention only by virtue of that amendment.

(g) Release limit values or performance standards may be used by a Party to fulfil its commitments for best available techniques under this paragraph.

3.4.5.1 Objective: To improve hazardous waste management in the country in five years

Poor hazardous waste management in Zimbabwe is a cause for concern, as it is resulting in a very high risk of exposure for Zimbabweans to POPs. This is mainly due to the fact that in many instances, hazardous waste is disposed of at ordinary municipal landfills, resulting in the increased release of PCDD/PCDF from the frequently occurring landfill fires. In addition, POPs including U-POPs and other hazardous chemicals are released via leachate that will emanate from the landfills. Although legislation for hazardous waste management exists, enforcement is often a challenge. There is thus a very high need to improve hazardous waste management in Zimbabwe in order to reduce or eliminate PCDD/PCDF release from this sector.

The following activities will be conducted in order to achieve the said objective:

a. Conduct a baseline study on hazardous waste management in the country.
b. Review the Hazardous Waste legislation to incorporate POPs and link it with the SAZ Hazardous Waste Standard ZWS 806.
c. Develop a National Hazardous Waste Management Strategy.
d. Develop a hazardous waste list and database.
e. Establish transfer stations or pre-treatment and engineered disposal facilities.

3.4.5.2 Objective: To improve the waste management situation in the country in five years

The U-POPs inventory revealed that the biggest source of dioxin release in Zimbabwe is waste burning (open waste burning and landfill fires). The main cause is the general poor waste management practices in the country, which results in the generation of unsustainably high volumes of waste. Local authorities do not have the capacity to manage this waste, and as a result, a lot of the waste is burned, both at the domestic level, and at the landfills. There is need to address the underlying problem of poor waste management in Zimbabwe, in order to deal with the issue of the high levels of PCDD/PCDF and other toxic release from uncontrolled waste burning.

The following activities will be conducted in order to achieve the said objective:

a. Review waste management legislation by having the 5R's (waste management hierarchy) enshrined in legislation.
b. Conduct awareness campaigns on sustainable waste management techniques, including the effects of waste burning, to the different stakeholders (also including government and the public).
c. Create a database of all waste management players in the country.
d. Coordinate all waste management projects.
e. Coordinate and establish pilot projects in each province on segregation of waste at source involving more waste management players and the public.
f. Facilitate formation of partnerships between local authorities in Zimbabwe with other international local authorities in order to access resources.
g. Encourage local authorities to sub contract private sector organizations for waste management services.
h. Introduce Community Based Planning in local authorities for more revenue turnover.

3.4.5.3 Objective: To reduce the hectarage burnt by veld fires by 10% annually over three years

The U-POPs Inventory revealed that biomass burning is another major contributor to PCDD/PCDF release. It was calculated that for the year 2011 alone, 2% of Zimbabwe's land area was burned by

wild fires. This is therefore another critical area that needs to be addressed in order to make any significant strides towards reducing the amount of PCDD/PCDF release in Zimbabwe.

The following activities will be conducted in order to achieve the said objective:
a. Develop inventory /database of veld fires from 2000 to present.
b. Conduct research on the causes and economic, social and environmental impacts of the veld fires from 2000 to present.
c. Coordinate veld fire prevention, mitigation and response teams.
d. Raise awareness on veld fire prevention.

The next three action plans are similar, and are all centred on revising the legal framework for PCDD/PCDF release from industrial processes as well as introducing Best Available Techniques / Best Environmental Practices into the operations of these entities. These processes were found to be among the more significant sources of PCDD/PCDF release.

3.4.5.4 Objective: To reduce the emissions of fossil fuel power stations by 5% annually in three years

The following activities will be conducted in order to achieve the said objective:
a. Establish the legal framework for critical emission release standards.
b. Ensure adoption of relevant BEP and encourage the implementation of BAT.
c. Raise awareness on impacts of emission releases from power plants.

3.4.5.5 Objective: To have all health facilities adopt BAT/BEP in their incinerators in five years

The following activities will be conducted in order to achieve the said objective:
a. Improve the waste management in hospitals and other health care facilities, including strengthening the legal framework for hospital waste management.
b. Assess alternative treatments of hazardous health care waste and establish pilot projects on alternative treatment.
c. Link the reduction from U-POPs in health care waste management with the reduction and phase out of mercury as synergy approach between Stockholm Convention and the just adopted Minamata Convention.
d. Raise awareness on impacts of PCDD/PCDF release on health.
e. Establish the legal framework for operation of waste incinerators.
f. Standardize the minimum requirements for incinerators to meet BAT/BEP.
g. Conduct an inventory of all incinerators at Private, Central, Provincial, District hospitals and Rural Health Centres.
h. Upgrade hospital incinerators, operation and maintenance systems to meet documented minimum requirements.
i. Monitor emissions at all hospital incinerators to check for effectiveness of interventions.

3.4.5.6 Objective: To have 50% of those industries which contribute most highly to PCDD/PCDF formation adopt BEP and implement BAT where feasible within five years

The following activities will be conducted in order to achieve the said objective:
a. Assess the usefulness of including PCDD/PCDF release reduction, particle emission reduction

and heavy metal emission reduction in a legal framework.
b. Develop a policy and guidelines for BAT/BEP requirements for metal processing industries associated with PCDD/PCDF formation (cleaner technologies approach).
c. Provide incentives for adoption of BAT BEP.
d. Ensure adoption of BAT/BEP in smelting industries by including it as part of the license requirements from NSSA.
e. Link issuance of pollution permits to BAT/BEP.

3.4.5.7 Objective: To assess PCDD/PCDF levels in clay used for human consumption in two years

Recent studies have shown that relatively high levels of PCDD/PCDF in human milk samples from Congo and Ivory Coast were due to the consumption of high amounts of clay during pregnancy. Other countries with low contaminated clays seem not to have a relevant impact from this practice. In Zimbabwe, clay is also used during pregnancy. PCDD/PCDF levels in ball/kaolinic clays, in particular from quarries where clays are used for human consumption or as animal feed additive are not known but need to be determined urgently.

The following activities will be conducted in order to achieve the said objective:
a. Assess consumption of clay from pregnant woman and other population groups.
b. Assess how many clay quarries are used for human consumption and possibly for feed additive.
c. Conduct sampling and analysis of those clay quarries used for human consumption and feed additives.

3.4.5.8 Objective: To conduct an inventory of POPs- and hazardous chemicals-contaminated sites in two years

Currently, there is insufficient knowledge pertaining to POPs-contaminated sites in Zimbabwe (with respect to location and extent of contamination). There is need for an inventory of POPs-contaminated sites, where all sites with potential POPs or hazardous chemical contamination are reported on. These sites include all current and closed dumpsites, as hazardous waste has historically been dumped together with domestic waste. This will serve as a starting point for identifying and implementing possible remediation initiatives.

The following activities will be conducted in order to achieve the said objective:
a. Train a task team for conducting the contaminated sites inventory.
b. Conduct the contaminated sites inventory (which will include detailed analyses of the materials at the dumpsites and leachates emanating from there) and input the results into the POPs Information System.
c. Identify ways of remediating the contaminated sites.

The projects corresponding to the U-POPs management issues are summarized in Table 20.

Table 20 Summary of Projects for U-POPs Management

	Project	Approximate Duration	Approximate Cost in USD
1.	Improvement of hazardous waste management	Five years	1,500,000
2.	Improvement of waste management in the country	Five years	3,000,000
3.	Reduction of the hectarage burnt by veld fires by 10% annually	Three years	50,000
4.	Reduction of the emissions of fossil fuel power stations by 5% annually	Three years	3,000,000
5.	Adoption by all health facilities, of BEP in their incinerators and evaluation of the option to adopt BAT where feasible, at the same time assessing alternative treatments and possibly implementing those in pilot projects.	Five years	3,000,000
6.	Implementation of BEP and evaluation of the options to adopt BAT were feasible, by 50% of those industries which contribute most highly to PCDD/PCDF formation	Five years	3,000,000
7.	Assessment of consumption of clay by pregnant woman and other population groups and monitoring the sources of clay	Two years	50,000
8.	Conducting an inventory of all POPs- and hazardous chemicals- contaminated sites	Two years	400,000
	Total		**14,000,000**

3.4.6 Specific Action Plans to Address New POPs (E-waste)

For now, Zimbabwe's attempts to address new POPs will focus on application for GEF funding for updating the NIP in respect to newly listed POPs.
However, due to the urgency of the issue of increased generation of e-waste, which is fast becoming an environmental menace in the country, this current NIP will also focus on objectives to deal with e-waste.

3.4.6.1 Objective: To develop and promote sound / sustainable E-Waste management

E-waste commonly contains brominated flame retardants (BFRs), some of which have been newly listed as POPs including hexabromobiphenyl (HBB), commercial pentabromo diphenyl ether (c-pentaBDE), certain congeners from octabromo diphenyl ether (octa-BDE). With the high rate of technological advancement, e-waste has become one of Zimbabwe's biggest waste management challenges, and needs to be addressed.

In order to attain the said objective, the following activities will be carried out:

a. Gather information on e-waste management activities from other African countries.
b. Establish a working group on E-waste management.
c. Build capacity of practitioners and decision makers in sustainable E waste management (Contact international stakeholders and Basel Convention Coordination Centre Africa cooperating with African countries to address e-waste).
d. Establish an inventory of electrical and electronic equipment and related wastes ((W)EEE inventory) and conduct a material flow analysis for Zimbabwe.
e. Establish minimum specification requirements for imported electronic goods.
f. Ensure that management of E-waste is enshrined in national legislation.
g. Set up collection and storage centres for obsolete electronic goods at province level.
h. Develop guidelines for the management of e-waste.
i. Raise public awareness on proper disposal of e-waste.

The projects for addressing e-waste and new POPs are summarised in Table 21.

Table 21: Summary of Projects to Address E-Waste and Other New POPs

Project	Approximate Duration and Timing	Approximate Cost in USD
Development and promotion of sound / sustainable E-Waste management	5 years	5,100,000
Participation in a regional project to update this NIP in order to include all new POPs	2 years	200,000
Total		**5,300,000**

3.5 Timetable for Implementation of the NIP

The implementation of the NIP will require funding, which is to be sought from both local and international donors. Once funding has been obtained, implementation is expected to commence. Where feasible, the projects will run concurrently, but in some cases, this will not be possible, and they will be implemented sequentially. It is hoped that implementation will begin as early as mid 2013.

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Annex 1: Members of the POPs National Coordinating Committee

NAME	ORGANIZATION
Mr. I.D. Kunene	MENRM
Mr. T. Njovana	MENRM
Mr. D. Nyamudeza	MENRM
Ms. F. R. Magadzire	MENRM-POPs Project
Mrs. S. Madume	MENRM-POPs Project
Mr. T. Chandisaita	City of Harare Waste Management Department
Mr. C. Chiota	Ministry of Education, Sport, Arts and Culture
Mr. C. Dzavakwa	Ministry of Media, Information and Publicity
Mr. W. I. Koga	ZESA Enterprises
Dr. J. Kugara	University of Zimbabwe - Chemistry Department
Mr. T. Lampard	BCSDZ / Paramark
Ms. G. Madziwanyika	Friends of the Environment
Ms. T. L. Marera	Ministry of Science and Technology Development
Ms. R. Marunda	Standards Association of Zimbabwe
Mr. C. Maseva	Zimbabwe Electricity Transmission and Distribution Company
Mrs. J. Matare	Zimbabwe Revenue Authority
Ms. L. Mawarire	Ministry of Justice and Legal Affairs
Mr. K. Mushore	Ministry of Agriculture, Mechanization and Irrigation Development
Mr. B. Mutetwa	National Social Security Authority
Mr. C. Muzofa	City of Harare Urban Planning Services
Mrs. N. Nziramasanga	Ministry of Agriculture, Mechanization and Irrigation Development
Mr. S. Sande	Ministry of Health and Child Welfare – National Malaria Control Programme
Mr. H. Shoko	Government Analyst Laboratory
Mrs. C. Tagwireyi	SIRDC-Environmental Science Institute
Mr. M. Viriri	Zimbabwe National Statistics Agency
Mrs. S. Yomisi	Environmental Management Agency

Annex 2: Participants in the Inventories, Priority Setting and Action Planning

	Name	Organization
1.	Mr. Taremekedzwa Machiwenyika	Standards Association of Zimbabwe
2.	Mrs. Zanele Guvakuva	Chemplex
3.	Mrs. Nozipo Nziramasanga	Department of Research and Specialist Services
4.	Mr. Sessely Mavunga	Environmental Management Agency
5.	Mr. Lloyd Mutetwa	Harare City Health Department
6.	Mr. Bongayi Gokoma	Agricura
7.	Ms. Kudzayi Taruvinga	Zimbabwe Farmers Union
8.	Mr. Nyemudzai J. Mupfupi	Ministry of Health
9.	Mrs. Ivy Saunyama	Consultant on Pesticide Inventories and Safe Guarding
10.	Dr. Peter. Jowah	University of Zimbabwe Crop Science Department
11.	Mr. T. Mutesva	Zimbabwe Commercial Farmers Union
12.	Ms. Margaret. Pagare	University of Zimbabwe Chemistry Department
13.	Mr. Tichaziva Gwata	Tobacco Research Board
14.	Mr. Kwadzanayi Mushore	Ministry of Agriculture
15.	Ms. Sharron. Mbera	University of Zimbabwe Chemistry Department
16.	Mr. Reginald Dozva	National Social Security Authority (NSSA)- Ministry of Labour and Social Services
17.	Mrs. Caroline Tagwireyi	Scientific and Industrial Research and Development Centre -Environmental Sciences Institute (SIRDC-ESI)
18.	Mr. Fredrick Maponga	Environmental Management Agency
19.	Mr. Dingane Sithole	Zimbabwe Fertilizer Company
20.	Mr. T.F. Chandisaita	City of Harare- Waste Management Department
21.	Mr. Alfred Madzvamuse	University of Zimbabwe (UZ)-Chemistry Department
22.	Ms. Gamuchirayi Dzimiri	Ministry of Health and Child Welfare
23.	Ms. Gwen Madzivanyika	Environment Africa
24.	Ms. Sekai Mukaro	Practical Action Southern Africa
25.	Ms. Tariro Lorraine Kadzirange	Practical Action Southern Africa
26.	Mr. P. Maringa	Standards Association of Zimbabwe
27.	Mr. E. Matimati	UZ-Chemistry
28.	Mr. Christopher Chiwalo	Zimbabwe Miners Federation (ZMF)
29.	Mr. Puruweti Siyakiya	Ministry of Industry and Commerce
30.	Ms. Melody Katsande	Ministry of Industry and Commerce
31.	Mr. Prosper Nyangove	Scientific Industrial Research Development Centre
32.	Mr. Remnant Mlalazi	Zimplats
33.	Ms. Angela Sibanda	Standards Association of Zimbabwe
34.	Mr. Blessing Jonga	Ministry of Energy
35.	Mr. Tendai Mudonhi	ZETDC
36.	Mr. David Phillip Dzirutwe	City Health Department City of Harare
37.	Mr. Wallace I. Koga	ZESA Enterprises Manufacturing
38.	Mr. Chrispen Maseva	ZETDC

39.	Ms. Margaret Z. Mashingaidze	University of Zimbabwe
40.	Mr. Boniface I Marufu	ZESA Enterprises
41.	Mr. Victor Jumbe	Harare City Council
42.	Ms. Farirai R. Magadzire	POPs Project
43.	Mrs. Spiwe Madume	POPs Project
44.	Mr. Peter Banda	Project Management Institute of Zimbabwe
45.	Mr O. Chiromo	Project Management Institute of Zimbabwe
46.	Ms. Tariro Muganhiri	Ministry of Health and Child Welfare
47.	Mr. Kozanai Mahembe	NSSA
48.	Mr. Elimon Maponde	Zimbabwe Farmers Union (ZFU)
49.	Dr. Elizabeth Ngadze	University of Zimbabwe-Crop Science Dept
50.	Dr. Upenyu Mazarura	University of Zimbabwe-Crop Science
51.	Ms. Morleen Mupandawana	Agritex
52.	Mr. Clorence Matewe	EMA
53.	Mr. Alfred Muriya	Harare City Council

Annex 3: List of Participants to the NIP Endorsement Workshop

	Name	Designation	Organisation
1.	Mr. Irvin D. Kunene	Director	Ministry of Environment and Natural Resources Management
2.	Mr. Edward S. Samuriwo	Director	Ministry of Environment and Natural Resources Management
3.	Mr. Tinashe Njovana	Principal Environmental Officer	Ministry of Environment and Natural Resources Management
4.	Ms. Farirai R. Magadzire	POPs National Project Coordinator	Ministry of Environment and Natural Resources Management
5.	Dr. Chipangura Chirara	Biodiversity Project Coordinator	Ministry of Environment and Natural Resources Management
6.	Mrs. Spiwe Madume	POPs Project Assistant	Ministry of Environment and Natural Resources Management
7.	Mr. Eddy Matimati	Teaching Assistant	University of Zimbabwe Chemistry Department
8.	Mr. Tawanda Nehohwa	Chemist	Zimbabwe Power Company (ZPC)
9.	Mr. David D. Matyanga	Mineral Economist and Technical Advisor	Chamber of Mines
10.	Mr. Elton A. Mazivazvose	Safety, Health, Environment and Quality (SHEQ)	Zimasco
11.	Mr. Tichaziva T. Gwata	Laboratory Technician	Tobacco Research Board
12.	Dr. Lawrence T. Gono	Agronomist	Windmill
13.	Dr. H. Mapuranga	Medical Officer (Occupational Safety and Health)	National Social Security Authority (NSSA)
14.	Ms. Ketiwe Siyaduba	Analytical Services Manager	Scientific and Industrial Research and Development Centre (SIRDC)
15.	Mr. James Muyambiri	Chemist	ZPC Hwange
16.	Mr. Alfred Madzvamuse	Teaching Assistant	University of Zimbabwe Chemistry
17.	Mr. Benjamin Mutetwa	Chief Research and Development Manager	NSSA
18.	Mr. Kimbton Chiota	Group Safety, Health and Environmental Manager	Metallon Gold
19.	Mrs. Caroline Tagwireyi	Assistant Director	SIRDC Environmental Sciences Institute
20.	Mr. Michael Tiki	Senior Ecologist	Zimbabwe Parks and Wildlife Management Authority (ZPWMA)

21.	Mr. Taengwa Chandisaita	City of Harare Waste Management	City of Harare
22.	Mr. Anthony Lampard	Technical Committee Chairperson	Business Council for Sustainable Development Zimbabwe (BCSDZ)
23.	Ms. Gamuchirayi Dzimiri	Factory Inspector	NSSA
24.	Ms. Tatenda L. Marera	Senior Science and Technology Officer	Ministry of Science and Technology Development
25.	Mr. Clifford Muzofa	City Environmental Regulatory Planner	City of Harare
26.	Mr. Christopher Chiwalo	Small Scale Miners Representative	Zimbabwe Miners' Federation
27.	Mr. Godfrey Nyoni	Principal Administration Officer	Department of Civil Protection
28.	Ms. Olivia Mufute	Manager	ZPWMA
29.	Mr. Taremekedzwa Machiwenyika	Technical Officer	Standards Association of Zimbabwe (SAZ)
30.	Mr. Bright Chitiki	Safety Health and Environment Manager	Zimasco (Pvt) Ltd
31.	Dr. Godfrey Chikwenhere	Head – Plant Protection Research Institute	Department of Research and Specialist Services
32.	Mr. David P. Dzirutwe	District Environmental Health Officer	City of Harare City Health Department
33.	Mr. Manase Viriri	Zimstat	Zimbabwe National Statistics Agency (Zimstat)
34.	Ms. Gwyneth Madzivanyika	Friends of the Environment Communications	Friends of the Environment
35.	Mr. Chrispen Maseva	Chief Environmental Planner	Zimbabwe Electricity Transmission and Distribution Company (ZETDC)
36.	Mr. Johnson Maviya	Environmental Advisor	Southern African Power Pool
37.	Ms. Romana Marunda	Manager – Standards Development	Standards Association of Zimbabwe
38.	Mr. Howard G. Madlunga	Plant Chemist	ZPC – Bulawayo Power Station
39.	Mr. Prosper T. Nyangove	Research Scientist	SIRDC
40.	Mr. Victor Jumbe	Chemist	City of Harare
41.	Mr. Andrew Chamisa	Deputy Director - Glossinologist	Tsetse Control Department
42.	Mr. Clorence Matewe	Principal Environmental Officer	Environmental Management Agency
43.	Ms. Kudzai Taruvinga	Agribusiness Officer	Zimbabwe Farmers Union

44.	Mr. Peter Maringa	Research Scientist	SIRDC
45.	Mr. Reginald Dozva	Research and Hygiene	NSSA
46.	Mr. Chris Musekiwa	Communications Officer	Urban Councils Association of Zimbabwe
47.	S. Chikoti	Intern	Global Environment Facility – Small Grants Programme
48.	Ms. Tariro Kadzirange	Project Manager	Practical Action Southern Africa
49.	Ms. Hilda Manditsvara	Agricultural Extension Specialist	Agritex
50.	Mr. Tawanda Chinembiri	Senior Programme Officer	National Association of Non-Governmental Organisations
51.	Mr. L. Muradzi	Chief Lands officer - Planning	Ministry of Lands and Land Resettlement
52.	Ms. C. Chingombe	Journalist	The Patriot
53.	Dr. Elizabeth Ngadze	Lecturer	University of Zimbabwe Crop Science Department
54.	Mr. George Msumba	Reporter	Star FM
55.	Mr. Bongayi Gokoma	Agronomist	Agricura
56.	Dr. Upenyu Mazarura	Chairperson	University of Zimbabwe Crop Science Department
57.	Eng. Betty Nhachi	Environmentalist	BN Environmental Consulting
58.	J. Mandirasa	SHEQ Manager	Chemplex
59.	Dr. J. Kugara	Chairman	University of Zimbabwe Chemistry Department
60.	Mr. Patrick Musira	Journalist	Southern Times
61.	Mr. Josiah Dimbo	Chief Reporter	Southern Africa Media
62.	Ms. Rugare Dhobbie	ZBC Reporter	Zimbabwe Broadcasting Corporation
63.	Mr. Nevson Mpofu	Journalist	Sunday Times
64.	Trinity K. Matendere	Journalist	New Ziana (Gweru)