

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

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**environmental affairs**

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## **National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants**

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### **Executing organization**

Ministry of Water and Environmental Affairs  
Department of Environmental Affairs

Republic of South Africa  
Private Bag x447  
Fedsure Building  
315 Pretorius Street  
Pretoria, 0001

### **The project team:**

Ms Dee Fischer - Project Director  
Dr Shauna Costley - Project coordinator  
Ms Mangaka Moloi - Project coordinator  
Ms Xolile Jila - Project coordinator  
Mr Gordon Khauoe - Project coordinator

The National Implementation Plan was developed based on the Article 7 of the Stockholm Convention signed on May 23, 2001 and entered into force on May 17, 2004. According to the provisions of the Convention, each Party shall develop and endeavour to implement a plan for the implementation of its obligations under this Convention.

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## FOREWORD

The development and growth of the chemical sector over the past centuries has fundamentally transformed the way in which we live. We use chemicals on a daily basis in agriculture, industry and to protect human health. However, in the global movement towards development which is sustainable and protective of our human health and the environment, we have become acutely aware that not all the chemicals that we have developed and use meet sustainable development objectives. Immense harm has been caused to both human health and the environment by the toxic nature of some chemicals and the mismanagement of chemicals and their wastes. One group of chemicals which are especially dangerous is what has been termed persistent organic pollutants (POPs). These chemicals bio-accumulate in the environment, are persistent and have the potential for long range transport. As the effects of these chemicals do not respect country borders, they have become the topic of global concern. This concern transformed into action with the development of the Stockholm Convention. This Convention, which entered into force in May 2004, was crafted to specifically deal with the phasing out of the production and use of these chemicals and the management of their wastes.

South Africa has used and in many cases produced these chemicals and our environment and population have and are being exposed to their effects. In line with the country's commitment to sustainable development, South Africa has joined the international communities' efforts to phase out these chemicals and wastes by becoming a Party to the Stockholm Convention. As a Party to the Convention, South Africa must put in place measures to meet the Conventions objectives and must report on its efforts in this regard.

This document represents the findings of an initial investigation into the status of the implementation of the Convention, the prevalence of use of these chemicals, their accumulation in the environment and the management of their resulting wastes. It also identifies the legislative and management measures available to meet the Conventions objectives and to protect human health and the environment from the effects of these POP chemicals. Gaps in the current management measures have been identified and an action plan developed which will address the gaps and strengthen the current management measures. The country is committed to the safe and sustainable use and management of, as such, this document will be continuously updated and the information will improve as will the management measures.

I take this opportunity on behalf of the Department to thank all who have contributed to the development of this important document. It is a first step in a much longer journey to sustainable and safe chemicals

management and I invite and request all stakeholders in a position to do so to assist with the implementation of the action plan, the updating of the document and the monitoring of the success of our action. Together we can ensure that our country adopts a safe chemicals management approach which protects human health and the environment.



**BOMO EDITH EDNA MOLEWA**  
**MINISTER OF WATER AND ENVIRONMENTAL AFFAIRS**



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## GLOSSARY OF ABBREVIATIONS

APPA	Atmospheric Pollution Prevention Act, 1965 (Act No. 45 of 1965)
ARC	Agricultural Research Council
ASP	Africa Stockpile Program
AVCASA	Agricultural and Veterinary Chemicals Association of South Africa
BAT	Best Available Technology
BCOCC	Boarder Control Operational Coordinating Committee
CAIA	Chemical Allied and Industry Association
CBOs	Community Based Organisations
CBU	Customs Border Control
CEA	Customs and Excise Act, 1964 (Act No. 91 of 1964)
CISA	Consumer Institute of South Africa
CFCs	Chlorofluorocarbons
CSIR	Council for Scientific and Industrial Research
DAFF	Department of Agriculture, Forestry and Fisheries
DANIDA	Danish International Development Assistance
DDE	Dichlorodiphenyldichloro-ethylene
DDT	Dichlorodiphenyltrichloroethane
DEA	Department of Environmental Affairs
DIRCO	Department of International Relations and Corporation
DoH	Department of Health
DoL	Department of Labour
DoT	Department of Transport
DST	Department of Science and Technology
DWA	Department of Water Affairs
ELA	Earthlife Africa
ECA	Environmental Conservation Act, 1989 (Act No. 73 of 1989)
EIAs	Environmental Impact Assessments
EJNF	Environmental Justice Networking Forum
EMIs	Environmental Management Inspectors
EU	European Union
Eskom	Electricity Supply Commission
FCDA	Foodstuffs, Cosmetics and Disinfectants Act, 1972 (Act No. 54 of 1972)
FFASA	Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act No. 36 of 1947)
FRIDGE	Fund for Research into Industrial Development, Growth and Equity
GAPS	Global Atmospheric Passive Sampling



GDP	Gross Domestic Product
GEF	Global Environmental Facility
GHS	Globally Harmonised System of Classification and Labeling of Hazardous Chemicals
GVA	Gross Value Added
HCB	Hexachlorobenzene
HCH	Hexachlorocyclohexane
HCS	Hazardous Chemical Substances
HSA	Hazardous Substances Act, 1973 (Act No. 15 of 1973)
ICCM	International Conference on Chemicals Management
INDAC	Interdepartmental Advisory Committee for the Protection of Humans against Poisonous Substance
ILO	International Labour Organization
IPPIE	Integrated Permitting Procedure for the Import and Export of Substances
IRS	Indoor Residual Spraying
ISO	International Standards Organization
ITAA	International Trade Administration Act, 2002 (Act No. 71 of 2002)
ITAC	International Trade Administration Commission of South Africa
MEC	Member of the Executive Council
MFMA	Municipal Finance Management Act, 2003 (Act No. 56 of 2003)
MHI	Major Hazardous Installation
Mintek	Council for Mineral Technology
MRC	Medical Research Council
mV	milliVolt
NA	National Assembly
NAAQMN	National Air Quality Monitoring Network
NCCM	National Committee on Chemicals Management
NCMP	National Chemical Monitoring Programme
NCOP	National Council of Provinces
NCPC-SA	National Cleaner Production Centre
NEDLAC	National Economic Development and Labour Council
NEMWA	National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)
NEMAQA	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NEMP	National Eutrophication Monitoring Programme
NEPAD	New Partnership for Africa's Development
NGOs	Non-Government Organisations
NIP	National Implementation Plan
NMMP	National Microbial Monitoring Programme

NRF	National Research Foundation
NTMP	National Toxicity Monitoring Programme
NWA	National Water Act, 1998 (Act No. 36 of 1998)
LOQ	Limit of Quantification
OCP	Organochlorine Pesticides
ODS	Ozone Depleting Substances
OHSA	Occupational Health and Safety Act, 1993 (Act No. 85 of 1993)
PCBs	Polychlorinated Biphenyls
PCDDs	Polychlorinated dibenzo-para-dioxins
PCDFs	Polychlorinated dibenzofurans
PFMA	Public Finance Management Act, 1999 (Act No. 1 of 1999)
POPs	Persistent Organic Pollutants
<i>p</i> -NP	Para - Nonylphenol
PSC	Project Steering Committee
PWG	Poisoning Working Group
PVC	Polyvinyl chloride
QSP	Quick Start Programme
REACH	Registration Evaluation and Authorisation of Chemicals
SAAQIS	South African Air Quality Information System
SADC	South African Development Community
SAICM	Strategic Approach to International Chemicals Management
SAMSA	South African Maritime Safety Authority
SANS	South African National Standards
SARS	South African Revenue Services
SDS	Safety Data Sheets
SOER	State of Environment Report
SMEs	Small Medium Enterprises
The dti	Department of Trade and Industry
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organisation
UNITAR	United Nations Institute for Training and Research
USNDAMIN	United States Dioxin Monitoring Network
WESSA	Wildlife and Environment Society of South Africa
WHO	World Health Organisation
WRC	Water Research Commission
WRM	Water Resources Management
WSSD	World Summit on Sustainable Development

## EXECUTIVE SUMMARY

“Persistent Organic Pollutants (POPs) are a group of chemicals that are characterized by their persistence, bio-accumulation and potential for long range transport. They were and are widely used in agriculture and industrial practices, and they are unintentionally released from many anthropogenic activities around the globe. The ability of these toxic compounds to be transported to isolated areas of the globe, such as the Arctic has raised concerns for the health of humans and the environment, particularly for indigenous people that rely on traditional diets of marine mammals and fish. In order to manage the threats posed by the trans-boundary movement of these POPs it was decided that an international binding agreement was required. On the 23 May 2001, a convention on POPs was signed in Stockholm Sweden which is known as the Stockholm Convention on POPs. The Convention entered into force on the 17 May 2004, and South Africa became a party on 4 September 2002. The main objective of the Convention is to protect human health and the environment from POPs by controlling POPs with the view to phasing them out. The Convention requires each Party to prohibit and/or take any legal and administrative actions required for the elimination/reduction of POPs production and use, export and import, as well as to take actions to minimize or prevent POPs releases into the environment. The Convention identified twelve POPs chemicals for intervention and new chemicals are considered for listing at each Conference of the Parties. Nine of the initial POPs chemicals identified are pesticides, one is an industrial chemical and two are unintentionally produced through certain industrial processes.

South Africa manufactured and used many of the POPs chemicals and continues to use DDT for malaria vector control. Article 7 of the Convention identifies the requirement for each Party to develop and to endeavor to put into practice a plan for the implementation of its obligation under the Convention. In line with the requirements of the Convention, South Africa has developed its National Implementation plan (NIP) for the initial twelve POPs identified and will now submit this implementation plan to the Secretariat. The NIP documents the manner in which the Stockholm Convention is being implemented in the country, identifies implementation gaps and outlines an action plan to take forward priority initiatives. The main findings and actions have been presented in this executive summary.

The research undertaken to support the development of the NIP noted that the management of chemicals in South Africa falls within the mandate of several Government Departments and is enforced through a number of Acts and regulations. For POPs pesticides there is a clear legislative framework which begins with the registration of agricultural pesticides and makes provision for the banning or restriction of pesticides and stock remedies. The management procedures for POPs pesticides are therefore in place and are being implemented with the result that all of the nine initial POPs pesticides listed in the Convention, have been banned or deregistered in the country. With respect to industrial POPs chemicals, Acts and regulations were presented which identified that the framework is in place for the management of these chemicals based on their ability to cause injury, ill health or death to human beings. However, implementation gaps were highlighted with respect to the management of industrial POP chemicals which need to be addressed.

Polychlorinated Biphenyls (PCB) is the initial industrial POP chemical listed in the Convention. This chemical was never manufactured in the country but PCB containing equipment and PCB oils were imported into the country for use predominantly in the electricity generation sector. Although PCBs are no longer manufactured globally, PCB containing equipment is still found and utilized in the country. The Convention requires that PCB contaminated equipment is to be phase out by 2025. In order to comply, there is a need to develop a national inventory of PCB containing equipment and to produce a national phase out plan. The development of regulations to compel owners of PCB containing equipment to develop inventories and phase out plans has been identified as a priority activity in the NIP action plan.

Polychlorinated dibenzo-p-dioxins (PCDD) and dibenzofurans (PCDF), are the two unintentionally produced POPs that have been identified for action in the Convention. South Africa has industries that could contribute to the unintentional production of PCDD/PCDF. There are also incidents of open burning of waste, cane burning and uncontrolled veld fires which are known to produce PCDD/PCDF. The legislative and management framework to deal with the monitoring and reduction of dioxins and furans is in place, although POPs emissions have not been prioritized. The inclusion of POPs emission limits has been identified in the action plan.

Although there is no comprehensive monitoring program to monitor POPs in the South African environment, a number of specific studies have been undertaken which monitored the levels of POPs in identified environmental media. In some cases the monitoring was undertaken to determine the impacts of POPs on human health. Generally, the studies indicate low concentrations of POPs in different media. Due to the limited dioxin and furan monitoring requirements, little is known about the contribution of industrial sources of unintentionally released POPs to the ambient environment. In order to assess the possible national releases of unintentional POPs for the drafting of this report, the UNEP standardized toolkit was applied to estimate total dioxin and furan releases from all identified industries of interest in the country. In addition, a regional assessment using the UNEP Toolkit was also undertaken in the Potchefstroom area in the North West Province. The results of the Toolkit assessment indicated that dioxin and furan levels from unintentional releases of POPs were low, with the power generation being responsible for the highest contribution to air releases and the production of ferrous and non ferrous metals being the highest contributor to dioxins and furans to residues. Other major emitters to air are uncontrolled combustion processes. The modeling of emissions to determine their impact on human health indicated that the practice of sugar cane burning may lead to high levels of dioxins and deserves further investigation. Although the levels of dioxins and furans are low, due to the highly industrialized nature of the country, South Africa does rank as the number one source of unintentional PCDD/Fs in 47 sub-Saharan countries. In order to better assess the released of POPs to the environment into the future the need to set up specific water and air monitoring for POPs and to develop guideline values for POPs in water and sediments was identified as an action item.

As South Africa has manufactured, stored and traded in POPs, some stockpiles of POPs containing waste have been accumulated and sites have been contaminated by POPs. Although specific information on a number of contaminated sites has been gathered through the process of obtaining environmental authorization for remediation, there is currently no national database of contaminated sites. This situation will change when Part 8 of the National Environmental Management: Waste Act is brought into effect, as this section allows the Minister to keep a national contaminated land register of investigation areas which will provide information on among others, the nature and origin of contamination, the extent of contamination and the status of any remedial measures required. South Africa is also implementing an African Stockpiles



project which has collected obsolete pesticides in the Limpopo Province and will soon collect obsolete pesticides in the Free State and Western Cape Provinces. An inventory of this waste which includes POPs waste has and will be maintained.

Concerning the availability of analytical infrastructure to manage POPs, it has been found that South Africa has limited capacity to measure POPs in terms of both laboratory capacity as well as trained and skilled staff. A report undertaken to specifically assess the availability of laboratory capacity to support the chemical sector indicated that only a small number of laboratories are able to measure a limited range of POPs. The report also identified the need to expand the training for laboratory staff. With respect to technologies to manage POPs waste in an environmentally safe manner, it was found that infrastructure in this regard is limited. The most common waste management method used currently to manage POPs waste is encapsulation or landfilled with a small amount of POPs waste being incinerated. Regulations dealing with the classification and general management to waste are presently being finalised and will bring the much needed policy certainty to the waste industry. It is hoped that this in turn will facilitate the investment in alternative technologies to landfill to manage waste which will also provide additional opportunities to manage POPs waste.

With respect to capacity building and awareness raising among stakeholders, there are various mechanism used in South Africa to bring information to stakeholders and the public and a number of institutions, sectors and organizations are involved. There are also several government and non-government interventions in place to bring information to the attention of those who require it.

In order to document, prioritize and action the interventions that are required to fully implement the Stockholm Convention in South Africa a five year action plan has been developed. The Departments required to lead the implementation have also been identified. The plan will be updated to include the newly listed POPs. Progress on the interventions will be reported quarterly through the national committee on chemicals management.

# 1 INTRODUCTION

## 1.1 Context

The Global Monitoring Plan for Persistent Organic Pollutants provides the following explanation for a Persistent Organic Pollutant, “POPs are a group of chemicals that are widely used in agriculture and industrial practices, as well as unintentionally released from many anthropogenic activities around the globe”<sup>1</sup>. POPs are characterized by *persistence* – the ability to resist degradation in various media (air, water, sediments, and organisms) for months and even decades; *bio-accumulation* - the ability to accumulate in living tissues at levels higher than those in the surrounding environment; and *potential for long range transport* – the potential to travel great distances from the source of release through various media (air, water, and migratory species). Specific effects of POPs can include cancer, allergies and hypersensitivity, damage to the central and peripheral nervous systems, reproductive disorders, and disruption of the immune system. Some POPs are also considered to be endocrine disrupters, which, by altering the hormonal system, can damage the reproductive and immune systems of exposed individuals as well as their offspring. The ability of these toxic compounds to be transported to isolated areas of the globe, such as the Arctic, and to bio-accumulate in food webs, has raised concerns for the health of humans and the environment, particularly for indigenous people that rely on traditional diets of marine mammals and fish”.

As POPs have the potential to be transported between countries, governments agreed that in order to address the threats posed by the trans-boundary movement of these POPs a multilateral approach was required. In May 1995 the Governing Council of the United Nations Environmental Programme (UNEP) requested that an international process be undertaken to assess an initial list of twelve POPs and that recommendations be prepared for consideration by the UNEP Governing Council and the World Health Assembly by 1997. Based on the recommendations made, governments agreed in February 1997 that the most effective approach to managing the threats posed by POPs was a binding international agreement. Negotiations to develop the text for the international legally binding instrument began in June 1998 and were concluded in December 2000. The Convention on POPs was signed on 23 May 2001 in

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<sup>1</sup> UNEP, 2009. Global Monitoring Plan for Persistent Organic Pollutants. First Regional Monitoring Draft Report. Africa Region. 15th March 2009.

Stockholm Sweden at a ceremony attended by 92 states and the European Community and is known as the Stockholm Convention on POPs<sup>2</sup>.

The Convention entered into force on the 17 May 2004, 90 days after the 50<sup>th</sup> party ratified the Convention. South Africa ratified the Convention on the 23 May 2001 and became a party on 4 September 2002. As at the 4 May 2010, 152 countries had signed the convention and 170 countries had ratified and become parties to the Convention.

The main objective of the Convention is to protect human health and the environment from POPs by controlling POPs with a view to phasing them out. The Convention focuses on three broad areas namely:

- POPs which are intentionally produced and used,
- POPs which are unintentionally produced, and released from anthropogenic sources, and
- POPs in stockpiles and wastes.

The Convention requires each Party to prohibit and/or take any legal and administrative actions required for the elimination/reduction of POPs production and use, export and import, as well as to take actions to minimize or prevent POPs releases. The Convention identifies specific POPs for management which are contained in Annexes A, B and C of the Convention. These Annexes include the initial twelve POPs identified in May 1995, the nine new POPs listed in May 2009 as well as the unintentionally produced and released POPs which result from some industrial processes. Management measures for these POPs are contained in specific Articles to the Convention. These POPs and their management measures are identified in Table 1.

In South Africa, the Stockholm Convention is implemented by the South African Government through the Department of Environmental Affairs (DEA), who is the focal point, in consultation with various other departments including but not limited to the Departments of: Agriculture Forestry and Fisheries, Water Affairs, International Relations, Trade and Industries, Science and Technology and Health. In addition several non-governmental organisations, industry bodies and para-statal organizations are consulted on the implementation of the Convention through a national chemicals stakeholder coordination committee.

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<sup>2</sup> UNEP, 2001. Stockholm Convention on Persistent Organic Pollutants. The Interim Secretariat for the Stockholm Convention, Geneva, Switzerland.

Chemical	Intentional production and use - Pesticide	Intentional production and use - industrial chemical	Un-intentional production	Annex and Management measure
Aldrin	√			Annex A – Elimination for production, limited used as local ectoparasiticide
Chlordane	√			Annex A – exemption for production in countries registering exemptions, limited use
Dieldrin	√			Annex A – Elimination for production, limited use in agricultural operations
Endrin	√			Annex A – Elimination
Heptachlor	√			Annex A – Elimination for production, limited use
Hexachlorobenzene	√	√	√	Annex A – exemption for production in countries registering exemptions, limited use Annex C - Implement measures to reduce or eliminate released from unintentional production
Mirex	√			Annex A – exemption for production in countries registering exemptions, limited use
Toxaphene	√			Annex A – Elimination
Polychlorinated Biphenyls		√	√	Annex A – Elimination for production, elimination for use by 2025
DDT	√			Annex B – Restricted use for malaria vector control and under exemption for use as an intermediate in the production of dicofol
Dioxins (polychlorinated dibenzo-p-dioxins)			√	Annex C - Implement measures to reduce or eliminate released from unintentional production
Furans (polychlorinated dibenzofurans)			√	Annex C - Implement measures to reduce or eliminate released from unintentional production
<b>POPs listed by COP 4 2009</b>				
Chlordecone	√			Annex A – Elimination
Hexabromobiphenyl		√		Annex A – Elimination
Hexabromodiphenyl ether and heptabromodiphenyl ether		√		Annex A – Elimination for production, exemption for use as articles containing these chemicals for recycling
Alpha hexachlorocyclohexane	√		√	Annex A – Elimination Annex C – manage unintentionally production
Beta hexachlorocyclohexane	√		√	Annex A – Elimination Annex C – manage unintentionally production
Lindane	√			Annex A – exemption for production in countries registering exemptions for use as a human health pharmaceutical
Pentachlorobenzene (PeCB)	√	√	√	Annex A – Elimination Annex C – manage unintentionally produced
Perfluorooctane sulfonic acid (PFOS) its salts & perfluorooctane sulfonyl fluoride (PFOS-F)		√		Annex B – phase out with acceptable purpose and specific exemptions
Tetrabromodiphenyl ether and penta-bromodiphenyl ether		√		Annex A – Elimination for production, exemption for use as articles containing these chemicals for recycling

**Table 1: List of identified POPs and their management measures**

South Africa is a party to three other multilateral agreements which deal with chemicals management issues namely; the Basel Convention on the Control of Trans-boundary Movement

of Hazardous Waste, the Rotterdam Convention on the Prior Informed Consent Procedures for Certain Hazardous Chemicals and Pesticides in International Trade, and the Montreal Protocol on Substances that Deplete the Ozone Layer. South Africa also played a leading role in the development of the Strategic Approach to International Chemicals Management (SAICM) and contributes to its Quick Start Programme.

## 1.2 National Implementation Plan

Article 7 of the Convention identifies the requirement for each Party to develop and to endeavor to put into practice a plan for the implementation of its obligation under the Convention. The plan is to be integrated into the sustainable development strategies where appropriate and is to be reviewed and updated on a periodic basis.

In line with the requirements of the Convention and realizing the need to take the necessary measure to prevent the harmful impacts of POPs, South Africa has developed its National Implementation plan (NIP) with the following expected outcomes:

- to protect South Africans' health from the effect of POPs;
- to promote a cleaner South African environment;
- to improve South Africa's capacity to manage POPs;
- to reduce South Africa's contribution to global pollutant loading; and
- to contribute to meeting South Africa's commitments under the Stockholm Convention

This NIP will consider the current legislative framework; the institutional and infrastructural capacity and the research and monitoring capability the POPs profile for the country including an assessment of the extent of unintentional released of POPs from industrial processes and the country's ability to manage POPs.

The methodology used to develop this document included the development and distribution of questionnaires, the holding of personal and telephonic interviews with relevant departments and intuitions, internet searches, document and database reviews and interaction through focus group meetings and stakeholder workshops. In order to assess the extent of unintentional releases of POPs the UNEP Dioxin Toolkit was used, this also required the development and distribution of



questionnaires to industry, interview with industry representative, telephonic interviews and database reviews.

The South African NIP which has been drafted by the Department of Environmental Affairs (DEA) with active participation from all concerned government and non-government stakeholders, including representatives of industry, the energy, health and agricultural sectors as well as research institutions and environmental NGO's. Although Table 1 includes the nine POPs identified at the fourth Conference of the Parties (COP) in 2009, this version of the South African NIP will only consider the original twelve POPs listed. The NIP will now be updated to reflect the research on the nine new POPs which has recently been completed. The NIP includes a five year action plan which has been agreed with all stakeholders. The action plan is to be implemented by the various implementing Departments.

The structure of the NIP is as follows:

- Foreword and Executive summary
- Chapter 1 provides the introduction to the Convention as well as the methodology used to develop the NIP
- Chapter 2 contains the country profile including background information, general socio-demographical, political, economic, ecological data and information on the environmental management system in the country.
- Chapter 3 provides an assessment of POPs issues in South Africa and includes the past and present uses of POPs chemicals, an assessment of unintentionally produced POPs, an indication of POPs in the environment, POPs monitoring and management measures, public awareness and information exchange opportunities.
- Chapter 4 provides the 5 year action plan which provides an implementation description of the measures and action plans in line with the relevant Annexes of the Convention aimed at strengthening the existing management capacity, and timeframes for updating of the NIP.

## 2 COUNTRY BASELINE

### 2.1 Geography

South Africa occupies the southern tip of the African continent, covering an area of over 1.2 million km<sup>2</sup>. Its coastline stretches for more than 2 500 km from Namibia on the Atlantic Coast to the border with Mozambique on the Indian Ocean. South Africa shares its northern borders with Namibia, Botswana, Zimbabwe, Mozambique, Swaziland and Lesotho which is a land locked country completely surrounded by South Africa.



Figure 1: Map of South Africa<sup>3</sup>

The country has nine provinces: Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, Northern Cape, North West and Western Cape. Gauteng is the smallest province geographically, but is the economic hub of the country and has the largest portion of the population (10.5%). South Africa has three capital cities: Cape Town, Bloemfontein and Pretoria. Cape Town hosts the country's Parliament and is the legislative capital, while Bloemfontein is the judicial capital and is home to the Supreme Court of Appeal. Pretoria is the administrative capital of the country and is home to the head offices of all the National Departments. Harbours exist at Richards Bay and Durban in KwaZulu-Natal, East London and Port Elizabeth in the Eastern Cape, and Mossel Bay and Cape Town in the Western Cape.

### 2.2 Climatic specifics

Although the country is classified as semi-arid, it has considerable variation in climate as well as topography. **Climatic conditions generally range from Mediterranean in the south western corner of the country to temperate in the interior plateau. The north east is characterized by a subtropical climate, while the central and north west areas of the country can be classified as semi-arid. Rainfall generally occurs during summer (October – March), although winter rainfall (June – August) is characteristic in the Western Cape region.**

<sup>3</sup> <http://www.go2africa.com>

**Temperatures are influenced by variations in elevation, terrain and ocean currents more than the latitude.**

### 2.3 Population and employment

According to the mid-2010 estimates from Statistics South Africa, the country's population stands at 49.99-million, up from the census 2008 count of 48.6-million of which 49% is male and 51% female<sup>4</sup>. As can be seen from Figure 2 the population consists of 79% Black African, 9% Coloured, 9% White and 3% Indian and Asian. The rate of growth for the South African population has been declining steadily between 2001 and 2008. The estimated overall growth rate declined from approximately 1.4% between 2001-2001 to 1.06% for 2009-2010. Life expectancy at birth is estimated at approximately 53.3 years for males and 55.2 years for females.

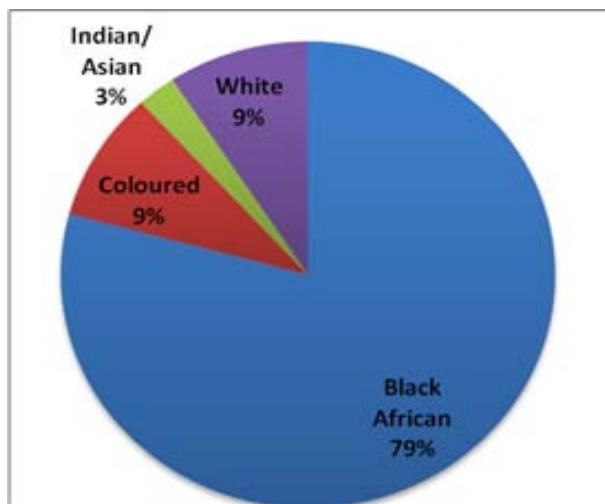


Figure 2: Population profile

The most populated province is the Gauteng province (22.4%) followed by the Kwazulu-Natal province (21.3%), while the least populated province is Northern Cape at 2.2%. According to the 2007 Labour Force Survey<sup>5</sup>, of the working age population that constituted 68.7% of the total population in the country only 17.4% were economically active. These were divided into 77.3% of employed and 22.3% unemployed population. The poverty level in the country is relatively high. It is estimated that about 41% of the population lived on less than R361 in 2007, which is about US\$2 per day. At the same time, the monthly income of the average poor person was 19% below this poverty line. Importantly the income of the poorest has been steadily growing in the past few years; however this growth did not match that of the income of the richest portion of the population.

4 Statistics SA. 2010. Mid-year Population Estimates. 2010.

5 Statistics SA. 2007. Labour Force Survey, September 2007.

## 2.4 Political profile

The Constitution is the supreme law of the country and dictates the system and structure of government. The Constitution provides for the separation of power between the legislature, the executive and a judiciary and further identifies three distinct but interdependent spheres of government: namely the national, provincial and local sphere of government. These three spheres are subject to the principles of cooperative governance and intergovernmental relations. The Constitution makes provision for nine provinces and two hundred and eighty three municipalities<sup>6</sup>. The Legislature is the law making body in the country and exists in each sphere of government: as Parliament in the national sphere, the Provincial Legislature in the Provincial sphere and Municipal Councils in the Local sphere. Each sphere of government has legislative and executive authority in their own spheres, which are defined in the Constitution as "distinctive, interdependent and interrelated".

Within the National sphere, Parliament consists of two houses, namely the National Assembly (NA) and the National Council of Provinces (NCOP). The NA consists of 350 to 400 members. Seats are awarded by each political party in proportion to the outcome of the national elections which are held every five years. The President who is the executive Head of State and leads the Cabinet is elected by the National Assembly.

The NCOP is a body created to achieve co-operative governance and participatory democracy. It is through this body that the national and provincial interests are aligned. The NCOP consists of 54 permanent members and 36 special delegates. Each of South Africa's nine provinces sends 10 representatives to the NCOP - six permanent members, and four special delegates

The Cabinet consists of the President, the Deputy President and 36 Ministers. The President appoints the Deputy President and Ministers, assigns their powers and functions, and may dismiss them. All but two Ministers must be selected from among the members of the National Assembly. The members of Cabinet are accountable individually and collectively to Parliament. Deputy Ministers are also appointed by the President from among the members of the National Assembly. Each province has its own executive council, legislature and Premier.

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6 BKS. 2008. Draft Establishment of an Inventory and Assessment of Infrastructure and Capacity for the Development of National Implementation Plans (NIPs) of the Stockholm Convention on Persistent Organic Pollutants (POPs) in South Africa. Chapter 3: Legal Review.

## 2.5 Economic Profile

Parliament is responsible for ensuring the equitable division and allocation of revenue raised nationally among all three spheres of government. In the National and Provincial sphere of government public spending is regulated in terms of the uniform norms and standards which are spelt out in the Public Finance Management Act (the “PFMA”), and supported by Treasury Regulations. Within the Local Government sphere spending is regulated in terms of the Municipal Finance Management Act (“the MFMA”). Provinces are largely dependent upon transfers from national government, whereas municipalities are able to raise their own revenue through property taxes and service charges<sup>6</sup>.

South Africa’s economy is highly dependent on natural resources for food, energy production and inputs to manufacturing. South Africa follows a macro-economic policy aimed at economic growth, increasing employment, a positive trade balance, combating inflation and equity.

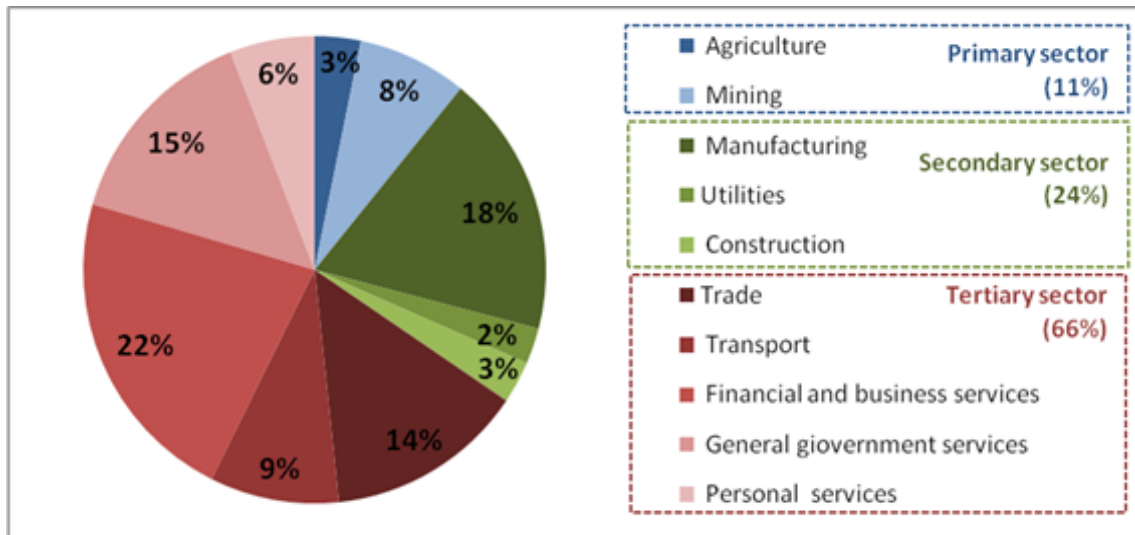


Figure 3: Economic profile of the South African economy<sup>7</sup>

In 2007, the South African economy was valued at R1 993.9 billion in current prices, contributing about 0.92% to the world economy. Despite a small contribution to the world economy, the competitiveness of the South African economy is relatively high. According to the

<sup>7</sup> Statistics SA. 2008. Gross Domestic Product: First Quarter 2008.



World Economic Forum's "Global Competitiveness Report 2010-2011"<sup>8</sup>, South Africa was ranked 54 out of 139 countries and had the lead position among the sub-Saharan countries.

As indicated in Figure 3 two thirds of the South African economy comprises of the tertiary sector. The secondary sector contributes 22% to the national economy and the primary sector comprising of agriculture and mining contribute 11% to the national Gross Value Added (GVA).

The biggest sector among the nine broad economic sectors in the country is the financial and business services sector which shows a relative advancement of the national economy in the service industry and lower dependency on the development of natural resources as was observed in the late 20<sup>th</sup> century<sup>9</sup>.

## 2.6 Profiles of economic sectors

### **2.6.1 Agriculture**

South Africa has a dual agricultural economy, with both well-developed commercial farming and more subsistence-based production in the deep rural areas. Climatic and topographical variations favours the cultivation of a highly diverse range of marine and agricultural products, from deciduous, citrus and subtropical fruit to grain, wool, cut flowers, livestock and game.

Agricultural activities range from intensive crop production and mixed farming in winter rainfall and high summer rainfall areas to cattle ranching in the bushveld and sheep farming in the arid regions. Maize is most widely grown, followed by wheat, oats, sugar cane and sunflowers.

While 13% of South Africa's land can be used for crop production, only 22% of this is high-potential arable land. The most important limiting factor is the availability of water. Almost 50% of South Africa's water is used for agriculture, with .3 million hectares under irrigation.

Today South Africa is not only self sufficient in virtually all major agricultural products, but is also a net food exporter. Farming contributes some 8% to the country's total exports. The largest export groups are wine, citrus, sugar, grapes, maize, fruit juice, wool and deciduous fruit such as apples, pears, peaches and apricots. Other important export products are avocados, dairy

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<sup>8</sup> World Economic Forum. 2010. The Global Competitiveness Report 2010-2011.

<sup>9</sup> BKS. 2008. Draft Establishment of an Inventory and Assessment of Infrastructure and Capacity for the Development of National Implementation Plans (NIPs) of the Stockholm Convention on Persistent Organic Pollutants (POPs) in South Africa. Chapter 7: Socio-Economic Assessment.

products, flowers, food preparations, hides and skins, meat, non-alcoholic beverages, pineapples, preserved fruit and nuts.

### **2.6.2 Automotive Industry**

South Africa's automotive industry accounts for about 10% of South Africa's manufacturing exports. With annual production of 535 000 vehicles in 2007, South Africa can be regarded as a minor contributor to global vehicle production, which reached 73-million units in 2007. But, locally, the automotive sector contributes about 7.5% to the country's gross domestic product (GDP) and employing around 36 000 people.

South Africa currently exports vehicles to over 70 countries, mainly Japan (around 29% of the value of total exports), Australia (20%), the UK (12%) and the US (11%). African export destinations include Algeria, Zimbabwe and Nigeria<sup>10</sup>.

### **2.6.3 Tourism**

The country is highly diverse in terms of its climate, culture, tourist activities and infrastructure, catering for every tourism niche, from business, eco- and cultural tourism through to adventure, sport and paleo-tourism.

In 2009 a total of 11 million foreigners visited South Africa - an 11% increase over 2007 figure. Tourism is also one of the fastest growing sectors of South Africa's economy, its contribution to the country's gross domestic product (GDP) increasing from 4.6% back in 1993 to 8.3% in 2006. Directly and indirectly, tourism constitutes approximately 7% of employment in South Africa<sup>11</sup>.

### **2.6.4 Mining and Minerals**

South Africa, boasts an abundance of mineral resources, producing and owning a significant proportion of the world's minerals and is leading global supplier of minerals and mineral products with 55 minerals being produced from some 1113 mines in 2005. South Africa has the world's largest resources of platinum-group metals, manganese, chromium, gold and aluminosilicates. Further, it accounts for over 40% of global production of the following: ferrochromium, platinum-group metals and vanadium. It is the leading producer of chrome ore, vermiculite and alumina-silicates, and is among the top three producers of gold, manganese ore, titanium

<sup>10</sup> South Africa's Automotive Industry. <http://www.southafrica.info/business/economy/sectors/automotive-overview.htm>

<sup>11</sup> South Africa's Tourism Industry <http://www.southafrica.info/business/economy/sectors/tourism-overview.htm>

minerals and fluorspar<sup>12</sup>. Gold was previously the keystone to the South African economy, but has diminished in importance with increasing difficulty in mining the deep coal seams. An estimated 7% direct contribution was made to GDP by mining in 2006 and R140 billion to South African exports in the same year, although when multipliers are accounted for the GDP contribution is closer to 40%.

In 2007, mining and quarrying contributed about 5.8% to the country's GDP. Although its contribution to the economy is declining, the mining industry is still crucial to South Africa, with precious metals contributing 65% to the country's mineral export earnings and 21% of total exports of goods in 2006.

The mining industry is South Africa's biggest employer, with around 460 000 employees and another 400 000 employed by the suppliers of goods and services to the industry.

South Africa has progressed from being a predominantly primary commodity exporter to being a world exporter of processed minerals since 1990. The largest contributors to beneficiated mineral sales were classified commodities (51,2 %) which are lead by aluminum and followed by chromium alloys (31,9 %). Total production of processed minerals increased by 7,3 % to 8,8 Mt in 2007. The value of local sales of processed mineral products increased by 13.9 %, from R11,5 billion in 2006 to R13,1 billion in 2007<sup>12</sup>.

### **2.6.5 Chemical Industry**

The South African chemical industry including fuel and plastics fabrication as well as pharmaceuticals is the largest of its kind in Africa and manufactures around 300 mostly low value and high volume chemicals<sup>13</sup>. Total chemical production in the SADC region amounts to an estimated 40.4 million metric tons worth approximately \$15.2 billion in 2000. South Africa accounts for an estimated 87% of the total SADC output. Even though South Africa remains a net importer of chemicals with the value of imports of chemical products ranging between ZAR 26 billion to ZAR 30 billion between 2002 to 2004, exports over the same period were in the region of ZAR 15.7 billion to ZAR 19.7 million per year.

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<sup>12</sup> Department of Environmental Affairs, 2010. South African Country Report for the Eighteen Session of the United Nations Commission on Sustainable Development.

<sup>13</sup> Munjoma, H. 2009. Status of Environmentally Sound Management of Chemicals National Report, South Africa. Draft No. 2. UNIDO Project: YA/RAF/09/010/17-52.

The industry is dominated by the basic chemicals sub-sector whose liquid fuels, olefins, organic solvents and industrial mineral derivatives together account for around 31% of chemicals production in the country. The 10 other subsectors are plastic products (around 20% of production), pharmaceuticals (8%), inorganic chemicals (8%), primary polymers and rubbers (7%), organic chemicals (6%), rubber products (5%), bulk formulated (5%) and consumer formulated chemicals (5%), and pure functional and specialty chemicals (5%)<sup>14</sup>.

This sector contributes approximately 5% of South Africa's GDP and 22% of its manufacturing sales annually. According to the Statistics South Africa sales of chemical products in 2008 amounted to ZAR 318 billion. This sector also accounts for over half the jobs created by the manufacturing sector as a whole and generates 150 000 direct employment opportunities annually. A few large upstream producers are responsible for 60 to 70% of the chemicals sector turnover. Currently more chemicals are imported into South Africa than exported but the South African Government has prioritized the development of the chemical sector.

### **2.6.6 Financial Sector**

South Africa's financial services sector, backed by a sound regulatory and legal framework, provides a full range of services - commercial, retail and merchant banking, mortgage lending, insurance and investment.

South Africa's banking sector compares favourably with those of industrialized countries. Foreign banks are well represented and electronic banking facilities are extensive, with a nationwide network of automatic teller machines (ATMs) and internet banking facilities available.

The Financial Services Board oversees the regulation of financial markets and institutions, including insurers, fund managers and broking operations but excluding banks, which fall under the South African Reserve Bank<sup>15</sup>.

## **2.7 Environmental overview**

South Africa is characterized by a wide diversity of plant and animal life and is ranked as the third most biologically diverse country in the world (mainly due to the richness of the plant life).

<sup>14</sup> <http://www.southafrica.info/business/economy/sectors/chemical-sector.htm>

<sup>15</sup> <http://www.southafrica.info/business/economy/sectors/financial.htm>

Over 18 000 species of vascular plants occur in South Africa, of which over 80% occur nowhere else. Estimates of total species numbers in the country vary from 250 000 to 1 000 000 and it is estimated that South Africa has 5.8% of the world's mammal species, 8% of the world's bird species, 4.6% of the world's reptile species, 16% of marine fish species and 5.5% of the world's recorded insect species. Over 10 000 species of the coastal animals and plants (almost 15% of the world's total coastal species) are found along South Africa's coast, with about 12% of these occurring nowhere else. In terms of the number of endemic species of mammals, birds, reptiles and amphibians, South Africa ranks as the 5th richest country in Africa and the 24th richest in the world. This diversity is caused by variation in climate, geology, soils and landscape form.

However, South Africa also has the highest concentration of threatened plant groups in the world. Approximately 3 435 of South Africa's plant groups are considered to be globally threatened with extinction. A further 204 groups are estimated to be threatened at a local level.

Nearly 91% of the country falls within the United Nations definition of "affected drylands". These are extraordinarily dry areas where the rainfall is low, and potential evaporation is high. Dryland systems are often very sensitive to change, and therefore need to be managed carefully. The maintenance of biodiversity is a prerequisite for ecosystem sustainability<sup>6</sup>.

## 2.8 Institutional, policy and regulatory framework<sup>16</sup>

### ***2.8.1 Roles and responsibilities of departments, agencies and other government institutions involved in POPs lifecycles***

Under the Constitution, in South Africa the responsibility for the environment, which includes the management of the different aspects of the POPs life cycle, falls within the ambit of both exclusive and concurrent competencies in all three spheres of government and is shared by various organs of state. The section below identifies the key organs of state in all three spheres of government involved and provides a brief summary of their environmental mandate generally and the different life cycle stages of POPs specifically.

#### ***2.8.1.1 Department of International Relations and Cooperation (DIRCO)***

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<sup>16</sup> This section was sourced predominantly from the work of BKS, 2008. Draft Establishment of an Inventory and Assessment of Infrastructure and Capacity for the Development of National Implementation Plans (NIPs) of the Stockholm Convention on Persistent Organic Pollutants (POPs) in South Africa.

This Department negotiates and signs multilateral and bilateral agreements on behalf of the country and participates in international negotiations including all negotiations related to POPs e.g. the Conference of the Parties.

#### *2.8.1.2 Department of Environmental Affairs (DEA)*

DEA is the lead executing organ of state regarding the implementation of the Stockholm Convention in South Africa and is responsible for ensuring the development of the NIP and coordinated the implementation of the Convention. With respect to the environment DEA is among others responsible for setting national policy, norms and standards; developing strategies and frameworks; co-ordination; reporting and building capacity building within the population.

One of its key goals of the Department is to protect and improve the quality and safety of the environment. The Department's Branch Environmental Quality and Protection is tasked with achieving this goal.

DEA has professional capacity dedicated to the implementation of the Stockholm Convention. The Department liaises closely with the Departments of Trade and Industry and its Agent International Trade Administration Commission of South Africa (ITAC), Agriculture, Science and Technology, and Health, among others, to ensure a coordinated and uniform approach to the implementation of the Convention and formulation of negotiating mandates.

The Department's POPs related functions include the compilation of the National Implementation Plan and regulating certain processes and activities relevant to the management of POPs. The regulatory functions relate to POPs waste and stockpiles; movement of controlled wastes; industrial air emissions and releases of dioxins and furans; and assessing the environmental impacts of certain listed processes and activities which require environmental authorization.

#### *2.8.1.3 Department of Health (DoH)*

The DoH role in chemicals management is to protect human health by ensuring a sustainable, safe and healthy environment for South Africans and the protection of public health and the environment by providing adequate regulatory tools and comprehensive environmental health services. The Department administers the National Health Act, the Hazardous Substances Act



and the Foodstuffs, Cosmetics and Disinfectants Act. With respect to POPs chemicals the Directorate: Environmental Health has key responsibilities as this Directorate administers the HSA, and the relevant sections under the NHA which are associated with POPs management; its main functions include:

- supporting, training, monitoring and evaluating Municipal Environmental Health Services;
- cooperating with other government departments on environmental health related matters such as air quality, water treatment chemicals, health care waste, water quality and sanitation;
- licensing hazardous chemical substances;
- providing technical advice to the DAFF on the registration of products and new chemicals;
- initiating and coordinating chemical safety programmes; and
- cooperating with the DEA on the implementation of international multilateral environmental agreements such as the Stockholm, Basel and Rotterdam Conventions.

In addition the DoH is responsible for overseeing and coordinating the malaria vector control programme in South Africa. The Directorate: Malaria and Other Vector-Borne Diseases is responsible for the prevention and control of specific vector-borne diseases, including malaria, and to ensure a pro-active, appropriate and effective response to these diseases in the interest of the public in South Africa. Its key functions include: developing policy and guidelines for the prevention and control of vector-borne diseases and implementing the malaria control interventions. Guidelines on the use of insecticides (chemicals used for indoor Residual Spraying and larviciding) are in keeping with those of the World Health Organisation and Stockholm convention.

#### ***2.8.1.4 Department of Agriculture, Forestry and Fisheries (DAFF)***

The Act provide for the appointment of a Registrar of Fertilizers, Farm Feeds and Agricultural Remedies; for the registration of fertilizers, farm feeds, agricultural remedies, stock remedies, sterilizing plants and pest control operators; to regulate or prohibit the importation, sale, acquisition, disposal or use of fertilizers, farm feeds, agricultural remedies and stock remedies;. The Minister of DAFF has the power to restrict or ban certain pesticide for use in South Africa through the identification of a Registrar of agricultural and stock remedies. The Registrar is located in the Directorate Food Safety and Quality Assurance and is responsible for regulating

the production, use, import and export of pesticides; and the review and registration of new agricultural remedies and chemicals. The Registrar is supported by an Administration, Technical Evaluation Service and Inspection Service. The inspectors are assisted by officials from the Port Health Authorities of the DOH, the DAFF Agricultural Product Inspection Services (APIS) and by Customs agents.

In December 2010 the DAFF gazetted a Pesticide Management Policy<sup>17</sup> for the country. The policy identifies that the current legislation, the FFASA and its regulations which provide the framework for managing pesticides is outdated and will need to be revised/repealed. The policy sets out the approach to pesticide management on which the revision of the current legislative framework should be based. This approach leans towards reducing the countries reliance on pesticides in favour of other less interventionist approaches. It takes into cognisance the fact that special attention should be given to pesticides that pose unmanageable risk, with an understanding that such pesticides should be considered for phase-out, severe restriction and bans. POPs pesticides are among the pesticides that have been identified for this special attention. Harmful pesticides will be substituted with non pesticide alternatives through among others the pesticide registration process. The policy supports the use of international agreements to manage pesticides including the Rotterdam, Stockholm and Vienna Conventions and identifies the need to improve labeling of chemicals in line with the GHS labeling protocols. Similarly the policy recognizes the need for regulation and management of pesticides to be developed in line with information provided by monitoring and research and supports the development, availability and adoption of sustainable pest management tools and practices in agriculture.

#### *2.8.1.5 Department of Labour (DoL)*

DOL provides policy advice on a range of issues including - national occupational health and safety, workers' compensation, as well as reviewing, developing and implementing safety standards, e.g. for storage and handling of chemicals in the workplace. The DoL also administers the Occupational Health and Safety Act and the Hazardous Substances regulations promulgated under the Occupational Health and Safety Act which requires all chemicals for use in a work

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17 DAFF. 2010. Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, Act No 36 f 1947. Pesticide management Policy For South Africa. GG No 33899, GN 1120 of 2010.

place to be accompanied by a Materials Safety Data Sheet (MSDS). This will apply to any POPs chemicals used in the workplace.

#### 2.8.1.6 *Department of Water Affairs (DWA)*

DWA is entrusted with the custody of the nation's water resources. As such the Department has the power to regulate the use, flow and control of water in the country and currently performs both implementation and regulatory functions in respect of water quality and quantity. The Programme: Water Resources Management (WRM) is responsible for ensuring that the water resources are protected, used, managed and controlled in a sustainable and equitable manner. Although not specifically designed to ensure compliance with the obligations under the Stockholm Convention, certain of the strategic objectives of this Programme are relevant to the Convention. These include the minimization of the impacts of waste discharge and disposal and other land-based activities on water resources; and the establishment and maintenance of a national water resource monitoring and management responsible for executing its water quality functions. Sections within the Department that have relevance to POPs management include:

- The Directorate Water Quality Management, which provides policy development, capacity building, specialist support, authorization and audit services at a strategic level;
- The Regional Offices in each of the nine provinces, which provide policy implementation, operation, control and monitoring services at an operational level; and
- The Institute for Water Quality Studies, which provides a scientific support service system.

#### 2.8.1.7 *Department of Trade and Industry (The dti)*

The *dti* administers the International Trade Administration Act (ITAC) which makes provision for the control, through a permit system, of the import and export of goods specified by regulation. The import and export control system extends to chemicals and could include POPs chemicals. The *dti* also plays a significant role in the development and growth of the South African economy. The department has been mandated to improve competitiveness, create a fair trading environment, enhance growth in the economy and improve the creation of new jobs. The *dti* has identified the chemical sector as a growth sector in the country and in order to enhance the competitiveness of this sector has developed a Chemicals Sector Development Strategy.<sup>18</sup> This strategy seeks to give existing and potential investors in the chemicals sector some certainty

<sup>18</sup> The dti. 2005. Sector Development Strategy: Chemicals. <http://www.dti.gov.za/chemicals/csp.pdf>

on the strategic direction Government is taking with respect to this sector. To increase the competitiveness of the chemicals sector as a whole, a chemicals sector expert advisory committee (CSEAC), consisting of government and industry role-players, has been established to advise the *diti* on the implementation of Key Action Programmes for the sector. In addition, the CSEAC has also been responsible for the drafting of the chemicals sector summit agreement, which focuses on investment in the chemicals sector, skills development, research and development, a chemical sector trade strategy, supply chain management, black economic empowerment, employment, promotion of cooperatives and small, medium-sized and micro-enterprises (SMMEs), and the implementation of the advanced manufacturing technology strategy.

#### *2.8.1.8 International Trade Administration Commission of South Africa (ITAC)*

ITAC administers the International Trade Administration Act which makes provision for the control, through a permit system, of the import and export of goods specified by regulation. In terms of the powers vested in the Minister of Economic Development, under this Act, he/she may prescribe that no goods of a specified class or kind, or no good other than goods of a specified class or kind, may be imported into the Republic except under the authority of, and in accordance with, the conditions stated in the permit issued by the Commission. However, to date no POPs have been prescribed by the Minister and the Commission consequently currently has no direct responsibility in respect of regulating trade in Persistent Organic Pollutants. ITAC is responsible for listing prohibited and restricted substances on its list of imports and exports which require import and export permits.

#### *2.8.1.9 SARS: Customs and Excise Divisions (Border Control)*

The SARS performs several important functions in international and local trade, some of which are relevant to POPs management. One of its core functions, the provision of a customs service, is central to regulating the import and export of POPs and enforcing compliance with the obligations under the Stockholm Convention to eliminate the import and export of chemicals listed in Annex A to the Convention. Customs' responsibilities are not limited to trade issues only. Customs are also responsible for the enforcement of environmental, anti-dumping, health and agricultural controls such as those inherent in the Stockholm Convention in respect of POPs chemicals. There are Customs offices at all the major land, sea and air points of entry to, or exit

from, the Country. In order to ensure an efficient and effective border control service and system, Customs have established the Customs Border Control Unit (CBCU).

The Customs and Excise Department has a list of prohibited and restricted imports and exports. Any department or organ of state that intends to ban a substance (import and export of such a substance) must formally in writing request the Customs and Excise Commissioner to list such substance on the list of restricted or prohibited imports and exports.

#### *2.8.1.10 Department of Science and Technology (DST)*

DSTs key functions include developing and coordinating research and technological innovation and creating centres of excellence' in science and technology. It administers various laws that regulate the development of science and research, technology and innovation. The Department's Branch International Co-operation and Resources' main function is to develop bilateral and multilateral co-operation agreements in science, technology and innovation and create technological intelligence capacity in the country. In relation to POPs this Department has considered the hosting of a National Laboratory Service which could analysis for POPs.

#### *2.8.1.11 South African Maritime Safety Association (SAMSA)*

SAMSA, under the Department of Transport is the national maritime safety agency whose primary task is maritime safety of the environment, managing ocean going vessels that are of local and international origin and is responsible for implementing and enforcing a number of international conventions that pertain to the management of chemical and hazardous substances. SAMSA has given effect to the International Conventions in local legislation including the Marine Pollution (Control and Civil Liability), 1989 (Act No.6 of 1989), the Marine Pollution (Prevention of Pollution from Ships), 1986 (Act No. 2 of 1986) and Marine Pollution (Intervention) Act, 1987 (Act No. 64 of 1987). Responsibilities of the organization that have relevance to POPs management include:

- Participating in the development and implementation of national and international maritime safety and marine environment protection standards;
- Enforcing technical and operational standards for all shipping operations in South African waters and for South African ships anywhere, to promote responsible operations in terms of seaworthiness, safety and pollution prevention; and

- Managing the national capability to respond to marine pollution incidents and other maritime emergencies; and
- Public awareness and education in marine safety and pollution prevention.

## 2.9 Environmental policy and general legislative framework

Post 1994 with the inauguration of a democratically elected government law making including environmental law making in South Africa underwent philosophical as well as structural reforms. Prior to 1994 environmental management was achieved through various acts and regulations that focused on addressing end of pipe emissions through command-and-control type legislation. This type of legislative paradigm resulted in a legislation which lacked adequate integration of environmental media, was reactive and addressed symptoms rather than focusing on proactive measures which went to the root causes of pollution. In the pre 1994 era, development was typically unsustainable and inequitable resulting in environmental degradation with significant economic and social impacts.

The post 1994 law reform process began with the adoption of the Constitution. With respect to environmental management the constitution sets out the rights and obligations of government in adopting international agreements, recognizes the environmental rights of all South Africans and describes the governance principles that are to underpin the actions of decision makers.

In line with the WSSD target, the law reform process has produced several policies, acts and regulations which provide the legislative framework for environmental protection. This framework gives effect to the environmental rights of South Africa and entrench the principles of sustainable development to which South Africa is committed.

In South Africa framework legislation of relevance to the environment with a specific emphasis on POPs management includes:

- the Constitution;
- the National Environmental Management Act, Act No 107 of 1998 and Regulations;
- the National Environmental Management: Waste Act, Act No 59 of 2008;
- the National Environmental Management: Air Quality Act, Act No 39 of 2004



- Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, Act No 36 of 1947 and Regulations
- Hazardous Substances Act, Act No 15 of 1973 and Regulations
- National Health Act, Act No 61 of 2003
- Occupational Health and Safety Act, Act No 85 of 1993 and Regulations
- National Water Act, Act No 36 of 1998
- National Road Traffic Act, Act No 93 of 1996 and Regulations
- Foodstuffs, Cosmetics and Disinfectants Act, Act 54 of 1972
- Customs and Excise Act, Act No 91 of 1964
- International Trade Administration Act, Act No 71 of 2002

In order to provide an understanding of the environmental framework that governs environmental decision-making, with specific emphasis on managing the POPs life cycle, each of these pieces of legislation is discussed in more detail below.

### ***2.9.1 The Constitution***

The constitution as it relates to the structuring of government has been discussed above therefore this review will focus on the Bill of Rights with specific emphasis on the environmental right.

The Bill of Rights states, among other things, that:

*“everyone has the right –*

*(a) To an environment that is not harmful to their health or well-being; and*

*(b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that-*

*a. prevent pollution and ecological degradation;*

*b. promote conservation; and*

*c. secure ecologically sustainable development and use of natural*

*d. resources while promoting justifiable economic and social development.”*

The South African State has a duty to give effect to this right by implementing measures to protect the environment for present and future generations. Examples of such measures would be those for regulating the existence, production and use of POPs in South Africa.

The Constitution also sets out the rights and obligations of the legislative and executive arms of government in adopting international agreements: essentially the executive is responsible for negotiating and signing international agreements and such agreements only become binding on the State after Parliament has approved the adoption of the international agreement.

### ***2.9.2 National Environmental Management Act (NEMA) and Regulations***

The NEMA gives effect to the constitutional right to an environment that is not harmful to health or well-being. It does this by providing for, among others, setting out principles for environmental management, and provides the empowering provisions which allow for the development of regulations to give effect to international obligations and for the identification of activities which require environmental authorization.

The Act includes the duty of care provision that states that any person who undertakes any activity that causes significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation. This would apply to any activity that may result in the release or use of POPs. In terms of the NEMA identified activities require environmental authorization in order to be undertaken legally. The facilities or infrastructure linked to intentional or unintentional POPs production and use may be subject to these provisions

### ***2.9.3 National Environmental Management: Waste Act (NEM:WA)***

The NEM:WA contains a broad definition of “waste”, which includes substances that are “surplus, unwanted, rejected, discarded, abandoned or disposed of”. The objects of the Act include: to protect health, well-being and the environment by providing measures for, among other things, reducing, re-using and recycling waste and preventing pollution and ecological degradation. The Act provides general requirements for the storage of waste and imposes duties on persons transporting waste. Licenses may be required for waste management activities, which activities may include, among other things, the disposal of hazardous waste to land and the importation and exportation of waste. A license may be issued subject to conditions and requirements which may include conditions relating to exporting in compliance with international rules and guidelines such as the Stockholm Convention

If releases from unintentional production of POPs are considered to be ‘waste’, a generator of such waste, among others, would have a general duty in respect of the management of releases,

including to minimize the toxicity and amounts of waste generated and manage the wastes in a manner that does not endanger health or the environment or cause a nuisance through noise, odour or visual impacts. The Minister or the MEC may also identify and declare waste to be a ‘priority waste’. Such waste may only be recycled, reused, recovered, treated or disposed in accordance with the Act or measures prescribed by the Minister or MEC. Equipment containing PCBs could be declared a priority waste and the Minister would be able to determine the waste management measures which must be applied to the waste.

The Act also makes provision for the Minister to identify land on which a high-risk activity has taken place or is taking place that may result in land contamination. The Minister may then direct the owner of the land or the person undertaking the high risk activity, to submit a site assessment report within a specified timeframe indicating if the site is contaminated or not. Should the site be contaminated the Minister may issue a remediation order or a directive to clean up the contamination. The Minister may stipulate a time-frame within which remediation must be accomplished, or merely require that monitoring and risk management be undertaken.

This section of the act will, however, only be effected once the remediation standards currently under development have been finalized. In the POPs context if a site has been found to be contaminated with POPs, provision is made in law to ensure the remediation can be effected and enforced.

#### ***2.9.4 Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act (FFASA) and Regulations***

The primary objectives of this Act include: the appointment of Registrar of Fertilizer, Farm Feeds and Agricultural Remedies, for the registration of fertilizers, farm feeds, agricultural remedies, stock remedies, sterilizing plants and pest control operators to regulation or prohibition of the importation, sale, acquisition, disposal and use of fertilizers, farm feeds, agricultural remedies and stock remedies. The provisions of this Act are implemented through the establishment of a registrar whose role it is to register pesticides and companies who would be eligible to trade in chemicals used in preparation of agricultural and stock remedies. “Agricultural remedies”, or “stock remedies” that comprise POPs, regulated under the Stockholm Convention fall within the ambit of the FFASA and its regulations. The nine agricultural POPs currently listed in the Stockholm Convention – aldrin, chlordane, dieldrin,

endrin, heptachlor, hexachlorobenzene, mirex, toxaphene and DDT – amount to “agricultural remedies” as per the FFASA. Table 2 provides the list of the chemicals banned or restricted for agricultural and stock purposes as is available from the National Department of Agriculture website<sup>19</sup>. It is evident when considering the information provided, that all Annex A pesticides have been banned or restricted for agricultural use in South Africa.

Substance	Status
Aldrin (HHDN)	The acquisition, disposal, sale and use of an agricultural remedy or stock remedy which contains Aldrin, with an exception of Aldrin for use underneath buildings for the control of wood destructing termites, was prohibited as from the 25 February 1983
Chlordane	The acquisition, disposal, sale or use of an agricultural and stock remedy which contains Chlordane was prohibited as from the 30 March 2005
Dieldrin	The acquisition, disposal, sale or use of an agricultural remedy or stock remedy which contains Dieldrin was prohibited as from the 25 February 1983
Endrin	Withdrawn in 1980
Heptachlor	Registration of Heptachlor formulations used as agricultural remedies was withdrawn in 1976
Hexachlorobenzene	The acquisition, disposal, sale, or use of agricultural remedy or stock remedy which contains a mixture of different isomers of BHC was prohibited as from 25 February 1983 except for experimental purposes approved in writing by the registrar.
Mirex	Mirex was never registered in South Africa
Toxaphene (Campheclor)	Withdrawn as an agricultural remedy in 1970 and banned as a stock remedy in 1987
DDT	The acquisition, disposal, sale or use of an agricultural remedy or stock remedy which contains dichlor-diphenyl-trichloroethane (DDT) was prohibited as from the 25 February 1983. The only use that remains allowed is public health use for malaria vector control.
Polychlorinated Biphenyls	Declared a Group II hazardous substance in the Government Notice R.2128 of Government Gazette No.8410 of 8 October 1982.

**Table 2: Chemicals banned for agricultural and stock purposes**

### ***2.9.5 Hazardous Substances Act (HAS) and Regulations***

The HSA is the primary Act that directly regulates industrial chemicals and is administered by the Minister of Health. The primary purpose of this Act is to provide for the control of substances which may cause injury, ill-health or death of humans because of their nature, which may be toxic, corrosive or an irritant. The Minister exercises control over the various products by declaring them to be in any one of four specified groups of hazardous substance. Group I and II consist of any substance or mixture of substances declared as such by notice in the *Government Gazette* and which, in the course of reasonable handling or use, including ingestion, might by

<sup>19</sup> www.daff.gov.za

reason of its toxic, corrosive, irritant, strongly sensitizing or flammable nature, or because it generates pressure through decomposition, heat or other means, cause injury, ill health or death to human beings. (Group I being more hazardous than Group II.) Group III substances concern electronic products and Group IV substances are radioactive.

The Minister may make regulations authorizing, regulating, controlling, restricting or prohibiting the manufacture; modification; importation; sale, use, application, storage; transportation; or dumping and other disposal, of any grouped hazardous substance or class of grouped hazardous substances.

The list of hazardous substances declared as Group I substances is published in Government Notice R.452 of 25 March 1977. In relation to POPs, chlordane, heptachlor, hexachlorobenzene and DDT are Group I hazardous substances. Once a substance has been declared as a Group I hazardous substance, no person may sell the substance unless he/she has obtained a license from the Department and complies with any conditions prescribed or determined by the Director-General in the license. Manufacturing of chemicals *per se* is captured by the licensing requirement, as “sell” has a very broad definition and includes “offer, advertise, keep, display, transmit, consign, convey or deliver for sale, or exchange, or dispose of to any person in any manner, whether for a consideration or otherwise, or manufacture or import for use in the Republic”<sup>20</sup>. Although importation of Group I substances is not expressly dealt with in the Act, they are likely to fall within the broad definition of “sell” and such substances will therefore be covered by the Act.

Chlordane, heptachlor, hexachlorobenzene and DDT are Group I hazardous substances and a person importing, selling or manufacturing these chemicals would be required to obtain a license from the Department of Health and would be required to comply with any conditions prescribed or determined by the Director-General in the license.

The list of hazardous substances declared as Group II substances is published in Government Notice R. 1382 of 12 August 1994. In terms of POPs, PCBs are identified as a Group II hazardous substance and may also be present in older electronic goods regulated as Group III

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<sup>20</sup> Trade and Industry Chamber - FRIDGE. 2003. Study into the Implications of Implementing the Globally Harmonised System of Classification and Labelling of Chemicals and Development of an Implementation Strategy for South Africa - December 2003.

hazardous substances. Although a list of Group II substances has been declared, no licensing requirements have been put in place for Group II hazardous substances. Only very limited control measures such as the regulation of the aerial application of agricultural products have been put in place by regulation.

The Act may apply to substances in transit. In terms of section 30, the Minister may at the request of the government or administration of a country outside South Africa (by notice in the *Government Gazette*) apply any provision of this Act to any grouped hazardous substance which arrives at, or is imported through an import harbour or other place in the Republic and which is intended for transmission to a place in that country. (Grouped hazardous substance in this context means any Group IV hazardous substance and any substance, mixture of substances, product or material declared in terms of the Act to be a hazardous substance of any kind.)

#### ***2.9.6 National Environmental Management: Air Quality Act (NEM: AQA)***

The NEM: AQA was enacted to reform the law regulating air quality in order to protect the environment by providing reasonable measures for the prevention of pollution and ecological degradation. Atmospheric emission licenses are required for undertaking activities that may have a significant detrimental effect on the environment. Intentional production and use of POPs would fall within the ambit of such activities to the extent that atmospheric emissions result.

The Minister may investigate any situation that creates or may be anticipated to contribute to air pollution and that violates an international agreement regarding pollution which is binding on South Africa. The Minister may also prescribe measures to prevent, control or correct atmospheric releases within South Africa where there may be a significant detrimental impact of air quality of another country. These measures include the declaration of priority areas, listing of processes requiring a license; setting of minimum emission standards for listed processes, the controlled emitters and fuels; the preparation of pollution plan, atmospheric impact reports and recognition programmes; and measure for dust, noise and offensive odours. Thus, to the extent that the production and/or use of POPs may cause air pollution in contravention of South Africa's obligations under the Stockholm Convention, the Minister is empowered to set emission standards for processors which may cause unintentional releases of POPs and prescribe measures to prevent, control or correct such pollution where it has trans-boundary effects.



### **2.9.7 National Health Act (NHA)**

The NHA regulates conditions which are offensive or a danger to health unless immediately remedied. The measures contained in the Act regarding remedying conditions that are offensive or a danger to health are supportive of measures to eliminate POPs intentional production and use in other legislative instruments.

### **2.9.8 Occupational Health and Safety Act (OHSA) and Regulations**

In terms of the OHSA, employers are required to maintain a working environment that is without risk to the health of employees and must ensure that employees' exposure to hazardous chemical substances is prevented or adequately controlled. Objects and products including chemicals that are to be used at the work place must be without risks to health and property, and in compliance with the prescribed requirements before they may be imported, sold or supplied. Any person who manufactures, imports, sells or supplies a substance for use at work has to ensure the substance is safe and without risks to health when properly used and has to ensure that information is available with regards to the risk to health and safety associated with the substance.

With respect to the use of chemicals including possible POPs chemicals in the work place, the OHSA regulations require that persons supplying such chemicals to the work place must provide a materials safety data sheet (MSDS) to the person receiving the substance. The MSDS must include information including, among others, the ingredients of the chemical, the hazards associated with it, toxicological information and handling and storage requirements. The measures contained in OHSA regarding prevention and the control of exposure to hazardous chemical substances in the workplace, are supportive of measure in other legislative instruments to eliminate POPs production and use.

The Act has been supplemented by Hazardous Chemical Substances Regulations which were published in August 1995. These regulations among others stipulate labeling, packaging, transport and storage requirements for HCS. Storage, distribution, classification and handling requirements are contained in SANS 10228. SANS 10228 and SANS 10229<sup>21</sup> also contains the requirements for the packaging and transportation of Hazardous Chemical Substances.

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21 South African Bureau of Standards. 2006. SANS 10229-1:2010: Transport of Dangerous Goods – Packaging and Large Packaging For Road and Rail Transport.

In the future these regulations will be affected by the Standard for the Globally Harmonised System of Classification and Labeling of Chemicals contained in SANS 10234:2008<sup>22</sup> its supplementary document. This standard covers the classification of hazardous substances and mixtures for their safe use at the workplace or in the home according to their health, environmental and physical hazards. It provides for the proper labeling, safe packaging and the physical and health hazards associated. South Africa participated as a pilot country in the Globally Harmonised System Capacity Building Programme which is discussed in more detail in section 2.12. As part of the programme a study on the implications of implementing the GHS was undertaken. A decision has also been taken in the country to classify wastes according to the GHS codes. This classification requirement will be identified in the Waste Classification and Management regulations which are currently being finalized for public comment.

### **2.9.9 National Water Act (NWA)**

The duty of care in the NWA imposes liability for pollution of water resources. Directives may also be issued. This may have application to persons who deliberately produce and/or use POPs to the extent that the use/production is shown to pollute a water resource. The Act makes provision for the establishment of the national monitoring systems that monitor, record, assess and disseminate information on water resources. This provides DWA with the mandate to monitor POPs in the water environment and to ensure that the impacts from POPs chemicals can be reduced and eliminated.

### **2.9.10 Foodstuffs, Cosmetics and Disinfectants Act (FCDA)**

The FCDA regulates the manufacture, sale and importation of foodstuffs, cosmetics and disinfectants. The Act allows the Minister to make regulations prescribing the nature and composition of any food stuff, cosmetic or disinfectant. These regulations may prescribe the composition, strength, purity or quality for any other attribute of any foodstuff, cosmetic or disinfectant or any ingredient or part thereof. Foodstuffs, cosmetics and disinfectants falling in the ambit of this Act may not be sold, manufactured or imported for sale if any of the listed conditions are met. This Act can be used to restrict or ban the use of POPs chemicals in foodstuffs, cosmetics and disinfectants.

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22 South African Bureau of Standards. 2008. SANS 10234: 2008: Standard for the Globally Harmonised System of Classification and Labelling of Chemicals.

Regulations have been developed under this Act, and the following regulations which have relevance to the management of POPs are as follows:

- GN No. R490 of 8 June 2001: The analysis or examination of foodstuffs referred to in these Regulations for determining the presence of bacteria or other micro-organisms.
- **GN No. R. 34 of 21 January 2000** Food grade salt may contain contaminants listed, e.g. Arsenic, Copper, Lead, Cadmium and Mercury.

### ***2.9.11 National Road Traffic Act (NRTA) and Regulations***

The NRTA sets out responsibilities of drivers, operators and consignors in respect of ensuring roadworthiness of vehicles, emergency reporting and insurance. The Minister of Transport has developed regulations in terms of Chapter VIII of the Act which governs the transportation of dangerous goods and substances by road. These regulations include:

- the classification of dangerous goods;
- the powers and duties of traffic officers in respect of the transportation of dangerous goods;
- the manner in and conditions on which specified dangerous goods may be transported;
- dangerous goods which may not be transported; and
- the training of persons performing any task in relation to the transportation of dangerous goods on public roads.

In addition various national codes of practice have been developed through the South African National Standards (SANS) which provide guidance regarding the transportation of dangerous goods and which would apply to the handling and transportation of POPs. These include:

- SANS 10228: Identification and classification of dangerous goods and substances – provides information pertaining to the substance.
- SANS 10229: Packaging of dangerous goods for rail and transportation – provides information on the recommended packaging for goods as well as the testing of the packaging and correct labeling and marking.
- SANS 10233: Intermediate bulk containers for dangerous substances – requirements for intermediate bulk containers and suitability of container and substance permitted for transportation.

- SANS 10230: Inspection Requirements for road vehicles – statutory inspection requirements for vehicles transporting classified dangerous goods, including requirements by in-house and outside agencies.
- SANS 10231: Operational Requirements for road vehicles – operational rules and procedures including responsibilities of the operator of the vehicle. Specifies drivers qualifications and duties.
- SANS 10232-1: Emergency information System for Road Transportation – placarding requirements for vehicles.
- SANS 10233–3: Emergency information System: Emergency action Codes – emergency response guides to be used in case of an incident.

### ***2.9.12 Tobacco Products Control Act (TPCA)***

The TPCA was promulgated in 1993 and amended in 1999 and 2007. This Act prohibits smoking in public places and required health warnings on packaging and advertising. A second round of legislation in 1999 placed further restrictions on public smoking, banned most advertising and limited the age of smokers. The most recent legislation bans advertising altogether and further restricts public smoking. As dioxins are one of the chemicals produced from thermal combustion of cigarettes and cigars, this Act can be used to reduce the releases of unintentionally released POPs in the country.

### ***2.9.13 Marine Pollution (Intervention) Act (MPIA),***

The MPIA (Act No. 64 of 1987) gives effect to the International Convention relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, and to the Protocol Relating to Intervention on the High Seas in Cases of Marine Pollution by Substances other than oil in 1973. The Convention and Protocol are reproduced in the Act as Schedule 1 and Schedule 2 to the Act respectively. The Convention enables South Africa to take such measures on the high seas as may be necessary to prevent, mitigate or eliminate grave and imminent danger to their coastline or related interests from pollution or threat of pollution of the sea by oil. In order to extend similar provisions to prevent danger to the coastline or related interests from pollution by substances other than oil, the parties to the Convention signed the Protocol Relating to Intervention on the High Seas in Cases of Marine Pollution by Substances other than Oil. It

covers approximately 500 substances which includes, amongst others, aldrin, chlordane, dioxins and PCBs.

#### ***2.9.14 Customs and Excise Act (CEA)***

The CEA prohibits and controls the import, export, manufacture or use of certain goods. Under the regime created by the CEA, SARS has issued lists of prohibited and restricted imports and exports. These lists are intended to be a comprehensive compilation of all restricted imports and exports in South Africa, including those contained in other legislative instruments, such as the International Trade Administration Act. Of the Stockholm Convention Annex A chemicals aldrin, chlordane, dieldrin, heptachlor and hexa-chloro-benzene are listed as organic chemicals prohibited from being imported into South Africa. aldrin, campherchlor, dieldrin, endrin and heptachlor are classified as ‘fertilisers’ which may not be imported into South Africa other than in terms of the requirements of FFASA. Mixtures and preparations containing PCBs are classified as ‘miscellaneous chemical products’ and may not be imported or exported.

#### ***2.9.15 International Trade Administration Act (ITAA)***

Under the ITAA the Minister of Trade and Industry may, by notice in the Government Gazette, regulate imports and exports, including by prescribing that no goods of a specified class or kind, or no goods other than goods of a specified class or kind, among other things, may be imported or exported into South Africa, or imported or exported other than in terms of permits. Various criteria for classification of goods may be applied, and various persons (including owners and carriers of goods) are subject to the requirements of the Act. To the extent that PCBs in equipment may be contained in ‘second-hand waste and scrap of whatever nature’, they are subject to import controls.

### **2.10 Specific Acts to manage the POPs life cycle**

No regulation is in place in South Africa which directly implements the provisions of the chemical Conventions. However, these Conventions, including the Stockholm Convention on POPs can be implemented through the following specific existing legislation:

- Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act Foodstuffs, Cosmetics and Disinfectants Act
- Occupational Health and Safety Act

- Hazardous Substances Act
- International Trade Administration Act
- Customs and Excise Act
- National Environmental Management: Air Quality Act
- National Environmental Management: Waste Act

#### *2.10.1.1 Managing POPs pesticides and industrial chemicals*

With respect to Annex A, part I and II chemicals as well as Annex B chemicals used in agriculture the FFASA allows for the deregistering, banning or restricting of the use of the chemical as an agricultural or stock remedy in the country. Once the chemical is restricted or banned through the FFASA and a unique tariff code for the chemical can be identified, the chemical can be included on the SARS list of prohibited and restricted imports or exports. Where the chemical is restricted, the listing can include the requirements for such an import or export to be subject to an import or export permit issued by ITAC. ITAC through the International and Trade Administration Act can require that a permit be issued before a product or chemical may be imported or exported. Compliance to the specific restrictions being imposed on the pesticide can therefore be monitored and enforced by ITAC.

All pesticides identified in the Stockholm Convention other than mirex, tris (2,3-dibromopropyl) phosphate and hexachlorobenzene have been restricted or banned in terms of the FFASA. In addition all of the POPs chemicals have been included on SARS list of prohibited and restricted imports and exports in terms of the CEA.

A similar process can be followed with respect to restricted or banned industrial chemicals using the HSA or the FCDA. Both Acts are administered by the DoH. Through the provisions of the HSA, the Minister may make regulations controlling, restricting or prohibiting the manufacture; modification; importation; storage and transportation of any grouped hazardous substance. Similarly the FCDA can prohibit the use of certain chemicals in food stuffs, cosmetics or disinfectants. The CEA can similarly be used to restrict or ban industrial chemicals and the restrictions can be enforced through the International and Trade Administration Act by ITAC.

#### *2.10.1.2 Procedures for managing POPs chemicals*



DEA as the Stockholm Convention focal point has worked in collaboration with SARS to identify unique tariff codes for all Stockholm and Rotterdam chemicals. This process is almost complete and unique tariff codes are in place for all of the first 12 listed POPs chemicals. In addition, all of the Stockholm and Rotterdam Convention chemicals have been included on the SARS list of prohibited and restricted imports or exports. DEA has also made a request to the ITAC Commissioner to require an import permit on specific Stockholm chemicals for which exemptions are identified in terms of the South African legislation.

#### *2.10.1.3 Managing unintentionally produced POPs*

With respect to Annex C - unintentionally produced POPs - emissions to the atmosphere can be managed through the NEM: AQA which allows for the listing of processes that may have a significant detrimental effect on the environment. Once listed, an emission license is required for undertaking the process. Emissions for identified processes have been set through National Emission Standards. The processes with the potential to unintentionally produce POPs (incineration, cement manufacture, steelmaking etc.) have been included. Dioxins and furans emissions values for these processes are enforced through the license. The OHSA provides exposure limits for PCB's, heptachlor, endrin, dieldrin, chlordane and aldrin. Similarly with emission to water, the NWA can set discharge limits for POPs releases into any water body.

With respect to Article 6 - the management of POPs releases from stockpiles and wastes – the NEM: WA makes provision for the management of waste stockpiles and contaminated sites. A list of waste management activities that require a license in terms of the NEM: WA have been identified in a schedule to the Act. The disposal of any quantity of hazardous waste to land, the storage including the temporary storage of hazardous waste in excess of 35 m<sup>3</sup>, the remediation of contaminated land and the closure of any waste site are activities which require a waste management license. Management measures can be included in the conditions of the license. The Act also makes provision for the proactive identification of sites on which high risk activities which may lead to soil contamination are being undertaken. Once high risk activities are identified the Act then makes provision for requesting studies to identify if pollution has taken place and if so requires the submission of a remediation plan for execution. The provisions of the NEM: WA will apply to the management of POPs waste and land contaminated with POPs.

## 2.11 Non-Binding Instruments of Application to POPs

The South African legal framework is supported by South African National codes of practice. These codes represent voluntary technical standards and become legally binding if incorporated into law. The SANS standards that are relevant to the management of POPs chemicals are:

- SANS 10219 - Labeling and packaging
- SANS 10228 - Identification and Classification of Dangerous Goods for Transport
- SANS 10263 - Warehousing of dangerous goods
- SANS 10304 - Classification of Pesticides for Sale and Handling
- SANS 10206 - Handling, Storage and Disposal of Pesticides
- SANS 10229 - Packaging for Transport
- SANS 290 - Mineral Insulating Oils – Management of PCBs

## 2.12 Global Harmonised System of Classification and Labeling of Chemicals (GHS)

During 2002-2003, South Africa participated as a pilot country in the UNITAR/ILO Global GHS Capacity Building Programme<sup>23</sup>. GHS is a UN system to assist in chemicals management across the globe. It provides a framework for identifying and communicating hazards associated with chemicals in order to reduce human health risk and remove obstacles to controlled trade in chemicals. It makes far-reaching recommendations for labeling and information provision on safety data sheets. GHS provides a common basis to define and classify chemicals according to their hazards and to communicate this information via labels and safety data sheets.

A study on the implications of implementing the GHS in South Africa and the development of an implementation strategy was concluded in December 2003. The strategy provides for a sound basis for the implementation of the GHS and serves as a framework within which all stakeholders can play their appropriate roles in its implementation. The strategy addressed the gaps identified between the present system of classification of, and communication about hazardous chemicals in South Africa.

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<sup>23</sup> <http://www.unitar.org/cwm/ghs>

The GHS system of classification and labeling of chemicals will assist in the identification and management of POPs chemicals in the country and globally<sup>24</sup>.

### 2.13 Relevant international commitments and obligations

In addition to the national legislation that is applicable to the environmental management in South Africa, the country also actively participates in international organizations and agreements on the management of chemicals and wastes and has signed and ratified a number of international environmental conventions and agreements for which the DEA is the national focal point. South Africa is party, amongst others, to four other international chemical-related conventions and agreements, which together, with the Stockholm Convention provide an international framework governing the environmentally sound management of hazardous chemicals and wastes throughout their life cycle. These include the Basel Convention, the Rotterdam Convention and the Montreal Protocol. South Africa also supports the Strategic Approach to International Chemicals Management (SAICM).

#### ***2.13.1 Basel Convention***

The Basel Convention on the Control of Trans-boundary Movements of Hazardous Waste and their Disposal was adopted in 1989 to manage movement of hazardous wastes between countries. South Africa ratified this convention in 1994 and implements its obligations. Under the Convention, South Africa is obliged to:

- minimize the generation of hazardous waste;
- ensure adequate disposal facilities are available;
- control and reduce international movements of hazardous wastes;
- ensure environmentally sound management of waste; and
- prevent and punish illegal traffic.

#### ***2.13.2 Rotterdam Convention***

The Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade was adopted in 1998 and entered into force in 2004. South Africa ratified the Convention in September 2002. The Convention promotes a shared responsibility between exporting and importing countries in protecting human health and

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24 DEAT. 2005. South African National Chemicals Profile 2002 – 2005.

the environment from the harmful effects of hazardous chemicals. As a party to the Convention, South Africa is required to designate a National Authority. South Africa is also required to take decisions on the future imports of the chemicals listed in Annex III of the convention and is obliged to exchange scientific, technical, economic and legal information concerning the chemicals regulated by the Convention.

### ***2.13.3 Montreal Protocol***

The original Montreal Protocol on Substances that Deplete the Ozone Layer, signed in 1987, was the first step in international efforts to protect stratospheric ozone, calling for phase out the use of CFCs, halons and other man-made ozone depleting substances. Since that time, the Montreal Protocol has been repeatedly strengthened by both controlling additional ozone-depleting substances (ODS) as well as by moving up the date by which already controlled substances must be phased out. South Africa became a signatory in 1990 and also ratified the subsequent London Amendments in 1992.

### ***2.13.4 The Strategic Approach to International Chemicals Management***

The Strategic Approach to International Chemicals Management (SAICM) was adopted by the International Conference on Chemicals Management (ICCM) on the 6 February 2006 in Dubai. SAICM is a policy framework to foster the sound management of chemicals. SAICM encourages governments and other stakeholders to address chemical safety more effectively in all relevant sectors such as agriculture, environment, health, industry and labour. It supports the achievement of the goal agreed at the 2002 Johannesburg World Summit on Sustainable Development of ensuring that by the year 2020, chemicals are produced and used in ways that minimize significant adverse effects on the environment and human health. In order to do this it promotes capacity building for developing countries, small island developing states, and countries with economies in transition. It also assists with better coordination of international efforts to improve chemicals management.

In order to implement the SAICM objectives the International Conference on Chemicals Management (ICCM) decided to establish a “Quick Start Programme” (QSP). The QSP includes a voluntary, time-limited trust fund, administered by the United Nations Environment Programme, and multilateral, bilateral and other forms of cooperation. The objectives of the QSP

is to support initial enabling capacity building and implementation activities in developing countries, least developed countries, small island developing States and countries with economies in transition.

South Africa makes financial contributions to the SAICM QSP and in 2010 made a contribution of \$100 000.

### ***2.13.5 European Union Reach Legislation***

The European Commission has developed a new EU regulatory system for chemicals “Registration, Evaluation and Authorization of Chemicals” (REACH) which came into effect on 1 June 2007<sup>25</sup>. This international legislation has an implication on the management of chemicals including chemicals which are suspected of being POPs chemicals. Under this legislation producers and importers of chemicals in volumes in excess of 1 ton or more per year and per producer/importer will have to register them with a new EU Chemicals Agency, submitting information on properties, uses and safe ways of handling the chemicals they are producing or importing and providing safety information to downstream users. Through the evaluation procedures, public authorities will look in detail at the registration dossiers related to substances of concern. Use-specific authorization will be required for chemicals that cause cancer, mutations or problems with reproduction, or that accumulate in the human body and the environment. The Commission will be able to restrict the use of certain dangerous substances within the EU.

## **2.14 Key approaches and procedures for POPs chemicals and pesticide management including enforcing and monitoring requirements**

### ***2.14.1 Registration of pesticides and industrial chemicals***

With respect to the management of the risks associated with chemicals, South Africa has a different risk management approach for chemicals sold to the public including farmers, chemicals used in products and chemicals sold into the industrial sector. This is largely due to the difference nature and requirements of the sectors into which the chemicals are sold. Pesticides in the agricultural sector are used largely by unskilled farm workers with a low level of literacy and by households in domestic applications. The environment in which the pesticides are used is therefore largely uncontrolled. The same is true when chemicals are sold to public or

<sup>25</sup> [http://ec.europa.eu/environment/chemicals/reach/reach\\_intro.htm](http://ec.europa.eu/environment/chemicals/reach/reach_intro.htm)

used in products, the number of users will be vast and the environment into which they are sold cannot be easily controlled. Chemicals sold into industry on the other hand are sold into a controlled environment where workers are skilled or semi skilled and the use can be managed.

In agriculture the approach to risk management is firstly through registration of the product i.e. pre production. Agricultural chemicals are registration in terms of the FFASA. The registration process includes the testing of efficacy of the product in a South African context and requires a full understanding of the risk associated with the chemical prior to registration. Should chemicals be found to pose significant health and/or environmental risks their use can be restricted or banned. This is true also for hazardous chemicals used in a consumer product like food, cosmetics or disinfectants. In the case of pesticides and medicines, the labels are individually approved for each product as are the instructions for use.

Industrial chemicals on the other hand do not go through a process of registration, the risk management focus rather on the use of the chemicals. The primary legislation for managing the risk of industrial chemicals is the OHS Act which requires all hazardous chemicals to be sold with a comprehensive MSDS. In order to develop the MSDS a range of information on the chemical must be known. Further if one is supplying a hazardous substance to a Major Hazardous Installation (MHI) then the chemical supplier may need to provide an emergency response service in the case of a major incident<sup>26</sup>. Should the chemical be identified as a Group I hazardous substance i.e. that it be toxic, corrosive, irritant strongly sensitising or flammable in nature, or generate pressure through decomposition, heat or other means, this chemical would fall within the licensing regime of the DoH.

#### ***2.14.2 Regulatory instruments<sup>27</sup>***

The key regulatory measures which are relevant for the management of the POPs life cycle include:

- Regulations which provide a wide range of controls and measures that include the authorization of certain listed processes and activities that relate to chemicals management; atmospheric emission licensing; registration of agricultural remedies and chemicals,

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<sup>26</sup> Personal Communication with Laurraine Lotter from CAIA, 2010.

<sup>27</sup> BKS, 2008. Draft Establishment of an Inventory and Assessment of Infrastructure and Capacity for the Development of National Implementation Plans (NIPs) of the Stockholm Convention on Persistent Organic Pollutants (POPs) in South Africa. Chapter 4: Infrastructure Capacity.

development of industrial waste management plans for certain identified industries, identification for priority waste streams; import controls and import permit requirements for certain listed products as well as the ability to implement import restrictions on certain identified products and wastes;

- Norms and standards which include remediation standards, air quality and emission standards for listed activities and technical specifications for the management or use of certain products;
- Directives and compliance notices requiring that reasonable measures are taken to prevent and remedy pollution or degradation of the environment;
- Market based management instruments such as the water pricing strategy which includes charges for waste discharges and incentives for introducing new technologies; and
- Public participation requirements in licensing, permitting and environmental authorization processes.

In addition to the above regulatory measures industry also applies certain self-regulatory measures on a voluntary basis. These include among others the ISO 14001 Environmental Management System of the International Organisation for Standardisation, audited by the SABS and the Chemical Allied and Industry Association's (CAIA) Responsible Care Initiative. Many exporting farmer subscribe to the Global Gap requirements, and the forestry sector apply the Forestry Stewardship Councils' Pesticide Policy.

### ***2.14.3 Coordination of POPs management activities***<sup>16</sup>

As there are several departments that have a mandate with respect to protecting the environment and managing the POPs life cycle, coordination of activities is vital. Among others, the follow coordinating structures have been set up in South Africa to ensure the effective and efficient execution of this mandate.

#### ***2.14.3.1 NIP project steering committee***

The National Project Steering Committee for the development of the NIP ("the PSC") in line with the UNEP Guidance Document to oversee the development of the First Generation POPs Profile and the NIP. The PSC which is chaired by DEA is a multi-stakeholder forum and comprises fifteen permanent member institutions and some five temporary member institutions which represent government, industry, the agricultural sector and civil society.



#### *2.14.3.2 National Committee on Chemicals Management*

The National Committee on Chemicals Management (NCCM) was established jointly by DEA and the *dti* in 2008. The committee meets quarterly and consists of representatives from the key national organs of state responsible for chemicals such as DEA, DAFF, DST, DWA, the *dti*, DOT, SAPS and DOH. The major industry and NGO stakeholders are also invited to attend its meetings. The Committee's Terms of Reference cover all the MEAs associated with chemicals management as well as SAICM and mercury. This Committee is responsible for preparing for international meetings, reporting back to the key national organs of state and stakeholders on decisions taken at international meetings, communicating the implications of such decisions and the actions needed to implement these decisions to organs of state and stakeholders and for coordinating national implementation.

#### *2.14.3.3 Boarder Control Operational Coordinating Committee*

The Boarder Control Operational Coordinating Committee (BCOCC) which is chaired by SARS is mandated to ensure that the measures taken to address border security and congestion at ports of entry also support legitimate trade. It consists of representatives from the national Departments of Home Affairs, Intelligence, Transport, Public Works, Agriculture, Health and Defense.

#### *2.14.3.4 The Programme on Chemical Safety*

The Programme on Chemical Safety has been set up by the DoH and is aimed at developing capacity within Municipalities to enable them to promote chemical safety and awareness within communities on all issues relating to safe usage of chemicals. It comprises of seven focus areas, which include: household chemicals, pesticides, heavy metals and industrial chemicals, water treatment chemicals, other hazardous chemicals, poison control centres and chemicals in food.

The objective of the programme is to reduce illnesses and deaths caused by unsafe use and management of chemicals through:

- preventing damage to the environment;
- promoting healthy lifestyles;
- coordinating and harmonizing all chemical safety activities at local government level;

- ensuring safe use and management of chemicals from production to disposal; and
- strengthening poison control centres and developing policies, regulations, guidelines, training and educational material.

#### *2.14.3.5 National Economic Development and Labour Council (NEDLAC)*

In 1994 the NEDLAC Act was passed and on the 18 February 1995, the National Economic Development and Labour Council (NEDLAC) was launched<sup>28</sup>. Although not specifically relevant to the management of chemicals NEDLAC has an important coordinating function that brings together key roleplayers that amongst others are operating in chemical industry. At NEDLAC, Government comes together with organised business, organised labour and organised community groupings on a national level to discuss and try to reach consensus on issues of social and economic policy. The main Government department is the Department of Labour, out of which NEDLAC is funded, but the Departments of Trade and Industry, Finance and Public Works are also centrally involved in NEDLAC. Other departments attend when there is an issue which relates to their portfolio. Through NEDLAC a “Fund for Research into Industrial Development, Growth and Equity (FRIDGE)” has been set up<sup>29</sup>. This fund has been used to fund important research related to chemicals including a study on the “Socio Economic Impact of the Phasing-Out of Asbestos”, the “Global Harmonized System of Classification and Hazardous Communication (GHS)” as well as the “Investigation into the extent of Manufacture, Use, Import and Export of new chemicals listed in terms of the Stockholm and Rotterdam Conventions”.

#### *2.14.3.6 Intergovernmental permitting procedure for the import/export of substances controlled by multilateral environmental agreements*

A further coordinating measure which is currently under development is the intergovernmental permitting procedure for the import/export of substances controlled by multilateral environmental agreements (IPPIE) for which DEA is the focal point. As several government departments have a mandate with respect to the approval of imports and exports of chemicals restricted under the chemicals conventions, the relevant Departments are setting up an integrated process for authorizing the movement of these chemicals through the NCCM. The intention of this integrated permitting process is that ITAC will be the entry point for the granting of all

<sup>28</sup> <http://www.nedlac.org.za/home.aspx>

<sup>29</sup> <http://www.nedlac.org.za/research/fridge-studies.aspx>

import/export permits required under the Montreal Protocol and the Basel, Rotterdam and Stockholm Conventions through the completion of a single multipurpose application form. This provides a streamlined approach and will ensure that information on the movement of identified chemicals is collected to fulfill the reporting obligations under each of the agreements.

## 2.15 Existing programmes for monitoring releases and environmental and human health impacts

### ***2.15.1 Programmes to monitoring of releases to the atmosphere***

In terms of the Constitution of the country, the management of ambient air quality in South Africa is a mandate that is shared between all three spheres of government. The role of the DEA is to develop the policy and legislative framework to manage ambient air quality and to coordinate air quality activities. National government is also required to identify specific air quality “hot spots” that require special attention and to put in place action plans in consultation with other stakeholders to improve the situation. The Provincial Departments responsible for the environment are required to support and assist Local Municipalities who are required to maintain an ambient air quality which is not detrimental to the health or wellbeing of the population or the environment through licensing activities which could lead to emissions and implementing ambient air quality monitoring programs.

Over the past 10 years significant progress has been made in setting up the National Ambient Air Quality Monitoring Network (NAAQMN). This network of approximately 90 government-owned ambient air quality monitoring stations, monitors air in all of the large municipalities and pollution hot-spots in South Africa and full national coverage is planned for 2020. Most of the continuous monitoring stations making up the NAAQMN measure criteria pollutants including PM<sub>10</sub>, SO<sub>2</sub>, NO<sub>x</sub>, O<sub>3</sub>, etc. Information obtained from approximately 40 of these monitoring stations is electronically submitted to the South African Air Quality Information System (SAAQIS)<sup>30</sup>. This data is accessible online and is published in an annual “state of the air” report prepared by the National Air Quality Officer. At present no POPs are monitored at the ambient air quality monitoring stations and POPs do not form part of the annual reporting.

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<sup>30</sup> <http://www.saaqis.org.za>

In 2011 the SAAQIS Phase II project will be launched which will develop the National Atmospheric Emission Inventory and associated mandatory emission monitoring and reporting requirements. Initially the national emission inventory is only likely to require the monitoring and reporting of greenhouse gases and the criteria pollutants which will not include POPs. However the system will be structured to allow for more detailed reporting requirements including in the future which could include POPs emissions.

The DEA has also published a list of activities<sup>31</sup> which result in atmospheric emissions which have or may have a significant detrimental effect on the environment, including health, social conditions, economic conditions, ecological conditions or cultural heritage. 60 processes have been identified and emission limits set for various pollutants. Currently 3 of the 60 processes set emission limits for dioxins namely; waste incineration, the processing of zinc, nickel and cadmium and cement production using alternative fuels and/or raw materials. The emission limits set are in line with international requirements and have been set at 0.1 ng/TEQm<sup>3</sup>.

### ***2.15.2 Programmes to monitoring of releases to water***

The DWA is responsible for water quality monitoring in the country. This function is shared between the National Office housed in Pretoria and the Regional Offices which are located in each of the nine provinces of the Country. Chapter 14 of the NWA requires that the Minister of Water Affairs establish national monitoring and information systems that acquire, record, assess and disseminate information on water resources. To comply with these requirements, the DWA runs a water quality monitoring programme, and a centralised web-based database. The Department is also developing, implementing and operating a number of national water resource quality monitoring programmes that include: The National Chemical Monitoring Programme (NCMP) which samples surface water at more than 330 sampling points; the National Eutrophication Monitoring program (NEMP) which primarily focuses on eutrophication in impoundments and lakes. Currently there are 75 prioritised sites; the National Microbiological Monitoring programme (NMMP), which provides information on the status and trends of the extent of faecal pollution in surface water resources especially in selected high risk settlement areas. Currently this program monitors 180 sites countrywide; the National River Health

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31 DEA, 2010. National Environmental Management: Air Quality Act, Act 39 of 2004. List of Activities which result in Atmospheric Emissions which have or may have a Significant Detrimental Effect on the Environment including Health, Social Conditions, Economic Conditions, Ecological Conditions or Cultural Heritage. GG No 33064, GN 248 of 2010.

Programme which incorporates a number of ecologically relevant parameters, monitors the ecological integrity of South Africa's rivers by sampling 638 points in streams and rivers; and the National Radioactivity Monitoring Programme focuses on monitoring for radioactivity in hot spots around the country. There is also a groundwater monitoring programme which deals with the assessment of the quantity and quality of ground water in the country and water quality monitoring which is carried out by bulk water suppliers.

One of the newer developments in surface water monitoring is the National Toxicity Monitoring Programme (NTMP). The NTMP, which is still in the development phase, uses both chemical and bio-assessment technology to assess the toxic hazard and eventually the environmental and health risks posed by specific pollutants in suspected "hot spot" areas. In its pilot implementation phase the program chemical and biotic ecotoxicity tests results of water sampled at six pre-selected point in four lotic systems at frequencies ranging from fortnightly to monthly depending on flow conditions. The chemical analyses included the first 12 POPs. The NTMP is currently being redesigned with attention being given to a range of more sensitive bio-assessment tools and an extended range of chemical determinants in both water and sediment. Due to the high operational costs of this programme and the limited available budget, the NTMP is likely to remain a "hot spot" driven programme<sup>32</sup>.

DWA has also published South African Water Quality Guidelines<sup>33</sup> which guides the assessment of fitness for use with respect to number of recognized water uses, including: Human use, the Aquatic ecosystem, Agriculture (irrigation and stock watering) and Industrial use. The only POPs parameters included in this guideline currently is Endosulfan.

With respect to POPs, it is noted that POPs are not currently included in either the South African Water Quality guidelines or the current water monitoring program. The NTMP will however assess the following organic compounds: aldrin, chlordane, DDT, dieldrin, endosulfan ( $\alpha+\beta$ ), endrin, heptachlor, hexachlorobenzene, lindane, mirex, monocrotophos, toxaphene and two of the triazines namely atrazine and simazine in both surface water and sediments. There is also currently no sediment guideline developed for South Africa.

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<sup>32</sup> Personal communication with Dr Jooste Sabastian from Department of Water Affairs

<sup>33</sup> DWAF, 1996. Water Quality Guidelines for South Africa: First Edition 1996. [http://dwaf.gov.za/iwqs/wq\\_guide/index.asp](http://dwaf.gov.za/iwqs/wq_guide/index.asp)

Although there is currently no comprehensive national monitoring program which considers POPs in the water environment, water quality monitoring which considered POPs has been undertaken to gather data for specific studies or in identified “hot spot” areas. The results of a selection of these monitoring results will be discussed in more detail in Chapter 3.

#### 2.16 National enforcement and compliance monitoring system

One of the overall objectives of the Stockholm Convention is the call for the reduction or elimination of releases of POPs into the environment over time to effect a corresponding reduction or elimination of environmental levels of POPs over time. The national enforcement and compliance monitoring systems within the country play a significant role in being able to ensure that the objectives of the convention are being met. South Africa has this capacity to ensure compliance and monitoring of the environmental legislative provisions of the country.

Chapter 7 of NEMA makes provision for the establishment of an environmental enforcement and compliance monitoring system through the designation of Environmental Management Inspectors (EMIs). The main functions of EMIs are to monitor compliance with, and enforce, certain national environmental laws, including regulations and licenses issued under those laws. The Environmental Management Inspectorate is a national network of environmental enforcement officials from different departments in all three spheres of government. This network transcends the traditional separation between the protections of different environmental media, and includes park rangers, conservation officers, air quality officers, marine and coastal enforcement officers and pollution and waste enforcement officers. The network of EMIs collaborates closely with the South African Police Services in investigating environmental crimes and with the National Prosecuting Agency to ensure the successful prosecution of offenders.

Through the work of the EMIs, South Africa has the ability to monitor and enforce compliance with the legislative provision used to manage the life cycle of POPs<sup>6</sup>.

### 3 ASSESSMENT OF THE POPS ISSUES IN SOUTH AFRICA

#### 3.1 Assessment with respect to Annex A, part I chemicals (POPs Pesticides): historical, present and projected future production, use, import and export;

Chemicals have been used extensively by various sectors in South Africa for many years. South Africa is also a manufacturer of chemicals and several chemical formulators are registered and operate in the country. It is known that Chlordane was still being manufactured in South Africa as late as May 2001. The chemicals used, manufactured and still formulated include POPs chemicals. The use and manufacture of POPs chemicals could have and may still contribute to releases of POPs into the environment and have led to contamination of sites and the generation of wastes and stockpiles containing POPs.

### ***3.1.1 Historical, present and projected future use, import and export of POPs pesticides in South Africa***

In response to the need to boost agricultural productivity and to attain food sufficiency, there was a global move towards the use of chemicals such as fertilizers, veterinary chemicals, and plant protection substances. According to the Global Monitoring Plan, pesticides constitute one of the major sources of POPs in sub-Saharan Africa. The report indicates that the most widely used POP pesticides in sub-Saharan are organochlorines including DDT, endosulfan, chlordane, lindane (HCH), heptachlor, toxaphene, HCB and aldrin. This would be true also for South Africa. There is evidence of several of the Annex A chemicals being used in South Africa as early as 1942. The following is known about POPs pesticide use in South Africa.

- Aldrin was introduced into the country in 1950 as a pesticide used to control soil insects and grasshoppers. It has been widely used to protect crops such as corn and potatoes, and has been effective to protect wooden structures from termites.
- Chlordane was introduced in 1948 as a broad spectrum contact insecticide used on agricultural crops including vegetables, small grains, maize, other oilseeds, potatoes, sugarcane, sugar beets, fruits, nuts, cotton and jute. It has also been used extensively in the control of termites.
- Dieldrin was introduced to South Africa in 1950 as a pesticide used to control soil insects and several insect vectors.
- Endrin was introduced in 1950 as a foliar insecticide used mainly on field crops such as cotton and grains. It has also been used as a rodenticide to control mice and voles.



- Heptachlor was introduced in 1946 as a non-systemic stomach and contact insecticide, used primarily against soil insects and termites. It has also been used against cotton insects, grasshoppers, some crop pests and to combat malaria.
- Toxaphene was first introduced in 1949 as a non-systemic and contact insecticide that was used primarily on cotton; cereal grains fruits, nuts and vegetables. It has also been used to control ticks and mites in livestock.
- DDT was first introduced into the country in 1942. The chemicals usage was wide spread and was used on a variety of crops including cotton.

The only POPs identified in Annex A that were not registered in South Africa, and were therefore not authorised for use in the country, are hexachlorobenzene and mirex<sup>34</sup>. Water and sediment monitoring has however identified the presence of mirex in the environment.

All POPs pesticides in South Africa have either been banned, deregistered, their registration withdrawn as agricultural pesticides or their import or export is subject to import permit requirements. These chemicals have also been identified on the list of prohibited and restricted imports and exports and may not be imported or exported to or from South Africa for use in the country or their import is subject to permit requirements. The import and export of these chemicals for use in neighbouring countries is however not restricted. In order to manage any possible movement of POPs chemicals to neighbouring countries, a process is currently underway to require any POPs pesticides listed in the Stockholm Convention being imported or exported not for use in the country to be subject to import permit requirements. Such precautionary requirements will allow the country to enforce prior informed consent requirements and thereby protect our neighbouring countries from receiving unknown and unwanted imports of POPs pesticides from South Africa.

### ***3.1.2 Historical, present and future manufacturing of POPs pesticides in South Africa***

Although information on the historical manufacturing of POPs chemicals in South Africa is limited, some information has been collected which indicates that POPs pesticides have been manufactured, formulated and packaged at several locations within the country. Table 3 below

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34 Bouwman, H. 2003. POPs in Southern Africa. The Handbook of Environmental Chemistry. Persistent Organic Pollutants. Vol. 3 (0): 297 – 320.

provides known information on the companies, sites and the names of the POPs chemicals manufactured or handled at the sites<sup>35</sup>.

South Africa no longer manufactures any POPs pesticides but did formulate DDT for use within the country and sale to African countries to support malaria vector control programmes in these countries until mid 2010. There is no requirement at this stage to continue formulating DDT for internal consumption, as DDT is imported ready for use. This could change if the need the need arises.

Organization	Site Location	Chemical
Gulf Chemicals	South Durban - Kwa Zulu Natal	Manufactured Chlordane until 2001
Formchem also known as Klipfontein Organic Products	Chloorkop - Gauteng	Manufactured DDT from the early 1950's until 1980's. Formulated Heptachlor, toxaphene and Lindane
Shell Chemicals	Wadeville - Gauteng	Production and handling of Aldrin and DDT. Formulation of Dieldrin, Endrin, Aldrin and DDT from 1955 to 1975
Dow Agro-Sciences	North Durban - Kwa Zulu Natal	Formulation of Aldrin and Dieldrin. Packaging and formulation of other POPs including DDT Chlordane, Endosulfane and Lindane until early 80's
AECI	South Durban - Kwa Zulu Natal	Formulation of DDT
NCP	Chloorkop - Gauteng	Lindane
AVIMA	Brits - North West	Formulation of DDT - ceased 2010

Table 3: South African Pesticide Industry: Formulators Past and Present

### ***3.1.3 Summary of available monitoring data and health impacts with respect to Annex A, part 1 chemicals (POPs) pesticides***

As indicated in Chapter 2 there is currently no comprehensive monitoring program to monitor POPs in the South African environment. However, a number of specific studies have been undertaken which monitored the levels of POPs in specific environmental media and related the results to effects on human health or impacts on the environment. A selection of studies have been identified and discussed below to provide an impression of the situation in South Africa.

#### ***3.1.3.1 The Global Passive Sampling Programme (GAPs) and the MONET Africa Study***

Work done by the Stockholm Convention with respect to POPs monitoring in the global environment has provided some data on POPs in the South African environment. As the

<sup>35</sup> Information provided by Mr A Gericket from Avima, 2010.

Stockholm Convention is designed to lead to gradual decrease of the presence of POPs in the environment, [Article 16](#) of the Convention requires that the effectiveness of the measures adopted by the Convention is evaluated in regular intervals.

As part of this evaluation process with the objective of establishing baseline trends at global background sites, two programmes monitoring POPs in the environment have been set up for the African region. The first is the Global Passive Sampling Programme<sup>36</sup> (GAP) and the second is MONET Africa<sup>37</sup>. The GAP was launched in January 2005 and collected data from Egypt, Ghana, Malawi, and South Africa between 2005 – 2006. MONET Africa was launched in January 2008 as a six month pilot project covering 15 countries in Africa with a total of 26 sampling sites. South Africa participated in both monitoring programs. Through this process, data on POPs in air were measured in South Africa. Three sampling sites were selected. Two sites, the Molopo Nature Reserve and Barberspan sites are conservation sites. It would not be expected that POPs would be identified at these two sites. The third site was located in Vanderbijlpark which is a highly industrialized area in the heart of the Gauteng province. The Vanderbijlpark sampling site was within a 20km radius of an iron and steel manufacturing plant, a power station and an open cast coal mine. The Molopo Nature Reserve was sampled for aldrin, dieldrin, endrin, mirex, chlordane, DDT and

heptachlor while the Vanderbijlpark and Barberspan sites were sampled for DDT and PCBs. The results indicate that the first two sampling sites showed very little air pollution. Aldrin, dieldrin, endrin, mirex, chlordane, and heptachlor emissions were below the Limit of Quantification (LOQ). The levels of DDT were quantifiable, but the levels were very low, being between 1.1 and 3.1ng/filter for the Molopo site, 1.0 and 5.5ng/filter for the Barberspan site and 1.5 and 6.5ng/filter for the Vanderbijlpark site.

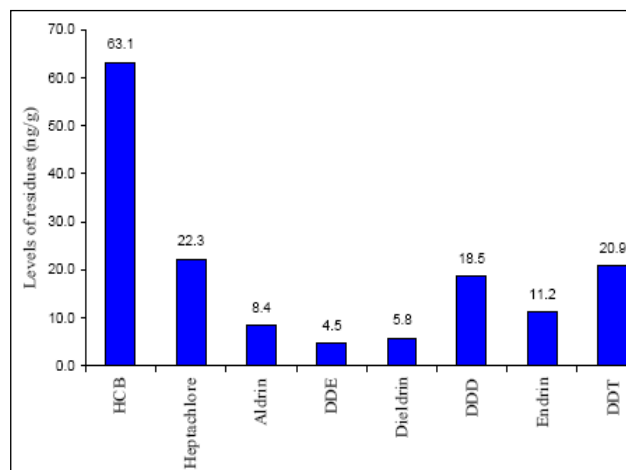


Figure 4: POPs in sediments

36 UNEP-GEF. 2009. Global Monitoring Plan For Persistent Organic Pollutants. First Regional Monitoring Draft Report Africa Region. 15th March 2009.

37 Masaryk University 2008. Application of Passive Sampler for Monitoring of POPs in Ambient Air, Part VI: Pilot study for development of the monitoring network in the African continent (MONET\_AFRICA)

The GAP report also indicates that a study was undertaken in 2003 on POPs in sediment at a site in South Africa. The actual location of the sampling site is not provided. The sediments were sampled for HCB, heptachlor, aldrin, DDE, dieldrin, DDD, endrin and DDT. The results are provided in Figure 4 and indicate that levels of POPs are fairly low except for HCB, which was found at levels of 63.1 ng/g in the sediment sampled.

### 3.1.3.2 *Groblersdal study*<sup>38</sup>

Pesticides like organophosphates and carbamates are regularly applied to crops in the Groblersdal area which is an agricultural area situated in the Mpumalanga Province. The DWA received a written complaint from a general practitioner consulting in the area, which suggested the occurrence of pesticide-related symptoms in humans in the Groblersdal area. Patients suffered from headaches, dizziness, asthma, nausea, red eyes and these seemed to be the side effects from pesticide exposure. Blood samples from patients in Groblersdal were analysed and showed chronic levels of organophosphate and carbamate exposure. On the basis of this information the DWA decided to undertake an eight month integrated water quality monitoring program in the area. The study was undertaken in the upper Olifants River catchment around the Groblersdal town. The aim of the study was to provide information on the extent of pesticide contamination and to give an overview of the resulting impacts on the aquatic ecosystem and human health.

Water and sediment samples were taken at seven sampling points along the Olifants River referred to as O in Table 4 and at several points along the Moses River, referred to as M in Table 5. The samples were analysed for aldrin, chlordane, dieldrin, endrin, heptachlor, hexachlorobenzene, mirex and toxaphene and PCBs. Concentrations of arochlor 1254 and dibenzofuran were analysed to assess PCB contamination. Unfortunately for many of the chemicals detected in the suspended solids, no guideline values exist to allow a comparison of results against allowable limits. When analysing the data generated, it is noted that at median concentrations sediment samples indicate generally low levels of organochlorides however, 24%

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<sup>38</sup> Bollmohr, S, Thwala, M, Jooste, S, Havemann, A. 2008. Report: An Assessment of Agricultural Pesticides in the Upper Olifants River Catchment. Report No. N/0000/REQ0801. Resource Quality Services, Department of Water Affairs and Forestry, Pretoria, South Africa.

of sediment samples exceeded the Interim Sediment Quality Guideline<sup>39</sup> (ISQC) values of the Canadian government, for example: DDE-*p,p,p* (at all sites), DDD-*p,p,p* (at O3 and M1), Chlordane *cis* (at O1 and M2) and Endosulfan (at M2) with mostly higher concentration at the upstream sites within the Olifants River.

### 3.1.3.3 South African marine pollution survey report 1976-1979<sup>40</sup>

Median concentrations of organic chemicals in sediments of the Olifants and Moses

Rivers (August 2007 – 2008) Marine pollution surveys of the South African coast were undertaken between 1976 – 1979 at known impact areas and important estuaries. Sediments and fish were sampled for chlorinated hydrocarbons in 32 estuaries, rivers and oceanic transects (deep waters) along the east, south and west coasts. While no pesticide levels greater than 1 µg/kg were detected in sediments, pesticide residues were detected in most of the animal samples. In all the estuaries, the pesticide levels tended to be higher in the mobile animals than in the sedentary animals. The study assumed that as the concentrations found in the animals seldom exceeded 100µg/kg the pesticide concentration in water were probably less than 1 ng/l which is below the detection limits of the method of analysis used. Although low, detectable levels of DDT were found in the sediments of Kosi Bay. The samples taken at Kosi Bay demonstrated a

MEDIAN							
(µg/kg)	Detection limit	O1	O2	O3	M1	M2	ISQG (µg/kg)
<b>ORGANOCHLORINE PESTICIDES</b>							
BHC-alpha	0.001	bd	bd	bd	bd	bd	
BHC-beta	0.001	bd	bd	bd	bd	bd	
BHC-delta	0.002	bd	bd	bd	bd	bd	
BHC-gamma (Lindane)	0.001	bd	bd	bd	bd	bd	0.94
DDT-4,4'	0.004	bd	bd	bd	bd	bd	1.19
DDE-4,4'	0.001	4.4	9	4.9	3.1	11	1.42
DDD-4,4'	0.001	bd	1	5.1	5.3	bd	3.54
Chlordane cis	0.001	7.4	1	4.1	4	5.5	4.5
Chlordane trans	0.001	14.8	2	5.4	5.2	1	
Aldrin	0.001	bd	bd	bd	bd	bd	
Dieldrin	0.002	bd	bd	bd	bd	2.6	2.85
Endosulfan alpha & beta	0.004	bd	bd	bd	bd	7.9	
Endrin	0.008	bd	bd	bd	0.5	bd	2.67
Heptachlor	0.002	bd	bd	bd	bd	bd	0.6
Heptachlor-epoxide	0.001	bd	bd	bd	bd	bd	
Mirex	0.001	bd	bd	bd	2.5	bd	
Toxaphene	0.001	bd	bd	bd	bd	bd	0.1
Acetochlor	0.002	bd	bd	bd	bd	bd	

**Table 4: Median concentrations of organic chemicals in sediments of the Olifants and Moses Rivers (August 2007 - 2008)**

39 Ontario Ministry of Environment and Energy. 1993. Guidelines For the Protection and Management of Aquatic Sediment Quality in Ontario. August 1993. <http://www.ene.gov.on.ca/envision/gp/B1-3.pdf>[http://www.ccme.ca/assets/pdf/sedqg\\_summary\\_table.pdf](http://www.ccme.ca/assets/pdf/sedqg_summary_table.pdf)

40 Gardner, B.D., Connell, A.D., Eagle, G.A., Moldan, A.G.S., Oliff, W.D., Orren, M.J. and Watling, R.J. 1983. South African Marine Pollution Survey Report 1976 – 1979. A Report to the Marine Pollution Committee of the South African National Committee for Oceanographic Research (SANCOR). Report No 73, September 1983.

higher proportion of DDT and DDD to the more stable DDE isomers which indicate that the pesticide was of local origin. The levels of DDT in fish in Kosi Bay were higher than recorded anywhere else on the east coast of South Africa and the study attributed this to the increasing malaria control efforts in the area. Detectable levels of DDT were also found in fish in the Richards Bay harbor. As in Kosi Bay there was a dominance of DDT over DDE in the samples which suggested a local source of DDT in the area. The study concluded that this could be attributed to the mosquito control activities in the area. Dieldrin levels in fishes from the Umgeni River and Durban harbour were the highest recorded, averaging between 40 – 120 µg/kg. In other areas studied, levels were less than 10 µg/kg, an order of magnitude lower than the levels in Durban. Although the survey showed that generally there is very little pesticide accumulation in the environment, the Kosi Bay, Durban harbor and Umgeni Estuary were identified as areas needing more in depth surveying and regular monitoring to determine the source of the chlorinated hydrocarbons since the purchase of dieldrin is prohibited.

#### *3.1.3.4 Persistent Organic Pollutants (POPs) in the Water Environment*

The WRC has undertaken a study<sup>41</sup> that assesses the scale and significance of organochlorine pesticides and POPs pollutants in selected waterbodies in South Africa. The study made use of a screening technique called the H4IIE-*luc* reporter gene bio-assay to identify dioxin like compounds (DLC) in samples. This bioassay is a rapid, sensitive and relatively cost-effective method, which measures the effects of dioxin-like compounds on rat hepatoma cells, transfected with the firefly luciferase gene. Selected samples were then analysed with gas chromatography/mass spectrometry (GC/MS) to confirm results.

The first phase of the study aimed at investigating the extent of PCDD, PCDF and PCB pollution in the Vaal Triangle by collecting and screening sediment and fish samples for the presence of dioxin-like compounds (DLCs). The rivers sampled included the Klip River, Natal Spruit, Riet Spruit, Blesbok Spruit, Taaibos Spruit, Leeu Spruit and Suikerbosrand. The levels of DLCs at the majority of sites were below the detection limit of the assay and no DLCs were found in fish tissues.

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<sup>41</sup> Based on presentation made at MCCM, 25 March 2011.

The second phase focused on a broader spectrum of compounds, which included various organochlorine pesticides (OCPs), polycyclic aromatic hydrocarbons (PAHs), non dioxin-like PCBs and polybrominated diphenyl ethers, in addition to DLCs. Sampling regions included the industrial cities – Cape Town, Richards Bay, Durban, Bloemfontein and low-income high density residential areas surrounding a wetland in Soweto/Lenasia and Botshabelo. Additionally, rivers flowing into neighbouring countries, rivers in the vicinity of paper and pulp producers and high altitude rivers were also included.

Samples from all the sites was screened for the presence of DLCs through the use of the H4IIE-*luc* bio-assay and sites where samples showed detectable levels of pollutants, further chemicals analysis using the gas chromatography/mass spectrometry was undertaken.

Of the 96 sites, only 23 had quantifiable levels of DLCs. These sites were mainly of industrial, semi-industrial or low-income residential origin. Aldrin and chlordane were not detected at any of the sites, whereas nonachlor, chlordane and oxychlordane were present at only a few of the sites in minor concentrations. HCB, HCH and DDT were the predominant organochlorine pesticides identified while heptachlor and mirex were present in lower concentrations.

The concentrations of pollutants measured at South African soils and sediments were intermediate when compared to concentrations measured in some European, Asian and Scandinavian countries but the normalized concentrations (1% TOC) of the compounds of interest at a few sites exceeded the Canadian sediment quality guidelines.

### 3.2 Inventory and management of Annex A, part II chemicals (Polychlorinated Biphenyls - PCBs)

PCBs are a class of synthetic organic chemicals which are fire resistance, have a low electrical conductivity, high resistance to thermal breakdown and a high resistance to oxidants and other chemicals. PCBs are considered to be immunotoxic and affect reproduction. Adverse effects associated with the exposure of PCBs are: damage to the immune system, liver, skin, reproductive system, gastrointestinal tract and thyroid gland. Around 1.7 million tons of PCBs were produced between 1929 and 1989 worldwide. Since the early 1930s PCBs have been widely used as dielectric fluids in electrical transformers and capacitors. Minor applications of PCBs in equipment have been as heat transfer and hydraulic fluids in industry, cooling fluids in



switches, voltage regulators and motors. Other applications of PCBs have been as a plasticizer in paint, flame retardants, ink solvents, plastics and sealants and in carbonless copy paper.

PCBs are difficult to degrade or destroy as they have extremely high thermal and chemical stability. They may be thermally degraded at very high temperatures (1 200°C – 1 600°C), and through various chemical and microbial degradation processes. Chemical processes are well developed and used commercially to treat liquid PCBs and PCB-contaminated equipment. Catalytic hydrodechlorination/Hydrogenation is one such method which is gaining attention as it prevents the formation of toxic compounds such as dioxins. Other methods of PCB destruction include ultrasound, irradiation, bioremediation, microbial, nucleophilic aromatic substitution and land filling. From the increasing research conducted on PCB destruction, it appears that hydrogenation is one of the most environmentally friendly methods and is widely recognized as “Best Available Technology” for PCB destruction.

### ***3.2.1 PCB Management in South Africa***

The Stockholm Convention bans the production of PCBs, but gives parties to the Convention until 2025 to take action to phase out the use of PCB oils and equipment contaminated with PCBs. Recovered PCBs must be treated and eliminated by 2028.

Although PCBs were never produced in South Africa, PCB oils and equipment containing PCB oils were imported for use mainly for electricity generation. PCBs have been listed as a Group II hazardous substance in South Africa and have been allocated a unique tariff code in the South African tariff book. This allows them to be identified specifically on import and PCBs have been placed on Customs and Excise list of “Prohibited and Restricted” imports and exports. Customs will therefore retain any PCBs entering the country and no further imports of PCBs are expected to be received into the country.

In order to manage existing PCB oils and contaminated equipment a national standard on Mineral Insulating Oil Management referred to as the SANS 290:2007 has been developed. This standard identifies materials containing between 51-500 ppm as PCB contaminated and material containing in excess of 500 ppm are regarded as PCB containing materials. The standards prescribe certain inspection, labeling, refilling and management measures to mitigate the risks associated with these materials.

There is currently no national inventory of PCBs and no phase out plan to ensure that the phase out timeframe for PCB oils and contaminated equipment imposed by the Stockholm Convention will be met. A data collection process was embarked on through the NIP development process to determine the current status of PCBs oils and PCB contaminated equipment use in the country. The potential sources of PCBs and/or PCBs contaminated oils were identified and letters were sent to all identified industries requesting them to submit information on the status of PCBs in their company or sector. The energy sector was identified as being the largest potential owner of PCB oils and PCB containing equipment.

There was a general reluctance to provide information. No response was received from any Municipalities and only four industries provided information. The reluctance to provide information could be as a result of no inventories having been taken and therefore the information is not available, or a concern that phase out plans are not in place to ensure that the phase out of PCBs by 2025 would be achieved. The information provided in this section is therefore not complete and provides only a general overview of the status of PCB oils and PCB contaminated equipment in the country. Table 5 represents figures obtained by the only commercial

Sector	PCB oils	PCB equipment
Mining	4918.5	0
Electricity	119244.5	828179.5
Cement manufacture	3989.2	0
Chemical	8889	10380
Petrochemical	5928.5	0
Transport	5928.5	37657
TOTAL	148898.2	876216.5

**Table 5: PCBs destructed between 2005 - 2010 (kg/sector)**

facility permitted to destruct PCBs in South Africa<sup>42</sup>. It is evident from this table that PCBs are found in various sectors, including the mining, transport, energy, cement manufacturing, chemical manufacturing, and petrochemical industries. Further it is noted that the largest quantity of PCB oils and PCB equipment destructed in South Africa between 2005 and April 2010 was from the energy sector. It is evident from the information provided that the total volume of PCB oils and equipment destructed over the past five years is not high with a total of just over 1 000 tons having been destructed from all sectors.

### 3.2.1.1 PCBs in the energy sector

The main electricity supplier in South Africa is Eskom, which provides 95% of the country's energy requirements, and also generates electricity for export. However local municipalities,

<sup>42</sup> Personal communication with Amanda Andrews from Thermopower, 2010.

mines and energy intensive industry also own and manage electricity generating equipment which could contain PCB oils.

An inventory of PCB oils and equipment undertaken by Eskom indicates that they do own transformers and capacitors containing PCB oils<sup>43</sup>. The inventory provided by Eskom for large equipment revealed that 17 086 pieces of equipment owned by the company contain PCBs with a content greater than 50ppm. This

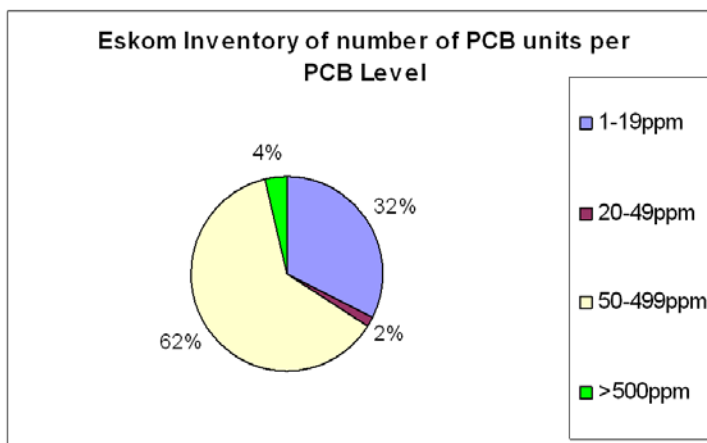


Figure 5: Eskom inventory of PCB levels per PCB units

equipment comprises of transformers, capacitor cans and auxiliary equipment. indicates that 4% of equipment inventoried had PCB levels in excess of 500 ppm, 62% had PCB levels between 50 – 499 ppm, 2% had PCB levels between 20-49 ppm and 32% had PCB levels between 1-19 ppm. For the smaller pole transformers which are hermetically sealed testing is done on failure of the equipment to determine disposal requirements. Eskom also uses this information to label other similar pole transformers from the same batch which further informs the inventory. Eskom publishes the amount of PCB contaminated oils and equipment treated each year in their annual report. Testing of PCBs is done at an in-house laboratory which is SANAS accredited for PCB testing. The results of the tests are included in the maintenance certificate for each piece of equipment and recorded on a label which is affixed to each piece of equipment in accordance with SANS 290.

Eskom has a PCB phase out plan which will ensure that they will be able to meet the Stockholm Convention phase out deadline. The strategy is based on the inventory and the risk assessments undertaken and is linked to refurbishment and expansion plans of Eskom<sup>44</sup>. Eskom has also registered and is participating in the PCB Elimination Network (PEN). This network was set up at the Stockholm Conventions fourth Conference of the Parties (COP) where a decision was

<sup>43</sup> Information supplied by Eskom, 2010.

<sup>44</sup> Information obtained from presentation made by I Cloete and S Nassiep from Eskom. NCCM/MCCM Meeting of 22 October 2008.

adopted to create a network that would provide and support information exchange on PCBs and would promote the cost-effective implementation of environmentally sound management of liquids and equipment containing or contaminated with PCBs. PEN is a partnership for stakeholders from different sectors including government, NGOs and industries, with an interest in environmentally sound management of PCBs where they interact within a voluntary framework<sup>45</sup>. Currently PEN is undertaking a project in Southern Africa which promotes transformer life cycle management as a tool to preventing cross contamination of PCB free equipment with PCB residue.

Eskom is also participating in an initiative which aims to assist SADC countries to manage PCBs in the Southern African Power Pool (SAPP). The SAPP<sup>46</sup> is a Regional body that was formed in 1995 through a SADC treaty to optimise the use of available energy resources in the region and support one another during emergencies. The Power Pool, whose Coordination Centre is in Harare, Zimbabwe, comprise of twelve SADC member countries represented by their respective Electric Power Utilities. The twelve are Botswana Power Corporation (BPC), Elecridade de Mozambique (EDM), Electricity Supply Commission of Malawi (ESCOM), Empresa Nacional de Electricidade (ENE- Angola), Eskom, Lesotho power Corporation (LEC), NamPower, Societe National d'Electricite (SNEL - DRC), Swaziland Electricity Company (SEC), Tanzania electricity Supply Company Ltd (TANESCO), ZESCO Limited – Zambia, Zimbabwe electricity Supply Authority (ZESA). The SAPP project is embarking on a PCB phase out within power utilities in the SADC region. The project will be coordinated by the SAPP coordination Centre and funded by the Global Environmental Facility (GEF). Power utilities have been requested to submit information on the status of PCBs in their respective organisations. This information includes detailed inventories of equipment containing or contaminated with PCBs, management systems for equipment tracking and maintenance. The project aims at developing a plan for gradual replacement of PCB contaminated equipment and elimination.

### *3.2.1.2 PCBs in the steel industry*

South Africa has a large steel industry which is energy intensive. These industries own and maintain their own electrical equipment which may contain PCB oils. Information supplied by

<sup>45</sup> PCB Elimination Network (PEN) [http://chm.pop.int/Programmes/PCBs Elimination Network \(PEN\)/tabid/438/language/en-US/Default.aspx](http://chm.pop.int/Programmes/PCBs%20Elimination%20Network%20(PEN)/tabid/438/language/en-US/Default.aspx)

<sup>46</sup> [www.sapp.co.zw](http://www.sapp.co.zw)

ArcelorMittal<sup>47</sup> indicates that the company has undertaken an inventory of the transformers at their Vanderbijlpark Works to identify the extent of PCB contamination of this equipment. This inventory has identified that only a small number of transformers owned and maintained by the company contain oils which have PCB levels which exceed 50ppm. Of the 30 pieces of equipment inventoried, 10 pieces or 33% of their PCB inventory is identified as “PCB contaminated materials” (PCB content levels between 51 – 500 mg/kg). In order to deal with the management of this equipment they have developed a management strategy which identifies the manner in which this equipment should be dealt with. No timeframe was however provided for the phase out of the PCBs contaminated oils.

Evrz Highveld Steel and Vanadium Limited is a large steel manufacturing industry located just outside of the town of eMalahleni (formerly known as Witbank). This industry has also undertaken an inventory of the transformers at their site to identify the extent of PCB contamination of their equipment. Sampling was undertaken from 2003 – 2008. It has been determined that of the 205 pieces of equipment only 4 transformers have levels of PCB which exceed the 50ppm, the levels range between 70 – 215 ppm. Evraz Highveld Steel has a management plan for these transformers as well as a plan to phase out this equipment by the 2025 deadline<sup>48</sup>.

### *3.2.1.3 PCBs contamination in used lubricating oil*

South Africa has a very active lubricating oil recycling industry which is championed by the ROSE (Recycling Used Oil Saves the Environment) foundation. The ROSE foundation was founded in 1994 and has collected in excess of 1 billion litres of used lubricating oil for recycling within a 15 year period. Used oil is collected from several sources without PCB testing and it is possible that these oils may have been contaminated with PCBs. Testing of the recycled oil is however undertaken as part of the ROSE foundation’s auditing protocol. Oils from recyclers are sampled on an annual basis and the sampling protocol includes PCBs. The results of the sampling undertaken have not found PCBs in recycled lubricating oil to date<sup>49</sup>.

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47 Information provided by ArcelorMittal, 2010.

48 Personal communication with Yolandi Bezuidenhout from Evraz Highveld Steel. 2010.

49 Information provided by ROSE Foundation. 2010

### 3.2.2 Summary of available monitoring data and environmental/health impacts with respect to Annex A, part II chemicals (PCBs)

As was the case for section 3.2.1 on available monitoring data and environmental/health impacts of POPs pesticides in the environment, there is no comprehensive monitoring program to monitor PCB's in the environment and to determine their impacts on human health and the environment in South Africa. However, for POPs pesticides in the environment there have been a number of specific studies undertaken which monitored the levels of PCB's in the environment and which have related the results to effects on human health or the environment. A selection of studies have been identified and discussed below to provide an impression of the situation with respect to PCBs contamination in South Africa.

#### 3.2.2.1 POPs in Sediments

A national survey has been published in 2005 by

Vosloo and Bouwman<sup>50</sup>. The survey looked at the incidences of a selection of POPs in certain rivers in South Africa. A total of twenty-two sites were selected for sampling to establish the presence and levels of PCDD (polychlorinated dibenzo-*p*-dioxins),

Name	Closest town/farm/resort	PCB TEQ (ng/kg)	PCDD/F TEQ (ng/kg)	Total TEQ (ng/kg)	TEQ Normalised (ng/kg)
Gariep River (mouth)	Alexander Bay	0.01	0.22	0.23	370.7
Saldanha Bay harbour	Saldanha Bay	0.01	0.27	0.28	-
Berg River	Hermon, Wellington, Paarl	0.02	0.26	0.28	-
Theewaterskloof Dam	Villiersdorp	0.02	0.3	0.32	39.29
Groot River (mouth)	Nature's Valley	0.02	0.22	0.24	14.36
Zwartkops Estuary	Port Elizabeth	0.61	1.58	2.19	192.53
Vaal River (before Gariep River confluence)	Douglas	0.03	0.21	0.24	20.3
Buffalo River	Dundee	0.01	0.23	0.24	153.69
Mooi River	Rosetta	0.02	0.32	0.34	17.72
Umlazi River (mouth)	Durban	0.3	0.9	1.2	124.93
Umgeni River (mouth)	Durban	0.32	1.19	1.51	221.26
Richard's Bay (harbour)	Richard's Bay	0.01	0.24	0.25	147.29
Thulazihleka Pan	Richard's Bay	0.04	0.49	0.53	10.91
Vaal Dam	Leboya Bay	0.01	0.23	0.24	-
Riet Spruit	Vanderbijl Park	0.31	0.84	1.14	62.83
Riet Spruit (diverted brook)	Louisrus	10.01	11.9	21.9	302.54
Loch Vaal	Vanderbijl Park	0.65	2.25	2.9	134.11
Crocodile River	Nelspruit	1.74	0.78	2.52	207.67
Olifants River	Phalaborwa	0.02	0.23	0.25	27.53
Loskop Dam	Groblersdal	0.01	0.2	0.21	116.95
Hartbeespoort Dam	Oberon	0.47	0.54	1.01	221.42
Modderfontein Spruit	Modderfontein	1.58	4.41	5.99	241.06

Table 6: PCB levels in selected rivers in South Africa

50 Vosloo, R. and Bouman, H. 2005. Survey of Certain Persistent Organic Pollutants in Major South African Waters. WRC Research No. 1213/1/05.

PCDF (polychlorinated dibenzo-furans) and PCB (polychlorinated biphenyls). The results of the survey are provided in Table 7. The table indicates that PCBs are present in all twenty-two sites sampled in this investigation. The highest TEQ-value (toxic ecological quotient) was determined for the Riet Spruit that is close to an iron and steel refinery in Vanderbijlpark. A TEQ of almost 22 ng/kg was determined. The Modderfontein Spruit had a TEQ of almost 6 ng/kg. This site is also located in close proximity to a highly industrialised site. The lowest TEQ was recorded at the Loskop Dam at 0.22 ng/kg.

According to the USA Agency for Toxic Substances and Disease Register<sup>51</sup>, a screening level of 50 ng/kg for soils and sediments warrants further investigation. The sampling results provided in Table 6 indicate that none of the dioxin and furan samples collected in this study approached this value. It therefore appears that generally dioxin and furan levels in sediments are low in the South African rivers sampled.

In a separate study undertaken in 1983 to illustrate the bio-accumulative effectiveness of PCBs, samples were taken from marine bird and mammal species<sup>52</sup>. The results of the study are provided in Table 7 and Table 8. From these tables it can be seen that concentrations of PCBs in marine birds range from 4 600 µg/kg in Kelp Gulls and 1 060 µg/kg in Grey-headed gulls. The levels identified in marine mammals range from between 1 890 µg/kg to 30 600 µg/kg. No guidelines of acceptable levels of PCBs in birds and marine animals could be identified. It is therefore difficult to indicate if these levels are high or low. With respect to these levels indicating the bio-accumulative effect of PCB's, the study concluded that the sample size was too small to be conclusive.

Marine birds species	Concentration in range (ug/kg)
African Black Oystercatcher	47 – 142
Cormorant	0 – 1636
Skua	890 – 2900
Kelp gull	3400 - 4600

**Table 7: PCB concentrations in birds**

Mammal species	Concentration
Bottlenose dolphin	1760 - 30600
Common dolphin	4600 - 5150
Cape Fur Seal	328 - 3493
Blainville's Beaked Whale	450 - 1890

**Table 8: PCB concentrations in Mammals**

In 1990 a study to investigate the PCB's and chlorinated hydrocarbon pesticide residues in water, sediment and fish in the middle and lower reaches of the Olifants River in the Mpumalanga

51 <http://www.atsdr.cdc.gov>

52 Gardener, B.D., Connell, A.D., Eagle, G.A., Moldan, A.G.S., Oliff, W.D., Orren, M.J. and Watling, R.J. 1983. South African Marine Pollution Survey Report 1976 – 1979. National Scientific Programmes Unit: CSIR, SANSP Report 73, September 1983.



province (formerly known as the Eastern Transvaal) was initiated by the Department of Water Affairs and Forestry<sup>53</sup>. DDT was also included in the study as it was still being used for malaria control in the lower reaches of the study area at the time. Water, sediments and fish samples were collected and analysed for 10 chlorinated pesticides and two PCBs. A total of 31 fish representing 3 species were collected from the Loskop and Phalaborwa Dams. Water and sediment samples were collected from 11 sampling sites on all major tributaries on the Olifants River. The results of the analysis are presented in Table 9.

Fish Species	% Fat	PCB 1260	Hepta Chlor	2,4 DDE	4,4 DDE	2,4 DDD	4,4 DDD	4,4 DDT	t-DDT
<b>Loskop Dam (Olifants River)</b>									
<i>C. gariepinus</i>	1.17	n.d	n.d	<d.l	26.0 (2.22)	<d.l	<d.l	<d.l	26.0
<i>O. mossabius</i>	12.66	n.d	1.0	n.d	8.4 (0,066)	n.d	n.d	<d.l	8.4
<i>E.depressirostris</i>	3.99	41.0 (1.03)	<d.l	n.d	198 (4,96)	<d.l	1,49 (0,035)	2.9 (0,073)	202 (5,07)
<b>Phalaborwa Dam (Olifants River)</b>									
<i>C. gariepinus</i>	1.28	n.d	n.d	n.d	10,2 (0,08)	<d.l	3,7 (0,29)	2,2 (0,17)	16,10 (1,26)
<i>O. mossabius</i>	1,98	n.d	<d.l	<d.l	5,3 (0,27)	<d.l	1,9 (0,096)	2,2 (0,11)	9,40 (0,47)
<i>E.depressirostris</i>	5,84	n.d	<d.l	22,0	92,3 (1,58)	1,8 (0,03)	13,2 (0,23)	76,0 (1,30)	205 (3,52)
(values in brackets indicate concentrations as mg/kg muscle fat)									
<dl - below detection limit									
n.d - not detected									

Table 9: Concentrations of PCBs and chlorinated pesticides in fish collected from the Olifants River ( $\mu\text{g}/\text{kg}$  wet mass)

No Polychlorinated biphenyls (PCB's) or chlorinated pesticides were detected in the water phase and the concentrations in the sediment were too low to be detected by mass spectrometry. Residues of DDT were found to be present in the entire fish specimen collected, however levels were not high and did not contribute a health hazard in terms of fish consumption. The study concluded that the concentrations of DDT were lower than those reported in the literature and were within international criteria for the protection of aquatic life.

In a separate study undertaken in 2005 to determine the level of selected organochlorine pesticide (OCP) compounds in the Jukskei River catchment area in the Gauteng province<sup>54</sup>. The Jukskei River catchment receives effluent from industries and runoff from waste dumps and

53 Grobler, D.F. A Note on PCBs and Chlorinated Hydrocarbon Pesticide Residues in Water, Fish and Sediment from the Olifants River, Eastern Transvaal, South Africa. Water SA, Vol. 20, No 3, pg 187 -194.

54 Sibali, L.L., Okwonkwo, J.O. and McCrindle, R.I. 2008. Determination of Selected Organochlorine Pesticide (OCP) Compounds from the Jukskei River Catchment Area in Gauteng, South Africa. Water SA, Vol. 34, No 5. 611 – 621.

agricultural practices, the river also passes through several densely populated areas. The Jukskei drains into the Crocodile River from where it enters the Hartbeespoort Dam which is used for recreational purposes and as a source of raw water for the Magalies Water Board. Sampling points were chosen randomly and six water samples were collected from each site. Both water and sediment samples were collected.

Analysis of results of water and sediment samples in this study showed that the levels of most OCPs detected were above the maximum acceptable levels for water recommended by the US-EPA<sup>55</sup> and by the DWAF<sup>56</sup>. The levels of OCPs in the water samples are as indicated in Table 10.

OCPs	USEPA Water Quality Guidelines (ng·mℓ <sup>-1</sup> )	DWA Water Quality Guidelines (ng·mℓ <sup>-1</sup> )	Mean levels during summer period (ng·mℓ <sup>-1</sup> )	Mean levels during winter period (ng·mℓ <sup>-1</sup> )
4,4'DDD	0.00083	#	2.230 ±0.11 – 76.00±6.02	5.657±0.16 – 306.5±2.04
4,4'DDE	0.00059	#	1.320±0.06 – 96.01±4.01	4.967±0.11 – 189.8±1.07
4,4'DDT	0.00059	< 0.30 (0.06 – 0.30)	54.91±2.34 – 1554±0.38	6.956±0.01 – 443.6±2.19
Heptachlor	0.00021	< 0.39 (0.02 – 0.39)	13.58 ±1.88 – 1067±9.01	79.53±2.07 – 1285±1.09
α-HCH	0.0092	#	5.468±0.11 – 195.6 ±1.10	13.05±2.01 – 795.2±5.07
γ-HCH	0.0186	#	0.981 ±0.16 – 13.94±2.18	0.631±0.23 – 33.79±5.01
ENDO I	0.056	< 0.57 (0.01 – 0.57)	7.282±0.61 – 34.80±0.93	15.85±1.03 – 363.9±2.09
ENDO II	0.056	< 0.57 (0.01 – 0.57)	3.817±0.31 – 629.3±14.1	7.461±3.22 – 966.5±1.32
Endrin	0.0023	< 0.08 (0.03 – 0.08)	1.955±0.12 – 10.68±0.34	3.226 ±8.06 – 50.96±1.03

**Table 10: Mean levels of OCPs in water samples collected in winter and summer in the Jekskie River**  
# No guideline level

Similarly, the average OCP levels observed in the sediment samples (1 176.12 ng·gdw<sup>-1</sup>) was significantly higher than that observed for water samples (142.310 ng·mℓ<sup>-1</sup>). This was expected as sediments are known to act as sinks for pollutants in the aquatic environment. The average levels were observed to be higher in winter (1 032.37) than in summer (286.06), this could be attributed to the impact of precipitation, however no significant correlation was observed between compounds during the two seasons. Comparing the levels of OCPs in the downstream, midstream and upper-stream river, the average levels in the downstream (731.210 ng·mℓ<sup>-1</sup>) and

55 USEPA. 1984. Test Method 608. Organochlorine pesticides and PCBs. Environmental Monitoring System laboratory, Cincinnati, OH. USA.

56 DWAF, 1996. South African Water Quality Guidelines (Volume 7). Aquatic Ecosystems (1st edition.). Department of Water Affairs and Forestry, Pretoria.

midstream (721.923 ng·m<sup>-1</sup>) gave significantly higher values than the upper stream levels (237.672 ng·mL<sup>-1</sup>).

These high levels of OCPs obtained in the study area give cause for concern because this could expose some of the primary users of water to these pollutants with potential health effects if the trend is not monitored.

### 3.2.2.2 PCBs in air

As mentioned in section 3.1.3.1 samples of ambient air including samples for PCB's were taken at three sites through the GAPs. Two of the sites were rural sites namely: the Molopo Nature Reserve and Barberspan with no industrial pollution sources nearby. The third site was located in Vanderbijlpark, a highly industrialized town located in the Gauteng province. Table 11 indicates that PCB levels measured at the third site in Vanderbijlpark were 2 – 3 times higher than those measured at the background sites. However when compared to the United States Integrated Risk Information System (IRIS) cancer risk level for PCB in ambient air which is 10ng/m<sup>3</sup>, it is noted that from the results presented in Table 11, the levels are orders of magnitude below the cancer risk level at all sites.

Units	Min	Max	Mean
Sites	pg/m <sup>3</sup>	pg/m <sup>3</sup>	pg/m <sup>3</sup>
Molopo	8	61	18
Barberspan	9	19	14
Vanderbijlpark	10	45	31

**Table 11: PCB concentrations in air**

### 3.3 Assessment with respect to Annex B Chemicals (DDT: historical, present and projected future production, use, import and export)

Dichloro-diphenyl-trichloroethane (DDT) was discovered in Switzerland during the Second World War and was widely used to protect troops and civilians from the spread of malaria, typhus and other vector borne diseases. After the war, DDT was used on a variety of agricultural crops and for the control of disease vectors in South Africa and other countries.

#### 3.3.1 Historical, present and projected future use of DDT

Between the 1950's until early 1980 large quantities of DDT were used in agriculture and aerially sprayed as contract pest control. In 1983 all uses of DDT as an active ingredient for agricultural purposes were banned. DDT is no longer registered to be used as an agricultural pesticide. DDT

however remains an important chemical in the country's fight against malaria where it is used as part of an Integrated Vector Control Management Programme in the malaria control program.

The transmission of malaria occurs in the low altitude areas (below 1 000 meters above sea level). In South Africa three provinces namely KwaZulu Natal, Limpopo and Mpumalanga are affected by malaria as indicated in Figure 6<sup>57</sup>. These areas are located along the northern borders with Zimbabwe and along the eastern borders with Mozambique. Limited focal transmission occurs occasionally in the Northern West Province along the Molopo River. Approximately 10% (4.9 million) of the total population live in malaria risk areas. DDT has been used for malaria

vector control in South Africa for both larviciding and indoor residual spraying (IRS) since 1946. The use of DDT for larviciding was discontinued in 1956, however, South Africa has maintained an extensive IRS program using DDT as the primary insecticide, with DDT discontinued for a short period between 1996 - 2000. Indoor residual spraying is the application of long-acting insecticides on the walls and ceilings of houses and domestic animal shelters in order to kill malaria-carrying mosquitoes that land on the surfaces. The application of DDT occurred twice a year between 1957 and 1977, and was reduced to once a year after 1977.

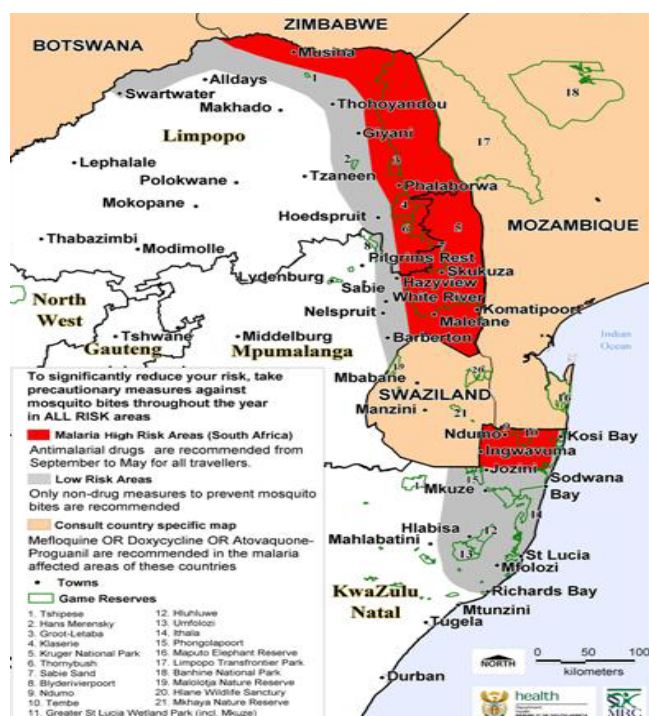


Figure 6: Areas of Malaria Transmission in South Africa

In 1996, the government stopped the usage of DDT for the control of malaria vector and relied on pyrethroid insecticides which were proven to be effective against the *Anopheles arabiensis*, which was believed at that time to be the only malaria vector in the country. South Africa re-introduced DDT for indoor residual spraying during 2000 at the height of a malaria epidemic

57 Department of Health.2010. Republic of South Africa Malaria Elimination Strategic Plan 2010-2015.

associated with the emergence of a pyrethroid resistant strain of *Anopheles unestus* which occurred along the border of Mozambique during a period of heavy rains and flooding. The DOH indicates that malaria cases in South Africa were reduced from 64 868 (15 out of every 10 000 people) in 2000 to 7 754 (2 per 10 000) in 2005.

In 2004 South Africa registered an exemption for the use of DDT for malaria vector control with the Secretariat of the Stockholm Convention. In order to ensure that the necessary controls can be implemented and that DDT is used only for malaria vector control, DDT is only purchased by the DOH. The Department advertises an annual tender and on the basis of proposals the tender is awarded to one contractor for the period. The DEA considers all requests for the import of DDT as required by the Stockholm Convention and coordinates the submission of the required information on DDT use to the Stockholm Secretariat on a three year basis. The DEA also implements the prior informed consent procedures on behalf of the country when DDT is exported to other African countries who are Parties to the convention.

Over the past 6 years approximately 456 tons of DDT was purchased by the DOH for malaria vector control. The annual sales figures are indicated in Table 12 . It should be noted however that the sales figures for DDT to the 3 malarious provinces in SA, does not necessarily reflect the quantities used in that specific year. For example, product supplied in one year could be forward stock for the following year or buffer stock for possible epidemics. The figures would therefore not equate to an annual usage. It is estimated that 64g DDT (per dwelling at 2 g/m<sup>2</sup>) is applied to each home for the IRS program. During spray events the inside of dwellings are sprayed with a dilute solution of an insecticide, DDT is applied in daub (mud) wall substrates and pyrethroids is applied on painted wall substrates. It is apparent from Table 12 that there is an overall decrease in DDT imports into the country since 2003.

Year	RSA (kg)
2003-2004	63,905
2004-2005	82,475
2005-2006	131,655
2006-2007	101,545
2007-2008	43,935
2008-2009	32,948
<b>Country</b>	
<b>6yr Total</b>	<b>456,462</b>

**Table 12: Quantities of DDT imported into South Africa**

South Africa was one of the African countries identified by the Africa Union (AU) and the Southern African Development Community (SADC) as a candidate for malaria elimination by

2015<sup>58</sup>. The Health Ministers of the identified countries reaffirmed their commitment to eliminate malaria in their countries by 2015 by signing the Windhoek Resolution at the “Elimination Eight” (E8) Ministerial Meeting in March 2009. In order to ensure that South Africa reaches the target date, a Malaria Elimination Strategic Plan for 2010-2018 has been developed. After an assessment of the current malaria status and what is required for elimination, the conclusion was that South Africa could achieve malaria elimination by 2018 if all the interventions outlined in the elimination strategy are implemented and the resources are available. DDT will remain an important chemical for malaria control at the control and elimination stages.

A key intervention for achieving the objectives of the Malaria Elimination Strategic Plan is the need to suppress vector activity to interrupt malaria transmission and thereby decrease malaria morbidity. Noting that the Indoor Residual Spraying (IRS) has been the mainstay of the vector control intervention, and further noting the targets set in the South Africa’s Malaria Elimination Strategy, there is a need to upscale vector control activities in certain targeted areas.

In the pre-elimination phase of the program there is a need to scale up the IRS in targeted areas and to increase the coverage to 90%. For the elimination and the prevention of re-introduction phase it is necessary to improve the IRS coverage to 100% for targeted areas and to sustain the IRS coverage at 100%. At the same time, surveillance will be increased in all malaria risk areas, with reduced reliance on indoor residual spraying in consolidation areas. As such there will be a need for the continued use of DDT, however quantities used over the past five seasons should remain the same during the pre-elimination phase, where after quantities might decrease gradually. At the same time, there might be an increased use of DDT in other SADC countries, as these countries start to scale-up control, towards the pre-elimination phase of malaria<sup>59</sup>.

There is currently no coordinated government program to find alternatives to DDT. South Africa is however represented through the DOH on the Global Alliance for the Development and Deployment of Alternative Products, Methods and Strategies for DDT Use<sup>60</sup>. This is a long term program which will research alternatives to DDT for use in malaria vector control to assist

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58 SADC. Malaria Strategic Plan 2007 – 2015.

59 Department of Health, South African Malaria Elimination Strategic Plan, 2010-2015, 2010

60 <http://chm.pops.int/Programmes/DDT/Global%20Alliance/tabid/621/language/en-US/Default.aspx>

developing countries and countries with economies in transition that currently utilize DDT. The alliance has been set up through the Stockholm Convention. A Center for Sustainable Malaria Control has also been set up at the University of Pretoria. In addition South Africa will be participating in the Stockholm Convention DDT expert group through representation by the Department of Health.

Although there is no national program to identify alternatives to DDT, information is available on development of a product called Nomorlaria<sup>61</sup> which is a larvicide that is effective against *Anopheles arabienies* larvae. Trials undertaken by the Pesticide Trials Section of the South African National Standards (SANS) on the larvicide in November 2009 to determine the efficacy and durability of the product indicate that of the 15 mosquito larvae exposed to Nomorlaria there was a 100% mortality rate. This trial established that even after the medium in which the larvae breeds had evaporated, the product remained active and once it rained the product resumed its function. The product however, had limited success acting as an adulticide as the product needs to remain moist to be active. A gel form of the product is currently being developed which targets adult mosquitoes that come into contact with the gel. Preliminary results of tests undertaken with the gel indicate 100% mortality of all vectors. Testing of the product is continuing.

### **3.3.2 Production of DDT**

Table 3 identifies that South Africa manufactured DDT from the early 50's to the early 80's at several locations in the country. Although South Africa intends to continue to use DDT for malaria vector control until safe and effective alternatives are identified, currently it is not anticipated that South Africa would manufacture DDT again. With regards to the formulation of DDT, information provided by Avima<sup>35</sup> indicates that South Africa formulated DDT for the countries malaria vector control program and for export to neighbouring countries for malaria vector control until mid 2010. The tender for the supply of DDT to the DOH has now been awarded to a new company, Arysta LifeScience and they import formulated product from their supplier in India. Currently, no further DDT formulation is expected to be undertaken in the country.

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<sup>61</sup> Personnel Communication with Mr Tony Karsten from Nomorlaria. 2010



### 3.3.3 Summary of available monitoring data and environmental/health impacts with respect to Annex B Chemicals (DDT)

As South Africa uses DDT for agricultural purposes in the past and currently uses DDT for indoor residual spraying for malaria vector control, noting the bio-accumulative properties of DDT, it would be expected that DDT would be found in the environment. Although a number of studies have been undertaken that have measured DDT concentrations in various media for specific research projects, there is no national monitoring programme for monitoring DDT levels in the environment. Information is however available on DDT levels in ambient air, in a number of water bodies, in sewage sludge, breast milk, animals and fish.

The results of the monitoring are varied with limited traces of DDT being found in the ambient air sampling. Levels of DDT in water in the KwaZulu Natal province are below drinking water standards and samples taken of sewage sludge in East London also reveal levels lower than drinking water standards. DDT in breast milk does not show significant elevated levels of DDT however, DDT levels in fish and animals are higher thereby confirming the bio-accumulative effect of DDT but as no standards or guidelines for DDT in animal fat have been found it is not possible to assess the levels against any guideline levels. The studies and results are discussed in more detail in the section below.

#### 3.3.3.1 DDT in ambient samples

The GAP<sup>36</sup> provided information on DDT concentration in ambient air at three sampling sites. Two of the sites were rural sites namely: the Molopo Nature Reserve (Site 1) and Barberspan (Site 2) with no

	Min	Max	Mean
	pg/m <sup>3</sup>	pg/m <sup>3</sup>	pg/m <sup>3</sup>
Site 1	11	31	15
Site 2	10	55	21
Site 3	15	65	35

Table 13: DDT concentration in ambient air

industrial pollution sources in the nearby vicinity. The third site is located in Vanderbijlpark (Site 3), a highly industrialized town located in the Gauteng province. Table 13 provides the results of DDT concentrations measured at the three South African sites.

There are no ambient standard for DDT in air, the only way to assess the countries status is to compare results with other countries. In this case the results were compared to results obtained from DDT emission values taken in Eastern Europe. On comparison of the levels of DDT

measured at the three sites with the DDT levels in ambient air in Eastern Europe it is noted that the levels from South Africa are regarded as being low.

### 3.3.3.2 DDT in water

In 2007, a focused research project titled ‘The Use of Sentinal Species to Determine the Endocrine Disruptive Activity in an Urban Nature Reserve’<sup>62</sup>, investigated the occurrence of selected endocrine inhibitors in an urban nature reserve near Pretoria. Thirty-five water samples were taken at two month intervals for two years at two dams, a channel and a wetland in the reserve. Fat samples were also taken from among other species cat-fish. The samples were analysed for several POPs chemicals including lindane, aldrin, endrin, DDT, PCB and heptachlor.

Results from the water sampling indicated that lindane was the most prevalent chemical found. Lindane was detected in 11 samples (31.4%), DDT in 9 samples (25.7%) and no dioxin or dioxin like activity was detected in any sample analysed. Results from the sediment samples indicated that 4,4'-DDD occurred in 7 samples (20%) and *p-NP* was the most prevalent chemical found in 14 samples (40%). Table 14 indicates the

Chemical	Concentration $\mu\text{L}$ WATER		Concentration $\mu\text{Kg}$ FISH FAT	
	D2	D1	D2	D1
Lindane	14	0.58	15	88
Aldrin	ND	ND	ND	24
Endrin	0.57	ND	ND	ND
DDT	2.3	0.6	14	52
DDD	1.1	1.1	6	38
DDE	ND	0.02	22	215
BHC	ND	15	ND	ND
DEHP	700	600	ND	ND
DBP (84-74-2)	5000	6310	ND	ND
DEP*	3200	3200	ND	ND
PCB	ND	ND	5	25
Heptachlor	ND	0.68	ND	ND
Cd	500	ND	ND	ND
As	5000	ND	ND	ND
Hg	16000	ND	ND	ND
Pb*	1700	ND	ND	ND

**Table 14: Chemical concentrations measured in water from Dams 1 & 2 and fish fat**

concentrations of POPs measured in water and fish fat from D1 and D2. The table indicates that concentrations of up to 2.3  $\mu\text{g/L}$  of DDT were found and the highest concentration of DDD and DDE were 1.1  $\mu\text{g/L}$ . The DDD and DDE concentration are slightly higher than the acceptable limit of DDT metabolites according to the WHO Drinking Quality Guidelines<sup>63</sup>. The concentrations of DDT and DDT metabolites in fish fat in D1 than D2 ranged from 52 -215

62 Bornman, M.S., Van Vuren, J.H., Bouwman, H., De Jager, C., Genthe, B. & Barnhoorn, E.J. 2007. The Use of Sentinal Species to Determine the Endocrine Disruptive Activity in an Urban Nature Reserve. Water Research Commission, Pretoria. WRC Report No. 1505/1/0.

63 WHO. 2008. Guidelines for Drinking Water Quality. Volume 1, 3rd Edition.

µg/kg. PCB was not detected in water, however PCBs were found in fish fat at concentration of up to 25 µg/kg.

A risk assessment was undertaken to determine the health risks posed by the levels of POPs found in water and fish. This assessment found the risks of toxic effects were unacceptably high, particularly for the use of untreated water for vegetable watering (caused by DDT, DEHP and DBP). Risk of toxic effects was also high through dermal absorption for D2 and by DBP for DI, however if the water was treated through a water treatment process using inactivated carbon it appears that the treated water is safe to use.

In 2002 a study was undertaken in East London on effluent from a sewage treatment works<sup>64</sup>. The results which are presented in Table 15 indicate that the levels of DDT, DDE and DDD at the various samples points were lower than South African drinking water standards, which are 0.0015mg/l (1500 ng/l).

Source subcategories	Sampling site	Sampling Period	2,4 DDE	2,4 DDD	4,4 DDD	2,4 DDT	4,4 DDT
Domestic and industrial effluents from sewage works	East London, Orient Pier	Jan-02	50	100	13.4	6	18.9
Domestic and industrial effluents from sewage works	East London, West Quay	Jan-02	7.7	5.5	13.4	6	18.9
Domestic and industrial effluents from sewage works	East London, S-Berth	Jan-02	7.7	5.5	13.4	6	18.9

**Table 15: DDT, DDE and DDD concentrations in East London (ng/l)**

The Agricultural Research Council has been monitoring the levels of DDT in the KwaZulu Natal province for a number of years and in 2003 published a report on DDT contamination in selected rivers in the Makhatini Flats, Ophansi and Ndumo areas<sup>65</sup>. While DDT was found in water in the Makhatini area, the levels were relatively low. Run off from agricultural lands to the Buffalo River has slightly higher concentrations of DDT ranging from 20 – 260ng/l. These concentrations are lower than the South African drinking water standards. The results are presented in Table 16 below.

64 BKS, 2009. Draft Establishment of an Inventory and Assessment of Infrastructure and Capacity for the Development of National Implementation Plans (NIPs) of the Stockholm Convention on Persistent Organic Pollutants (POPs) in South Africa. Chapter 5: First Generation POPs Profile.

65 Sereda, B.L. and Memhardt, H.R. 2003. Insecticide Contamination of the Water Environment in Malaria Endemic Areas Of Kwazulu-Natal (South Africa). WRC Report No. 1119/1/03.

Sampling Date	Locality	Organochlorines Metabolites
01/09/2000	Balemhlanga Pan	p,p' – DDE (0.001µg/kg)
01/02/2001	Irrigation Dam close to rice field	p,p' – DDD (BD)
01/09/2000	Mamfene	p,p' – DDE (0.0004µg/kg)
01/11/2000	Msunduzi Pan	p,p' – DDD (0.002µg/kg)
01/11/2000	Msunduzi Pan	p,p' – DDE (BD)
01/02/2001	Rice Field	p,p' – DDE (0.002µg/kg)
01/02/2001	Rice Field	p,p' – DDD (BD)
01/02/2001	Rice Field	p,p' – DDD (BD)
01/02/2001	Tembe	p,p' – DDE (BD)
01/09/2000	Tembe	p,p' – DDE (BD)
01/02/2001	Zineshe	p,p' – DDE (BD)

**Table 16: DDT data for rivers in Makatini**

### 3.3.3.3 Human exposure to DDT

In 2005, a study was commissioned to determine the effects of simultaneous presence of DDT and pyrethroid residues in human breast milk from malaria endemic areas. DDT and pyrethroids were determined in 152 human milk samples from three towns in South, one of which was not utilizing DDT for malaria control<sup>66</sup>. All compounds were found present in breast milk. Primiparae from one town had the highest mean  $\Sigma$ DDT whole milk levels (238.23 µg/l), and multiparae from the same town had the highest means for permethrin (14.51 µg/l), cyfluthrin (41.74 µg/l), cypermethrin (4.24 µg/l), deltamethrin (8.39 µg/l), and  $\Sigma$ pyrethroid (31.5 µg/l), most likely derived from agriculture. The ADI for DDT was only exceeded by infants from one town, but the ADI for pyrethroids was not exceeded. However, a concern based on toxicant interactions, due to the presence of four different pyrethroids and DDT was raised in the study. The study concluded that breastfeeding remained safe under the prevailing conditions.

A study was also undertaken in the Limpopo Province to determine the sperm chromatin integrity in DDT-exposed young men<sup>67</sup>. The study investigated whether non-occupational exposure to DDT could be associated with sperm DNA/chromatin defects as assayed by the Sperm Chromatin Structure Assay (SCSA) and the Aniline Blue (AB) test in young healthy men in an area where DDT-spraying still takes place during the malaria season. The study area was in

66 Bouwman, H., Sereda, B. and Meinhardt, H.M. 2006. Simultaneous Presence of DDT and Pyrethroid Residues in Human Breast Milk from a Malaria Endemic Area in South Africa. *Environ Poll* 144:902–917.

67 De Jager C, Aneck-Hahn NH, Bornman MS, Farias P, Leter G, Eleuteri P, Rescia M and Spanò M. Sperm chromatin integrity in DDT exposed young men living in a malaria area in the Limpopo Province, South Africa. *Human Reproduction*. 2009;24(10):2429-2438

three rural communities of Dididi, Tshiulungoma and Tshikhudini near Thohoyandou within the Vhembe District Municipality of Limpopo Province.

The objective of the study was to gather information on possible adverse effects on human sperm genetic integrity of DDT at high exposure levels. The results obtained point to a weak association between DDT/DDE plasma concentration and the incidence of sperm with chromatin defects. The results suggest that non-occupational environmental DDT exposure may have a negative impact on the sperm chromatin integrity of South African young men<sup>68</sup>.

#### 3.3.3.4 *Organo-chlorines in birds' eggs*

Between November 2004 and March 2005, the levels of organochlorine pollution in the eggs of water birds were assessed to determine if the levels could contribute to eggshell thinning<sup>69</sup>. Forty-three eggs were collected from eight bird species at five different sampling sites, in non DDT spraying areas within the country. The levels of organochlorine found in the eggs are indicated in Table 16 below. It is noted that the concentration of organochlorines in the birds eggs samples were very low, the highest levels being recorded for the African Darter eggs. Although the pollution levels were low, there were strong indications of egg shell thinning in African Darter eggs which could be attributed to PCB's and DDT, however there were no threshold limits found to compare the results obtained against to judge if the exposure is high or low.

	Cattle egret (n=11)	Cattle egret (n=9)	African darter (n=14)	Reed cormorant (n=3)	African sacred ibis (n=2)	Crowned Plover (n=1)	Little grebe (n=1)	White Plover (n=1)	Kelp gull (n=1)
HCB	0.61	1.0	4.1	1.7	0.90	1.2	0.88	0.96	5.2
Σ HCH	0.90	0.73	99	3.4	2.3	4.2	0.80	1.7	13
Σ chlordanes	1.1	0.40	8.8	2.4	22	0.63	0.29	0.52	0.77
Σ DDT	24	25	260	300	68	23	46	43	88
Mirex	0.32	1.12	2.0	1.5	0.3	0.56	0.49	0.32	0.81
Σ Pest	28	28	370	308	94	30	49	46	96
Σ PCBs	3.8	8.0	300	110	59	9.7	11	33	100
DDE/PCB	6.2	3.5	0.8	2.6	1.2	2.3	4.2	1.3	0.9
%Lipid	7	5.8	5.9	4.3	7.9	9.89	4.84	10.8	9.96

**Table 16: Mean concentrations of selected organochlorine in bird's egg shells. (ng/g ww)**

68 De Jager C, Aneck-Hahn NH, Bornman MS, Farias P, Leter G, Eleuteri P, Rescia M and Spanò M. Sperm chromatin integrity in DDT exposed young men living in a malaria area in the Limpopo Province, South Africa. *Human Reproduction*. 2009;24(10):2429-2438.

69 Bouwman, H., Polder, A., Venter, B. and Skaare, J.U. 2007. Organochlorine Contaminants in Cormorant, Darter, Egret, and Ibis Eggs in South Africa.

### 3.4 Assessment of releases from unintentional production of Annex C chemicals (PCDD/PCDF, HCB and PCBs)

It is known that unintended generation and emissions of polychlorinated dibenzo-p-dioxins (PCDD) and dibenzofurans (PCDF), Hexachlorobenzene (HCB) and polychlorinated biphenyls (PCBs) takes place during thermal process in the presence of organic matter and chlorine at temperatures which range between 200°C and 650°C. Formation occurs via two primary mechanisms: the so-called de novo synthesis in which PCDD/PCDF are formed from nonextractable carbon structures that are basically dissimilar to the final product (PCDD/PCDF); and precursor formation/reactions via aryl structures derived from either incomplete aromatic oxidation or cyclization of hydrocarbon fragments. The following activities are identified in the Stockholm Convention as being potential sources of PCDD/PCDF:

- chemical and petrochemical plants;
- ferrous and non-ferrous metal smelting operations;
- paper and pulp industries, cement production; and
- fuel combustion.

Additional smaller non-point sources include domestic burning of wood, landfill fires and open burning and veld fires. South Africa has industries that could contribute to the unintentional production of PCDD/PCDF, there are also incidents of open burning of waste, cane burning and uncontrolled veld fires which are known to produce PCDD/PCDF.

As mentioned in Chapter 2, a list of activities that result in atmospheric emissions and which may have a detrimental effect on the environment, have been identified in a set of emission standards promulgated under the NEM: AQA. In addition to the identification of the activity, monitoring parameters as well as allowable emission values have been included. Only four activities currently require dioxin monitoring, namely incineration of general or hazardous waste, the manufacture of cement using alternative fuels and/or raw materials the recovery of non-ferrous metals from scrap and the production and processing of zinc, nickel and cadmium. These emission requirements apply to any facilities commissioned after the promulgation of these standards and will apply in five years to any existing facilities. As these standards were promulgated in April 2010, it will be some time before a database of dioxin and furan emissions is built up. Due to the limited dioxin and furan monitoring requirements, little is known about the

contribution of industrial sources of unintentionally released POPs to ambient emission levels. In order to assess the possible national releases of unintentional POPs for the drafting of this report, the UNEP standardized toolkit<sup>70</sup> was applied to estimate total dioxin and furan releases from all identified industries of interest in the South African regions. A regional assessment using the UNEP Toolkit was also undertaken in the Potchefstroom area in the North West Province<sup>71</sup>. The results of these studies are discussed below.

### 3.4.1 National assessment of unintentional releases of POPs

To develop a standardized PCDD/PCDF source inventory using the UNEP toolkit, the first step is to identify industries and potential sources under the nine Main Source Categories. In the South African assessment, this was achieved by reviewing a list of licensed operators in the country using the

database of “Scheduled Activities” held by the Department<sup>72</sup>. Information on possible industrial sources was also obtained from the National Statistics Database and more detailed information

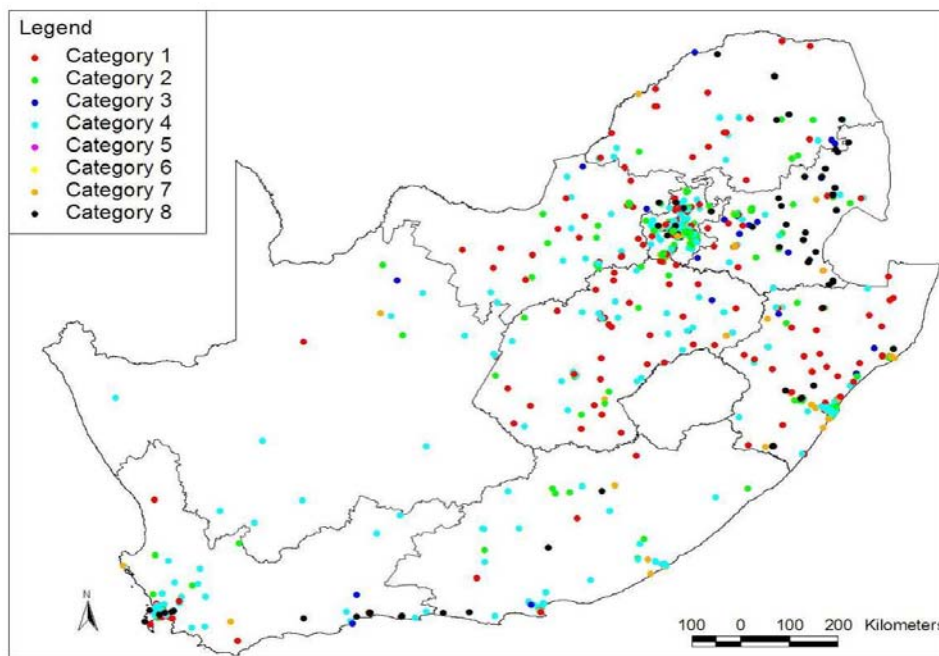


Figure 7: Locations of potential industrial sources of POPs

specific to certain source categories was obtained through industrial associations which liaise closely with the relevant industries. The location of potential industrial sources of POPs related

70 UNEP, 2005. Standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases.

71 Quinn, L.P, Jordaan, I, Bouman, H and Pieters, R. 2007. Inventory of Chlorinated Dioxin and Furan Sources and Releases in Potchefstroom, South Africa. South African Journal of Science 103, May/June 2007.

72 <http://www.environment.gov.za/appa/apparegcertificate/login.aspx>



to the toolkit categories (excluding miscellaneous sources) are indicated in the Figure 7<sup>73</sup>. It can be seen that there is a concentration of industries in the Gauteng, the Western Cape and the KwaZulu-Natal Provinces, these areas would also indicated areas of potential concern.

The second step was to identify existing activities and sources in the country related to the sub-categories identified in the toolkit. In the South African situation there were 53 relevant sub-categories. The third step was to collect the plant and process information and to populate the various tables. Information was collected for 2006 where possible but information for 2007, 2005 and 2004 was also used. The standard questionnaire provided in the toolkit was sent to the identified industries and assistance was provided to fill in the required sections of the questionnaire. In the fourth step the team applied the standard toolkit default emission factors to the identified main source and sub-category sources.

The final step was to populate the standard toolkit table of emission releases under the five media which included, air, water, land, products and residue. Releases in terms of the main source categories are identified in Table 17.

Cat.	Source Categories	Annual Releases (g TEQ/a)					
		Air	Water	Land	Products	Residue	Total
1	Waste Incineration	24.42	0.00	0.00	0.00	12.22	36.64
2	Ferrous and Non-Ferrous Metal Production	73.01	0.00000031	0.00	0.00	1718.57	1791.58
3	Power Generation and Heating	441.87	0.00	0.00	0.00	215.21	657.08
4	Production of Mineral Products	4.04	0.00	0.00	0.00	0.23	4.27
5	Transportation	14.40	0.00	0.00	0.00	0.00	14.40
6	Uncontrolled Combustion Processes	150.96	0.00	63.99	0.00	0.00	214.99
7	Production of Chemicals and Consumer Goods	0.23	2.70	0.17	30.87	10.14	44.37
8	Miscellaneous	0.02	0.00	0.00	0.00	0.09	0.11
9	Disposal/Landfilling	0.00	0.00	0.00	0.00	0.00	0
	<b>Total</b>	<b>708.94</b>	<b>2.70</b>	<b>64.16</b>	<b>30.87</b>	<b>1956.46</b>	

**Table 17: Toolkit results summary - South Africa**

Note: Where the annual release is 0, the activity does not take place or there is not enough data to estimate the emissions to the relevant environment media.

73 Watson, R., Thompson, S., Chirima, V. and Landman, S. 2008. National Implementation Plan on Persistent Organic Pollutants: The Dioxin and Furan Toolkit.

From the information available, the major source of dioxins and furans in South Africa is ferrous and non-ferrous metal production (category 2) whose principle release vector is residue (1718.57g TEQ/a), followed by power generation and heating (category 3) who principle sink is air at 441.87 g TEQ/a. Other major emitters to air are uncontrolled combustion processes (category 6) emitting 150.96 g TEQ/a. Other African countries, including Ethiopia, Kenya, Zambia and Ghana reflected similar results of major contributors, specifically in terms of the impact of uncontrolled combustion processes. In all these countries, including South Africa, the open burning of municipal waste as well as indiscriminate bush fires were identified as major sources of PCDDs/PCDFs.

The national assessment on category 2 “ferrous and non-ferrous metal production” identified hot dip galvanizing processes as the main contributors in the form of residue produced from the process. This industry, i.e. iron and steel industry, is one of the source categories identified in Annex C of the

PROVINCE	Total number of households	Backlog	Households not electrified %	Number of electrified households	Electrified households %
EASTERN CAPE	1,683,420	647,593	38.5	1,035,827	61.5
FREE STATE	834,337	199,625	23.9	634,712	76.1
GAUTENG	3,185,858	779,754	24.5	2,406,104	75.5
KWAZULU NATAL	2,439,751	816,354	33.5	1,623,397	66.5
MPUMALANGA	889,958	227,479	25.6	662,479	74.4
NORTHERN CAPE	276,265	49,794	18.0	226,471	82.0
LIMPOPO	1,264,792	322,172	25.5	942,620	74.5
NORTH WEST	923,954	195,802	21.2	728,152	78.8
WESTERN CAPE	1,355,952	202,125	14.9	1,153,827	85.1
<b>TOTAL</b>	<b>12,860,165</b>	<b>3,440,699</b>	<b>25.1</b>	<b>9,419,466</b>	<b>74.9</b>

**Table 18: Electrification Statistics for March 2010**

Stockholm Convention, as having the potential for comparatively high formation and release of PCDD/Fs to the environment. South Africa is the largest steel producer in Africa (almost 60% of Africa’s total production), and is ranked as the world’s 19th largest steel producing country in 2001. Sinter plants are located at the three large iron and steel industries which are situated in Vanderbijlpark, Saldanha and Newcastle. Sinter plants are also associated with ferroalloy plants. Several small secondary copper, zinc and aluminum operations also exist.

Category 3 “power generation and heating” is the largest contributor to air releases. The annual release figure is largely accounted for by domestic heating on coal fired stoves. South Africa has a very high energy usage, with energy sources limited to predominately to coal-burning which causes air pollution and greenhouse gas emissions. A significant amount of emissions in this

category is associated with the use of coals for domestic cooking and heating. This activity also impacts significantly on human health as it creates indoor pollution and affects the vulnerably population being old people and the very young. As part of Governments program to ensure equal access to basic services for all South Africans and to reduce air pollution and the impacts of air pollution on human health a plan to roll out electrification was launched. Between 1994 and 2009 approximately 5 million households were electrified. Currently at least 150 000 households are electrified per annum and 10 substations and MV lines are constructed to extend the service to deep rural areas. Table 18 indicates the number of households electrified as well as the backlog per province<sup>74</sup>. The date set for the eradication of the electrification backlog is 2014.

It is interesting to note that over 50 000 households are connected to solar heat systems. The continued roll out of the electrification program and the move towards solar power will further reduce the unintentional releases of POPs to the environment.

Power generation/heating was also found to be a common major source of PCDDs/PCDFs in a number of sub-Saharan African countries including Ghana, Ethiopia and the Comoros where the use of wood or biomass for ovens and household heating is common practice.

The main contributor to the third largest contributor category 6 "uncontrolled combustion processes" is veld and forest fires (biomass burning) with the main sink being to air. Agricultural burning in the form of sugar cane fields which is a common practice on the east coast of South Africa is considered to have significant impacts on air quality. The burning of sugar cane is common practice to mature the cane and also to reduce the volume for the extraction of sugar. The burning of sugar cane is also a common practice to a number of other African countries. Information specific to this category could only be sourced for veld and forest fires, no accurate, readily accessible records are held with respect to landfill fires, or accidental fires in houses, factories, vehicles etc. and hence this section of the toolkit should be considered as being significantly under reported. A large amount of accidental and deliberate combustion is also taking place, including the burning of tyres as well as plastic insulation in electrical and telecommunications cabling to expose the wire which is then sold for recycling. This simplified method of extracting reclaimable wire has resulted in a large number of open and uncontrolled

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<sup>74</sup> Department of Energy. 2010

burning at many sites around the country. However the extent of these activities cannot be confirmed and hence this section should be considered substantially underestimated.

Of the other sources identified in the Stockholm Convention as having the potential for high formation and release of dioxins and furans, category 7 production of chemicals and consumer goods, specifically the pulp and paper mills, is the main contributor to water accounting for approximately 96% of the contribution to this sink. It has been determined that all the paper pulp industries currently operating in South Africa have phased out the chlorine bleaching process. Of the other major industrial source categories of dioxins and furans identified in the Convention, in South Africa waste incineration is the 5<sup>th</sup> largest contributor to air (3.4% of the contribution to air) whilst cement kilns only contribute 0.10% to the air.

Category 8 – miscellaneous sources includes tobacco smoking. The total contribution of cigarette smoking to the unintentional releases of POPs in South Africa was 0.0023g/TEQ/annum. In order to reduce the impacts of cigarette smoking on human health and thereby also reducing the releases of dioxins and furans from cigarette smoking, the Government of South Africa has had three legislative processes to ban smoking in public places since 1993 and has consistently increases the excise tax on cigarettes which has reduced cigarette consumption and smoking prevalence dramatically. In 1993, 33% of South Africans smoked 1.8 billion cigarettes – or about 4 500 cigarettes per smoker per year. In 2008, 25% of South Africans smoked 1.2 billion cigarettes – or about 3 100 cigarettes per smoker per year.

In a regional assessment of persistent toxic substances in 47 sub-Saharan countries, South Africa has been ranked as the number one source of unintentional PCDD/Fs<sup>75</sup>. Through the development of the source inventory, a number of challenges were experienced. One of the first challenges is that for all the categories investigated there is a portion of the activities taking place which are not formalized. This means that no statistical data is available to establish the contribution made to the release of dioxins and furans to the various environmental media from this section of the economy. Industry also questioned the representivity of the various emission factors listed for use as there were various instances when a company or group of companies only partially met the requirements of a category or they were noted to straddle two categories.

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75 UNEP. 2002. Regionally Based Assessment of Persistent Toxic Substances. Sub-Saharan Regional Report, December 2002.

In these cases, the worst case scenario for assessing potential impacts was selected which may have resulted in an over estimation of the overall impacts. The categories of concern with respect to this situation are summarised as follows; Brick making, Paper and Pulp production, Iron and Steel production and Hot Dip Galvanizing.

Information gaps were also identified in the database held by the Department and the consultants recommended that the Department interact with other government Departments such as the South African Revenue Services, Statistics South Africa, *the dti* and the Department of Transport to facilitate the collection of the information required for populating the toolkit on an ongoing basis.

Areas of concern for more accurate data collection include: Number of cremations, animal carcass incineration, hazardous waste incineration, veld and forest fires, smoke houses, landfill leachate, sewage treatment, open water dumping, composting, waste oil disposal, shredders, thermal wire reclamation and ash quantities from domestic fuel usage.

#### **3.4.2 Regional assessment of unintentional releases of POPs**

In 2007 an investigation<sup>71</sup> of the PCDD/Fs and PCBs was conducted in the Potchefstroom area using the UNEP toolkit. This was the first such inventory for southern Africa. Potchefstroom is not a major industrial centre, the main activities include service industries, a fertilizer plant, a brick manufacturer as well as a brewery. An initial inventory was drawn up for the Potchefstroom area in 2006/07. The estimated total PCDD/F emissions for Potchefstroom were 0.396g TEQ/yr, corresponding 0.215g TEQ/yr to air, 0.181g TEQ/yr as soil residues and 0.000006g TEQ/yr to water media. The principle sources of these emissions were sewage/sewage treatment, waste incineration, mineral products and power generation and heating. Transport and uncontrolled combustion were also noteworthy contributors to PCDD/F releases. The percentage that each source category contributed to the respective totals were determined and compared with the results for New Zealand, Macedonia, Jordan, Philippines, Taiwan, Brunei-Darussalam and Lebanon. The results are presented in Table 19.

The source that contributed the majority of POPs releases in Potchefstroom was the disposal/landfill category (30.5%). The corresponding values for New Zealand and Jordan were 88.3% and 16.7% respectively. Table 19 indicates that uncontrolled combustion contributed the

most to the releases in three of seven countries: Macedonia (76.5%), Philippines (35.0%) and Lebanon (69.8%) and the second most in Jordan (10.1%). The study also found that with the implementation of air pollution control systems, improved fuel management and the ban on leaded petrol the total emission of PCDD/Fs would be decreased by about 40%.

Source	New Zealand (2000)	Macedonia (2004)	Jordan (2003)	Philippines (2003)	Taiwan (2004)	Brunel-Darussalam (2003)	Lebanon (2003)	Potchefstroom
Disposal/Landfill	88.32	1.80	16.71	8.09		40.94	2.30	30.47
Waste incineration	4.29	12.66	6.04	7.79	11.5	42.02	14.98	27.89
Mineral products	0.21	0.97	1.12	0.49	5.13	4.40	0.71	15.14
Power generation & heating	1.01	2.02	0.70	29.43	4.87	1.64	0.45	11.26
Transport	0.11	0.16	1.12	0.02	0.07	4.78	3.18	8.62
Uncontrolled combustion	0.37	76.51	10.08	35.02	-	5.72	69.79	6.59
Miscellaneous	0.04	-	0	0.04	0.01	0.49	0	0.09
Ferrous & non-ferrous metal production	1.47	5.88	3.79	1.98	27.27	0.01	7.62	-
Chemicals and consumer goods	4.19	0.01	0.42	17.15	51.15	0	0.97	-
TOTAL PCDD/F emission (g TEQ/yr)	594.2	177.8	71.2	534.2	138.5	1401	77.43	0.40

**Table 19: Comparative percentage contributions of each source category for Potchefstroom and various countries**

### 3.4.3 Specific studies on the levels of unintentionally released POPs in environmental media

As for the other POPs mentioned there is no national monitoring program which monitors the levels of PCDD/F in the South African environment. There have however been some specific studies undertaken which have measured dioxins and furans in specific media at specific sites. The results of a selection of available literature have been presented to give an impression of the levels of PCDD/F in the South African environment. The results are presented below.

#### 3.4.3.1 Dioxin and Furan in Sediments

The results of a study which compared the results of PCDD/F pollution in sediments of twenty-two aquatic sites in South Africa to those identified for the northern hemisphere were published in 2008<sup>76</sup>. The study, first of its kind in South Africa, focused on seven polychlorinated dibenzo-para-dioxins (PCDDs) and ten polychlorinated dibenzofurans (PCDFs) and sampled sites including harbours, rivers, dams and estuaries. Although the patterns of relative

<sup>76</sup> Pieters, R., Bowman, H. and Ellis, S. Comparison of PCDD/F Sources between Northern and Southern Hemispheres. 2008. Organohalogen Compounds, Volume 70, page 000954.

concentrations of PCDD/Fs alone were insufficient to determine the exact source of PCDD/Fs the study did show that South Africa has dioxin-like pollution.

### 3.4.3.2 CSIR study of Dioxins and Furans in Ambient Air

A second study was undertaken by the CSIR in the Durban South Industrial Basin in KwaZulu-Natal over a period from August 2004 to September 2005<sup>77</sup>. The area is heavily industrialized and contains two petroleum refineries, a paper mill, a large chemical tank farm, landfill sites, incinerators, processing and manufacturing industries, major trucking, harbor and rail facilities and other more minor industries. Residential and recreational areas are intermingled with industry. Monitoring was conducted at three sites, the first site being located in the southern part of the study areas, the second site was in the central portion and the third site was located 20km to the north. The study determined the ambient concentrations of PCDD, PCDF and PCBs and then compared these levels to levels measured in rural, urban and industrial sites in New Zealand, the US, Spain, Slovakia and Japan. The results are presented in Figure 8.

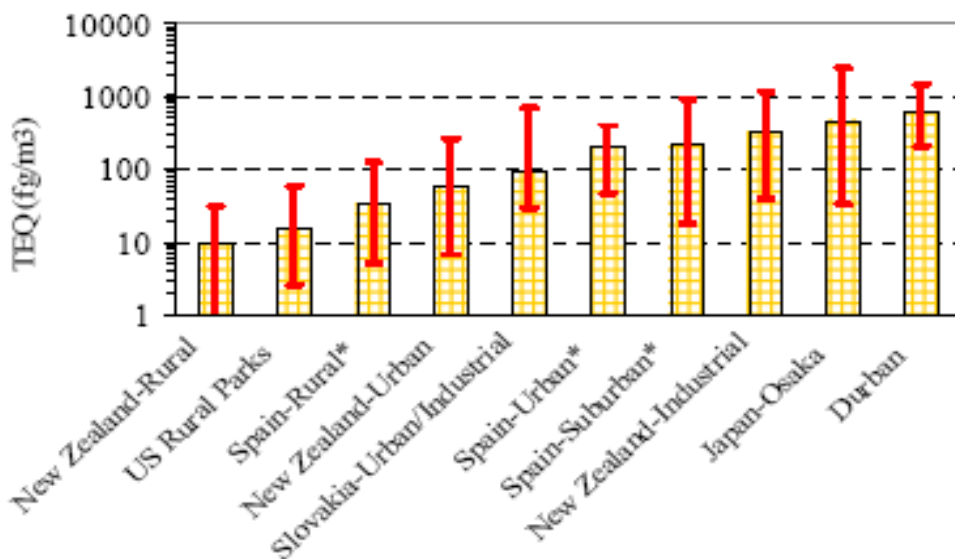


Figure 8: PCDD and PCDF concentrations (as TEQs) in recent studies. Estimated mean and range (error bars) shown.

PCDD/PCDF TEQ levels in Durban, which averaged 605 (range from 213 – 1465) TEQ  $\text{fg m}^{-3}$ , exceeded levels reported elsewhere with the exception of an older (1995) study in Krakow, Poland where PCDD/PCDF concentrations ranged from 950 to 12,000 TEQ  $\text{fg m}^{-3}$ . For PCBs,

77 Batterman, S, Chernyak, S, Gounden, Y and Matookane, M. 2007. Concentrations of Persistence Organic Pollutants in Ambient Air in Durban, South Africa. NRE Parliamentary Grant 2006/07. Peer Reviewed Conference Paper. CSIR/NRE/PW/EXP/2007/0021/A.



using the United States National Dioxin Air Monitoring Network (US NDAMN) it is seen that a mean of 1.1 (range from 0.2 to 9.9) TEQ fg m<sup>-3</sup> is reported. In comparison, Durban levels for PCBs averaged 8.7 (range from 2.1 to 28.9) TEQ fg m<sup>-3</sup>, or 8 times higher.

In terms of risk to human health, it is noted that the major source of human exposure to PCDDs, PCDFs and PCBs is dietary (especially meat, dairy products and fish). Therefore although this area is not used commercial food production, the elevated concentrations measured in Durban are indicative of strong POPs sources.

#### *3.4.3.3 PCB and HCB in soils and ash from brick production*

A recent study was undertaken in Gauteng, Limpopo and the North West province to determine the unintentional dioxin and furan emissions from brick making<sup>78</sup>. This was part of a larger study undertaken to confirm the emission factors for the unintentional released of dioxins and furans used in the UNEP Standardized Toolkit. Soils around brick production plants were analyzed for PCDD/F, dioxin-like PCB, and hexachlorobenzene compounds. Three sites were investigated, one in the Limpopo province, one in the Gauteng Province and one in the North West province. All sites were located away from urban and industrial activities. The results indicated that in the soils around the brick production sites, PCDD/Fs, PCBs and HCB were all below 1 ng/kg TEQ independently of the installation or the fuel used. No interpretable spatial gradients were observed. The same low levels were recorded for HCB, except for the industrial sites in SA where slightly higher PCB values were observed near the kilns. The bottom ashes displays similar low values below 1 ng WHO<sub>2005</sub>-TEQ/kg for PCDD/Fs; HCB was at a maximum of 177 ng/kg. From this data there is no indication that artisanal brick making using virgin wood and even at industrial scale using coal may impact the surrounding soil environments concerning PCDD/Fs, PCBs and HCB<sup>79</sup>.

#### ***3.4.4 Impacted populations or environments, estimated scale and magnitude of threats to public health and environmental quality***

In order to determine the impact of the threat to public health due to unintentional POPs releases, following on from the Toolkit work, discussions were held with various parties to identify the

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78 Umlauf G, Bouwman H, Cardenas B, Fiedler H, Mariani G, Mirikau C, Skejo H, Thanner G: PCDD/F, PCB and HCB in soil and ash from brick production sites in Kenya, South Africa and Mexico, 2011

79 Umlauf G, Bouwman H, Cardenas B, Fiedler H, Mariani G, Mirikau C, Skejo H, Thanner G: PCDD/F, PCB and HCB in soil and ash from brick production sites in Kenya, South Africa and Mexico, 2011

lowest and highest level of PCDD/PCDF. These two areas were then modeled to determine the ground level concentration for PCDD/PCDF and a human health risk assessment<sup>80</sup> was undertaken based on the ground level concentrations. The City of Tshwane represented the lowest level of dioxins and sugar cane burning in KwaZulu-Natal the highest.

#### 3.4.4.1 Impacts from Industrial Sources in the City of Tshwane

For the City of Tshwane, the result of the human health risk assessment shown that dioxin and furan air concentrations and surface deposition rates resulting from industrial emissions in and around the City of Tshwane were low in comparison with concentrations and deposition rates reported in Australia and industrial European countries. The results<sup>81</sup> of the modeled annual average ground concentration of dioxins and furans for the area are provided in Figure 9 and indicate concentrations range between  $2.5E-10$  and  $9.0E-10$  pg TEQ/m<sup>3</sup>.

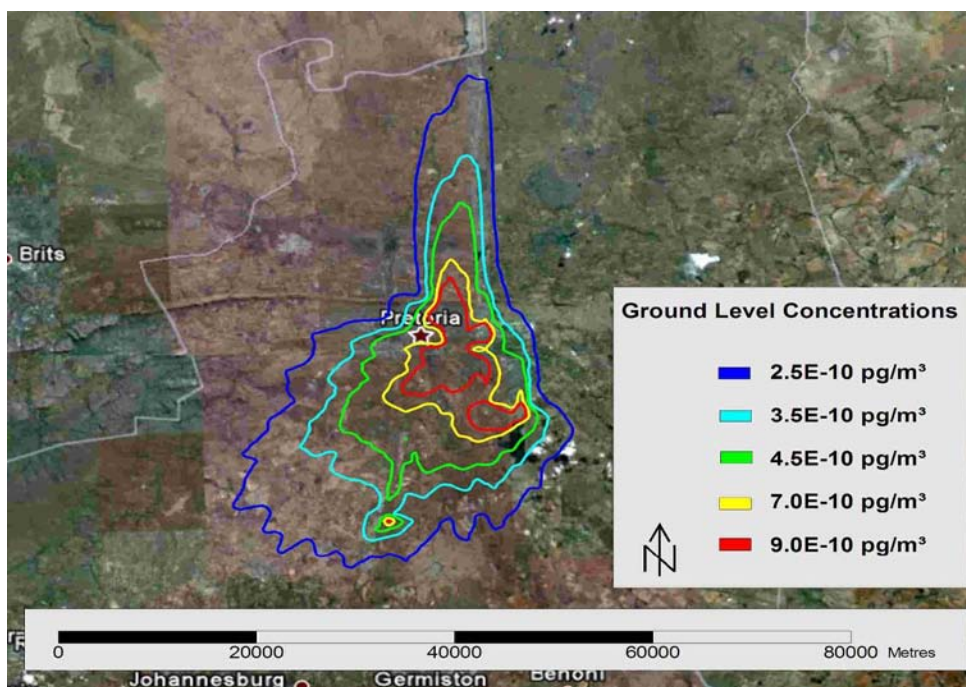


Figure 9: Modeled annual average ground level concentrations of dioxins and furans for industrial sources in the City of Tshwane

80 BKS, 2009. Draft South African National Implementation Plan for Persistent Organic Pollutants: Chapter 6a – Human Health Risk Assessment.

81 Watson R and Thompson S. 2008. Modelling Results For Highly Impacted Areas

The estimated soil concentrations were low when compared to other countries and estimates for farming areas in the vicinity of Tshwane compared favourably with internationally recommended allowable soil concentrations in the horticultural and agricultural crop production industry. The human health risk assessment indicated relatively small human intake rates associated with inhalation of contaminated air and incidental ingestion of contaminated soil. Indirect cumulative exposure through pathways relating to the food chain is of much greater significance, and this was assessed in the hypothetical Tshwane farming scenario. Estimated intake rates in the farming scenario were acceptable in comparison with international guidelines and are not expected to result in significant health effects.

#### 3.4.4.2 Impacts from Sugar Cane Burning in KwaZulu-Natal

For sugar cane burning in areas in KwaZulu-Natal the deposition rates for a 1-hectare plantation burned within one day, during relatively wind-free conditions were modeled. The deposition rates which are indicated in Table 10 exceeded internationally reported deposition rates at concentrations of 5 orders of magnitude higher in the range of  $2 \times 10^{-5}$  to  $2 \times 10^{-4}$  pg TEQ/m<sup>3</sup>. The estimated soil concentrations in areas of sugar cane burning are higher than any of the reported values, and the use of soil for commercial crop production for human consumption would probably not be acceptable.

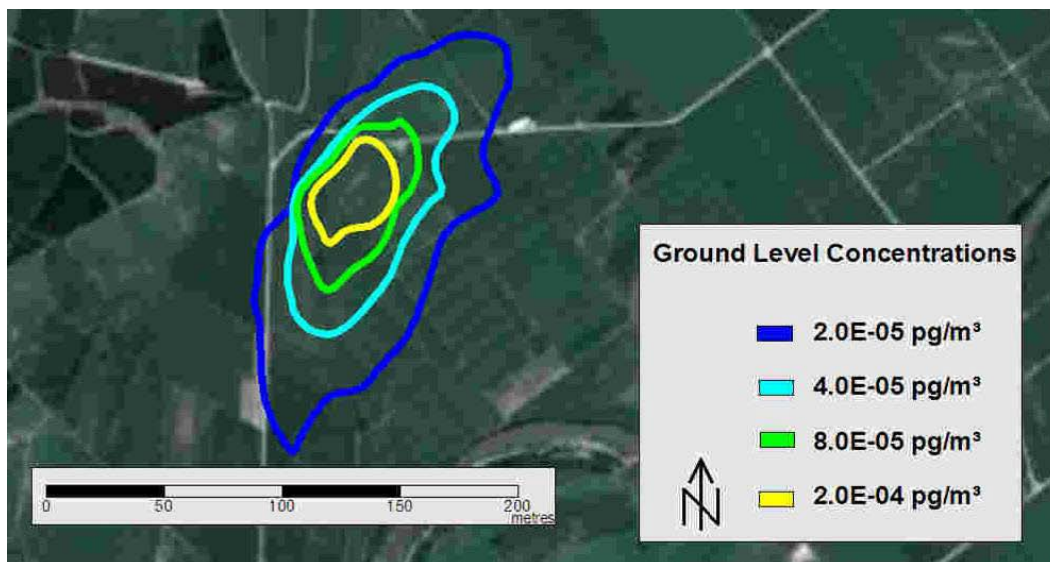


Figure 10: Modeled annual average ground level concentrations of dioxins and furans associated with a 1-ha plot of sugar cane being burnt

Estimated cumulative human intake rates of meat, poultry, milk and eggs grown on a farm and consumed at rates fairly close to that expected for subsistence farming in areas close to sugar cane burning exceed international recommendations and are therefore associated with a significant risk of potential detrimental health effects. Breastfeeding infants on the farm would be at particular risk of unacceptable intake of dioxins, due to contamination of breast milk by the accumulated body burden of dioxins and furans in mothers consuming meat, poultry, milk and eggs produced on the farm.

#### ***3.4.5 Information on the state of knowledge on stockpiles and contaminated sites***

There have been four separate initiatives undertaken to determine the extent of pesticide stockpiles in South Africa which has provided the country with a reasonable estimate of the extent of the problem. It should however be noted that these stockpiles are not pesticides located in a central store as is the case in many other African countries but rather redundant and unwanted pesticides and pesticide residues on farms located throughout the nine provinces.

In 1997/8 the South African Department of Agriculture launched a National Retrieval Project (NRP) aimed at disposal of unwanted pesticides in South Africa. The Crop Protection and Animal health Association (AVCASA) implemented the project which collected and destructed obsolete pesticides stocks in the country. Pesticides were collected at 45 collection depots country wide, from where they were transported to five repackaging sites. The pesticides were then inventoried and the majority of the pesticides were shipped to the Wales for destruction. Some of the unknown stocks were encapsulated at the Enviroserv high hazard landfill site. It is estimated that approximately 1040 tons of obsolete pesticides were collected and disposed of in this initiative of which as much as 70 tons (8%) was DDT or other POPs pesticides.

In 2000 the Danish Government, through the DANIDA agency, funded an additional survey in South Africa. Some 170 000 questionnaires were “distributed” mainly through the agricultural dealerships. The result of the survey indicated that approximately 87 tons of obsolete pesticides were still accumulated on farms in the country of which 5.1 tons or 6% were estimated to be POPs pesticides including DDT. The response to the questionnaires was poor and the results were believed to be under estimated.

In 1995 a survey was undertaken of 37 farms in the Stellenbosch area to determine if farmers were in the possession of unwanted pesticides. Stellenbosch is a rural district of South Africa, which is home to a large farming community<sup>82</sup>. The survey found that 37 farms had been in possession of unwanted pesticides. In 2003 a further sampling process was undertaken on 34 neighbouring farms to build on the information collected. The results from both studies indicated that 40 (56%) of farms surveyed were in possession of obsolete pesticides. There were more than 9 tons of pesticides being stored which included 20 banned, withdrawn or restricted chemicals. In addition 59 farms (83%) had empty containers on their premises, and 67% had store rooms with floors contaminated with pesticides. The survey found that despite the National Retrieval Project that had been undertaken in 1997/8 the problem of unwanted pesticides in the study area had deteriorated and new stocks had accumulated<sup>83</sup>.

In 2004 AVCASA initiated a project which collected pesticides from households in South Africa. The redundant pesticides were dropped off by households at participating nurseries countrywide from where they were collected and repackaged for disposal. This initiative collected approximately 12 tons of pesticides of which 2% were POPs pesticides including DDT.

In 2004 the Africa Stockpiles program was launched in South Africa through the signing of a grant agreement between the Department of Environmental Affairs and the World Bank. The Africa Stockpiles program (ASP) is a GEF funded initiative implemented through the World Bank supporting the objectives of the Stockholm Convention to phase out POPs. The aim of the ASP is to clean up and safely dispose of all obsolete pesticide stocks from Africa and establish preventative measures to avoid future accumulation.

South Africa began the implementation of the ASP by undertaking a pilot obsolete pesticide collection project in the Limpopo province. Approximately 90 tons of public and privately owned obsolete pesticides were collected over a period of one week. The pesticides were then transported to a central store where they were inventoried and repackaged. Existing and newly listed POPs found in the inventory include dieldrin, lindane, chlordane and DDT. These POPs account for 0.5% of the total inventory. The pesticides were exported to the United Kingdom for

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82 Dalvie, M.A., Frica, A. and London, L. 2006. Disposal of Unwanted Pesticides in Stellenbosch, South Africa. *Science of the Total Environment* 2006: 361: 8 – 17.

83 Dalvie, M.A. and London, L.A. 2001. Unwanted Agricultural Chemicals in Stellenbosch: A Need for Public Health Intervention. *South African Journal of Science* 2001: 97 (7 and 8): 309-12.

environmentally sound management through incineration. The data collected from the pilot project indicates that there are still approximately 600 tons of obsolete pesticide stocks being stored on farms throughout the country.

The project will be rolled out to two additional provinces during 2011 after which the pesticide industry will put in place a industry lead collection scheme funded by a levy to collect redundant pesticides and pesticide residues from farms into the future. There should therefore be no further build up of pesticide stocks or containers into the future and the current stockpiles should have been managed within the medium term.

#### *3.4.5.1 Survey of Contaminated Sites*

In contrast to information available on obsolete pesticide stockpiles there is currently limited information on the number of contaminated sites in the country. It would be expected that sites where POPs chemicals were produced could be contaminated and some information regarding exists in through documentation submitted when companies apply for remediation authorization. Information is available on five sites contaminated with POPs which is discussed under individual site headings in the section below. Contamination could also be expected from spillages from changing capacitors and transformers containing PCB oils as well as this equipment leaking. No information was available in this category of possible contamination. It is however evident from the information gathered on the disposal of PCB soils represented in Table 20 that the predominant POPs waste stream disposed to landfill is PCB contaminated soils.

Although there is currently a lack of information on contaminated sites, measures are in place to ensure that information is gathered in the future to allow for remediation measure to be implemented. Part 8 of the NEM:WA provides for the implementation of measures to deal with contaminated land. This part of the Act will makes provision for the Minister, by notice in the Gazette, to identify as investigation areas, land on which high risk activities may have or are taking place or are taking place at are likely to result in contaminated land. Sites on which POPs have been manufactured, formulated or used may be listed in this manner and assessed for contamination.

The Act further allows for the Minister to keep a national contaminated land register of investigation areas and therefore should contamination be found following an assessment, the



site/s will be categorized as contaminated in the register. The register will also provide information on among others, the nature and origin of contamination, the extent of contamination and the status of any remedial measures required.

Year	Waste in liters	Waste Stream Description
<b>Holfontein Hazardous waste site – Gauteng</b>		
2006	4650	<ul style="list-style-type: none"> <li>• Contaminated rags and clothes with ethanol, toluene and traces of PCB oil, - Iso -octane and traces of PCB oil,</li> <li>• empty plastic bottles containing PCB residues</li> </ul>
2007	13700	<ul style="list-style-type: none"> <li>• Porcelain bushing</li> </ul>
2008	6650	<ul style="list-style-type: none"> <li>• Transformer oil contaminated waste and soil contaminated with insulation oil</li> </ul>
2009	145900	<ul style="list-style-type: none"> <li>• Soil contaminated with PCB's and</li> <li>• transformer oil contaminated waste</li> <li>• Insulation Oil, Altis Grease &amp; Water and oil-PCB capacitors</li> </ul>
2010	137992	<ul style="list-style-type: none"> <li>• Sawdust contaminated with transformer oil.</li> <li>• Soil contaminated with transformer oil low level PCB's.</li> <li>• Rags &amp; Filters contaminated with PCB oil.</li> <li>• Soil contaminated with Hydraulic oil, Lube oil, Transformer Fluid, Antifreeze, Gear oil, Diesel, Brake Fluid, Grease.</li> </ul>
<b>Aloes Hazardous Waste Site – Eastern Cape</b>		
2009	3150	<ul style="list-style-type: none"> <li>• Oil -PCB capacitors</li> </ul>
2010	65400	<ul style="list-style-type: none"> <li>• Soil contaminated with transformer oil - low level PCB's</li> </ul>
<b>Shongweni – KwaZulu-Natal</b>		
2010	300	<ul style="list-style-type: none"> <li>• Novasol Grey P2R MD</li> </ul>
<b>Vissershoek – Western Cape</b>		
2005	610	<ul style="list-style-type: none"> <li>• PCB's &amp; PCB contaminated soils</li> </ul>
2006	210	<ul style="list-style-type: none"> <li>• PCB's &amp; PCB contaminated soils</li> </ul>
2007	420	<ul style="list-style-type: none"> <li>• PCB's &amp; PCB contaminated soils</li> </ul>
2008	210	<ul style="list-style-type: none"> <li>• PCB's &amp; PCB contaminated soils</li> </ul>
2009	3570	<ul style="list-style-type: none"> <li>• PCB's &amp; PCB contaminated soils</li> </ul>
2010	6300	<ul style="list-style-type: none"> <li>• PCB's &amp; PCB contaminated soils</li> </ul>

**Table 20: Disposal of POPs to landfill – information supplied by Enviroserv**

### 3.4.5.2 *The Umbogintwini Industrial Complex (UIC)*

In 1909 a dynamite factory was built at Umbogintwini, south of Durban. In 1955 Umbogintwini started the production of polyvinyl chloride (PVC), the first commodity plastic to be made in South Africa. The associated chlor-alkali plant also marketed chlorine and caustic. Later in the history of the site other pesticides and dips where also manufactured, including DDT and Lindane. The chemicals, insecticides and dips area at the Umbogintwini Industrial Complex ceased operations in December 1998. Through the closure operations it was identified that the site was contaminated with among others POPs chemicals. Investigations into the extent of contamination identified the major contaminants to include pesticides, arsenic and semi-volatiles. Ground water was sampled for these contaminants between 2006 and 2007. The



outcome of the analysis<sup>84</sup> indicated that, organo-chlorine pesticides (OCP) appeared to be leaching from the buried waste and contaminated soils which included DDT and its metabolites BCH. In 2008 remediation measures were implemented. A comparison of sampling results taken in 2006 (before remediation) and in 2007 (after the remediation) show a general decrease in all points with the exception of one. The levels sampled were between 3.6 ppb and 225 ppb in 2006 and between 3.4 ppb and 8.9 ppb in 2007. The sampling point which increased, increased from 13ppb (2006) to 38ppb (2007)). Selected boreholes were re-sampled again in 2010 and OCP residues immediately down gradient of the old CID factory area were recorded at 18ppb while no residues could be detected further down gradient along the flow path.

#### *3.4.5.3 Klipfontein Organic Products – NCP*

Klipfontein Organic Products was established in the 1940's. This chlor-alkali factory was built between Johannesburg and Pretoria to produce mustard gas through World War II although the chemicals were never used. After the war production was focused on DDT and other insecticides and agricultural chemicals including lindane, all of which have since been ceased. A large stockpile of HCH (hexachloro cyclohexane) waste which resulted from the lindane production at is currently stockpiled in several areas on the site<sup>85</sup>. In total an estimated 93 700tons of the isomer is stockpiled covering an area of approximately 3 hectares. The composition of the material is 65% alpha isomer, 31% beta isomer and 4% gamma isomer. Significant ground and water contamination has resulted from these stockpiles. The company submitted a plan to cover and close the landfill in situ which has been rejected by the Environmental Authority and the applicant is currently appealing the decision.

#### *3.4.5.4 Canelands*

The Dow AgroScience Canelands site is situated north of Verulam within the industrial area of Canelands in KwaZulu-Natal. The site was used by Sanachem since 1982 for the production of various pesticides and herbicides; Dow bought Sanachem in 1997 and continued to operate the site for pesticides and herbicide production.

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<sup>84</sup> SRK Consulting Engineers and Scientists 2009. Umbongintwini Industrial Complex Review and Interpretation of Groundwater Quality Monitoring Data.

<sup>85</sup> Electronic communication from Dr Barney Steyn from NCP, September 2010.

A soil and groundwater investigation<sup>86</sup> was undertaken at the site in 2007. This study revealed the presence of a number of POPs pesticide compounds in the groundwater and soils which exceeded screening guideline values. The POPs contaminants included; gamma HCH, a-Endosulfan, DDT and its metabolites (DDD and DDE) and chlordane. DDT and its metabolites and the sum of aldrin/dieldrin/endrin were found in concentrations which exceeding guideline values in the soil samples taken. The concentrations are indicated in Table 21 and Table 22.

Waste buried at the site which contributed to the high levels of DDT and its metabolites being found in the groundwater and soils have since been removed. Further remedial measures are underway to deal with the high levels of arsenic found in the groundwater.

Compound	Screening Guideline	Concentrations (µg/L)			
		Zone E	Zone H	Zone I	Zone M
DDT/DDE/DDD (sum)	0,010µg/L		0,040µg/L		
a-Endoslfan	5µg/L			250µg/L	
Fenthion	18µg/L			37µg/L	
Fentrithion	8 µg/L			42µg/L	
Gamma-HCH	2µg/L			360µg/L	29µg/L
Chlordane (sum)	0,20µg/L	0,31µg/L			

**Table 21: POPs Concentration in soil**

Compound	Screening Guideline	Concentrations (mg/kg)			
		Zone A	Zone C	Zone E	Zone H
DDT/DDE/DDD (sum)	4mg/kg	0,14	39	0,044	0,037
Aldrin/dieldrin/endrin (sum)	4mg/kg	0,063	150	-	0,027
Sum 4 HCH-compounds	2mg/kg	0,011	-	0,013	-
Chlordane (sum)	1.8mg/kg	0,015	-	0,091	-
Heptachlor	4mg/kg	-	-	-	0,024

**Table 22: POPs Concentration in groundwater**

#### 3.4.5.5 Shell Wadeville

This site was owned by Shell South Africa Energy (Pty) Ltd (Chemical Division) and was used for the formulation of the organo-chlorine pesticides dieldrin, endrin, aldrin (drins) and DDT between 1955 and 1975. In addition to the production and handling of drins and DDT, a number of other products were handled, stored and processed on the site, including organic solvents. All operations on the site ceased in 1994.

<sup>86</sup> Jones and Wagener Consulting Civil Engineers, 2007: Soil and Groundwater Investigation at DAS Canelands Factory Site, Phase II.

In 1995 a soil and groundwater study was undertaken on the site, which identified pollution of both media. The total area impacted by drins and other POPs chemicals at concentrations exceeding the site specific threshold levels was approximately 2 650 m<sup>2</sup>, and extended to an average depth of about 0,7 m below ground level. The drins impacted soils were excavated, and treated using a mobile thermal desorption treatment plan which was established at the site. POPs were also identified in the groundwater beneath and down gradient of the former blend plant at levels above the Dutch Intervention Values. The groundwater in the blend plant area was consequently remediated and monitoring boreholes were installed in and around the blend plant<sup>87</sup>. A comparison of the results of sampling carried out in October 2007 and the results of the latest sampling carried out in November 2009 are indicated in Table 23 demonstrate a decrease in pollution levels of most POPs pollution on the site.

Laboratory	SUBSOIL DRAIN		CUT-OFF DRAIN	
	SABS	SABS	SABS	SABS
Date	04/10/2007	27/11/2009	04/10/2007	27/11/2009
Aldrin	0.62	ND	0.12	ND
Diieldrin	2.3	2.3	9.2	3.9
Sum aldrin/diieldrin	2.92	ND	9.32	ND
Endrin	0.21	0.36	0.3	0.66
Sum Drins	3.13	ND	9.62	ND

Table 23: Groundwater sampling results (µ/lt)

### 3.4.6 Forecast of future production, use and releases of POPs – requirements for exemptions

South Africa no longer manufactures or formulates chemicals listed in Annexes A and B of the Convention and the country has banned or severely restricted seven of the nine POPs chemicals listed in Annex A for agricultural purposes and a process is in place to consider the fate of the three industrial chemicals. The country does not intend to produce or use these chemicals in the future.

DDT which is listed in Annex B has been severely restricted and may only be used by the DoH for malaria vector control purposes as allowed for in the exemption listed under Annex B, Part 2. South Africa is included in the Stockholm DDT register as a country which uses DDT for malaria vector control and submits information as required by the Convention to the Secretariat

<sup>87</sup> Moore Spence Jones Consulting Geotechnical, Civil and Environmental Engineers & Scientists, 30 September 2010: Shell Chemicals Depot on Tedstone Road, Wadeville, Gauteng

as required every three years. The use of DDT in the malaria elimination program will continue into the future, it is estimated that the requirements for DDT will remain more or less constant at approximately 25 tons being required for use each year.

With respect to releases of Annex C chemicals, it is assumed that releases of dioxins and furans will continue at more or less the same levels as indicated in the PCDD/PCDF source inventory assessment undertaken using the UNEP toolkit until the new minimum emission standards come into effect. Details of emissions are included in Table 16.

### ***3.4.7 Current level of information, awareness and education among target groups; existing systems to communicate such information to the various groups; mechanism for information exchange with other Parties to the Convention***

“Access to information” is one of the basic rights every South African has in terms of the Bill of Rights which is included in the Constitution of South Africa.

(1) *“everyone has the right of access to*

*a. any information held by the state; and*

*b. any information that is held by another person and that is required for the exercise or protection of any right.*

This right has been cascaded down into other legislation and the National Environmental Management Act (NEMA) in section 31 expands on this right to access information.

There are various target groups who would require information on chemicals for different reasons. These groups include among others chemical workers, consumers, consultants, scholars, researchers, government officials, industries, environmental bodies, farmers and general public. There are therefore various mechanism used in South Africa to bring information to stakeholders and the public and a number of institutions, sectors and organizations are involved. There are also several interventions in place to bring information to the attention of those who require it, these interventions include among others the development of legislation and standards, the setting of standard operating procedures, industry and government training, government publications and reports, industry voluntary initiatives, industry and government databases and websites, non-governmental publications and campaigns to name but a few. Selected examples of some initiatives are included below:

- The OHSA which puts certain responsibilities onto the employer to ensure safety in the workplace;
- The NEMA which gives workers the prerogative to refrain from working in dangerous conditions and provides for the protection of whistleblowers if working conditions or tasks are not in line with safety or environmental regulations.
- The draft Waste Information Regulations – these regulations which will become effective in 2011 will require reporting from all waste treatment facilities and have identified reporting on POPs chemicals specifically. Reporting will be to a central national database and will facilitate the release of an annual “State of Waste” report.
- The SANS 0232, Code of Practices for the requirements of emergency information system during transportation of dangerous goods;
- The SANS 11014 which provides the information requirements for a Material Safety Data Sheet for Chemical Products
- Training by employers is a requirement under the National Skills Development Act (1998), and there is a specific Chemical Industries Education and Training Authority which has been set up to advance training in the chemical sector;
- The Responsible Care initiative which is a voluntary chemical industry lead initiative encouraged awareness panels and committees to be set up to enable relevant information to be disseminated to all sectors including the general public;
- Labour Unions provide extensive comment to legislative process to ensure that the interests of the workers is considered and also play a key role in worker awareness and understanding
- The Foodstuffs, Cosmetics and Disinfectant Act regulates the labeling and advertisement of foodstuffs and ensure that the general public are informed about the products that they are purchasing;
- Through conditions in permits or licenses, Government makes provision for the setting up of monitoring committees where sites or activities could impact on communities. Examples of activities where such monitoring committees could be set up include; Water Permit advisory committees, catchment management agencies, marine pipeline forums and waste treatment monitoring committees.
- Training on use of pesticides is carried out through of initiatives AVCASA and Croplife have produced a booklet on responsible use of agrochemicals. Training programmes are targeted

at both upcoming farmers and established farming operations. There is a massive need for these activities radio broadcasts go out to the public and AVCASA runs a helpline.

- The government programmes on Safety Towards Our People (STOP) is aimed at educating and improving awareness among the people regarding managing or handling of household chemicals including their use, storage, disposal of obsolete chemicals and disposal of empty containers. The Paraffin Safety Programme is also directed at addressing the problem of poisonings, mainly of children, which are caused by paraffin.
- The Sector Skills Plan for the chemicals sector, for implementation by the Chemical Industry Education and Training Authority (CHIETA). This programme has identified priority scarce skills for development, such as Artisans; Research and Development (R&D) scientists in specific areas; Metrology and Operational supervision.

A number of non-governmental organization are also active in South Africa which facilitate access to information and provides a forum for the general public to engage with government on a number of issues. They also play an important watchdog role in consumer rights and environmental management and protection Non-governmental organizations that play a role related to chemicals including POPs chemicals are among others<sup>88</sup>:

- GroundWork – this is an environmental NGO which seeks to improve the quality of life of people in South Africa through assisting civil society to have a greater impact on environmental governance. They run campaigns and are involved with campaigns related specifically to chemical including POPs chemicals and waste. GroundWork places particular emphasis on assisting vulnerable and previously disadvantaged people who are most affected by environmental injustices.
- Environmental Justice Networking Forum (EJNF) – The National Chemicals Profile<sup>24</sup> identifies the Environmental Justice Forum as a non-governmental organization that is about social transformation directed towards meeting basic human needs and enhancing quality of life. EJNF is a loose alliance and network of over 266 South African non-profit community based organisations and non-governmental organizations united to bring about environmental justice in the world. CBOs, NGOs trade unions, civics, youth, religious, women, rural and

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<sup>88</sup> This section is adapted from the South African Chemicals Profile 2002 – 2005.

urban organizations are jointly promoting environmental justice through this organization. EJNF is involved with chemical matters including POPs chemicals.

- Earthlife Africa (ELA) – is a broad-based activist group which seeks to promote the sustainable interaction of humans and our environment. ELA have been involved with chemicals and waste campaigns that relate to POPs.
- Birdlife South Africa – the home page of the Birdlife website identifies the organization as a non-profit public benefit environmental origination that among others strives to conserves birds in their natural habitats. The organization aims to prevent the extinction of any bird species, maintain and improve the conservation status of all bird species, conserve, improve and enlarge sites and habitats that are important for birds. As birds are impacted on by POPs chemicals they engage in debate, campaigns and research related to POPs issues.
- Wildlife and Environment Society of South Africa (WESSA) – the homepage of WESSA’s website describes the organization which was founded in 1926 as one of South Africa’s oldest non-governmental membership based environmental organizations in the country. WESSA’s vision is to achieve a South Africa which is wisely managed by all to ensure long-term environmental sustainability. To this end they promote public participation in caring for the environment. They are involved with matters that relate to the environment and chemicals including POPs chemicals.
- The Poison Working Group (PWG) – aims to address the poisoning of wildlife through data collection, dissemination and analysis and to take pro-active education and conservation action to protect the wildlife and people of Southern Africa. The PWG maintains an information database with all relevant information on wildlife poisoning in Southern Africa. It provides a support and information system for poisoning incidents and creates general public awareness about the perils of agrochemical misuse.
- Consumer Institute of South Africa (CISA) - The Consumer Institute of South Africa (CISA) strives to improve the welfare of all consumers and enable them to assert their consumer rights. Its purpose is to conduct impartial research and analysis into the law of consumer protection in the Republic of South Africa; the standards of goods and services available to consumers; ways in which the quality, safety and prices of such goods and services may be improved and maintained, and to disseminate the results of such research for the benefit of



consumers. They are involved in consumer education, consumer research and consumer activism.

A chemical website has been set up called the Chemissa website, which is a collaborative project of the *diti*, chemical industry role-players and three chemical worker trade unions. The website provides a business information resource for the chemical, plastics and petrochemical industries in Southern Africa and the SADC region. There are links to health, safety and environmental sites around the world. SAICM stakeholders in Africa can subscribe for free to exchange information and experience on the implementation of SAICM.

All government Departments have web-sites which provide information on the latest projects, legislation and matters of educational interest. In addition DEA publishes a State of the Environment Report every five years, with the next report being due for release in 2012. The report currently does not provide information on POPs specifically but as this information is collected, this aspect could be included.

In general it is acknowledged although several initiatives are in place awareness of possible risks posed by chemicals is still low among major segments of the South African population. This is further complicated by the general lack of reliable data and information on toxicity and safe use practices for chemicals. Access to such information in local languages is also key to improving environmentally sound management of chemicals.

With respect to mechanisms for information exchange between Parties, DEA utilizes the international meetings that it attends as an opportunity for information exchange between Parties. DEA as the focal point for the waste and chemical conventions sends representation to the various Conference of the Party meetings as well as the Rotterdam Chemicals Review Committee and the Stockholm POPs Review Committee. Representatives of the Marine and Coastal Branch attend and are involved in the work of the London Convention for the prevention of pollution from ships and its protocols. DEA is also a member of the UNEP governing council and participates in all related meetings and provides the UN CSD with an annual report on sustainable development and reports on initiatives related. In addition DEA has over the years has implemented programmes run by various international agencies and is currently implementing the Africa Stockpiles Programme to rid the country of obsolete pesticides. Various

bilateral programs also exist and DEA has an extensive donor programs related to the environment with both DANIDA and NORAD.

The African Institute which is an Intergovernmental Organization which acts as the Basel and Stockholm regional centers is hosted by DEA. This organization which aims to strengthen the capacity of its Members in the area of environmentally sound management of hazardous and other wastes is hosted by DEA and provide a further avenue for information exchange, consulting, awareness raising, research and guidance on the management of wastes between English speaking African Countries. It also provides an entry point for interaction by other Parties to the Convention.

These organizations, forums and communication channels can be used to gather information and to ensure information exchange regarding aspects related to chemicals management.

#### ***3.4.8 Overview of technical infrastructure for POPs assessment, measurement, analysis and prevention measures, management, research and development***

It has been determined from the information generated through populating the UNEP dioxin and furan toolkit that the major unintentional releases of PCDD/PCDF in South Africa are from ferrous and non-ferrous metal production due to the impact of the residues from this sector. Power generation is the largest contributor of PCDD/PCDF's to the air and the production of chemicals and consumer goods is the largest contributor to the water. There are also releases through the continued use of DDT for malaria vector control and the historical use of PCBs.

Several interventions are in place which have and will achieve reductions of POPs releases to the environment. These interventions include the setting of emission standards for POPs releases, the banning and restriction of the use POPs chemicals in agriculture and for industrial purposes and the remediation of land contaminated with POPs chemicals. In order to further eliminate POPs releases and where it is not possible to reduce, to manage the impacts of POPs with a view to protecting human health and the environment, capacity to identify, quantify and manage POPs is required. This section will deal with the capacity to deal with PCDD/PCDF's in South Africa under specific headings related to:

- Monitoring and measurement
- POPs analysis – laboratory capacity

- Research and development
- Prevention measures
- Management
- Mitigation

#### *3.4.8.1 Monitoring and measurement*

It has been noted in previous sections, that there are no national programs for the monitoring of POPs in the environment. Monitoring for other pollutants however, does take place both in water and air. Monitoring capacity therefore does exist in the country. The current monitoring networks need to be expanded to include the monitoring of POPs where impacts are suspected.

#### *3.4.8.2 POPs Laboratory Analysis*

In order to be able to identify if POPs are present in the environment or in wastes, laboratory analysis is required. In January 2007 the Enterprise Industry Development division of *the dti* undertook an assessment to determine the current capacity of laboratories in the country. The study report was entitled “Chemical Testing Laboratory Capacity to Expand the Scope of Good Laboratory Practice Compliant Testing Facilities in South Africa<sup>89</sup>. The study aimed to amongst others identify laboratories that are available to undertake chemical analysis and to determine if there are sufficient laboratories. 77 Chemical testing laboratories covering commercial, private and chemical company testing facilities were surveyed. Based on the findings of this assessment, the report recommended that the scope and number of laboratories performing chemical testing should be expanded. The report also identified that South Africa has limited capacity to measure POPs both in terms of laboratory capacity as well as trained and skilled staff. The results from this study, the report entitled “Pesticide Laboratory Capacity in the SADC Region<sup>90</sup>,” and information taken from SANAS website<sup>91</sup> indicate that only a small number of laboratories are able to measure POPs. Even when POPs analysis is possible, not all laboratories can analyze for the full range of POPs, some laboratories can only measure POPs in water and sediments while other laboratories can only measure pesticides in human samples, such as blood or urine.

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89 the dti. 2007. Development Of Chemical Testing Laboratory Capacity To Expand The Scope Of Good Laboratory Practise Compliant Testing Facilities. Enterprise Industry Development Division of South Africa.

90 Work and Health in Southern Africa. 2008. Pesticide Laboratory Capacity in the SADC Region – A Vital link in Pesticide Risk Reduction. <http://www.wahsa.net>

91 [http://www.sanas.co.za/directory/test\\_default.php](http://www.sanas.co.za/directory/test_default.php)

Name of the Laboratory	Conduct the analysis of pesticides residue	Conduct the Bio-monitoring (testing for pesticides in samples)
Hearshaw & Kinnes Analysis Laboratory, CT	Yes – in fruits, vegetables, soil and water.	No
Forensic Chem. Laboratory, CT	No	Stomach contents of postmortem cases.
Biocrop, Johannesburg.	Yes – In soil, water, milk, honey, meat, fat, nuts, dried fruits and vegetables.	No
NIOH Analysis Laboratory, Johannesburg.	No	Biomarkers in humans.
CSIR Biosciences, Johannesburg.	Yes – In water and plants.	No
CSIR (Environmentek)	No	Yes - Yeast screen, AIMS test, Daphnia test, Anti androgen test, urease enzyme tests, mammalian cell cloning efficiency, Ames Salmonella mutagenicity tests, frog embryo teratogenicity test.
SANS pesticide residues, chromatographic services, Pretoria	Yes – In food, soil and water.	No
ARC (OVI), Pretoria	Yes - In animal tissue.	No
SMI Analysis, Johannesburg	Yes – In air, soil and water down to ppt levels.	No
ARC, Pesticide Science Division of plant protection, research institute of the ARC, Roodeplaat Campus, Pretoria.	Yes – In environmental samples, such as air, soil and water.	No
DWA Resource Quality Services, Roodeplaat Dam, Pretoria.	Yes – Water and Sediments	Yes- Bio-analytical methods ( <i>Daphnia pulex</i> , <i>Poecilia reticulata</i> , <i>Oreochromis mosambicus</i> )
Universities of Pretoria	Yes – Water and Sediments Gas Chromatography and Mass Spectrometry for analysis of persistent organic pesticides (POPs).	Yes - E-screen, Yeast screen, MVLN reporter analysis, Uterotrophic, Harschlanger <i>Catfish VTG analysis end 2003</i>
North West University	No, only in association with other local and international laboratories as required for research	Yes - MVLN Cell-line 2003, MDA cell-line anti-androgenic activity 2004, EDC Xenopus testing
National Metrology Institute of South Africa (NMISA).	Yes – sediments and soil. BFRs and pesticides (including OCPs). 16 EPA PAHs, the chlorinated pesticides and the PCBs 28, 101, 105, 153, 170.	No
Rand Water Analytical Services	Yes – Water. Determination of organochlorins and triazine Pesticides in water by GC-MS	Yes
Pesticide Analytical Technology cc	Yes - Pesticide raw materials & formulated products and Pharmaceutical raw materials & formulated products. Gas Chromatography tandem Mass Spectrometry technique employing:- GC-MS (Mass selective detection) High Performance Liquid Chromatography technique employing: - Ultra violet/visible detection	No
Food and Drug Assurance Laboratories (Pty) Ltd	Yes - Residues of pesticides and organic compounds in plant material & products, water and environmental samples. Gas Chromatography tandem Mass Spectrometry technique employing - GC-MS (mass selective detection)	No
Absolute Science (Pty) Ltd	Residues of pesticides, herbicides, fungicides, fertilizers, plant growth regulators and organic contaminants in plant material & plant. Gas Chromatography and Mass Spectrometry technique (GC-MS) High Performance Liquid Chromatography with Ultra Violet detection (HPLC-UV) Atomic Absorption Spectrometry products, water, soil, raw materials and agro-chemical formulations	No
Department of Agriculture, Forestry and Fisheries Stellenbosch	Yes - Residues of pesticides in plant materials & plant products. Gas Chromatography technique employing - flame photometric detector - electron capture detector	No
UIS Organic Laboratory	Yes – Water. Gas Chromatography	No

**Table 24: Capacity for analyzing pesticides in South African laboratories**

Capacities therefore differed greatly between laboratories. Table 24 identifies laboratories that can undertake POPs analysis and indicates the media for which they have capacity. The report also identified the need to expand the training for laboratory staff. The assessment identified that chemical testing laboratories have difficulties in attracting and retaining staff, particularly higher qualified staff (MSc, Ph.D. and specialist staff). There was also a need identified to provide more practical training for graduates.

In addition to limited capacity for the analysis of POPs only one non-commercial facility exists in the country for the chemical determination of dioxins and furans. North West university (Potchefstroom campus), however, use a bioassay (the H4IIE-luc reporter gene assay) to determine dioxins, dibenzofurans and coplanar PCBs in extracts of sediment, soil, water and air. This assay (DR-CALUX assay) is available commercially but at high cost.

#### *3.4.8.3 Infrastructure to manage POPs*

South Africa has a well established waste management sector with several waste management companies being registered. These companies provide a range of services, from waste collection, treatment and final disposal. They deal with domestic waste, health care risk waste, industrial wastes and hazardous wastes. The most prevalent waste management method for hazardous waste is currently disposal to sanitary landfill. There are currently four commercial sanitary landfill sites which are licensed to take highly hazardous waste including POPs. These landfills are located in four of the nine provinces.

The Basel Convention “General Technical Guidelines for the Environmentally Sound Management of Wastes consisting of, containing or contaminated with Persistent Organic Pollutants (POPs) identifies the following commercially available operations for the destruction and irreversible transformation of the POPs content in wastes:

- Alkali metal reduction.
- Base-catalysed decomposition (BCD).
- Catalytic hydrodechlorination (CHD).
- Cement kiln co-incineration.
- Gas-phase chemical reduction (GPCR).
- Hazardous waste incineration.

- Photochemical dechlorination (PCD) and catalytic dechlorination (CD) reaction.
- Plasma arc.
- Potassium tert-Butoxide (t-BuOK) method.
- Supercritical waste oxidation (SCWO) and subcritical waste oxidation.
- Thermal and metallurgical production of metals.
- Waste-to-gas conversion.

Of these technologies which have been identified as being suitable for the destruction and irreversible transformation of the POPs content in wastes, in South Africa only cement kiln co-incineration, hazardous waste incineration and thermal and metallurgical production of metals are available. In the case of cement kiln co-processing although the assessment of the twenty kilns in the country undertaken in 2007 identified that several kilns have the possibility to co-process hazardous wastes including POPs waste, the industry has not applied for licenses to process hazardous wastes and are therefore not permitted to do so. The industry has however been exploring these options and the potential exists that selected kilns could be authorized to process hazardous wastes including POPs waste in the future. National emission standards which meet international requirements have been developed for co-processing and will be implemented should facilities apply for authorization.

In the case of hazardous waste incineration, there are several licensed plants in the country but only one plant is available to accept POPs waste on a commercial basis. This facility also has a very modest capacity with a throughput of 50 tons per annum which could include POPs waste. National emission standards which meet international requirements have also been developed for the incineration of hazardous wastes. These standards are being implemented.

It is noted from the above list that the disposal of POPs waste to landfill does not achieve the environmental requirement of the destruction and irreversible transformation of the POPs content in the waste and is therefore not a preferred option for the management of POPs waste. However the disposal of POPs waste to sanitary landfill is currently an authorized practice. DEA has recently prepared draft standards for disposal of waste to landfill which has identified certain waste types which will be required to be diverted from landfill within a certain timeframes. POPs pesticides listed under the Stockholm Convention have been included in this restriction and the

timeframe of five years has been proposed. The five year diversion timeframe has been granted to allow for the development an authorization of best available treatment technologies.

There is currently an ongoing study which will also benchmark current commercially available hazardous waste treatment technologies against international best practice standards. This will allow the country to identify any improvements that may be required.

#### *3.4.8.4 Mitigation – contaminated site remediation capacity*

It has been a legal requirement for any activity which has been identified as potentially having a detrimental effect on the environment to apply for an environmental authorization before such an activity can take place. The decommissioning of a facility where the facility or the land on which it was located has the potential of being polluted requires authorization. Through the review of these applications it is evident that there is capacity to deal with contaminated land and where no treatment technologies exist, it is evident from the figures of POPs contaminated soils disposed of to landfill referred to in Table 19 that there is capacity to dispose of such soils. The successful remediation of the Shell Wadeville site which was discussed in section 3.3.4.5 is another demonstration that capacity exists in the country to manage site contaminated with POPs. As new technologies for the overall management of POPs waste become available due to ban placed on the land filling of POPs waste, more facilities will become available for remediation of contaminated soils.

#### *3.4.8.5 Research and development capacity*

South Africa has 22 universities and 13 technikons as well as a number of other higher education institutions that offer a wide range of courses, modules and qualifications that have relevance to managing chemicals throughout the chemicals life cycle. Students can receive qualifications in Chemistry, Chemical Engineering, Environmental Science, Environmental Law, Occupational Health and Safety and Toxicology. In addition courses are increasingly supplemented with modules on topics such as cleaner production, environmental impact assessment and occupational health science. All these institutions contribute to the research body in the county. Certain universities also have research centres or groups that research fields that are of relevance to the management of chemicals.



The country also has a significant number of statutory research institutions which provide research and contribute to generating new knowledge in a variety of fields including the field of chemistry. These include the institutions discussed below<sup>92</sup>:

- National Research Foundation (NRF) - Much of the research undertaken in the country is coordinated through the (NRF) which supports and promotes research through funding, human resource development and the provision of the necessary research facilities. The NRF funds research units at eight South African universities which conduct research into the social sciences and humanities.
- The Council for Scientific and Industrial Research (CSIR) - is a statutory scientific research organisation which was established in 1945 to foster industrial and scientific development to contribute to the improvement of the quality of life of the people of South Africa. The CSIR undertakes market-driven research and development and technology transfer to support its clients in the public and private sectors as well as the needs of communities.
- The Medical Research Council (MRC) - is a statutory body which was established in 1969 is funded solely by an annual government grant and reports to the Minister of Health. The MRC aims to improve the nation's health status and quality of life through relevant and excellent health research aimed at promoting equity and development. The Council co-ordinates medical research within the country and distributes government funding for research. With respect to POPs chemicals, the MRC has funded research into reproductive health and DDT.
- The Water Research Commission (WRC) – this statutory body was established in 1971 to promote coordination, communication and cooperation in the field of water research and to fund this research on a priority basis. The WRC has funded several studies on POPs chemicals specifically DDT.
- The Agricultural Research Council (ARC) – The ARC is a statutory body which was established in 1992 to provide research into a wide range of problems relating to agriculture. These problems range from the protecting crops and livestock against pests and diseases to improving the quality and safety of agricultural commodities and products, resource planning and the protection of the

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<sup>92</sup> This section has been adapted from the National Chemical Profile 2003-2005.

- The Council for Mineral Technology (Mintek) - Mintek was set up in 1934 and is regarded as being one of the world's leading technology providers specializing in mineral processing, extractive metallurgy and related mining fields. Mintek offers R&D expertise, service testwork, equipment, and novel process technologies for the precious metals, base metals, ferro-alloys, and industrial minerals sectors world-wide. Mintek's Mineral Economic and Strategy Unit has a strong focus on skills development and training and has undertaken Recent initiatives undertaken by Mintek include among others, a project on the Olifants Water Catchment area to determine the impact of platinum mining on the catchment, water security in the mining sector; energy sector projects to investigate models of energy efficiency at selected stages of the value chain; and the development of level 2 qualifications for small scale miners. Mintek was appointed by the Department of Labour as an Employment and Skills Development Agency to train small scale mining and women learners in mining.
- The National Cleaner Production Centre (NCPC-SA) - The NCPC-SA was launched during the World Summit for sustainable development in 2002. It is a cooperative program between South Africa and UNIDO with financial assistance from *the dti*, CSIR and the Government of Austria and Switzerland. The NCPC-SA aims to enhance the competitiveness and productive capacity of the national industry, focusing on SME's through Cleaner Production techniques. The NCPC-SA exists as a national body to strengthen market access by South African industry and business sectors through the fostering of networks to transfer Cleaner Production technologies and services. The NCPC-SA is also active in the chemical field. For more information see <http://www.ncpc.ca.za>.

#### 4 ACTION PLAN

The following activities required in implementing priority goals of the “National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants in South Africa”.

ACTIVITY	BRIEF DESCRIPTION	LEADING AND IMPLEMENTING AGENCIES	DURATION
<b>ARTICLE 3: MEASURES TO REDUCE OR ELIMINATE RELEASES FROM INTENTIONS PRODUCTION AND USE</b>			
Embark on a process to phase-out equipment containing and contaminated with PCBs.	Develop Regulations for the phasing-out of equipment containing and contaminated with PCBs.	DEA	2011-2012
	Development of the Terms of Reference for a pilot PCB inventory development process for PCB containing and contaminated equipment in a Municipal area.	DEA/Municipalities	2012 - 2013
	Secure funding for PCB inventory development process for PCB containing and contaminated equipment in a Municipal area.	DEA / Municipalities	2012-2013
	Develop an inventory of all equipment and transformers containing PCBs in Municipal areas through extrapolation from pilot project figures.	DEA/Municipalities	2013-2014
	Development a National PCB phase out plan.	Municipalities/Industries	2014-2015
	Approval of phase out plans for PCB containing and contaminated equipment from industry.	DEA	2015-2016
	Implementation of phase-out plans.	Municipalities/Industries	2016 - 2025
	Secure funding for a PCB destruction project.	DEA/UNEP	2014-2015
Ban the use and production of POPs in Agriculture.	Ban the use of POPs pesticides that are no longer in use in the agricultural sector but are still registered in their database.	DAFF	2011-2012
Revise regulations to the Hazardous substances act to include all POPs chemicals as a Group I pesticide.	Revise the regulations and gazette.	DOH	2012-2013
Asses the need to continue to use the 2 originally listed industrial POPs chemicals with a view to banning their use.	Commission a study to determine the use of the initial 2 POPs pesticides in industry, identification possible alternatives and the impact of a possible ban of these chemicals.	the dti/DEA	2011 - 2012
	Depending on recommendation of FRIDGE study request DOH to ban the 2 industrial chemicals.	DEA/dti/DOH	2012 - 2013
Assess the status quo of chemicals being considered by POPRC	Annually draft TOR to undertake a FRIDGE study on chemicals being considered by CRC and POPRC.	DEA/dti	Ongoing

Strengthen the control of the import and export of POPs.	Continue to ban listed chemicals depending on recommendations of the FRIDGE studies undertaken.	DEA/ITAC/DAFF/NDOH/SARS	Ongoing
	Identify unique tariff codes for newly banned POPs chemicals.	DEA/SARS/ITAC	Ongoing
Ensure finalization of the planning and effective implementation of the “Intergovernmental procedure for import/export authorization” (IPIE) for substances controlled by multilateral environmental agreements.	Establishment an IPIE process for the import/export of substances controlled by multilateral environmental agreements.	DEA/ITAC/SARS	2011 - 2012
	Confirm arrangements through the signing of MoU’s between Departments.	DEA/ITAC/SARS	2012 - 2013
	Implement procedures.	DEA/ITAC/SARS	2012 - 2013
Develop guidelines for POPs in sediments.	Develop guidelines for POPs in sediment.	DWA	2012-2013
	Monitoring of Annex A and B chemicals in sediments.	DWA	2012-2013
Monitoring of Annex A and B chemicals in water.	Inclusion of Annex A and B chemicals in the DWA monitoring program.	DWA	2012-2013
	Inclusion of Annex A and B chemicals in DWA drinking water quality guideline	DWA	2012-2013
Ensure a long term solution to collection of residue pesticides and pesticide containers.	Review and approve the AVCASA Integrated Industry Waste Management Plan to deal with residue pesticides and pesticide containers.	DEA/Industry	2011-2012
<b>ARTICLE 4: REGISTER OF SPECIFIC EXEMPTIONS</b>			
Exemptions listed in Annex A or B	Reporting on the quantity of DDT used, imported and exported and ensure the completion of DDT questionnaire in 2012 as issued by the Secretariat every three years.	DOH/DEA	Ongoing
	Submit completed questionnaire to WHO and the Secretariat.	DEA	2012-2013
<b>ARTICLE 5: MEASURES TO REDUCE OR ELIMINATE RELEASES FROM UNINTENTIONAL PRODUCTION</b>			
Monitoring of Dioxins and Furans in ambient air	Inclusion of dioxins and furans in ambient air monitoring for priority areas.	DEA	2012-2013
	Reporting the results of monitoring dioxins and furans into the State of the Environment Report (SOER).	DEA	2012-2013
Monitoring of Dioxins and Furans from point source emissions.	Include minimum emission standards for dioxin and furans into the national standards for priority industries including paper and pulp manufacturing, sinter plants, zinc production, copper production plants and aluminum production plants.	DEA	2012-2013
	Monitoring of emissions from priority industries including paper and pulp manufacturing, sinter plants, zinc production, copper production plants and aluminum production plants.	Industries	2013 then ongoing
Employ Best Available Technologies.	Environmental authorisations of priority industries (i.e. industries having their processes unintentionally producing POPs) to include a condition that ensures BAT (Best available technologies) are	DEA	2012-2013

	implemented by the industries.		
Research into effects of cane burning	Draft a TOR to assess the effects and needs of cane burning in the country.	DEA	2012-2013
<b>ARTICLE 6: MEASURES TO REDUCE OR ELIMINATE RELEASES FROM STOCKPILES AND WASTE.</b>			
Management of POP's wastes and contaminated land.	Monitor the implementation of Pesticide Industry Waste Management Plans (IndWMP).	DEA	2012-2013
	Implementation of Part 8 of National Environmental Management Waste Act (NEMWA) which provides for remediation of contaminated land.	Affected Parties	2012-2013
	Amend NEMWA to include a section that gives power to the Minister to list high risk activities that are likely to result in land contamination.	DEA	2012-2013
<b>ARTICLE 9: INFORMATION EXCHANGE</b>			
Facilitate information exchange.	Place all relevant information on the Departmental website.	DEA/the dti	2011
	Facilitate and ensure the continuation of NCCM and MCCM.	DEA/the dti	Ongoing
	Provide information on POPs to the Africa Institute for dissemination.	DEA/AI	2012
<b>ARTICLE 10: PUBLIC INFORMATION, AWARENESS AND EDUCATION</b>			
Improve on the level of POPs public awareness.	To ensure that the Chemicals Safety Committee strengthens and up scales efforts on public awareness initiatives.	DOH	Ongoing
	Encourage industries to keep-up with public awareness campaigns.	DEA/DOH	Ongoing
	Include a section on POPs in the State of Environment Report.	DEA	2012
<b>ARTICLE 11: RESEARCH AND DEVELOPMENT AND MONITORING</b>			
Encourage research in POPs management.	Upgrading and equipping a laboratory for POPs analysis.	DWA	2013
	Award bursaries or scholarships to students to pursue careers in Analytic Chemistry.	DST	2012
	Create a demand for POPs analysis through implementation of air quality standards requiring POPs monitoring.	DEA	2012
	Inform the researchers including the NRF, WRC, CSIR and ARC about the POPRC and the CRC to enable the country to participate meaningfully and to allow the country to conduct meaningful research on POPs and research that will inform the country's position on POPs and banned and severely restricted chemicals.	DEA/DWA/DAFF	2012
	Promote research and development of safe alternative chemical and non-chemical products, methods and strategies related to DDT with the goal of decreasing the human and economic burden of vector borne diseases.	DEA/DWA/DAFF	2012-onwards
<b>ARTICLE 12: TECHNICAL ASSISTANCE</b>			
Identification of the need for technical	Identify where South Africa needs technical assistance to	DEA	

assistance on implementation.	implement POPs mitigation measures and submit proposals to GEF for technical and financial assistance		
<b>ARTICLE 13&amp;14: FINANCIAL RESOURCES AND MECHANISMS &amp; INTERIM FINANCIAL ARRANGEMENTS</b>			
Provide financial assistance.	If financial situation allows, support GEF through contributing financially to GEF replenishment programme.	DEA/DWA/DAFF	
<b>ARTICLE 15: REPORTING</b>			
Reporting to the COP.	Transmit NIP to the Secretariat.	DEA	2011
	Update the NIP to include 9 new POPS and then every 5 years and submit to the Secretariat.	DEA	2016
	Submit a 3-year report on: <ul style="list-style-type: none"> <li>• measures taken to implement the provisions of the Convention and the effectiveness of such measures in meeting the objectives of the Convention production;</li> <li>• import or export of Annex A and B chemicals including the state from which it has been imported or exported.</li> </ul>	DEA	2011 2014 Every three years
	Include POPs reporting in the SOER.	DEA	2012-2013
<b>ARTICLE 16: EFFECTIVENESS EVALUATION</b>			
Ensuring effectiveness evaluation.	Contribute to the global monitoring programme by providing relevant information obtained from existing POPs monitoring programmes and, subject to resources, from future research programmes.	DEA	