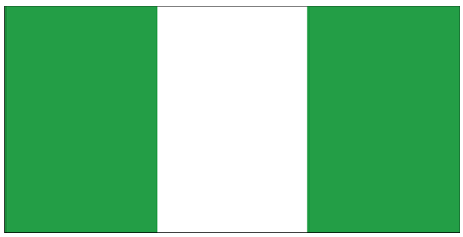
FEDERAL REPUBLIC OF NIGERIA

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

Final Report



Federal Ministry of Environment

Abuja, Nigeria

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FOREWORD

The strategic importance of chemicals in the transformation of the economic, industrial, health, social and developmental landscape of Nigeria has been recognized nationally, fully conscious of the risk to human health and the environment by the adoption of unsound management principles and practices especially for hazardous chemicals. Chemicals are important to mankind and sustenance of life on earth with multifarious uses in agriculture, medicine, industrial manufacturing, public health/vector control, etc, yet hazardous chemicals can result in significant adverse effects on human health and the environment. Nigeria as a rapidly industrializing developing country with abundant natural resources, a large human population of about 150 million people and diverse sensitive ecosystems that must be managed in a sustainable manner, has put in place since 1988 institutional and regulatory framework for environmental protection and natural resources conservation.

The country has participated actively in most international forum and initiatives on the environment since the 1992 United Nations Conference on the Environment (UNCED); and has ratified major Multilateral Environmental Agreements (MEAs) including those on chemicals and wastes. Nigeria also supports actively international initiatives on integrated chemicals management such as requirements of chapters 19 and 20 of UNCED AGENDA 21, the Johannesburg Plan of Implementation (JOPI) of the 2002 World Summit on Sustainable Development (WSSD), which includes a number of chemicals related targets including the implementation of chemicals conventions, and adoption of the Strategic Approach to International Chemicals Management (SAICM); and not the least the Globally Harmonised System (GHS) of Classification and Labelling of Chemicals.

Nigeria ratified the Stockholm Convention on Persistent Organic Pollutants (POPs) in May 2004. The development of this National Implementation Plan arises from the recognition by the Nigerian Government that the Stockholm Convention is relevant to Nigeria and that its implementation is beneficial to the National Development Plan for 2003 -2020 and the achievement of Nigeria's Millennium Development Goals insofar as they relate to POPs. The nexus between poverty and toxic chemicals has been established internationally. The National Policy on the Environment is presently under review and would incorporate strategies on sound chemicals and wastes management.

Recent policy initiatives by government include the strengthening of the regulatory framework by the establishment of the National Standards and Regulations Enforcement Agency (NESREA) for the enforcement of all environmental laws and regulations. The President of the Federal Republic of Nigeria signed the NESREA act into law in July 2007. The proposed Hazardous Chemicals Management Act is under preparation and will incorporate GHS elements while actions are in progress on the domestication of MEAs on chemicals and wastes.

The government will give political and financial support to the programs and activities of the NIP within the constraints of the annual national budget provisions. Consequently government would partner with the private sector, bilateral and multilateral funding agencies and other development partners to ensure successful implementation and attainment of the goals of the NIP for the benefit of present and future generation of Nigerians and towards a POPs free environment.

Honourable John Odey

Minister of Environment, Federal Republic of Nigeria

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GLOSSARY

ADI	Acceptable Daily Intake
ADPs	Agricultural Development Projects
AG	Attorney General
AGO	Automotive Gas Oil
AP	African Petroleum
APCS	Air Pollution Control System
ATK	Aviation Turbine Kerosene
AU	African Union
BAT	Best Available Technology
BCF	Bio-concentration Factor
BCRC	Basel Convention Regional Centre
BEP	Best Environmental Practice
CAS	Chemical Abstract Service
CAPL	Chemical and Allied Products Limited
CBO	Community Based Organisation
CONOIL	Consolidated Oil
COP	Conference of Parties
CRIN	Cocoa Research Institute of Nigeria
CSIR	Council for Scientific and Industrial Research
CSO	Civil Society Organisation
DDD/DDE	Metabolites of DDT
DDT	Dichlorodiphenyltrichloroethane
DNA	Designated National Authority
DPK	Dual Purpose Kerosene
DPR	Department of Petroleum Resources
EA	Environmental Assessment
EC	Emulsifiable Concentrate
ECN	Energy Commision of Nigeria
ECOWAS	Economic Community of West African States
EH	Environmental Health
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
ERM	Environmental Resources Managers
ESM	Environmentally Sound Management
FAO	Food and Agriculture Organisation of the United Nations
FMA&WR	Federal Ministry of Agriculture and Water Resources

FMCInd	Federal Ministry of Cormmerce and Industry
FMEHUD	Federal Ministry of Environment, Housing and Urban Development
FMENV	Federal Ministry of Environment
FMH	Federal Ministry of Health
FMI&NO	Federal Ministry of Information and National Orientation
FMJ	Federal Ministry of Justice
FML&P	Federal Ministry of Labour and Productivity
FMM&SD	Federal Ministry of Mines and Solid Mineral Development
FMST	Federal Ministry of Science and Technology
FOS	Federal Office of Statistics
GC-ECD	Gas Chromatography with Electron Capture Detector
GDP	Gross Domestic Product
GEF	Global Environment Facility
GPA	Global Plan of Action
HCB	Hexachlorobenzene
HRGC	High Resolution Gas Chromatography
HW	Hazardous Waste
IARC	International Agency for the Research on Cancer
ICCM	International Conference on Chemical Management
ICT	Information Communication Technology
IFCS	Intergovernmental Forum on Chemical Safety
IIR	Institute of Industrial Research
IITA	International Institute for Tropical Agriculture
ILRI	International Livestock Research Institute
INC	International Negotiating Committee
INPOPsI	Initial National POPs Infrastucture
IOMC	Inter-Organisation Programme for the Sound Management of Chemicals
IPEP	International POPs Elimination Project
I-TEQ	International Toxicity Equivalence
IVM	Integrated Vector Management
IW	Inception Workshop
JESL	Jawura Environmental Services Limited
JOPI	Johannesburg Plan of Implementation
K_{ow}	Octanol/Water Partition Coefficient
LC_{50}	Median Lethal Concentration
LD_{50}	Median Lethal Dose
LGA	Local Government Area
LPG	Liquefied Petroleum Gas

LUTH	Lagos University Teaching Hospital
MAN	Manufacturers Association of Nigeria
MEA	Multilateral Environmental Agreement
MOFA	Ministry of Foreign Affairs
MSDS	Material Safety Data Sheet
MSW	Municipal Solid Waste
NABDA	National Biotechnology Development Agency
NAFDAC	National Agency for Food and Drug Administration and Control
NARICT	National Research Institute for Chemical Technology
NCT	National Coordinating Team
NEPA	National Electric Power Authority
NEPAD	New Partnership for Africa's Development
NES	Nigerian Environmental Society
NESREA	Nigerian Environmental Standards and Regulations Enforcement Agency
NEST	Nigerian Environmental Study Team
NFP	National Focal Point
NGO	Non-Governmental Organisation
NIP	National Implementation Plan
NITDA	National Information Technology Development Agency
NOEC	No Observable Effect Concentration
NOEL	No Observable Effect Limit
NOLCHEM	National Oil and Chemicals Marketing Company
NNPC	Nigerian National Petroleum Corporation
NPA	Nigerian Ports Authority
NPC	National Population Commission
NPVW	National Priority Validation Workshop
NRCC	Natural Resource Conservation Council
NTC	Nigerian Tobbacco Company
NUC	Nigerian Universities Commission
OAU	Organisation for African Unity
ODS	Ozone Depleting Substances
OPS	Overarching Policy Strategy
PC	Pollution Control
PCBs	Polychlorinated biphenyls
PCDDs	Polychlorinated dibenzo-p-dioxins
PCDFs	Polychlorinated dibenzofurans
PCP	Pentachlorophenol
PCU	Project Coordination Unit

PHCN	Power Holding Company of Nigeria
PIC	Prior Informed Consent
PMS	Premium Motor Spirit
PMU	Project Management Unit
POPs	Persistent Organic Pollutants
ppm	Parts Per Million
RIs	Research Institutes
SAICM	Strategic Approach to International Chemical Management
SAPsPOPs	Specific Action Plans on POPs
SEPA	State Environmental Protection Agency
SES	Safe and Environmentally Sound
SON	Standards Organisation of Nigeria
TCDD	Tetrachlorodibenzo-p-dioxin
TDI	Tolerable Daily Intake
TDU	Thermal Desorbing Unit
TEQ	Toxicity Equivalent
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNICEM	United Cement Company
UNIDO	United Nations Industrial Development Organisation
UNITAR	United Nations Institute for Training and Research
USEPA	United States Environmental Protection Agency
WAMASON	Waste Management Society of Nigeria
WAPCO	West African Portland Cement Company
WHO	World Health Organisation
WSSD	World Summit on Sustainable Development

ACKNOWLEDGEMENT

The successful compilation of the National Implementation Plan (NIP) for the Stockholm Convention on Persistent Organic Pollutants (POPs) in Nigeria is the cumulative contributions, hard work, cooperation and support by many individuals and institutions that deserve special appreciation and commendation.

The Project was coordinated by the Federal Ministry of Environment, Housing and Urban Development (FMEHUD). Prof. O. A. Afolabi, former Director Pollution Control and Environmental Health Department of the ministry was the National Projector Director, and succeeded later by Dr. O. O. Dada, who is the current Director of the Department. Prof. O. Osibanjo was the National Project Coordinator. Special gratitude goes to the following persons who contributed immensely to the success of the project in various ways : Prof. Chidi lbe (former UNIDO's Regional Programme Adviser for Africa on POPs), His Excellency Dr. Imeh Okopido (former Minister of State for Environment 1999 – 2003); Dr. Mrs. Ngeri Benebo (Director General NESREA); Mrs. O. Ogungbuyi (NESREA), Mrs. S. Mojekwu (Programme Officer POPs in FMEHUD), Mrs. F. Afolabi (Assistant General Manager Chemicals, PHCN); Mrs. Comfort Sako (HSE officer, PHCN); Prof. Gadzama (Chairman of Council of National Open University); Prof. J. A. Adebiyi (University of Ibadan); Prof AMA Imebore (ERM , Lagos) ; Prof. N. O. Adedipe (NUC), Mr. Olokun (FMH); Mrs O. Babade (FMEHUD); Mrs A. Soyombo (NESREA); Ms A. Sodeko (FMEHUD), Mr Yunus (FMEHUD), Mr Adeyemi (FMEHUD); Mr T. Nwaokwe (ASP Project ,Coordinator, Abuja, Dr. O. A. Anyadiegwu, and Arc R. Ossai (President WAMASON).

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Organic Pollutants that was basic for the NIP development process. It also provided skills on inventory of POPs, validation of inventory, priority setting and Action Plan Development through multi-stakeholder national workshops. In this regard special gratitude goes to the UNIDO international Consultant, Dr. Richard Temsch for facilitating the aforementioned workshops and for reviewing the NIP document at various stages of its development process. We cannot but recognise and appreciate the role of another UNIDO international Consultant Dr. Szabolcs Fejes who conducted the training on POPs inventory at the beginning of the project and offered valuable suggestions on the finalisation of the NIP report.

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EXECUTIVE SUMMARY

A. Introduction

There has been international concern in recent times based on scientific and toxicological evidence about the dangers to human health and the environment by persistent toxic chemicals and their wastes (UNEP 1999). Of special concern is a group of 12 chemicals known as "Persistent Organic Pollutants" or "POPs" based on the UNEP Governing Council decision of February 1997, as chemicals internationally recognised as needing immediate global action. International efforts at minimising and eventually phasing out POPs globally gave rise to the Stockholm Convention on POPs in May 2001.

The Stockholm Convention, which is global in scope and multimedia in coverage, identifies twelve substances for initial global action. The initial list of POPs consist of 12 chemicals, namely 8 pesticides: Aldrin, Chlordane, DDT, Dieldrin, Endrin, Heptachlor, Mirex, Toxaphene; 2 industrial chemicals: Hexachlorobenzene (also a pesticide), and Polychlorinated Biphenyls (PCB); and unintended produced products or by-products (UPOPs): Polychlorinated Dibenzo-para-Dioxins (PCDD), Polychlorinated dibenzo-Furans (PCDF), as well as unintentionally produced HCB and PCBs.

B. POPs Enabling Activities

In the year 2000, the Global Environment Facility (GEF) Secretariat authorised up to US$150 million in existing resources to be utilized in support of Enabling Activities in the POPs Project following signature of the Stockholm Convention in May 2001. The principal focus of these Enabling Activities is to assist countries in preparation of their Implementation Plans and first reporting obligations. Enabling Activities represent a basic building block of GEF assistance to countries. They are a means of fulfilling essential communication requirements to the Convention, providing a basic and essential level of information to enable policy and strategic decisions to be made, or assisting the development of plans that identify priority activities within a country.

Following the approval of the GEF Council of the Regional Program on the Development of National Implementation Plans (NIPs) for the Management of POPs at its May 2001 meeting, Nigeria applied to GEF with UNIDO as the implementing Agency and solicited the inclusion of the country among the first group of countries to benefit from US$500,000 POPs Enabling Activities.

C. The Purpose of the NIP Project

Under Article 7 of the Convention, Nigeria, as a Contracting Party, is obligated to develop and implement a National Implementation Plan (NIP). The purpose of the NIP is to inform the Conference of the Parties and the public regarding national initiatives and projects designed to meet the requirements of the Stockholm Convention.

These initiatives include the preparation of legislation, regulations, voluntary programmes, standards, policies, plans, programmes and other actions by the Nigerian government to manage and eliminate POPs from the environment.

Articles 3 and 5 of the Convention stipulate that the NIP shall include a National Action Plan (NAP) for reducing intentionally and unintentionally produced POPs, such as polychlorinated dioxins and furans, hexachlorobenzene (HCB) and polychlorinated biphenyls (PCBs).

The project aims at formulating a National Implementation Plan in order to protect human health and the environment from POPs chemicals. The Project will have the five main outcomes:

(i) Determination of the co-ordinating and organization process - this phase will end with the organisation of Inception Workshop (IW);

(ii) Establishment of POPs inventories, assessment and strengthening of the national infrastructure and capacity - the development of Initial National POPs Inventory (INPOPsI);

(iii) Determination of objectives and setting of priorities - organisation of National Priority Validation Workshop (NPVW);

(iv) Formulation of the National Implementation Plan (NIP) and Specific Action Plans on POPs (SAPsPOPs) including expert review;

(v) Endorsement of the National Implementation Plan by the stakeholders (organisation of workshop).

D. Project Objectives

(i) Allowing Nigeria to meet her reporting obligation under the Stockholm Convention;

(ii) Preparing the ground for the implementation of the Stockholm Convention in Nigeria;

(iii) Strengthening national capacity to manage POPs and other chemicals in general;

(iv) Developing and endorsing its National Implementation Plan on POPs.

E. Development of the Nigerian National Implementation Plan

The development of this National Implementation Plan arises from the recognition by the Nigerian Government that the Stockholm Convention is relevant to Nigeria and that its implementation is beneficial to the National Development Plan for 2003 -2020 and the achievement of Nigeria's Millennium Development Goals insofar as they relate to POPs.

To develop the NIP, a POPs Coordinating Office was established in the Federal Ministry of Environment, Housing and Urban Development (FMEHUD) which has the mandate for the overall protection of the Nigerian environment and the conservation of natural resources. The Federal Ministry of Environment developed the Nigerian NIP through a consultative process. The main mechanism has been through the use of guidelines provided by UNEP and UNIDO combined with UNEP/UNIDO consultation and participation in national activities that have a bearing to Stockholm Convention.

The following is a summary of various actions, which have been taken in the process of developing the NIP. They included:

- The involvement of policymakers, regulatory bodies, researchers, manufacturers and other stakeholders; the process included consultative meetings, workshops, seminars, surveys and awareness creation activities;

- Strong delegations at Intergovernmental Negotiating Committees, and at the First and Second Conference of Parties;
- Formation of an inter-ministerial/intersectoral National Coordinating Committee for POPs in August 2002;
- 2-days lnception Workshop in 19-20 August 2002 in Abuja;
- 2-days training in POPs inventory in 2003 by UNIDO international Consultant Dr. Szabolcs Fejes;
- Field surveys/visits in the six geo-political zones of Nigeria in 2003/2004.
- 3-days National Revalidation and Priority Setting Training Workshops held back to back in 22-24 January 2007 in Abuja facilitated by UNIDO international Consultant Dr Richard Temsch;
- 1-day roundtable meeting of the National Steering Committee on POPs on 24 January 2007 ;
- 2-days National Workshop to Review and Endorse the Draft NIP on 24-25 October 2007 facilitated by UNIDO international Consultant Dr. Richard Temsch;
- Field surveys/visits.

F. Overview of Status of POPs in Nigeria

Inventory of Annex A Part I and Annex B Part l POPs Chemicals

According to the inventory results , Nigeria does not produce POPs Pesticides (Annex A Part l) and DDT (Annex B Part I) but had imported them mainly from Europe and USA, and in recent times from China and India. Nigeria used POPs chemicals intensively in the past for agricultural and public vector disease control purposes from the 1940s to the late 1990s, when the FMEHUD banned their importation in 1999. All of the POPs pesticides are banned in Nigeria but some are still being used illegally, such as dieldrin and aldrin. However, the Federal Ministry of Health still used DDT on a small scale on an as needs basis for malaria control until 2002. Nonetheless DDT remains banned in Nigeria and the government does not intend to request for exemption for DDT use in malaria control. There is no documented evidence that Mirex and Toxaphene have ever been used as insecticides in Nigeria. The major sources of POPs at present include stockpiles of obsolete POP pesticides and waste that were originally intended for plant protection and public health.

Inventory of Annex A: Part II POPs Chemicals

The power generating sector is the major source of PCBs (Annex A Part II Chemicals) as electric transformer oils contain PCBs. There is poor house keeping in the power plants with transformers leaking PCB oil. Transformer oils containing PCB used in electricity generation/distribution/transmission equipment and the contaminated equipment are key sources of PCBs. Comprehensive database is lacking on transformers in use and decommissioned in the Power Holding Company of Nigeria (the Nigerian National Electricity Company) representing the public sector as well as those in use in the private sector of the national economy. A national Inventory project on PCBs just approved by the World Bank should be able to fill the data gaps on PCBs.

Obsolete stocks of POPs and Contaminates Sites

There are about 30 MT (unconfirmed estimate) of POP pesticides that are stored in various locations all over the country. These pose risks to human health and the environment through continuous leaks and spills. The African Stockpile Project (ASP) which is on-going in the country should address the issues on obsolete stock of pesticides. About fifty sites or more are possibly contaminated with PCBs. Several sites are potential sources of future releases of UPOPs. The sub-regional projects on contaminated sites already approved by GEF for Ghana and Nigeria should address this problem in a comprehensive manner on project completion.

Assessment of Releases from Unintentional Production of Annex C Chemicals (PCDD/PCDF, HCB and PCB -UPOPs)

Total emission of dioxins and furans released into the air in Nigeria is 2783.98g TEQ per annum. Uncontrolled combustion processes are the major source category with 5273.21g TEQ/a contributing 98.84% of the total emissions; followed in descending order by production of mineral products with 10.72 g TEQ/a (0.38%); transportation with 8.75 g TEQ/a (0.31%); ferrous and non-ferrous metal production with 8.20g TEQ/a (0.29%); waste incineration with 4.30g TEQ/a (0.15%); heat and power generation with 0.22g TEQ/a (0.008%); production and use of chemicals and consumer goods - specifically gas flaring from petroleum production with 0.007 g TEQ/a (0.0003%); and lastly miscellaneous (tobacco smoking) with 0.0009 g TEQ/a. Since open burning of waste is by far the most important source of UPOPs releases to air and residues, all major refuse dumps in urban centres are potential hotspots especially as co-disposal of non-hazardous and hazardous wastes is the common practice.

> *For release of dioxin and furan unto land uncontrolled combustion processes are the singular source 2521.4 g TEQ/a (100%). In the residue, the total emission released is 34.42 g TEQ/a. The sources in descending order of magnitude are waste incineration with 15.85 g TEQ/a (46.05%), ferrous and non-ferrous metal production with 12.01 g TEQ/a (35.02%) and heat and power generation with 6.51 g TEQ/a (18.91%). The total dioxin and furan released in all vectors is 5339.86g TEQ/a.*

Summary of Future production

The convention allows exemption for acceptable uses of certain POPs. Nigeria does not however wish to seek exemption on the use of DDT which the Ministry of Health used for malaria control until recently.

Existing Programs for Monitoring of Releases, Environmental and Human Health Impacts

Presently, there are no programs to monitor levels of POPs chemicals in the environment although there were limited studies in the past carried out by the University of Ibadan, Department of Chemistry on POPs pesticides residue in soil, water, foods, wildlife, blood, and breast milk.

Information, Awareness and Education

Public awareness of the hazards and dangers of POPs and chemicals in general are low. Nonetheless the various activities under NIP involved active participation by the media accompanied by press interviews and releases to media houses. An information mechanism has also been established within the project secretariat. The stakeholders at the various activities manifest high levels of commitments to POPs and pesticides management issues.

Relevant Activities of NGOs

The participation of NGOs in the NIP process has been intense and consistent. Some of their members are in the Expert task Teams and the National Steering Committee of the project.

Overview of Technical Infrastructure

Periodic or regular sampling and monitoring of POPs in the environment are not carried out. Only a few universities, the FMEHUD/NESREA National Environmental Reference Laboratory in Surulere Lagos and the NAFDAC laboratory in Lagos have analytical equipment, most of which is non-functional and old, for POPs residue analysis. The facilities in these laboratories need to be upgraded and the capacity of the laboratory staff enhanced through training.

Resources for Program Implementation

Available resources for the implementation of the NIP are rather limited and inadequate. These will require additional human, technical and financial resources for the various programmes and activities concerned with monitoring, compliance and enforcement, public awareness raising, information dissemination, public education, and reporting functions of FMEHUD/NESREA.

Disposal Facilities

There are limited facilities in the country at present for the environmentally sound disposal of hazardous wastes. Cement kilns are being used sparingly for the disposal of PCB waste oil. Although the FMEHUD has licensed a few high temperature incinerators for treatment of waste oil and drilling mud in the oil and gas industry, these facilities could be deployed for POPs wastes.

Identification of Impacted Populations or Environments and Threats to Public Health and Environmental Quality,

The limited monitoring data available indicated contamination of environmental media by POPs including foods, wildlife, human blood and breast milk. No human exposure data for POPs have been reported in the country

Systems for Assessment and Listing of new Chemicals

Importation of pesticides is regulated by NAFDAC with FMEHUD also giving permits for importation on a limited scale. There is no elaborate and comprehensive system of listing new chemicals. The regulatory agencies usually demand report of toxicity tests and risk

assessment already carried out by the manufacturers overseas with a requirement for toxicity tests locally with indigenous organisms. The system needs to be evaluated and upgraded to respond to the challenges of the NIP.

Strategy and Action Plan Elements

The strategies and action plan elements for the NIP implementation can be found in chapter 3 of the report. The policy thrust is hinged on certain key principles in particular, " The Precautionary Principle ", "Polluter pays Principle ", and the " Extended Producer Social Responsibility" , " The Citizens Right to know " and "Public Private Partnership initiative " respectively. The strategy goals include elimination of the risk to human health; prevention of the importation of unwanted POPs and other hazardous chemicals; establishment of suitable storage and disposal sites; clean up and remediation and meeting goals of the Johannesburg Plan of Implementation of the 2002 World Summit on Sustainable Development (WSSD).

Action Plan

Table EC1 below is a summary of the 18 activities identified and agreed to at the Priority Setting and the NIP Endorsement workshops needed to implement the plan with indication of resources required.

Table EC 1
Summary of Resource requirements for POPs NIP Implementation in Nigeria

Principal Tasks/Activities No.	Principal Tasks/Activities Titles	Estimated Cost (USD)
3.3.1	Institutional and Regulatory Strengthening Measures	335,800
3.3.2	Measures to Reduce or Eliminate Releases from Intentional Production and Use	420,000
3.3.3	Production, Import and Export, Use, Stockpiles and Wastes of Annex A POPs Pesticides (Annex A, Part I Chemicals)	320,000
3.3.4	Production, Import and Export, Use, Identification, Labelling, Removal, Storage and Disposal of PCBs and Equipment Containing PCBs (Annex A, Part II chemicals)	66,752,000.00
3.3.5	Production, Import and Export, Use, Stockpiles and Wastes of DDT (Annex B Chemicals) if used in country	270,000
3.3.6	Register for Specific Exemptions and the Continuing need for Exemptions	44,000
3.3.7	Measures to Reduce Releases from Unintentional Production	1,507,000
3.3.8	Measures to Reduce Releases from Stockpiles and Wastes	2,065,000
3.3.9	Identification of Stockpiles, Articles in Use and Wastes	75,000
3.3.10	Measures to Manage Stockpiles and Appropriate Measures for Handling and Disposal of Articles in Use	75,000
3.3.11	Strategy: Identification of Contaminated Sites (Annex A, B and C Chemicals) and Remediation in an Environmentally Sound Manner	3,020,000
3.3.12	Facilitating or undertaking Information Exchange and Stakeholder Involvement	595,000
3.3.13	Activity: Public awareness, information and Education	204,000
3.3.14	Effectiveness Evaluation	30,000
3.3.15	Reporting	179,500
3.3.16	Research, Development and Monitoring	6,832,000
3.3.17	Technical and Financial Assistance	14,500
3.4	Development and capacity building proposals and priorities	18,700,000
Total	**All Tasks and Activities** **NIP Coordination (15% of the Total Cost of All Tasks**	**$101,439,300** **$15,215,895**
Grand Total		**$116,655,195**

Table EC 2 indicates the priority Post NIP Projects identified at the endorsement workshop held during 24-25 November 2007.

Table EC 2
List of Post NIP Projects for Nigeria identified at the Endorsement Workshop in November 2007

S/N	POST NIP PROJECTS FOR NIGERIA
1	African Stockpile Project (ASP) on the disposal of obsolete pesticides
2	PCB Management Plan for Nigeria- Inventory, disposal of PCB equipment and PCB Oils, contamination levels of ecosystems, Post Impact Environmental and Health Impact Assessment.
3	Demonstration of BAT/BEP implementation in selected industries together with the Cleaner Production Concept.
4	Development and Assessment of Alternatives to POPs Pesticides e.g. Neem Tree
5	Alternatives to Open Air Burning of Wastes
6	Strengthening of National Capacity for POPs Monitoring including the establishment of a sub-regional and regional POPs laboratory
7	Updating curriculum of Environmental Management Education in Tertiary Institutions to include POPs issues
8	National Programme on Emergency Response for POPs

Post NIP Projects

Some of the Post NIP projects identified have already been approved for funding by GEF especially the projects on obsolete POPs pesticides under the ASP as well as the sub – regional project on contaminated sites between Nigeria and Ghana. The World Bank recently gave a USD 250,000 grant to FMEHUD for inventory of PCBs and PCBs containing equipment in Nigeria; especially as limited and inadequate data was obtained in this sector during the NIP study. A BAT/BEP project is being prepared by UNIDO to promote its implementation in selected industries using the cleaner production concept with the aim of demonstrating reduction and elimination of unintentional production of POPs in industry recognized by the preliminary inventory conducted, as key sources of UPOPs chemicals and promotes the adoption of best available techniques and best environmental practice.

In response to the high releases of UPOPs from uncontrolled burning of refuse and a lesser degree from chemicals production and manufacturing, the Nigerian government has taken some positive actions already. Integrated waste management projects are planned for seven urban centres in a public – private partnership initiative to minimise UPOPs release from waste burning. The government has pledged about US$ 2.0 million for each urban centre and

has already released US $ 2 million per centre for the take off of the projects in Ibadan, Oyo state and Aba in Abia state. A BAT/BEP project is about to be formulated for minimisation of UPOPs release from already identified manufacturing sectors. Capacity building for POPs monitoring is critical for assessing the success of mitigation measures being developed for UPOPs minimisation and phase out. In this regard, the establishment of a regional monitoring laboratory for POPs in Nigeria, which will also serve other countries in the West African sub-region or the entire African region, is a top priority. Since any reforms in the institutional and regulatory framework would entail enactment of new laws, awareness workshops for legislators at the federal, state and local governments become imperative.

There is no comprehensive national law on chemicals, although piecemeal legislation exists to deal with chemicals issues, but not specific to POPs. There is limited institutional capacity for monitoring of POPs. The existing regulatory institutions are not specifically involved in POPs monitoring. Interagency cooperation including information sharing and exchange is poor. The FMEHUD and NAFDAC and some Nigerian universities have laboratory facilities for POPs analysis but they require capacity enhancement, specifically upgrading of facilities and retraining of the staff. The assessment found no inter-ministerial reporting network on POPs; there is also no specific media available for dissemination of POPs information. It is therefore critical to develop a roadmap for effective public information dissemination, education and awareness creation on POPs. Most of the stakeholders showed lack of awareness of the POPs issue. Consequently, Nigeria shall build capacity in information generation and dissemination for the purpose of meeting her obligation under Article 10 of the Convention.

Eighteen (18) Action plans with timelines and costs have been prepared to address the multidimensional issues identified and agreed to at the National Validation and Priority Setting Workshop held in Abuja 22-25 January 2007. This National Implementation Plan (NIP) has been discussed and endorsed at a National Workshop held on 24-25 October 2007. The NIP will be forwarded to the Stockholm Convention Secretariat.

1. INTRODUCTION

1.1. The Dirty Dozen

There is international concern in recent times based on scientific and toxicological evidence about the dangers to human health and the environment from persistent toxic chemicals and their wastes (UNEP 1999). Of special concern is a group of 12 chemicals known as "Persistent Organic Pollutants" or "POPs" based on the UNEP Governing Council decision of February 1997, as chemicals internationally recognised as needing immediate global action. International efforts at minimising and eventually phasing out POPs globally gave rise to the Stockholm Convention on POPs in May 2001.

The Stockholm Convention, which is global in scope and multimedia in coverage, identifies twelve substances for initial global action. These substances are categorized as 8 pesticides; 2 industrial chemicals; and 2 chemical by-products that are unintentionally formed and released to the environment in combustion and chemical processes. These substances are: aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, mirex, toxaphene; hexachlorobenzene, polychlorinated biphenyls (PCBs); dioxins and furans. See Table 1.1 for the twelve POPs. The POPs have the undesirable characteristics of persistence, long-range transport from point of origin in the environment, bioaccumulation in humans and other organisms through the food chain as well as adverse effects to humans and wildlife.

Table 1.1
Initial List of 12 Persistent Organic Pollutants (POPs)

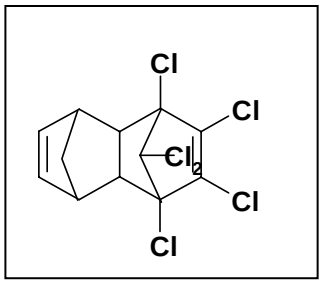
Name	Pesticide	Industrial Chemical	By-product
Aldrin			
Chlordane			
DDT			
Dieldrin			
Endrin			
Heptachlor			
Mirex			
Toxaphene			
HCB			
PCB			
PCDD			
PCDF			

1.2. *General Information on the Physico-Chemical Properties of 12 Persistent Organic Pollutants*

The summary of physico-chemical properties, including eco-toxicological and safety data, on each of the POPs chemicals is given below.

Pesticides

Aldrin



Chemical Name: 1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-hexahydro-1,4-endo, exo-5,8-dimethanonaphthalene ($C_{12}H_8Cl_6$).

CAS Number: 309-00-2

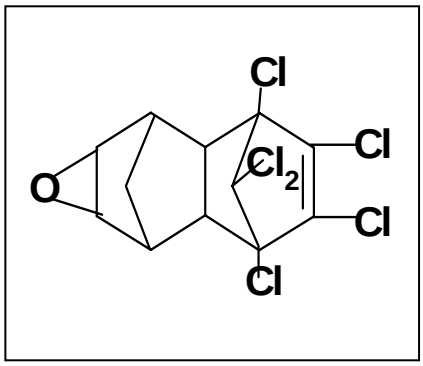
Properties: Solubility in water: 27 µg/L at 25°C; vapour pressure: 2.3 x 10^{-5} mm Hg at 20°C; log KOW: 5.17- 7.4.

Discovery/Uses: It has been manufactured commercially since 1950, and used throughout the world up to the early 1970s to control soil pests such as corn rootworm, wireworms, rice water weevil, and grasshoppers. It has also been used to protect wooden structures from termites.

Persistence/Fate: Readily metabolized to dieldrin by both plants and animals. Biodegradation is expected to be slow and it binds strongly to soil particles, and is resistant to leaching into groundwater. Aldrin was classified as moderately persistent with half-life in soil and surface waters ranging from 20 days to 1.6 years.

Toxicity: Aldrin is toxic to humans; the lethal dose for an adult has been estimated to be about 80 mg/kg body weight. The acute oral LD_{50} in laboratory animals is in the range of 33 mg/kg body weight for guinea pigs to 320 mg/kg body weight for hamsters. The toxicity of aldrin to aquatic organisms is quite variable, with aquatic insects being the most sensitive group of invertebrates. The 96-h LC_{50} values range from 1-200 µg/L for insects, and from 2.2-53 µg/L for fish. The maximum residue limits in food recommended by FAO/WHO varies from 0.006 mg/kg milk fat to 0.2 mg/kg meat fat. Water quality criteria from 0.1 to 180 µg/L have been published.

Dieldrin



Chemical Name: 1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydroexo-1,4-endo-5,8-dimethanonaphthalene ($C_{12}H_8Cl_6O$).

CAS Number: 60-57-1

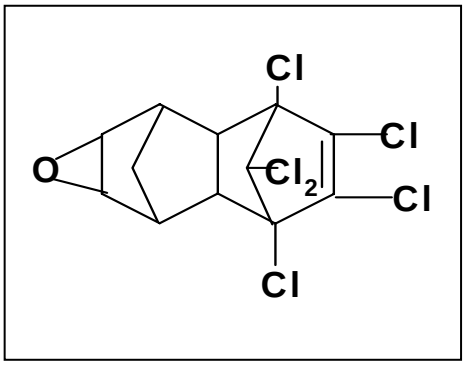
Properties: Solubility in water: 140 µg/L at 20°C; vapour pressure: 1.78 x 10^{-7} mm Hg at 20°C; log KOW: 3.69-6.2.

Discovery/Uses: It appeared in 1948 after World War II and was used mainly for the control of soil insects such as corn rootworms, wireworms and cat worms.

Persistence/Fate: It is highly persistent in soils, with a half-life of 3-4 years in temperate climates, and bioconcentrates in organisms. The persistence in air has been estimated at 4-40 hrs.

Toxicity: The acute toxicity for fish is high (LC_{50} between 1.1 and 41 mg/L) and moderate for mammals (LD_{50} in mouse and rat ranging from 40 to 70 mg/kg body weight). However, a daily administration of 0.6mg/kg to rabbits adversely affected the survival rate. Aldrin and dieldrin mainly affect the central nervous system but there is no direct evidence that they cause cancer in humans. The maximum residue limits in food recommended by FAO/WHO varies from 0.006 mg/kg milk fat and 0.2 mg/kg poultry fat. Water quality criteria from 0.1 to 18 µg/L have been published.

Endrin



Chemical Name: 3,4,5,6,9,9-Hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-2,7:3,6-dimethanonaphth[2,3-b]oxirene ($C_{12}H_8Cl_6O$).

CAS Number: 72-20-8

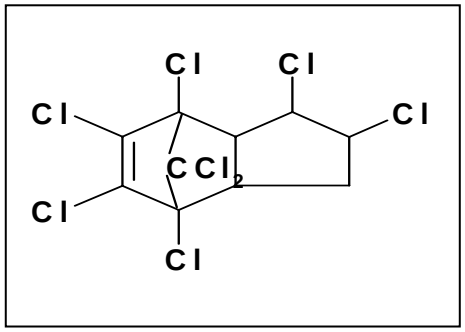
Properties: Solubility in water: 220-260 µg/L at 25 °C; vapour pressure: 2.7 x 10^{-7} mm Hg at 25°C; log KOW: 3.21-5.34

Discovery/Uses: It has been used since the 1950s against a wide range of agricultural pests, mostly on cotton but also on rice, sugar cane, maize and other crops. It has also been used as a rodenticide.

Persistence/Fate: Is highly persistent in soils (half-lives of up to 12 years have been reported in some cases). Bio-concentration factors of 14 to 18,000 have been recorded in fish, after continuous exposure.

Toxicity: Endrin is very toxic to fish, aquatic invertebrates and phytoplankton; the LC_{50} values are mostly less than 1 µg/L. The acute toxicity is high in laboratory animals, with LD_{50} values of 3-43 mg/kg, and a dermal LD_{50} of 5-20 mg/kg in rats. Long-term toxicity in the rat has been studied over two years and a NOEL of 0.05 mg/kg bw/day was found.

Chlordane



Chemical Name: 1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methanoindene ($C_{10}H_6Cl_8$).

CAS Number: 57-74-9

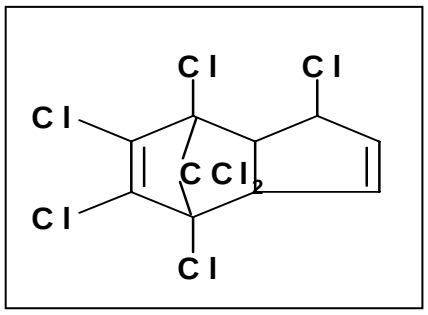
Properties: Solubility in water: 56 µg/L at 25°C; vapour pressure: 0.98 x 10^{-5} mm Hg at 25°C; log KOW: 6.00.

Discovery/Uses: Chlordane appeared in 1945 and was used primarily as an insecticide for control of cockroaches, ants, termites, and other household pests. Technical chlordane is a mixture of at least 120 compounds. Of these, 60-75% are chlordane isomers, the remainder being related to endo-compounds including heptachlor, nonachlor, Diels-Alder adduct of cyclopentadiene and penta/hexa/octachlorocyclopentadienes.

Persistence/Fate: Chlordane is highly persistent in soils with a half-life of about 4 years. Its persistence and high partition coefficient promotes binding to aquatic sediments and bioconcentration in organisms.

Toxicity: LC_{50} from 0.4 mg/L (pink shrimp) to 90 mg/L (rainbow trout) have been reported for aquatic organisms. The acute toxicity for mammals is moderate with an LD_{50} in rat of 200-590 mg/kg body weight (19.1 mg/kg body weight for oxychlordane). The maximum residue limits for chlordane in food are, according to FAO/WHO between 0.002 mg/kg milk fat and 0.5 mg/kg poultry fat. Water quality criteria from 1.5 to 6 µg/L have been published. Chlordane has been classified as a substance for which there is evidence of endocrine disruption in an intact organism and possible carcinogenicity to humans.

Heptachlor



Chemical Name: 1,4,5,6,7,8,8-Heptachloro-3a,4,7,7a-tetrahydro-4,7-methanoindene ($C_{10}H_5Cl_7$).

CAS Number: 76-44-8

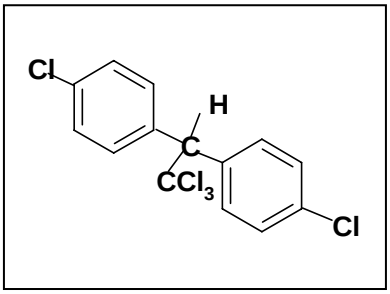
Properties: Solubility in water: 180 µg/L at 25°C; vapour pressure: 0.3 x 10^{-5} mm Hg at 20°C; log KOW: 4.4-5.5.

Production/Uses: Heptachlor is used primarily against soil insects and termites, but also against cotton insects, grasshoppers, and malaria mosquitoes. Heptachlor epoxide is a more stable breakdown product of heptachlor.

Persistence/Fate: Heptachlor is metabolised in soils, plants and animals to heptachlor epoxide, which is more stable in biological systems and is carcinogenic. The half-life of heptachlor in soil is in temperate regions 0.75 – 2 years. Its high partition coefficient provides the necessary conditions for bioconcentrating in organisms.

Toxicity: The acute toxicity of heptachlor to mammals is moderate (LD_{50} values between 40 and 119 mg/kg have been published). The toxicity to aquatic organisms is higher and LC_{50} values down to 0.11 µg/L have been found for pink shrimp. Limited information is available on the effects in humans and studies are inconclusive regarding heptachlor and cancer. The maximum residue levels recommended by FAO/WHO are between 0.006 mg/kg milk fat and 0.2 mg/kg meat or poultry fat.

Dichlorodiphenyltrichloroethane (DDT)



Chemical Name: 1,1,1-Trichloro-2,2-bis-(4-chlorophenyl)-ethane ($C_{14}H_9Cl_5$).

CAS Number: 50-29-3.

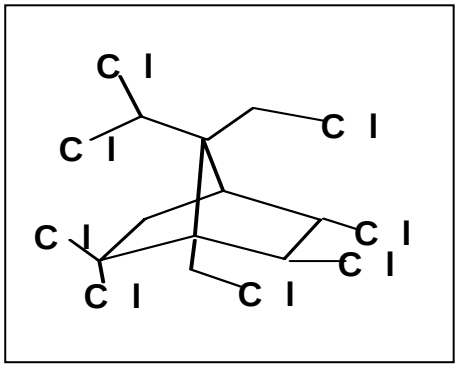
Properties: Solubility in water: 1.2-5.5 µg/L at 25°C; vapour pressure: 0.2 x 10^{-6} mm Hg at 20°C; log KOW: 6.19 for *p,p'*-DDT, 5.5 for *p,p'*-DDD and 5.7 for *p,p'*-DDE.

Discovery/Use: DDT appeared for use during World War II to control insects that spread diseases like malaria, dengue fever and typhus. Following this, it was widely used on a variety of agricultural crops. The technical product is a mixture of about 85% *p,p'*-DDT and 15% *o,p'*-DDT isomers.

Persistence/Fate: DDT is highly persistent in soils with a half-life of up to 15 years and of 7 days in air. It also exhibits high bioconcentration factors (in the order of 50,000 for fish and 500,000 for bivalves). In the environment, the product is metabolized mainly to DDD and DDE.

Toxicity: The lowest dietary concentration of DDT reported to cause egg shell thinning was 0.6 mg/kg for the black duck. LC_{50} of 1.5 mg/L for largemouth bass and 56 mg/L for guppy have been reported. The acute toxicity of DDT for mammals is moderate with an LD_{50} in rat of 113-118 mg/kg body weight. DDT has been shown to have an estrogens'-like activity, and possible carcinogenic activity in humans. The maximum residue level in food recommended by WHO/FAO range from 0.02 mg/kg milk fat to 5 mg/kg meat fat. Maximum permissible DDT residue levels in drinking water (WHO) is 1.0 µg/L.

Toxaphene



Chemical Name: Polychlorinated bornanes and camphenes ($C_{10}H_{10}Cl_8$).

CAS Number: 8001-35-2

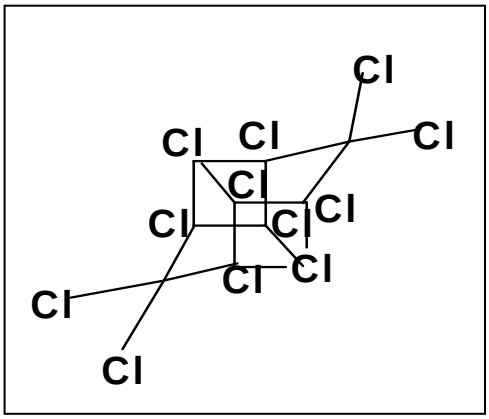
Properties: Solubility in water: 550 µg/L at 20°C; vapour pressure: 3.3 x 10^{-5} mm Hg at 25°C; log KOW: 3.23-5.50.

Discovery/Uses: Toxaphene has been in use since 1949 as a nonsystemic insecticide with some acaricidal activity, primarily on cotton, cereal grains fruits, nuts and vegetables. It was also used to control livestock ectoparasites such as lice, flies, ticks, mange, and scab mites. The technical product is a complex mixture of over 300 congeners, containing 67-69% chlorine by weight.

Persistence/Fate: Toxaphene has a half-life in soil from 100 days up to 12 years. It has been shown to bioconcentrate in aquatic organisms (BCF of 4247 in mosquito fish and 76000 in brook trout).

Toxicity: Toxaphene is highly toxic in fish, with 96-hour LC_{50} values in the range of 1.8 µg/L in rainbow trout to 22 µg/L in bluegill. Long term exposure to 0.5 µg/L reduced egg viability to zero. The acute oral toxicity is in the range of 49 mg/kg body weight in dogs to 365 mg/kg in guinea pigs. In long term studies, NOEL in rats was 0.35 mg/kg bw/day, LD_{50} ranging from 60 to 293 mg/kg bw. For toxaphene a strong evidence exists of the potential for endocrine disruption. Toxaphene is carcinogenic in mice and rats and is of carcinogenic risk to humans, with a cancer potency factor of 1.1 mg/kg/day for oral exposure.

Mirex



Chemical Name: 1,1a,2,2,3,3a,4,5,5a,5b,6-Dodecachloroacta-hydro-1,3,4-metheno-1Hcyclobuta[cd]pentalene ($C_{10}Cl_{12}$).

CAS Number: 2385-85-5

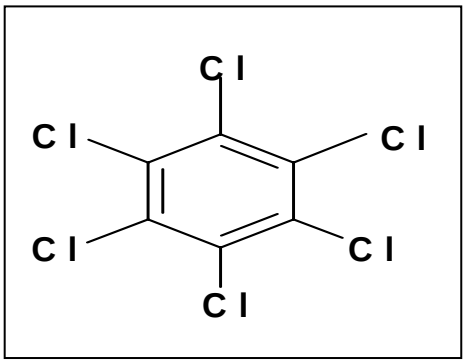
Properties: Solubility in water: 0.07 µg/L at 25°C; vapour pressure: 3 x 10^{-7} mm Hg at 25°C; log KOW: 5.28.

Discovery/Uses: The use in pesticide formulations started in the mid 1950s largely focused on the control of ants. It is also a fire retardant for plastics, rubber, paint, paper and electrical goods. Technical grade preparations of mirex contain 95.19% mirex and 2.58% chlordecone, the rest being unspecified. Mirex is also used to refer to bait comprising corncob grits, soy bean oil, and mirex.

Persistence/Fate: Mirex is considered to be one of the most stable and persistent pesticides, with a half-life in soils of up to 10 years. Bio-concentration factors of 2,600 and 51,400 have been observed in pink shrimp and fathead minnows, respectively. It is capable of undergoing long-range transport due to its relative volatility (VPL = 4.76 Pa; H = 52 Pa m^3/mol).

Toxicity: The acute toxicity of mirex for mammals is moderate with an LD_{50} in rat of 235 mg/kg and dermal toxicity in rabbits of 80 mg/kg. Mirex is also toxic to fish and can affect their behaviour (LC_{50} [96 hr] from 0.2 to 30 mg/L for rainbow trout and bluegill, respectively). Delayed mortality of crustaceans occurred at 1 µg/L exposure levels. There is evidence of its potential for endocrine disruption and possibly carcinogenic risk to humans.

Hexachlorobenzene (HCB)



Chemical Name: Hexachlorobenzene (C_6H_6).

CAS Number: 118-74-1

Properties: Solubility in water: 50 µg/L at 20°C; vapour pressure: 1.09 x 10^{-5} mm Hg at 20°C; log KOW: 3.93-6.42.

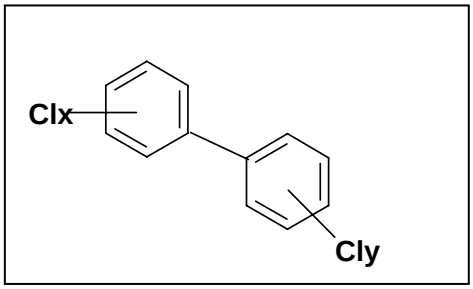
Discovery/Uses: It was first introduced in 1945 as fungicide for seed treatments of grain crops, and used to make fireworks, ammunition, and synthetic rubber. Today it is mainly a by-product in the production of a large number of chlorinated compounds, particularly lower chlorinated benzenes, solvents and several pesticides. HCB is emitted to the atmosphere in flue gases generated by waste incineration facilities and metallurgical industries.

Persistence/Fate: HCB has an estimated half-life in soils of 2.7-5.7 years and of 0.5-4.2 years in air. HCB has a relatively high bioaccumulation potential and long half-life in biota.

Toxicity: LC_{50} for fish varies between 50 and 200 µg/L. The acute toxicity of HCB is low with LD_{50} values of 3.5 mg/g for rats. Mild effects on the rat liver have been observed at a daily dose of 0.25 mg HCB/kg bw. HCB is known to cause liver disease in humans (porphyria cutanea tarda) and has been classified as a possible carcinogen to humans by IARC.

Industrial chemicals and UPOPs

Polychlorinated biphenyls (PCBs)



Chemical Name: Polychlorinated biphenyls ($C_{12}H_{(10-n)}Cl_n$, where n is within the range of 1 - 10).

CAS Number: Various (e.g., for Aroclor 1242, CAS No.: 53469-21-9; for Aroclor 1254, CAS No.: 11097-69-1);

Properties: Water solubility decreases with increasing chlorination: 0.01 to 0.0001 µg/L at 25°C; vapour pressure: 1.6-0.003 x 10^{-6} mm Hg at 20°C; log KOW: 4.3-8.26.

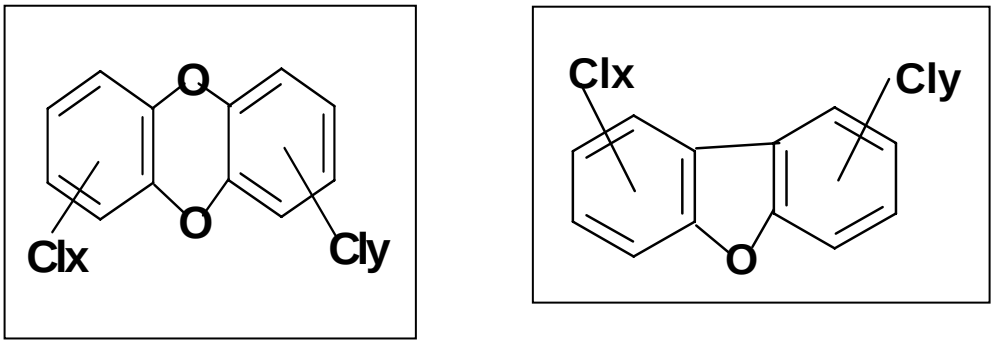
Discovery/Uses: PCBs were introduced in 1929 and were manufactured in different countries under various trade names (e.g., Aroclor, Clophen, Phenoclor). They are chemically stable and heat resistant, and were used worldwide as transformer and capacitor oils, hydraulic and heat exchange fluids, and lubricating and cutting oils. Theoretically, a total of 209 possible chlorinated biphenyl congeners exist, but only about 130 of these are likely to occur in commercial products.

Persistence/Fate: Most PCB congeners, particularly those lacking adjacent unsubstituted positions on the biphenyl rings (e.g., 2,4,5-, 2,3,5- or 2,3,6-substituted on both rings) are

extremely persistent in the environment. They are estimated to have half-lives ranging from three weeks to two years in air and, with the exception of mono- and di-chlorobiphenyls, more than six years in aerobic soils and sediments. PCBs also have extremely long half-lives in adult fish, for example, an eight-year study of eels found that the half-life of CB153 was more than ten years.

Toxicity: LC_{50} for the larval stages of rainbow trout is 0.32 µg/L with a NOEL of 0.01 µg/L. The acute toxicity of PCB in mammals is generally low and LD_{50} values in rat of 1g/kg bw. IARC has concluded that PCBs are carcinogenic to laboratory animals and probably also for humans. They have also been classified as substances for which there is evidence of endocrine disruption in an intact organism.

Polychlorinated dibenzo-p-dioxins (PCDDs) and Polychlorinated dibenzofurans (PCDFs)



Chemical Name: PCDDs ($C_{12}H_{(8-n)}Cl_nO_2$) and PCDFs ($C_{12}H_{(8-n)}Cl_nO$) may contain between 1 and 8 chlorine atoms. Dioxins and furans have 75 and 135 possible positional isomers, respectively.

CAS Number: Various (2,3,7,8-TetraCDD: 1746-01-6; 2,3,7,8-TetraCDF: 51207-31-9)

Properties: Solubility in water: in the range 0.43 – 0.0002 ng/L at 25°C; vapour pressure: 2-0.007 x 10^{-6} mm Hg at 20°C; log KOW: in the range 6.60 – 8.20 for tetra- to octa-substituted congeners.

Discovery/Uses: They are by-products resulting from the production of other chemicals and from the low temperature combustion and incineration processes. They have no known use.

Persistence/Fate: PCDD/Fs are characterized by their lipophilicity, semi-volatility and resistance to degradation (half-life of TCDD in soil of 10-12 years) and to long-range transport. They are also known for their ability to bioconcentrate and biomagnify under typical environmental conditions.

Toxicity: The toxicological effects reported refers to the 2,3,7,8-substituted compounds (17 congeners) that are agonist for the AhR. All the 2,3,7,8-substituted PCDDs and PCDFs plus coplanar PCBs (with no chlorine substitution at the ortho positions) show the same type of biological and toxic response. Possible effects include dermal toxicity, immunotoxicity, reproductive effects and teratogenicity, endocrine disruption and carcinogenicity. At the present time, the only persistent effect associated with dioxin exposure in humans is chloracne. The most sensitive groups are foeti and neonatal infants. Effects on the immune

systems in the mouse have been found at doses of 10 ng/kg bw/day, while reproductive effects were seen in rhesus monkeys at 1-2 ng/kg bw/day. Biochemical effects have been seen in rats down to 0.1 ng/kg bw/day. In a re-evaluation of the TDI for dioxins, furans (and planar PCBs), the WHO decided to recommend a range of 1-4 TEQ pg/kg bw, although more recently the acceptable intake value has been set monthly at 1-70 TEQ pg/kg bw.

1.3 POPs Enabling Activities

In the year 2000, the Global Environment Facility (GEF) Secretariat authorised up to $150 million in existing resources to be utilized in support of Enabling Activities in the POPs Project following signature of the Stockholm Convention in May 2001. The principal focus of these Enabling Activities is to assist countries in preparation of their Implementation Plans and first reporting obligations. Enabling Activities represent a basic building block of GEF assistance to countries. They are a means of fulfilling essential communication requirements to the Convention, providing a basic and essential level of information to enable policy and strategic decisions to be made, or assisting the development of plans that identify priority activities within a country.

Following the approval of the GEF Council of Regional Program on the Development of National Implementation Plans (NIPs) for the Management of POPs at its May 2001 meeting, Nigeria applied to GEF with UNIDO as the implementing Agency and solicited the inclusion of the country among the first group of countries to benefit from US$500,000 POPs Enabling Activities.

This process was completed in the following 5 phases:

i. Determination of the coordinating and organizational process
ii. Establishment of POPs inventories; assessment and strengthening of the national infrastructure and capacity - the development of Initial National POPs Infrastructure (INPOPsI)
iii. Determination of objectives and setting of priorities - organization of National Priority Validation Workshop (NPVW)
iv. Formulation of the National Implementation Plan (NIP) and Specific Action Plan on POPs (SAPs POPs) including expert review
v. Endorsement of National Implementation Plan

1.3.1 The Purpose of the NIP Project

Under Article 7 of the Convention, Nigeria, as a Contracting Party, is obligated to develop and implement a National Implementation Plan (NIP). The purpose of the NIP is to inform the Conference of the Parties and the public regarding national initiatives and projects designed to meet the requirements of the Stockholm Convention.

These initiatives include the preparation of legislation, regulations, voluntary programmes, standards, policies, plans, programmes and other actions by the Nigerian government to manage and eliminate POPs from the environment.

Articles 3 and 5 of the Convention stipulate that the NIP shall include a National Action Plan (NAP) for reducing intentionally and unintentionally produced POPs, such as polychlorinated dioxins and furans, hexachlorobenzene (HCB) and polychlorinated biphenyls (PCBs).

The project aims at formulating a national implementation plan in order to protect human health and the environment from POPs chemicals. The Project will have the five main outcomes:

i. Determination of the coordinating and organization process - this phase will end with the organisation of Inception Workshop (IW);
ii. Establishment of POPs inventories; assessment and strengthening of the national infrastructure and capacity - the development of Initial National POPs Inventory (INPOPsI);
iii. Determination of objectives and setting of priorities - organisation of National Priority Validation Workshop (NPVW)
iv. Formulation of National Implementation Plan (NIP) and Specific Action Plans on POPs (SAPsPOPs) including expert review;
v. Endorsement of the National Implementation Plan by the stakeholders (organisation of workshop).

1.4 Project Objectives

The project objectives are as follows:

i. Allowing Nigeria to meet her reporting obligations under the Stockholm Convention
ii. Preparing the ground for the implementation of the Stockholm Convention in Nigeria
iii. Strengthening national capacity to manage POPs and other chemicals in general
iv. Developing and endorsing its national Implementation Plan on POPs

This report presents the results and recommendations of the National POPs Inventory study for Nigeria.

1.5 Development of the Nigerian National Implementation Plan

The development of this National Implementation Plan arises from the recognition by the Nigerian Government that the Stockholm Convention is relevant to Nigeria and that its implementation is beneficial to the National Development Plan for 2003 - 2020 and the achievement of Nigeria's Millennium Development Goals insofar as they relate to POPs.

To develop the NIP, a POPs Coordinating Office was established in the Federal Ministry of Environment, Housing and Urban Development (FMEHUD), which has the mandate for the overall protection of the Nigerian environment and the conservation of natural resources. The Federal Ministry of Environment, Housing and Urban Development (FMEHUD) developed the Nigerian NIP through a consultative process. The main mechanism has been through the use of guidelines provided by UNEP and UNIDO combined with UNEP/UNIDO consultation and participation in national activities that have a bearing to Stockholm Convention.

The process has identified priority POPs through stakeholder consultations and formulated an Environmental Action Plan for POPs and assessed infrastructure as contained in Annex 3 to this plan. Since the signing and ratification of the Convention, there have been wide national consultations with key stakeholders and the public concerning regulatory aspects, monitoring, research, manufacturing, capacity building, disposal, and awareness creation in relation to POPs.

This NIP is consistent with the Convention guidelines that specify that, where appropriate Parties shall cooperate, directly or indirectly, with global, regional and sub-regional organizations and consult national stakeholders, including women's groups and groups involved in the health of children, to facilitate the development, implementation and updating of national implementation plans.

The guidelines further require that the Parties endeavour to utilize and, where appropriate, integrate their national implementation plans for persistent organic pollutants into their sustainable development strategies. The development of this NIP therefore follows these basic obligations as well as the guidelines issued and adopted by the Contracting Parties at the First Conference of Parties.

The following is a summary of various actions, which have been taken in the process of developing the NIP. They included:

- The involvement of policymakers, regulatory bodies, researchers, manufacturers and other stakeholders; the process included consultative meetings, workshops, seminars, surveys and awareness creation activities;
- Strong delegations at Intergovernmental Negotiating Committees, and at the First and Second Conference of Parties;
- 2-days lnception Workshop in 19-20 August 2002 in Abuja;
- Formation of an inter-ministerial/intersectoral National Coordinating Committee for NIP POPs in 20 August 2002 (Annex 1);
- 2-days training in POPs inventory in 2003 by UNIDO international Consultant Dr. Szabolcs Fejes;
- Field surveys/visits in the six geo-political zones of Nigeria in 2003/2004.
- 3-days National Revalidation and Priority Setting Training Workshops held back to back in 22-24 January 2007 in Abuja facilitated by UNIDO international Consultant Dr Richard Temsch;
- 2-days roundtable meeting of the National Steering Committee on POPs in 24-25 January 2007 ;

- 2-days National Workshop to Review and Endorse the Draft NIP in 24-25 October 2007 facilitated by UNIDO international Consultant Dr. Richard Temsch;

1.6 POPs Inventory Project Objectives and Output

The objective of inventory project is to identify the sources and estimate releases of persistent organic pollutants with a view to reducing and/or eliminating their releases in line with the objectives of the Stockholm Convention on Persistent Organic Pollutants (POPs).

The inventory study relied upon the collection and assessment of existing data and information all around the country.

The three main objectives of the inventory study were as follows:

(i) Identification and evaluation of major sources at the national level including information on production, distribution, use, import and export, etc., including obsolete stocks of:

- POPs pesticides (Annex A, part I chemicals)
- DDT (Annex B chemicals)
- Polychlorinated Biphenyls – PCBs (Annex A, Part II chemicals)
- Releases from unintentional production of PCDDs/PCDFs, HCB and PCBs (Annex C Chemicals)
- Identification and survey of contaminated sites
- Monitoring of releases and environmental and human health impacts
- Assessment of current legislation and POPs regulated infrastructure
- Baseline assessment of public information and awareness of POPs issues

(ii) Producing a report analyzing the data covering inventory issues itemized in (i) above

(iii) Making appropriate recommendations including future work

1.7 Inventory Methodology

The project relied upon the collection and interpretation of existing data and information as the basis for the assessment. No research was undertaken to generate primary data, but projections were made as appropriate to fill data/information gaps, and to predict threats to the environment.

1.7.1 Ronal Offices

To achieve the national result, the country was divided into the six recognised geopolitical zones, namely: South West, South East, South- South, North Central, North West and North East, while Lagos State, which houses about 70% of industries in the country as well as the major sea ports, was designated the seventh zone although it is part of the South West zone. Details of the government agencies, other stakeholders involved in the inventory study and their locations are presented in Section 1.7.4 below.

1.7.2 Management structure

The National Project Coordinator in collaboration with the implementing ministry, the Federal Ministry of Environment, Housing and Urban Development (FMEHUD), established seven geopolitical task teams for effective coverage and ensuring participation of all the states of the country and the Federal Capital Abuja. A team leader coordinated each geopolitical zone. Each team leader appointed supervisors as appropriate to coordinate the field studies while each supervisor appointed a number of enumerators, who actually carried out the distribution of questionnaires and interview of stakeholders with oversight function by the supervisors. The latter were appointed mainly from among the officers of the states' Ministries of Environment or Agriculture or Health and the Federal Ministry of Environment, Housing and Urban Development (FMEHUD), while the Team Leaders were mostly from academia.

1.7.3 Pre-inventory activities

As part of the preparatory activities for the study take-off, relevant stakeholders were identified, and they included industries, manufacturers associations, regulatory agencies, agricultural/health research institutes, universities, chemicals marketing companies, Civil Society Organisations (CSOs), including Non Governmental Organisations (NGOs) and Community Based Organisation (CBOs). Thereafter UNIDO international consultants trained the team leaders on the methodology for the inventory study. The team leaders in turn trained the supervisors while the latter trained the filed enumerators in the inventory methodology. The content of the questionnaires (Appendix 2) to be administered was reviewed with team leaders, supervisors and enumerators prior to field activities.

1.7.4 Inventory activities

The following sources, where existing data on POPs chemicals could be obtained from various stakeholders, were identified and made available for field work:

- Livestock & Vector Disease Pests Control – Agricultural Development Programmes (ADPs) in all the states, Project Coordinating Unit (PCU) Abuja, abattoirs, National Livestock & Pest Control Unit, Food and Agricultural Organization (FAO), World Bank, relevant research institutes, e.g., Veterinary Research Institute VOM, veterinary public health faculties and faculties of agriculture in universities, colleges of agriculture in the states, International Institute for Tropical Agriculture (IITA) Ibadan, International Livestock Research Institute (ILRI), Federal Ministry of Science and Technology, etc.
- Agriculture Pests Control – Federal and States Ministry of Agriculture, Federal Department of Agriculture, Federal and States Ministries of Environment, Agricultural Development Projects (ADPs), Project Coordinating Unit (PCU), abattoirs, agricultural research institutes, river basin development authorities, Veterinary Research Institute VOM, veterinary public health, faculties of agriculture in universities, colleges of

agriculture, Institute of International Tropical Agriculture (IITA), forestry special projects, e.g., trypanomiasis/tsetse flies control projects, etc.

- Industries – agrochemical formulation and blending plants, e.g., CAPL, CONOIL, Mobil, AP, Unipetrol, etc., MAN, NACCIMA, textile manufacturing plants, Association of Textile Manufacturers, NEPA/PHCN, FMENV, SON, NAFDAC, multinational industries –manufacturing, oil and gas industry, railways, etc.
- POPs imports – Federal Office of Statistics, Central Bank, MAN, NAFDAC, FMENV, chemical importers and marketing/sale companies, NEPA, NEPA World Bank projects, customs, NPA ports in Lagos, Port Health in Apapa, Port Harcourt (PH), Onne, Warri, etc.
- PCBs and obsolete stocks – National Electrical Power Authority (NEPA/PHCN), NEPA Power Stations nationwide, e.g., Jebba, Kainji, Shiroro, Afam, Osogbo, Sapele for PCBs; ADPs, FAO, Federal Department of Agriculture, FMENV, World Bank, etc., for obsolete stocks, manufacturing industries
- Uncontrolled burning of wastes – States Waste Disposal Boards, FMENV, SEPAs, industries, medical wastes, abattoirs, large markets, etc.
- Desk study of reports of OAU/AU, UNDP, FAO, UNIDO, WHO, etc., projects in Nigeria relevant to POPs
- Burning of biomass – FMENV, Federal Department of Agriculture, NEST, FAO, World Bank, etc.
- Contaminated sites – past agrochemical formulation plants sites, Nigerian Railways, NEPA, NES, power generation stations, incinerators, boilers, incinerator plants (high and low temperature), etc.
- Ports Authority – Port Health, chemicals imports into the country
- UNEP Chemicals "Standardised Toolkit for Identification and Quantification of Dioxin and Furan Releases", published in 2001 (revised 2005). The Toolkit is a methodology to help countries just developing their inventories to estimate releases of dioxin/furan and also leads them through the process of how to enhance and refine these inventories. One of the Toolkit key elements is an effective methodology for identifying the relevant industrial and non-industrial processes releasing dioxins and furans to air, water, land, products and residues.

1.7.5 Data processing

Data was collected through the administration/distribution of questionnaires by field enumerators/supervisors, to relevant stakeholders that are government ministries/agencies/research institutes, industries, marketers, tertiary educational institutions, Non Governmental Organisations identified in paragraph 1.7.4 above, of prepared questionnaires (Appendix 2) on sources all over the country; including information on production, distribution, use, import and export, etc., environmental concentrations, human and ecological effects. The National Project Coordinator coordinated data collection and processing

2. Country Baseline

2.1. Country Profile

Figure 2.1
Map of Nigeria interposed between maps of Africa and the World

2.1.1. Geography and Population

The Federal Republic of Nigeria covers an area of 923,768 m^2 on the shores of the Gulf of Guinea, with Republics of Benin to the west, Niger to the north, Chad to the north-east, and Cameroon to the east and south-east and the Atlantic Ocean to the south respectively. The land area covers 910,768 m^2 while water covers 13,000 m^2. The River Niger which runs through the entire country enters the country in the northwest and flows southward through tropical rain forests and swamps to its delta in the Gulf of Guinea The country is located on the west coast of Africa between latitudes 4.16 and 13.52 north and longitudes 2.40 and 14.32 east. The country has a humid sub-tropical climate, which is variable: equatorial in south, tropical in the centre, and arid in the north. The southern part is located on the Atlantic Ocean in the Gulf of Guinea. The coastline is 853 km long. The country's population is estimated at 140 million (National Population Commission 2005). It is the most populous country in Africa. About seventy percent (70%) of the population is rural based. The rate of urbanization is high due to significant rural-urban migration. There are more than 500 spoken languages, and well over 250 ethnic groups, some numbering fewer than 10,000 people, while Hausa, Ibo and Yoruba are the major linguistic groups. English is the official language and lingua franca of the country.

The broad pattern of soil distribution in the country reflects both the climatic conditions and the geological structure: heavily leached, reddish brown, sandy soils are found in the south, and light or moderately leached, yellowish-brown, sandy soils in the north. The nutrient content of the soils is linked to the geological structure. Over a large part of the northern and south western areas of the country, the geological structure is that of old crystalline basement complex rocks. These are highly mineralised and give rise to soils of high nutrient status,

although variable from place to place. On the sedimentary rocks found in the southeast, northeast and northwest of the country the soils are sandy and less variable but are deficient in plant nutrient. They are highly susceptible to erosion. The nature of the soil will also influence the environmental fate of POPs applied in agriculture for crop protection in different parts of the country.

2.1.2. **Political and Economic Profile**

After a long period of military rule, democratic governance has been restored since 1999. There is a 3-tier government system (National, State and Local Government). There are 36 States, a Federal Capital Territory (Abuja), 774 Local Government Areas (L.G.A.s) and 6 Geo-political zones namely North East, North West, North Central, South East, South West, and South-South respectively.

The major economic sectors include Oil and Gas, agriculture, industry, mining and quarrying, wholesale and retail trades. Insurance, banking and finance form the major part of the invisible trade.

2.1.3. Profiles of Economic Sectors

The country is well endowed with mineral resources including natural gas, petroleum, tin, iron ore, coal, limestone, niobium, lead, and zinc. Whereas the oil and gas sector contributes about 90% of the country's foreign exchange earning, agriculture is a major component of the country's non-oil sector, contributing on average 71.7% in 1992-94. Apart from food crops to boost national food security, the value of agricultural exports was 2.9% of total GDP during 1988-1992. Cocoa, oil palm, soybean, rubber, fish and shrimps, forest products and cotton are the main agricultural commodities boosting the country's agricultural exports. Hence there were fairly large agricultural and vector disease control activities involving the use of POPs pesticides and other chlorinated pesticides in the past.

The manufacturing sector is diverse with metallurgical, mineral, chemical and allied productions, including those processing and/or producing chlorine-containing chemicals, foundries, cement plants, power plants, as well as a few industrial incinerators for hazardous wastes.

COUNTRY PROFILE	**FEDERAL REPUBLIC OF NIGERIA**
Capital	Abuja
Area	923,768 km^2
Land boundaries	4,047 km (Benin 652 km, Cameroon 773 km, Chad 87 km, Niger 1,497 km)
Coastline	853 km
Climate	Equatorial in the south, tropical in the centre, arid in the north
	Natural gas, petroleum, tin, iron ore, coal, limestone, niobium, lead, zinc
Land Use	*Arable land:* 33.02%, *permanent crops:* 3.14%; *other:* 63.84% (2005)
Irrigated land	2,820 km^2 (2003)
Natural hazards	Periodic droughts; flooding
Environmental issues	Soil degradation; rapid deforestation; urban air and water pollution; desertification; oil pollution - water, air, and soil; has suffered serious damage from oil spills; loss of arable land; rapid urbanization
Geography note	The Niger River enters the country in the northwest and flows southward through tropical rain forests and swamps to its delta in the Gulf of Guinea
Population	131,859,731 (July 2006 est.)
Age structure	*0-14 years:* 42.3%, *15-64 years:* 54.6%, *65 years and over:* 3.1% (2006 est.)
Growth rate	2.38% (2006 est.)
Infant mortality	97.14 deaths/1,000 live births (2006 est.)
Life expectancy	*Total population:* 47.08 years - *female:* 47.66 years *male:* 46.52 years (2006 est.)
Total fertility	**5.49 children born/woman (2006 est.)**
Ethnic groups	More than 250 ethnic groups; Hausa and Fulani 29%, Yoruba 21%, Igbo (Ibo) 18%, Ijaw 10%, Kanuri 4%, Ibibio 3.5%, Tiv 2.5%
Religions	Muslim 50%, Christian 40%, indigenous beliefs 10%
Languages	English (official), Hausa, Yoruba, Igbo (Ibo), Fulani
Literacy	*Definition:* age 15 and over can read and write, *total population:* 68% - *male:* 75.7%, *female:* 60.6% (2003 est.)
Independence	1 October 1960 (from UK)
GDP	Purchasing power parity: $188.5 billion (2006 est.) Official exchange rate: $83.36 billion (2006 est.)

GDP real growth	5.3% (2006 est.)
GDP - per capita	Purchasing power parity - $1,400 (2006 est.)
GDP composition	*Agriculture:* 17.3%, *industry:* 53.2%, *services:* 29.5% (2006 est.)

2.1.4 Environmental Overview

Major environmental challenges facing the country are soil degradation, rapid deforestation, urban air and water pollution, desertification, chemical and oil pollution (water, air, and soil; serious ecological damage from oil spills), loss of arable land and rapid urbanization accompanied by unsustainable waste management . Uncontrolled open burning of solid wastes is the rule rather than the exception which, although convenient, is environmentally unacceptable.

A number of areas of concern where improvements are urgently required are: pollution of inland waterways, air pollution, soil contamination, impact of chemicals on public health, occupational health, drinking water contamination, hazardous chemicals imports, treatment of hazardous waste and emergency preparedness (Nigeria National Chemical Profile Report 1999)

The country is a party to the following Multilateral Environmental Agreements (MEAs): Biodiversity, Climate Change, Climate Change/Kyoto Protocol, Desertification, Endangered Species, Hazardous Wastes, Law of the Sea, Marine Dumping, Marine Life Conservation, Ozone Layer Protection, Ship Pollution, Wetlands, Basel, Stockholm and Rotterdam. The country is also very active in regional and sub-regional activities in the area of environment including the New Partnership for African Development (NEPAD).

The 1989 National Policy on the environment currently under review is hinged on sustainable development as the policy goal. Institutional and regulatory frameworks on environmental protection and natural resources conservation were put in place in 1988 through the establishment of the Federal Environmental Protection Agency (FEPA) by Act 58 of 1988. FEPA metamorphosed into the Federal Ministry of Environment, Housing and Urban Development (FMEHUD) (FMENV) in 1999 on the return from military rule to democratic governance. The FMENV has the overall mandate for green and brown environmental issues including chemicals and waste management.

2.2 Institutional, Policy and Regulatory Framework

2.2.1 Nigeria's Commitments and Obligations with respect to Persistent Organic Pollutants are to be met at the international, regional and national levels.

Environmental policy, sustainable development policy and general legislative framework

Environmental management in Nigeria is hinged on the 1989 National Policy on the Environment as revised in 1998, as well as a set of laws, regulations and guidelines to ensure the conservation of natural resources and the protection of the environment and human health. The goal of the National Policy on the Environment Government of Nigeria is to achieve sustainable development in Nigeria, and in particular to:

- Secure for all Nigerians a quality of environment adequate for their health and wellbeing;
- Restore, maintain and enhance the ecosystems and ecological processes essential for the functioning of the biosphere to preserve biological diversity and the principle of optimum sustainable yield in the use of these natural resources and ecosystems;
- Raise public awareness and promote understanding of essential linkages between environmental and development and to encourage individual and community participation in environmental improvement efforts; and
- Cooperate in good faith with other countries, international organizations/agencies to achieve optimal use of transboundary natural resources and effective prevention of transboundary environmental pollution.

Before and after independence in 1960, most of the legislations that can be called environmental laws in Nigeria were resource-specific or sector specific and were also piecemeal and not coordinated. Further to the discovery of about 4,000 tonnes of toxic wastes illegally dumped in Koko port in the old Bendel state (Koko port is now in Delta State) in 1988, the Federal Government promulgated on 30 December 1988 Decree No. 58 of 1988 establishing the Federal Environmental Protection Agency (FEPA) (as amended by Decree No. 59 of 1992) as the apex organisation for all matters relating to environmental protection and natural resources conservation in the country. The decree is now incorporated as an Act in Chapter 131 Laws of the Federation of Nigeria, 1990. The intention is that while the Federal Level controls all conservation and environmental protection issues, roles for participation in the implementation of the national policy on environment should be allocated to the states and local governments.

Consequently, State Environmental Protection Agencies (SEPAs) were established in the states while Environmental Committees were also established at the local government levels. The National Council on Environment provides the platform for periodic federal–states consultations on environmental issues as well the harmonisation of implementation strategies for implementing environmental laws and regulations.

The FEPA Act is the major framework law on environment in Nigeria as its provisions provide the framework for further legislations in specific aspects of environment. At the onset of democratic governance in 1999, the FEPA metamorphosed into the Federal Ministry of Environment (FMENV) in June 1999. Since a ministry is more of a policy-making organ, the Federal Government established in November 2006 the National Environmental Standards and Regulations Enforcement Agency (NESREA) with powers similar to the defunct FEPA for effective enforcement of environmental regulations in the country. All FEPA's laws have been repealed with the NESREA act signed into laws by the President of Nigeria in July 2007. The federal laws are the minimum standards in the states. The Constitution allows states to establish stricter standards than the Federal and also impose stiffer penalties on violators.

The defunct FEPA advocated the inclusion of environmental considerations in the planning and decision making process and in the execution of major developmental projects in Nigeria. This led eventually to the enactment of Decree No. 86 of 1992, which makes Environmental Impact Assessment (EIA) mandatory for all new major development projects such as industrial chemicals manufacturing, oil and gas development projects, infrastructure development projects (e.g., road, airport and seaport construction, etc.). The enactment of this

law was a major and strategic follow-up action by FEPA to AGENDA 21 of the Rio Earth Summit held in Brazil in 1992.

The defunct FEPA now named FMENHUD also set up a number of Strategic Linkage Centres in some universities, to assist with Research and Development as well as elements of advocacy. A good example is the Linkage Centre for Cleaner Production Technology and Hazardous Waste Management at the University of Ibadan, which was established in September 1994, and also serves as the Basel Convention Regional Coordinating Centre (BCRC) for Africa for Training and Technology Transfer in Hazardous Waste Management.

2.2.2 Roles and responsibilities of ministries, agencies and other governmental institutions involved in POPs life cycles

In Nigeria, the national infrastructure for the management of chemicals is cross-sectoral in nature. As such there are a number of piecemeal legal instruments addressing various aspects of chemicals management. The four main organisations identified as key players in the management of chemicals in the country are the Federal Ministry of Environment, Housing and Urban Development (FMEHUD); Federal Ministry of Health; National Agency for Food and Drug Administration and Control (NAFDAC) – a parastatal of the Federal Ministry of Health; and the Factory Inspectorate Division of the Federal Ministry of Labour and Productivity. The laws in place require that chemicals usage should be tracked through registration, and management from "cradle to grave", that is from importation through formulation, usage, distribution through disposal based on the life cycle approach.

A description of some relevant ministerial authorities and mandates is provided below.

FEPA/FMENV / FMEHUD

According to the Federal Environmental Protection Agency (FEPA Decree 58 of 1988 as amended by Decree 59 of 1992) FEPA, later FMENV, followed by FMEHUD, and now again, FMENV is the lead ministry in charge of protecting the Nigerian environment against chemicals induced and other risks. The enabling decree gives it the mandate of full legal responsibility to control and oversee the environment. The amended decree also identified certain priority technical programmes in the area of chemicals management, as tools for protecting the environment.

Prominent among these are:

- Industrial compliance monitoring
- Hazardous chemical and toxic waste dump watch
- Management of locally generated solid and hazardous waste
- Establishment of an ozone office for management of ozone depleting substances (ODS) and implementation of the Montreal Protocol
- Environmental impact assessment
- Environmental information management

Prior to these programmes the Agency had been implementing the Harmful Waste Criminal Provision Decree No.42 of 1988 which bans the importation, transit, transportation, deposit, and storage of harmful waste into the country.

Also, it has the role of designated national authority (DNA) and focal point for some Multilateral Environmental Agreements (MEAs) :

i UNEP/FAO Prior Informed Consent (PIC) Procedure and the London Guidelines for Potentially Toxic Chemicals and Pesticides in International Trade, 1989;

ii Montreal Protocol for the Control of Substances that Deplete the Ozone Layer, 1987 and its amendments;

iii Basel Convention on the Control of Transboundary Movement of Hazardous Waste and their Disposal, 1989;

iv Intergovernmental Forum on Chemical Safety (IFCS);

v Stockholm Convention on Persistent Organic Pollutants; and

vi Rotterdam Convention.

FMENV is responsible for developing national programmes for effective regulation of chemicals and chemical wastes among other responsibilities.. Prominent among such programmes which represent local action are the Chemical Tracking Programme which controls and monitors chemicals by a "cradle to grave" approach i.e. from import/formulation to storage, use and disposal, and the Chemicals Registration Programme, which requires a pre-notification/registration for all chemical imports.

The Ministry has also set up consultative meetings which make recommendations on national control actions on chemicals/pesticides under the PIC procedure taking cognizance of the local situation. Furthermore, the Ministry has the National Environmental Reference Laboratory in Surulere, Lagos with capabilities for the analysis of imported chemicals for authenticity and priority pollutants in environmental media. The National Reference laboratory needs strengthening to be operational optimally. Resources are allocated for chemical management as the need arises.

The Ministry initially has over 200 professional staff including 22 PhDs and 82 graduates, who form the think tank of its research management and policy formulation functions. With the new structure of the Ministry since January 2007, various relevant departments and divisions are added to enable the Ministry to be more effective in its mandate.

National Environmental Standards and Regulations Enforcement Agency (NESREA)

Enforcement of environmental laws and regulations in the country has been strengthened by the passage of the National Environmental Standards and Regulations Agency (NESREA) act 2007 by the national assembly. The President of the Federal Republic of Nigeria signed the NESREA act into law in July 2007. NESREA has the mandate to make new regulations and enforce all environmental regulations in Nigeria. NESREA is an enforcement agency and a parastatal of FMEHUD.

NAFDAC Decree 15 1993 and its Amendment Decree 19 of 1999

The Decree mandates the National Agency for Food and Drug Administration and Control to:

- Regulate and control the importation, exportation, manufacture, advertisement, distribution, sale and use of food, drugs, cosmetics, medical devices, bottled water and chemicals;
- Undertake appropriate investigations into the production premises and raw materials for food drugs, cosmetics, medical devices, bottled water and chemicals and establish relevant quality assurance systems including certification of the production sites and of the regulated products;
- Undertake inspection of imported food, drugs, cosmetics, medical devices, bottled water and chemicals and establish relevant quality assurance systems, including certification of the production sites and of the regulated products; and
- Registration of pesticides.

Ministry of Industry

In the field of public awareness and understanding chemical safety issues., the Ministry of Industry is fully represented in the National Executive Council of the Industrial Safety Council of Nigeria housed in the Federal Ministry of Labour and Productivity.

Standards Organisation of Nigeria (SON)

The Standards Organisation of Nigeria (SON), which is a parastatal of the Ministry of Industry, was established by an Enabling Act No 56 of 1971- the Standard Organisation of Nigeria Act Cap 412 of the laws of Federal Republic of Nigeria. The Act has three amendments: Act No. 20 of 1976, Act No. 32 of 1984 and Act No. 18 of 1990.

The aims and objectives of the Organisation include preparation of Standards relating to products, measurements, materials and processes, among others and their promotion at national, regional and international levels; certification of industrial products, assistance in the production of quality goods; improvement of measurement accuracies and circulation of information relating to standards.

Federal Ministry of Labour and Productivity

Conscious that some workers are exposed to dangerous chemicals at their places of work the Factory Inspectorate division of the Federal Ministry of Labour and Productivity has responsibility for workers safety and protection from exposure to chemicals at the work place. The ministry ensures compliance by industries with the use of Personal Protective Equipment (PPE) by factory workers.

Federal Ministry of Agriculture and Water Resources

This ministry is concerned with the recommendation for use and control of agricultural chemicals as part of its mandate. The ministry through some of its research institutes conduct trials on new chemicals before they are recommended for release into the market and use by farmers in pest control. The ministry is also a Designated National Authority (DNA) along with FMEHUD for the Rotterdam Convention on Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade which adopted globally was adopted in 1998 and entered into force in 2004.

Federal Ministry of Health

The Public Health Service of the Ministry of Health provides basic protection of the public health of the population. This includes public education and the enforcement of laws on sanitation and public hygiene, protection against environmental hazards, the maintenance of public health standards and the control of environmental pollution. The Ministry of Health also has interest in POPs issues because of the health risk to humans on exposure to POPs either occupationally or through ingestion of foods with high residues of harmful chemicals including POPs. The malaria control unit of the ministry also has a long history of use of POPs pesticides especially DDT for malaria control including the use of mosquito nets impregnated with non-POPs chemicals.

There is the Interministerial Committee on Chemicals Management. It also serves as the Standing Committee on Prior Informed Consent (PIC) Procedure, which is a consultative mechanism with membership from relevant ministries, private sector and NGOs. It meets periodically to discuss and harmonise national actions/decisions on chemicals issues including POPs pesticides under the PIC procedure, with FMEHUD as the secretariat. This committee took the administrative decision to ban POPs pesticide chemicals in 1999, which is in force, although the decision to ban POPs is yet to be backed by law.

2.2.3 Relevant international commitments and obligations

Due to the long-range transportation of POPs, a global approach is necessary to agree on the control of these substances. In addition to the Stockholm Convention, Nigeria has additional commitments at the international and regional level and has ratified all the multilateral Environmental Agreements (MEAs) on chemicals and wastes. These include:

The Rotterdam Convention on the Prior Informed Consent for certain hazardous chemicals and pesticides in international trade.

The Rotterdam Convention is a global agreement which seeks to promote shared responsibility and cooperative efforts among Parties in the international trade of certain hazardous chemicals in order to protect human health and the environment. It establishes a Prior Informed Consent (PIC) procedure, which seeks agreement from importing countries to accept shipments of certain hazardous chemicals. The POPs listed in the Stockholm Convention are all included in the Rotterdam Convention, which Nigeria ratified in 2004.

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (1989).

The Basel Convention is a global agreement which addresses the problems and challenges posed by the transboundary movement and management of hazardous wastes, including those consisting of, containing or contaminated with POPs. It was adopted on 22 March 1989 and came into force on 5 May 1992. Nigeria became a party to the Convention in 1992. The provisions of the Convention are yet to be domesticated into a national law.

The Basel Convention uses a Prior Informed Consent (PIC) procedure to control transboundary movements of waste, whereby hazardous waste cannot be shipped from one country to another without the consent of those countries involved, including countries of transit. The Convention has developed guidelines for managing wastes contaminated by chemicals in Annexes A and B of the Stockholm Convention and recognizes these guidelines as BATs and BEPs.

The Basel Convention was amended in 1995. The amendment prohibits the export of all hazardous waste from Parties that are members of the EU, OECD and Liechtenstein to all other Parties to the Convention. The ban is not yet in force in its own right.

Bamako Convention on the Control of Trans-boundary Movements of Hazardous Wastes (1991)

This convention is the only regional convention on hazardous wastes. It is a replica of the Basel Convention, put together by the African governments with the inclusion of radioactive waste which is missing in the Basel Convention. Nigeria was one of the first sets of African countries to ratify the convention. The special provisions in the convention are noteworthy of attention (BAN 2001):

i. The importation of hazardous wastes into the continent of Africa from outside the Continent is prohibited (Article 4, paragraph 1). This will thus forbid *any* non-African imports of hzardous waste.

ii. The Bamako Convention includes as part of its definition of hazardous wastes, "hazardous substances which have been banned, cancelled or refused registration by government regulatory action, or voluntarily withdrawn from registration in the country of manufacture, for human health or environmental reasons." This provision is very important with respect to preventing future pesticide and chemical stockpiles and could also lead to legal actions against importers of such materials. (Article 2, paragraph 1 (d)

iii. The Bamako Convention requires its parties to impose strict, unlimited liability as well as joint and several liability of its hazardous waste generators. This will go a long way toward ensuring true environmentally sound management of wastes with respect to waste management in Bamako member states. (Article 4, paragraph 3 (b)

iv. The Bamako Convention prohibits, (absent a special bilateral or multilateral agreement) imports of hazardous wastes from a non-Party, and there are only currently 17 Bamako Parties out of 51 African States. This could mean that efforts to establish a regional chemical waste facility in Africa will face difficulty. (Article 4, paragraph 1 (b)

v. Parties are to promote clean production methods. *Incineration is specifically excluded from the definitions of clean production methods*. This means that the introduction of incineration technology into Bamako Parties will be very difficult to justify. (Article 4, paragraph 3(g))

The World Summit on Sustainable Development

The World Summit on Sustainable Development (WSSD), held in September 2002 in Johannesburg, South Africa agreed to an Intergovernmental Plan of Implementation setting out what needs to be done to achieve global sustainable development. The Johannesburg Plan of implementation (JOP1) included a number of chemicals related targets, including the implementation of existing chemicals conventions and the development of a Strategic Approach to International Chemicals Management (SAICM).

FAO International Code of Conduct for the Distribution and Use of Pesticides (as amended in 2003).

FAO is one of the international bodies that have significant roles in formulating and implementing policies to reduce hazards associated with the production, use, disposal, and reuse of chemicals especially in areas dealing with food and agriculture. FAO has since 1994 operated a project, funded by the Government of the Netherlands, for the prevention of accumulation and disposal of obsolete stocks in Africa and the Near East. The FAO project collected and compiled data on obsolete pesticide stocks from these regions; maintained a database, reviewed and assessed disposal technologies; produced several technical guidelines; conducted pilot disposal operations and helped in facilitating and co-ordinating international efforts in disposal and related operations. Such efforts were instrumental to the formation and establishment of the strategic partnership of the Africa Stockpiles Programme (ASP) whose anticipated operational success is so much desired. Among others the FAO's efforts in bringing together all concerned stakeholders was demonstrated through the organisation of regular donor consultations aimed at enhancing
both collaboration and co-ordination among all interested groups. FAO also took advantage of the media to inform the world both about the seriousness of the problem and the need for urgent solutions.

The Strategic Approach to International Chemicals Management (SAlCM)

At the international level, considerable attention has been given to the sound management of chemicals. Several international policy instruments have been adopted since the 1980s. The most recent being the adoption of the Strategic Approach to International Chemicals Management (SAICM) by the International Conference on Chemicals Management (ICCM) in Dubai United Arab Emirates, February 2006. The SAICM, consisting of the "Dubai Declaration on International Chemicals Management", the "Overarching Policy Strategy (OPS)" and the "Global Plan of Action (GPA)" gives recognition to the need of government's commitment to the sound management of chemicals as essential for environmental sustainability and protection of human health, which, in turn, is a prerequisite for sustainable development as a whole.

The Johannesburg Plan of Implementation (JOPl) for the World Summit on Sustainable Development (WSSD), adopted in 2002, also calls for renewed commitment, as advanced in Agenda 21, to sound management of chemicals throughout their life cycle and of hazardous

wastes for sustainable development as well as for the protection of human health and the environment. It states that countries should aim to achieve, by 2020, among other things that chemicals are used and produced in ways that lead to the minimization of significant adverse effects on human health and the environment. Countries are also to take actions at all levels to promote the ratification and implementation of relevant international instruments on chemicals and hazardous waste, while further developing a strategic approach to international chemicals management based on the Bahia Declaration and Priorities for Action beyond 2000 of the Intergovernmental Forum on Chemical Safety and implementing the new globally harmonized system for the classification and labeling of chemicals as soon as possible with a view to having the system fully operational by 2008.

The International Conference on Chemicals Management held in February 2006 finalised and adopted the Strategic Approach to International Chemicals Management. SAICM is a global framework to improve chemicals management. It is a voluntary agreement supported by a high-level declaration and contains a toolkit of policies and activities aimed at raising the standards of chemicals management, particularly in developing countries. SAICM will pull together international bodies with responsibility for chemicals management and will support and enhance the global treaties that cover chemicals and hazardous waste. Nigeria is actively involved in SAICM activities.

2.2.3.1 Domestication of Multilateral Environmental Agreements (MEAs)

None of the aforementioned MEAs has been domesticated as part of national environmental legislation

Description of Existing legislation and Regulations Addressing POPs
(Manufactured chemicals and unintentionally produced POPs)

There is no comprehensive national law on chemicals in Nigeria. The existent national legislations relevant to chemicals management are too general, fragmentary and not specific to POPs. Table 2.1 provides a summary of extant laws addressing chemicals management in the country. A number of the laws have some relevance to the POPs chemicals listed in the Stockholm Convention.

Table 2.1:
Existing legal instruments which address the management of chemicals in Nigeria

Legal Instrument (type, reference year)	Responsible Ministries or Bodies	Chemical Use Category Covered	Objectives of Legislature	Relevant Articles, Provisions	Resources Allocated	Enforcement Ranking*
S. 1.8 National Environment Protection (Effluent Limitation) Regs. 1991	FEPA	Chemicals and chemical waste	Environmental protection; effluent and waste water pollution control	Section 1-6	N/A	2
S. 1.9 National Environment Protection (Pollution Abatement in Industries. and Facilities Generation Wastes). Regs. 1991	FEPA	Chemicals and chemical waste	Environmental protection; pollution abatement; safety	Section 1-23	N/A	2
S. 1.5 National Environment Protection (Management of Solid & Hazardous Wastes). Regs. 1991	FEPA	Industrial & consumer chemicals radioactive substances agrochemical	Environment protection, sound environmental management of solid and hazardous waste including storage trans-boundary movement, treatment & disposal	Part 1-12	N/A	2
FEPA Decree 58 of 1998 (Amended by FEPA Decree 59 of 1992)	FEPA	Industrial agrochemical domestic	Environment protection, pollution abatement & control; human health est. FEPA enforcement of FEP regulation	Section 15, 16, 17, 18, 19, 20	30 million Naira	1
Decree 86-Environmental Impact Assessment 1992	FEPA	Industrial	Environment Protection, human health (by evaluation/assessment of the suitability of locating a new industry at a site in the light of its environmental impact)	Section 13, sub section 8	N/A	1
Guidelines and Standards 1991	FEPA	Pesticides and waste	Environmental protection	Part I-IV	N/A	2
Harmful Waste (Special Criminal Provision etc.) Decree 42 of 1988	FEPA	Agrochemical; industrial & consumer chemicals (toxic hazardous waste	Environmental protection; human health; pollution control		N/A	2

Table 2.1continued

Legal Instrument (type, reference year)	Responsible Ministries or Bodies	Chemical Use Category Covered	Objectives of Legislature	Relevant Articles, Provisions	Resources Allocated	Enforcement Ranking*
NAFDAC Decree 15 1993 amended by Decree 19 of 1999;	NAFDAC	Chemical	Control of importation, exportation, manufacture, advertisement, distribution, sale, of use of chemicals; health hazard prevention	Section 5	N/A	1
Factories Act 1990	Federal Ministry of Labour & Productivity	Industrial chemicals	Occupational safety & health	Section 2, 3, 11, 1, 30, 45	N/A	2
Pesticides Registration Regulation 1996	NAFDAC	Pesticides	Registration of pesticides safety of pesticides	Section 1-9	N/A	1
Pharmacy Council Decree 1992	Federal Ministry of Health	Pharmaceuticals	Regulation, appointments and discipline		N/A	1
IPAN Decree No. 100 of 1992	Federal Ministry of Health	All chemicals	Registration/appointments & discipline of public analysts		N/A	2
Customs & Excise Act 1990	Federal Ministry of Finance	All chemicals	Regulation of all importation		N/A	2
Standards Organisation of Nigeria Act No 56 of 1971, as amended by acts No 20 of 1976, Act No 32 of 1984 and Act No 18 of 1990.	Federal Ministry of Industry	Standards for quality of chemicals	Standardization of products including chemicals			2
Occupational Safety & Health Guidelines	Federal Ministry of Labour & Productivity Federal Ministry Health	Cement, textile, industrial chemicals	Safety and health workers		N/A	2
Nigeria Ports Authority Act	Federal Ministry of Transport	All chemicals	Transporting of chemical goods	Part II section 3, subsection 2	N/A	2
Nigeria Maritime Decree	Federal Ministry of Transport	All chemical	Transporting of chemical goods		N/A	2
DPR Guidelines and standards 1991	DPR	Drilling chemicals and explosives and chemical additives	Regulates the petroleum		N/A	1
NDLEA Decree	Federal Ministry of Justice	Narcotics & psychotropics	Regulation and monitoring		N/A	1

**) Enforcement ranking: 1 – Effective 2 – Fair 3 – Weak*

Source: Nigeria National Chemical Profile Report 1999

2.2.4 Key approaches and procedures for POPs management (Enforcement and Monitoring Requirements)

The present procedure for chemicals import into Nigeria is to apply for a permit from NAFDAC. The agency will not grant a permit for importing POPs as they are banned chemicals in the country. This does not prevent smuggling of the chemicals into the country through the borders as customs officers have little or no awareness of chemicals hazard issues. It is therefore important to raise the awareness of customs and immigration officers and other security agencies on the issue of POPs in particular and chemicals in general.

Awareness training is also highly desirable for marketers of chemicals as well as small scale chemicals vendors.

A monitoring and enforcement system is in place for all legislations on chemical control in the country. There are in-built administrative and management schemes such as permitting, classification, restriction, reporting and feedback with mechanisms to monitor the implementation. Inspections, revocation of licenses/permits, audit procedures and reporting has been the major mechanisms adopted nationally to ensure compliance. There are also punitive provisions to ensure compliance such as shutting down facilities and prison sentences.

The Federal Ministry of Environment, Housing and Urban Development (FMEHUD) as the lead governmental body on chemical management is currently consulting through its coordinating mechanism on a chemical management regulation that will incorporate persistent organic pollutants. A successful POPs management regime will require harmonisation of the chemical management system in the country on several fronts. It would include synchronisation of national legislation, the Stockholm Convention and other international and regional agreements whose contents may be related.

The second step towards harmonization would be the establishment of standards and strengthening of the institution for enforcement of standards. There are currently four main coordinating mechanisms in place in Nigeria for sound chemicals management, which have a critical role to play in developing appropriate policy and regulatory regimes for environmentally sound management of POPs; namely:

- Standing Committee on PIC Import Decisions
- Interministerial Committee on Notification of Toxic chemicals in International Trade
- National Committee on Ozone Depleting Substances
- National Council on Environment
- National committee on management of hazardous substances

2.3 Assessment of the POPs Situation in Nigeria

2.3.1 Assessment with respect to Annex A, Part I chemicals (POPs pesticides)

2.3.1.1. Historical, current and projected future production, use, import and export; existing policy and regulatory framework; summary of available monitoring data (environment, food, humans) and health impacts**Production of POPs Pesticides**

The history of organochlorine pesticides including POPs use in Nigeria dates back to the 1940s for agricultural production of food crops for the country's rapidly growing population and cash crops (cocoa, rubber, forest products and cotton) for export for economic buoyancy as well as malaria vector control activities. But there is a paucity of data on the production and use of POPs and other pesticides in Nigeria, whereas such data are readily available in developed countries. This is a reflection of the lack of mechanism and planning programme in place for chemicals management including POPs as well as low level of understanding of the environmental and public health hazards of chemicals/pesticide/POPs use.

POPs pesticides have not been produced in Nigeria similar to the situation in the rest of Africa (UNEP/GEF 2002). All the pesticides including POPs used in Nigeria have been imported from the developed countries, especially Europe, America and in recent years from Asia.

However, there were until the late 1980s/early 1990s a few formulation facilities/plants in Lagos, Port Harcourt and Kaduna owned by the multinational oil companies such as National Oil and Chemicals Marketing Company, NOLCHEM (Shell Petroleum Development Company was a major share holder) now under new management as Consolidated Oil Plc (Con Oil), Mobil Oil Nigeria Plc and Chemical and Allied Product Limited (CAPL). NOLCHEM then had plants formulating POPs and other organochlorine pesticides in Apapa, Lagos; Port Harcourt and Kaduna. Mobil Oil also had a plant formulating POPs in Apapa, Lagos; and Port Harcourt while CAPL had a formulation plant in Ibadan for Lindane and some POPS pesticides. In response to international concern about the deleterious health and environmental effects of all POPs pesticides, the formulation plants have been closed down since the 1990s except the CAPL plant at Ibadan, Oyo State that closed down in 2004 producing Lindane.

There is data gap on quantities of locally formulated POPs pesticides over time as such data could not be provided neither by the companies concerned nor government agencies.

However, the Government of Nigeria and the World Bank on 4 August 2006 signed a Letter of Agreement for the International Development Association (IDA) to serve as administrator of grant funds provided by the Canadian International Development Agency (CIDA) to the Federal Republic of Nigeria for the Nigeria-Africa Stockpiles Programme (ASP).

The purpose of the grant, amounting to two million, two hundred and thirty five thousand, one hundred and forty six United States dollars ($2,235,146) is to strengthen Nigeria's capacity for pesticide management and prevention of future accumulation of publicly held obsolete pesticides and associated waste. The project's past activities include submissions of a hard copy of the report on preliminary inventory of obsolete pesticide stocks in Nigeria carried out by the Federal Ministry of Environment in 1999 to the Project Management Unit (PMU) ,which has been passed on to FAO officers during their mission to Nigeria in

February 2007. Other activities it has engaged in include, stakeholder analysis for pilot preparatory inventory of obsolete pesticides in Oyo and Benue states; sensitization of stakeholders in Benue, Kano, Cross River, Anambra, Adamawa and Oyo states; organised stakeholder fora and validated sites of obsolete pesticides in the same six states; submitted hard copy of existing legislations on pesticide management to the PMU.

The following activities have been carried out and accomplished.

- Inaugurated Nigeria-ASP Steering Committee
- PMU fully established
- Grant Agreement signed
- Project launched
- Task Lead Institutions designated and task team leaders appointed
- Received first year counterpart contribution
- Received the 1st tranche of US$350,000 from Nigeria-ASP Trust Fund being administered by World Bank (made withdrawals, disbursed funds and replenishments made)
- Purchased vehicles and computer/accessories
- Short-listed applicants for consultancy services
- Conducted stakeholder analysis for pilot preparatory inventory in Oyo and Benue States
- Sensitized key stakeholders and validated sites of obsolete pesticides in Benue, Kano Cross River, Anambra , Adamawa and Oyo States
- Organized stakeholder forums and validated sites of obsolete pesticides in Benue, Kano, Cross River, Anambra, Cross River and Oyo States
- Inaugurated project task teams
- Inspected Kainji Hydro Electric Plc site of expired chemicals
- Signed FAO Technical Support Agreement
- Passed 1st joint FAO/World Bank assessment of project implementation

The stockpiles of obsolete POPs pesticides are further elaborated in section 2.3.5 of this Report

2.3.1.2. POPs Pesticides Import

The survey in all the six geopolitical zones indicated that over 90% of pesticides used or in use including POPs pesticides are imported largely from the developed countries especially France, United Kingdom, and Japan and recently from China, a rising economic giant and a developing country. However there is no authentic record of POPs pesticides imports. The database in place at the Federal Office of Statistics, Federal Ministry of Agriculture and the Federal Livestock and Pests Control Unit lumps all pesticides together without differentiation into chemical classes such as organochlorine, organophosphorus or carbamate pesticides. A survey on pesticide usage in Nigeria indicated that about 15,000 metric tonnes annually of pesticides comprising about 135 pesticide chemicals marketed locally under 200 different product brands and formulations were imported during 1983 - 1990.

The customs services could not provide any information as the staff is ignorant of POPs issues or chemicals classification in general.

Nonetheless the Federal Office of Statistics (FOS) in Lagos provided useful information on the importation of DDT and Hexachlorobenzene (HCB) into the country as recent as the year 2002. From the questionnaire returned by the FOS, 146.5 kg (0.146 tonnes) of DDT was imported into the country in 1998, 1,922.8 kg (1.922 tonnes) in 2000 and only 7.5 kg (0.007 tonnes) in 2002. 1,318.5 kg (1.318 tonnes) of HCB was imported in 1998, 17,305 kg (17.305 tonnes) in 2000 and 70.2 kg (0.072 tonnes) in 2002. DDT and HCB were purported to have been imported from France. The big decrease in importation in 2002 could be due to the FEPA 1999 ban as well as lack of availability of the chemicals in the international market as the developed countries phased out the production of POPs pesticides.

Most of the Stakeholders contacted admitted using the following POPs pesticides in the past: aldrin, dieldrin, hexachlorobenzene, chlordane and DDT. Following the ban in 1999 by the Federal Environmental Protection Agency, FEPA, (now Federal Ministry of Environment, Housing and Urban Development (FMEHUD), FMENV since 1999), on aldrin, chlordane, DDT, dieldrin, heptachlor and endrin the importation of these chemicals was prohibited by law. Nonetheless these chemicals still thrive in the informal sector where vendors without any modicum of the knowledge of chemistry or safety store and sell these chemicals under the counter. There is no statistics of POPs pesticides in the informal sector, which could be significant, as the ban has driven the marketers underground to the black market.

The defunct FEPA now FMEHUD and the National Agency for Food and Drug and Administration and Control, NAFDAC, of the Federal Ministry of Health were jointly responsible for issuance of permits for chemicals import. However in 1993 NAFDAC became the regulatory agency with preserve at the port for monitoring chemical imports; while the FMEHUD continued issuance of permits on a limited scale for chemicals permits. According to NAFDAC, the agency does not issue import permits for POPs pesticides into the country since the national ban of these chemicals in 1999.

2.3.1.3. Use of POPs Pesticides

POPs pesticides, e.g., aldrin and dieldrin, have been used as insecticides in food crops protection as well as export crops including cocoa, rubber and cotton. Heptachlor, chlordane and dieldrin had been used for termite control in virtually all zones. The general response in all six geopolitical zones indicated that all POPs substances were no longer in use. But nobody was able to tell when exactly the use of those substances stopped. Although the POPs had been banned, some of the pesticides are still being sold in the markets, as farmers prefer to buy and use them because of their potency and relatively cheaper cost. Although alternatives to POPs pesticides including Basudin, Unden 20 EC, and Phosphine exist, they are expensive and not affordable to the farmers.

A survey commissioned by the Federal Livestock Department and Pest Control Services, Federal Ministry of Agriculture and Rural Development, Abuja (Aliu and Areola 2002) listed 124 pesticides available in Nigeria. The seven POPs pesticides included in the list were aldrin (Aldrosol$^{R;}$ Seedrin^{R}), chlordane (Octachlor^{R}; Octa-Klor^{R}), DDT (Anofex^{R}; Ixodex^{R}), dieldrin (Dieldrex^{R}; Quintox^{R}), endrin (Hexadrin^{R}), heptachlor (Soladrin^{R}; Heptagram^{R}) and toxaphene. Only mirex was missing in the list.

Tsetse fly control and eradication programmes involving the spraying of DDT, dieldrin and non-POPs pesticides such as Endosulfan had taken place in different parts of the northern states in the country in the past.

The Federal Ministry of Health (Roll Back Malaria Unit) and the Lagos Ministry of Health provided information that 5 out of the 8 POPs pesticides namely: aldrin, dieldrin, chlordane, DDT and endrin were used through fumigation for the control of arthropods of medical and veterinary importance and their use had been stopped in 2002.

However, DDT is still being used largely to control malaria from the source especially fumigation of anopheles mosquito, mosquito borne viruses (yellow fever) and mosquito borne filariasis. There is no stockpile of these obsolete POPs chemicals because they were consumed as soon as they were purchased. Nigeria does not however intend to request for exemptions to use DDT under the Stockholm Convention.

Neopybrutin has been identified as alternative to POPs for "Roll Back Malaria". Again there has been no statistics of the quantities of POPs pesticides used for health purposes.

The abuse and misuse of POPs chemicals for fishing, control of head lice and toothache is common among rural farmers. Chemicals poisoning incidents are common among illiterate farmers and others who apply POPs and other chemicals without adequate safety measures. Some of the farmers claimed that POPs pesticides such as aldrin diluted in water can be used to cure stomach ache, toothache and any mouth disease. No follow up study was done on the detection of POPs in this regard.

The last known uses for each of the POPs pesticides are summarised in Table 2.2. Data on the use of some of these POPs pesticides were difficult to obtain as companies claim non-usage or import and yet local market surveys indicate chemicals with such labels either genuinely or as a form of misguides to reluctant farmers not accepting alternatives. Furthermore the old database of the Federal office of statistics lumps all pesticides together without classification into organochlorine pesticides/POPs and other categories of pesticides which makes estimation of POPs chemicals import in the past prior to the ban in 1999 difficult.

Nigeria does not formally export POPs to other countries but there could be illicit export albeit on a small scale in the informal sector or black market, especially as Nigeria is the economic hub of West and Central African countries under the ECOWAS sub-regional economic grouping.

Table 2.2
POP pesticides and examples of last known uses

POPs pesticide	Last Known Uses	Remarks
Aldrin	Against termites and other soil pests, termites attacking building materials, in grain storage and for vector control	Some labels still found in local markets in Lagos State
Toxaphene (Camphechlor)	Control of insects pest in cotton and other crops	Not available in the market
Chlordane	Against termites and other soil pests, termites attacking building materials	
DDT	Control of medical and veterinary vectors such as malaria transmitting mosquitoes, plague transmitting fleas and trypanosomiasis transmitting tsetse flies.	Limited use in de-ratting of ports
Dieldrin	Control of locust, termites, human disease vectors	Limited use in de-ratting of ports
Endrin	Formerly used against insects and rodents	No current uses known
Heptachlor	Against termites and other soil pest, termites attacking building materials	
HCB	Formerly used for seed treatment against fungal diseases, as well as for industrial purposes	No current uses are known
Mirex	Against leaf cutting ants, termites in buildings and outdoors; as a fire retardant; industrial purposes	

Summary of available monitoring data in environmental media, humans and wildlife

Although there is lack of data on POPs consumption and use in Nigeria, it is a well known fact that POPs chemicals have been widely used in the country for food and cash crops as well as vector disease control since post World War II (Osibanjo 2002) because of their relatively cheaper cost and also being first generation insecticides. However FEPA's ban on POPs in the early 1990s has drastically reduced their use. Establishing the residue levels of POPs in environmental media provides information on the potential socio-economic, health and environmental impact of POPs usage in the country over time. Although analytical capability for POPs detection and quantitative analysis is generally limited in the country, limited data is however available based on some past research studies (Osibanjo 2002). The data are presented first for POPs pesticides that is Annex a Part l and Annex B chemicals of the Stockholm Convention in environmental samples followed by data for PCBs which are Annex A Part ll chemicals.

2.3.1.4. POPs in Nigerian Soils

Annex A Part l and Annex B chemicals

In spite of the relatively short half-lives of POPs pesticides in Nigerian soils compared to temperate countries (Osibanjo 2002), there is widespread contamination of Nigerian soils with these chemicals. The contamination trend in soils (Table 2.3) is private farms < industrial sites < municipal refuse dumps. Refuse dump soils have the highest concentrations (ng/g dry weight) of pesticide POPs as well as lindane a likely future POP still under consideration, with the mean and range in parenthesis as follows: aldrin 104 (9-630), heptachlor 84 (ND-352), dieldrin 41(7.4 –159); non-POPs organochlorine pesticides - lindane 135 (ND-712) and endosulfan 16 (ND-60). The concentration of Annex B chemicals were DDEpp 57 (4-204) and total DDT 201 (ND-530).

Annex A - Part ll chemicals

The corresponding concentrations (ng/g) mean with the range in parenthesis for PCBs, which are Annex A Part ll chemicals were soils in industrial areas 11(ND – 740) compared to 16(ND – 60) in refuse dump soils (Table 2.3).

Table 2.3

Concentrations (ng/g dry weight) of POPs, non-POPs Pesticides and PCBs in Nigerian soils

	Concentration (ng/g) dry weight		
Pollutant	Farm land soils	Industrial soils	Refuse dump soils
Lindane	8.7 (ND* – 20.5)	8.6 (ND* – 13.7)	135 (ND* – 712)
Aldrin	ND	ND	104 (9 – 630)
DDE_{pp}	7.9 (ND* – 60)	32 (ND* – 127)	57 (4 – 204)
Total DDT	2 (ND* – 11)	195 (4 – 774)	201 (ND* – 530)
Heptachlor	6 (3 – 43)	8 (ND* – 56)	84 (ND* – 352)
Dieldrin	-	11 (ND* – 28)	41 (7.4 – 159)
Endosulfan	-	-	16 (ND* – 60)
PCBs	ND*	122 (ND* – 740)	16 (ND* – 60)

*N.B: - implies no data, *ND = Non-detectable.*

Source: (Osibanjo 2002)

2.3.1.5. Concentrations of POPs in Nigerian waters

Annex A Part l and Annex B chemicals

The occurrence and levels of some POPs pesticides and non-POPs pesticides in inland waters, notably lindane and endosulfan in water in 17 rivers, 2 lakes and one dam in southern Nigeria had been studied (Table 2.4). The overall range of values (ng/L) of POPs pesticides were dieldrin 17.8 – 2150, HCB ND-92, heptachlor ND-202, and aldrin ND-143 respectively, while the concentrations of the non- POP pesticides lindane and endosulfan

were ND – 297 and ND – 430 respectively. DDT and metabolites were not detected. (Osibanjo et. al 1994).

Table 2.4 also indicate the levels of these substances in some specific rivers. For example, the concentration ranges of POPs with the means in parenthesis (ng/L) in Ogun River, which traverses three states (Oyo, Ogun and Lagos) and discharges into the Lagos Lagoon were: aldrin 40 (5.1-49) and heptachlor 0.25 (ND-0.8); the values for endosulfan and Lindane were 116 (ND-260) and 13.3 (1.4-41.9) respectively. The occurrence and levels of POPs and non-POPs in 9 rivers in Ondo State, a major cocoa growing area of Nigeria were also studied (Ogunlowo 1991) with the following results (in ng/L) were: dieldrin 190 (560 – 1380), aldrin 1.3 (ND-5.0), and heptachlor aldrin 2.9 (ND-3.5) respectively. Annex B chemicals DDT and metabolites were non-detectable. The detection of POPs pesticides residues in surface waters in Ibadan, the largest indigenous city in Nigeria has also been reported (Nwakwoala and Osibanjo 1992). The mean concentrations with the ranges in parenthesis (ng/L) of POPs pesticides quantified were aldrin 20 (ND-40), dieldrin 250 (17.8-657), heptachlor 72(4-202) and HCB 17(ND- 92) respectively. Total DDT concentration was 310 (ND-1266). These results show higher loads of POPs pesticides in the water bodies studied compared to concentrations elsewhere. This study confirms that POPs pesticides residues are widely distributed in the surface waters studied, even at sites remote from point sources. The presence of pesticide POPs residues in the Lagos Lagoon water was confirmed with concentrations in ng/L as: aldrin 53 (3-90), dieldrin 8(ND- 24), HCB 2 (0.8- 4.1), and total DDT 250 (ND- 900) respectively (Osibanjo et al. 1994).

The problem of gross contamination of ground water by POPs pesticides had also been identified in parts of Nigeria (Osibanjo and Aiyejuyo 1994). Table 2.5 shows that the mean concentrations of total DDT and heptachlor exceed the WHO limits for these chemicals in drinking water.

Annex A., Part ll Chemicals

The mean concentration (ng/L) and range of PCBs in inland waters of southern Nigeria specifically Ogun River were 87(ND-224). See Table 2.4 The value for PCB in Awba Dam, lbadan was 330(ND-1000). Although PCBs were detected in streams and rivers in Ibadan, they were not quantified. (Nwakwoala and Osibanjo 1992). PCBs were not detected in surface waters in Ondo state, a purely agricultural area.

Table 2.4

Concentration (ng/L) of POPs Pesticides and PCBs in Nigerian Inland Waters and the Lagos Lagoon.

Location/water type	Dieldrin	α – HCH	HCB	γ-HCH (Lindane)	Heptachlor	Aldrin	Endosulfan	P,P\-DDE	P,P\-DDD	P,P\-DDT	Total DDT	PCB
INLAND WATERS												
West and Central Africa-Nigeria												
Ibadan, Streams	250(17.8-657)	150(1-302)	17(ND-92)	100(7-297)	72(4-202)	20(ND-40)	98(ND-430)				310(ND-1266)	
River Ogun				13.3(1.4-41.9)	0.25(ND-0.8)	40(5.1-49)	116(ND-260)					87(ND-244)
River Imo				0.2(ND-0.6)	4(ND-11.4)	13(ND-40)	13(ND-41)					121(ND-241)
Cross River			1.0(ND-5)	0.3(ND-1.1)	2(ND-8.6)	36(ND-143)	20(ND-80)					120(ND-470)
Awba Dam, Ibadan			0.8(ND-2.5)	61(9-167)		18(12-29)	20(ND-30)					330(ND-1000)
Kainji Lake				0.12(ND-0.24)	0.47(ND-3.84)	0.55(ND-3.05)					3.88(ND-10.05)	
R. Ero Dam, Ondo	560			2.0	3.3	3.1	ND	ND	ND	ND	ND	ND
River Ero Ondo	740			2.0	ND	ND	ND	ND	ND	ND	ND	ND
River Osse, Ondo	2150			2.0	5.0	ND	ND	ND	ND	ND	ND	ND
R. Owesse, Ondo	1120			6.4	1.6	ND	ND	ND	ND	ND	ND	ND
River Apomu, Ondo	1380			4.8	4.6	3.5	ND	ND	ND	ND	ND	ND
COASTAL WATER												
Lagos Lagoon	8(ND-24)		2(0.8-4.1)	182(16-634)	ND	53(3-190)	29(ND-86)	3(ND-15)	83(ND-344)	ND	2,500(ND-9,000)	

Source: (Osibanjo 2002)

Table 2.5
POPs pesticides concentrations (ng/L) in ground water, Ibadan, Oyo State

Chlorinated hydrocarbon	Concentration range; mean	% Occurrence in samples	WHO limit ($\mu g 1^{-1}$)
Aldrin	0.0190 (ND-0.367)	15	0.03
BHC	0.0211 (ND-0.1250)	95	
Lindane	0.0184 (ND-0.1866)	25	3.0
Total DDT	2.200 (0.2791-11.89)	100	1.3
Heptachlor	2.256 (0.2890-17.50)	100	0.10
Endosulfan	0.318 (ND-114)		

Source: Osibanjo and Aiyejuyo 1994

2.3.1.6. Concentrations of POPs pesticides in Nigerian fish

Annex A Part l and Annex B chemicals

Fish samples from fresh water sources were found to contain significantly higher concentration of these chemicals than sediments and water. In Nigeria the detection of 10 POPs pesticides in 40 freshwater fish samples collected from various locations in Oyo and Ogun States had been reported (Amakwe 1984). The relative occurrence of some of the POPs pesticides and chlorinated non-POP pesticides identified were lindane 100%, PCB and endosulfan 97%, DDT and metabolites 75%. The concentration ranges with mean in parenthesis in ng/g fresh weight were: lindane 7-106.0 (25.6), p,p-DDE 2.0-30.0 (3.4), p,p'DDD 2.0-60.0 (7.8), p,p'DDT 3.0-18.0 (2.9), total DDT 3.3-161 (20.6), heptachlor 1.0-300 (50.0), endosulfan 3-904 (173), HCB 9.0-130.0 (12.7) and α-HCH 0.2-5.0 (1.3) . In an earlier study in 1980 (Osibanjo and Jensen 1980), DDT concentrations of 0.08 to 4.4 μg/g, γ-HCH 0.08 to 4.4 μg/g and HCB 0.06 to 0.60 μg/g in fish from Oyo state Nigeria had been found. The very high values in this study were attributed to suspected cases of fishing deliberately with lindane and DDT insecticides for human consumption. The detection and quantification of 9 OCPs including POPs in south-eastern Nigeria has also been reported (Fayomi 1987). The relative occurrence of some of these compounds were PCBs, aldrin, lindane, and α,β -HCH 100%, endosulfan, p, p'-DDD, p, p'-DDE and heptachlor 44.4%, 33.3%, 61.1% and 72.2% respectively. The concentration ranges with means in parenthesis in ng/g fresh weight were: α-HCH 0.2-7.4 (1.8), lindane 0.6-13 (4.4), heptachlor ND-1.0 (0.3), aldrin ND-14.9 (5.5), endosulfan ND-89.6 (14), p, p'-DDE ND-4.2 (1.8), and DDD ND-8 (0.7).

Contamination of marine fishes to a lesser extent than fresh water fishes had been reported in Nigeria (Osibanjo and Bamgbose 1991) based on the analyses of 94 samples of 25 marine fish species over 1983-1985 and 14 samples of 7 shellfish species in 1987. The mean and concentration ranges in parenthesis in fresh weight were found to be for HCB 0.92 (0.04-9.48), lindane 0.83 (ND-5.30), endosulfan 0.16 (ND-4.95), DDT 4.37 (0.15-18.6), and aldrin 2.85 (ND-54.60).. Fish contained higher concentrations of aldrin, heptachlor, HCB and lindane than shellfish, while the reverse was observed for DDT. The concentrations of residues obtained were found to be lower than those reported in literature for industrialised countries.

Annex A - Part ll chemicals

PCBs were detected in 97% of 40 freshwater fish samples in Oyo and Ogun states. The PCBs mean concentrations with the range in parenthesis in ng/g fresh weight basis were 28.7 (8-130). PCBs were detected in 44.4% of fish samples analysed from south eastern states of Nigeria. PCBs found in fish from this area were 3.8(0.7-14). The concentration range and in mean in parenthesis for PCBs was 0.7-14 (3.8).

2.3.1.7. POPs in Nigerian Foods

Annex A Part l and Annex B Chemicals

Ingestion of contaminated foods is a major source of human exposure to POPs. Hence in Nigeria, exposure to POPs through dietary source had been established by the collection and analysis of foodstuffs: 217 fruit and vegetable samples; 4 major cereals (rice, maize, sorghum and soybean) as well as foodstuffs of animal origin from different locations in the country and analysing them for the presence and levels of the POPs (Osibanjo and Adeyeye 1995, 1997; Adeyeye and Osibanjo 1999). Table 2.6 shows the summary of mean concentrations of the POPs residues in Nigerian foodstuffs. Most samples had maximum residue levels below the FAO's maximum residue limits (MRL). However some samples of meat, cereals and pulses had DDT, aldrin and dieldrin with levels above the MRL. Thus meat and pulses form the greatest sources of human exposure to POPs in Nigeria.

The high levels obtained for DDT, aldrin and dieldrin could be correlated with house treatment with DDT for malaria control and aldrin and dieldrin with house treatment for termite control respectively. The study further established that the dietary intakes of HCHs, DDTs, aldrin and dieldrin came predominantly from tubers, pulses and cereals. The dietary intakes of aldrin and dieldrin in Nigeria were estimated for the first time and found similar to the values for India but higher than the values of Japan and European countries. The dietary intake values for DDTs and HCHs were below the Acceptable Daily Intake (ADI) of the FAO and those of the developed countries (Table 2.7).

2.3.1.8. Concentrations of POPs Pesticides in Nigerian Wildlife

Annex A Part l and Annex B Chemicals

Wildlife is a major source of foreign exchange earning for some African countries where tourism has been well developed, especially in East and Southern African countries and to some extent in Nigeria. Some classes and species are however important sources of animal protein for the rural population and a delicacy for the urban dwellers in some countries like Nigeria. Their socio-cultural importance is exemplified with wildlife being important ingredients of traditional medicinal preparations and in witchcraft in the African traditional society. There is a paucity of data on POPs pesticides levels in wildlife in Africa. In view of the proven ecotoxicological hazards of POPs usage in the developed countries and concerns that Nigerian wildlife resources have been dwindling with many animals and birds becoming extinct, the only baseline study on POPs pesticides levels in Nigeria thus far (Osibanjo and Jinadu 2002) indicated the relative occurrence of the POPs detected in tissues of Nigerian wildlife to be DDEpp (88.7%), BHC (73.6%), endosulfan (64.1%), heptachlor (52.8%), HCB (34.0%), and aldrin (17.0%) respectively.

Table 2.6
Overall mean concentration (μg/kg) of the POPs and non-POPs Residues in Nigerian Foodstuffs.

	MRL	Fruits	Vegetables	Tubers	MRL	Cereals[b]	Pulses	MRL	Cow	Pig	Goat	Marine Fish[d]
HCB		1.6 (1.2 – 6.2)**	1.4 (1.2 – 1.8)	ND		ND	5.0		ND	ND	ND	2.31
Lindane		1.5 (1.2 – 120)	2.9 (1.5 – 6.7)	10.1 (2.0 – 32.0)		8.0 (1.0 – 51)	108 (11 – 402)		35 (30 – 70)	226 (40 – 450)	54 (32 – 82)	1.77
Total HCH	2000	17.4 (1.9 – 13.6)	5.7 (2.2 – 13.2)	14.0 (10 – 46)	500	17.0 (1.0 – 123)	203 (30 – 428)	2000	50 (30 – 110)	244 (62 – 625)	61 (4 – 112)	-
Aldrin	100[e]	1.9 (1.6 –18.3)	2.1 (1.6 – 4.6)	8.0 (4.0 – 18)	20[e]	8.0 (2.0 – 30)	36 (25 – 51)	200[e]	28 (15 – 50)	70 (20 – 190)	14 (4.0 – 30)	-
Dieldrin		*	*	32.0 (20 – 67)		45 (6.0 – 410)	208 (58 – 290)		312 (20 – 2160)	337 (44 – 1420)	145 (62 – 640)	*
DDE		5.8 (1.3 – 16.4)	4.7 (1.1 – 13.1)	12.0 (4.0 – 21)		29 (2.0 – 126)	113 (28 – 189)		106 (15 – 233)	374 (44 –890)	90 (10 – 224)	-
Total DDT	1000	6.9 (2.2 – 22.6)	28.3 (4.3 – 49.8)	30.4 (8.0 – 44.0)	100	81 (5.0 0 410)	189 (103 – 334)	5000	164 (30 – 302)	510 (140 – 960)	141 (10 – 556)	4.80
Heptachlor		ND	ND	ND	20[F]	9.5 (2.0 – 18)	156 (38 – 320)	200[f]	ND	ND	ND	3.60
Heptachlor epoxide		*	*	ND		18 (2.0 – 33)	156 (85 – 330)		ND	ND	ND	*

* = destroyed by acid clean-up process; [a] = Maximum Residue Limits (*FAO/WHO, 1986*) [b] = *Osibanjo & Adeyeye* (1995); [c] = highest of the means in the liver, kidney, heart and muscle of each animal (*Osibanjo & Adeyeye, 1997)*; [d] = *Osibanjo & Bamgbose, 1990* (mean figures from Table 2, 1985 results); [e] = aldrin + dieldrin; [f] = heptachlor + heptachlor epoxide; ND = below detection limit, ** Range in bracket.

Table 2.7
Estimated Daily Intake of HCH, Aldrin and Dieldrin and DDT by Nigerians in Comparison Some Other Countries and the ADI of the FAO/WHO

Pesticide	Nigeria	India	USA[a]	Japan	FAO/WHO[a]
HCH	13.1± 8.2	155	0.17	0.47	600[b]
Aldrin & Dieldrin	18.0±10.8	19.0	0.29	0.05	6.0
DDT	28.8±15.3	48.0	1.6	3.1	1200

[a] Values converted from µgk/g body weight/day to µg/person/day, using an average body weight of 60kg/person, for ease of comparison. [b] Value for gamma – HCH alone.

Sources: India (Kannan et al, 1992), Japan (Matsumoto et al, 1988), U.S.A (FDA, 1989), FAO/WHO (1986)

The concept that the POPs body burden depends on the feeding habit is supported by the fact that carnivores and birds concentrate more POPs in their tissues than herbivorous wildlife in the study (Table 2.8). The highest concentrations (μg/g fresh weight) of total DDT of 1.98 μg/g, 1.27 μg/g and 1.25 μg/g respectively were found in the heart; muscle; and liver of owl. The heart (0.49 μg/g), muscle (0.41 μg/g), and kidney (0.09 μg/g) of saddle-bill stork respectively also contained the highest concentrations of α-HCH. The heart accumulated the highest concentration of organochlorine pesticides in most cases. (Table 2.8). The values are generally lower than residue values in wildlife from areas following intense pesticide spraying (Koerman and Genderen 1966) but higher than levels of OCPs/POPs (DDE 3.8-46.5; 21.7; DDT 0.6-93.2; 48.6) in duck liver samples from South Africa (Evans and Bouwman 1993).

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However, PCBs were detectable in 53% of the tissues analyzed. The highest concentrations of PCBs were found in the brain of vulture (0.52 μg/g); owl (0.51 μg/g) and cattle egret (0.38 μg/g) respectively whereas the POPs pesticides concentrations were highest mainly in the hearts and livers of the samples studied. Generally the DDT/PCB ratio is greater than 1 thereby implicating agricultural activities rather than industrial activities as the source of POPs contamination of the wildlife in Nigeria. The high levels of POPs obtained for some of the species might have adverse toxicological effects on wildlife. The deleterious effects of POPs usage on wildlife are yet to be investigated in the country.

2.3.1.9. POPs Concentrations in Human Breast Milk from Nigeria

Annex A Part l and Annex B chemicals

The concentrations of POPs contaminants in human breast milk provide reliable indicator on the exposure of different populations to chlorinated hydrocarbon chemicals. Although data abound for developed countries, studies on POPs contaminants in human breast milk are few in Africa. A survey of POPs in human breast milk in 1986 indicated that POPs and non –POPs pesticides grossly contaminate breast milk in Nigeria. The levels (μg/g fat weight) of POPs and non POPs pesticides in breast milk varied widely as follows (Table 2.9) indicating mean values and range in parenthesis: DDEpp 1.95(0.18-9.01), DDTpp 1.27 (0.-6.69), total DDT 3.60 (0.18-13.82), aldrin 0.04 (<0.01-0.40), HCB 0.33 (<0.01-4.87), (0.18-13.82), α,β-HCH 0.03 (< 0.01-0.30), lindane 0.46 (ND-6.55), heptachlor 0.06 (<0.01-0.38), endosulfan 0.64 (<0.01-10.03) This shows that Nigerian mothers are exposed to and accumulate considerable amounts of DDE, DDT, lindane, HCB and endosulfan and with low exposure to α,β-HCH and PCBs respectively. The POPs pesticides concentrations are relatively higher than values reported in literature for European countries and South Africa (non-occupationally exposed population) but much lower than values for Hong Kong except for HCB. See Table 09.

Table 2.8
POPs residue levels in tissues of some Nigerian wildlife (μg/g)

		Hooded Vulture					Cattle egret					Saddle bill stork				
		Muscle	**Kidney**	**Liver**	**Heart**	**Brain**	**Muscle**	**Kidney**	**Liver**	**Heart**	**Brain**	**Muscle**	**Kidney**	**Liver**	**Heart**	**Brain**
Number of samples		3	3	3	3	3	2	2	2	2	2	2	2	2	2	2
Lindane	A	1.16	1.4	3..9	4..9	19.4	ND	ND	ND	ND	5.7	11.3	38	95	249	460
	B	ND-1..9	0.4-25	ND-10.7	3.0-6.7	8..8-26	ND	ND	ND	ND	ND-11.4	22.7	ND-76	ND-189	ND-487	ND-920
	C	100	100	67	100	100	0	0	0	0	50	50	50	50	50	50
Aldrin	A	ND	ND	ND	ND-19.7	ND-22.2	ND	ND	ND	ND	380	ND	ND	ND	ND	ND
	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	C	0	0	0	67	67	0	0	0	0	100	0	0	0	0	0
Endosulphan	A	91	8.4	17	108	8	11	90	273	11	596	355	346	716	492	-
	B	-	ND-19.6	15-18	ND-242	ND-14	ND-22	ND	ND-181	ND-22	ND-1191	273-436	-	248-1184	257-727	-
	C	67	67	100	67	67	50	50	50	50	50	100	50	100	100	-
Heptachlor	A	26	9.1	11.3	6.7	12	9	-	ND	58	29.17	52	-	433	ND	-
	B	ND-4.6	ND-25	ND-21	ND-20	ND-13	ND-18	-	29-87	13-44	ND-34	19-39		41-45	-	-
	C	67	67	67	67	67	50	0	100	100	50	ND	ND	ND	ND	ND
Hexachloro-benzene	A	ND	0.1	0.2	1.4	2	ND	ND	ND	ND	ND	-	-	-	-	-
	B	-	ND-0.30	ND-0.7	ND-4.2	ND-6.0	-	-	-	-	-	0	0	0	0	0
	C	0	33	33	33	33	0	0	0	0	0	269	119	42	301	-
PP-DDE	A	70	55	120	635		118	30	34	49	51	7-530	-	8-75.0	7-596	-
	B	ND-135	0.3-104	49-139	265-1340		72-163	-	20-48	27-71	13-89	100	50	100	100	-
	C	67	100	100	100		100	100	100	100	100	260	33	50	376	-
TOTAL DDT	A	130	79	164	870	60	163	33	195	694	56	7-513	-	8-920	11-741	-
	B	106-154	32-130	73-302	383-1784	32-	114-215	-	148-	322-	14-98	100	100	100	100	-

						96			242	1067						
	C	100	100	100	100	100	100	100	100	100	100	22	1.5	0.5	158	-
PCB	A	63	ND	ND	487	174	40	3.5	ND	30	190	ND-44	ND-3	ND-1	ND-315	-
	B	ND-188	-	-	-	ND-524	Aug –72	ND-7	-	ND-6	ND-380	50	50	50	50	-
	C	50	-	-	33	33	100	100	0	50	50					

		Hooded Vulture					Cattle egret					Saddle bill stork				
		Muscle	Kidney	Liver	Heart	Brain	Muscle	Kidney	Liver	Heart	Brain	Muscle	Kidney	Liver	Heart	Brain
Number of samples		3	3	3	3	3	2	2	2	2	2	2	2	2	2	2
Lindane	A	1.16	1.4	3..9	4..9	19.4	ND	ND	ND	ND	5.7	11.3	38	95	249	460
	B	ND-1.9	0.4-2.5	ND-10.7	3.0-6.7	8.8-26	ND	ND	ND	ND	ND-114	22.7	ND-76	ND-189	ND-487	ND-920
	C	100	100	67	100	100	0	0	0	0	50	50	50	50	50	50
Aldrin	A	ND	ND	ND	ND-19.7	ND-22.2	ND	ND	ND	ND	380	ND	ND	ND	ND	ND
	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	C	0	0	0	67	67	0	0	0	0	100	0	0	0	0	0
Endosulphan	A	91	8.4	17	108	8	11	90	273	11	596	355	346	716	492	-
	B	-	ND-19.6	15-18	ND-242	ND-14	ND-22	ND	ND-181	ND-22	ND-1191	273-436	-	248-1184	257-727	-
	C	67	67	100	67	67	50	50	50	50	50	100	50	100	100	-
Heptachlor	A	2.6	9.1	11.3	6.7	12	9	-	ND	58	29.17	52	-	433	ND	-
	B	ND-4.6	ND-25	ND-21	ND-20	ND-13	ND-18	-	29-87	13-44	ND-34	19-39		41-45	-	-
	C	67	67	67	67	67	50	0	100	100	50	ND	ND	ND	ND	ND
Hexachlorobenzene	A	ND	0.1	0.2	1.4	2	ND	ND	ND	ND	ND	-	-	-	-	-
	B	-	ND-0.30	ND-0.7	ND-4.2	ND-6.0	-	-	-	-	-	0	0	0	0	0
	C	0	33	33	33	33	0	0	0	0	0	269	119	42	301	-
PP-DDE	A	70	55	120	635		118	30	34	49	51	7-530	-	8-75.0	7-596	-
	B	ND-135	0.3-104	49-139	265-1340		72-163	-	20-48	27-71	13-89	100	50	100	100	-
	C	67	100	100	100		100	100	100	100	100	260	33	50	376	-
TOTAL DDT	A	130	79	164	870	60	163	33	195	694	56	7-513	-	8-920	11-741	-
	B	106-154	32-130	73-302	383-1784	32-96	114-215	-	148-242	322-1067	14-98	100	100	100	100	-
	C	100	100	100	100	100	100	100	100	100	100	22	1.5	0.5	158	-
PCB	A	63	ND	ND	487	174	40	3.5	ND	30	190	ND-44	ND-3	ND-1	ND-315	-
	B	ND-188	-	-	-	ND-524	Aug – 72	ND-7	-	ND-6	ND-380	50	50	50	50	-
	C	50	-	-	33	33	100	100	0	50	50					

Table 2.8 continued

		Hooded Vulture					Cattle egret					Saddle bill stork				
		Muscle	**Kidney**	**Liver**	**Heart**	**Brain**	**Muscle**	**Kidney**	**Liver**	**Heart**	**Brain**	**Muscle**	**Kidney**	**Liver**	**Heart**	**Brain**
Number of samples		3	3	3	3	3	2	2	2	2	2	2	2	2	2	2
Lindane	A	1.16	1.4	3..9	4..9	19.4	ND	ND	ND	ND	5.7	11.3	38	95	249	460
	B	ND-1.9	0.4-25	ND-10.7	3.0-6.7	8.8-26	ND	ND	ND	ND	ND-114	22.7	ND-76	ND-189	ND-487	ND-920
	C	100	100	67	100	100	0	0	0	0	50	50	50	50	50	50
Aldrin	A	ND	ND	ND	ND-19.7	ND-22.2	ND	ND	ND	ND	380	ND	ND	ND	ND	ND
	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	C	0	0	0	67	67	0	0	0	0	100	0	0	0	0	0
Endosulphan	A	91	8.4	17	108	8	11	90	273	11	596	355	346	716	492	-
	B	-	ND-19.6	15-18	ND-242	ND-14	ND-22	ND	ND-181	ND-22	ND-1191	273-436	-	248-1184	257-727	-
	C	67	67	100	67	67	50	50	50	50	50	100	50	100	100	-
Heptachlor	A	2.6	9.1	11.3	6.7	12	9	-	ND	58	29.17	52	-	433	ND	-
	B	ND-4.6	ND-25	ND-21	ND-20	ND-13	ND-18	-	29-87	13-44	ND-34	19-39		41-45	-	-
	C	67	67	67	67	67	50	0	100	100	50	ND	ND	ND	ND	ND
Hexachlorobenzene	A	ND	0.1	0.2	1.4	2	ND	ND	ND	ND	ND	-	-	-	-	-
	B	-	ND-0.30	ND-0.7	ND-4.2	ND-6.0	-	-	-	-	-	0	0	0	0	0
	C	0	33	33	33	33	0	0	0	0	0	269	119	42	301	-
PP-DDE	A	70	55	120	635		118	30	34	49	51	7-530	-	8-75.0	7-596	-
	B	ND-135	0.3-104	49-139	265-1340		72-163	-	20-48	27-71	13-89	100	50	100	100	-
	C	67	100	100	100		100	100	100	100	100	260	33	50	376	-
TOTAL DDT	A	130	79	164	870	60	163	33	195	694	56	7-513	-	8-920	11-741	-
	B	106-154	32-130	73-302	383-1784	32-96	114-215	-	148-242	322-1067	14-98	100	100	100	100	-
	C	100	100	100	100	100	100	100	100	100	100	22	1.5	0.5	158	-
PCB	A	63	ND	ND	487	174	40	3.5	ND	30	190	ND-44	ND-3	ND-1	ND-315	-
	B	ND-188	-	-	-	ND-524	Aug –72	ND-7	-	ND-6	ND-380	50	50	50	50	-
	C	50	-	-	33	33	100	100	0	50	50					

Source: Osibanjo and Jinadu 2002

Key: A-mean, B-range, C-% occurence in samples

Table 2.8 continued

		Hooded Vulture					Cattle egret					Saddle bill stork				
		Muscle	**Kidney**	**Liver**	**Heart**	**Brain**	**Muscle**	**Kidney**	**Liver**	**Heart**	**Brain**	**Muscle**	**Kidney**	**Liver**	**Heart**	**Brain**
Number of samples		3	3	3	3	3	2	2	2	2	2	2	2	2	2	2
Lindane	A	1.16	1.4	3..9	4..9	19.4	ND	ND	ND	ND	5.7	11.3	38	95	249	460
	B	ND-1.9	0.4-25	ND-10.7	3.0-6.7	8.8-26	ND	ND	ND	ND	ND-11.4	22.7	ND-76	ND-189	ND-487	ND-920
	C	100	100	67	100	100	0	0	0	0	50	50	50	50	50	50
Aldrin	A	ND	ND	ND	ND-19.7	ND-22.2	ND	ND	ND	ND	380	ND	ND	ND	ND	ND
	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	C	0	0	0	67	67	0	0	0	0	100	0	0	0	0	0
Endosulphan	A	91	8.4	17	108	8	11	90	273	11	596	355	346	716	492	-
	B	-	ND-19.6	15-18	ND-242	ND-14	ND-22	ND	ND-181	ND-22	ND-1191	273-436	-	248-1184	257-727	-
	C	67	67	100	67	67	50	50	50	50	50	100	50	100	100	-
Heptachlor	A	2.6	9.1	11.3	6.7	12	9	-	ND	58	29.17	52	-	433	ND	-
	B	ND-4.6	ND-25	ND-21	ND-20	ND-13	ND-18	-	29-87	13-44	ND-34	19-39		41-45	-	-
	C	67	67	67	67	67	50	0	100	100	50	ND	ND	ND	ND	ND
Hexachlorobenzene	A	ND	0.1	0.2	1.4	2	ND	ND	ND	ND	ND	-	-	-	-	-
	B	-	ND-0.30	ND-0.7	ND-4.2	ND-6.0	-	-	-	-	-	0	0	0	0	0
	C	0	33	33	33	33	0	0	0	0	0	269	119	42	301	-
PP-DDE	A	70	55	120	635		118	30	34	49	51	7-530	-	8-75.0	7-596	-
	B	ND-135	0.3-104	49-139	265-1340		72-163	-	20-48	27-71	13-89	100	50	100	100	-
	C	67	100	100	100		100	100	100	100	100	260	33	50	376	-
TOTAL DDT	A	130	79	164	870	60	163	33	195	694	56	7-513	-	8-92.0	11-741	-
	B	106-154	32-130	73-302	383-1784	32-96	114-215	-	148-242	322-1067	14-98	100	100	100	100	-
	C	100	100	100	100	100	100	100	100	100	100	22	1.5	0.5	158	-
PCB	A	63	ND	ND	487	174	40	3.5	ND	30	190	ND-44	ND-3	ND-1	ND-315	-
	B	ND-188	-	-	-	ND-524	Aug –72	ND-7	-	ND-6	ND-380	50	50	50	50	-
	C	50	-	-	33	33	100	100	0	50	50					

Source: Osibanjo and Jinadu 2002

Key: A-mean, B-range, C-% occurence in samples

Table 2.8 continued

					Owl otus ireneae					Monkey, Colubus polykmos					Squirrel xerus erythropus				
Muscle	**Kidney**	**Liver**	**Heart**	**Brain**	**Muscle**	**Kidney**	**Liver**	**Heart**	**Brain**	**Muscle**	**Kidney**	**Liver**	**Heart**	**Brain**	**Muscle**	**Kidney**	**Liver**	**Heart**	**Brain**
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
32	ND	ND	143.8	ND	0.7	ND	49.2	ND	3.9	2.3	2.7	1	9.7	2.7	0.8	0.7	ND	15	5.3
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	100	100	100	100
100	0	0	100	0	100	0	100	0	100	100	100	100	100	100					
ND	ND	ND	74.8	ND	ND	ND	ND	ND	ND	2.7	4.6	8.9	7.8	2.8	ND	ND	ND	ND	ND
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0	0	0	100	0	0	0	0	0	0	100	100	100	100	100	0	0	0	0	0
22	ND	ND	ND	ND	81	139	46	ND	ND	23	25	22	54	18	ND	ND	ND	ND	ND
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
100	0	0	0	0	100	100	100	0	0	100	100	100	100	100	0	0	0	0	0
-	ND	ND	ND	ND	ND	ND	14	31	23	ND	ND	ND	ND	ND	14	7	ND	3	ND
100	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	8	23	17	16	0	0	100	100	100	0	0	0	0	0	100	100	0	100	0
-	-	-	-	-	ND	ND	ND	ND	ND	9	ND	0.3	1	ND	0.7	0.7	ND	1	ND
100	100	100	100	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
187	66	134	180	27	0	0	0	0	0	100	0	100	100	0	100	100	0	0	0
-	-	-	-	-	1052	640	892	1445	1210	2	2.4	14	3		ND	ND	ND	ND	ND
100	100	100	100	200	-	-	-	-	-	-	-	-	-		-	-	-	-	-
211	93	216	263	30	100	100	100	100	100	100	100	100	100		100	100	100	100	100
-	-	-	-	-	1270	664	1254	1985	133	2	2.3	4.2	3.4	3	ND	ND	ND	ND	ND
100	-	100	100	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
100	8	23	4	16	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
-	-	-	-	-	ND	42	ND	425	512	ND	33	20	91	ND	ND	ND	ND	ND	ND
100	100	100	100	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
					0	100	100	100	100	0	100	100	100	0	0	0	0	0	0

Source: Osibanjo and Jinadu 2002

Key: A-mean, B-range, C-% occurence in samples

The occurrence of relatively high levels of DDE, DDT, HCB, lindane and endosulfan in human breast milk is of concern in view of Nigerian government vigorous campaign that mothers' breast milk is best for children. It has been established by studies in South Africa that POPs can be transferred to infants via breast milk. Thus infants are being exposed to these xenobiotics while the toxicological hazards and risks have not been studied in Nigeria and many African countries.

Annex A Part ll chemicals

Low level contamination of breast milk by PCBs was observed in Nigeria. The levels (μg/g fat weight) of PCBs in breast milk with the mean and range in parenthesis was 0.02 (< 0.01-0.30). See Table 2.9.

2.3.1.10. Data gaps

There is no organized database at the national or state level on POPs chemicals import, local formulation output, and consumption. Most institutions in the country lack the analytical facilities in terms of high technology equipment, such as mass spectrometers (MS), high resolution gas chromatographs (HRGC) and high pressure liquid chromatographs (HPLC), in addition to recently developed efficient extraction and clean up apparatus/equipment for the detection and quantitative analysis of POPs in environmental samples. Consequently there is no National Monitoring Programme to allow trend analysis as the monitoring data available were gathered through academic research.

Highly trained experts in trace organic analysis, access to current periodicals and other literature, as well as funds for solvents and other pertinent chemicals are the main limiting factors for conducting research and/or monitoring POPs residues.

POPs data gaps have been identified in the following areas:

- POPs atmospheric concentrations as well as levels in water, fish and sediments of the major rivers, e.g., Niger and Benue
- Dioxins and furans, in environmental compartments and humans
- Systematic studies on the food web contamination & biomagnifications of POPs
- Epidemiological surveillance
- Transboundary movement of POPs residues
- Effect of uncontrolled open burning of refuse and other waste

Table 09:
Concentrations of Chlorinated Hydrocarbons and POPs (μg/g fat weight) in Human Breast Milk from Nigeria and from Other Countries in Europe and Asia

	Nigeria	Sweden	Great Britain	West Germany	Hong Kong	South Africa*
DDE	1.95 (0.18 – 9.01)	1.64 (1.15 – 2.83)	1.6 (<0.01 – 7.3)	1.51 (< 0.01 – 12.8)	11.67 (4.07 – 22.96)	8.65 (0.5-46.9) exposed people; 0.65 (ND-4.73) non-exposed people
$DDT_{p,p}$	1.27 (<0.01 – 11.90)	0.26 (0.21 – 0.33)	0.11 (<0.01 – 1.2)	-	2.17 (0.67 – 4.04)	6.77 (0.42-28.8) exposed people 0.04 (ND-0.36) non-exposed people
Aldrin	0.04 (<0.01 – 0.40)	-	-	-	-	
Dieldrin	-	0.02 (0.01 – 0.03)	0.08 (<0.01 – 0.55)	-	0.24 (0.04 – 0.80)	
HCB	0.33 (<0.01 – 4.87)	0.14 (0.11 – 0.20)	0.14 (<0.01 – 1.0)	0.72 (<0.01 – 5.38)	0.05 (<0.01 – 0.29)	
α,β-BHC	0.03 (<0.01 – 0.30)	0.17 (0.14 – 0.22)	0.22 (<0.01 – 4.4)	0.44 (<0.01 – 9.10)	15.96 (2.91 – 27.24)	
Lindane	0.46 (<0.01 – 6.55)		-	-	-	
Heptachlor	0.06 (<0.01 – 0.38)	-		-	-	
Endosulfan	0.64 (<0.01 – 10.03)	-	-	-	-	
PCBs	0.02 (<0.01 – 0.30)	1.44 (1.22 – 2.00)	0.5 (<0.1 – 2.1)	2.04 (<0.01 – 12.0)	0.64 (0.25 – 1.43)	

Source: Osibanjo 2002

- The long-term effect of the accumulated stocks of obsolete POPs on the health of the human and animal populations near them
- Concentrations of dioxins/furans in environmental media and biota
- Health impact assessment of POPs past usage
- Informal sector contribution to POPs trade and potential impact on development of alternatives to POPs and Phase out of POPs
- Human poisoning incidents
- Public perception and awareness of POPs issues

Therefore, the following measures should be carried out:

- Building national awareness of the health effects of DDT, especially in malaria endemic areas
- Disposing of obsolete DDT stocks
- Undertaking laboratory analyses to determine the distribution of DDT in the environment
- Undertaking sustained and continuous monitoring of DDT in the environment
- Encouraging more investment in research for development of effective and affordable alternatives to DDT
- Undertaking a comprehensive review and assessment of current alternatives to DDT followed by epidemiological surveillance
- Identifying the social aspects of banning DDT
- Strengthening the national and local institutional capacity to control malaria without the use of DDT, e.g., National Malaria Program

2.3.2. *Assessment with respect to Annex A, Part II chemicals (PCBs)*

PCBs are additives in transformer oils and PCB containing equipment such as transformers and capacitors. PCBs were imported in large quantities over the years and found a wide range of applications due to their high thermal, chemical and electrical stability. The electricity generating industry is the major source of PCB release into the Nigerian environment. Transformer oils not containing PCBs have become available in the market in recent years but not widely used. There is appreciable stock of transformer oil containing PCBs existing in most establishments who have to provide their independent energy source.

The Power Holding Company of Nigeria (PHCN) with primary responsibility for electric power generation, distribution and transmission in the country, which changed its name last year due to a reform in the energy sector to Power Holding Company of Nigeria (PHCN), could not provide information on the total number of transformers, hydraulic and cooling systems in the country as a comprehensive database was lacking. Nonetheless an on-going World Bank project to establish a database for transformers being undertaken by PHCN has provided some information on power transformers.

278 transmission transformers with oil containing PCB are currently in use by PHCN throughout the country (PHCN 2007, Table 2.10). Scaling up this figure by 30% to accommodate transformers owned by the private sector, the total number could be at least 341 transformers in use. The number could be much more if we factor in the various independent power plant projects being developed and run by the private sector. The information provided by PHCN did not indicate the number of decommissioned or abandoned transformers. The inventory could not consider other sector (power generation, distribution and private sector transformers) due to logistic and other constraints. A World Bank project has just been initiated to elaborate on these other sectors. lt is expected that a holistic database of all transformers in use would be available when the World Bank Inventory of Transformers project is completed.

The transformers were imported mainly from Europe, Asia (especially Japan, India and South Korea) and South Africa respectively. Most of them are old, having been manufactured between 15 and 30 years ago. Environmental considerations have driven PHCN to begin to retro-fill old transformers with PCB free (<50ppm PCB) transformer oil in recent years. The spate of new Independent Power Plants coming on stream has caused a leapfrog in the amount of transformer oil (mineral oil expected to be PCB free) imported from 236 metric tonnes in 2004 to 931 metric tonnes in 2005 and then rise marginally relative to 2005 to 1,084 metric tonnes in 2006 (Table 2.11). No quality check for PCB concentration is carried out on the imported transformer oils by NAFDAC.

The transmission stations (TS) visited are generally sited away from residential areas, schools, institutions or water bodies. There were apparent leakages from some of the transformers inventoried. In some cases there were no PCB warning signs on the transformers, workshop areas or premises.

It was also observed that most of the workers were not well informed on PCBs and their hazards to human health and the environment. The problems are similar in all the zones and worthy of note is the lack of awareness by PHCN staff of the chemical nature and toxicological effects of PCB in transformer oils.

Information is also lacking on transformers retro-filling companies in the country. Nonetheless PHCN's Kaduna office has the equipment to drain oils containing PCBs from old transformers, flush them with oil that is PCB free (that is containing less than 0.005% or less than 50 ppm PCB), and retro-fill such transformers with PCB free oil. There are currently no forms of control on PCBs in the country although PCB use is allowed internationally till 2025.

In view of the absence of an effective enforcement of the national law on management of hazardous waste and absence of a sanitary landfill sites in the country, PCBs will be released to the atmosphere from historically contaminated soils or sediments or from landfills which may contain PCBs from previous disposal of electric appliances.

Table 2.10:
Report on Inventory of Power Transformers in the Transmission Sector of Power Holding Company of Nigeria (PHCN) Plc. 2005

Item	Region	Site name	Manufacturer	Origin	Serial no.	Production Year	Power (MVA)	Rating (KVA)	Mass of Dielectric	Total Mass of Equipment	Type of dielectric	State
1	Bauchi	Gombe	Mitsubishi	Japan			150	330/132/33			Oil	In use
2	Bauchi	Gombe	ABB	South Africa			150	330/132/33			Oil	In use
3	Bauchi	Jos	Mitsubishi	Japan			150	330/132/33			Oil	In use
4	Bauchi	Gombe	Ferranti	England			30	132/33			Oil	In use
5	Bauchi	Gombe	Ferranti	England			40	132/33			Oil	In use
6	Bauchi	Potiskum	CEM	?			30	132/33			Oil	In use
7	Bauchi	Potiskum	Toshiba	Japan			30	132/33			Oil	In use
8	Bauchi	Maiduguri	Hyundai	South Korea			45	132/33			Oil	In use
9	Bauchi	Maiduguri	Hyundai	South Korea			45	132/33			Oil	In use
10	Bauchi	Maiduguri	Ferranti	England			15	132/33			Oil	In use
11	Bauchi	Domboa	Toshiba	Japan			30	132/33			Oil	In use
12	Bauchi	Biu	Ferranti	England			15	132/33			Oil	In use
13	Bauchi	Yola	Leechum	South Korea			30	132/33			Oil	In use
14	Bauchi	Yola	Leechum	South Korea			30	132/33			Oil	In use
15	Bauchi	Yola	Mitsubishi	Japan			15	132/33			Oil	In use
16	Bauchi	Savanah	CEM	?			15	132/33			Oil	In use
17	Bauchi	Jos	Elta	Poland			60	132/33			Oil	In use
18	Bauchi	Jos	Elta	Poland			60	132/33			Oil	In use
19	Bauchi	Bauchi	Telk	India			40	132/33			Oil	In use
20	Bauchi	Bauchi	ABB	South Africa			30	132/33			Oil	In use
21	Benin	Benin	Mitsubishi	Japan			150	330/132/33			Oil	In use
22	Benin	Benin	Mitsubishi	Japan			150	330/132/33			Oil	In use
23	Benin	Ajaokuta	Mitsubishi	Japan			162	330/132/33			Oil	In use
24	Benin	Ajaokuta	Mitsubishi	Japan			162	330/132/33			Oil	In use
25	Benin	Ajaokuta	Mitsubishi	Japan			162	330/132/33			Oil	In use
26	Benin	Ughelli	Mitsubishi	Japan			150	330/132/33			Oil	In use

Table 2.10 continued

Item	Region	Site name	Manufacturer	Origin	Serial no.	Production Year	Power (MVA)	Rating (KVA)	Mass of Dielectric	Total Mass of Equipment	Type of dielectric	State
27	Benin	Benin	ABB	South Africa			60	132/33			Oil	In use
28	Benin	Benin	Pauwels	Belgium			60	132/33			Oil	In use
29	Benin	Benin	Toshiba	Japan			40	132/33			Oil	In use
30	Benin	Irrua	ABB	South Africa			60	132/33			Oil	In use
31	Benin	Irrua	ABB	South Africa			30	132/33			Oil	In use
32	Benin	Okene	Red Koncar	Croatia			30	132/33			Oil	In use
33	Benin	Okene	Toshiba	Japan			40	132/33			Oil	In use
	Benin	Ukpilla	Ferranti	England			15	132/33			Oil	In use
34	Benin	Geregu TS	-	-			30	132/33			Oil	In use
35	Benin	Ughelli	Elta	Poland			30	132/33			Oil	In use
36	Benin	Ughelli	Elta	Poland			30	132/33			Oil	In use
37	Benin	Effurun	Ferranti	England			30	132/33			Oil	In use
38	Benin	Effurun	Elta	Poland			60	132/33			Oil	In use
39	Benin	Effurun	Pauwel	Belgium			60	132/33			Oil	In use
40	Enugu	Alaoji	Mitsubishi	Japan			150	330/132/33			Oil	In use
41	Enugu	Alaoji	Mitsubishi	Japan			150	330/132/33			Oil	In use
42	Enugu	Afam	Mitsubishi	Japan			162	330/132/33			Oil	In use
43	Enugu	New Haven	Mitsubishi	Japan			150	330/132/33			Oil	In use
44	Enugu	New Haven	Mitsubishi	Japan			150	330/132/33			Oil	In use
45	Enugu	Onitsha	Mitsubishi	Japan			90	330/132/33			Oil	In use
46	Enugu	Onitsha	Asgen	?			90	330/132/33			Oil	In use
47	Enugu	Aba Town	Parson	Italy			7.5	132/6.6			Oil	In use
48	Enugu	Aba Town	Pauwel	Belgium			30	132/33			Oil	In use
49	Enugu	Aba Town	Hundai	South Korea			45	132/33/11			Oil	In use
50	Enugu	Aba Town	Mitsubishi	Japan			30	132/33			Oil	In use

Item	Region	Site name	Manufacturer	Origin	Serial no.	Production Year	Power (MVA)	Rating (KVA)	Mass of Dielectric	Total Mass of Equipment	Type of dielectric	State
51	Enugu	Aba Town	Pauwel	Belgium			60	132/33			Oil	In use
52	Enugu	Owerri	Gen. Electric	?			45	132/33			Oil	In use
53	Enugu	Owerri	Toshiba	Japan			60	132/33			Oil	In use
54	Enugu	Owerr i	Pauwels	Belgium			40	132/33			Oil	In use
55	Enugu	P.H. Mains	Indust. Elect.	?			45	132/33/11			Oil	In use
56	Enugu	P.H.Mains	Indust. Elect.	?			45	132/33/11			Oil	In use
57	Enugu	P.H. Mains	Pauwels	Belgium			60	132/33			Oil	In use
58	Enugu	P.H. Town	Ferranti	England			12.5	132/11			Oil	In use
59	Enugu	P.H Town	Pauwells	Belgium			30	132/33			Oil	In use
60	Enugu	P.H Town	Pauwells	Belgium			30	132/33			Oil	In use
61	Enugu	P.H Town	Hundai	South Korea			45	132/11			Oil	In use
62	Enugu	Ahoada	STEM	?			40	132/33			Oil	In use
63	Enugu	Ahoada	STEM	?			40	132/33			Oil	In use
64	Enugu	Calabar	ASEA	?			30	132/33			Oil	In use
65	Enugu	Calabar	ASEA	?			60	132/33			Oil	In use
66	Enugu	Calabar	ABB	South Africa			60	132/33			Oil	In use
67	Enugu	Eket	ASEA	?			45	132/33			Oil	In use
68	Enugu	Eket	Pauwel	Belgium			60	132/33			Oil	In use
69	Enugu	Uyo	Pauwels	Belgium			40	132/33			Oil	In use
70	Enugu	Uyo	ABB	South Africa			40	132/33			Oil	In use
71	Enugu	Itu	Trafounion	?			15	132/33			Oil	In use
72	Enugu	New Haven	Leechum	South Korea			30	132/33			Oil	In use
73	Enugu	New Haven	Leechum	South Korea			30	132/33			Oil	In use
74	Enugu	New Haven	ABB	South Africa			60	132/33			Oil	In use
75	Enugu	Abakaliki	Pauwells	Belgium			30	132/33			Oil	In use

Item	Region	Site name	Manufacturer	Origin	Serial no.	Production Year	Power (MVA)	Rating (KVA)	Mass of Dielectric	Total Mass of Equipment	Type of dielectric	State
76	Enugu	Abakaliki	Tamini	?			15	132/33			Oil	In use
77	Enugu	Otukpo	Pauweltrafo	-			7.5	132/33			Oil	In use
78	Enugu	Otukpo	Pauwel	Belgium			30	132/33			Oil	In use
79	Enugu	Nkalagu	Gen. Electric	?			30	132/33			Oil	In use
80	Enugu	Nkalagu	Espanola	?			30	132/33			Oil	In use
81	Enugu	Yandev	BCC	Sweden			15	132/33			Oil	In use
82	Enugu	Yandev	BCC	Sweden			15	132/33			Oil	In use
83	Enugu	Yandev	Mitsubishi	Japan			45	132/33			Oil	In use
84	Enugu	Apir	ABB	South Africa			40	132/33			Oil	In use
85	Enugu	Onitsha	Pauwel	Belgium			45	132/33			Oil	In use
86	Enugu	Onitsha	Hyundai	South Korea			60	132/33			Oil	In use
87	Enugu	Onitsha	Trafounion	?			15	132/33			Oil	In use
88	Enugu	Onitsha	ABB	South Africa			60	132/33			Oil	In use
89	Enugu	Awka	ABB	South Africa			30	132/33			Oil	In use
90	Enugu	Awka	PauwelTrafo	-			30	132/33			Oil	In use
91	Enugu	Oji River	Pauwel	Belgium			30	132/33			Oil	In use
92	Enugu	Oji River	Savglino	?			15	132/66			Oil	In use
93	Enugu	GCM	OEL	?			15	132/33				
94	Kaduna	Mando	Marrilli	?			60	330/132			Oil	In use
95	Kaduna	Mando	Marrilli	?			60	330/132			Oil	In use
96	Kaduna	Mando	Asgen	Italy			90	330/132			Oil	In use
97	Kaduna	Mando	Mitsubishi	Japan			150	330/132			Oil	In use
98	Kaduna	Kumbotso	Mitsubishi	Japan			150	330/132			Oil	In use
99	Kaduna	Kumbotso	Mitsubishi	Japan			150	330/132			Oil	In use
100	Lagos	Mando	ABB	South Africa			30	132/33			Oil	In use

Item	Region	Site name	Manufacturer	Origin	Serial no.	Production Year	Power (MVA)	Rating (KVA)	Mass of Dielectric	Total Mass of Equipment	Type of dielectric	State
101	Lagos	Mando	Pauwells	Belgium			60	132/33			Oil	In use
102	Lagos	Mando	Cenemesia	?			30	132/33			Oil	In use
103	Lagos	Kad. Town	Ferranti	England			30	132/33			Oil	In use
104	Lagos	-	ABB	South Africa			60	132/33			Oil	-
105	Lagos	-	Ferranti	England			30	-			-	-
106	Lagos	-	Hack bridge	?			30	-			-	-
107	Lagos	-	Ferranti	England			15	-			-	-
108	Lagos	Zaria	Ferranti	England			15	132/33			-	-
109	Lagos	Zaria	Ferranti	England			15	132/11			-	-
110	Lagos	Zaria	Hyundai	South Korea			30	132/33/11			-	-
112	Lagos	Zaria	Pauwels	Belgium			40	132/33			-	-
113	Lagos	Funtua	Brush	England			5	132/33			-	-
114	Lagos	Funtua	Asea	?			7.5	132/33			-	-
115	Lagos	Funtua	Pauwels	Belgium			30	132/33			-	-
116	Lagos	Gusau	Ferranti	England			15	132/33				
117	Lagos	Gusau	Hawker Sidley	?			30	132/33			-	-
118	Lagos	Gusau	Elprom Energ.	?			7.5	132/11			-	-
119	Lagos	Gusau	Hyundai	South Korea			7.5	132/11			-	-
120	Lagos	Kumbotso	Toshiba	Japan			30	132/33			-	-
121	Lagos	Kumbotso	ABB	South Africa			40	132/33			-	-
122												
123	Lagos	Kumbotso	ABB	South Africa			30					
124	Lagos	Dakata	Ital Travo	?			30	132/33				

Item	Region	Site name	Manufacturer	Origin	Serial no.	Production Year	Power (MVA)	Rating (KVA)	Mass of Dielectric	Total Mass of Equipment	Type of dielectric	State
125	Lagos	Dakata	Toshiba	Japan			60	132/33				
126	Lagos	Dakata	Taltravo	?			30	132/33				
127	Lagos	Dakasa	Pauwels	Belgium			30	132/33			-	-
128	Lagos	Dan-Agundi	Pauwels	Belgium			60	132/33			-	-
129	Lagos	Dan- Agundi	ABB	South Africa			60	132/32			-	-
130	Lagos	Dan- Agundi	Pauwels	Belgium			60	132/33			-	-
131	Lagos	Hadeja	C.E.M	?			15	132/33			-	-
132	Lagos	Hadeja	Ferranti	England			15	132/33			-	-
133	Lagos	Kankia	Pauwel	Belgium			7.5	132/33			-	-
134	Lagos	Kankia	Pauwels	Belgium			30	132/33			-	-
135	Lagos	Katsina	Pauwels	Belgium			7.5	132/33			-	-
136	Lagos	Katsina	ELTA	Poland			30	132/33			-	-
137	Lagos	Katsina	ABB	South Africa			30	132/33			-	-
138	Lagos	Aja	Mitsubishi	Japan			150	330/132/33			Oil	In use
139	Lagos	Aja	Pauwels	Belgium			150	330/132/33			-	-
140	Lagos	Aiyede	Mitsubishi	Japan			150	330/132/33			-	-
141	Lagos	Aiyede	Mitsubishi	Japan			150	330/132/33			-	-
142	Lagos	Egbin	Mitsubishi	Japan			150	330/132/33			-	-
143	Lagos	Egbin	Mitsubishi	Japan			150	330/132/33			-	-
144	Lagos	Ikeja-West	Mitsubishi	Japan			150	330/132/33			-	-
145	Lagos	Ikeja- West	Mitsubishi	Japan			150	330/132/33			-	-
146	Lagos	Ikeja- West	Mitsubishi	Japan			150	330/132/33			-	-
147	Lagos	Ikeja-West	Mitsubishi	Japan			150	330/132/33			-	-
148	Lagos	Akangba	-	-			90	-			-	-

Item	Region	Site name	Manufacturer	Origin	Serial no.	Production Year	Power (MVA)	Rating (KVA)	Mass of Dielectric	Total Mass of Equipment	Type of dielectric	State
149	Lagos	Akangba	-	-			90	330/132/13.8			-	-
150	Lagos	Akangba	-	-			90	330/132/13.8			-	-
151	Lagos	Akangba	Asgen	Italy			90	-			-	-
152	Lagos	Akangba	Mitsubishi	Japan			150	330/132/33			-	-
153	Lagos	Osogbo	Mitsubishi	Japan			150	330/132/33			Oil	In use
154	Lagos	Osogbo	ABB	South Africa			90	330/132/33			-	-
155	Lagos	Aja	Mitsubishi	Japan			60	132/33			-	-
156	Lagos	Aja	ABB	South Africa			60	132/33			-	-
157	Lagos	Owororshonk	ELTA	Poland			30	132/33			-	-
158	Lagos	Owororshonk	ELTA	Poland			30	132/33			-	-
159	Lagos	Alagbon	-	-			60	-			-	-
160	Lagos	Alagbon	-	-			-	-			-	-
161	Lagos	Apapa Road	Hyundai	South Korea			45	-			-	-
162	Lagos	Apapa Road	ItalTrafo	Italy			30	-			-	-
163	Lagos	Apapa Road	Mitsubishi	Japan			15	132/11			-	-
164	Lagos	Apapa Road	-	-			-	-			-	-
165	Lagos	Akoka	Toshiba	-			45	132/33			-	-
166	Lagos	Akoka	Toshiba	-			30	132/33			-	-
167	Lagos	Amuwo-Odofin	-	-			30	-			-	-
168	Lagos	Amuwo-Odofin	Toshiba	Japan			30	132/33			Oil	In use
169	Lagos	-	ItalTrafo	Italy			30	132/33			-	-
170	Lagos	Aiyede	Samsung	South Korea			-	-			-	-
171	Lagos	Aiyede	Ferranti	England			-	-			-	-
172	Lagos	-	Pauwels	Belgium			60	-			-	-

Item	Region	Site name	Manufacturer	Origin	Serial no.	Production Year	Power (MVA)	Rating (KVA)	Mass of Dielectric	Total Mass of Equipment	Type of dielectric	State
173	Lagos	Jerico	Mitsubishi	Japan			45	132/33/11			-	-
174	Lagos	-	Pauwels	Belgium			40	132/33			-	-
175	Lagos	Ibadan north	Hyundai	South Korea			45	132/33/11			-	-
176	Lagos	Ibadan north	Toshiba	Japan			60	132/33			-	-
177	Lagos	Shagamu	ELTA	Poland			30	-			-	-
178	Lagos	Shagamu	-	-			-	-			-	-
179	Lagos	Ijebuode	-	-			-	-			-	-
180	Lagos	Ijebuode	-	-			-	-			-	-
181	Lagos	Iseyin	Hyundai	South Korea			45	-			-	-
182	Lagos	Maryland	Mitsubishi	Japan			30	-			-	-
183	Lagos	Maryland	Toshiba	Japan			40	132/33			Oil	In use
184	Lagos	-	Mitsubishi	-			30	-			-	-
185	Lagos	Ikorodu	-	-			60	-			-	-
186	Lagos	-	ABB	South Africa			60	-			-	-
187	Lagos	Ogba	Mitsubishi	Japan			-	-			-	-
188	Lagos	-	Pauwel	Belgium			-	-			-	-
189	Lagos	-	Toshiba	Japan			30	-			-	-
190	Lagos	-	Mitsubishi	-			25	-				
191	Lagos	-	-	-			20	132/11			-	-
192	Lagos	Alimosho	-	-			30	132/33			-	-
193	Lagos	-	ABB	South Africa			60	-			-	-
194	Lagos	-	Mitsubishi	Japan			30	-			-	-
195	Lagos	Papalanto	Trafounion	?			15	-			-	-
196	Lagos	-	-	-			15	-			-	-
197	Lagos	-	Pauwels	Belgium			30	-			-	-

Item	Region	Site name	Manufacturer	Origin	Serial no.	Production Year	Power (MVA)	Rating (KVA)	Mass of Dielectric	Total Mass of Equipment	Type of dielectric	State
198	Lagos	Abeokuta	ELTA	Poland			-	-			-	-
199	Lagos	Abeokuta	ELTA	Poland			30	132/33			-	-
200	Lagos	-	Pauwel	Belgium			-	-			-	-
201	Lagos	Ejigbo	Trafounion	?			-	-			-	-
102	Lagos	-	-	-			-	-			-	-
203	Lagos	Agbara	Hyundai	South Korea			45	-			-	-
204	Lagos	-	-	-			-	-			-	-
205	Lagos	Alausa	-	-			-	-			-	-
206	Lagos	-	Pauwels	Belgium			60	-			-	-
207	Lagos	Otta	MINEL	?			40	-			-	-
208	Lagos	-	Pauwel	Belgium			60	-			-	-
209	Lagos	Akangba	ABB	South Africa			-	-			-	-
210	Lagos	-	BBC	Sweden			-	-			-	-
211	Lagos	Ojo	CEM	?			30	-			-	-
212	Lagos	-	ABB	South Africa			-	-			-	-
213	Lagos	Ilupeju	OEL	?			15	132/11			-	-
214	Lagos	Ilupeju	MINEL	?			25	132/11			Oil	In use
215	Lagos	-	OEL	-			15	-			-	-
216	Lagos	-	Pauwel	Belgium			30	132/33			-	-
217	Lagos	Isolo	BBC	Sweden			45	132/33/11			-	-
218	Lagos	-	-	-			-	-			-	-
219	Lagos	-	-	-			-	-			-	-
220	Lagos	Itire	Toshiba	Japan			30	132/33			-	-
221	Lagos	-	-	-			40	-			-	-
222	Lagos	Ijora	GEC	?			30	-			-	-

Item	Region	Site name	Manufacturer	Origin	Serial no.	Production Year	Power (MVA)	Rating (KVA)	Mass of Dielectric	Total Mass of Equipment	Type of dielectric	State
223	Lagos	-	-	-			-	-			-	-
224	Lagos	-	Hyundai	South Korea			45	-			-	-
225	Lagos	-	GEC	?			30	-			-	-
226	Lagos	Osogbo	Ferranti	England			-	-			-	-
227	Lagos	-	Hyundai	South Korea			45	-			-	-
228	Lagos	-	Mitsubishi	Japan			30	-			-	-
229	Lagos	Ilorin	Toshiba	Japan			60	132/33			Oil	In use
230	Lagos	-	Hyundai	South Korea			30	-			-	-
231	Lagos	Akure	Ferranti	England			15	-			-	-
232	Lagos	-	Mitsubishi	Japan			30	-			-	-
233	Lagos	-	Pauwels	Belgium			60	-			-	-
234	Lagos	Ondo	ELTA	Poland			30	-			-	-
235	Lagos	-	-	-			-	-			-	-
236	Lagos	Ife	-	-			-	-			-	-
237	Lagos	-	-	-			-	-			-	-
238	Lagos	Ilesha	ABB	South Africa			-	-			-	-
239	Lagos	-	-	-			-	-			-	-
240	Lagos	Ofa	Toshiba	Japan			-	-			-	-
241	Lagos	Omuaran	Mitsubishi	-			-	-			-	-
242	Lagos	-	Toshiba	-			-	-			-	-
243	Lagos	-	-	-			-	-			-	-
244	Shiroro	Shiroro 1	Mitsubishi	Japan			150	330/132/33			Oil	In use
245	Shiroro	-	-	-			-	-			-	-
246	Shiroro	Katampe	ABB	South Africa			-	-			-	-
247	Shiroro	-	-	-			-	-			-	-

Item	Region	Site name	Manufacturer	Origin	Serial no.	Production Year	Power (MVA)	Rating (KVA)	Mass of Dielectric	Total Mass of Equipment	Type of dielectric	State
248	Shiroro	Jebba	Marilli	Italy			80	-			-	-
249	Shiroro	Birnin Kebbi	Saviglino	Tarino			90	-			-	-
250	Shiroro	-	Asgen	Italy			-	-			-	-
251	Shiroro	Shiroro 2	OEL	?			30	132/33			-	-
252	Shiroro	Minna	Trafounion	?			-	-			-	-
253	Shiroro	-	-	-			-	-			-	-
254	Shiroro	Tegina	TELk	India			-	-			-	-
255	Shiroro	Abuja	Trafounion	?			-	-			-	-
256	Shiroro	-	-	-			-	-			-	-
257	Shiroro	-	Hyundai	South Korea			-	-			-	-
258	Shiroro	Kubwa	ABB	South Africa			40	-			-	-
259	Shiroro	Katampe	ABB	South Africa			30	132/33			Oil	In use
260	Shiroro	-	-	-			60	-			-	-
261	Shiroro	-	-	-			-	-			-	-
262	Shiroro	Central Area	-	-			-	-			-	-
263	Shiroro	-	-	-			-	-			-	-
264	Shiroro	Akwanga	-	-			40	-			-	-
265	Shiroro	Jebba	-	-			30	-			-	-
266	Shiroro	Bida	Trafounion	?			-	-			-	-
267	Shiroro	-	Mitsubishi	Japan			-	-			-	-
268	Shiroro	Kontagora	Toshiba	-			-	-			-	-
269	Shiroro	Birnin-kebbi	Compania	?			5	-			-	-
270	Shiroro	-	Foster	?			15	-			-	-
271	Shiroro	-	Pauwels	Belgium			30	-			-	-
272	Shiroro	Sokoto	Toshiba	Japan			-	-			-	-

Item	Region	Site name	Manufacturer	Origin	Serial no.	Production Year	Power (MVA)	Rating (KVA)	Mass of Dielectric	Total Mass of Equipment	Type of dielectric	State
273	Shiroro	-	-	-			-	-			-	-
274	Shiroro	Sokoto	ELTA	Poland			30	132/33			Oil	In use
275	Shiroro	T-Mafara	Cenemesia	Spain			-	-			-	-
276	Shiroro	Suleja	Trafounion	?			7.5	132/11			-	-
277	Shiroro	-	-	-			S-	-			-	-
278	Shiroro	-	ABB	South Africa			30	-			-	-

Source: PHCN 2007

Table 2.11:
Transformer oil importation into Nigeria

Year	Quantity (metric tonnes)	CIF Value US $
2004	236.0	266,271.30
2005	930.9	981,549.30
2006	1084.3	1,275,222.90

Source: Chemical Import Control Unit, Narcotics and Controlled Substances Directorate, NAFDAC, 2007

Housekeeping is poor in most of the National Electric Power Authority (NEPA) Power Generating Stations and Distribution/Transmission Stations as PCB oil leakage unto soil was common with PCB contamination of groundwater occurring in some cases. Of significance is that staff of NEPA have little or no awareness of POPs issues and the deleterious effects of PCBs on human health - hence the lack of regard for chemical safety in the NEPA stations. A national database on PCB sources needs to address the issue. Furthermore the capacity of PHCN need to be enhanced for routine monitoring of PCB levels in transformer oil, soils, water and human blood towards assessing exposure risk to PCBs.

The Nigerian Tobacco Company (NTC) Plc. Zaria, now British American Tobacco (BAT) provides a case study on the disposal of PCB contaminated transformer oil in the country. Following the ban of use of PCB transformer oil in United Kingdom (U.K), BAT U.K. directed its subsidiary in Nigeria in 1991 to stop further use of PCB transformer oil and to dispose all transformers using PCB oil. Based on recommendation from the Federal Ministry of Environment, Housing and Urban Development (FMEHUD), NTC in 2000 engaged the services of Jawura Environmental Services Limited, Nigeria, to assist with the disposal of 7.62 metric tonnes of PCB oil drained from six transformers manufactured between 1967 and 1980, already in use in NTC's Zaria plant and rinsate. The oils were stored in 42no, 209 - litre drums, properly sealed and transported by road for destruction at the kiln of West African Portland Cement (WAPCO), Sagamu. The kiln offered a temperature of about 1300 – 1500^{o}C suitable for PCB destruction without production of dioxins. PHCN was sub-contracted by Jawura Environmental Services Limited to provide the machine for sucking out PCB oil and retro-filling with PCB free oil.

The PCB concentration as determined by capillary column gas chromatography with electron capture detector; was 123.2 ppm of the original oil drained out of the transformers while that of the final rinsate of the six transformers ranged from 2.65ppm to 8.18ppm, which was found to be below the 50ppm statutory limit. Screening of three samples of PCB free oil from the market gave PCB values of 165.7 ppm, 0.43 ppm and non detectable (< 0. 01 ppm) respectively. (Jawura 2000). The 6 transformers were retro-filled with PCB free oil (Table 2.12).

Table 2.12
Step-up Transformers at NTC (Now British American Tobacco), Zaria, Retro-filled in 2000

Transformer Type	Year of Manufacture
Bonarlong & Co. Ltd **1500KVA Transformer, Serial No: 02/76/33**	**1977**
Brush Electrical Engineering Co. Ltd. 1250 KVA Transformer, Serial No 50139/1	1967
Brush Electrical Engineering Co. Ltd. 1000 KVA Transformer, Serial No 69731	1967
Columbine 1600 KVA Transformer, Serial No 800702/2	1980
Columbine 1600 KVA Transformer, Serial No: 800702/1	1980
Bruce Peebles & Co. Ltd. 500 KVA Transformer, Serial No B4634	1980

The Environmental Audit Report (NEPA/World Bank 2004) of 5 NEPA 330/132 KV Transmission Substations in Alaoji (Abia State), Onitsha (Anambra State), Benin (Edo State), Kano (Kano State) and Oshogbo (Osun State) confirmed leaking drums of transformer oils into soils as well as the storage of food products such as vegetable oil in cans, and rice bags in close proximity to drums of transformer oils in mechanical workshops in most of the PHCN substations studied. The report was lacking in PCB levels in soils as the Environmental Auditors lacked the capability for PCB analysis.

The survey in Lagos State, the country's commercial nerve centre, confirmed that PHCN uses a lot of oil coolant for the transformers and the two facilities (Ijora and Egbin) also confirmed orally the presence of PCBs in the transformers but without providing supporting evidence. It was reported that large quantities are being used annually though statistical data are not available on PCB oil consumption and waste oil generation including quantities recycled. It was also indicated that a lot of PCB contaminated transformer oil was discharged onto the soil. Table 2.13 indicates different application examples of POPs industrial chemicals.

2.3.3. *Summary of available monitoring data on PCBs in environmental samples in Nigeria*

The limited environmental monitoring data available (Tables 2.3) indicates contamination by PCBs of industrial soil (ND - 740; 122 ng/g dry weight) and refuse dump (ND - 60; 16 ng/g dry weight) with the range and mean values in parenthesis. Similarly fresh water and marine fish; wildlife especially vulture's brain had concentration (ND - 524 ng/g; 33 ng/g fat weight) and mother's breast milk (ND – 0.30 µg/g; 0.02 µg/g fat weight) respectively. See Table 2.3-Table 2.9.

Table 2.13
POP industrial chemicals and application examples

Application	Remarks
Electrical transformers and capacitors	Closed application
Heat transfer fluids	Partially closed application
Hydraulic fluids	Partially closed application
Switches	Partially closed application
Voltage regulators	Partially closed application
Liquid filled circuit breakers	Partially closed application
Vacuum pumps	Partially closed application
Plasticizer in polyvinyl chloride(PVC)	PVC Plastics-Floor carpets, gasket sealers
Neoprene & other chlorinated rubbers	Open application
Paints as flame retardants	On furniture and walls
Adhesive as plasticizers	
Surface coatings as flame retardant	Paint underside of ships
Lubricants	Lubricant oils, brake lining, cutting oils
Dust control	Dust binders, asphalt
Inks	Printing inks, dyes

There are currently no forms of control on PCBs and the following activities have been identified as of immediate priority:

i) Preparing detailed inventories with special attention to closed down industries that were high power consumers;

ii) Labelling PCB-containing transformers;

iii) Creating an electronic database for POPs that includes, among other things, the name and address of the equipment holder, the location and description of equipment, the quantity of PCBs contained therein and the dates and types of disposal envisaged;

vi) Ensuring that updating of the national inventory is a responsibility of the PCB users;

iii) Creating awareness on the dangers involved in the use of PCB-containing oils for domestic purposes;

iv) Establishing legislation for the control of imports, exports and use of PCBs; and

vii) Analyzing the levels of PCBs in environmental media, the tissues of animals and plants, as well as human blood and mothers' breast milk to establish the extent of environmental contamination with PCBs.

2.3.4. *Assessment with respect to Annex B chemicals (DDT)*

DDT was used as a wide spectrum insecticide in agriculture, livestock rearing and malaria vector control. It was first used in the control of malaria in the early 1950s. The product was banned for use in livestock rearing and agriculture in the 1970s and severely restricted for use

in disease vector control in the 1980s. At present there are no specific legal provisions that regulate DDT use for public health in Nigeria, although its importation has been banned since 1999 along with other POPs.

The POPs inventory indicated that most of the residual DDT is held in stores illegally of recent because of the resistance encountered with alternatives pesticides to DDT for malaria control.

Nigeria has joined the committee of nations with strong commitment to developing alternatives to DDT. Several products are currently under investigation. NIP activities should target the further development and commercial roll-out of alternative disease vector control strategies that avoid the use of DDT. Chief among the alternatives is the use of biopesticides such as extracts of the neem tree and pyrethroids.*Assessment of Releases from Unintentional Production of Annex C Chemicals (PCDD/PCDF, HCB and PCB - UPOPs)****Main source categories for PCDD/PCDF in Nigeria***

Introduction

Polychlorinated dibenzo-p-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF), commonly known as dioxins and furans together with polychlorinated biphenyls (PCB) and hexachlorobenzene (HCB) are listed in Annex C of the Stockholm Convention on POPs. They are unintentionally formed and released into environmental media (air, land, water) from thermal processes involving organic matter and chlorine as a result of incomplete combustion or chemical reactions and are commonly named "by-products". They are also referred to as ''UPOPs''. Besides being formed as unintentional by-products of manufacturing or disposal processes, PCDD/PCDF may also be introduced into processes as contaminants in raw materials. Consequently, PCDD/PCDF can occur even where they are not formed in the process under consideration. All POPs listed in Annex C require "continuing minimization and, where feasible, ultimate elimination" (Stockholm Convention 2001).

Open burning and uncontrolled incineration of municipal and industrial wastes and hospital/clinical wastes are well known sources of PCDD/Fs. A large amount of accidental and deliberate combustion is taking place continually including the burning of tyres, as well as stripping insulation of copper wires and cables, and leads to dioxins release into the environment. Burning of bush, forests and sugar cane fields, to cut labour costs just before weeding for planting and/or harvest as appropriate also contribute to the formation of dioxins (Osibanjo et. al 2002).

Inventory of the main sources of UPOPs through desk study, visits to facilities and administration of questionnaires were part of this assessment. The assessment of UPOPs is intended to evaluate the releases and the impact of the emissions on environment and human health in Nigeria, using UNEP's 2001 Standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases as well as the 2005 revised edition of the Toolkit. The protocol used includes the identification of activities capable of generating dioxins and furans in different categories, which are divided into sub-categories. For each sub-category the Toolkit gives emission factors, which depend on the technology used in the process. In this inventory direct emission to air, water, soil, residues and products were considered.

Before starting inventorying, the first task was to identify the main activities of the main categories that are known as primary generators of dioxin and furan emissions in the country. The sub-categories were also revised in order to identify the specific activities and the data collection about the processes; thereafter they were classified according to the groups of similar characteristics.

The emissions factors from the Toolkit were applied. The annual emission of UPOPs is expressed in grams of TEQ, and from the inventory the total emission of dioxins and furans in g TEQ/year was calculated.

The following target anthropogenic activities were identified as sources for the release of dioxins and furans in the country: incinerators, power generation plants, industries (especially oil and gas, textile, paint, glass, pharmaceutical, pulp & paper, cement, iron and steel), and transport.

Apart from data obtained through the administration of questionnaires and visits to facilities, secondary relevant data sources consulted in Nigeria included the following: Manufacturers' Association of Nigeria (MAN) annual reports 2003 and 2004, World Bank Report (1998) on Industrial Pollution Load Inventory in Nigeria, Federal Office of Statistics, Federal Ministries of Science & Technology, Agriculture and Natural Resources, Transport, Department of Customs & Excise and the Central Bank of Nigeria.

In conformity with the UNEP Toolkit, the inventory is compiled as annual emissions in all sub-categories and categories for five potential routes after the estimation for sub-categories. Then the emissions of 9 main source categories are summed, thus providing the total estimation of the anthropogenic sources of UPOPs emissions from all sources identified in the country. The Toolkit does not give emission factors for the 10^{th} category (Hot Spots). Hence, emissions for Hot spots are therefore not included in the estimates, but qualitative information is given as appropriate. Emission results by category on the individual sectors studied are provided below.

Table 2.14 and fig 2.2 give a summary of estimated PCDD/PCDF emissions in Nigeria from major source categories in this survey. Total emission of dioxins and furans into the air is 2783.98g TEQ/annum. Uncontrolled combustion processes are the major source category with 5273.21g TEQ/a contributing 98.84% of the total emissions; followed in descending order by production of mineral products with 10.72 g TEQ/a (0.38%); transportation with 8.75 g TEQ/a (0.31%); ferrous and non-ferrous metal production with 8.20g TEQ/a (0.29%); waste incineration with 4.30g TEQ/a (0.15%); heat and power generation with 0.22g TEQ/a (0.008%); production and use of chemicals and consumer goods - specifically gas flaring from petroleum production with 0.007 g TEQ/a (0.0003%); and lastly miscellaneous (tobacco smoking) with 0.0009 g TEQ/a. For release of dioxin and furan unto land uncontrolled combustion processes are the singular source 2521.4 g TEQ/a (100%). In the residue, the total emission released is 34.42 g TEQ/a. The sources in descending order of magnitude are waste incineration with 15.85 g TEQ/a (46.05%), ferrous and non-ferrous metal production with 12.01 g TEQ/a (35.02%) and heat and power generation with 6.51 g TEQ/a (18.91%). The total dioxin and furan released in all vectors is 5339.86g TEQ/a.

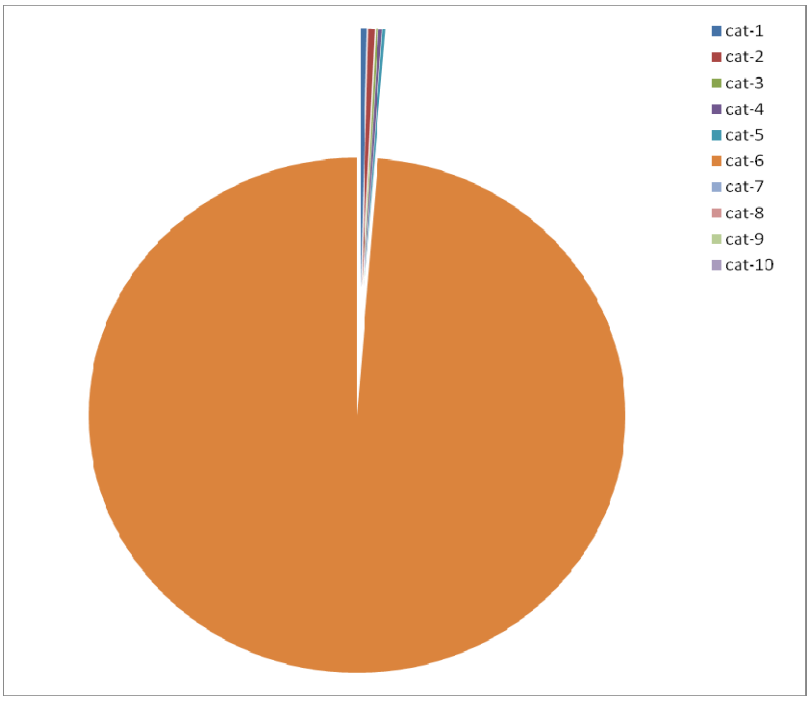
Since open burning of domestic and agricultural waste is by far the most important source of UPOPs releases to air and residues, all major refuse dumps in urban centres are potential hotspots especially as co-disposal of non-hazardous and hazardous wastes is the common practice. Thermal power stations for electric generation are also important potential hotspots.

Furthermore, as transformer oils containing PCB are often contaminated with UPOPs, all locations and sites containing a cluster of PCB filled oil drums for transformers and capacitors are potential sites, as well as the storage sites for old, abandoned or decommissioned transformers and capacitors. Sediments in inland surface waters in which waste oil (used engine oil or crankcase oil) is dumped are also potential hotspots for UPOPs.

Table 2.14
Annual Release of U-POPs Inventory in Nigeria

Cat.	Source Categories	Annual Releases (g TEQ/a)				
		Air	Water	Land	Product	Residue
1	Waste Incineration	4.301	0.000	0.000	0.000	15.852
2	Ferrous and Non-Ferrous Metal Production	8.201	0.000	0.000	0.000	12.055
3	Heat and Power Generation	0.223	0.000	0.000	0.000	6.510
4	Production of Mineral Products	10.717	0.000	0.000	0.000	0.000
5	Transportation	8.750	0.000	0.000	0.000	0.000
6	Open Burning Processes	2751.783	0.000	2521.427	0.000	0.000
7	Production of Chemicals and Consumer Goods	0.007	0.000	0.000	0.000	0.000
8	Miscellaneous	0.001	0.000	0.000	0.000	0.000
9	Disposal	0.000	0.034	0.000	0.000	0.000
10	Identification of Potential Hot-Spots				0.000	0.000
1-9	**Total**	**2783.984**	**0.034**	**2521.427**	**0.000**	**34.417**
	Grand Total			**5339.862**		

Figure 2.2
Anthropogenic Sources of UPOPs Emissions in Nigeria



2.3.6. Results By Category

Main Category 1: Waste Incineration

Municipal solid waste incineration

Municipal solid waste (MSW) includes any type of solid waste generated by households, residential activities, and/or waste material to be disposed of by people during their normal course of living activities. It also includes domestic-like wastes produced in industrial, commercial or agricultural activities. It is generally considered non-hazardous. Common constituents are paper and cardboard, plastics, food and kitchen residues, cloth and leather, wood, glass and metals as well as dirt and rocks and other inert materials. Small quantities of hazardous materials often cannot be eliminated such as batteries, paints, drugs, and some household chemicals.

Incineration of municipal solid waste (MSW) is not practised in Nigeria. Rather open and uncontrolled burning of MSW is the norm in the country. This mode of MSW treatment is considered later on.

Hazardous waste incineration

Hazardous Waste (HW) incineration is a recent technology introduced into the country less than 10 years ago to treat hazardous wastes primarily from oil exploration and production activities in the Niger Delta area. By definition, hazardous waste (HW) refers to residues and wastes, which contain hazardous materials in significant quantities. Generally speaking, all materials including consumer goods, which require special precautions and restrictions during handling and use, belong to this group. Any consumer goods, which are labelled as such and have entered the waste stream, must be considered hazardous waste. These include solvents and other volatile hydrocarbons, paints and dyes, chemicals including pesticides, herbicides, and other halogenated chemicals, pharmaceutical products, batteries, fuels, oils and other lubricants, as well as goods containing heavy metals. Also, all materials contaminated with these materials such as soaked rags or paper, treated wood, production residues, etc. must be considered hazardous waste.

This primary data survey was carried out in two incineration facilities namely ITS drilling services, Onne, and Titan Projects Nigeria Limited, Port-Harcourt, both in the Rivers state of the country.

ITS Drilling Services is a multinational company actively involved in oily waste and office waste incineration. It has two furnaces, RD 700 and DSD. DSD has a capacity of 1.1 ton/hr and operates 2,400 hrs/annum at a temperature of 1200^0C. Its air pollution control system (APCS) is a fan. The APCS inlet temperature is greater than 400^0c while the APCS outlet temp is 300^0C. The APCS flue gas flow rate is 8,000 Nm^3/hr.

RD 700 has a capacity of 3 tonnes/hr, operates 2,920 hrs/annum at a temperature of 1000^0C; its APCS is a fan. The APCS inlet temperature is greater than 400^0C while the APCS outlet temperature is 300^0C. The APCS flue gas flow rate is 8,000 Nm^3/hr..

Titan Project Limited is a joint venture incineration facility located in the Shell Forcados terminal in Delta state. It incinerates 12,424 tonnes of oily waste and drill cuttings per annum. The furnaces are RK type and equipped with HRS. The furnace temp is 400 – 1,450^{0}C it has wet scrubber, NaOH injection and a fan air pollution control system. The APCS outlet temperature is 90.2^{0}C.

The dioxin and furan emissions into the air and fly ash (residue) from these sources are shown in Table 2.15. lTS incinerator with minimal APCS releases 3.990 g TEQ/a of dioxin and furan into the air while Titan Project Limited which incinerator has good APCS releases significantly lower concentration of 0.124 g TEQ/a into the air.

However, there are more incinerators undergoing the process of licensing in the country by the Federal Ministry of Environment, such that there could be more than 12 incinerators in operation by 2010.

Medical waste incineration

Medical waste is considered to be every waste generated from medical activities regardless if these activities take place in a hospital or are performed by a medical doctor, dentist or any other physician. The waste generated during these activities contains in many cases infectious materials, secretes, blood, pharmaceuticals and packaging materials and/or tools used during or for the medical treatment of people or animals. To reliably destroy viruses, bacteria, and pathogens this waste is often thermally treated (by incineration or pyrolysis). Further, due to its origin and its composition, medical waste can contain toxic chemicals, e.g., heavy metals or precursors, which may form dioxins and furans.

In Nigeria medical waste is classified as infectious dangerous waste. Yet it is co-disposed with municipal solid wastes (MSW) and landfilled in open dumpsites or burned without any pollution controls thereby posing high health risks to humans and the environment. At best hearth kilns without any pollution control and poorly maintained are used in a few hospitals thereby releasing dioxins and furans into environmental media.

The federal government took positive steps to curtail human exposure to medical wastes about five years ago by approving the purchase and installation of four incinerators in different parts of the country, specifically at the Nigerian Institute of Medical Research, Lagos; and three orthopaedic hospitals at Igbobi (Lagos), Enugu, and Dalla (Kano) respectively. Each of the incinerators with minimum APCS have the capacity of 100 kg waste/day operating 8 hours a day and 3 days a week, that is 62.4 tonnes of waste per annum and release 0.187 g TEQ/a of dioxin and furan to air.

Approval has also been given by the federal government for the installation of medical waste incinerators with better APCS, which are yet to be installed, at the Lagos University Teaching Hospital (LUTH), Lagos; University of Ilorin Teaching Hospital, Ilorin; Nigerian Institute of Pharmaceutical Research, Abuja; and Federal Government Medical Centres in Owo, Yola and Jalingo, respectively.

Waste incineration releases at least 4.301 g TEQ/a dioxins and furans into the air while almost four times this concentration, that is 15.851 g TEQ/a of these chemicals is released in fly ash while non is release into bottom ash.

A draft national policy on Medical Wastes Management in Nigeria has been prepared early this year awaiting federal government approval.

Table 2.15
Subcategories of Main Category 1-Waste Incineration

Cat.	Sub Cat.	Class	Sub-categories	Potential Release Route (µg TEQ/t)						Production t/a	Annual release					
				Air	Water	Land	Product	Residue Fly Ash	Residue Bottom Ash		g TEQ/a Air	g TEQ/a Water	g TEQ/a Land	g TEQ/a Product	g TEQ/a Fly ash	g TEQ/a Bottom Ash
1			**Waste incineration**													
	A		**Municipal solid waste incineration**							**0**	**0.000**	**0**	**0**	**0**	**0.000**	**0.000**
		1	Low technol. combustion, no APCS	3,500		NA	NA	0	75		**0.000**				**0.000**	**0.000**
		2	Controlled comb., minimal APCS	350		NA	NA	500	15		**0.000**				**0.000**	**0.000**
		3	Controlled comb., good APCS	30		NA	NA	200	7		**0.000**				**0.000**	**0.000**
		4	High tech. combustion, sophisticated APCS	0.5		NA	NA	15	1.5		**0.000**				**0.000**	**0.000**
	B		**Hazardous waste incineration**							**23,824**	**4.114**	**0**	**0**	**0**	**15.851**	**0.000**
		1	Low technol. combustion, no APCS	35,000		NA	NA	9,000			**0.000**				**0.000**	**0.000**
		2	Controlled comb., minimal APCS	350		NA	NA	900		11,400	**3.990**				**10.260**	**0.000**
		3	Controlled comb., good APCS	10		NA	NA	450		12,424	**0.124**				**5.591**	**0.000**
		4	High tech. combustion, sophisticated APCS	0.75		NA	NA	30			**0.0000**				**0.000**	**0.000**
	C		**Medical waste incineration**							**62**	**0.187**	**0**	**0**	**0**	**0.000**	**0.001**
		1	Uncontrolled batch combustion, no APCS	40,000		NA	NA		200		**0.000**				**0.000**	**0.000**
		2	Controlled, batch, no or minimal APCS	3,000		NA	NA		20	62	**0.187**				**0.000**	**0.001**
		3	Controlled, batch comb., good APCS	525		NA	NA	920	ND		**0.000**				**0.000**	
		4	High tech, continuous, sophisticated APCS	1		NA	NA	150			**0.000**				**0.000**	**0.000**

Table 2.15 Continues

	D		**Light fraction shredder waste incineration**							**0**	**0.000**	**0**	**0**	**0**	**0.000**	**0.000**
		1	Uncontrolled batch comb., no APCS	1,000		NA	NA	ND	ND		**0.000**					
		2	Controlled, batch, no or minimal APCS	50		NA	NA	ND	ND		**0.000**					
		3	High tech, continuous, sophisticated APCS	1		NA	NA	150			**0.000**				**0.000**	**0.000**
	E		**Sewage sludge incineration**							**0**	**0.000**	**0**	**0**	**0**	**0.000**	**0.000**
		1	Old furnaces, batch, no/little APCS	50		NA	NA	23			**0.000**				**0.000**	**0.000**
		2	Updated, continuously, some APCS	4		NA	NA	0.5			**0.000**				**0.000**	**0.000**
		3	State-of-the-art, full APCS	0.4		NA	NA	0.5			**0.000**				**0.000**	**0.000**
	F		**Waste wood and waste biomass incineration**							**0**	**0.000**	**0**	**0**	**0**	**0.000**	**0.000**
		1	Old furnaces, batch, no/little APCS	100		NA	NA	1,000			**0.000**				**0.000**	**0.000**
		2	Updated, continuously, some APCS	10		NA	NA	10			**0.000**				**0.000**	**0.000**
		3	State-of-the-art, full APCS	1		NA	NA	0.2			**0.000**				**0.000**	**0.000**
	G		**Animal carcasses burning**							**0**	**0.000**	**0**	**0**	**0**	**0.000**	**0.000**
		1	Old furnaces, batch, no/little APCS	500		NA	NA		ND		**0.000**				**0.000**	
		2	Updated, continuously, some APCS	50		NA	NA		ND		**0.000**				**0.000**	
		3	State-of-the-art, full APCS	5		NA	NA		ND		**0.000**				**0.000**	
1			**Waste Incineration**								**4.301**	**0**	**0**	**0**	**15.851**	**0.001**
															15.9	

Light-fraction shredder waste incineration

Light-fraction shredder waste (LFSW) describes the light fraction derived from a shredder. In many countries, large items such as old vehicles, white goods, bulky containers, etc. are shredded in order to reduce the volume as well as enable the separation of recoverable materials such as metals from plastics and composites. This mode of waste incineration is not common in Nigeria.

Sewage sludge incineration

Sewage sludge is the product of any wastewater treatment processes regardless of its origin (e.g., wastewater from municipal, agricultural or industrial activities). Wastewater always contains solids, which are normally removed during the treatment process. Sludge from effluent treatment plants contains PCDD/PCDF. This sludge can be either incinerated, otherwise treated (co-combustion in power plants or cement kilns, undergo wet oxidation, pyrolysis, gasification, etc.) or be landfilled. This subsection addresses PCDD/PCDF releases from incineration of sewage sludge in dedicated plants which is not common in developing countries including Nigeria. Landfilling of sewage sludge and not sewage incineration is the norm in Nigeria.

Waste wood and waste biomass incineration

This subcategory addresses the combustion of waste wood and waste biomass in furnaces under controlled conditions. It entails the incineration of wood and biomass, which may have been treated or become mixed with treated wood or contaminated biomass. This waste biomass is incinerated in furnaces under conditions ranging from no control to high control. Incineration of waste wood and biomass is not practised in Nigeria.

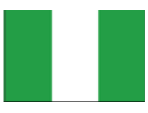
Destruction of animal carcasses

The thermal destruction of animal carcasses in simple or high technology furnaces does not exist in Nigeria. The cultural practice is to bury dead animals for the protection of public health.

Main Category 2 – Ferrous and Non-Ferrous Metal Production

Primary metallurgical processes here are understood to be those aimed at obtaining metals such as iron, copper, aluminium, lead, zinc, etc. from their original ores, whether sulfidized or oxidized, through such processes as concentration, smelting, reduction, refining, etc. Secondary metallurgical processes utilize scrap metals, often coated with plastics, paints, used batteries (for lead production), oils, etc., or slags and fly ashes from metallurgical or other processes as raw materials. In this main category 2, the term “primary” metal production should only be applied when no used or waste material enters into the process as the metal source.

Some of the components or operations may lead to the formation and release of PCDD/PCDF. When estimating PCDD/PCDF releases, within each of the subcategories individual steps have to be evaluated for their potential to be a source of PCDD/PCDF releases. Besides the furnaces used to produce the metal, the pre-treatment steps have a potential to generate PCDD/PCDF.



The survey was carried out in Jos Steel Rolling Mill Limited, Jos and Universal Steels Limited, Lagos for primary data collection. Secondary data about other companies were obtained from the publications of the Manufacturers Association of Nigeria (MAN), Central Bank of Nigeria and Federal Office of Statistics.

Jos Steel Rolling Mill is a government owned company which commenced operation in 1983. It has an installed capacity of 180,000 tonnes/annum. It operates 3,490 hours per annum. It manufactures steel bars and wires. The production for 2002 was 2,120 tonnes which is 1.2% of the installed capacity due to low profit while Government was trying to maintain skeletal service before selling off the plant to another buyer. Universal Steel Limited is a privately owned company which commenced operation in 1970. It has an installed capacity of 34 tonnes/hr and operates 5,200 hrs per annum. It has an electric arc furnace and a furnace temperature of 1200-1600^{0}C. It has a wet scrubber APCS. In year 2002, it produced 60,000 tonnes of steel billets and 110,000 tonnes of steel bars. Its raw materials are iron and steel scraps and metal finings.

In Nigeria, there are other iron and steel companies which are not covered by the survey. For example, in 1985 records show that these companies produced as follows:

- Northern Steel Mill 3,757 tonnes
- GMO Steel Ind. Ltd. 14,400 tonnes
- Wisks Ltd 3,529 tonnes
- UTC Nigeria 60,829 tonnes
- Rolled Steel Products Ltd. 2,500 tonnes
- Tower Galvanized Products 7,000 tonnes
- United Rolling Ind. Ltd. 40,000 tonnes
- Delta Steel Co. Ltd. 139,000 tonnes
- Jos Steel Rolling Co. Ltd. 20,384 tonnes
- Oshogbo Steel Rolling Ltd 210,000 tonnes

The total tonnage of products for these industries is 673,519 tonnes of iron and steel per annum which figure was used in calculating the UPOPs emission releases.

Table 2.16 indicates that iron and steel making releases 6.714 g TEQ/a of dioxins and furan to the air whereas almost one and half fold concentration of 10.071 g TEQ/a is released in to the residue.

Foundries

A survey was carried out in Nigerian Foundries Limited, Lagos. The company commenced operation in 1969. It has high frequency electric induction furnace producing $1^1/_2$tons/hr and operates 2,000 hrs per annum. Total tonnage of product is 3,000 per annum. The furnace temperature is 160^{0}C. Its raw materials include iron and steel scrap and foundry returns. The products are cast iron, manganese steel, Hichrome alloys and stainless steel alloys. In Nigeria there are other foundries, especially small and privately owned ones, which official records were not available.

This source releases negligible dioxin and furan into the air and 0.002 g TEQ/a of these chemicals to the residue.

Aluminium production

The survey was carried out in Tower Aluminium Nigeria PLC, Lagos which is about the foremost aluminium industry in the country. The company has two plants in Lagos. One plant manufactures casseroles, kettles and frying pans while the other plant is a rolling null. The rolling null commenced operation an 1983 and has a capacity of 12,000 tonnes/annum and operates 7,200 hrs per annum. The furnace type is natural gas/low pour fuel oil fired and furnace temperature is 800^0C. In 2002, the mill produced 8,600 tonnes of rolled products. The kitchenware plant commenced operation in 1959. The furnace type is crucible-fired, has a capacity of 0.15 tonnes/hr and operates 24 hrs/day. In year 2002, it produced 9,914 tonnes of rolled products and kitchenware.

The furnace releases 1.487 g TEQ/a of dioxin and furan to air while 1.983 g TEQ/a of these chemicals are released to residue.

In Nigeria, there are several other companies engaged in production of aluminium profiles, roofing sheets or kitchen wares, for example, Aluminium Extrusion Ind., Inyishi, Asaba Aluminium Co. Ltd, Critter Hope, Lagos, First Aluminium Co. Ltd., Lagos, General Metal Products, Lagos, Metalum and Sarg Aims Aluminium Production Ltd.

Copper production

There are several small and private companies engaged in casting of copper alloys. There are no official records of their annual production.

Lead production

Recovery of lead from scrap and PVC battery separators is a thriving business in Nigeria. There are also companies actively involved in production of lead alloys. However, there are no official statistical data on their production.

Zinc production

Most activities in this area focus on galvanizing zinc (i.e. production of galvanised roofing sheets) and not the production of zinc metal. There are also no official records of their production.

Table 2.16: Subcategories of Main Category 2-Ferrous and non-ferrous metal production

Cat,.	Sub Cat.	Class	Sub-categories	Potential Release Route (µg TEQ/t)					Production	Annual release				
				Air	Water	Land	Product	Residue	t/a	g TEQ/a	g TEQ/a	g TEQ/a	g TEQ/a	g TEQ/a
2			**Ferrous and Non-Ferrous Metal Production**							**Air**	**Water**	**Land**	**Product**	**Residue**
	A		**Iron ore sintering**						**0**	**0.000**	**0**	**0**	**0**	**0.0**
		1	High waste recycling, incl. oil contaminated materials	20	ND	ND	ND	0.003		**0.000**				**0.000**
		2	Low waste use, well controlled plant	5	ND	ND	ND	0.003		**0.000**				**0.000**
		3	High technology, emission reduction	0.3	ND	ND	ND	0.003		**0.000**				**0.000**
	B		**Coke production**						**0**	**0.000**	**0**	**0**	**0**	**0**
		1	No gas cleaning	3	0.06	ND	ND	ND		**0.000**	**0**			
		2	Afterburner/ dust removal	0.3	0.06	ND	ND	ND		**0.000**	**0**			
	C		**Iron and steel production plants and foundries**						**676,519**	**7**	**0**	**0**	**0**	**10**
			Iron and steel plants						*673,519*	*7*	*0*	*0*	*0*	*10.071*
		1	Dirty scrap, scrap preheating, limited controls	10	ND	ND	NA	15	671,399	**6.714**				**10.071**
		2	Clean scrap/virgin iron, afterburner, fabric filter	3	ND	ND	NA	15		**0.000**				**0.000**
		3	Clean scrap/virgin iron, BOS furnaces	0.1	ND	ND	NA	1.5		**0.000**				**0.000**
		4	Blast furnaces with APC	0.01	ND	ND	NA	ND	2120	**0.000**				
			Foundries						***3,000***	***0.000***	***0***	***0***	***0***	***0.0***
		1	Cold air cupola or rotary drum, no APCS	10	ND	ND	NA	ND		**0.000**				
		2	Rotary drum - fabric filter	4.3	ND	ND	NA	0.2		**0.000**				**0.000**
		3	Cold air cupola, fabric filter	1	ND	ND	NA	8		**0.000**				**0.000**
		4	Hot air cupola or induction furnace, fabric filter	0.03	ND	ND	NA	0.5	3,000	**0.000**				**0.002**
			Hot-dip galvanizing plants						**0**	**0.000**	**0**	**0**	**0**	**0.0**
		1	Facilities without APCS	0.06	NA	NA	NA	ND		**0.000**				
		2	Facilities without degreasing step, good APCS	0.05	NA	NA	NA	2,000		**0.000**				**0.000**
		3	Facilities with degreasing step, good APCS	0.02	NA	NA	NA	1,000		**0.000**				**0.000**

Table 2.16 continued

	d		**Copper production**						**0**	**0.000**	**0**	**0**	**0**	**0.0**
		1	Sec. Cu - Basic technology	800	ND	NA	NA	630		**0.000**				**0.000**
		2	Sec. Cu - Well controlled	50	ND	NA	NA	630		**0.000**				**0.000**
		3	Sec. Cu - Optimized for PCDD/PCDF control	5	ND	NA	NA	300		**0.000**				**0.000**
		4	Smelting and casting of Cu/Cu alloys	0.03	ND	NA	NA	ND		**0.000**				
		5	Prim. Cu, well-controlled, with some secondary feed materials	0.01	ND	NA	NA	ND		**0.000**				
		6	Pure prim. Cu smelters with no secondary feed	ND	ND	NA	NA	NA						
	e		**Aluminum production**						**9,914**	**1.487**	**0**	**0**	**0**	**2.0**
		1	Processing scrap Al, minimal treatment of inputs, simple dust removal	150	ND	NA	NA	200	9,914	**1.487**				**1.983**
		2	Scrap treatment, well controlled, good APCS	35	ND	NA	NA	400		**0.000**				**0.000**
		3	Scrap treatment, well-controlled, fabric filter, lime injection	5	ND	NA	NA	100		**0.000**				**0.000**
		4	Optimized process for PCDD/PPCDF abatement	0.5	ND	NA	NA	100		**0.000**				**0.000**
		5	Shavings/turnings drying (simple plants)	5.0	NA	NA	NA	NA		**0.000**				
		6	Thermal de-oiling, rotary furnaces, afterburners, fabric filters	0.3	NA	NA	NA	NA		**0.000**				
		7	Pure primary Al plants	ND	NA	NA	NA	ND						
	f		**Lead production**						**0**	**0.000**	**0**	**0**	**0**	**0.0**
		1	Sec. lead from scrap, PVC battery separators	80	ND	NA	NA	ND		**0.000**				
		2	Sec. from PVC/Cl2 free scrap, some APCS	8	ND	NA	NA	5		**0.000**				**0.000**
		3	Sec. Lead, PVC/Cl2 free scrap in modern furnaces, with scrubber	0.5	ND	NA	NA	ND		**0.000**				
		4	Pure primary lead production	0.5	ND	NA	NA	ND		**0.000**				
	g		**Zinc production**						**0**	**0.000**	**0**	**0**	**0**	**0**
		1	Kiln with no dust control	1,000	ND	NA	NA	ND		**0.000**				
		2	Hot briquetting/rotary furnaces, basic control	100	ND	NA	NA	ND		**0.000**				

		3	Comprehensive control	5	ND	NA	NA	ND		0.000				
		4	Melting (only)	0.3	ND	NA	NA	ND		0.000				
		5	Pure primary zinc production	ND	ND	NA	NA	ND						
	h		**Brass and bronze production**						**0**	0.000	0	0	0	0.0
		1	Thermal de-oiling of turnings	2.5	NA	NA	NA	NA		0.000				
		2	Simple melting furnaces	10	NA	NA	NA	ND		0.000				
		3	Mixed scarp, induction furnace, bag filter	3.5	ND	NA	NA	125		0.000				0.000
		4	Sophisticated equipment, clean inputs, good APCS	0.1	ND	NA	NA	ND		0.000				
	i		**Magnesium production**						**0**	0.000	0.0	0.0	0.0	0.0
		1	Using MgO/C thermal treatment in Cl2, no effluent treatment, poor APCS	250	9,000	NA	ND	0		0.000	0.000			
		2	Using MgO/C thermal treatment in Cl2, comprehensive pollution control	50	24	NA	ND	9,000		0.000	0.000			0.000
		3	Thermal reduction process	3	ND	NA	NA	ND		0.000				
	j		**Thermal Non-ferrous metal production (e.g., Ni)**						**0**	0.000	0	0	0	0
		1	Contaminated scrap, simple or no APCS	100	ND	ND	ND	ND		0.000				
		2	Clean scrap, good APCS	2	ND	ND	ND	ND		0.000				
	l		**Shredders**						**0**	0.000	0	0	0	0
		1	Metal shredding plants	0.2	NA	NA	ND	ND		0.000				
	m		**Thermal wire reclamation**						**0**	0.000	0	0	0	0
		1	Open burning of cable	5,000	ND	ND	ND	ND		0.000				
		2	Basic furnace with after burner, wet scrubber	40	ND	NA	ND	ND		0.000				
		3	Burning electric motors, brake shoes, etc., afterburner	3.3	ND	NA	ND	ND		0.000				
2			**Ferrous and Non-Ferrous Metal Production**							**8.201**	**0.000**	**0.000**	**0.000**	**12.055**

Main Category 3 – Heat and Power Generation

The category of power generation and heating includes power stations, industrial firing places (furnaces) and installations for providing space heating, which are fired with fossil fuels (including the co-combustion of up to 1/3 of waste), biogas including landfill gas, and biomass only. It also includes domestic heating and cooking. The main release vectors are air and residue.

Fossil fuel power plants

Primary data collection occurred in two power stations namely the AFAM Power Station in Rivers State and the Egbin Power Station in Lagos State.

The Afam Power Station commenced operation in 1962 and produced 412 MWh of electric power in 2002. It has an installed capacity of 980 MWh of electrical energy/annum. It has 20 gas chambers but only 5 are functional. It receives pure natural gas in pipelines from gas companies and consumes 2,486,136,328 scf of gas/month for the last three years; it generated 416MWh of electrical power/annum. The furnace type is turbine and furnace temperature is 9000C. The APCS is dry scrubber and APCS temperature is. Egbin Power Station has 6 gas chambers and operates continuously. It has installed capacity of 330 MM scf/day. Its operational hours are 7,940. The furnace type is membrane wall dual fired manufactured by Babcock & Wilcox and the furnace type temperature is

The Afam Power Plant and the Egbin Power Plant are owned and operated by PHCN. The company has other power plants, which could not be covered by the survey. In 2002, the company generated about 5,000 MWh of electrical power from gas and hydro power plants. In Nigeria, oil companies, big industrial facilities and even some state governments have private and independent power plants on which data is scanty. The power output from the national grid is grossly inadequate; consequently there are several thousands of small and medium sized petrol and diesel generators owned by individuals, businesses and industrial facilities, but national data is lacking on generators import. However this is accounted for in Category 5 (Transport). Nigeria produces 20,635.74 GWH of energy annually from two sources namely hydropower 6,093.25 GWH (29.53%) and 52,353The release of dioxin and furan to air from this source is .079 g TEQ/annum.thermal energy 14,542.49 GWH (70.47%) from fossil fuels (PHCN 2006). On converting the energy from fossil fuel using the conversion factor of 1 GWh = 3.6 TJ, The energy production is

The major fossil fuel for thermal energy in Nigeria is light fuel oil (diesel) or natural gas. The use of the latter has become prevalent in recent years due to government policy to encourage more utilisation of gas instead of flaring natural gas, which is economically wasteful and contributing to greenhouse gas in the atmosphere. Table 2.28 below indicates Nigeria's petroleum product import data in 2004 (FOS 2005). Most if not all the 170,274 tonnes/annum diesel imported that year and indeed generally is used to fuel generators for energy generation.

Biomass power plants

Many countries and regions rely heavily on the combustion of biomass for power and heat production. For the Toolkit, two categories are defined within this subcategory according to the types of biomass fuel used, namely wood fired boilers, and all other types of biomass

fired boilers. In Nigeria activities, in which fuel wood is used intensely, include cooking, heating and purifying drinking water, production of ethanol and local dry gins, processing of foods – fish drying, garri frying, and preservation of agricultural products (NRCC). These types of power plants could be found at small scale enterprises level. Data on a national basis of their use is lacking. Wood fired boilers have been largely phased out in Nigeria. Contribution to release of dioxin and furan would be negligible if at all.

Landfill/biogas combustion

Landfill gas and biogas are both generated from anaerobic digestion of organic matter. The resulting gas is a mixture of 23 to 38% carbon monoxide (CO)/carbon dioxide (CO2), 60-70% methane (CH4 and traces of), ammonia (NH3), hydrogen sulphide (H2S) and other combustible gases as well as a large fraction of water (H2O). The combustible portion of the gas is usually around 50% and the heating value is 15–25 MJ/kg depending on the origin of the gas.

The combustion of these gases for power generation is yet to be explored in Nigeria for energy purposes on the industrial scale, although biogas research is on-going in some energy oriented research institutes at Usman Danfodio University, Sokoto; Ahmadu Bello University, Zaria; and Obafemi Awolowo University, lle Ife.

Instead spontaneous landfill fires occur especially in the dry season in major open dumpsites in urban centres, leading to smoke and haze in the sky over the landfill area, causing air pollution episodes.

Household heating and cooking with biomass

The biomass resources of Nigeria consist of wood, forage grasses and shrubs, animal wastes arising from forestry, agricultural, municipal and industrial activities as well as aquatic biomass (UNDP/ECN 2005). It is an important source of energy for Nigeria as it contributes 37% of total energy demand, and it is the energy of choice for majority of rural dwellers and the urban poor. The majority of Nigerians use virgin fuel wood/firewood as a source of fuel (this also includes charcoal users) for domestic cooking.

The traditional methods of cooking which have been used for centuries with little modifications, involve burning of wood and other crop residues in an open fire, sometimes enclosed by metallic, clay or bricks to act as wind shield. In most cases, three stones are placed around the fire to act as support for the cooking pots (UNDP/ECN 2005). This method of cooking is inefficient and a source of dioxin and furan release.

Biomass energy resources of the nation have been estimated to be 144 million tonnes/year and Nigeria is presently consuming about firewood annually (UNDP/ECN 2005). Assuming that about 15% ash result from every unit kilogram of wood burned, the annual ash generated is 6.51×10^{9}kg/annum or 6.51×10^{6}ton/annum. Table 2.17 shows the estimated PCDD/PCDF releases from household cooking with biomass as 6.500 g TEQ/annum to residue, which is ash.

Domestic heating using fossil fuels

A good number of Nigerians use fossil fuel (kerosene) for lighting of lanterns and cooking. The inventory did not cover this segment. However based on NNPC fossil fuel import data, the quantity of kerosene imported in 2004 was 418,244.87 tonnes. It is estimated that the amount of kerosene used nationally as cooking and lighting fuel stands at about 14,490 TJ/a.

Table 2.16 shows the estimated PCDD/PCDF releases from fossil fuel (kerosene) used in house cooking as 1.449 g TEQ /annum dioxin and furan to air and 72.5 g TEQ/annum to residue. Liquefied petroleum gas (LPG) is used by the upper middle class in urban centres for cooking. For example the import of LPG in 2001 was 8,527.91 metric tonnes. The use of LPG has not been covered in this survey because the release of dioxin and furan is estimated to be negligible.

Main Category 4 - Production of Mineral Products

Cement production

Five major cement companies namely Ashaka Cement, West African Portland Cement Company (WAPCO) Works Ewekoro, Shagamu, and Nigerite and United Cement Company UNICEM Calabar were surveyed. West African Portland Cement with factories in Sagamu and Ewekoro uses gas for power generation while the others use diesel generators. All the companies use a dry process in cement manufacturing. Raw materials are calcium carbonate (lime stone), silica, aluminium oxide and ferrous oxide (red soil), all of which react at elevated temperature to form clinker. UNICEM imports clinker at its Calabar factory although a new ultramodern cement plant to produce 2.5 million metric tonnes per annum is under construction. The clinker is then ground or milled together with gypsum and other additives to produce cement. All cement industries have electrostatic precipitators although their operational efficiencies are not known.

The product output of each of these cement plants is as follows:

- Ashaka cement works 719,659 ton per annum
- WAPCO (Ewekoro) 196,152 tonnes per annum)
- WAPCO (Sagamu) 903,848 tonnes per annum
- Nigerite Lagos 170,000 tonnes per annum
- UNICEM Calabar 150,000 tonnes per annum

The combined cement output from these plants is 2,139,659 tonnes per annum, which was used in calculating the emission releases. Table 2.17 shows that dioxin and furan released to air is 10.698 g TEQ/annum.

Table 2.17: Subcategories of Main Category 3-Heat and Power Generation

Sub-categories	Potential Release Route (µg TEQ/TJ)					Production	Annual release					Ash Generation
	Air	Water	Land	Product	Residue	TJ/a	g TEQ/a	g TEQ/a	g TEQ/a	g TEQ/a	g TEQ/a	t/a
Heat and Power Generation							**Air**	**Water**	**Land**	**Product**	**Residue**	
Fossil fuel power plants						**52,353**	**0.079**	**0**	**0**	**0**	**0.0**	
Fossil fuel/waste co-fired power boilers	35	ND	NA	NA	ND		**0.000**					
Coal fired power boilers	10	ND	NA	NA	14		**0.000**				**0.000**	
Heavy fuel fired power boilers	2.5	ND	NA	NA	ND		**0.000**					
Shale oil fired power plants	1.5	ND	NA	NA	ND	52,353	**0.079**					
Light fuel oil/natural gas fired power boilers	0.5	ND	NA	NA	ND		**0.000**					
Biomass power plants						**0**	**0.000**	**0**	**0**	**0**	**0.0**	
1. Mixed biomass fired power boilers	500	ND	NA	NA	ND		**0.000**					
2. Clean wood fired power boilers	50	ND	NA	NA	15		**0.000**				**0.000**	
Landfill and biogas combustion						**0**	**0.000**	**0**	**0**	**0**	**0.0**	
Biogas-/landfill gas fired boilers, motors/turbines and flaring	8	ND	NA	NA	NA		**0.000**					
Household heating and cooking - Biomass					µg TEQ/t Ash	**0**	**0.000**	**0**	**0**	**0**	**6.5**	Please enter mass of ash here
Contaminated wood/biomass fired stoves	1,500	ND	NA	NA	1,000		**0.000**				**0.000**	
Virgin wood/biomass fired stoves	100	ND	NA	NA	10	0	**0.000**				**6.510**	6510000
Domestic heating - Fossil fuels					µg TEQ/t Ash	**14,490**	**0.145**	**0**	**0**	**0**	**0.0**	Please enter mass of ash here
High-chlorine coal fired stoves	12,000	ND	NA	NA	30,000		**0.000**				**0.000**	
Coal fired stoves	100	ND	NA	NA	5,000		**0.000**				**0.000**	
Oil fired stoves	10	ND	NA	NA	NA	14,490	**0.145**					
Natural gas fired stoves	1.5	ND	NA	NA	NA		**0.000**					
Heat and Power Generation							**0.223**	**0**	**0**	**0**	**6.5**	

Glass manufacture

Nigeria is abundantly rich in diverse solid minerals (gold, kaolin, coal, clay, iron ore, limestone, barites, etc.) and also sand, limestone, dolomite and soda, which are raw materials for glass making. Six major glass manufacturing companies were surveyed in this study.

West African Glass plant uses 132 tonnes/day (or 48,180 tonnes/annum) of raw materials and produces 110 tonnes/day (40,150 tonnes/annum) of glass bottles. The plant has one furnace that operates at 1600^0C. The APCS is a high chimney. The APCS temperature is 300^0C at the bottom of chimney, and $<100^0$C at the top.

TSG Nigeria plant has four furnaces and operates continuously for 4,000 hrs per annum. It produces 540 tonnes of flat glass per annum. The manufacturing processes take place at 600^0C, but no air pollution control system (APCS) data are given.

Isoglass Industry is privately owned. The plant has three furnaces, operates a batch system for 2,020 hrs per annum, and produces 60,000 pieces of wind shield (10kg weight per piece) per annum, that is 600 tonnes of glass sheet per annum. It operates at the temperature of 640-750^0C. No details are available on APCS installed in the facility.

Beta Glass Plc is privately owned by Nigerian and foreign shareholders. It has two furnaces and operates continuously 24 hrs a day all year round. No information is provided on APCS. The plant produces 84,096 tonnes of glass bottles per annum. It also produces 1,432 tonnes of solid wastes which is broken glass and is recycled on site.

Beta Glass PLC Agbara is located at Agbara Industrial Estate, Agbara in Ogun State, South West Nigeria. The plant has 2 furnaces, operates continuously for 8,760 hours per annum. The FT temperature is 1500-1560^0C and the APCS temperature is 250^0C at the base of the stack.

It produces 71,000 tonnes of glass containers and 3,840 tonnes of solid waste per annum.

International Glass Industry Limited Plant produces 40 tonnes per annum. FT Temperature is 1500^0C, APCS data is not provided.

The sum of the annual production of all plants with APCS is 119,180tons/a of glass with the release to air of dioxin and furan of 0.002 g TEQ/annum. The production figure for all plants without APCS is tonnes of glass per annum while the release of dioxin and furan to air is 0.017 g TEQ /annum. See Table 2.18.

Ceramics production

Since the UNEP Toolkit indicated the lack of enough information to consider the production of ceramics as a source of PCDD/PCDF and there are not many ceramic companies in the country, this sub-category was not surveyed.

Asphalt mixing

Nigeria has 194,394 km of road network out of which 60,068 km is paved with asphalt. Asphalt is used for road construction and generally would consist of rock chips, sand, fillers bound together in bitumen. National data on asphalt production is lacking. It is expected that

the release of UPOPs is negligible since there are only a few asphalt production plants in the country, if we discount possible localised effects.

Oil shale processing

Nigeria has abundant crude oil deposits. Oil shale processing does not occur in the country.

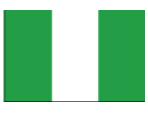


Table 2.18: Subcategories of Main Category 4-Production of Mineral Products

Cat.	Sub Cat.	Class	Sub-categories	Potential Release Route (µg TEQ/t)					Production	Annual release				
				Air	Water	Land	Product	Residue	t/a	g TEQ/a	g TEQ/a	g TEQ/a	g TEQ/a	g TEQ/a
										Air	Water	Land	Product	Residue
4			**Production of Mineral Products**											
	a		**Cement kilns**						**2,139,659**	**10.698**	**0**	**0**	**0**	**0**
		1	Shaft kilns	5	NA	NA	ND	ND		**0.000**				
		2	Old wet kilns, ESP temperature >300 °C	5	NA	ND	ND	NA	2,139,659	**10.698**				
		3	Wet kilns, ESP/FF temperature 200 to 300 °C	0.6	NA	ND	ND	NA		**0.000**				
		4	Wet kilns, ESP/FF temperature <200 °C and all types of dry kilns with preheater/precalciner, T<200 °C	0.05	NA	ND	ND	NA		**0.000**				
	b		**Lime**						**0**	**0.000**	**0**	**0**	**0**	**0**
		1	Cyclone/no dust control, contaminated or poor fuels	10	ND	ND	ND	ND		**0.000**				
		2	Good dust abatement	0.07	ND	ND	ND	ND		**0.000**				
	c		**Brick**						**0**	**0.000**	**0**	**0**	**0**	**0**
		1	Cyclone/no dust control, contaminated or poor fuels	0.2	NA	ND	ND	ND		**0.000**				
		2	Good dust abatement	0.02	NA	ND	ND	ND		**0.000**				
	d		**Glass**						**204,465**	**0.019**	**0**	**0**	**0**	**0**
		1	Cyclone/no dust control, contaminated or poor fuels	0.2	NA	ND	ND	ND	86,708	**0.017**				
		2	Good dust abatement	0.015	NA	ND	ND	ND	119,180	**0.002**				
	e		**Ceramics**						**0**	**0.000**	**0**	**0**	**0**	**0**
		1	Cyclone/no dust control, contaminated or poor fuels	0.2	NA	ND	ND	ND		**0.000**				
		2	Good dust abatement	0.02	NA	ND	ND	ND		**0.000**				
	f		**Asphalt mixing**						**0**	**0.000**	**0**	**0**	**0**	**0.000**
		1	Mixing plant with no gas cleaning	0.07	NA	ND	ND	ND		**0.000**				
		2	Mixing plant with fabric filter, wet scrubber	0.007	NA	ND	ND	0.06		**0.000**				**0.000**
	g		**Oil shale processing**						**0**	**0.000**	**0**	**0**	**0**	**0.000**
		1	Thermal fractionation	ND	ND	ND	ND	ND						
		2	Oil shale pyrolysis	0.003	NA	ND	0.07	2		**0.000**			**0.000**	**0.000**
4			**Production of Mineral Products**							**10.717**	**0**	**0**	**0**	**0.000**

Main Category 5 – Transport

The data on oil importation for 2004 (Table 2.19) was used for estimation of dioxin and furan releases to environmental media. Table 2.20 provides information on vehicles ownership by Nigerians during the period 1999-2005 (NAC 2006; FOS 2006.)

The major fossil fuel for thermal energy in Nigeria is light fuel oil (diesel) or natural gas. The use of the latter has become prevalent in recent years due to government policy to encourage more utilisation of gas instead of flaring natural gas which is economically wasteful and contributing to greenhouse gas in the atmosphere. Table 2.19 indicates Nigeria's petroleum product import data in 2004 (FOS 2005).

4-stroke engines

Most gasoline powered internal combustion engines used today in cars, light trucks, motor cycles and other vehicles are 4-stroke engines. 4,134,983 vehicles (cars, trucks, and buses) were registered in Nigeria as of 2004 (FOS 2005). On the assumption that 80% of PMS imported is consumed by passenger cars, 4,558,031.50 tonnes of PMS out of 5,697,539.38 tonnes of unleaded gasoline (PMS) without catalyst imported in 2004 (FOS 2005) see Table 2.19 were used for this purpose. This is because none of the petroleum refineries in the country had been working for sometime now, such that the country depends on petroleum products imports. Out of the remaining 20%, 15% of the imported PMS 854,630.91 metric tonnes per annum) is used in generators bringing the consumption to 5,412,662.40 metric tonnes per annum. Using the emission factor of 0.1 µg TEQ/tonne of fuel burned for unleaded fuel without catalyst, the dioxin and furan emission release into air from this source is 0.541 g TEQ/annum.

2-stroke engines

Most small gasoline powered internal combustion engines used today in boats, mopeds, small motor cycles, lawnmowers, chain saws and other vehicles are 2-stroke engines. 1,172,141 motor-cycles were in use in the country in 2004 (FOS 2005) estimated to consume 5% of annual PMS import in 2004, that is ,metric tonnes of PMS per annum. Using the emission factor of 2.5 µg TEQ/tonne of fuel burned for unleaded fuel, the dioxin and furan emission release into air from this source is 0.712 g TEQ/annum.

Diesel engines

Diesel oil (light oil or automotive gas oil) import was 170,278.58 tonnes per annum in 2004. Most if not all the 8.58tonnes/annum diesels imported that year and indeed generally is used to fuel generators and heavy-duty trucks such as trailers. The estimated release of dioxin and furan from this source to air is 0.017 g TEQ/annum.

Heavy oil fired engines

Heavy fuel oil (HFO) is commonly used for transportation in ships and for the heating of organic liquid storage tanks and stationary power generation. The activity data included in this subcategory in Nigeria is heavy fuel oil combusted by marine vessels. Based on emission factor of 4.0 µg TEQ/tonne of Heavy fuel oil and the average value of 1,870,000 tonnes was burned in 2004 as obtained from personal communication and interview with a NNPC official , the dioxin and furan release into air from this source is 7.480 g TEQ/ annum.

Uncertainty about the source and reliability of the heavy oil import and cosumption data are constraint towards estimating dioxin and furan or Table 2.1 below shows the UPOPs emission releases from transport emisions from this source.

Main Category 6 – Open Burning Processes

Biomass burning

Biomass burning considered under this category includes forest fires (deliberate and accidental), burning of grassland, uncontrolled burning of domestic wastes, and destruction by fire of agricultural residues, such as straw, in the field, etc. Nigeria has a total land area of about 960,000 km^2, and an estimated 360,000 km^2 (about 40%) had been classified as forest land with high forest zone of about 133,000 km^2 or 13.3 million hectares and savannah woodland of about 227,000 km^2 or 22.7 million hectares. It is assumed that 10% of forest land (1.33 million hectares) and 30% of savannah land (6.81 million hectares) is burned annually and material lost in fire is 10t/ha (forest) and 2.5 t/ha (savannah) annually. These correspond to 13300000 tonnes/annum and 17025000 tonnes/annum of forest and savannah open burnings respectively.

The release of dioxin and furan from forest land into air is 66.5 g TEQ/annum and land 53.20 g TEQ/annum while their release from savannah land into air and land are 85.125g TEQ/annum and 68.100 g TEQ/annum respectively. The total release to air and land are 151.625 g TEQ/annum and 121.300 g TEQ/annum respectively (Table 2.22).

Waste burning and accidental fires

Uncontrollable management of domestic refuse has been an intractable problem in the country over the years. Co-disposal of non-hazardous domestic waste and hazardous industrial waste including POPs wastes and containers is generally practised. The solid wastes are normally set on fire to tame the mountains of refuse which sometimes adorn urban landscape in major cities (Figure 2.3). Nigeria's population is estimated at 140 million. With a per capita waste generation of 0.4 kg/person/day, the annual solid waste generation in Nigeria is 20 million tonnes per annum. Assuming 20% of the wastes undergo uncontrolled open burning, the estimated quantity of waste burned per annum is 4 million tonnes, about 50% of which is burned in landfills and the remaining 50% is burned at residences. The estimated release of dioxin and furan to air from landfills is 2,000/ g TEQ/annum and 600 g TEQ/annum from households, while the release into the residue for landfills and households are 1,200 g TEQ/annum (Table 2.2).

Used vehicle tyres are uncharacteristically used to roast cow skin and goat carcass which are consumed as special delicacy in the urban centres (Figure 2.4). This method of food processing is a potential source of UPOPs emission release into meat and meat products with likely adverse health risks to humans.

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Table 2.19: Petroleum imports in Nigeria 2004

MONTHS	PMS		ATK		DPK		AGO		TOTAL	
	mt	Value ($)	mt	Value ($)	Mt	Value ($)	mt	Value ($)	mt	Value ($)
January	381,655.93	131,429,276.20			71,277.16	2,528,088.29	106,182.19	33,249,214.51	559,115.28	167,206,579.00
February	514,539.00	195,708,465.57	17,133.75	5,899,017.96	24,282.81	8,821,945.96			555,955.56	210,429,429.49
March	432,323.96	167,599,316.29			41,378.54	14,301,773.11	32,040.48	9,860,458.03	473,702.50	191,761,547.43
April	622,568.14	256,229,228.33	26,963.95	9,234,077.04	30,771.83	12,313,346.97			680,303.92	277,776,652.34
May	393,021.34	193,530,967.64			56,282.84	23,882,197.16	32,055.91	11,564,563.84	449,304.18	228,977,728.64
June	510,209.13	242,726,019.88			28,142.07	11,088,131.60			538,351.20	253,814,151.48
July	470,368.56	232,580,301.91							470,368.56	232,580,301.91
August	496,617.31	230,494,754.72			102,979.46	48,843,793.90			599,596.77	279,338,548.62
September	384,605.86	167,268,342.20	45,058.06	22,837,199.18					429,663.92	190,105,541.38
October	488,033.12	254,304,502.48	92,571.83	52,121,016.76					580,604.95	306,425,519.24
November	502,499.00	288,360,365.94	30,743.65	17,048,891.11	27,755.38	14,009,528.06			560,998.03	319,418,785.11
December	501,098.03	232,083,536.39			35,374.40	17,094,284.21			536,472.43	249,177,820.60
Total	5,697,539.38	2,592,315,077.55	212471.24	107140202.1	418,244.49	152,883,089.26	170,278.58	54,674,236.38	6,498,533.69	2,907,012,605.24

PMS = Premium Motor Spirit **ATK** = Aviation Turbine Kerosene **DPK** = Dual Purpose Kerosene **AGO** = Automotive Gas Oil

Table 2.20
Census of different vehicles used in Nigeria

Type of vehicle	Number/year: 2005	2004	2003	2002	2001	2000	1999	98	97	96
Passenger cars	3,154,937	2,926,385	2,956,112	2,442,114	2,184,252	1,052,640	1,321,397	812,786	623,993	470,246
Trucks	164,030	169,801	166,450	168,007	137,960	119,498	122,570	120,897	124,486	101,031
Buses	988,480	866,656	840,280	764,128	760,850	475,618	482,302	368,984	333,454	16,094
Motorcycles	2,223,858	172,141	151,782	1,308,778	1,016,286	984,370	558,171	561,103	520,313	308,650

Source: *National Automotive Council (NAC) of Nigeria; Federal Office of Statistics.*

Table 2.21
Subcategories of Main Category 5- Transport

Cat.	Sub Cat.	Class	Sub-categories	Potential Release Route (µg TEQ/t) Air	Water	Land	Product	Residue	Consumption t/a *	Annual release g TEQ/a Air	g TEQ/a Water	g TEQ/a Land	g TEQ/a Product	g TEQ/a Residue
5			**Transport**											
	a		**4-Stroke engines**						**5,412,662**	**0.541**	**0**	**0**	**0**	**0**
		1	Leaded fuel	2.2	NA	NA	NA	NA		**0.000**				
		2	Unleaded fuel without catalyst	0.1	NA	NA	NA	NA	5,412,662	**0.541**				
		3	Unleaded fuel with catalyst	0.00	NA	NA	NA	NA		**0.000**				
	b		**2-Stroke engines**						**284,877**	**0.712**		**0**	**0**	**0**
		1	Leaded fuel	3.5	NA	NA	NA	NA		**0.000**				
		2	Unleaded fuel without catalyst	2.5	NA	NA	NA	NA	284,877	**0.712**				
	c		**Diesel engines**						**170,279**	**0.017**	**0**	**0**	**0**	**0**
		1	Diesel engines	0.1	NA	NA	NA	ND	170,279	**0.017**				
	d		**Heavy oil fired engines**						**1,870,000**	**7.480**	**0**	**0**	**0**	**0**
		1	All types	4	NA	NA	NA	ND	1,870,000	**7.480**				
5			**Transport**							**8.750**	**0**	**0**	**0**	**0**

Accidental fire in houses and vehicles

Accidental fires occur periodically in houses, factories, vehicles and even dumpsites. However, national data from the National Fire Service was not readily available. The assumption of at least 300 fires in houses and factories; and 400 vehicle fires were made based on relative comparison with other countries in the region. The amounts of dioxin and furan release to air from these sources are 0.120 g TEQ/annum and 0.038 g TEQ/annum respectively.

Akure, Ondo State: Open air burning at a refuse dump

Ondo State: Walled Dumpsite

Oyo State: Dumpsite showing Combustion of Refuse

Sawdust at a dumpsite ready for burning

Figure 2.3: Uncontrolled solid waste burning in Akure, Ondo and Oyo States, Nigeria

Figure 2.4
Roasting of cow skin and goat carcass with vehicle tyres at the Bodija market abattoir, Ibadan, Oyo State (both skin and carcasses are used as food by people)

(Pictrure missing from document)

Table 2.22: Subcategories of Main Category 6-Open Burning Processes

Cat.	Sub Cat.	Class	Sub-categories	Potential Release Route (µg TEQ/t)					Production	Annual release				
				Air	Water	Land	Product	Residue	t/a	g TEQ/a	g TEQ/a	g TEQ/a	g TEQ/a	g TEQ/a
6			**Open Burning Processes**							**Air**	**Water**	**Land**	**Product**	**Residue**
	a		**Fires/burnings – biomass**						**30,325,000**	**151.625**	**0**	**121.300**	**0**	**0**
		1	Forest fires	5	ND	4	NA	ND	13,300,000	**66.500**		**53.200**		
		2	Grassland and moor fires	5	ND	4	NA	ND	17,025,000	**85.125**		**68.100**		
		3	Agricultural residue burning (in field), impacted, poor combustion conditions	30	ND	10	NA	ND		**0.000**		**0.000**		
		4	Agricultural residue burning (in field), not impacted	0.5	ND	10	NA	ND		**0.000**		**0.000**		
	b		**Fires, waste burning, landfill fires, industrial fires, accidental fires**						**4,000,700**	**2600.158**	**0**	**2400.127**	**0**	**0**
		1	Landfill fires	1,000	ND	600	NA	600	2,000,000	**2000.000**		**1200.000**		
		2	Accidental fires in houses, factories	400	ND	400	NA	400	300	**0.120**		**0.120**		
		3	Uncontrolled domestic waste burning	300	ND	600	NA	600	2,000,000	**600.000**		**1200.000**		
		4	Accidental fires in vehicles (per vehicle)	94	ND	18	NA	18	400	**0.038**		**0.007**		
		5	Open burning of wood (construction/demolition)	60	ND	10	NA	10		**0.000**		**0.000**		
6			**Open Burning Processes**							**2751.783**	**0**	**2521.427**	**0**	**0.000**

Releases in Sub-category 6b (classes 2-5) may be assigned as release to land or as release in residues, depending on local circumstances

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

Inclement economic conditions in the country have drastically reduced capacity utilisation by industries. For example the formerly booming textile industry and tanneries are now struggling to survive as most of the factories have closed down. The two pulp and paper manufacturing industries located in Jebba, Kwara State, and Oku Iboku in Akwa, Ibom State, have also closed down many years ago. Chemical industry engaged in the production of chlorophenols, halogenated organics and oxychlorination processes do not exist in Nigeria. Since the petroleum industry is the crown jewel of the industrial sector and the largest contributor to the national economy, the survey focused on the biggest petrochemical companies in the country. These are the Eleme Petrochemical Company, Eleme, Rivers State, and the Kaduna Refinery and Petrochemical Company, Eleme.

Eleme Refining Company in Port Harcourt was designed to receive 210,000 barrels of crude petroleum per day for refining. The operations of the refinery have been epileptic with long periods of shut down. Reliable production data from the refinery is not readily available. The plant has settling pond as primary wastewater treatment, Dispersed Air Flotation (DAF) units as secondary treatment, and rotary biodisk as tertiary wastewater treatment facilities. Data on APCS was not provided.

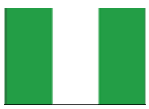
Kaduna Refining and Petrochemical Company was designed to receive 110,000 barrels of crude petroleum as raw material daily. The company's operation has been epileptic too with long periods of shut down. Data on Air Pollution Control System (APCS) was not provided. It generates 730 tonnes of sludge per annum which is disposed of by incineration (details of the incineration were not provided).

Wastewater treatment is by settling pond (primary), clarification (secondary) and biotreatment (tertiary) facilities. Oil in wastewater is also recovered before discharge into the environment.

Delta Environmental Logistics, Port Harcourt is a privately owned facility. The plant is a thermal desorbing unit (DTU) facility for treating drilling mud. Delta Environmental logistics has capacity for 19,180 tonnes of raw materials per year but produces 18,250 tonnes of products a year. It is a low temperature plant and runs continuously for 6,480 hours per annum. It operates at temperatures between 325^0C to 600^0C. The APC temperature is 600^0C. The plant uses a distillation process, with a condenser-enclosed system (APCS) equipped with a water interceptor. There are 4 installations with combined capacity of 73,000 tonnes/a.

According to the UNEP Toolkit, PCDD/PCDF may be emitted to air or captured in scrubbing systems and transferred to effluents. Ultimate releases will depend on the pollution controls and handling of residues. No emission factors for PCDD/PCDF in refineries can be given at this time due to lack of data. Presently, only PCDD/PCDF generated from the flaring of the gases released from the petroleum industry can be quantified.(UNEP Toolkit 2005).

Nigeria is the sixth largest oil producing country in the world. Noteworthy is the fact that the proportion of gas being flared has declined from an average rate of 97% over the period 1970-1979 to about 72% for the period 1980-1989, and remained at about the same figure of 72% during the period 1990-2000. With the on-going economic reform programmes of the



Government, emphasis has shifted to gas utilisation rather than gas flaring, while 2008 has been given as deadline for "flares out". Consequently, there has been a decline in the quantity of gas being flared. Out of a total gas output of 44,233 billion cubic meters in 2000; 23,930 billion cubic meters or 54.1% was flared (Fig 2.5).

A recent statistics from the Nigerian National Petroleum Corporation (FOS 2005) gave the quantity of gas produced in 2004 by the petroleum industry as 2,082,288.188 mscf while gas flared was 888,304.14 (4). Converting the amount of gas flare (Fig 2.6) to scm (1 cubic metre = 0.0008 tonnes), the annual gas flared therefore is 20120.547 tonnes/annum. The energy equivalent is 905424.637 GJ and 905.425 TJ. Using the emission factor of 8 g TEQ/TJ of gas burned according to the UNEP Toolkit (2005) the release of dioxin and furan from this source is 0.007 g TEQ/annum (Table 2.23). Thus gas flaring in Nigeria contributes minimally to dioxin and furan emissions into the environment.

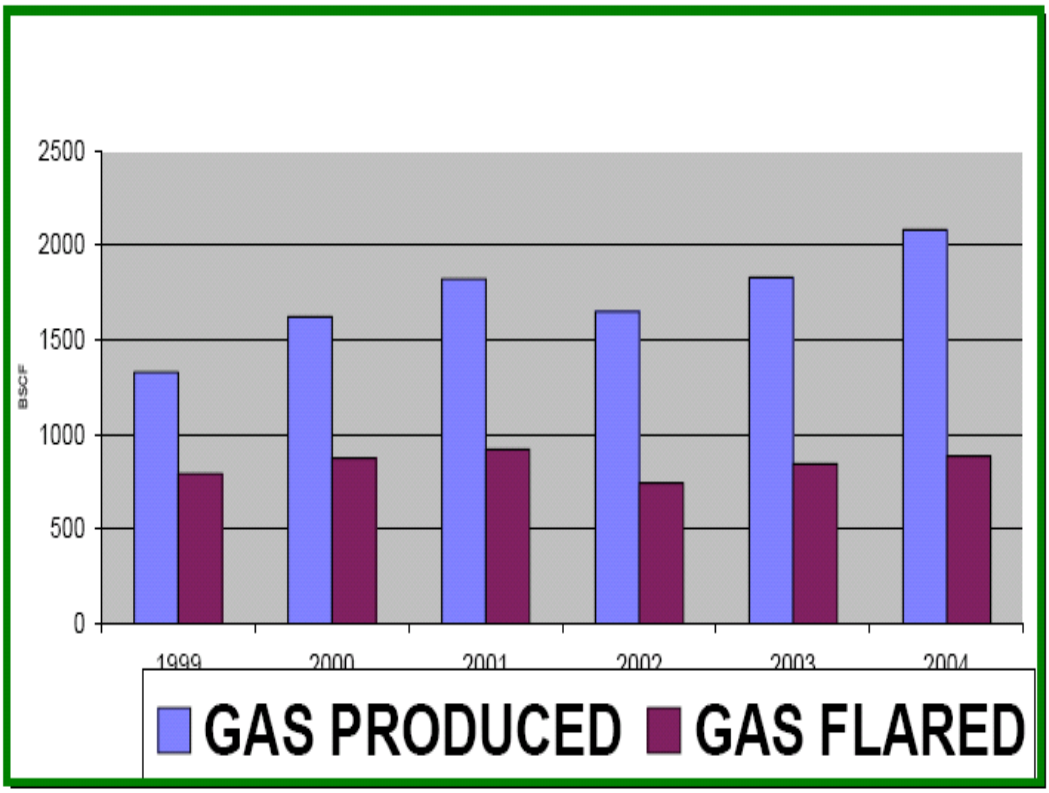


Figure 2.5
Natural gas flaring data in the Niger Delta 1999 – 2004

Figure 2.6
Horizontal natural gas flaring in the Niger Delta region, Nigeria

(Pictrure Missing from Document)

Table 2.23
Subcategories of Main Category 7- Production and Use of chemicals and Consumer goods

Cat.	Sub Cat.	Class	Sub-categories	Potential Release Route (µg TEQ/t)					Production	Annual release				
				Air	Water	Land	Product	Residue	t/a	g TEQ/a	g TEQ/a	g TEQ/a	g TEQ/a	g TEQ/a
7			**Production and Use of Chemicals and Consumer Goods**							**Air**	**Water**	**Land**	**Product**	**Residue**
	A		**Pulp and paper mills ***							**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
			Boilers (per ton of pulp)						**0**	**0.000**	**0**	**0**	**0**	**0.000**
		1	Black liquor boilers, burning of sludges, wood	0.07				NA		**0.000**				
		2	Bark boilers only	0.2				50		**0.000**				**0.000**
			Acqueous discharges and products						0		**0.000**		**0.000**	**0.000**
		1	Kraft process, Cl2 gas, non-wood fibers, impacted		ND		30	ND					**0.000**	
		2	Kraft process, old technology (Cl2)		4.5		8	4.5			**0.000**		**0.000**	**0.000**
		3	Kraft process, mixed technology		1.0		3	1.5			**0.000**		**0.000**	**0.000**
		4	Sulfite pulp/papers, old technology		ND		1	ND					**0.000**	
		5	Kraft process, modern technology (ClO2)		0.06		0.5	0.2			**0.000**		**0.000**	**0.000**
		6	Sulfite papers, new technology (ClO2, TCF)		ND		0.1	ND					**0.000**	
		7	TMP pulp		ND		1.0	ND					**0.000**	
		8	Recycling papers from contaminated waste papers		ND		10						**0.000**	
		9	Recycling pulp/paper from modern papers		ND		3	ND					**0.000**	
	B		**Chemical industry**							**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
			PCP						0	**0**	**0**	**0**	**0.000**	**0**
		1	European, American production (chlorination of phenol with Cl2)				2,000,000						**0.000**	
		2	Chinese production (thermolysis of HCH)				800,000						**0.000**	
		3	PCP-Na				500						**0.000**	
			PCB						0	**0**	**0**	**0**	**0.0**	**0**
		1	Low chlorinated, e.g., Clophen A30, Aroclor 1242				15,000							
		2	Medium chlorinated, e.g., Clophen A40, Aroclor 1248				70,000						**0.000**	
		3	Medium chlorinated, e.g., Clophen A50, Aroclor 1254				300,000						**0.000**	

4	High chlorinated, e.g., Clophen A60, Aroclor 1260				1,500,000						0.000	
	Chlorinated Pesticides						0	0	0	0	0.000	0
1	Pure 2,4,5-Trichlorophenoxy acetic acid (2,4,5-T)				7,000						0.000	
2	2,4,6-Trichlorophenol (2,4,6-PCPh)				700						0.000	
3	Dichlorprop				1,000						0.000	
4	2,4-Dichlorophenoxy acetic acid (2,4-D)				700						0.000	
5	2,4,6-Trichlorophenyl-4'-nitrophenyl ether (CNP = chloronitrofen)						*0*	*0*	*0*	*0*	*0.000*	*0*
	Old technology				300,000						0.000	
	New technology				400						0.000	
	Chloranil						0	0	0.0	0.0	0.000	0
1	*p*-chloranil *via* chlorination of phenol				400,000						0.000	
2	*p*-chloranil *via* hydrochinone				100						0.000	
3	Dyestuffs on chloranil basis (old process, Class 1)				1,200						0.000	
4	*o*-chloranil *via* chlorination of phenol				60,000						0.000	
	Chlorobenzenes						0	0	0	0	0	0
1	*p*-Dichlorobenzene	ND	NA	NA	39	ND					0.000	
2	*o*-Dichlorobenzene	ND	NA	NA	0	ND					0.000	
3	1,2,4-Trichlorobenzene	ND	NA	MA	0	3,000					0.000	0
	Chlorine/chloralkali production						0	0	0	0	0	0
	Chloralkali production using graphite anodes	NA	NA	NA	NA	1,000						0
	ECD/VCM/PVC						0	0.0	0.0		0.000	0
1	Old technology, EDC/VCM, PVC		1	NA		ND			0			
2	Modern plants, EDC/VCM or EDC/VCM/PVC	0.4	0.5	NA	0.03	10		0	0.000		0.000	0

		3	PVC only	0.0003	0.03	NA	0.1	0.2		**0**	**0**		**0.000**	**0.0**
	c		**Petroleum refineries**						**906**	**0.007**	**0**	**0**	**0**	**0**
		1	All types (flares) (µg TEQ/TJ) **	8	NA	NA	NA	ND	906	**0.007**				
	d		**Textile plants**						**0**	**0**	**0**	**0**	**0**	**0**
		1	Upper limit	NA	ND	NA	100	ND					**0**	
		2	Lower limit	NA	ND	NA	0.1	ND					**0**	
	e		**Leather plants**						**0**	**0**	**0**	**0**	**0**	**0**
		1	Upper limit	NA	ND	NA	1,000	ND					**0**	
		2	Lower limit	NA	ND	NA	10	ND					**0**	
7			**All Main Sectors**							**0.007**	**0.000**	**0.000**	**0.000**	**0**

Main Category 8 – Miscellaneous

There are five sub-categories under this main category namely: drying of biomass (green fodder, wood chips), crematoria, smoke houses, dry cleaning, and tobacco smoking. Drying of biomass is normally done by open sun drying. There are no crematoria in Nigeria as it is against the culture of the people. Some dry cleaning houses exist in urban centres using perchlorothylene as solvent. However, national data is lacking on the foregoing four activities. Therefore, the only activity to be considered in this category is tobacco smoking.

Tobacco smoking

British American Tobacco (BAT) with factories in Zaria, Kaduna State and Ibadan, Oyo State, is the largest manufacturer of cigarettes in Nigeria producing about 6 billion cigarette sticks annually which represents 70% of total national consumption. In effect 8.57 billion cigarettes are consumed annually. The emission release from tobacco smoking in Nigeria is 0.0009 g TEQ/annum. (Table 2.)

Main Category 9- Disposal

The sub-categories here are landfills and waste dumps; sewage/sewage treatment, open water dumping, composting and waste oil treatment. There are no engineered landfills in Nigeria but open dumps; the latter has been addressed under open burning already. Only a few sewage systems exist in the country and are usually small scale, located in small communities or housing estates. A central sewage system for Abuja, the capital of Nigeria, is under construction. The leachate or seepage from the dumps may discharge into surface waters such as streams and rivers especially during the rainy season. This does not pose threat of dioxin and furan emissions, since studies carried out so far did not find these chemicals in aqueous phase from these sources.

Open water dumping

Open water dumping subcategory relates to discharges from households, offices and other small businesses as well as run-off from contained land (e.g. parking lots) (UNEP, 2003). Based on annual per capita average volume of 100 litres, and 2006 National census population figure of 131,859,731, the annual discharge of about 13,185,973,100 litres/annum or 13,185,973.1m^3/annum is estimated. If the percentage input by the subcategories are, mixed domestic and industrial, 50%, urban environment, 45% and remote environment or input control, 5%, the annual input are 6,592,986.5, 2,670,159.6 and 659,298.7 litres respectively. The total emission released from open water dumping in Nigeria is 0.034 g TEQ/annum to water . Composting is a popular method of disposal for wastes originating from kitchen activities, gardening, park and other public/private area maintenance, agriculture, and forestry. Composting is still at infancy stage in Nigeria. National data is lacking to undertake any assessment of dioxin and furan release from this source.

Table 2.24: Subcategories of Main Category 8- Miscellaneous

Cat.	Sub Cat.	Class	Sub-categories	Potential Release Route (µg TEQ/t)					Production	Annual release				
				Air	Water	Land	Product	Residue	t/a	g TEQ/a	g TEQ/a	g TEQ/a	g TEQ/a	g TEQ/a
8			**Miscellaneous**							**Air**	**Water**	**Land**	**Product**	**Residue**
	a		**Drying of biomass**						**0**	**0.000**	**0**	**0**	**0.000**	**0**
		1	Clean wood	0.007	NA	ND	0.1	ND		**0.000**			**0.000**	
		2	Green fodder	0.1	NA	ND	0.1	ND		**0.000**			**0.000**	
		3	PCP- or otherwise treated biomass	10	NA	ND	0.5	ND		**0.000**			**0.000**	
	b		**Crematoria**						**0**	**0.000**	**0**	**0**	**0**	**0.000**
		1	No control (per cremation)	90	NA	NA	NA	ND		**0.000**				
		2	Medium control (per cremation)	10	NA	NA	NA	2.5		**0.000**				**0.000**
		3	Optimal control (per cremation)	0.4	NA	NA	NA	2.5		**0.000**				**0.000**
	c		**Smoke houses**						**0**	**0.000**	**0**	**0**	**0**	**0.000**
		1	Treated wood, waste fuels used as fuel	50	NA	ND	ND	2,000		**0.000**				**0.000**
		2	Clean fuel, no afterburner	6	NA	ND	ND	20		**0.000**				**0.000**
		3	Clean fuel, afterburner	0.6	NA	ND	ND	20		**0.000**				**0.000**
	d		**Dry cleaning residues**						**0**	**0**	**0**	**0**	**0**	**0.000**
		1	Heavy textiles, PCP-treated, etc.	NA	NA	NA	NA	3,000						**0.000**
		2	Normal textiles	NA	NA	NA	NA	50						**0.000**
	e		**Tobacco smoking**						**8,570,000,000**	**0.0009**	**0**	**0**	**0**	**0**
		1	Cigar (per item)	0.3	NA	NA	NA	NA		**0.0000**				
		2	Cigarette (per item)	0.1	Na	NA	NA	NA	8,570,000,000	**0.0009**				
8			**Miscellaneous**							**0.001**	**0**	**0**	**0.000**	**0.000**

Waste Oil Disposal

About 200 million litres or 18.4 tonnes of used oil is generated from vehicular oil change and industrial activities annually in the country (Bamiro and Osibanjo 2004); and disposed in drains or land (non-thermal) while a percentage is recycled through re-use as fuel for old vehicles or in block making machines. Dioxin and furan emission from this source is estimated to be negligible. Because the PCBs inventory was incomplete there is no result of releases from waste oil containing PCBs.

Main Category 10 - Hotspots

Table 2.14 and fig 2.2 give a summary of estimated PCDD/PCDF emissions in Nigeria from major source categories in this survey. Total emission of dioxins and furans into the air is 2783.98g TEQ/annum. Uncontrolled combustion processes are the major source category with 5273.21g TEQ/a contributing 98.84% of the total emissions; followed in descending order by production of mineral products with 10.72 g TEQ/a (0.38%); transportation with 8.75 g TEQ/a (0.31%); ferrous and non-ferrous metal production with 8.20g TEQ/a (0.29%); waste incineration with 4.30g TEQ/a (0.15%); heat and power generation with 0.22g TEQ/a (0.008%); production and use of chemicals and consumer goods - specifically gas flaring from petroleum production with 0.007 g TEQ/a (0.0003%); and lastly miscellaneous (tobacco smoking) with 0.0009 g TEQ/a. For release of dioxin and furan unto land uncontrolled combustion processes are the singular source 2521.4 g TEQ/a (100%). In the residue, the total emission released is 34.42 g TEQ/a. The sources in descending order of magnitude are waste incineration with 15.85 g TEQ/a (46.05%), ferrous and non-ferrous metal production with 12.01 g TEQ/a (35.02%) and heat and power generation with 6.51 g TEQ/a (18.91%). The total dioxin and furan released in all vectors is 5339.86g TEQ/a.

Since open burning of domestic and agricultural waste is by far the most important source of UPOPs releases to air and residues, all major refuse dumps in urban centres are potential hotspots especially as co-disposal of non-hazardous and hazardous wastes is the common practice. Thermal power stations for electric generation are also important potential hotspots. Furthermore, as transformer oils containing PCB are often contaminated with UPOPs, all locations and sites containing a cluster of PCB filled oil drums for transformers and capacitors are potential sites, as well as the storage sites for old, abandoned or decommissioned transformers and capacitors. Sediments in inland surface waters in which waste oil (used engine oil or crankcase oil) is dumped are also potential hotspots for UPOPs.

Article 5 and Annex C of the Stockholm Convention contain provisions for measures, which should be taken to reduce the total releases of dioxins/furans, PCBs and HCB from industrial and diffuse source categories.

Table 2.25: Subcategories of Main Category 9- Disposal

Cat.	Sub Cat.	Class	Sub-categories	Potential Release Route (µg TEQ/t) Air	Water	Land	Product	Residue	Production	Annual release g TEQ/a Air	g TEQ/a Water	g TEQ/a Land	g TEQ/a Product	g TEQ/a Residue	
9			**Disposal**		µg TEQ/m³			µg TEQ/m³							
	a		**Landfill leachate**						**0**	**0**	**0.000**	**0**	**0**	**0**	
		1	Hazardous waste *	NA	0.2	NA	NA	50			**0.000**			**0**	
		2	Non-hazardous waste *	NA	0.03	NA	NA	6			**0.000**		**0**	**0**	
	b		**Sewage/sewage treatment**						**0**		**0.000**	**0**	**0**	**0.000**	Please enter mass of sludge (t/a) *
		1	Industrial, mixed domestic with chlorine relevance	NA					*0*		*0.000*	*0*	*0*	*0.000*	
			No sludge removal	NA	0.005	NA	NA	1,000			**0.000**			**0.000**	
			With sludge removal	NA	0.0005	NA	NA	1,000			**0.000**			**0.000**	
		2	Urban environments	NA					*0*		*0.000*	*0*	*0*	*0.000*	
			No sludge removal	NA	0.002	NA	NA	100			**0.000**			**0.000**	
			With sludge removal	NA	0.0005	NA	NA	100			**0.000**			**0.000**	
		3	Remote and residential or modern treatment plant	NA	0.0001	NA	NA	10			**0.000**			**0.000**	
	c		**Open water dumping**						**9,922,445**	**0**	**0.034**	**0**	**0**	**0**	
		1	Mixed domestic and industrial inputs	NA	0.005	NA	NA	NA	6,592,987		**0.033**				
		2	Urban environments	NA	0.0002	NA	NA	NA	2,670,160		**0.001**				
		3	Remote environments or input control	NA	0.0001	NA	NA	NA	659,299		**0.000**				
	d		**Composting**						**0**	**0**	**0**	**0**	**0.000**	**0**	
		1	All organic fraction	NA	ND	NA	100	NA					**0.000**		
		2	Garden, kitchen wastes	NA	ND	NA	15	NA					**0.000**		
		3	Green materials,not impacted environments	NA	ND	NA	5	NA					**0.000**		
	e		**Waste oil disposal**						**0**	**0**	**0**	**0**	**0**	**0**	
		1	All fractions	ND	ND	ND	ND	ND							
9			**Disposal/Landfill**							**0.000**	**0.034**	**0**	**0.000**	**0**	

***** no sludge removal: Sludge that is lost in the piping system or deposited and removed has to be estimated. There is no general formula provided.

One key measure is the development of a Dioxins Action Plan to reduce or eliminate releases from unintentional production.

Article 5 (a) requires that the Action Plan presents the following information:

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

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

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

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

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

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

Dioxins and furans are unintentional by-products of industrial and incineration activities and constitute a special niche of POPs. Open burning and uncontrolled incineration of municipal and industrial wastes and hospital/clinical waste are well known sources of PCCD/Fs. A large amount of accidental and deliberate combustion is taking place continually including the burning of tyres (see Fig 2.4) as well stripping insulation of copper wires and cable and leading to dioxin releases into the environment. Burning of bush, forest and sugar cane fields, to cut labour costs just before weeding for planting and/or harvest as appropriate also contribute to the formation of dioxins (Osibanjo et. al 2002).

A comprehensive assessment of unintentional releases of PCB could not be made, as there is no laboratory capacity to analyse dioxins and furans in the country nor legislation requiring minimizing emissions of UPOPs.

2.3.7 Information on the state of knowledge on stockpiles, contaminated sites and wastes Identification, likely numbers, relevant regulations, guidance, remediation measures and data on releases from sites

Hazardous waste management

The major hazardous wastes generated in the country include used oil, drilling mud waste, hospital waste, oil sludge, sewage sludge, obsolete stock of POPs and equipment containing POPs and other toxic chemicals. Environmentally sound management of waste is not practised. The waste management system is not well developed and largely rudimentary. Hazardous waste is usually co-disposed with general waste in open dumpsites. There are no engineered landfills. The waste is combusted openly without any pollution control system or measures thereby causing release of pollutants into environmental media. Leachate from

these dumpsites is a veritable source of surface water pollution. It is not surprising therefore that POPs contamination of soil, surface and ground water has been reported from the limited POPs monitoring studies earlier reported in this report. High cost of infrastructure, especially equipment, personnel and running costs and lack of easy access to finance have been major constraints to the rapid development of the waste management industry.

In recent years, public outcry in the Niger Delta on the ecologically damaging effect of hazardous waste has driven the Federal Ministry of Environment, Housing and Urban Development (FMEHUD) to licence a few waste incinerator plants in the last few years mainly in Rivers State and operating off-site.

The weak infrastructure for hazardous waste management is a challenge for the successful implementation of programmes and activities envisaged in the remediation of contaminated sites. The infrastructure for hazardous waste management has to be reformed and greatly improved to meet international standards. Capacity building and training in-country mixed with overseas experience and exposure will facilitate building capacity of new competent hazardous waste managers, who can meet all the challenges for environmentally sound operation. The Basel Conventional Regionally Coordinating Centre for Africa for Training and Technological Transfer in hazardous waste management would be a valuable partner in the area of training, research and execution of projects especially pilot/demonstration projects of successful case studies.

Nigeria has capabilities in universities, private sector and even government for POPs hazardous waste management services and monitoring capabilities. A major challenge to meaningful POPs monitoring is the dearth of well equipped analytical laboratories, well staffed with competent and highly experienced analytical chemists/scientists and technical staff, to undertake reliable POPs monitoring studies to international standards.

The facilities used to produce the analytical data on POPs environmental levels reported in this document are old and need upgrading as well as the replacement of the high resolution-gas chromatograph/electron capture detector with state of the art new ones and a gas chromatograph - mass spectrometer in order to include environmental monitoring of dioxins. Research activities on the environmental fate of POPs and remediation technologies integrating indigenous technology and knowledge should be accorded priority with adequate funding in all the geopolitical zones of the country.

It is critically important to develop the infrastructure for sound hazardous waste management services and a proper waste management control system that will meet international standards. In this regard the following elements are important: efficient logistics, infrastructure, public awareness, adequate funding, standards and regulations, and international best practices. Implementing a proper and efficient waste management system would without doubt attract international funding and technological support with potential technology transfer to Nigeria.

Obsolete stocks

According to FAO, obsolete unwanted and banned pesticides and persistent organic pollutants (POPs) are serious environmental hazards, especially where they are stocked and mostly neglected. FAO estimates that there are about 120,000 tonnes of obsolete stocks of pesticides in Africa that require disposal (Osibanjo et. al 2002). The proportions of these that are POPs pesticides are unknown.

According to FAO (1999), obsolete pesticides are to be considered in these forms:

- Pesticides that are in the form of liquids, powder or dust, granules, emulsions, etc.
- Empty and contaminated pesticide containers of all forms and kinds (i.e. metal drums, plastic containers, paper cartons, jute and other bags, etc.)
- Heavily contaminated soil,
- Buried pesticides, etc. (FAO 1999)

Obsolete pesticides are therefore pesticides that can no longer be used for their intended purpose or any other purpose. Thus the stocks require disposal. Common causes of this situation include the following:

- Use of the product has been prohibited or severely restricted for health or environmental reasons (e.g., through banning, withdrawal of registration, or policy decisions);
- The product has deteriorated as a result of improper or prolonged storage and can no longer be used according to its label specifications and instructions for use, nor can it easily be reformulated to become usable again;
- The product is not suitable for its intended use and cannot be used for other purposes, nor can it easily be modified to become usable (FAO 1999).

Based on projections made on FAO data, Nigeria is estimated to have 22 tonnes of obsolete stocks of 40 assorted pesticides in 55 different sites which have become contaminated (Osibanjo 2002). An in-country survey undertaken in 1999 estimated obsolete stock of pesticides including POPs in the country to be 30 tonnes (FEPA 1999). The FAO figure and the earlier in-country study data need validation by means of a comprehensive study. Table 2.26 indicates sites where obsolete stocks of pesticides were observed. Obsolete stocks of aldrin, dieldrin and HCB, which are Annex A chemicals, were found during the inventory field work. Lindane, which is a potential POP candidate, was also found to be in use in most parts of the country.

Table 2.26
Some locations of obsolete POPs in Nigeria

Item	Name	Quantity	Location	Remarks
1	Aldrin 40	0.045 tonnes	Teaching and Research farm, Obafemi Awolowo University, Ile Ife	Dust powder
2	Aldrin 40	0.009 tonnes	Oyo State Integrated Self-Employment Scheme (OSIES), Secretariat, Ibadan.	Dust powder
3.	Dieldrin 20	14 litres emulsifiable concentrate (EC)	Abia State Agricultural Development Authority	Obsolete chemical and damaged containers
4.	Dieldrin 20	10 litres emulsifiable concentrate (EC)	Chemical store in Awka, Anambra state.	Obsolete chemical
5.	HCB	Unknown quantity	Osun State Agricultural Development Project	Obsolete
6.	HCB	Unknown quantity	Teaching and Research farm, Obafemi Awolowo University, Ile Ife	Obsolete
7.	Dieldrin 20	0.50 tonnes	Bauchi State Agricultural Development Project (ADP)	Dust powder; manufactured 1985
8.	Dieldrin 20	Unknown quantity	Chad Basin Development Authority, Maiduguri	Several 1L EC packs

Table 2.26
Some locations of obsolete POPs in Nigeria

Item	Name	Quantity	Location	Remarks
1	Aldrin 40	0.045 tonnes	Teaching and Research farm, Obafemi Awolowo University, Ile Ife	Dust powder
2	Aldrin 40	0.009 tonnes	Oyo State Integrated Self-Employment Scheme (OSIES), Secretariat, Ibadan.	Dust powder
3.	Dieldrin 20	14 litres emulsifiable concentrate (EC)	Abia State Agricultural Development Authority	Obsolete chemical and damaged containers
4.	Dieldrin 20	10 litres emulsifiable concentrate (EC)	Chemical store in Awka, Anambra state.	Obsolete chemical
5.	HCB	Unknown quantity	Osun State Agricultural Development Project	Obsolete
6.	HCB	Unknown quantity	Teaching and Research farm, Obafemi Awolowo University, Ile Ife	Obsolete
7.	Dieldrin 20	0.50 tonnes	Bauchi State Agricultural Development Project (ADP)	Dust powder; manufactured 1985
8.	Dieldrin 20	Unknown quantity	Chad Basin Development Authority, Maiduguri	Several 1L EC packs

There is no national database on obsolete stocks, reservoirs and contaminated sites. A reliable estimate of the quantities of the obsolete stocks could not be made during the inventory exercise. This is a gap that must be filled. It is expected that part of the problem would be addressed by the on-going African Stockpile Project (ASP). Nonetheless, results from the inventory studies indicate potential reservoirs and contaminated sites as power plants, dump yards for old/faulty/decommissioned transformers, chemical stores of the Agricultural Development Projects (ADPs) in the states, waste dumpsites in urban centres, chemical warehouses/stores previously used for storage of POPs, and old factory sites of POPs formulation plants. Risk assessment would have to come into play to identify the priority high risk sites for any future remediation actions.

The opinion of most respondents in the inventory study is that obsolete stock of POPs pesticides is not a problem because inadequate funding makes the purchase of pesticides difficult and as such the POPs pesticides are not readily purchased as they are controlled or banned chemicals. Furthermore, where POPs pesticides are purchased out of necessity, e.g., DDT for malaria control, they are consumed as soon as they are purchased.

Contaminated sites

While no contaminated sites have been confirmed, all ADP stores in the states used for storage of POPs in the past, soils around old and new PHCN power generating stations/plants, e.g., Ijora and Egbin in Lagos, Sapele and Afam, including stores and stacking areas for old and decommissioned transformers and capacitors for example at Osogbo, Osun state, which often are leaking, (Fig. 2.7), PHCN power transmission stations; old and abandoned formulation plants for POPs in Lagos, Ibadan, Kaduna and Port Harcourt, major dump sites in urban centres and soils around stalls, where sellers of POPs and other chemicals display their goods for sale and their warehouses, are all potentially contaminated sites. The improper storage of obsolete POPs in damaged or leaking drums or containers, as was observed in some PHCN power plants, contaminates such sites with potential deleterious environmental and human health effects. (Fig. 2.8 is a picture of leaking drums of transformer oils containing PCBs at a Power Generating Plant in Sapele).

The potentially contaminated sites would have to be confirmed through scientific study and laboratory analysis involving high resolution gas chromatography with electron capture detector/gas chromatography mass spectrometry. Thereafter risk assessment would be required to identify the most dangerous contaminated sites posing the greatest hazard to human health. A choice has to be made of the best and most practicable remediation technologies for POPs contaminated sites not entailing excessive cost.

Figure 2.7
Transformer Oil spillages at transformer base in Oshogbo and oil drums stored in open air

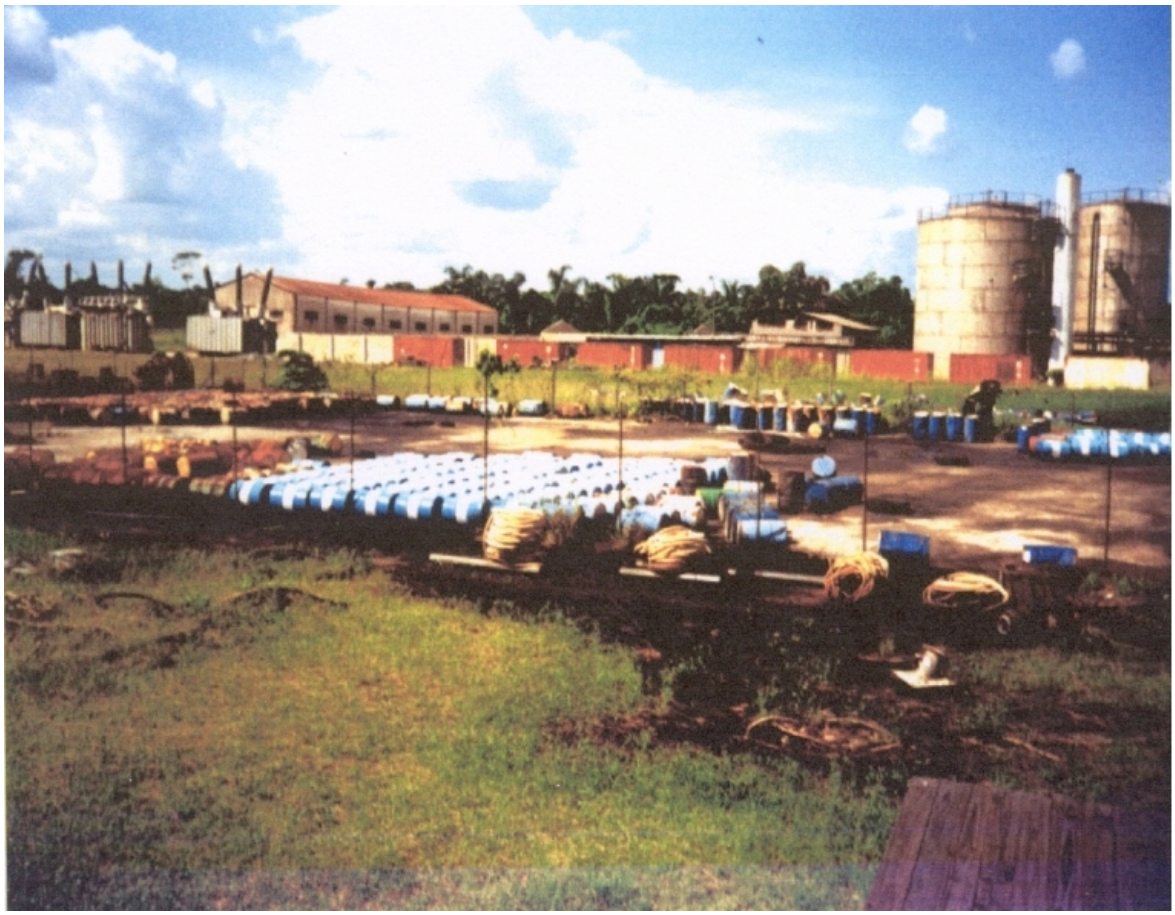


Figure 2.8
Storage area for transformer/turbine oils with extensive spillage in Sapele Power Plant

Disposal opportunities

Disposal opportunities exist for stock of obsolete POPs ranging from safe collection, proper storage and re-packaging of the stocks for shipment overseas to be incinerated in approved incineration facilities in Europe or the USA. Alternatively, the stocks after proper re-packaging can be transported to locally approved high temperature incinerators in Port Harcourt, Rivers State, Nigeria. Another option is to dispose the stocks in high temperature cements kilns with state of the art air pollution control systems available locally such as WAPCO, Sagamu.

The elements of cost, transportation logistics, national and international permitting requirements under the Basel Convention, technology transfer and incineration technological efficiency and human safety risks may determine the best option to adopt in view of the limited capacity available within the country.

Requirements under the Basel Convention, technology transfer and incineration technological efficiency and human safety risks may determine the best option to adopt.

Relevant regulations

The major hazardous wastes generated in the country include used engine oil; obsolete stock of POPs; medical wastes; oil drilling mud; sludge from wastewaters, wastes from tanneries,

textiles, refineries, oil drilling mud, etc. The quantity of hazardous waste generated was estimated to vary between 105,000 metric tonnes per annum (World Bank Industry and Energy Division, West Africa Department 1995) and 850,000 metric tonnes per annum (IMO Global Waste Survey 1995, Nigeria National Chemical Profile 1999). This necessitates the need for a comprehensive and integrated national survey of hazardous wastes including POPs wastes.

Due to low public awareness hazardous wastes are co-disposed with household refuse in open dumps thereby endangering human health. National laws exist for the environmentally sound management of hazardous wastes especially FEPA/FMENV Decree 42 of 1988 which prohibits the importation of hazardous waste into Nigeria; FMENV S.I.9 Regulation on: Pollution Abatement in Industries and Facilities Generating Wastes (1991) which restricts and controls the discharge of hazardous waste; and Regulation S.I.15 on waste management (1991), which provides guidelines for collection, treatment & disposal of solid/hazardous waste. The laws are weakly enforced and infrastructural facilities for the environmentally sound management of hazardous wastes are weak, too. Technologies such as high temperature incinerators for sound hazardous waste management, are just emerging in the country.

Remediation measures

Nigeria has in-country expertise for the remediation of petroleum contaminated sites in the oil producing area of Niger Delta and there have been many successful remediation projects to showcase. While remediation of POPs contaminated sites had not been undertaken before in the country; it is believed that the expertise and experience in the Niger Delta can be built upon with incremental capacity building to enable successful POPs remediation activities in collaboration with experienced institutions and organisations overseas and the support of the United Nations agencies such as UNIDO and UNEP and multilateral organisations including the World Bank.

2.3.7 Summary of future production, use and releases of POPs – requirements for exemptions

Nigeria has never been a producer of POPs, only formulation of pesticide plants existed in the past and is not likely to produce these chemicals in the future as a committed and responsible Party to the Stockholm Convention. The Government is not likely to ask for exemptions for the use of DDT, although the Federal Ministry of Health, Malaria Control Unit, uses DDT for malaria control alongside alternative strategies and methods of control such as nets impregnated with non-POPs chemicals.

There has been no national data system on chemicals including POPs releases into the environment in the past. This NIP project has provided a unique opportunity to inventory the sources of UPOPs and estimate their releases into environmental media which information was non-existent before now. The data would be valuable for policy planning and implementation of strategies to reduce emissions from priority sources identified especially open burning of assorted wastes (cocktail of hazardous and non-hazardous wastes) in refuse dumps; power plants which numbers are rapidly increasing as the country strives for self-sufficiency in energy generation; transportation (the phase-out of leaded gasoline should be strictly enforced, else dioxin releases from this source will increase). Releases from gas flaring can be phased out by adhering to the 2008 gas flare out date in the petroleum industry,

and the adoption of cleaner production technologies will minimise releases from the ferrous and non-ferrous metal production as well as mineral production.

2.3.8 Existing programmes for monitoring releases and environmental and human health impacts including findings

There are no programmes in place for environmental pollution monitoring including pollutants release. No adequate POPs monitoring has been undertaken in the country apart from past research efforts by some Nigerian universities, especially the Universities of Ibadan, Ahmadu Bello and Obafemi Awolowo, Ile Ife. Nonetheless see Tables 2.2 and 2.9 for POPs residue levels in Nigerian foodstuffs and mothers breast milk thereby indicating possible human health impact from exposure to these chemicals. Nigeria therefore is yet to introduce a Pollutant Release and Transfer Register. Programmes are also lacking for assessing environmental and human health impacts of POPs. There has been no adequate human health impact assessment in Nigeria. The involvement of staff of the various States Ministries of Environment and the Agricultural Development Projects (ADPs) in the inventory study facilitated the location of the various sites identified. There is no reliable information on the quantities and handling of PCBs, more so as the database on transformers is still being developed by the PHCN with World Bank assistance.

The impact of other chemicals could be deduced from Environmental Audit and Environmental Impact Assessment reports but there is no dedicated national programme in this direction.

Currently expertise for POPs pesticides monitoring exists in the country but this is limited to a few universities and the FMEHUD National Reference Laboratory in Lagos, except that the staff of the latter will require re-training and some of their facilities upgraded. NAFDAC Oshodi laboratory in Lagos has recently acquired analytical capability yet to be installed and commissioned for dioxin analyses and monitoring in food products. The analytical capability of FMEHUD National Reference Laboratory in Lagos has to be upgraded for UPOPs analysis and monitoring in environmental media with the possibility of serving as a regional laboratory for this purpose for a number of countries in the African region.

2.3.9 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

2.3.9.1 Information management capacity

Article 9 of the Convention requests each Party to facilitate or undertake the exchange of information relevant inter alia to the reduction or elimination of the production, use and release of POPs, and alternatives to POPs, including information relating to their risk as well as their economic and social costs. Article 10 of the Convention also requests each Party, within its capabilities, to promote and facilitate inter alia, awareness among its policy and decision makers with regard to POPs pollutants, as well as the provision to the public of all available information on POPs taking into account paragraph 5 of Article 9.

The existence of an interactive and integrated mechanism in information generation, storage, management and dissemination is critical to the successful implementation of the Stockholm Convention. There are several database sources in the country that might either contain information on POPs or be repository of such information. These include the Federal

Ministry of Environment, Housing and Urban Development (FMEHUD), NAFDAC, the Ministry of Labour and Productivity, the Federal Office of Statistics (FOS), the Federal Ministry of Health, Federal Ministry of Trade and Industry, the Federal Ministry of Transport, National Livestock and Pest Control, the Federal Ministry of Agriculture, the Standards Organisation of Nigeria (SON), the Customs Service, the Central Bank, National Planning, agricultural research institutes such as Cocoa Research Institute of Nigeria (CRIN), Ibadan. Yet most of these institutions do not have organised and retrievable databases such as a computer database on POPs (some had used POPs in the past and discontinued). Even those that have one are reluctant to share information with other government ministries and agencies and even the public.

In this regard it is important to build capacity of institutions dealing with chemical management issues through the provision of information communication technology (ICT) infrastructure such as computers, Internet facilities and e-mails. These institutions should enhance their capacity in database development and management. A network for chemical information exchange should be established with links to international databases on chemicals management such as UNEP Chemicals, UNEP Regional Office for Africa and WHO Chemicals Safety Network. Active information exchange among agencies should be vigorously promoted and enforced. There should be adequate fiscal and budgetary provisions for the network and its sustainability. The Government should make a law compelling ministries and agencies to make information from their database available in the public domain. The bill before the national assembly on Public Right to Information might help when passed into law.

2.3.9.2 Systems and capacity for reporting POPs information

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

Therefore reporting of POPs information is an important instrument of public safety and precaution against avoidable chemical exposure and risks, such that future development activities would not occur in POPs /toxic chemicals heavily contaminated sites or potentially contaminated sites due to past and on-going anthropogenic activities. The importance of information reporting is to provide to the Secretariat statistical data on total quantities of production, import and export of each of the chemicals listed in Annex A and B of the Convention or a reasonable estimate of such data; and a list of the states from which each of such substances was imported; and the states to which each of such substances was exported.

There is no regular or periodic inter-institutional reporting mechanism or requirement on POPs. It is therefore important to establish a reporting mechanism for the purpose of the Convention which experience will be beneficial to other conventions.

The Federal Ministry of Environment, Housing and Urban Development (FMEHUD) is the designated national focal point for the Stockholm convention and other MEAs on chemicals and wastes to which Nigeria is a party. However, there are no specific legal provisions in the country for reporting POPs issues to the Focal Point of the Convention. Whereas there are inter-ministerial meetings and other consultations on POPs, regular or even periodic inter-institutional reporting on POPs in the country is lacking. This is caused by weak inter-institutional linkages coupled with limited institutional capacity for information generation, storage, management and dissemination.

Although there are environmental regulations on monitoring which were described earlier, they are not specific to POPs. There are no legal requirements to disclose or report the findings to third parties.

The information and communication technology (ICT) and infrastructural capacity of the relevant governmental and non-governmental organisations have to be developed and strengthened to enable them perform the functions of appropriate information generation, storage, retrieval and dissemination. Furthermore, there should be a policy directive from the Government to perform information reporting duty on POPs issues.

Institutions to be involved in reporting on POPs should include those concerned with monitoring POPs releases; policy formulation; environmental pollution standards, regulations and enforcement; chemicals management, chemicals markets association, specifically the Federal Office of Statistics, the Central Bank, National Planning, NAFDAC, PHCN; private sector umbrella organisations, such as the Manufacturers Association of Nigeria (MAN), and the Federal Ministry of Environment, Housing and Urban Development (FMEHUD), which is the Focal Point for the Stockholm Convention.

2.3.9.3 **Public Awareness**

The Federal Ministry of Environment, Housing and Urban Development (FMEHUD) is responsible for initiating activities for providing public awareness and general information on POPs in partnership with NGOs, nonetheless there is no on going activity in this regard presently.

2.3.10 **Relevant activities of non-governmental stakeholders**

The vital role of NGOs in the successful implementation of the Convention is recognised in its Article (10.d.), which prescribes public participation as essential in addressing POPs and their health and environmental impacts among others. Civil society organisations including NGOs and CBOs are closer to the grass roots and as such are people oriented and valuable bridges of communicating government actions and plans and mobilising appropriate responses from the masses.

2.3.10.1 There are a number of environmental NGOs in Nigeria with a few that are active in the area of chemicals management, especially POPs. The Nigerian Environmental Society (NES), Friends of the Environment (FOTE), and the Nigerian Environmental Study Team (NEST) have been active on POPs and involved in public awareness and advocacy by organising awareness workshops on POPs. They have also spearheaded the establishment of a Network Coalition of Nigerian NGOs on POPs as well as carried out projects on POPs. For example the Nigerian Environmental Society (NES) carried out a project in Lagos in 2006 on the identification of POPs contaminated sites in Lagos, Southwest Nigeria, under the auspices of the International POPs Elimination Project (IPEP). These NGOs are also working closely with women's groups and children and are engaged in health promotion

Overview of technical infrastructure for pops assessment, measurement, analysis, alternatives and prevention measures, management, research and development, linkage to international programmes

The primary objective of the National Task Team was to assess the country's historical perspective of past and present usage of POPs and POPs-containing equipment, storage facilities, emission releases arising from past and present uses, importation, marketing and sale, as well as impacts and threats to human and ecosystem health arising from anthropogenic activities such as power plants, uncontrolled combustion, wastes incineration, gas flaring from oil and gas production activities, obsolete stock of POPs and contaminated sites.

The Federal Ministry of Environment, Housing and Urban Development (FMEHUD), established seven geo-political task teams for effective coverage and ensuring participation of all the states of the country and the Federal Capital Abuja. A team leader coordinated each geopolitical zone. Each team leader appointed supervisors as appropriate to coordinate the field studies while each supervisor appointed a number of enumerators. Thereafter UNIDO international consultants trained the team leaders on the methodology for the inventory study. The team leaders in turn trained the supervisors while the latter trained the field enumerators in the inventory methodology.

2.3.10.2 *Waste Management Facilities in Nigeria*

There are limited facilities in the country at present for the environmentally sound management of hazardous wastes. This is because the hazardous waste management industry is in its infancy and starting to grow as the economy diversifies within the framework of sustainable development. The FMEHUD has licensed a few high temperature incinerators that handle treatment of waste oil and drilling mud located in Warri and Port Harcourt in the Niger Delta region, which is the oil producing area of the country. These facilities could be deployed for POPs wastes incineration. Thermal Desorption Units (TDUs) for low temperature treatment including recycling of drilling muds also exist in Port Harcourt. These are not suitable for POPs wastes because of the low temperature of operation and tendency to produce UPOPs. The West African Portland Cement Company WAPCO Sagamu has also been incinerating hazardous waste oil, solvents as well as PCB waste in its cement kiln.

The federal government took positive steps to curtail human exposure to medical wastes about five years ago by approving the purchase and installation of four incinerators in different parts of the country, specifically at the Nigerian Institute of Medical Research, Lagos; and three orthopaedic hospitals at Igbobi (Lagos), Enugu, and Dalla (Kano) respectively. Each of the incinerators with minimum APCS have the capacity of 100 kg waste/day operating 8 hours a day and 3 days a week. Approval has also been given by the federal government for the installation of medical waste incinerators with better APCS, which are yet to be installed, at the Lagos University Teaching Hospital (LUTH), Lagos; University of Ilorin Teaching Hospital, Ilorin; Nigerian Institute of Pharmaceutical Research, Abuja; and Federal Government Medical Centres in Owo, Yola and Jalingo, respectively.

2.3.10.3 Contaminated Sites Remediation Capability

All major refuse dumps in urban centres are potential contaminated sites especially as co-disposal of non-hazardous and hazardous wastes is the common practice. Thermal power stations for electric generation are also important potential hotspots for POPs. All locations

and sites containing a cluster of PCB filled oil drums for transformers and capacitors are potential contaminated sites, as well as the storage sites for old, abandoned or decommissioned transformers and capacitors.

At present, there are no dedicated or specialized facilities, offering biological soil treatment, transportable treatment technology and specialized thermal, physical or chemical soil decontamination of POPs. There has been no remediation of any POPs contaminated site in the country. Decontamination and remediation of POPs pesticides contaminated sites is thus one of the Post NIP POPs projects in the country as a follow up to the ASP project.

Furthermore despite the inadequacy of the existing PCB survey conducted under the GEF project, the government of Nigeria through the FMEHUD has identified PCBs management as one of its top priorities regarding POPs issues. Consequently the Development of Strategy and Action Plans to Manage and Phase out PCBs is also one of the Post NIP projects identified at the NIP endorsement workshop in October 2007. The Environmentally Sound management of in-use and out -of use equipment containing PCBs including decontamination and remediation of PCBs contaminated sites is one of the activity elements to be covered in the Post NIP Project on PCBs.

2.3.10.4 *Environmental Monitoring Capability*

There is no National Monitoring Programme to allow trend analysis; therefore, periodic or regular sampling and monitoring of POPs in the environment are not carried out. Only a few universities such as the University of Ibadan, the FMEHUD/NESREA National Environmental Reference Laboratory in Surulere Lagos and the NAFDAC laboratory in Lagos have analytical equipment, most of which are non-functional and old, for POPs residue analysis. The facilities in these laboratories need to be upgraded and the capacity of the laboratory staff enhanced through training.

POPs monitoring laboratories equipped with high resolution capillary column gas chromatographs with electron capture detectors (GC-ECD) exist in a few universities, government establishments and most recently in two private laboratories in Lagos and Port Harcourt respectively. Highly trained experts in trace organic analysis, access to current periodicals and other literature, as well as funds for solvents and other pertinent chemicals are the main limiting factors for conducting research and/or monitoring POPs residues. The POP laboratory at the University of Ibadan has been nominated by FMEHUD to participate in the GEF project entitled “Assessment of Existing Capacity and Capacity Building Needs to Analyse POPs in developing countries “ .

2.3.10.5 Health monitoring capability

Presently, there are no programs to monitor levels of POPs chemicals in the environment although there were limited studies in the past carried out by the University of Ibadan, Nigeria on POPs pesticides residue in soil, water, foods, wildlife, human blood and mothers breast milk.

The limited monitoring data available indicated contamination of environmental media by POPs including foods, wildlife, human blood and breast milk. Ingestion of contaminated foods is a major source of human exposure to POPs, yet no human exposure data for POPs have been reported in the country.

2.3.11 Identification of impacted populations or environments, establishing scale and magnitude of threats to public health and environmental quality and social implications for workers and local communities

Results of the POPs monitoring and assessment of dioxin releases gave differentiated concentrations and/or releases of POPs at different locations; those with much higher concentrations above international threshold limits or concentrations are adjudged to be heavily contaminated relative to others. Based on current literature on the toxicity of POPs, people working within and around the dumpsites (refuse collectors, labourers in dumpsites and scavengers) face potential health hazards and diseases from occupational exposure to POPs. Rapid urbanization and scarcity of land has caused people to build residential houses close to hazardous waste dumpsites or right on reclaimed dumpsites. People and especially children living in the vicinity of dumpsites are at risk of exposure to POPs and may suffer causative illnesses. The monitoring of mothers' breast milk confirmed contamination of breast milk with POPs. The lack of any epidemiological studies makes it difficult to ascertain without doubt the health impact of POPs. This therefore underscores the importance of health impact studies on POPs in the six geopolitical zones.

2.3.12 Details of any relevant system for the assessment, regulation and listing of new chemicals

The agricultural research institutes in the country have a system in place for screening new chemicals for use as pesticides. However, there is no national infrastructure and guidelines for chemicals risk assessment. The onus is on the importer of chemicals to provide a Material Safety Datasheet and other technical assessments already carried out by the producers/exporters of the chemicals in developed countries. The eco-toxicological and environmental stability tests are usually carried out in developed countries under temperate climatic conditions which are completely different from the tropical climatic conditions in Nigeria.

National infrastructure and capacity as well as institutional and regulatory work for chemical risk assessment are lacking. This gap needs to be filled, as such an expertise is critically important in assessing new chemicals as replacement or substitutes for the present POPs. It is desirable to be able to ascertain through local research and development under local ecological conditions the risks associated with alternatives to POPs through screening of these alternative chemicals. Capacity building in chemicals risk assessment including education in state of the art techniques is important. Capacity acquisition in life cycle analysis of chemicals as well as modelling techniques is also desirable. According to the Stockholm Convention, Annex D, 1, a Party can propose a chemical to be listed as POP in Annex A, B or C, if chemical identity, persistence, bio-accumulation, and potential for long-range environmental transport can be documented. There is need for stronger government commitment to R&D for national development; by having the capability to take knowledge based informed decisions, along with the introduction of appropriate legislations. According to the inventory assessment, there is no specific legislation on the production, import, export, monitoring, handling and management of POPs substances and waste. The general public and many of the other stakeholders are oblivious of the Stockholm Convention. There is no national regulatory framework for the disposal of POPs chemicals and POPs waste.

2.3.13 Details of any relevant system for the assessment, regulation and listing of chemicals already in the market

The National Policy on Environment articulates clear intention on sustainable and environmentally sound management of chemicals. However the implementation of the policy has not been undertaken as expected. The existing national legislations on hazardous chemicals control in Nigeria are either too general or too fragmentary in nature and non-specific to POPs. Currently Annex D paragraph-1 in the Stockholm Convention is not operational in Nigeria

Root cause analysis of the defects in national chemicals management infrastructure and strategy must be carried out to ensure the successful implementation of national programmes on alternatives to POPs and the eventual phase-out of POPs.

There is the problem of fragmental ministerial responsibilities with different ministries entrusted with the function of managing chemicals and wastes, especially the Federal Ministry of Environment, Housing and Urban Development (FMEHUD) , the Federal Ministry of Agriculture, Ministry of labour and Productivity., the National Agency for Food and Drug Administration and Control (NAFDAC) and the Department of Petroleum Resources (see Nigeria's National Chemicals Profile). Table 2.27provides an overview of the responsibilities of government agencies, ministries and other institutions in chemicals management.

There is jurisdictional conflict and lack of coordination among different ministries in charge of chemical management and even across different levels of government, exemplified by the lack of interaction between the Department of Customs on import and export of POPs and the FMEHUD.

Lack of information sharing is another challenge requiring urgent attention, especially as it affects:

- Discrepancies in information collected by different ministries
- Lack of information exchange amongst the relevant bodies
- Lack of networking and information sharing amongst experts in different relevant ministries
- Lack of public awareness and enlightenment on POPs chemicals

The responsibility of ensuring that chemicals do not present adverse effects to human health and environment rests with various ministries and governmental agencies through laws, regulations, guidelines and other measures that provide some degree of safety and protection.

The ministries and agencies involved in protecting the environment from chemical induced risks include: Federal Ministry of Environment, Housing and Urban Development (FMEHUD), Ministry of Agriculture and Natural Resources (Livestock and Pest Control Division), Ministry of Health (Occupational Health Division), NAFDAC, Ministry of Labour and Productivity (Factory Inspectorate Division); Ministry of Petroleum Resources (DPR), Ministry of Transport (Nigerian Ports Authority) and Ministry of Finance (Nigeria Customs Service).

There is need to review and modernise regulatory and assessment schemes for pesticides and or industrial chemicals in the country to make these responsive to the requirements of article 3, paragraphs 3 and 4 of the Stockholm Convention.

3 Strategy and action plan elements of the national implementation plan

3.1 Policy Statement

The National Implementation Plan (NIP) for Nigeria has been prepared and endorsed. The inventories and the measures described in the National Implementation Plan have been discussed, understood and approved. In undertaking the activities which culminated in the NIP, and implementing the planned actions enunciated therein, we are mindful of the following key principles:

(i) The environment is a legacy bequeathed by God to mankind;

(ii) The environment is the common heritage of present and future generations;

(iii) The environment is not a gift from our parents but a loan from our children;

(iv) A safe and clean environment is part of the fundamental human rights of every Nigerian citizen and resident;

(v) Every Nigerian citizen and resident has a solemn duty to protect and enhance the quality of the environment and to inform the relevant authority of any activity, event and incident that may adversely affect the environment;

(vi) Adverse effects be prevented and minimised through sustained integrated planning, coordination, integration and cooperation of stakeholders; and

(vii) The precautionary principle which requires that where there is risk of serious irreversible adverse effects occurring, a lack of scientific certainty should not prevent or impair the taking of precautionary measures to protect the environment.

The Federal Republic of Nigeria as a Party to the Stockholm Convention on Persistent Organic Pollutants and other multilateral environmental agreements (MEAs) on chemicals and wastes such as the Rotterdam Convention on Prior Informed Consent (PIC) Procedure on Certain Hazardous Chemicals and Pesticides in International Trade and the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal:

a) *Reiterates* its commitment to implement the Stockholm Convention and the related Conventions as well as international processes on chemicals management such as SAICM in order to safeguard the health of its people and the environment;

b) *Commits* to undertake review of its policies and legislative framework relevant to the implementation of the Stockholm Convention and the related conventions and international processes on chemicals and wastes management;

Table 2.27
Responsibilities of government agencies, ministries and other institutions

Stage of Life cycle / Ministry concerned	Import	Production	Storage	Transport	Distribution	Use/Handling	Disposal	Disaster Preparedness
FMEN	E	E	E	E	E	E	E	E
Health (NAFDAC)	E	E	E		E	E	E	
Labour & Productivity		E	E	E	E	E	E	E
Agriculture/Natural Resources	B		B	B	B	B		
NNPC (DPR)	A	A	A	A	A	A	A	A
Trade/Commerce	E					C		
Industry (SON)	C	C, D	C, D			C, D	C,D	C, D
Finance	E							
Nigerian Ports Authority	E		E	E		E		
Internal Affairs	E	E	E	E	E	E	E	E
Foreign Affairs	A							
Customs	E	E	E					
Police Force	E	E	E	E	E	E		
Justice	E	E	E	E	E	E	E	

(A) Petroleum (B) Pesticides (C) Consumers Chemicals (D) Industrial Chemicals (E) Classes A – D

c) *Recognises* the need to involve a wide range of stakeholders in the country for effective implementation of the Stockholm Convention and the related conventions and international processes on chemicals and wastes management*;*

d) *Resolves* to reduce or eliminate releases of POPs and other pollutants as soon as practicable by implementing the NIP;

e) *Determines* to achieve the milestones set in the National Implementation Plan including those agreed at national, sub-regional, regional and international levels on specific issues of POPs releases;

f) *Cognisant* of the limited financial capacity of the country the NIP will be implemented according to the earmarked priorities;

g) *Agrees* to cooperate with the international community in dealing with issues of POPs and other pollutants of concern in areas such as search for alternatives, monitoring releases of various pollutants, sharing of knowledge and experiences on issues of POPs and other toxic substances and wastes; and information exchange on management of POPs and other toxic chemical substances;

h) *Calls* for international assistance to bridge the financial gaps in order to accelerate implementation of desired actions.

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

3.2 Implementation Strategy

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

3.2.1 **Overview**

The environmental and health hazards caused by POPs are of global concern. The initial list of POPs consists of 12 chemicals, namely 8 pesticides: aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, mirex, toxaphene; 2 industrial chemicals: hexachlorobenzene (also a pesticide), and polychlorinated biphenyls (PCB); and 4 unintended products or by-products: polychlorinated dibenzo-para-dioxins (PCDD), and polychlorinated dibenzo- furans (PCDF). There is no documented evidence that mirex and toxaphene have ever been used as insecticides in Nigeria. The hazards caused by POPs are due to their distinct properties, which include persistence, bioaccumulation, ability for long-range transboundary atmospheric transport and deposition, and toxic characteristics. The NIP has revealed that flora and fauna as well as humans are at risk from POPs. However, there is no documented evidence that mirex and toxaphene have ever been used as insecticides in Nigeria

According to the preliminary results of the inventory of POPs conducted in 2003, Nigeria has sources of POPs releases to the environment. The major sources of POPs include stockpiles of obsolete POPs pesticides and waste that were originally intended for plant protection and

public health; transformer oils containing PCB used in electricity distribution/transmission equipment and contaminated equipment. Power generation and heating, uncontrolled combustion of waste, and waste incineration release high PCDD and PCDF. Other sources of PCDD and PCDF releases are transport and gas flaring from oil production. There is poor housekeeping in the power plants with transformers leaking PCB oil. There is no comprehensive national database on transformers whether in use and/or decommissioned.

There are about 30 tonnes (unconfirmed estimate) of POPs pesticides that are stored in various areas all over the country. These pose risks to human health and the environment through continuous leaks and spills. About fifty sites or more are possibly contaminated with PCBs. Several sites are potential sources of future releases of PCDD and PCDF.

There is limited institutional capacity for monitoring of POPs. The existing regulatory institutions are not specifically involved in POPs monitoring. They have mandate for pesticides and other chemicals monitoring and environmental quality monitoring as well. Interagency cooperation including information sharing and exchange is poor. The Federal Ministry of Environment, Housing and Urban Development (FMEHUD) and NAFDAC have laboratory facilities for POPs analysis but they require capacity enhancement, specifically upgrading of facilities and re-training of the staff. There is no comprehensive national law on chemicals, although piecemeal legislation exists to deal with chemicals issues, but they are not specific to POPs.

The assessment found no inter-ministerial reporting network on POPs; there are also no specific media available for dissemination of POPs information. It is therefore critical to develop a road map for effective public information dissemination, education and awareness creation on POPs. Several of the stakeholders showed lack of awareness of POPs issue. Consequently, Nigeria shall build capacity in information generation and dissemination for the purpose of meeting her obligation under Article 10 of the Convention.

Nigeria ratified the Convention on 24 May 2004. Nigeria was one of the countries to benefit from US $500,000 POPs Enabling Activities in 2002 from GEF through UNIDO to assist in the development of National Implementation Plan (NIP) to meet her obligations under the Stockholm Convention on POPs. Nigeria reiterates its resolve to address POPs related problems in order to minimize further releases of POPs into the environment.

3.2.2 Policies

The development of NIP is guided by the existing related national policies on environment, health, energy, science and technology, industry and agriculture. Extant legislations place POPs under legislation on environmental protection, pesticides, industrial and consumer chemicals.

The National Environmental Policy (1989) as revised in 1995 is hinged on sustainable development through conservation of natural resources and protection of the environment and human health. The policy advocates for sound management of chemicals but without specific reference to POPs. The policy underscores the need for promotion and application of environmentally friendly technologies such as recycling, reuse and safe waste disposal. In addition it emphasizes the importance of international cooperation to deal with transboundary environmental problems such as POPs and POPs waste.

The country banned DDT and other POPs pesticides in 1999. The country is committed to the development of safe alternatives towards the reduction and elimination of POPs. The alternatives being promoted include chemically impregnated nets and use of biopesticides from neem. The industrial policy promotes the reduction of toxic chemicals in form of discharges or emissions including POPs such as PCBs, PCDD and PCDF from industrial processes.

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

3.2.3 NIP policy basis and implementation objectives

3.2.3.1 Mandates for implementation of NIP

The mandate for implementation of the NIP lies with the Honourable Minister of Environment whose ministry is the National Focal Point (NFP) and has overall mandate for the protection of the environment and natural resources conservation.

FEPA Act empowers the Minister to make regulations on any aspect of the environment chemicals including POPs in consultation with relevant Agencies. More recently, the NESREA Act of 2007, which replaced the FEPA Act, empowered the Minister to exercise similar powers. In addition the Department of Pollution Control, prepares and oversees the implementation of the National Implementation Plan. It further requires all sector ministries and local authorities to mainstream respective parts of the NIP into their policies, legislation, plans and programmes and submit annual reports to the Honourable Minister of Environment.

3.2.3.2 The Government's commitment in the POPs issue

Nigeria is committed to implementing the Stockholm Convention on Persistent Organic Pollutants along with other MEAs on chemicals and wastes in order to safeguard the environment and the health of its people for the present and future generations. This is within the context of Chapter 19 of Agenda 21, the 2002 Johannesburg Plan of Action on the Strategic Approach to Integrated Chemicals Management, the NEPAD Environment Initiative and in line with the vision and goals of the National Policy on Environment.

The implementation will involve among others the review of related policies and legislation and the strengthening of institutional framework, coordination and the involvement of stakeholders. Moreover the Government is committed to strengthening international cooperation to facilitate sharing of knowledge and experiences on POPs issues including the available feasible alternative technology, substitutes and other POPs mitigation initiatives and approaches.

The country had undertaken activities in the past that foster sound management of POPs and other toxic chemicals. The preparation of the National Profile of Chemicals in Nigeria in 1999 was a practical first step towards ensuring sound management of chemicals. The document provides a comprehensive assessment of existing infrastructure as it relates to the institutional, legal, administrative, technical and commercial aspects of chemicals management, as an essential step towards strengthening national capabilities to manage

chemicals. The profile was reviewed in 2004 and would be further updated to integrate issues on POPs.

The Government's goal is to eliminate POPs as soon as practicable by implementing the NIP. Since management of POPs involves an array of stakeholders, the Government has established a National Steering Committee chaired by the Permanent Secretary, Federal Ministry of Environment, Housing and Urban Development (FMEHUD). Recognising the limitations and constraints of budgetary provision from the Government, the successful implementation of most of the activities planned will depend on the availability of international funding assistance from bilateral and multilateral sources.

3.2.3.3 **Endorsement of the NIP**

The process of the development of the NIP involved the active participation of an array of relevant stakeholders, including government ministries, departments and agencies; research institutions and universities; non-governmental organizations (including women's and youth rights activists), community based organizations; and the media. The NIP has been reviewed, commented upon and endorsed by the appropriate stakeholders (Annex 3)

3.2.3.4 **Objectives of the NIP**

The overall objective of the National Implementation Plan as indicated earlier, is to protect human health and the environment from impacts that are associated with the release of Persistent Organic Pollutants (POPs) through their reduction in use and eventual elimination. The NIP is intended to achieve the following specific objectives:

i) To demonstrate the commitment of the Government to the objectives of the Stockholm Convention and to achieve compliance with the obligations assumed as a Party to it;

ii) To present the information base and associated analysis supporting the development and implementation of an effective Action Plan and Strategies to achieve reduction and elimination of POPs with associated improvement of environmental quality and human health;

iii) To provide the basis for monitoring the country's progress in addressing the POPs issue, and specifically the effectiveness of the actions it has committed to in reducing or eliminating POPs use and release to the environment;

iv) To facilitate public awareness, education and participation in respect of the POPs issue and overall improvement in environmental and public health protection;

v) To provide the operational and institutional framework for attraction of international assistance such as might be provided under the Stockholm Convention's permanent financial mechanism for actions on POPs; and

vi) To promote synergies with other related Conventions and international processes on chemicals management.

3.2.3.5 Elements of the NIP strategy

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

(i) National intersectoral coordination: A coordinated and integrated approach shall be adopted, with co-operation among all relevant stakeholders at all levels with differentiated responsibilities on all issues related to chemicals management, as well as those whose activities influence chemical safety, including representatives of industry, labour and civil society groups (such as representatives of women and youth groups);

(ii) Establishment of a register/geo-referenced database of stockpiles, wastes and contaminated sites;

(iii) Establishment, development and sustainable maintenance of national chemical databases that will provide information on the amounts of chemicals imported, formulated and traded in the past and present, including information on clinical, epidemiological, and environmental data to support decision-making as well as assess and manage risks under local conditions;

(iv) Development and implementation of public awareness promotion materials, training and educational programmes and risk communication that will reach out to all groups and social classes in the society;

(v) Need to undertake relevant policies, legal, institutional, administrative and technical infrastructure reforms towards mainstreaming POPs and PIC issues;

(vi) Strengthening institutional capacity and capability in relevant organizations in terms of human resources development and scientific monitoring, scientific/technological research and development (R&D) facilities;

(vii) Strengthening the involvement of civil society organisations (NGOs, CBOs, etc.) in awareness promotion activities on POPs and other toxic chemicals and wastes;

(viii) Establishment and maintenance of experts networking on POPs/PIC issues and toxic wastes;

(ix) Initiation of research and development as well as POPs environmental and health monitoring programmes directional inputs to national databases on chemicals and risk factors towards policy development and compliance/enforcement reforms;

(x) Promote sub-regional (e.g., ECOWAS), regional (e.g., NEPAD, African Union) and international cooperation and collaboration in relevant programmes on the reduction and elimination of POPs;

(xi) Promotion of R&D activities on alternatives to POPs and PIC chemicals: Research into alternative chemicals, natural products (biopesticides, etc.), integrated pest management (IPM) and integrated vector management (IVM) to POPs will be vigorously pursued;

(xii) Establishment of a sustainable funding mechanism for POPs activities and other related chemicals management programmes including economic incentive/disincentive packages;

(xiii) Developing and implementing sound management plans for POPs contaminated sites;

(xiv) Initiation of studies on the development of local/regional emission factors for PCDD/PCDF;

(xv) Promoting transfer of successful and proven technologies including BAT/BEP for mitigation of releases of POPs and other toxic chemical pollutants;

(xvi) Development and institutionalisation of review, reporting, evaluation mechanisms and periodic updating of the NIP.

3.2.3.6 **Coordination Mechanism of the Action Plan**

The proposed organisational framework and coordination mechanism of the action plan of NIP is illustrated in figure 3.1. The NIP implementation arrangement will be put in place once the NIP has been approved and the post-NIP project prepared. The FMEHUD will be the coordinating ministry for the implementation of all facets of the action plan. The National Steering Committee for the Plan will be multistakeholder in composition involving, relevant ministries of government, private sector, civil society organisations including NGOs and CBOs. The National Steering Committee shall serve as the think thank and clearing house for all policy issues and decisions; and the consideration of the road map for the action plan implementation arrangements based on life cycle analysis approach. All segments of governance encompassing national, state and local governments shall be active participants in the implementation arrangements and activities thereby ensuring sustainability of the programme.

National Coordination will look at the macro-management of the NIP in a holistic and integrated manner consistent with national development plans. The National Coordinator shall have over sight functions on the activities of Programme Officers. A Programme Officer may be responsible for the management of a sectoral programme or clusters of programmes towards ensuring the overall success of the NIP. Each action plan shall have its monitoring and evaluation unit. Financial reporting and Technical evaluation will be used to monitor and evaluate the success of NIP implementation projects.

The coordination of the implementation arrangements at the state level will look at the micro-management issues and plans within the larger picture of the macro framework. The local governments being closer to the grassroots have a major role to play in implementing at the community level national and state policy directives on NIP of POPs.

About 15% of the total NIP cost will be devoted to overall management of post-NIP projects. The detail financial plan will be elaborated when implementation starts. Financial resources for NIP implementation would come from various sources including budgetary allocation, ecological fund, bilateral and multilateral donors assistance as well as private sector participation.

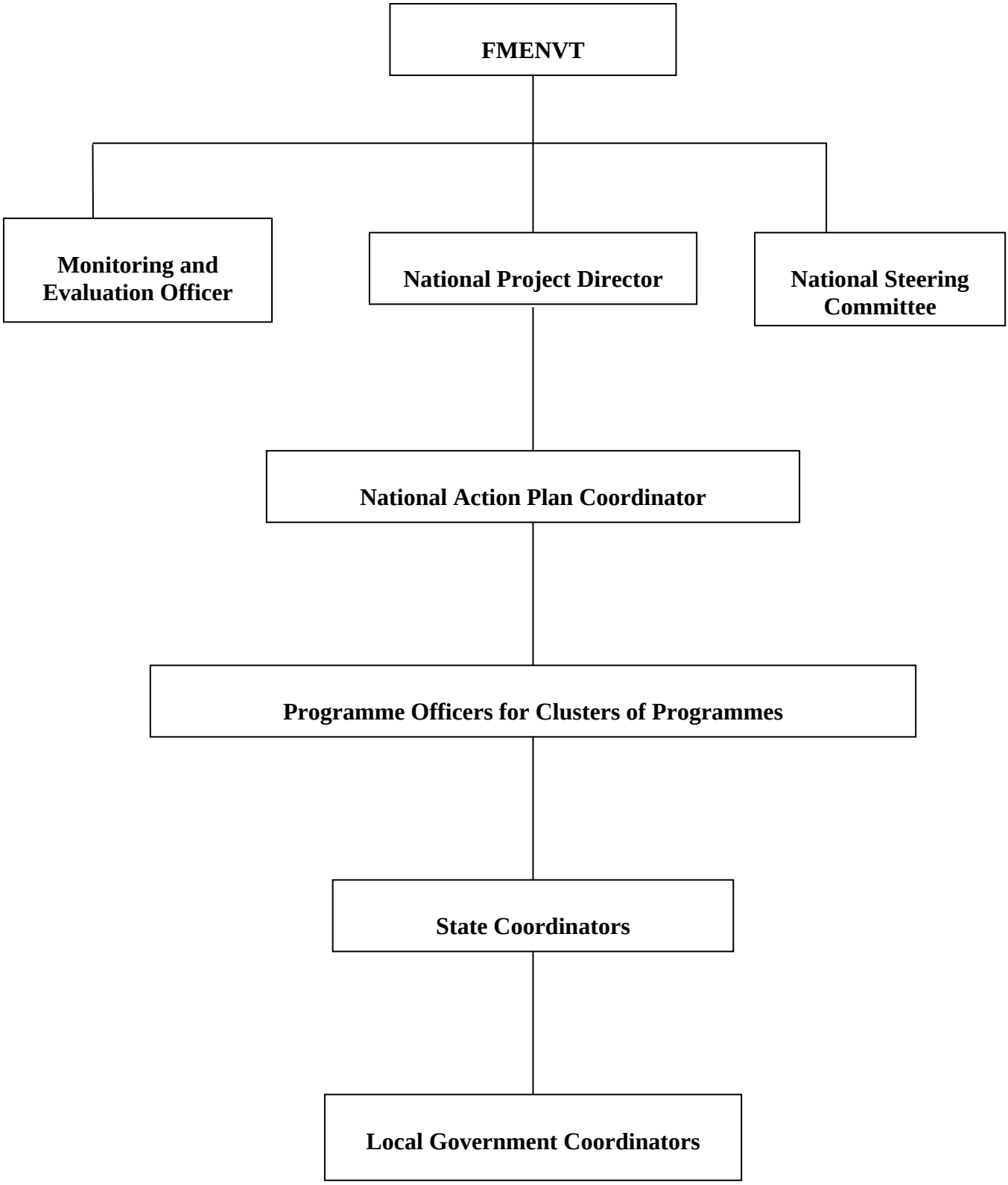


Figure 3.1
Proposed Organisational Framework and Coordination Mechanism of Nigeria's NIP Action Plan

3.2.3.7 Implementation principles of the NIP

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

(i) The public participation principle, which requires the involvement of the people in the development of plans and processes for the management of the environment. Accordingly, the various stakeholders shall be involved in the implementation of this Plan. Every person living in Nigeria have a stake and a duty to safeguard and enhance the environment and to inform the relevant authority of any activity and phenomenon that may affect the environment significantly;

The precautionary principle which requires that where there is risk of serious irreversible adverse effects occurring, a lack of scientific certainty should not prevent or impair the taking of precautionary measures to protect the environment;

The polluter pays principle, which requires that any person causing adverse effect on the environment shall be required to pay in full social and environmental costs of avoiding, mitigating, and or remediating those adverse effects. The right to a clean and healthy environment shall include right for access by any citizen to the various public elements or segments of the environment for recreational, educational, health, spiritual and cultural purposes; and

(ii) Access to environmental information, which enables citizens/residents to make informed personal choices and encourages improved performance by industry and Government, shall be promoted.

3.2.3.8 Priorities and conditionality

The following cross-cutting priorities have been identified during the Inventory Validation Workshop and the National Implementation Plan Training Workshop held in Abuja 22-27 January 2007 (See Tables 3.1 and 3.2); which form strong basis for the Action Plans on POPs and relevant Chemicals.

(i) Reviewing pollution control related policies and regulations for effective implementation of the Stockholm Convention and other related conventions and international processes on chemicals management;

(ii) Increasing institutional capacity of government departments/agencies and other institutions involved in implementation of the Rotterdam, Stockholm and other related Conventions and international processes on chemicals and wastes management;

(iii) Strengthening enforcement of relevant legislation;

(iv) Developing programmes and regulations on monitoring of POPs and relevant PIC chemicals;

(v) Strengthening the capacity of institutions responsible for POPs management

(vi) Developing mechanisms to promote proper management of stockpiles of POPs pesticides and DDT, wastes and contaminated sites; and

(vii) Establishing a coordination mechanism pertaining to PCDD/PCDF management.

3.2.3.9 **Conditionality**

This NIP implementation can only be achieved under the following conditions:

- Government fund, human resources and technical infrastructure are provided as elaborated in the action plan.
- International assistance is provided as elaborated in the NIP action plan

Table 3.1
Identified gaps, needs and issues from the Revalidation Workshop on POPs – January 2007

Gaps/Needs/Issues		Ranking	Timeframe
1.	Inventory of areas polluted with UPOPs	5	S
2.	Treatment and remediation of areas polluted with UPOPs	5	M, L
3.	Establishing of a national centre for POPs/toxicological centre	5	S
4.	Inventory of areas polluted with POPs pesticides	5	S
5.	Treatment of areas polluted with POPs pesticides	5	M, L
6.	Inventory of areas polluted with PCBs	5	S
7.	Treatment of areas polluted with PCBs	5	M, L
8.	Establishing databases on the results concluded on POPs and related research from universities and government institutions	5	M, L
9.	Using BAT/BEP/cleaner production options	4	M, L
10.	Setting of plans for the protection of public health from potential hazards of exposure to POPs	5	S
11.	Dissemination and elaboration of data and making access to such information available	5	S, M, L
12.	Amending legislations	5	S, M
13.	Setting up a national program on reduction of food pollution from POPs	4	M, L
14.	Disposal of obsolete pesticides	4	M
15.	Disposal of equipment polluted with PCBs	4	M, L
16.	Disposal of PCBs	4	S, M
17.	Initiating prevention procedures	4	S, M
18.	Sound environmental management of waste	5	S
19.	Stopping uncontrolled burning of biomass and process	5	M, L
20.	Designing a strategy for raising awareness	5	S
21.	Establishing a mechanism for information exchange	5	S
22.	Making information on POPs available to the public by various means	5	S, M, L
23.	Raising awareness of decision-makers concerning POPs	5	S, M, L
24.	Raising awareness of the public, especially of women and children, concerning POPs and their effects on health and environment	5	S, M, L
25.	Involvement of the public in combating POPs and their effects on public health and the environment	5	S, M, L
26.	Training of workers, scientists, women's organizations, staff and administrators on how to deal with POPs	5	S, M, L
27.	Exchange of educational and public awareness tools/materials related to POPs and their alternatives at national and state levels	5	S, M, L

Table 3.1 cont'd

Gaps/Needs/Issues	Ranking	Timeframe
28. Establishing registers of releasing and transporting POPs for the purpose of collecting and disseminating information on annual estimation of chemicals under the Convention that are released or disposed of	5	M, L
29. Encouraging research on POPs and their alternatives	5	S, M, L
30. Establishing a methodology for inventory processes of the sources generating POPs and analytical methods for measuring levels of releases	5	S
31. Making more data and information on POPs, their properties, accumulation and transfer in the environment available	5	S, M
32. Measuring POPs levels and their effects in soil, air, water, food, flora, fauna and humans	5	S, M
33. Legislative support	5	S, M, L
34. Setting mathematical models for measurements and analysis process	3	M, L
35. Applying quality settings for supervision and measurement	4	M, L
36. Establishing monitoring, following up and supervision networks	5	S, M
37. Checking current hazard of POPs on health	5	S, M, L
38. Providing technical support to build, develop and strengthen the country's capability to fulfil its obligations	5	M, L
39. Strengthening regional centres for capacity building and technology transfer	4	M, L
40. Synergy and exchange of information among relevant ministries	5	S
41. Facilitating access to enabling resources	5	S
42. Provision of a unifying policy on POPs and related chemicals management	5	S, M
43. Enhancing the performance of existing institutions dealing with hazardous substances	5	S
44. Risk assessment studies concerning POPs	5	S, M, L
45. Training of lawyers, media personnel, civil society, enforcement and regulatory officers	5	S, M, L
46. Enforcement of compliance and monitoring	5	S, M, L

N.B: S=short term (1-3 years); M=Medium (4-7 years); L=Long term= 8-12 years).

Table 3.2: National Priorities Ranking

	Short term (1- 3 years)	Medium term(4- 7 yrs)	Long term (8 – 12 years)
1	Inventory of areas polluted with POPs, PCBs, dioxin and furans	Treatment and remediation of areas polluted with POPs, PCBs, dioxin and furans	Treatment and remediation of areas polluted with POPs, PCBs, dioxin and furans
2	Establishing of National Centre for POPs/Toxicological Centre		
3	Using BAT/BEP/cleaner production options	Using BAT/BEP/cleaner production options	Using BAT/BEP/cleaner production options
4	Establishment of databases on findings concluded on POPs and related research from universities and government institutions	Establishing databases on findings concluded on POPs and related research from universities and government institutions	Establishing databases on findings concluded on POPs and related research from universities and government institutions
5	Drafting plans for the protection of public health from potential hazards of exposure to POPs		
6	Dissemination and elaboration of data and making access to such information available	Dissemination and elaboration of data and making access to such information available	Dissemination and elaboration of data and making access to such information available
7	Amending laws and legislations	Amending laws and legislations	
8		Setting up national program on reduction of food pollution from POPs	Setting up national program on reduction of food pollution from POPs
9	Disposal of obsolete pesticides, PCBs and equipment contaminated with PCBs	Disposal of obsolete pesticides, PCBs and equipment contaminated with PCBs	Disposal of obsolete pesticides, PCBs and equipment contaminated with PCBs
10	Sound environmental management of POPs waste	Sound environmental management of waste	Sound environmental management of waste
11	Setting a strategy for raising awareness and establishing a mechanism for information exchange		
12	Initiating prevention procedures		
13		Stopping uncontrolled burning of biomass in landfills	Stopping uncontrolled burning of biomass
14	Harmonization of relevant policies on chemicals management with cognizance for POPs	Harmonization of relevant policies on chemicals management with cognizance for POPs	

	Short term (1- 3 years)	Medium term(4- 7 yrs)	Long term (8 – 12 years)
15	Raising awareness of the public, decision makers, including vulnerable groups (women & children, etc.) concerning POPs and their effects on health and environment	Raising awareness of the public, decision makers, including vulnerable groups (women & children, etc.) concerning POPs and their effects on health and environment	Raising awareness of the public, decision makers, including vulnerable groups (women & children, etc.) concerning POPs and their effects on health and environment
16	Training of workers, lawyers, media personnel, civil society, enforcement and regulatory officers scientist, women's organizations, administrators, etc. on how to deal with POPs	Training of workers, lawyers, media personnel, civil society, enforcement and regulatory officers scientist, women's organizations, administrators, etc., on how to deal with POPs	Training of workers, lawyers, media personnel, civil society, enforcement and regulatory officers scientist, women's organizations, administrators, etc., on how to deal with POPs
17	Exchange of educational and public awareness tools/materials related to POPs and their alternatives at national, state and local government levels	Exchange of educational and public awareness tools/materials related to POPs and their alternatives at national, state and local government levels	Exchange of educational and public awareness tools/materials related to POPs and their alternatives at national, state and local government levels
18		Establishing registers of releasing and transporting POPs for the purpose of collecting and disseminating information on annual estimation of chemicals under the Convention that are released or disposed of	Establishing registers of releasing and transporting POPs for the purpose of collecting and disseminating information on annual estimation of chemicals under the Convention that are released or disposed of
19	Encouraging research on POPs and their alternatives	Encouraging research on POPs and their alternatives	Encouraging research on POPs and their alternatives
20	Establishing a methodology for inventory processes of the sources generating POPs and analytical methods for measuring levels of releases		
21	Synergy and exchange of information among relevant ministries, agencies and other stakeholders	Synergy and exchange of information among relevant ministries, agencies and other stakeholders	Synergy and exchange of information among relevant ministries, agencies and other stakeholders
22	Facilitating access to enabling resources		
23	Enforcement of compliance and monitoring, including follow-ups and supervision networks	Enforcement of compliance and monitoring, including follow-ups and supervision networks	Enforcement of compliance and monitoring, including follow-ups and supervision networks

	Short term (1- 3 years)	Medium term(4- 7 yrs)	Long term (8 – 12 years)
24		Applying quality settings for supervision and measurement including the use of mathematical models	Applying quality settings for supervision and measurement including the use of mathematical models
25	Assessment of hazards of POPs on human health and the environment	Assessment of hazards of POPs on human health and the environment	Assessment of hazards of POPs on human health and the environment
26		Providing technical support to build, develop and strengthen the country's capability to fulfil its obligations	Providing technical support to build, develop and strengthen the country's capability to fulfil its obligations
27		Strengthening regional Centres for capacity building and technology transfer	Strengthening regional Centres for capacity building and technology transfer

*Outcome of Priority Setting Workshop – 24th January 2007

NB: The serial numbers do not indicate order of ranking. The priorities are of equal importance.

3.3 Activities, Strategies and Time Frame

The following strategies, activities and time frame have been outlined with the view to actualising national efforts towards the fulfilment of Nigeria's obligations under the Stockholm Convention.

3.3.1 Activity: Institutional and regulatory strengthening measures

In view of human poisoning incidents, and ecological/human disaster episodes arising from the misuse and abuse of POPs in the past, the issue of sound chemicals including persistent organic pollutants (POPs) is of great concern in Nigeria. However, there is no comprehensive legislation for chemicals management in the country although piecemeal legislations exist that address chemicals issues but not in a coordinated manner. The Stockholm Convention on POPs mandates Parties to take certain measures to achieve the overall objectives of the Convention, which is to reduce or eliminate releases into environmental media from POPs. A successful implementation of the Stockholm Convention in the country requires the domestication of the provisions of the Convention in the national environmental laws relating to sound chemicals management, and the need to main stream POPs issues in the institutional and regulatory framework for chemicals management in the country.

The main objective is to protect human health and the environment from the harmful effects of POPs by reducing or eliminating releases from intentional and unintentional production and use. This Action Plan therefore aims at strengthening the existing institutional and regulatory framework in Nigeria. Table 3.3 provides elements of institutional and regulatory strengthening measures require for successful implementation of the NIP.

Table 3.3
Institutional and regulatory strengthening measures

Objectives	Activities	Key performance indicators	Time Frame	Implementers	Resources & Needs	Cost/US$	Sources of Funding
(1) To seek legislative support to harmonize existing legal/policy framework and regulations on chemicals including POPs	• Compile and update inventory of existing legal instruments that address the management of chemicals including POPs	Compiled and updated inventory	2years	FMEHUD, NESREA, FMS&T, NAFDAC, FMA&WR, FMH, FMJ, National Assembly, academia, lawyers, NGOs, CBOs	Finance, logistics, law experts, consultants	50,000	Government, multilateral & bilateral donors
	• Review relevant existing regulations in the management of chemicals/POPs to identify areas for modification and strengthening	Proposals for legislative and policy review					
	• Draft polices/regulations to prohibit/eliminate the production, use, importation and exportation of chemicals listed in Annexes A, B and C of the Convention	Draft regulation					
	• Codify all legislations related to chemicals and develop a chemicals management law	Draft chemicals code					
(2) rel ins POPs in a sound manner	Carry out needs assessment of evant institutions Prioritise needs of institutions • Determine resource needs for reforms and performance	Needs assessment conducted Modalities for upgrading capacity and capability of the institutions in place	6 months	FMEHUD, NESREA, FMS&T, NAFDAC, FMA&WR, FME	Finance, experts, consultants	10,000	Government, multilateral & bilateral donors

Table 3.3 continued

Table 3.3 continued

Objectives	Activities	Key performance indicators	Time Frame	Implementers	Resources & Needs	Cost/US$	Sources of Funding
(3) To sensitize relevant institutions on compliance and enforcement of regulations on POPs	• Organize sensitisation workshop for private sector, NGOs, CBOs, marketers of chemicals • Training for legislators, decision makers, managers and personnel responsible for POPS issues in 6 geopolitical zones	Workshops organised	6 months	FMEHUD, NESREA, FMS&T, NAFDAC, FMA&WR, FME, relevant stakeholders	Finance, logistiques, technical experts, consultants	50,000	Government, multilateral & bilateral donors
(4) To assist relevant institutions to implement compliance and enfoncement stratégies on POPs (i) POPs Pesticides (ii) PCB wastes disposal (iii) UPOPs inventory	• Prepare Memoranda of Understanding (MOUs) with relevant institutions at federal/states and assign them with specific responsibilities towards the implementation of the Convention	MOUs in place	2 years	FMEHUD, NESREA, police, customs, immigration, NIG Navy, NARICT, NABDA, relevant stakeholders	Finance, legal experts, consultants	150,600	Government, multilateral & bilateral donors
	• Form a Compliance and Enforcement Network	Compliance and Enforcement Network operational					
	• Build capacity of personnel from all relevant institutions, e.g., recruitment and training of staff	Well equipped institutions					
	• Develop monitoring plans of activities for relevant institutions	Operational monitoring plans					
(5) To harmonize the approach of the Stockholm Convention activities with the related chemical/waste	• Identify common issues and gaps between extant legislation and the Stockholm Convention		1 year	FMEHUD, NESREA, FMJ, National Assembly, relevant	Finance, legal experts, technical experts		

Objectives	Activities	Key performance indicators	Time Frame	Implementers	Resources & Needs	Cost/US$	Sources of Funding
	• Prepare draft comprehensive chemical law bill mainstreaming POPs	Draft of a comprehensive chemical law				50,200	Government, multilateral & bilateral donors
	• Passage of new chemical bill by legislature	New chemical law passed and enforced					
(6) To monitor compliance and enforce regulations on POPs	• Build capacity of regulatory agencies through training programmes	No of monitoring officers trained	1 year	FMEHUD, NESREA, Police, Customs	Finance, legal experts, technical experts	25,000	Government, multilateral & bilateral donors
	• Build capacity of enforcement officers and regulatory agencies	Enforcement and compliance					

Estimated cost requirement for Institutional and regulatory strengthening measures
$ 335,800

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

Nigeria does not produce POPs chemicals. Old stockpiles of POPs pesticides usually not well packaged are sources of POPs release. Importation of POPs chemicals into Nigeria has been banned since 1999 through an administrative circular which has no legal backing. The Federal Ministry of Health, Malaria Control Unit in Lagos claimed that aldrin, dieldrin, chlordane, DDT and endrin are POPs pesticides used for control of arthropods of medical and veterinary importance and their use was stopped in 2002. Although Nigeria does not intend to ask for an exemption, the Government continues to use DDT for malaria control on a need basis.

Nonetheless, there is not much illegitimate use of POPs pesticides. Illegal importation through clandestine means could be thriving in the informal sector though, but such activity is minimal as was observed during the inventory study. Old transformers with oils containing PCBs were imported in the past. Currently, PCB free oils or mineral oils are being imported into the country. Poor housekeeping entailing leaking transformers at PHCN stations, scrap yards or maintenance workshops/depots release POPs into the environment. It is therefore necessary put in place legal measures to ban and prohibit the illegal importation and use of POPs pesticides and to ensure safe management through appropriate disposal of old transformer oils containing PCBs. Nigeria conducted a National Profile on all Chemicals Management in 1997 and had a reviewed in 2005 as part of the preparatory activities for the implementation of the Stockholm Convention. The Action Plan presented below (Table 3.4) identifies legal, administrative and other measures to reduce or eliminate releases from intentional production and use of POPs.

Table 3.4: **Measures to reduce or eliminate releases from intentional production and use**

Objectives	Activities	Key performance indicators	Time Frame	Implementers	Resource / Needs	Cost/US$	Source of funding
(1) To reduce/eliminate releases from intentional production and use of POPs	(a) To update periodically inventories of Annex A and B chemicals imported and used	Database of Annex A & B Chemicals	5 years	FMEHUD, NESREA, NAFDAC, BCRC, NABDA, FMA&WR, FMST, relevant stakeholders	Financial assistance, technical assistance, experts	50,000	Government, multilateral/bi lateral donors
	(b) Analyse pattern of usage of Annex A and B chemicals	Use pattern of Annex A & B chemicals available					
	(c) Dispose of obsolete Annex A and B chemicals in environmentally sound manner	Report on disposal					
(2) T ban/prohibit import of Annex A & B chemicals (See section 3.3.1,	(a) Developing a regulatory framework	Prohibition regulation	2 years	FMEHUD, NESREA, NAFDAC, FMJ, relevant stakeholders,	Financial assistance, technical assistance, experts, consultants	240,000	Government,

Table 3.4 contiued

Objectives	Activities	Key performance indicators	Time Frame	Implementers	Resource / Needs	Cost/US$	Source of funding
	b) Strengthening controls on illegal entry of POPs at the Ports	Training of customs officers					
(3) Prevention of illegal use and handling of DDT	a) Public Information pamphlet on dangers of illegal use in major languages and pidgin English	Pamphlet produced and available in all LGAs and public places	3 years	FMEHUD, NESREA, FME, NAFDAC, FMH, FML&P, FMl&NO, UNIDO, WHO, UNEP, NGOs, THE MEDIA	Finance, technical assistance, experts, logistics		
	b) Intense Media Awareness Promotion	Public rejection of the use of DDT					
	Table 3.4 contd						
	shment of atch	DDT Phase out action network in place and functioning	1 year				
	tracking system for DDT importation and use	Tracking System for DDT in place				50,000	Government, multilateral/bi lateral donors

Table 3.4 contd

Objectives	Activities	Key performance indicators	Time Frame	Implementers	Resource / Needs	Cost/US$	Source of funding
	d) Search for alternatives to DDT	Well funded Research & Development activities on alternatives to DDT on going	3-12 years	FMEHUD, FMS&T, FMH, customs, research institutes, universities, UNIDO, UNEP, WHO	Finance, technical assistance, experts	80,000	Government, multilateral donors, Private sector
	e) Establish tracking system for DDT importation and use	Tracking System for DDT in place	1 year	FMEHUD, NESREA, FMH, NAFDAC, customs			
Estimated cost requirement for Measures to Reduce or Eliminate Releases from Intentional Production and Use						**$ 420,000**	

3.3.3 Activity: Production, import and export, use, stockpiles and wastes of Annex A POPs pesticides (Annex A, Part I chemicals)

The preliminary inventory of Annex A, Part I chemicals gave inconclusive qualitative and quantitative information on these compounds in Nigeria because of data gaps in the statistical records on production, import, export, and use of POPs pesticides in the country. Extant regulations are weakly enforced and there is also a weak mechanism for monitoring illegal imports. Because of lack of environmental and public health safety concerns associated with the past use of POPs pesticides, pockets of obsolete stocks of unspecified quantities of stockpiles and waste of Annex A, Part I chemicals were found in different geopolitical zones of the country. The inventory has not captured the true situation, which makes an update of the inventory inevitable. The gaps in the inventory could be addressed under the African Stockpile Programme.

Residue level data in Nigerian foods, wildlife, human blood and mothers' breast milk earlier reported in chapter 2 of this report (Table 2.3 to Table 2.9) are manifestations of human exposure to POPs pesticides (Annex A Part I chemicals) as a result of intense use in agriculture and vector disease control. Human poisoning by POPs pesticides is also prevalent in the country, especially in the rural areas, but there are no toxicological centres to offer medical support to such poisoning victims. The general population, especially the informal sector, is particularly exposed to POPs pesticides as a result of weak enforcement of regulations. The following action plan in Table 3.5 details the activities to be undertaken in respect of the production, import and export, use, stockpiles and wastes of Annex A part I chemicals.

Table 3.5: Production, import and export, use, stockpiles and wastes of POPs pesticides (Annex A, Part I chemicals)

Objectives	Activities	Key performance indicators	Time Frame	Implementers	Resources & Needs	Cost/US$	Source of funding
(1) To update inventories of production, import and export, use, stockpiles and wastes of Annex A part I chemicals (see 3.3.2, activity 1)	a) Carry out further inventories into the illegally imported, and use, stockpiles and wastes of Annex A part 1 chemicals b) Produce national GIS map of stockpiles and contaminated sites	Updated inventory report GIS map available	1 year	FMEHUD, NESREA, NAFDAC, ADPs, CBOs, NGOs, NACRS, NASDA, relevant stakeholders	Financial assistance, personal protective equipment, technical assistance, experts, consultants	240,000	Government, multilateral/bilateral donors
(2) Develop a data management system for Annex A part I chemicals	a) Archiving and data management system including modelling b) Training for personnel responsible for POPs issues, decision makers and managers on utilisation of database for decision making	Data base established ICT compliant knowledge based POPs decision makers and managers in place	1 year	FMEHUD, NAFDAC, customs, other relevant stakeholders	Computer hardware and software, accessories, training, experts, consultants	80,000	Government, multilateral/bilateral donors

Estimated cost requirement for Production, import and export, use, stockpiles and wastes of POPs pesticides (Annex A, Part I chemicals) $ 320,000

3.3.4 Activity: Production, import and export, use, identification, labelling, removal, storage and disposal of PCBs and equipment containing PCBs (Annex A, Part II chemicals)

PCB applications by location were found to include the PHCN electric power installations (including distribution networks), industrial facilities, residential and commercial buildings, etc. A comprehensive database on PCBs and/or PCB containing equipment is lacking in Nigeria. The database available to date is a recent one on transformers in the transmission sector (PHCN 2005), which indicates there are well over 278 transformers possibly with a good proportion containing PCB or are in use nationwide. Information is generally lacking whether the transformers contained oil with PCBs or are PCB free. PHCN staffs are oblivious of the hazard and high risk associated with use of oils containing PCBs. The inventory studies observed poor housekeeping around PHCN transformer stations as spillage of transformer oil from transformers in use, for repairs, or decommissioned was common, contaminating soil and threatening ground water quality. It is expected that technicians responsible for the servicing and maintenance of PCB containing transformers and capacitors are at risk from the adverse effects of PCB exposure. It is welcome news that the World Bank recently approved a grant of USD 250,000 to the FMEHUD for a comprehensive inventory of PCBs and PCBs containing equipment in the country, which would bridge the data gap in the NIP inventory concerning PHCN.

The NAFDAC database showed a steady increase in transformer oil import in the last five years. The import documents indicated that mineral oil rather than oil with PCBs was being imported. However the imports have not been screened for PCBs.

The activities proposed below in Table 3.6, define specific actions in respect of managing PCBs and PCB containing equipment in an environmentally sound manner with the goal of achieving a reduction and ultimate elimination of PCBs use, the prevention of releases of the chemicals into the environment, and to provide for environmentally sound disposal or final elimination of PCB wastes within the framework of the Stockholm Convention.

Table 3.6: Production, import and export, use, identification, labelling, removal, storage and disposal of PCBs and equipment containing PCBs (Annex A, Part II chemicals)

Objectives	Activities	Key performance indicators	Time Frame	Implementers	Resource / Needs	Cost/US $	Source of funding
(1) To carry out a detailed inventory on PCBs and equipment containing PCBs (Annex A, Part II Chemicals)	• Identify all source categories for PCBs within PHCN and industries, oil and gas, etc. to include transformers, capacitors and circuit breakers • Identify PCBs and PCB-containing equipment • Prepare an inventory of PCBs and PCB containing equipment • Identify PCB-contaminated sites	Inventory and labelling of PCBs and PCB containing equipment updated GIS map of PCBs Contaminated sites available	1 year	PHCN, FMEHUD, NESREA, FMS&T, relevant stakeholders	Financial Assistance, technical assistance, logistics, experts, consultants vehicles	200,000 25,400,000	Government, multilateral/ bilateral donors
(2) To analyse for PCBs in transformers and capacitors and other partially closed and open applications in Nigeria (see project proposal)	• Refurbish FMEHUD's National Reference Laboratory in Lagos and equip new BCRC Hazardous waste laboratory at University of Ibadan which already have analytical capacity and experience in PCB analysis • Training/re-training of staff in PCB analysis in transformer oil and environmental samples • Screen oils in old and new transformers for PCB levels as well as in new imported transformers oils	L2000DX equipment High resolution gas chromatograph mass spectrometer available	3 years	FMEHUD, BCRC, PHCN, NESREA, FMST, Universities and Research Institutes	Financial assistance, technical assistance, experts, consultants	300,000 38,100,000	Government, multilateral/ bilateral donors

Table 3.6 continued

Objectives	Activities	Key performance indicators	Time Frame	Implementers	Resource / Needs	Cost/US $	Source of funding
(3) To develop a database for PCBs and equipment containing PCBs (see 3.3.3 activity 2)	• Establish a database of results of inventory in (1) above • Training on the use of database for decision making	Database established ICT competent POPs officers and managers	2 years	FMEHUD, BCRC, PHCN, NESREA, FMST, Universities and Research Institutes	Computer hardware and software, financial assistance, technical assistance, experts, consultants	1,270,000	Government, multilateral/ bilateral donors
(4) To prohibit the import and use of PCBs and PCB containing equipment and materials (see 3.3.1 activity 1)	• Draft new regulations on imports, use, of PCBs and PCB containing equipment • Establish policies and guidelines/regulations for the management of PCBs and PCBs containing equipment and materials • Identify safer substitutes • Develop detailed phase-out programmes for organisations and institutions using of PCBs	Legislation passed Policies and guidelines in place Safer substitutes identified Phase-out programme developed	5 years	FMENV, FMJ, BCRC, PHCN, universities, NGOs, CBOs, NESREA, NABDA, NARICT, RIs, National Assembly	Financial assistance, legal experts, technical experts, consultants	25,000 50,000	Government, multilateral/ bilateral donors
(5) To promote measures to reduce exposure to human	• Place warning notices near equipment, especially where decommissioned ones are kept prior to disposal • Develop checklist for PCB equipment inspection • Regularly inspect PCB containing equipment	Warning signs and notices in place Checklist for equipment inspection developed Inspection programme developed	4 years	FMEHUD, FMJ, FMH, BCRC, PHCN, Universities, NGOs, CBOs, National Assembly, UNIDO, UNEP, WHO,	Financial assistance, technical assistance, logistics legal experts, technical experts, consultants		

Table 3.6 continued

Objectives	Activities	Key performance indicators	Time Frame	Implementers	Resource / Needs	Cost/US $	Source of funding
	• Install receptor tanks to replace concrete bunds	Receptor tanks built				250,000	Government, multilateral/ bilateral donors
	• Establish emergency plans for PCBs spillage and accidents	Emergency plans in place					
	• Organize training for personnel involved in handling of PCBs	Training programme organised					
	• Establish mechanism for reporting accidents to authorities	Mechanism for reporting accidents established					
	• Establish a Toxicological Centre	Toxicological Centre established and functioning					
	• Capacity building in all identified areas						
(6) To ensure safe management of PCBs and PCB containing equipment	• Develop guidelines on safe handling of PCBs	Guidelines on safe handling developed	10 years	FMEHUD, FMJ, BCRC, PHCN, Universities, NGOs, CBOs, UNIDO, UNEP, WHO.	Financial assistance	132,000	Government, multilateral/ bilateral donors
	• Develop guidelines for collection and transport of PCBs and PCB containing equipment	Guidelines for collection and transport of PCBs in place					
	• Establish permitting system for the collection and transport of PCBs and PCB containing equipment	Permitting system established			training, equipment technical expertise consultants		
	• Establish criteria for selection of the appropriate storage areas	Criteria developed				25,000	
	• Procedures to identify appropriate storage sites for PCBs and Equipment containing PCBs	Storage sites established					
	• Develop/upgrade infrastructure for safe storage	Infrastructure for storage upgraded					

Table 3.6 continued

Objectives	Activities	Key performance indicators	Time Frame	Implementers	Resource / Needs	Cost/US $	Source of funding
	• Establish system for proper labelling of stored items	Requisite labelling system in place					
(7) To identify and remove from use damaged equipment containing PCBs	• Establish appropriate procedures for the decommissioning of damaged equipment or that removed from use and its sound disposal • Clean equipment earmarked for decommissioning • Establish a collection system which ensures safe disposal of PCBs • Carry out safe disposal of Oils containing PCBs and equipment polluted with PCBs	Equipment decommissioned Disposal mechanism and facilities for safe disposal of PCB in place	10 years	FMEHUD, FMJ, BCRC, PHCN, universities, NGOs, CBOs	Financial assistance training equipment technical expertise consultants	150,000	Government, multilateral/ bilateral donors
(8) To build facilities for safe disposal of all PCB and PCB containing equipment	• Identify and finalize arrangements for the disposal of PCB and PCB containing equipment	Mechanism for disposal established	5 years	FMEHUD, FMJ, BCRC, PHCN, NESREA, NABDA universities, NGOs, CBO	Financial assistance training equipment Technical expertise Consultants	100,000	Government, multilateral/ bilateral donors
	• Package equipment for disposal	Procedures for packaging for disposal developed					
	• Identify appropriate technology for disposal of PCBs	Technology for disposal identified					
(9) To monitor and assess impact of PCBs in human and environmental media	• Develop programme for the monitoring of the entire PCB management processes.	Monitoring programmes in place	15 years	FMEHUD, NESREA, FMJ, BCRC, PHCN, Universities, RIs, FMST, FMH, NGOs, CBOs	Financial assistance training equipment technical expertise consultants	500,000	Government, multilateral/ bilateral donors
	• Establish a countrywide programme of monitoring exposure of PCBs in human fluids	Analysis programme established					
	• Monitor to ensure that PCB reduction is not causing adverse impacts on the industry	Industry feedback					

Objectives	Activities	Key performance indicators	Time Frame	Implementers	Resource / Needs	Cost/US $	Source of funding
	• Monitor the efficacy and safety of PCBs in areas where they continue to be used until their elimination and disposal	Monitoring programme in place					
	• Analysis of food, soil samples and water bodies for presence of PCBs	Analysis report					
	• Analysis of identified PCB contaminated sites	Analysis report					
(10) To capacit to han PCB containing equipment and waste	and prepare mes for institutional ening and capacity building • Involve relevant stakeholders in education and training	Capacity of institutions developed and strengthened	5 years	FMEHUD, NESREA, NABDA, NARICT, FMJ, BCRC, PHCN, universities, NGOs, CBOs	Financial assistance training equipment technical expertise consultants	200,000	Government, multilateral/ bilateral donors
(11) To raise awareness of the public on dangers of PCBs to human health and environment (see 3.3.13)	• Develop awareness creation strategy on environmental and health impact of PCBs	Development of awareness creation materials	5 years	FMEHUD, FMJ, BCRC, PHCN, universities, NGOs, CBOs	Financial assistance training equipment technical expertise consultants	50,000	Government, multilateral/ bilateral donors
	• Development of a website and information exchange networks on PCBs	Functional Website developed					
Estimated cost requirement for production, import and export, use, identification, labelling, removal, storage and disposal of PCBs and equipment containing PCBs (Annex A, Part II chemical						$ 66,752,000	

Table 3.6 continued

3.3.5 Activity: Production, import and export, use, stockpiles and wastes of DDT (Annex B chemicals)

See also 3.3.1 Activity 4 and 3.3.2.

DDT was used intensively in the past in Nigeria for agriculture and public health purpose but was banned along with other POPs chemicals in Nigeria in 1999. National data is lacking on DDT import, export and use in the country. Nonetheless it is still used on a needs basis by the Federal Ministries of Agriculture and Health. Table 3.7 below shows activities the country intends to adopt in the management of DDT.

3.3.6 Activity: Register for specific exemptions and the continuing need for exemptions (Article 4)

Article 4 of the Stockholm Convention requires the establishment of a POPs register for the purpose of identifying Parties that have specific exemptions listed in Annex A or B. All registrations of specific exemptions are subject to periodic review.

Nigeria will not file for exemption under the Stockholm Convention however; it shall undertake periodic assessment and evaluation of the POPs situation in the country and if for any reason, there is a need to file for a specific exemption, the appropriate action shall be taken as elaborated in Article 4 of the Stockholm Convention. The FMEHUD shall notify the Secretariats of the Stockholm Convention and WHO then of Nigerian's intention to use DDT. Government has to put in place measures to prevent DDT use as pesticide now and in future. This places responsibility on Federal Ministry of Health (FMH) to put in place restriction on the use, stock and empty containers of DDT.

Table 3.8 below provides activities that will be undertaken to keep and update such records at the country level should the need arise.

3.3.7 SAction Plan: Measures to reduce releases from unintentional production (Article 5)

The nexus between POPs in Annex C of the Convention (PCDD/PCDF), HCB and PCBs subject to the requirements of Article 5 of the Convention and adverse human health impact have not been appreciated in the country due to lack of in-country scientific research and empirical scientific data to support the link. Actually there are no epidemiological studies data to link releases of UPOPs with adverse health effects. Analytical capability for UPOPs analysis, in particular PCDD/PCDF, is lacking in Nigeria and in fact the African region. This NIP project has afforded Nigeria to carry out an inventory of UPOPs and the estimates of UPOPs release into environmental media for the first time and sensitise policy makers about areas of concern. Article 5 of the Convention prescribes measures that Parties must take to reduce the total releases derived from anthropogenic sources of each of the chemicals listed in Annex C. The inventory study identified uncontrolled burning of waste, power generation and heating, gas flaring, waste incineration and transport as the primary anthropogenic sources of release of UPOPs into the Nigerian environment. There is no legislation for the control of UPOPs releases in the country. Based on the precautionary principle Table 3.9 describes measures Nigeria's plans to take to reduce releases of UPOPs from unintentional production in line with Article 5 of the Convention.

Table 3.7: Production, import and export, use, stockpiles and wastes of DDT (Annex B chemicals)

Objectives	Activities	Key performance indicators	Time Frame	Implementers	Resource / Needs	Cost US $	Source of funding
(1) To update the inventory of production, import and export, use, stockpiles and wastes of Annex B chemicals	• Carry out further inventory into the production, import, and export, use, stockpiles and wastes of Annex B chemicals	Inventory report	2 years	FMEHUD, NAFDAC, FMH, FMA&WR, NESREA, NABDA, other relevant stakeholders	Finance, technical assistance laboratory equipment experts consultants	250,000	Government, multilateral/ bilateral donors
(2) Develop data management system for the Annex B chemicals	• Design an archiving and data management system	Data base established	2 years	FMEHUD, NPC, NAFDAC, NESREA, NABDA, NITDA, FMA&WR, other relevant stakeholders	Computer hardware and software financial assistance technical assistance experts consultants	20,000	Government, multilateral/ bilateral donors
	• Carry out training in database management	ICT competent staff available					
Estimated cost requirement for Production, import and export, use, stockpiles and wastes of DDT (Annex B chemicals)						$270,000	

Table 3.8: Register for specific exemptions and the continuing need for exemptions (Article 4)

Objectives	Activities	Performance indicators	Time Frame	Implementers	Resource & Needs	Cost/US$	Source of funding
To establish register on specific exemptions on POPs	(a) Organize stakeholders' consultation to establish criteria for selection of chemicals requiring exemptions under chemicals listed under Annex A or B	Stakeholder meetings held	Annually	FMEHUD, NESRA, NBOs (formerly FOS), FMA&WR, FML, FMST, FMCInd, SON, NAFDAC, FMH, PHCN, other relevant stakeholders	Financial assistance, technical assistance, computer, software and hardware, experts, consultants budgetary allocation	44,000	Government, multilateral/ bilateral donors
	(b) Develop criteria and procedures for identification and selection of candidate chemicals	Criteria for selection developed					
	(c) Develop protocols for the notification of convention secretariat on specific exemptions required	Notification reports submitted					
	(d) Establish registration centre(s) to register chemicals proposed for exemptions	Modalities for the operations of the centre established					
	(e) Review periodically to assess the need for continued exemptions	Review reports					
	(f) Build capacity to enable proper execution of the foregoing activities	Seminars, meetings held					

Estimated cost requirement for Register for specific exemptions and the continuing need for exemptions (Article 4) $
44,000

Table 3.9: Measures to reduce releases from unintentional production (Article 5)

Objectives	Activities	Performance indicators	Time Frame	Implementers	Resources & Needs	Cost/US$	Source of funding
(1) To update sources on existing inventories of unintentional production of PCDD/F, HCB and PCBs and releases	▪ Review of preliminary inventory data ▪ Incorporate new source categories as appropriate ▪ Collect and collate data from identified source categories	Inventory updated	2 years	FMENVT, NESREA, FMID, MAN, other stakeholders', Task Teams	Financial assistance, UNEP tool kit	,000	Government, multilateral/bilateral donors
(2) To develop data management systems for unintentional production of PCDD/F, HCB and PCBs and release	▪ Develop a database ▪ Archiving and data management	Database developed	2 years	FMENVT, NESREA, UNIDO, FOS, NPC, State governments consultants, other stakeholders'	Training	10,000	Government, multilateral/bilateral donors
(3) To establish an appropriate policy and legislation for effective regulation and enforcement of prevention of unintentional production of PCDD/F, HCB and PCBs	▪ Draft new regulations ▪ Prepare memoranda of understanding (MOUs) with industry groups on phasing out equipment and machinery, which are sources of releases	Regulations in place Modalities for MOUs established	3 years	FMENVT, NESREA FMJ, FMS&T, MAN, NACCIMA, National assembly. NGOs, CBOs, other relevant stakeholders,	Financial assistance technical assistance legal expert technical expert technology transfer:	150,000 100,000	Government, multilateral/bilateral donors

Objectives	Activities	Performance indicators	Time Frame	Implementers	Resources & Needs	Cost/US$	Source of funding
	▪ Introduce substitute technologies or modify materials and processes to prevent formation and releases	Investigations into finding substitutes initiated					
	▪ Institute a chemical and materials policy, which aims to reduce/eliminate PCDD/F, HCB and PCBs	Policy determined					
	▪ Integrate industry commitment into existing EPA permitting system	Permitting system integrated					
	▪ Education and awareness of stakeholders on legal issues	Workshops/seminars					
(4) To phase out activities using chemicals containing chlorine that are sources of unintentional releases of PCDD/F, HCB and PCBs	▪ Identify activities using chemicals containing chlorine (e.g., PVC production, chlorine in water treatment, pesticides)	Chlorine based activities identified	10 years	FMEHUD, NESREA FMJ, FMS&T, MAN, NACCIMA, National assembly. NGOs, CBOs, other relevant	Technology transfer finance assistance logistics	100,000	Government, multilateral/bilateral donors
	▪ Develop phase-out programmes for identified sources	Phase-out programmes in place					

Objectives	Activities	Performance indicators	Time Frame	Implementers	Resources & Needs	Cost/US$	Source of funding
	▪ Identify and promote feasible and affordable alternatives to activities, which are chlorine based, and sources of releases	Suitable alternatives entified					

Objectives	Activities	Performance indicators	Time Frame	Implementers	Resources & Needs	Cost/US$	Source of funding
(5) To reduce/eliminate release into the environment of PCDD/F, HCB and PCBs from uncontrolled burning activities, including waste burning and accidental fires	▪ Review and develop by-laws, guidelines and procedures for uncontrolled burning activities ▪ Intensify on-going educational and awareness programmes on effects of uncontrolled burning activities ▪ Develop alternative methods of bush clearing instead of burning ▪ Promote other income generating activities for the youth engaged in bush burning for games ▪ Enforce ban on bush and waste burning at dumpsite fires ▪ Establish a mechanism for the prevention and early detection of dumpsite fires ▪ Construct well-designed waste incinerators, e.g., waste to energy plants ▪ Sensitize waste management operators on the environmental impacts of waste burning and burning in general	By-laws and guidelines on waste burning reviewed/developed Awareness created Alternative methods for bush clearing identified Income generating activities developed Laws on bush and waste burning enforced Proper waste dumps developed Incinerators constructed and operational Workshops/training for waste managers Educational materials developed Composting plants reactivated and landfill sites operating Policy to ban chlorine containing	4 years	FMEHUD, NESREA, FMJ, FMA, SEPAs, Waste Management Authorities FMS&T, MAN, NACCIMA, National Assembly. NGOs, CBO, other relevant stakeholder, UNEP, UNIDO	Financial assistance, technical assistance, technical expertise, logistics technology	250,000	Government, multilateral/ bilateral donors

Table 3.9 continued

Objectives	Activities	Performance indicators	Time Frame	Implementers	Resources & Needs	Cost/US$	Source of funding
	▪ Develop educational material on the health and environmental effects of burning of materials suspected to be emission sources ▪ Placing jingles on TV, radio, doing TV programmes ▪ Expand on-going landfill site development and composting plants ▪ Implement a policy to ban burning of products containing chlorine or processed with chlorine, such as chlorinated chemicals, polyvinyl chloride plastic and chlorine bleached paper ▪ Domesticate Stockholm Convention ▪ Integrate Stockholm Convention obligations into existing by-laws of states ▪ Strengthen institutions to implement cleaner technologies ▪ Develop guidelines, policy and regulations on medical waste management ▪ Develop institutional and human resource capacities to implement national medical waste management guidelines	Convention obligation integrated into existing by laws Institutional capacity enhanced for cleaner technologies Efficient waste management systems established at all health centres			Transfer: north-south or south-south cooperation	150,000 50,000	Government, multilateral donors, private sectors

Table 3.9 continued

Objectives	Activities	Performance indicators	Time Frame	Implementers	Resources & Needs	Cost/US$	Source of funding
(6) To eliminate or reduce releases of PCDD/F, HCB and PCBs from incineration of medical waste	▪ Develop appropriate modern technology for pollution control, for final disposal of medical waste (autoclave, etc). ▪ Construct modern incinerators with designs to improve combustion of medical waste ▪ Integrate international emission discharge limits of PCDD/F, HCB and PCBs to air into national standards ▪ Develop institutional and human resource capacities to implement national medical waste management guidelines	Medical waste incinerators built and operational Modalities for integration established Workshops/training	5 years	FMEHUD, NESREA FMJ, FMS&T, MAN, NACCIMA, National assembly. NGOs, CBOs, other relevant stakeholders	Financial assistance, technical assistance	22,000	Government, Private Investors, Multilateral/bilateral donors
(7) To promote the use of alternative methods of household fuel for cooking	▪ Promote use of gas-fired stoves, solar systems and ovens ▪ Establish alternative energy use demonstration centres	Policy on LPG reviewed Demonstration centres established	5 years	FMEHUD, NESREA FMJ, FMS&T, MAN, NACCIMA, National assembly	Financial assistance technical assistance technology transfer:	25,000	Government, Private Investors, Multilateral/bilateral donors

Table 3.9 continued

Objectives	Activities	Performance indicators	Time Frame	Implementers	Resources & Needs	Cost/US$	Source of funding
	▪ Sensitize the public on the environmental and health impacts of burning wood fuels and benefits that accrue from energy efficiency initiatives	Awareness created					
	▪ Research into use of alternative energy sources in households	Alternatives energy sources available					
(8) To reduce or eliminate releases of PCDD/F, PCBs and HCB from the transport sector	▪ Support implementation of leaded fuel phase-out programme	Training workshops organized to implement leaded fuel phase-out programme	5 years	UNEP, UNIDO Research Institute, BCRC-University Linkages FMEHUD, NESREA FMJ, FMS&T, MAN, NACCIMA, National Assembly. NGOs, CBOs, other relevant stakeholders	Financial assistance technical assistance technology transfer: north-south or south-south cooperation	200,000	Government, Private Investors, Multilateral/bilateral donors
	▪ Sensitize motorists on the need for the adoption of fuel efficiency initiatives	Sensitisation workshops carried out					
	▪ Encourage reliance on mass transportation system to reduce fuel consumption	Compliance and enforcement network established					
	▪ Develop vehicle emission regulations and standards	Emission regulations standards developed					

Objectives	Activities	Performance indicators	Time Frame	Implementers	Resources & Needs	Cost/US$	Source of funding
	▪ Enforce permitting conditions for fuel service centres	Compliance and enforcement network monitoring					
(9) To promote the adoption of best practice in foundry processes to reduce/eliminate emissions	▪ Develop best practice guidelines on the selection of scrap metal for processing for small-scale foundry set-ups ▪ Develop and integrate discharge limits for secondary metal processing into draft regulations on emissions ▪ Integrate control of chlorine content in waste discharge by industry into permitting system	Workshops to develop guidelines on best practice Discharge limits developed Permitting system reviewed and updated to include discharge limits of chlorine content in waste	5 years	FMEHUD, NESREA FMJ, FMS&T, MAN, NACCIMA,. NGOs, CBOs, other relevant stakeholders UNEP, UNIDO, FMM&SD	Financial assistance technical assistance technology transfer: north-south or south-south cooperation	100,000	Government, Multilateral/bilateral donors
(10) To create awareness on the health and environmental effects of release from PCDD/F, HCB and PCBs	▪ Sensitize industry and relevant stakeholders on the generation elimination/reduction of PCDD/F, HCB and PCBs through seminars, workshops and training programmes	Workshop and seminars organised	5 years	FMEHUD, NESREA FMJ, FMS&T, MAN, NACCIMA, National Assembly. NGOs	Technical and financial supports	50,000	Government, Multilateral/bilateral donors

Objectives	Activities	Performance indicators	Time Frame	Implementers	Resources & Needs	Cost/US$	Source of funding
	▪ Sensitize the general public on the health effect of PCDD/F, HCB and PCBs through radio and television discussions and advertisements	TV and radio discussions held					
	▪ Develop educational/awareness materials on the health and environmental effects of PCDD/F, HCB and PCBs	Education materials developed					
	▪ Develop a comprehensive database on PCDD/F, HCB and PCBs	Database on PCDD/F, HCB and PCBs					
(11) To monitor the release of PCDD/F, HCB and PCBs	▪ Monitor conditions, types and sources of generation of PCDD/F, HCB and PCBs	Functional laboratories in place for monitoring	10 years	FMEHUD, NESREA FMJ, FMS&T, MAN, NACCIMA, NGOs, CBOs, other relevant stakeholders	Technical and financial supports	250,000	Government, Multilateral/bilateral donors
	▪ Sample and analyse human tissue/organs and foods samples	Sampling programme established					
	▪ Continuous study of conditions and processes generating the emissions	Study initiated					

Objectives	Activities	Performance indicators	Time Frame	Implementers	Resources & Needs	Cost/US$	Source of funding
	▪ Integrate information/results into database management system	Database in place					

Estimated cost requirement for Measures to reduce releases from unintentional production (Article 5)
1,507,000.00

3.3.8 **Activity: Measures to reduce releases from stockpiles and wastes (Article 6)**

Stockpiles and waste constitute anthropogenic sources of continual releases of toxic pollutants (POPs) into the environment with potential and real threat to human health and the environment.

Appropriate measures and plans are therefore necessary to ensure the environmentally sound management of toxic releases from these sources as provided in Table 3.10 below:

Table 3.10: Measures to reduce releases from stockpiles and wastes (Article 6) risk based assessment

Objectives	Activities	Performance indicators	Time Frame	Implementers	Resources & Needs	Cost/US$	Source of funding
(1) To identify sites and assess potential for releases from stockpiles and waste	▪ Identify sites where chemicals have been stockpiled or waste dumped ▪ Quantitative inventory of the potential for releases from stockpiles and waste into environmental media	Sites identified A criteria for assessment of releases established	1 year	FMEHUD, NESREA FMJ, FMS&T, BCRC, UNEP, UNIDO, NGOs, CBOs	Financial assistance technical assistance logistics analytical capability technology transfer risk based assessment	400,000	Government, multilateral & bilateral donors
(2) To assess mode and determined level of releases from stockpiles and waste	▪ Develop methods for estimating the potential for releases ▪ Sample soil, water, human tissues and fluids, tissue of fauna and flora from selected sites to determine residues and presence of Annex A, B and C chemicals ▪ Review of health records of populations exposed to waste and stockpiles of Annex A, B and C chemicals	Methods for estimating potential for releases developed Develop selection criteria and laboratory analysis carried out Health records of exposed populations collated and analysed	3 years	FMEHUD, NESREA FMJ, FMS&T, BCRC, UNEP, UNIDO, NGOs, CBOs other relevant stakeholders	Financial assistance technical assistance logistics analytical capability technology transfer risk based assessment	100,000	Government, multilateral & bilateral donors

Objectives	Activities	Performance indicators	Time Frame	Implementers	Resources & Needs	Cost/US$	Source of funding
	▪ Assess conditions and procedures for storage of stockpiles and waste of Annex A, B and C chemicals	Assessment for storage of stockpiles and waste established					
(3) To prevent the releases from waste and stockpiles of Annex A, B and C chemicals in order to safeguard human health and environment	▪ Secure and label sites having stockpiles and waste of Annex A, B and C chemicals to prevent releases from spreading	Sites identified and secured	10 years	FMEHUD, NESREA FMJ, FMS&T, MAN, NACCIMA, National Assembly., NGOs, CBOs FMCInf, other relevant stakeholders, UNEP, UNIDO		25,000	Government, multilateral & bilateral donors
	▪ Identify potential remediation technologies available	Best remediation measures identified				45,000	
	▪ Train and upgrade skills of personnel in the application of identified remedial measures and safe handling	Training programme developed				650,000 350,000	
	▪ Establish regulations and guidelines for reporting of leakages or spillages and clean-up of contaminated sites	Guidelines and regulations available					
	▪ Monitor surface and ground water	Monitoring programme in place				280,000	
	▪ Establish a programme for continued education and training in clean-up in areas contaminated by waste and stockpiles.	Education programme developed				120,000	

Objectives	Activities	Performance indicators	Time Frame	Implementers	Resources & Needs	Cost/US$	Source of funding
	▪ Develop procedures on inspections and maintenance of stockpiles and waste	Procedures on inspections and maintenance of stockpiles and waste developed				30,000	
(4) To make information accessible to the public	▪ Organise a public awareness programme to disseminate information	Workshops, seminar, radio and TV programmes organised	5 years	FMEHUD, NESREA, FMS&T, FMC&Inf, BCRC, UNEP, UNIDO, NGOs, CBOs, FMCInf, other relevant stakeholders	Financial assistance technical assistance logistics analytical capability technology transfer	40,000	
	▪ Establish collection points or schemes to encourage voluntary return of damaged or out of use equipment	Collection points/schemes established				15,000	
	▪ Prepare information and awareness education materials	Awareness creation materials available				10,000	Government, multilateral & bilateral donors
Estimated cost requirement for Measures to reduce releases from stockpiles and wastes (Article 6) risk based assessment							$2,065,000

3.3.9 Strategy: Identification of stockpiles, articles in use and wastes

The information obtained from the preliminary inventory of POPs stockpiles, articles in use and waste was inadequate to make meaningful conclusions and the right decisions. For an accurate assessment of these stockpiles, waste and articles in use to be done, it is necessary for these products to be properly identified and characterized by completing the database on hot spots, old loads and contaminated sites. The identification of stockpiles, articles in use and wastes are elaborated in sections 3.3.3, 3.3.4 and 3.3.5 while Table 3.11 shows the action plan that has to be taken to achieve the intended objective.

3.3.10 Activity: Managing stockpiles and appropriate measures for handling and disposal of articles in use

Safe, efficient and environmentally sound management of stockpiles as well as proper handling and disposal of articles in use, which contain POPs, are paramount for the achievement of the country's obligations under the Stockholm Convention (Article 6). Appropriate measures are required in order to achieve such goals, which include the activities indicated in Table 3. 12.

3.3.11 Strategy: Identification of contaminated sites (Annex A, B and C chemicals) and remediation in an environmentally sound manner

Article 6 of the Stockholm Convention requires that Parties develop appropriate strategies for the identification of sites contaminated with chemicals listed in Annex A, B or C and remediation of such sites be carried out in an environmentally sound manner. Nigeria's strategy is as outlined below in Table 3.13.

Table 3.11: Identification of stockpiles, articles in use and wastes

Objective	Activities	Performance indicators	Time frame	Implementers	Resource /Needs	Cost/US$	Source of funding
(1) To identify POPs stockpiles	▪ Identify sources of information and stocks of POPs stockpiles	POPs stockpiles identified and compiled	6 months	FMEHUD, NESREA, FMA&WR, ADPs, BCRC, other relevant stakeholders	Finance technical assistance logistics technical experts	40,000	Government, multilateral & bilateral donors
	▪ Design a questionnaire to collect information and quantify stocks of stockpiles	Survey to collect information carried out					
	▪ Training workshop for information collection	Workshop on data collection carried out					
	▪ Workshops on the collation of data on stockpiles	Workshop on data collection organised					
(2) To identify POPs articles in use (see 3.3.4)	▪ Identify sources of information and stocks of POPs articles in use in Nigeria	POP articles in use identified and compiled	6 months	FMEHUD, NESREA, FMA&WR, ADPs, BCRC, other relevant stakeholders	Finance technical assistance logistics technical experts	10,000	Government, multilateral & bilateral donors
	▪ Design a questionnaire to collect information and quantify stocks of articles in use and collect information	Survey to collect information carried out					
	▪ Organise workshops on the collation of data	Workshop organised					
(3) To identify POPs waste	▪ Identify sources of information and stocks of POPs waste	POP waste identified and compiled	6 months	FMEHUD, NESREA, FMA&WR, ADPs, BCRC, other relevant stakeholders	Finance technical assistance logistics technical experts	25,000	Government, multilateral & bilateral donors
	▪ Design a questionnaire to collect information and quantify stocks of waste and collect information	Survey to collect information carried out					
	▪ Organise workshops on the collation of data	Workshop organised					
Estimated cost requirement for Identification of stockpiles, articles in use and wastes							**$75,000**

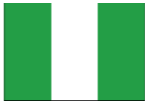


Table 3.12: Measures to manage stockpiles and appropriate measures for handling and disposal of articles in use

Objectives	Activities	Performance indicators	Time Frame	Implementers	Resources & Needs	Cost US$	Sources of funding
(1) To manage stockpiles in a safe and environmentally sound manner (see 3.3.3. and 3.3.4)	• Develop guideline for environmentally sound, safe and secure facility for interim storage of stockpiles • Identify appropriate storage facilities for interim storage of stockpiles	Guideline developed Safe and secure storage facilities identified	2 years	FMEHUD, NESREA, FMA&WR, ADPs, BCRC, UEP, UNIDO, PHCN, State government, other relevant stakeholders EPA	Financial assistance technical assistance technical experts	25,000	Government, multilateral & bilateral donors
(2) To develop measures for safe handling and sound disposal of articles in use	• Upgrade existing information for safe management of stockpiles • Develop manuals for safe handling and disposal • Develop guidelines for the transport of articles in use to safe locations	Updated document Manuals for safe handling and disposal developed Guidelines on transport developed	5 years	FMEHUD, NESREA, PHCN, State Governments, MOFA, DA, FMH, ECG, VRA	Financial assistance, technical expertise consultants	50,000	Government, multilateral & bilateral donors
Estimated cost requirement for Measures to manage stockpiles and appropriate measures for handling and disposal of articles in use $75,000							

Table 3.13
Identification of contaminated sites and remediation in an environmentally sound manner

Table 3.13 contd.

Objectives	Activities	Performance indicators	Time Frame	Implementers	Resource /Needs	Cost US$	Sources of funding
(1) To identify sites contaminated with annex A, B and C chemicals	▪ Carry out further investigations to identify contaminated sites ▪ Risk based assessment of sites	Procedures for investigations developed	5 years	EHUD, UNIDO, EP, FMA&WR, Ps, BCRC, Task am, NESREA, er relevant keholders	Financial assistance technical assistance technology transfer logistics	1,650,000	Government, multilateral & bilateral donors
(2) To institute remediation measures for identified contaminated sites	▪ Secure and label sites	Clearly identified and isolated contaminated sites	10 years	FMEHUD, NESREA ,FMA&WR, ADPs, BCRC, Task Team, , other relevant stakeholders	Financial assistance technical assistance technology transfer logistics	250,000	Government, multilateral & bilateral donors
	▪ Identify potential remediation technologies available	Selection of available environmentally sound remediation methods				650,000	Government, multilateral & bilateral donors
	▪ Establish regulations and guidelines for clean-up of contaminated sites	Draft regulations and guidelines on lean up procedures				120,000	Government, multilateral & bilateral donors
	▪ Train and upgrade skills of personnel in the application of identified remedial measures ▪ Liability issues	Training programmes in place				350,000	Government, multilateral & bilateral donors

Estimated cost requirement for Identification of contaminated sites and remediation in an environmentally sound manner $3,020,000.00

3.3.12 Activity: Facilitating or undertaking information exchange and stakeholder involvement

Article 9 of the Convention requests each Party to facilitate or undertake the exchange of information relevant to reduction or elimination of POPs and alternatives to POPs including information relating to their risks as well as to their economic and social costs. In mobilising all stakeholders to be integrated into all the processes and actions for POPs phase-out, information exchange is very vital. Table 3.14 provides actions planned at facilitating information exchange on POPs in the country.

3.3.13 Activity: Public awareness, information and education (Article 10)

Successful implementation of the Stockholm Convention on POPs in Nigeria will only be achieved when the general population is sensitised on the nature of POPs and their effects on human health and the environment and gets committed to the achievement of the objectives. It is therefore important for action to be directed at promoting the continuous and detailed public awareness, information and training programmes on POPs. Such programmes will be targeted at the policy and decision makers as well as the general public. Various stakeholders in the POPs management will be trained and equipped to play their respective roles. The activities of the National POPs Centre, educational institutions at all levels, NGOs and CBOs will be significant in this strategy. Table 3.15 indicates the activities that will be vigorously pursued in the attainment of the said objectives.

Table 3.14: Facilitating or undertaking information exchange and stakeholder involvement

Objectives	Activities	Performance indicators	Time Frame	Implementers & Collaborators	Needs	Cost/US$	Sources of funding
(1) To establish a national focal point for the exchange of information	▪ Designate national focal point for information exchange	National focal point established	1 year	FMEHUD, NAFDAC, NESREA, FMA&WR, NGOs, CBOs, FMI&NO, PHCN, State government, other relevant stakeholders	Financial assistance, technical assistance,	255,000	Government, multilateral & bilateral donors
	▪ Identify appropriate information required for information exchange	Required information identified					
	▪ Recruit professional and auxiliary staff, e.g., data analysts, information technologists, public relations officers, etc.	List of recruited professionals available					
	▪ Purchase and install equipment, e.g., communication gadgets, computers	Communication Equipment installed					
	▪ Subscribe to Internet websites with links to sources listed in the national inventory, etc.	Subscriptions effected					
	▪ Develop an Internet website	Website developed					
(2) To equip staff with relevant skills	▪ Train staff at focal point with relevant skills	Trained staff at national focal point Training workshop reports available	18 months	FMEHUD, NAFDAC, NESREA, FMA&WR, NGOs, CBOs, FMI&NO, other relevant stakeholders	Financial assistance technical assistance, experts consultants	100,000	Government, multilateral & bilateral donors

Table 3.14 continued

Objectives	Activities	Performance indicators	Time Frame	Implementers & Collaborators	Needs	Cost/US$	Sources of funding
(3) To strengthen the national capacity to collect and use multisectoral information	▪ Identify the resource persons	Resource persons identified	1 year	FMEHUD, NESREA, FMA&WR, NGOs, CBOs, FMI&NO, PHCN, State, media, other relevant stakeholders	Financial assistance technical assistance, experts consultants	150,000	Government, multilateral & bilateral donors
	▪ Carry out a needs assessment	Needs assessment report				35,000	Government, multilateral & bilateral donors
	▪ Develop training materials and programmes	Training materials developed				10,000	Government, multilateral & bilateral donors
	▪ Carry out training	Training organised					
(4) To Secure stakeholders commitment	▪ Identify relevant stakeholder institutions/partners ▪ Communicate with identified stakeholders ▪ Obtain feedback from stakeholders ▪ Involves stakeholders in programmes ▪ Establish a stakeholder consultative forum	Communication equipment installed Communication via Internet Regular publication of POPs data	2 years	FMENV, NAFDAC, NESREA, FMA&WR, NGOs, CBOs, FMI&NO, PHCN, State government, other relevant stakeholders.	Financial assistance technical assistance, experts consultants	45,000	Government, multilateral & bilateral donors
Estimated cost requirement for Facilitating or undertaking information exchange and stakeholder involvement						**$**595,000	

Table 3.15: Public awareness, information and education (Article 10)

Objectives	Activities	Performance indicator	Time frame	Implementers	Resource Needs/	Cost/US$	Sources of funding
(1) To develop and produce public awareness programme on POPs	▪ Develop and produce awareness raising materials, e.g., brochures, flyers, posters, newsletters etc on POPs	Awareness raising materials developed and produced	2 years	Federal Ministry of Information (National Orientation Agency (NGOs), Community Based Organisations (CBOs) and Faith Based Organisation (FBO) and Civil Societies and FMENV, NAFDAC, NESREA, FMA and WR, PHCN State government and other relevant stakeholders,	Financial assistance equipment: vehicles, digital cameras, recorders, Ict projector, etc.	35,000	Government, multilateral & bilateral donors
	▪ Translate these materials into local languages	Awareness raising materials in local languages produced					
	▪ Develop radio and TV education programmes, e.g., prepare synopsis, write scripts for local drama, etc. to cater for the needs of women, children and the non-formal society	Radio and TV programmes produced					
	▪ Place articles for publication in both private and state-owned newspapers	Feature articles published in newspapers					
(2) To create awareness among policy and decision makers/traditional authorities on POPs	▪ Identify relevant decision and policy makers/traditional authorities	List of identified relevant policy/decision makers/traditional authorities	1 year	FMEHUD, NESREA, NAFDAC, FMA&WR, FMI&NO, other relevant stakeholders	Financial assistance technical assistance training materials	42,000	Government, multilateral & bilateral donors
	▪ Organise workshops/seminars to sensitise identified groups	Workshops/seminars organized					
(3) To implement public education programmes	▪ Provide the Information Services Department and the media houses with information materials	Information on POPs for ISD	5 years	FMEHUD, NESREA, NAFDAC, FMA&WR,	Financial assistance technical assistance,		

Table 3.15 continued

Objectives	Activities	Performance indicator	Time frame	Implementers	Resource Needs/	Cost/US$	Sources of funding
	▪ Identify resource persons to carry out public education, e.g., representatives of various organisations and institutions, public interest groups, NGOs, media, traditional authorities, Municipal and District Assemblies	List of resource persons					
	▪ Training of media professional and journalists on POPs warder to propagate the impacts of POPs without a sole objective of gaining commitment of all stakeholder to eliminating POPs						
	▪ Train identified resource persons	Workshops organised for resource persons				10,000	Government, multilateral & bilateral donors
	▪ Collaborate with MOE/GES to integrate POPs management in the environmental education syllabus of basic and secondary schools	Suggested syllabus on POPs in place					
	▪ Design programme with electronic and print media houses to discuss/publish POPs related issues	Allocated airtime and space					
(4) To promote public awareness in addressing effects of POPs on human health and environment	▪ Promote benefits of use of alternatives to POPs	Promotion programmes organised	5 years	FMENV, media, NGOs, CBOs, relevant stakeholders	Financial assistance technical expertise logistics	18,000	Government, multilateral & bilateral donors
	▪ Organise programmes on POPs such as radio competitions, quizzes for schools, radio and TV phone-in programmes	Programmes on POPs organised					

Objectives	Activities	Performance indicator	Time frame	Implementers	Resource Needs/	Cost/US$	Sources of funding
(5) To compile and collate information on POPs in Nigeria (see 3.3.12)	▪ Establish Information Centres ▪ Develop mechanisms for the collection of information on chemicals listed in Annexes A, B and C	Assessment of needs of information centre Mechanisms developed	2 years	FMEHUD, media, NGOs, CBOs, relevant stakeholders	Financial assistance technical expertise logistics	35,000	Government, multilateral & bilateral donors
(6) To promote and facilitate information dissemination	▪ Develop websites, and newsletters ▪ Promote the dissemination of information on POP's to ministries, department and agencies (MDAs)	Websites, newsletters Leaflets and brochures supplied to MDAs	6 months	FMEHUD, media, NGOs, CBOs, relevant stakeholders	Financial assistance technical expertise logistics	39,000	Government, multilateral & bilateral donors
(7) To train workers, scientists, educators, technical and managerial personnel of relevant institutions	▪ Develop course modules for various categories of personnel ▪ Produce training materials for training workshops ▪ Organise workshops and seminars	Course modules designed Training materials developed Workshop/seminar reports	2 years	FMEHUD, media, NGOs, CBOs, relevant stakeholders	Financial assistance technical expertise logistics	25,000	Government, multilateral & bilateral donors
Estimated cost requirement for Public awareness, information and education (Article 10)						$204,000	

3.3.14 Activity: Effectiveness evaluation (Article 16)

Article 16 of the Convention requires Parties to establish mechanisms for providing comparable monitoring data on the presence of Annex A, B and C chemicals. This evaluation shall be conducted on the basis of available scientific, environmental, technical and economic information including national reports. A meaningful strategy in this regard is to check current health hazards of POPs in the environment, taking samples from different sites and analysing, checking the model used and the credibility of results, measuring levels of POPs in environmental samples and their effects. The activities in Table 3.16 below provide details of actions to achieve the provisions of the Convention.

Table 3.16: Effectiveness Evaluation (Article 16)

Objectives	Activities	Performance indicator	Time frame	Implementers	Resource /Needs	Cost US$	Sources of funding
(1) To evaluate the effectiveness of the implementation of the Convention in Nigeria	▪ Develop an evaluation framework	Evaluation framework prepared	2 years	FMEHUD, NGOs, CBOs, PHCN, State government and other relevant stakeholders	Financial assistance, technical assistance and expertise	10,000	Government, multilateral & bilateral donors
	▪ Develop checklist or format for evaluation	Checklist in place					
	▪ Develop national performance evaluation criteria	Criteria developed				10,000	Government, multilateral & bilateral donors
(2) To prepare and present evaluation report	▪ Mechanism for reporting established	Periodic reports showing monitoring performance	Continuous	FMEHUD, NGOs, CBOs, PHCN, State government and other relevant stakeholders	Financial assistance technical expertise	5,000	Government, multilateral & bilateral donors
	▪ Preparation and presentation of evaluation report	Periodic report of performance				5,000	Government, multilateral & bilateral donors
Estimated cost requirement for Effectiveness Evaluation (Article 16)						$30,000	

3.3.15 Activity: Reporting (Article 15)

Article 15 of the Stockholm Convention on POPs mandates Parties to report to the Conference of Parties (COP) on measures taken to implement the provisions of the Convention as well as the effectiveness of the measures taken. In addition, each party is to provide to the Secretariat statistical data on its total quantities of production, import and export of each of the chemicals listed in Annex A and B as well as a list of states from which it has imported/exported each of such substances. These reports will provide a substantial input to the effectiveness evaluation of the Convention (Article 16), which will commence four years after the entry into force of the Convention.

This Action Plan therefore aims at collecting/collating all information relevant to the provisions of the Convention and packaging them in a suitable manner for reporting to the Secretariat and the COP. See Table 3.17.

3.3.16 Activity: Research, development and monitoring (Article 11)

Article 11 of the Stockholm Convention mandates the Parties to undertake appropriate research, development, monitoring and cooperation pertaining to POPs and where relevant to their alternatives and candidate POPs. From initial assessment conducted, it was established that the country lacks the requisite infrastructure and institutional capacities to handle research and development issues relating to POPs. Table 3.18 indicates activities to be undertaken to remedy this defect.

Table 3.17: Reporting

Objectives	Activities	Performance indicator	Time frame	Implementers	Resources & Needs	Cost/US$	Source of funding
(1) To report on measures taken to implement provisions of the Stockholm Convention	▪ List measures developed to implement the provisions of the Convention ▪ Develop reporting format in line with Convention format ▪ Identify software to report statistical data and results of the implementation of the Stockholm Convention	Developed checklist Reporting format Software identified	Every 2 years	FMENHUD, NESREA, SEPA	Financial assistance	5,000	Government, other bilateral/multi lateral donors
(2) To report on measures taken to reduce or eliminate releases from intentional production and use of Annex A and B chemicals	Provide a report on following: ▪ Legal/administrative measures taken to eliminate the production and use of Annex A chemicals with dates ▪ Measures taken to restrict the production and/or use of Annex B chemicals with dates ▪ Legal or administrative measures necessary to eliminate the import/export of chemicals listed in Annex A of the Convention ▪ Measures regarding the import/export of chemicals listed in Annex B of the Convention	Report available	Every 2 years	EPA	Financial assistance	5,000	Government, other bilateral/multi lateral donors

Table 3.17 continued

Objectives	Activities	Performance indicator	Time frame	Implementers	Resources & Needs	Cost/US$	Source of funding
(3) To report on measures to reduce or eliminate releases from unintentional production	• Provide a report on the following: • Action Plan to identify, characterize and address release of Annex C chemicals • Implementation of Action Plan • Difficulties and successes of implementation • Evaluation of current and projected releases from anthropogenic sources of chemicals listed in Annex C of the Convention by the following specific actions: • Development of the format for evaluation comprising • Source category • Annual releases (g TEQ/a) to air, water, land, product and residue • Generation of data for current releases • Generation of data for projected releases • Analysis of data and compilation of a report • Review of strategies and of their success in meeting the obligations of Article 5	Report available	Every 2 years	FMEHUD NESERA SEPA	Financial assistance	60,000	Government, other bilateral/multilateral donors

Table 3.17 continued

Objectives	Activities	Performance indicator	Time frame	Implementers	Resources & Needs	Cost/US$	Source of funding
(4) To report on measures to reduce releases from stockpiles and wastes	Design a data collection/inventory format for collection of data on: ▪ Stockpiles consisting of or containing chemicals listed in either Annex A or B, i.e. type of chemical, quantity of stock, location and condition of stock ▪ Products and articles in use and wastes containing or contaminated with chemicals listed in Annex A, B or C ▪ Conduct training on use of the inventory format ▪ Collection of data ▪ Analysis of data and compilation of report ▪ Report on legislative or/and administrative measures to manage stockpiles	Report available	Every 2 years	EPA	Financial assistance, technical assistance vehicles	10,000	Government, other bilateral/multi lateral donors
(5) To provide an inventory on total quantities of production, importation and exportation of chemicals listed in Annexes A and B of the Convention	▪ Design and pilot test an inventory format for collection of data on name of chemical, total annual production (kg/yr), total annual import (kg/yr) and countries of origin, total annual export and destination countries ▪ Train collaborating stakeholders, e.g., CEPS, EPA, GSB, Factories Inspectorate Division, etc. on the use of the inventory format ▪ Collection of data at various sources of illegal entry points in Nigeria ▪ Analysis and compilation of the report	Report available	Every 2 years	FMEHUD, EPA	Financial assistance technical assistance	20,000	Government, other bilateral/multi lateral donors

Table 3.17 continued

Objectives	Activities	Performance indicator	Time frame	Implementers	Resources & Needs	Cost/US$	Source of funding
(6) To report on progress in eliminating polychlorinated biphenyls (PCBs)	Provide a report on the following: ▪ Measures taken to eliminate the use of PCBs in equipment (e.g., transformers, capacitors or other receptacles containing liquid stocks) by 2025. ▪ Measures taken to reduce exposures and risk and to control the use of PCBs ▪ Measures taken to ensure that equipment containing PCBs is not exported or imported except for the purpose of environmentally sound waste management	Report available	Every 2 years	FMEHUD, EPA, ECG, VRA	Financial assistance	5,000	Government, other bilateral/multilateral donors
(7) To report on information exchange	Provide a report on the following: ▪ Establishment of an information exchange mechanism ▪ Designation of a national focal point for information exchange	Report available	Every 2 years	EPA	Financial assistance	2,000	Government, other bilateral/multilateral donors
(8) To report on public information, awareness and education	▪ Provide a report on measures taken to enhance public information, awareness and education	Report available	Every 2 years	EPA	Financial assistance	2,000	Government, other bilateral/multilateral donors

Table 3.17 continued

Objectives	Activities	Performance indicator	Time frame	Implementers	Resources & Needs	Cost/US$	Source of funding
(9) To report on research, development and monitoring	Provide a report on the following: ▪ Measures taken to encourage research, development and monitoring of POPs including sources and releases into the environment, presence, levels and trends in humans and the environment, etc. as listed in Article 11 paragraph 1 ▪ Development of format for presentation of results/reports. ▪ Sensitisation of stakeholders, e.g., researchers, academia, on need to submit regular reports/findings to the national focal point using the format developed for presentation ▪ Generation of reports from information centres, e.g., toxicological centres ▪ Measures taken to store and maintain information generated from research, development and monitoring ▪ Overall report on research, development and monitoring	Report available	Every 2 years	FMEHD, EPA	Financial assistance technical assistance, e.g., data analysts	10,500 60,000	Government, other bilateral/multilateral donors
Estimated cost requirement for Reporting						$179,500	

Table 3.18: Research, development and monitoring (Article 11)

Objectives	Activities	Performance indicator	Time frame	Implementers	Resources & Needs	Cost/US$	Sources of funding
(1) To develop institutional and research capacity to manage POPs	▪ Identify institutions with the potential to undertake research on POPs	Mechanism for identifying institutions in place	10 years	FMEHUD, NESREA, EPA, Laboratory experts/, GSB, GAEC, tertiary, institutions, CSIR	Financial assistance vehicles technical expertise consultants	10,000	Government, multilateral & bilateral donors
	▪ Strengthen national scientific and technical research capabilities and infrastructure to promote assess to exchange of data and analysis	National scientific and technical research capabilities in relation to POPs strengthened				15,000	Government, multilateral & bilateral donors
	▪ Develop a mechanism for networking among identified research institutions	Meetings to identify proper avenues for networking				5,000	Government, multilateral & bilateral donors
	▪ Undertake research aimed at alleviating the effects of POPs on reproductive health	Research on the alleviation of effects of POP on reproductive health initiated				45,000	
	▪ Establish procedures for communicating research and development findings to the public	Linkages for communication established				15,000	Government, multilateral & bilateral donors
	▪ Undertake research on identifying alternatives to POPs	Research initiatives into finding alternatives to POPs				25,000	Government, multilateral & bilateral donors

Objectives	Activities	Performance indicator	Time frame	Implementers	Resources & Needs	Cost/US$	Sources of funding
(2) To identify appropriate laboratories to monitor all POPs activities	▪ Compile a list of existing laboratories (see National Profile on Chemicals)	Data base of existing laboratories	1 year	EPA, laboratory experts, GSB, GAEC, Tertiary institutions, CSIR	Financial assistance vehicles technical expertise consultants	2,000	Government, multilateral & bilateral donors
	▪ Develop criteria for the assessment of capacities of existing laboratories to analyse POPs	Stakeholder consultations to identify assessment criteria for listing laboratories				5,000	Government, multilateral & bilateral donors
	▪ Assess and select laboratories	Stakeholder consultation to assess and select laboratory					
(3) To upgrade two laboratories capable of analyzing Annexes A and B chemicals	▪ Upgrade the infrastructure of two laboratories to analyse Annexes A and B chemicals	Laboratories established Equipment purchased Staff trained	5 years	FMEHUD, GAEC, MFA, CSIR, research institutions, universities	Financial assistance vehicles technical expertise consultants	5,000,000	Government, multilateral & bilateral donors
(4) To monitor levels of concentration of POPs in the environment	▪ Select matrices to sample	Sample matrices identified	10 years	EPA, GAEC, GSB, CSIR, universities, EPA, stakeholders	Financial assistance vehicles technical expertise consultants	20,000	Government, multilateral & bilateral donors
	▪ Determine appropriate methods of sampling and analysis to apply	Methods for sampling selected				15,000 1,650,000	Government, multilateral & bilateral donors
	▪ Analysis of soil, air water, human milk, other biota for presence of POPs	Sample collected and analysed					

Table 3.18 continued

Objectives	Activities	Performance indicator	Time frame	Implementers	Resources & Needs	Cost/US$	Sources of funding
(5) To undertake proper management of data	▪ Establish procedures for the management of analysis results ▪ Develop internationally recognized guidelines for interpreting monitoring results and presenting monitoring reports	Procedure for management of analysis results established Harmonized methodology for reporting interpretation of results	2 years	EPA, stakeholder	Training, computer software	15,000	Government, multilateral & bilateral donors
(6) To establish a mechanism for quality assurance and control of monitoring activities	▪ Establish effective quality assurance and quality control system	Protocol for ensuring QA/QC in place Procedure for data evaluation developed	2 years	EPA, stakeholders	Financial assistance, Training	5,000	Government, multilateral & bilateral donors
	▪ Set up a review panel to evaluate data prior to acceptance	Workshop to identify review panel organised				5,000	Government, multilateral & bilateral donors
Estimated cost requirement for Research, development and monitoring (Article 11)						$6,832,000	

3.3.17 Activity: Technical and financial assistance (Articles 12 and 13)

The ability of Nigeria to fulfil its obligations under the POPs Convention depends on the provision of adequate financial and technical assistance. The following actions in Table 3.19 would be required to enable the country obtain the needed financial and technical support required for the successful implementation of activities and actions to be carried out to achieve the POPs overall objectives.

Table 3.19: Technical and financial assistance (Articles 12 and 13)

Objectives	Activities	Performance indicator	Time frame	Imple-menters	Resource/ Needs	Cost/US $	Sources of funding
(a) To source for technical assistance towards the successful implementation of the Convention	▪ Assess technical needs ▪ Identify sources of financial assistance	Documentation of needs List of sources of technical assistance Number of proposals prepared and submitted	1 year	FMEHUD, NPC, MFA	Technical expertise financial assistance	10,000	Government, multilateral & bilateral donors
(b) To source for financial assistance towards the successful implementation of the Convention	▪ Financial needs assessment	Documents showing financial needs	1 year	FMEHUD, NPC, MFA,	Technical expertise financial assistance		Government, multilateral & bilateral donors
	▪ Identify sources of financial assistance	List of potential donors identified				2,000	
	▪ Requisition for financial assistance through proposal writing	Number of proposals prepared and submitted				2,500	Government, multilateral & bilateral donors
Estimated cost requirement for Technical and financial assistance (Articles 12 and 13) $14,500							

3.4 Development and Capacity Building Proposals and Priorities

This section presents initial six (6) project proposals to operationalise the National Implementation Plan. The overall goal of the projects is to improve the management of risks to human health and the environment from persistent organic pollutants. The specific projects and their respective objectives are summarized below in Table 3.20 as post-NIP projects.

Table 3.20: Development and capacity building proposals and priorities

No.	Project Purpose	Objectives	Time Frame	Budget USD	Sources of funding
1	To strengthen human and institutional capacities for the management of POPs	▪ Develop guidelines for the safe and environmentally sound production, usage, transportation, storage, handling and disposal of POPs and POPs containing equipment ▪ Develop policy and legislation for the management and control of POPs ▪ Develop capacities in relevant institutions for the management of POPs ▪ Promote coordination of activities of relevant institutions on POPs	2 years	250,000	Government, multilateral & bilateral donors
2	To develop capacity and capability for the identification, analysis and monitoring of POPs in the environment	▪ Upgrade at least two laboratories and acquire analytical equipment for analysing POPs ▪ Train staff to run laboratories ▪ Assess levels of POPs in the environment	5 years	6,000,000	Government, multilateral & bilateral donors
3	To develop and implement an information and communication system for the management of POPs	▪ Establish a national data and information centre on POPs ▪ Formulate and implement a communication strategy on POPs ▪ Promote networking among stakeholders at the national and international levels ▪ Establish poison information and management centres	1 year	250,000	Government, multilateral & bilateral donors
4	To investigate and assess the nature and severity of health effects experienced by humans as a result of exposure to POPs	▪ Estimate nature and severity of health effects experienced by high risk groups ▪ Recommend opportunities for management interventions required to reduce identified adverse effects and risks to acceptable levels ▪ Strengthen capacity of health centres to handle POPs poisoning	2 years	500,000	

No.	Project Purpose	Objectives	Time Frame	Budget USD	Sources of funding
5	To undertake safe and environmentally sound (SES) treatment and disposal of POPs, POPs contaminated equipment and remediation of contaminated sites	▪ Enhance capabilities of line institutions and for the safe and environmentally sound (SES) collection, transportation and storage of POPs ▪ Promote private sector participation in the SES collection, transportation, storage, treatment and disposal of POPs ▪ Identify and rehabilitate and/or redesign facilities for the SES storage and disposal of existing POPs pesticides and POPs-containing equipment ▪ Develop procedures for the SES treatment and disposal of POPs pesticides, PCBs and PCPs-containing equipment ▪ Conduct treatment and disposal of existing stockpiles of PCP-containing equipment, POPs pesticides.	5 years	6,500,000	Government, multilateral & bilateral donors
6	To promote BAT/BEP implementation in selected industries using the cleaner production concept	• Reduce the total annual UPOPs releases in the selected industries by at least 5%, • Demonstrate BAT/BEP implementation in selected industries(including uncontrolled combustion processes, Ferrous and non-ferrous metal production, Power generation and heating, Waste incineration) together with the Cleaner Production Concept. • To demonstrate reduction and elimination of unintentional production of POPs in industry recognized by the preliminary inventory conducted, as key sources of UPOPs chemicals. To promote the adoption of best available techniques and best environmental practice.	3 years	5,200,000	
Estimated cost requirement for $13,500,000		Development and capacity building proposals and priorities			

3.5 Timetable for Plan Implementation and Measures of Success

Table 3.21 provides a summary of the eighteen activities, strategies and action plans outlined in section 3.3 to minimise releases and eventually phase out POPs. Specific targets and milestones are outlined to allow progress of implementation to be reviewed and monitored. The overall NIP coordination time line is estimated to be at least fifteen years as shown in 3.21.

Table 3.21: Implementation chart showing activity schedules of NIP in Nigeria

Activities	Year of Implementation														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
3.3.1 Institutional and Regulatory Strengthening Measures															
• Compile and update inventory of existing legal instruments that address the management of chemicals including POPs • Review relevant existing regulations in the management of chemicals/POPs to identify areas for modification and strengthening • Draft polices/regulations to prohibit/eliminate the production, use, importation and exportation of chemicals listed in Annexes A, B and C of the Convention • Codify all legislations related to chemicals and develop a chemicals management law	2														
• Carry out needs assessment of relevant institutions • Prioritise needs of institutions • Determine resource needs for reforms and performance	1														
• Organize sensitization workshop for private sector, NGOs, CBOs, marketers of chemicals • Training for legislators, decision makers, managers and personnel responsible for POPS issues in 6 geopolitical zones	1														

Table 3.21continued

• Prepare Memoranda of Understanding (MOUs) with relevant institutions at federal/states and assign them with specific responsibilities towards the implementation of the Convention • Form a Compliance and Enforcement Network • Build capacity of personnel from all relevant institutions, e.g., recruitment and training of staff • Develop monitoring plans of activities for relevant institutions	2
• Identify common issues and gaps between extant legislation and the Stockholm Convention • Prepare draft comprehensive chemical law bill mainstreaming POPs • Passage of new chemical bill by legislature • Build capacity of regulatory agencies through training programmes	1
• Build capacity of enforcement officers and regulatory agencies	1
3.3.2 Measures to Reduce or Eliminate Releases from Intentional Production and Use	
• A To update periodically inventories of Annex A and B chemicals imported and used • Analyse pattern of usage of Annex A and B chemicals • Dispose of obsolete Annex and B chemicals in environmentally sound manner	5
• Developing a regulatory framework • Strengthening controls on illegal entry of POPs at the Ports	2

Table 3.21continued

• a) Public Information pamphlet on dangers of illegal use in major languages and pidgin English • Intense Media Awareness Promotion • Establishment of DDT Alert Watch • (ii) Establish tracking system for DDT importation and use 1	3
• Search for alternatives to DDT	1
• Establish tracking system for DDT importation and use	1
3.3.3 Production, Import and Export, Use, Stockpiles and Wastes of Annex A POPs Pesticides (Annex A, Part I Chemicals)	
• Carry out further inventories into the illegally imported, and use, stockpiles and wastes of Annex A part 1 chemicals • Produce national GIS map of stockpiles and contaminated sites	1
• Archiving and data management system including modeling • Training for personnel responsible for POPs issues, decision makers and managers on utilisation of database for decision making	1
3.3.4 Production, Import and Export, Use, Identification, Labelling, Removal, Storage and Disposal of PCBs and Equipment Containing PCBs (Annex A, Part II chemicals)	

Table 3.21continued

• Identify all source categories for PCBs within PHCN and industries, oil and gas, etc. to include transformers, capacitors and circuit breakers • Identify PCBs and PCB-containing equipment • Prepare an inventory of PCBs and PCB containing equipment • Identify PCB-contaminated sites	1
• Refurbish FMEHUD's National Reference Laboratory in Lagos and equip new BCRC Hazardous waste laboratory at University of Ibadan which already have analytical capacity and experience in PCB analysis • Training/re-training of staff in PCB analysis in transformer oil and environmental samples • Screen oils in old and new transformers for PCB levels as well as in new imported transformers oils	3
• Establish a database of results of inventory in (1) above • Training on the use of database for decision making	2
• Draft new regulations on imports, use, of PCBs and PCB containing equipment • Establish policies and guidelines/regulations for the management of PCBs and PCBs containing equipment and materials • Identify safer substitutes • Develop detailed phase-out programmes for organisations and institutions using of PCBs	5

Table 3.21continued

• Place warning notices near equipment, especially where decommissioned ones are kept prior to disposal • Develop checklist for PCB equipment inspection • Regularly inspect PCB containing equipment • Install receptor tanks to replace concrete bunds • Establish emergency plans for PCBs spillage and accidents • Organize training for personnel involved in handling of PCBs • Establish mechanism for reporting accidents to authorities • Establish a Toxicological Centre • Capacity building in all identified areas	4
• Develop guidelines on safe handling of PCBs • Develop guidelines for collection and transport of PCBs and PCB containing equipment • Establish permitting system for the collection and transport of PCBs and PCB containing equipment • Establish criteria for selection of the appropriate storage areas • Procedures to identify appropriate storage sites for PCBs and Equipment containing PCBs • Develop/upgrade infrastructure for safe storage • Establish system for proper labelling of stored items	10

Table 3.21continued

• Establish appropriate procedures for the decommissioning of damaged equipment or that removed from use and its sound disposal • Clean equipment earmarked for decommissioning • Establish a collection system which ensures safe disposal of PCBs • Carry out safe disposal of Oils containing PCBs and equipment polluted with PCBs	10
• Identify and finalize arrangements for the disposal of PCB and PCB containing equipment • Package equipment for disposal • Identify appropriate technology for disposal of PCBs	5
• Develop programme for the monitoring of the entire PCB management processes. • Establish a countrywide programme of monitoring exposure of PCBs in human fluids • Monitor to ensure that PCB reduction is not causing adverse impacts on the industry • Monitor the efficacy and safety of PCBs in areas where they continue to be used until their elimination and disposal • Analysis of food, soil samples and water bodies for presence of PCBs • Analysis of identified PCB contaminated sites	15
• Identify and prepare programmes for institutional strengthening and capacity building • Involve relevant stakeholders in education and training	5

Table 3.21continued

• Develop awareness creation strategy on environmental and health impact of PCBs • Development of a website and information exchange networks on PCBs	5
3.3.5 Production, Import and Export, Use, Stockpiles and Wastes of DDT (Annex B Chemicals) if used in country	
• Carry out further inventory into the production, import, and export, use, stockpiles and wastes of Annex B chemicals	2
• Design an archiving and data management system • Carry out training in database management	2
3.3.6 Register for Specific Exemptions and the Continuing need for Exemptions	
• Organize stakeholders' consultation to establish criteria for selection of chemicals requiring exemptions under chemicals listed under Annex A or B • Develop criteria and procedures for identification and selection of candidate chemicals • Develop protocols for the notification of convention secretariat on specific exemptions required • Establish registration centre(s) to register chemicals proposed for exemptions • Review periodically to assess the need for continued exemptions • Build capacity to enable proper execution of the foregoing activities	1s

Table 3.21continued

3.3.7 Measures to Reduce Releases from Unintentional Production	
▪ Review of preliminary inventory data ▪ Incorporate new source categories as appropriate ▪ Collect and collate data from identified source categories	2
▪ Develop a database ▪ Archiving and data management	2
▪ Draft new regulations ▪ Prepare memoranda of understanding (MOUs) with industry groups on phasing out equipment and machinery, which are sources of releases ▪ Introduce substitute technologies or modify materials and processes to prevent formation and releases ▪ Institute a chemical and materials policy, which aims to reduce/eliminate PCDD/F, HCB and PCBs ▪ Integrate industry commitment into existing EPA permitting system ▪ Education and awareness of stakeholders on legal issues	3
▪ Identify activities using chemicals containing chlorine (e.g., PVC production, chlorine in water treatment, pesticides) ▪ Develop phase-out programmes for identified sources ▪ Identify and promote feasible and affordable alternatives to activities, which are chlorine based, and sources of releases	10

Table 3.21continued

▪ Review and develop by-laws, guidelines and procedures for uncontrolled burning activities ▪ Intensify on-going educational and awareness programmes on effects of uncontrolled burning activities ▪ Develop alternative methods of bush clearing instead of burning ▪ Promote other income generating activities for the youth engaged in bush burning for games ▪ Enforce ban on bush and waste burning at dumpsite fires ▪ Establish a mechanism for the prevention and early detection of dumpsite fires ▪ Construct well-designed waste incinerators, e.g., waste to energy plants Sensitize waste management operators on the environmental impacts of waste burning and burning in general ▪ Develop educational material on the health and environmental effects of burning of materials suspected to be emission sources ▪ Placing jingles on TV, radio, doing TV programmes ▪ Expand on-going landfill site development and composting plants ▪ Implement a policy to ban burning of products containing chlorine or processed with chlorine, such as chlorinated chemicals, polyvinyl chloride plastic and chlorine bleached paper ▪ Domesticate Stockholm Convention ▪ Integrate Stockholm Convention obligations into existing by-laws of states ▪ Strengthen institutions to implement cleaner technologies ▪ Develop guidelines, policy and regulations on medical waste management	4

▪ Develop institutional and human resource capacities to implement national medical waste management guidelines	
▪ Develop appropriate modern technology for pollution control, for final disposal of medical waste (autoclave, etc). ▪ Construct modern incinerators with designs to improve combustion of medical waste ▪ Integrate international emission discharge limits of PCDD/F, HCB and PCBs to air into national standards ▪ Develop institutional and human resource capacities to implement national medical waste management guidelines ▪ Promote use of gas-fired stoves, solar systems and ovens ▪ Establish alternative energy use demonstration centres	5
▪ Sensitize the public on the environmental and health impacts of burning wood fuels and benefits that accrue from energy efficiency initiatives ▪ Research into use of alternative energy sources in households	5
▪ Support implementation of leaded fuel phase-out programme ▪ Sensitize motorists on the need for the adoption of fuel efficiency initiatives ▪ Encourage reliance on mass transportation system to reduce fuel consumption ▪ Develop vehicle emission regulations and standards ▪ Enforce permitting conditions for fuel service centers	
▪ Develop best practice guidelines on the selection of scrap metal for processing for small-scale foundry set-ups ▪ Develop and integrate discharge limits for secondary metal processing into draft regulations on emissions ▪ Integrate control of chlorine content in waste discharge by industry into permitting system	5

Table 3.21continued

▪ Sensitize industry and relevant stakeholders on the generation elimination/reduction of PCDD/F, HCB and PCBs through seminars, workshops and training programmes ▪ Sensitize the general public on the health effect of PCDD/F, HCB and PCBs through radio and television discussions and advertisements ▪ Develop educational/awareness materials on the health and environmental effects of PCDD/F, HCB and PCBs ▪ Develop a comprehensive database on PCDD/F, HCB and PCBs	5
▪ Monitor conditions, types and sources of generation of PCDD/F, HCB and PCBs ▪ Sample and analyse human tissue/organs and foods samples ▪ Continuous study of conditions and processes generating the emissions ▪ Integrate information/results into database management system	10
3.3.8 Measures to Reduce Releases from Stockpiles and Wastes	
▪ Identify sites where chemicals have been stockpiled or waste dumped ▪ Quantitative inventory of the potential for releases from stockpiles and waste into environmental media	1
▪ Develop methods for estimating the potential for releases ▪ Sample soil, water, human tissues and fluids, tissue of fauna and flora from selected sites to determine residues and presence of Annex A, B and C chemicals	3

▪ Review of health records of populations exposed to waste and stockpiles of Annex A, B and C chemicals ▪ Assess conditions and procedures for storage of stockpiles and waste of Annex A, B and C chemicals	
▪ Secure and label sites having stockpiles and waste of Annex A, B and C chemicals to prevent releases from spreading ▪ Identify potential remediation technologies available ▪ Train and upgrade skills of personnel in the application of identified remedial measures and safe handling ▪ Establish regulations and guidelines for reporting of leakages or spillages and clean-up of contaminated sites ▪ Monitor surface and ground water ▪ Establish a programme for continued education and training in clean-up in areas contaminated by waste and stockpiles. ▪ Develop procedures on inspections and maintenance of stockpiles and waste	10
▪ Organise a public awareness programme to disseminate information ▪ Establish collection points or schemes to encourage voluntary return of damaged or out of use equipment ▪ Prepare information and awareness education materials	5
3.3.9 Identification of Stockpiles, Articles in Use and Wastes	
▪ Identify sources of information and stocks of POPs stockpiles ▪ Design a questionnaire to collect information and quantify stocks of stockpiles ▪ Training workshop for information collection ▪ Workshops on the collation of data on stockpiles	0.5
▪ Identify sources of information and stocks of POPs articles in use in Nigeria ▪ Design a questionnaire to collect information and quantify stocks of articles in use and collect information ▪ Organise workshops on the collation of data	0.5

Table 3.21continued

▪ Identify sources of information and stocks of POPs waste ▪ Design a questionnaire to collect information and quantify stocks of waste and collect information ▪ Organise workshops on the collation of data	0.5
3.3.10 Measures to Manage Stockpiles and Appropriate Measures for Handling and Disposal of Articles in Use	
▪ Develop guideline for environmentally sound, safe and secure facility for interim storage of stockpiles ▪ Identify appropriate storage facilities for interim storage of stockpiles	2
• Upgrade existing information for safe management of stockpiles. • Develop manuals for safe handling and disposal • Develop guidelines for the transport of articles in use to safe locations	5
3.3.11 Strategy: Identification of Contaminated Sites (Annex A, B and C Chemicals) and Remediation in an Environmentally Sound Manner	
• Carry out further investigations to identify contaminated sites • Risk based assessment of sites	5
• Secure and label sites • Identify potential remediation technologies available • Establish regulations and guidelines for clean-up of contaminated sites ▪ Train and upgrade skills of personnel in the application of identified remedial measures • Liability issues	10

Table 3.21continued

3.3.12 Facilitating or undertaking Information Exchange and Stakeholder Involvement	
▪ Designate national focal point for information exchange ▪ Identify appropriate information required for information exchange ▪ Recruit professional and auxiliary staff, e.g., data analysts, information technologists, public relations officers, etc ▪ Purchase and install equipment, e.g., communication gadgets, computers ▪ Subscribe to Internet websites with links to sources listed in the national inventory, etc ▪ Develop an Internet website	1
▪ Train staff at focal point with relevant skills	1.5
▪ Identify the resource persons ▪ Carry out a needs assessment ▪ Develop training materials and programmes ▪ Carry out training	1
▪ Identify relevant stakeholder institutions/partners ▪ Communicate with identified stakeholders ▪ Obtain feedback from stakeholders ▪ Involves stakeholders in programmes ▪ Establish a stakeholder consultative forum 2	

Table 3.21continued

3.3.13 Activity: Public awareness, information and Education	
▪ Develop and produce awareness raising materials, e.g., brochures, flyers, posters, newsletters etc on POPs ▪ Translate these materials into local languages ▪ Develop radio and TV education programmes, e.g., prepare synopsis, write scripts for local drama, etc. to cater for the needs of women, children and the non-formal society ▪ Place articles for publication in both private and state-owned newspapers	2
▪ Identify relevant decision and policy makers/traditional authorities ▪ Organise workshops/seminars to sensitise identified groups	1
▪ Provide the Information Services Department and the media houses with information materials ▪ Identify resource persons to carry out public education, e.g., representatives of various organisations and institutions, public interest groups, NGOs, media, traditional authorities, Municipal and District Assemblies ▪ Training of media professional and journalists on POPs warder to propagate the impacts of POPs without a sole objective of gaining commitment of all stakeholder to eliminating POPs ▪ Train identified resource persons ▪ Collaborate with MOE/GES to integrate POPs management in the environmental education syllabus of basic and secondary schools ▪ Design programme with electronic and print media houses to discuss/publish POPs related issues	5

Table 3.21continued

▪ Promote benefits of use of alternatives to POPs ▪ Organise programmes on POPs such as radio competitions, quizzes for schools, radio and TV phone-in programmes	5
▪ Establish Information Centres ▪ Develop mechanisms for the collection of information on chemicals listed in Annexes A, B and C	2
▪ Develop websites, and newsletters ▪ Promote the dissemination of information on POP's to ministries, department and agencies (MDAs)	1.5
▪ Develop course modules for various categories of personnel ▪ Produce training materials for training workshops ▪ Organise workshops and seminars	2
3.3.14 Effectiveness Evaluation	
▪ Develop an evaluation framework ▪ Develop checklist or format for evaluation ▪ Develop national performance evaluation criteria	2
▪ Mechanism for reporting established ▪ Preparation and presentation of evaluation report	15
3.3.15 Reporting	
▪ List measures developed to implement the provisions of the Convention ▪ Develop reporting format in line with Convention format ▪ Identify software to report statistical data and results of the implementation of the Stockholm Convention	2s

Table 3.21continued

Provide a report on following: ▪ Legal/administrative measures taken to eliminate the production and use of Annex A chemicals with dates ▪ Measures taken to restrict the production and/or use of Annex B chemicals with dates ▪ Legal or administrative measures necessary to eliminate the import/export of chemicals listed in Annex A of the Convention ▪ Measures regarding the import/export of chemicals listed in Annex B of the Convention	2s
• Provide a report on the following: • Action Plan to identify, characterize and address release of Annex C chemicals • Implementation of Action Plan • Difficulties and successes of implementation • Evaluation of current and projected releases from anthropogenic sources of chemicals listed in Annex C of the Convention by the following specific actions: • Development of the format for evaluation comprising • Source category • Annual releases (g TEQ/a) to air, water, land, product and residue • Generation of data for current releases • Generation of data for projected releases • Analysis of data and compilation of a report • Review of strategies and of their success in meeting the obligations of Article 5	2s

Table 3.21continued

• Design a data collection/inventory format for collection of data on: ▪ Stockpiles consisting of or containing chemicals listed in either Annex A or B, i.e. type of chemical, quantity of stock, location and condition of stock ▪ Products and articles in use and wastes containing or contaminated with chemicals listed in Annex A, B or C ▪ Conduct training on use of the inventory format ▪ Collection of data ▪ Analysis of data and compilation of report ▪ Report on legislative or/and administrative measures to manage stockpiles	2s
▪ Design and pilot test an inventory format for collection of data on name of chemical, total annual production (kg/yr), total annual import (kg/yr) and countries of origin, total annual export and destination countries ▪ Train collaborating stakeholders, e.g., CEPS, EPA, GSB, Factories Inspectorate Division, etc. on the use of the inventory format ▪ Collection of data at various sources of illegal entry points in Nigeria ▪ Analysis and compilation of the report	2s
Provide a report on the following: ▪ Measures taken to eliminate the use of PCBs in equipment (e.g., transformers, capacitors or other receptacles containing liquid stocks) by 2025. ▪ Measures taken to reduce exposures and risk and to control the use of PCBs ▪ Measures taken to ensure that equipment containing PCBs is not exported or imported except for the purpose of environmentally sound waste management	2s

Table 3.21continued

▪ Provide a report on the following: ▪ Establishment of an information exchange mechanism ▪ Designation of a national focal point for information exchange	2s
▪ Provide a report on measures taken to enhance public information, awareness and education	2s
▪ Provide a report on the following: ▪ Measures taken to encourage research, development and monitoring of POPs including sources and releases into the environment, presence, levels and trends in humans and the environment, etc. as listed in Article 11 paragraph 1 ▪ Development of format for presentation of results/reports. ▪ Sensitisation of stakeholders, e.g., researchers, academia, on need to submit regular reports/findings to the national focal point using the format developed for presentation ▪ Generation of reports from information centres, e.g., toxicological centres ▪ Measures taken to store and maintain information generated from research, development and monitoring ▪ Overall report on research, development and monitoring	2s
Research, Development and Monitoring	
▪ Identify institutions with the potential to undertake research on POPs ▪ Strengthen national scientific and technical research capabilities and infrastructure to promote assess to exchange of data and analysis ▪ Develop a mechanism for networking among identified research institutions ▪ Undertake research aimed at alleviating the effects of POPs on reproductive health ▪ Establish procedures for communicating research and development findings to the public ▪ Undertake research on identifying alternatives to POPs	10

▪ Compile a list of existing laboratories (see National Profile on Chemicals ▪ Develop criteria for the assessment of capacities of existing laboratories to analyse POPs ▪ Assess and select laboratories	1
▪ Upgrade the infrastructure of two laboratories to analyse Annexes A and B chemicals	5
▪ Select matrices to sample ▪ Determine appropriate methods of sampling and analysis to apply ▪ Analysis of soil, air water, human milk, other biota for presence of POPs	10
▪ Establish procedures for the management of analysis results ▪ Develop internationally recognized guidelines for interpreting monitoring results and presenting monitoring reports	2
▪ Establish effective quality assurance and quality control system ▪ Set up a review panel to evaluate data prior to acceptance	2
Technical and Financial Assistance	
▪ Assess technical needs ▪ Identify sources of financial assistance	1
▪ Financial needs assessment ▪ Identify sources of financial assistance ▪ Requisition for financial assistance through proposal writing	1
Development and capacity building proposals and priorities	
▪ To strengthen human and institutional capacities for the management of POPs	2
▪ o develop capacity and capability for the identification, analysis and monitoring of POPs in the environment	5
▪ To develop and implement an information and communication system for the management of POPs	1

▪ To investigate and assess the nature and severity of health effects experienced by humans as a result of exposure to POPs	2
▪ To undertake safe and environmentally sound (SES) treatment and disposal of POPs, POPs contaminated equipment and remediation of contaminated sites	5
▪ To promote BAT/BEP implementation in selected industries using the cleaner production concept	3

3.6 Resource Requirements

A summary of resources required for the successful and effective implementation of the identified tasks and activities are provided in Table 3.22 below in a resource requirements matrix. Some of the Post NIP projects have already been approved for funding by GEF especially the projects on obsolete POPs pesticides under the ASP as well as the sub –regional project on contaminated sites between Nigeria and Ghana. The World Bank as mentioned earlier on has also approved a grant for USD 250,000 for inventory study of PCBs and PCBs containing equipment in Nigeria. In response to the high releases of UPOPs from uncontrolled burning of refuse and a lesser degree from chemicals production and manufacturing, the Nigerian government has taken some positive actions already. Integrated waste management projects are planned for seven urban centres in a public – private partnership initiative to minimise UPOPs release from waste burning. The government has pledged about US$ 2.0 million for each urban centre and has already released US $ 2 million per centre for the take off of the projects in Ibadan, Oyo state and Abe in Abita state. A BAT/BEP project is about to be formulated for minimisation of UPOPs release from already identified manufacturing sectors.

Table 3.23 below shows the eight Post NIP projects identified by the POPs NIP Endorsement Workshop held on 24th and 25th October 2007 respectively, some of which funds have already been approved. Capacity building for POPs monitoring is critical for assessing the success of mitigative measures being developed for UPOPs minimisation and phase out. In this regard, the establishment of a regional monitoring laboratory for POPs in Nigeria, which will also serve other countries in the West African sub-region or the entire African region, is a top variety. Since any reforms in the institutional and regulatory framework would entail enactment of new laws, awareness workshops for legislators at the federal, state and local governments become imperative.

Table 3.22: Summary of Resource requirements for POPs NIP Implementation in Nigeria

Principal Tasks/Activities No.	Principal Tasks/Activities Titles	Estimated Cost (USD)
3.3.1	Institutional and Regulatory Strengthening Measures	335,800
3.3.2	Measures to Reduce or Eliminate Releases from Intentional Production and Use	420,000
3.3.3	Production, Import and Export, Use, Stockpiles and Wastes of Annex A POPs Pesticides (Annex A, Part I Chemicals)	320,000
3.3.4	Production, Import and Export, Use, Identification, Labelling, Removal, Storage and Disposal of PCBs and Equipment Containing PCBs (Annex A, Part II chemicals)	66,752,000
3.3.5	Production, Import and Export, Use, Stockpiles and Wastes of DDT (Annex B Chemicals) if used in country	270,000
3.3.6	Register for Specific Exemptions and the Continuing need for Exemptions	44,000
3.3.7	Measures to Reduce Releases from Unintentional Production	1,507,000
3.3.8	Measures to Reduce Releases from Stockpiles and Wastes	2,065,000
3.3.9	Identification of Stockpiles, Articles in Use and Wastes	75,000
3.3.10	Measures to Manage Stockpiles and Appropriate Measures for Handling and Disposal of Articles in Use	75,000
3.3.11	Strategy: Identification of Contaminated Sites (Annex A, B and C Chemicals) and Remediation in an Environmentally Sound Manner	3,020,000

3.3.12	Facilitating or undertaking Information Exchange and Stakeholder Involvement	595,000
3.3.13	Activity: Public awareness, information and Education	204,000
3.3.14	Effectiveness Evaluation	30,000
3.3.15	Reporting	179,500
3.3.16	Research, Development and Monitoring	6,832,000
3.3.17	Technical and Financial Assistance	14,500
3.4	Development and capacity building proposals and priorities	$
Total	**All Tasks and Activities**	**$101,438,800.00**
	Nip Coordination (15 % Of The Total Cost Of All Tasks And Activities)	**$15, 215,895**
Grand Total		**$116,655,195**

Table 3.23: List of Post NIP Projects for Nigeria identified at the Endorsement Workshop in November 2007

S/N	POST NIP PROJECTS FOR NIGERIA
1	African Stockpile Project (ASP) on the disposal of obsolete pesticides
2	PCB Management Plan for Nigeria- Inventory, disposal of PCB equipment and PCB Oils, contamination levels of ecosystems, Post Impact Environmental and Health Impact Assessment.
3	Demonstration of BAT/BEP implementation in selected industries together with the Cleaner Production Concept.
4	Development and Assessment of Alternatives to POPs Pesticides e.g. Neem Tree
5	Alternatives to Open Air Burning of Wastes
6	Strengthening of National Capacity for POPs Monitoring including the establishment of a sub-regional and regional POPs laboratory
7	Updating curriculum of Environmental Management Education in Tertiary Institutions to include POPs issues
8	National Programme on Emergency Response for POPs

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UNEP: Guidance for Developing a National Implementation Plan for the Stockholm Convention.

ANNEXES

ANNEX 1 List of Members of the National Steering Committee

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ANNEX 2 POPs Questionnaire

FORM 1

Please send the completed form to

JAWURA ENVIRONMENTAL SERVICES LIMITED

(Environmental Safety & Industrial Consultants; Analytical Chemists, Public Analyst)

77 Ikorodu Road (1st floor)

Please list in space provided below, key national POPs experts (e.g. for particular chemicals or groups of chemicals, or for areas of expertise) for inclusion in the POPs Information Exchange Network

Address: _____

_____

Telephone: _____

Telefax

E-mail Address: _____: _____

Internet access: _____

Tick one of the following

☐ Yes ☐ No ☐ planned ☐ do not know

Area(s) of expertise or POPs substance of interest:

_____

_____

Name: _____

Institution: _____

Address: _____

Telephone: _____

Tel/fax

E-mail Address: _____: _____

Internet access? _____

Check one ofwing

☐ Yes ☐ No ☐ planned ☐ do not know

Area(s) of expertise or POPs substance of interest:

FORM 2

Note: the information sources to be provided are major review documents, database or reports on specific POPs or the groups as well as special control actions on POPs

Please send the completed form to

JAWURA ENVIRONMENTAL SERVICES LIMITED

(Environmental Safety & Industrial Consultants; Analytical Chemists, Public Analyst)

77 Ikorodu Road (1st floor)

Fadeyi, Lagos

Tel.: 01-4738511, 084-575281, 08023065081, 08033013378

1. Title of the information/publication:

2. Publisher/Journal &/Publication date

3. Format of the information material

Electronic product ☐ CD-ROM

☐

☐ On-line database

☐ Diskette

Printed publication

4. Type of information material

Database ☐

Report ☐

Review document ☐

Legal document

Other:

---

5. Access Mode

On request ☐

On-line ☐

Internet ☐

Bookshop ☐

Other:

6. Substance Covered:

Aldrin	☐	Heptachlor	☐	Dioxins	☐
Chlordane	☐	Hexachlorobenzene	☐	Furans	
Dieldrin	☐	Mirex	☐		
DDT	☐	Toxaphene	☐		
Endrin		PCBs	☐		

7. Scope of the information source

Toxicology	☐	Guidelines and Standards	☐
Handling	☐	Methodology	☐
Disposal/storage	☐	Training	☐
Regulatory information	☐	Other	

8.2 Publisher: _____

8.4 Other _____

9. Language(s):_____

10. Please list below or attach a list of and copies of your publications relevant to POPs chemicals_____

FORM 3

Please send the completed form to

JAWURA ENVIRONMENTAL SERVICES LIMITED

(Environmental Safety & Industrial Consultants; Analytical Chemists, Public Analyst)

77 Ikorodu Road (1st floor)

Fadeyi, Lagos

Please list in space provided below, POPs Pesticides, Hexachlorobenzene (HCB) and PCBs that are manufactured, imported, formulated, marketed, applied, exported, etc

NAME, ADDRESS OF THE COMPANY OR ORGANIZATION:
NAME, TITLE OF THE CONTACT PERSON: Tel: Fax: E-mail:
OWNERSHIP STRUCTURE: Nigerian: %;(Public %; Private %)

YEAR ESTABLISHED : YEAR PRODUCTIONS START
NUMBER OF EMPLOYEES: Total; (in manufacturing: in other departments:

Substance Covered: Tick as applicable to your company or organization

Aldrin	☐	Heptachlor	☐	Dioxins	☐
Chlordane	☐	Hexachlorobenzene	☐	Furans	
Dieldrin	☐	Mirex	☐		
DDT	☐	Toxaphene	☐		
Endrin	☐	PCBs	☐		

FORM 4

Please send the completed form to

JAWURA ENVIRONMENTAL SERVICES LIMITED

(Environmental Safety & Industrial Consultants; Analytical Chemists, Public Analyst)

77 Ikorodu Road (1st floor)

Fadeyi, Lagos

Tel.: 01-4738511, 084-575281, 08023065081, 08033013378

State (or Town/City/Location)	***Contact person***

IMPORTANT : See instructions before filiing the form

SECTION 1: POPs IDENTITY		
1.1	Substance name (check **one** of the following substances)	
	☐ Aldrin	☐ Hexachlorobenzene
	☐ Dieldrin	☐ Mirex
	☐ DDT	☐ Toxaphene
	☐ Endrin	☐ Heptachlor
	☐ Chlordane	☐ PCBs

1.2	Generic names for product, mixture or formulation used	Percentage of active ingredient in product, mixture or formulation
Comment:		

SECTION 2. PRODUCTION, IMPORT AND EXPORT DATA

		Quantity per year (active ingredient)	Year	Specification
2.1	1. Produced for ***use***	☐		
	2. Produced as ***by products***	☐		
	3. Produced as ***impurity***	☐		
	4. ***Other***	☐		
		Quantity per year (active ingredient)	Year	Specification
2.2	1. Imported for ***use***	☐		
	2. Imported ***impurity***	☐		
	3. Imported for ***destruction***	☐		
	4. ***Other***	☐		
Origins:				
Comment:				

2.3	1. Exported for ***use*** ☐			
	2. Exported ***impurity*** ☐			
	3. Exported for destruction ☐			
	4. ***Other*** ☐			

SECTION 3. LOCAL USE

Use type (see instructions)	Quantity used per year	Quantity reported as: (check **one** only)	Year	Specific legal restriction to use			
3.1		Active ingredient ☐ ☐ Formulation Mixture ☐		Yes ☐	No ☐	Description	Year

Comments:

SECTION 4. ALTERNATIVES

Use type (see instructions	Availability and use	Chemical alternatives name/short description	Non-chemical alternative name/short description	Reasons for not selecting alternative
	☐			☐
	☐			☐
	☐			☐
	☐			

4.1	Available ☐ Selected often ☐ Selected rarely ☐ Never selected ☐			Cost ☐ Effectiveness ☐ Other ☐
4.2	Available ☐ Selected often ☐ Selected rarely ☐ Never selected ☐			Cost ☐ Effectiveness ☐ Other ☐
4.3	Available ☐ Selected often ☐ Selected rarely ☐ Never selected ☐			Cost ☐ Effectiveness ☐ Other ☐
Comment :				

SECTION 5. STOCKPILE IDENTIFICATION

	Is the POP stockpiled?	Quantity	Stockpile Location(s)
5.1	**As a product** Yes (if **Yes,** please specify) ☐ Active Ingredient Formulation ☐ Mixture ☐ Other ☐ No ☐	_____ _____ _____ _____	NA
5.2	**As a Recyclable** Yes (if **Yes,** please specify) ☐ Active Ingredient Formulation ☐ Mixture ☐ Other ☐ No ☐	_____ _____ _____ _____	NA
5.3	**As a Waste** Yes (if **Yes,** please specify) ☐ Active Ingredient ☐ Formulation Mixture ☐ Other ☐ ☐ No	_____ _____ _____ _____	NA
Comments:			

SECTION 6. RELEASE TO ENVIRONMENTAL COMPARTMENTS

	Is the POP Released to environment	Origin of Release	Quantity per annum	Location
6.1	Air ☐ Yes ☐ No	☐ Agricultural pest control ☐ Non-Agricultural pest control ☐ Industrial activity ☐ Waste disposal Other		
6.2	Water ☐ Yes ☐ No	☐ Agricultural pest control ☐ Non-Agricultural pest control ☐ Industrial activity ☐ Waste disposal Other		
6.3	Soil ☐ Yes ☐ No	☐ Agricultural pest control ☐ Non-Agricultural pest control ☐ Industrial activity ☐ Waste disposal Other		

SECTION 7. POPULATION EXPOSURE

	Are humans exposed to the POP	Exposure type	Total estimated levels	Comments:
7.1	☐ Yes ☐ No	Occupational ☐ Consumer ☐ Residential ☐ Accident/Poisoning ☐ Other (please specify) ☐	_____ _____ _____ _____ _____	_____ _____ _____ _____ _____

SECTION 8. RELEASE AND EXPOSURE MONITORING

	Monitoring type	Short description (add separate page if needed)		
8.1	**Ambient air** ☐ Yes ☐ No			
8.2	**Ground water** ☐ Yes ☐ No			
8.3	**Surface water** ☐ Yes ☐ No			
8.4	**Point air** ☐ Yes ☐ No			

☐

☐

8.5	**Point water** ☐ Yes ☐ No			
8.6	**Soil** ☐ Yes ☐ No			
8.7	**Ecosystem** ☐ Yes ☐ No			
8.8	**Human** ☐ Yes ☐ No			
8.9	**Agricultural commodity** ☐ Yes ☐ No			
8.10	**Food products** ☐ Yes ☐ No			

Comments

Section 9 REGULATORY ACTIONS TAKEN TO CONTROL THE USE OF THE POP

Action type to control the manufacture, importation distribution in commerce, use or disposal		Short description (add separate page if needed)	Reference
9.1 Public health standards or regulations			
9.2 Occupational standards or regulations			
9.3 Environmental standards or regulations			
9.4 Guidance Document			
9.5 Voluntary programme			
9.6 Other (e.g., Governmental order, international agreements)			
9.7 No action			

Comments:

SECTION 10. REPORT ON CASE STUDIES ON POPs-RELATED PROBLEMS IN YOUR COUNTRY

(Please provide a copy of the full report if available)

		Short Description (add separate page if needed)		
10.1	Site location			

10.2	Human activities in which the substance is used or generated			
10.3	Pathways and distribution of POP			
10.4	Environmental Impacts			
10.5	Human health impact			
10.6	Economic value of the activities at the national level, (poverty alleviation, health improvement)			
10.7	Conclusions			

SECTION 11. DO YOU HAVE A NATIONAL ACTION PLAN TO CONTROL THE USE AND RELEASES OF THIS POP?

☐ No	☐ Yes	☐ Planned	☐ Implemented

Please provide a short description (add separate page if needed)

NATIONAL/REGIONAL ACTION PLANS are programmes designed to control, reduce or eliminate the releases of POPs. They may include regulatory actions and other actions aiming at the phasing out of one or more POPs and/or promoting the use of alternative substances or techniques.

Annex 3 List of Endorsement Workshop Participants

SN	Name	Title/Designation	Organization and Detailed Contact Address	E-mail / Telephone
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Annex 6 Details of relevant international and regional treaties

22 May 2001, Stockholm, Sweden –Convention on Persistent Organic Pollutants.

29 January 2000, Montreal, Canada-Cartagena Protocol on Biosafety to the Convention on Biological Diversity.**10 December 1999, Basel, Switzerland**-Protocol on Liability and Compensation for Damage Resulting from Transboundary Movements of Hazardous Wastes and their Disposal,… http://www.unep.ch/basel/

10 (11) September 998, Rotterdam, Netherlands-Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, with Annexes I-V, http://www.un.org/Depts/Treaty/collection/notpubl/27-14en.htm

September 1997, Strasbourg, France –International Resolution on Responsibility and Liability under International Law for Environmental Damages, **Institute De Droit (see: Edith Brown Weiss, 1999, p. 439)**

3 May 1996, London, UK – International Convention on Liability and Compensation for Damage Connection with the Carriage of Hazardous and Noxious Substances by Sea, **35 I.L.M 1406 (1996)** http://www.imo.org.http://www.fletcher,tufts.edu/multi/texts/IMO.text

15 April 1994, Marrakesh, Morocco-Agreement Establishing the World Trade Organization, 33 I.L.M. 1144 (1994); http//www.wto.org in force-January 1, 1995

21 June 1993, Lugarno, Switzerland –Convention on Civil Liability for Damage Resulting from Activities Dangerous to the Environment, 32 I.L.M 1228 (1993) http://www.coe.fr/eng/legaltxt/150e.htm; http://conventions.coe.int/treaty/EN/cadrepreincipal.htm http://fletcher.tufts.edu/multi/texts/dangerous-activities.txt

1993, Paris, France –Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and their Destruction.

14 June 1992, Rio de Janeiro, Brazil-Rio Declaration on Environment and Development, ..31 I.L.M. 874 (1992); [Principle 17-on EIA; Principle 15-precautionary principle; Principle 13-states shall develop national law regarding liability and compensation for victims of pollution and other environmental damage].

5 June 1992, Rio de Janeiro, Brazil-Convention on Biological Diversity, in force-December 29, 1993; http://www.biodiv.org 31 I.L.M. 818 (1992)

9 May June 1992, Rio de Janeiro, Framework-Convention on Climate Change, in force – March 21, 1994; http://www.unfcc.de 31 I.L.M. 8489 (1992).

23 March 1992 – Council Regulation 880/92 on A Community Eco-label Award Scheme, O. J. No. L 99/1 of 11 April 1992, 70; http://europa.eu.int/eur-lex/en/lif/dat/1992/en392R0880.html revised by Regulation (EC) No. 1980/2000 of the European Parliament and of the Council of 17 July 2000 on a Revised Community Eco-label Award Scheme O. J. L. 237 21.09.2000 p. 1.

3 December 1991, Paris, France –Good Practices for Environmental Impact Assessment of Development Projects endorsed by OECD Ministers of Environment and Development Cooperation, http://www.oecd.org

30 January 1991, Bamako, Mali-OAU Convention on the Ban of the Import to Africa and the Control of Transboundary Movement and Management of Hazardous Waste within Africa (with Annexes I-V),… Int'l Env. L. 991:08;30 I.L.M. 773 (1991), 31 I.L.M. 163 (1992) [Art. 4(3) (f) spells out precautionary principles; Art. 4(3) (b) –The Parties must impose unlimited and joint and several liability on hazardous waste

generators in Africa; Art. 4(1) – the import of hazardous wastes from non-contracting states into Africa is declared illegal and a criminal act] http://fletcher.tufts.edu/multi/texts/BH984.txt in force-April 22, 1998.

30 November 1990, London, United Kingdom-International Convention on Oil Pollution Preparedness, Response and Co-operation, …Int'l Env. Law. 990:88; 30 I.L.M. 773 (1991) in force –May 13, 1995; Nigeria is a party to the Convention

22 March 1989, Basel Switzerland–Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, in force – May 5, 1992; S 15 March 1990, R-13 March 1991; 28 I. L.M. 657 (1989); http://www.unep.ch/basel/tex/con e.pdf

18 1989, Brussels, Belgium-International Convention on Civil Liability for Oil Pollution Damage, http://www.imo.org

16 September 1987, Montreal, Canada-Montreal Protocol on Substances that Deplete the Ozone Layer, (in force-January 1, 1989) http://www.unep.org/ozone/mont t.htm as amended:1) London – 27-29 June 1990, 2) Copenhagen-23-25 November 1992,3) Vienna-5-7 December 1995, 4) Montreal – 15-17 September 1997, 5) Beijing – 3 December 1999

22 March 1985, Vienna, Austria- Convention on the Protection of the Ozone Layer, (in force –September 22, 1988) 26 I.L.M. 1529 (1987) http://www.unep.org/izibe/vc-textt.htm

3 March 1973, Washington, USA- Convention on International Trade in Endangered Species of Wild Fauna and Flora, (CITES-in force-July 1, 1975); 993 U.N.T.S. 243; 12 I.L.M. 1085 (1973), http://www.unep.ch/cites.html http://www.wcmc.org/uk/CITES/eng/index.shtml http://www.iucn.org

29 December 1972, London, United Kingdom, Moscow, Mexico City, Washington-Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, (in force –August 30, 1975) 18 I.L.M. 510 (1979); http://www.londonconvention.org http://ww.imo.org

23 16 June 1972, Stockholm, Sweden-Stockholm Declaration on the Human Environment*(Principle 22-States shall cooperate to develop further the international law regarding liability and compensation for vic*tims *of pollution and other environmental damage caused by activities within their jurisdiction or control of such states to area beyond their jurisdiction)* http://fletcher.tufts.edu/multi.texts/STOCKHOLM-DECL

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