

REPUBLIC OF KENYA



MINISTRY OF ENVIRONMENT, WATER AND NATURAL RESOURCES



## KENYA NATIONAL IMPLEMENTATION PLAN FOR THE STOCKHOLM CONVENTION ON PERSISTENT ORGANIC POLLUTANTS

2014-2019

The project "Updating of the Kenya National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants in Kenya" was developed with the financial and technical assistance of the Global Environment Facility through the World Bank Kenya Country Office.



Stockholm Convention



GEF



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## FORWARD

Chemicals are an integral part of modern life. There is hardly any industry or service sector where chemicals are not used. The UNEP Global Chemicals Outlook 2012 projects that chemicals production will continue to increase and sales will grow globally at 3%, with higher rates projected for developing countries.

In Kenya, chemicals contribute about 8% of Gross Domestic Product in agriculture, trade, manufacturing and energy sectors. The country uses approximately 8.2 billion Kenya Shillings (US\$100million) to import the chemicals, of which a small part is industrial POPs, giving an idea of business in chemicals. It is in the imports of plastic products, electrical and electronic goods, computers, mobile phones, foams and flame retardants that form the bulk of the newly listed POPs occur. The main challenge that comes with chemical use is the proper management of chemicals across the lifecycle. Poor management of chemicals comes with a price due to poor health and degraded ecosystems.

Kenya is Party to the Stockholm Convention whose objective is to protect human health and environment from persistent organic Pollutants. The first National Implementation Plan for POPs was developed and transmitted to the Stockholm Convention Secretariat in 2007. From that time the Conference of the Parties has added 10 more chemicals to the Convention annexes, hence necessitating the country to update her National implementation plan. The Development of the updated National implementation plan is a key milestone for Kenya and shows the country's commitment to implementing the Stockholm Convention.

The Ministry of Environment, Water and Natural Resources (MEWNR) is honored to play the lead role on behalf of Kenya in the review of policy, legal, regulatory and institutional frameworks to ensure compliance to the convention. Through it Kenya will put more effort to increased efficiency in adoption of new technologies and best practices in environmental management to eliminate use of intentionally produced persistent organic pollutants and to minimize the release of unintentionally produced ones.

It is important to note that the preparation of this NIP has been through a consultative and participatory process that gained valuable inputs from several stakeholders in the government institutions and the private sector. As the focal point for the Stockholm Convention the ministry will continue performing the leading role in the devolved system of government as provided in the Constitution 2010.

The updated National Implementation Plan shows the priority activities and strategies that Kenya will use to implement the Stockholm Convention on POPs including the new additional POP chemicals listed in the Convention annexes A, B and C, revised emission factors, and the provisions of the Kenya constitution 2010. The ministry will continue to provide for a for engagement of all the stakeholders in implementing the NIP.

A handwritten signature in black ink, appearing to read 'Richard L. Lesiyampe', is written over a horizontal line. The signature is fluid and cursive, with a large loop at the end.

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## **EXECUTIVE SUMMARY**

### **1. Persistent Organic Pollutants (POPs)**

Kenya is Party to the Stockholm Convention which is a globally binding treaty to protect human health and the environment from POPs. The Convention requires the Parties to adopt and introduce measures to reduce or eliminate releases of POPs to protect health and the environment. Kenya developed and transmitted her first National Implementation Plan for POPs to the Stockholm Convention Secretariat in 2007. The preparation of the updated NIP is a culmination of the fact that since 2007 to 2012a total of ten additional chemicals and groups of chemicals have been added to the Convention annexes, emission factors for calculating unintentionally produced POPs have been revised and the fact that the new constitution of Kenya 2010 entrenches a number of approaches the country should follow in addressing health and environment matters.

There are 22 chemicals currently listed under the Convention. This NIP outlines the priority activities and strategies that Kenya will follow to address management of POPs in her environment. The Plan was developed through participatory approach and in close consultation with the key national institutions, regulatory and research institutions, the private sector and the civil society.

### **2. POPS Inventory**

The preparation of the NIP was preceded by a detailed review of the POPs inventory and assessment of POPs management infrastructure in the country since 2007 to ensure a comprehensive and systematic update the NIP. The detailed assessment reports are provided in separate annex documents volumes:

- a) Vol.1 – POPs Pesticides- it provides detailed discussion of POPs production, import, export, alternatives and the human health population affected.
- b) Vol. 2 Industrial POPs –it provides detailed discussion of the newly added POPs compounds and electrical and electronic waste.
- c) Vol.3 Unintentionally produced POPs-it details the assessment of UPOPs the processes that make them produce UPOPs and the introduction of Best Available Technologies (BAT) and Best Environmental Practices(BEPs).
- d) Vol.4 Monitoring, research, Public Education and Awareness –it provides a summary of the national activities of public awareness, POPs monitoring activities, research and information exchange.
- e) Vol.5 Legal, Policy and Institutional aspects –it addresses the amendments to be made to make Kenya more compliant taking into consideration that Kenya has a new constitution which have revised the roles contained in the initial inventory.
- f) Vol.6 Socio Economic Assessment.

The development of these inventories followed the mechanisms provided in the convention guidance documents and materials which include the decisions of the conference of Parties, reports of the convention bodies, guidelines for developing national inventories and NIPs, toolkits for developing inventories, Kenya government policy documents and regulatory frame works among others.

### **3. Current Status of POPs**

#### **a) Pesticides POPs**

Most POPs pesticides are now either restricted or banned in the country. DDT continues to be banned for agricultural use and restricted for Public Health use. Kenya is currently engaged in promoting and developing of DDT alternatives that need to be up-scaled to the level of commercialization. Further effort also geared towards ensuring the control of illegal POPs entering Kenya and to dispose the present stockpiles and wastes estimated at 200 tons, as well mopping up the remaining obsolete stocks in the country.

## **b) Industrial POPs**

Kenya does not produce any of the four industrial POPs. The newly listed industrial POPs come as products and are released into the environment as POPs. Since 2007 there has been an exponential rise in the amounts of Polybrominated Diphenylether (PDEs) released from computers, monitors, printers, mobile phones, televisions and refrigerators and other unclassified sources to about 144 tons. About 1.5 million units of PFOS fire retardants are imported into Kenya are released during training and fire-fighting activities. The biggest threat is from plastics, electrical and electronic waste.

## **c) Unintentionally Produced POPs (UPOPs)**

Unintentionally produced POPs include: dioxins, furans and pentachlorobenzene. A total of 2872 toxic equivalents (TEQs) were released in 2012. Medical waste incineration contributed 837.1 TEQ, heat and power generation 964.1 TEQ, whereas open burning processes contributed 241.1 TEQ/year.

## **4. Strategies and Action Plans**

The NIP outlines several strategies and action plans that Kenya seeks to employ for effective management of POPs in the country. It recognises the fact that there are a number initiatives on public education, awareness creation, monitoring and research. Assessment indicates, they are all underfunded and new funding approaches should be put in place to accelerate these activities. There is also a lot of information available on the convention website that need to be synthesized for local consumption and transmitted to the stakeholders.

The NIP update shows that Kenya lacks established national POPs monitoring programme. Most of the POPs monitoring data in the country has been produced through Global Monitoring Program (GMP) activities. There is no systematic analysis of POPs residues in water and air from the national priority hot spots. However, the existing human and analytical capacity can support analysis of most of the basic POPs pesticides and PCBs. But this requires provision of spare parts and consumables to support POPs monitoring and research activities.

Kenya has several legislations and regulatory frameworks addressing chemical management. The draft regulations on electronic waste should be updated to include the related newly listed POPs. To comply the updated NIP addresses the following convention obligations;

### **a. Awareness creation, Public Education, Research, Technical and Financial Assistance**

The assessment of existing infrastructure revealed commendable initiatives by universities, research institutions and the private sector. However, there is a need to build capacity for assessment, evaluation of socio economic aspect of alternatives to POPs chemicals as well as the introduction of BAT and BEP. This should be promoted through better networking arrangements especially between the institutions in the implementation matrix.

### **b. Addressing future listing of chemicals**

The Stockholm convention is dynamic and assessment and listing of chemicals is continuous. There is need to continue to participate in the conventions regional and global initiatives to support POPs management activities.

### **c. Capacity building**

Because of lack of institutional mechanism that addresses POPs, Kenya will need to build on existing programs to create awareness and education of the general public. The threat of POPs requires coordinated action at national, regional and county levels. This will involve working with government institutions, nongovernmental organizations and the international agencies to develop and implement appropriate interventions.

**d. Financing the NIP**

The total cost of the NIP is estimated at Kshs 5.8 billion Kenya Shillings equivalent to US\$670 million. It will be funded by the National Government, county governments, bilateral programmes and the Global Environment Facility. The detailed budget lines are detailed in the Appendix.

Lack of funding was the greatest impediments to the implementation of the first NIP. This NIP proposes an objectively organized resource mobilization strategy that will see the establishment of the national coordination structure for POPs management activities, establishment of thematic groups for development of project proposals and streamlining of the NIP activities in the national and county development agenda.

**e. Coordination Mechanism**

The updated NIP will be implemented over a 5 year period from 2014 to 2019 by diverse of institutions specialized in POPs. The coordination office will be in the Directorate of Environment. A NIP implementation committee will be composed of Ministries of Environment Water and Natural Resources, Health, Energy, Devolution and Planning. National Environment Management Authority, Pest Control products Board, Kenya Medical Research Institute, universities and ICIPE. Non government organizations will be invited to participate. The counties of Nairobi, Mombasa Kisumu and Garissa will be members to represent the devolved government.

## **5. Endorsement and Implementation**

The NIP was endorsed on 21<sup>st</sup> May 2014, by stakeholders. By endorsing this NIP Kenya commits to address each of the action plans. This role may be specific to institutions, but also cross-sectoral. The implementation matrix in Annex 1 shows details of institutions specific actions.

## **6. The NIP lay out**

The NIP has 10 chapters.

**Chapter 1** reviews the POPs issues, describing the convention obligations and the chemicals to be regulated. It also gives the background of the NIP updating process.

**Chapter 2** is on the country baseline in relation to POPs, political, social and economic status of Kenya which will influence the pace and rate of the implementation process. It highlights the fact that industrial, agricultural and waste runoff can lead to large-scale fish kills and even lower levels of chemicals contamination of water and air can decimate fish populations over time. Chemicals contamination is associated with diseases in fish populations including cancers, and increased vulnerability to infectious diseases

**Chapter 3** highlights past and current programmes for monitoring releases and environmental and health impacts. This comes from sporadic monitoring and research much on pesticides showing levels of pesticide POPs found in breast milk, fish, water and air.

**Chapter 4** dwells on why and how Kenya needs to build on to existing programs to create awareness and education to the public that the threat of POPs is real and action is required at national, country and local levels.

**Chapter 5** is an assessment of current infrastructure assessment, measurement, analysis and the socio economic aspects of alternatives to POPs chemicals introducing BAT and Practices. Generally, more needs to be done to support what is already ongoing in terms of policy and infrastructure enhancement. The institutions to do so are highlighted in Annex 1.

**Chapter 6** recognizes that the convention being dynamic, assessment and listing of chemicals will be continuous.

**Chapter 7** is an overview of the technical and infrastructural facilities for future POPS management. It highlights the initiatives and progress made in monitoring POPs in the environment especially on pesticides. The main observation being that although there are several initiatives their objectives are largely academic and therefore they need high level recognition so that the findings coming out of; can influence policy formulation.

**Chapter 8** addresses the summary needs of Kenya into objectives that address specific POPs and their cross sectoral nature. It highlights the policy strategic objectives and actions for POPs pesticides, listed industrial chemicals, UPOPs, monitoring and legal and policy issues.

**Chapter 9** is on the technical and financial resources. It recognizes that although the convention has a financing mechanism, the onus is for the Kenya Government to mobilize the resources from the GEF and recognize that GEF funds attract a co-financing requirement which four parts should come from the people and the Government of Kenya.

**Chapter 10** concludes with specific activities that will be taken their timing and estimated financial requirements. Annex 1 is the Implementation matrix.

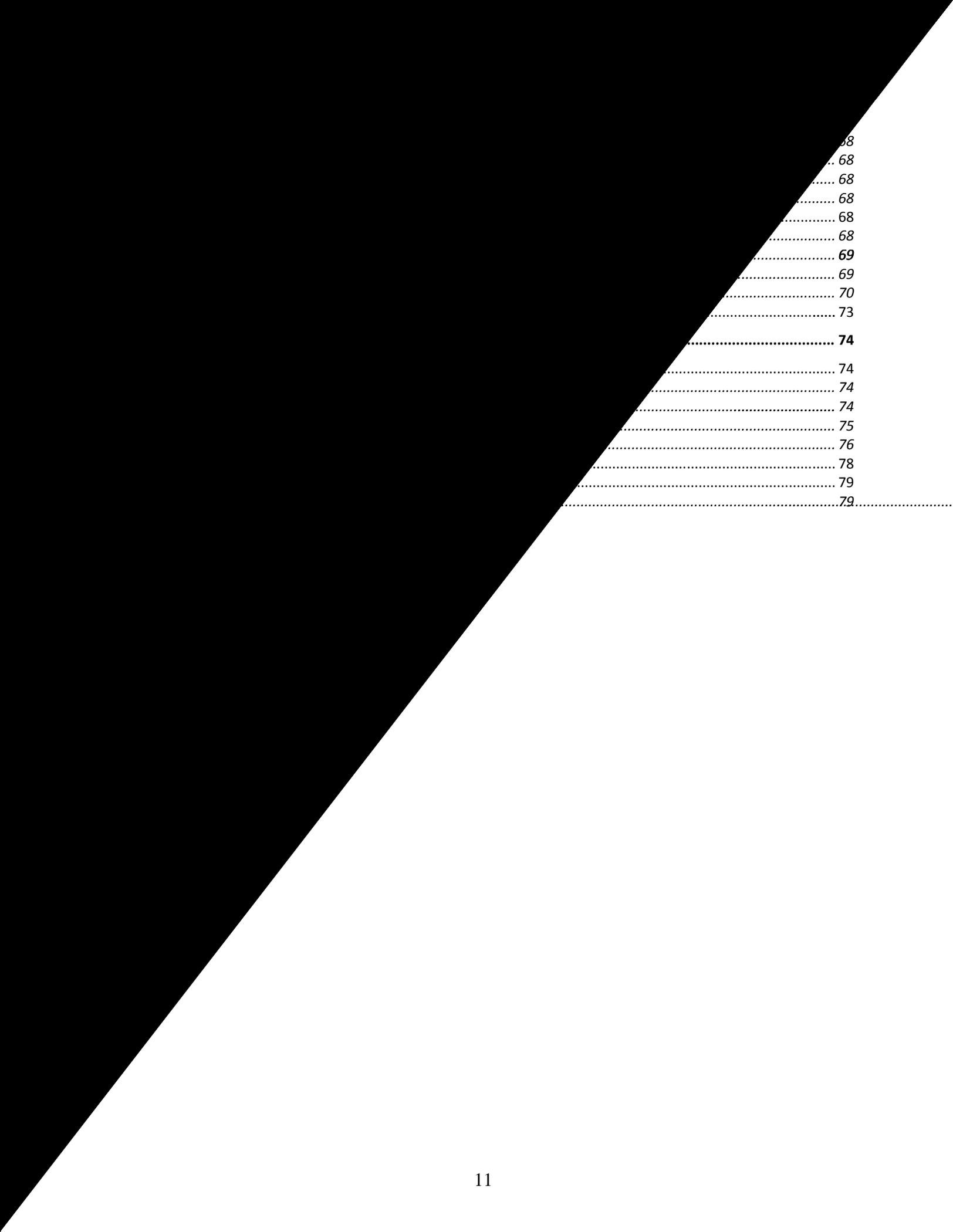
## GLOSSARY OF TERMS AND UNITS USED

ABS	Acrylonitrile Butadiene Styrene <i>plastic</i>
APC	Air Pollution Control
AFFF	Aqueous Film-Forming Foam
BAT	Best Available Techniques
BEPs	Best Environmental Practices
BFR	Brominated Flame Retardants
COP	Conference of the Parties
DDT	Dichlorodinitodiphenyl toluene
EEE	Electrical and Electronic Equipment
EMCA	Environmental Management Authority
e-waste	Electronic waste
Fluoroprotein	Fluorinated surfactants in a carefully formulated protein foam liquid base
GC	Gas Chromatograph
GMEA	General Motors East Africa
GDP	Gross Domestic Product
GEF	Global Environment Facility
GoK	Government of Kenya
HBB	Hexabromobiphenyl
ICIPE	International Centre for Insect Physiology and ecology
IPM	Integrated Pest Management
IVM	Integrated Vector Management
JKIA	Jomo Kenyatta International Airport
KARI	Kenya Agricultural Research Institute
KEMRI	Kenya Medical Research Institute
KMD	Kenya Meteorological department
KNBS	Kenya National Bureau of Statistics
KRA	Kenya Revenue Authority
Kshs	Kenya Shilling
KVM	Kenya Vehicles manufacturers
MEAs	Multilateral Environmental Agreements
M&E	Monitoring and Evaluation
MoA	Ministry of Agriculture
MoE	Ministry of Energy
MoE	Ministry of Education
MoH	Ministry of Health
Mitumba	Second hand clothes and textile
MSDS	Material Safety Data Sheet
NEMA	National Environment Management Authority
Ng	Nanogram (10 <sup>-9</sup> g)
NIPs	National Implementation Plans
NGOs	Non Governmental Organization
PBDEs	Polybrominated diphenylethers

PBT	Persistent, Bioaccumulative, and Toxic
PCPB	Pest Control Products Board
PCB	Polychlorinated biphenyls
PBDEs	Polychlorinated Dibromo Diphenyl Ethers
Perfluorinated Compounds	Compounds with chemical formula (C <sub>n</sub> F <sub>2n+1</sub> COOH,) and (C <sub>n</sub> F <sub>2n+1</sub> SO <sub>3</sub> H, )
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctanesulfonate
PFOS-F	Perfluorooctane sulfonic fluoride
Pg	Picogram (10 <sup>-12-12</sup> g)
POPs	POPs
PUR foam	Polyurethane Foam
SAICM	Strategic Approach to International chemicals Management
SOE	State of Environment
SDE	State Department of Environment
TKL	Toyota Kenya Ltd
UN	United Nations
UNDP	United Nations Development Programme
UPOPs	Unintentionally Produced POPS
UNEP	United Nations Environment Programme
WEEE	Waste of Electrical and Electronic Equipment
TEQs	Toxic Equivalents
WHO	World Health Organization
AAK	Agro-Chemical Association of Kenya
ASP	African Stockpiles Program



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## CHAPTER 1: PURPOSE OF NIP, AND AN OVERVIEW OF THE STOCKHOLM CONVENTION.

### 1.0 Chemicals in Perspective

The sound management of chemicals places significant responsibilities on governments and the private sector. Many nations have created competent authorities for managing chemicals. The private sector has established effective processes and practices for using chemicals appropriately and effectively managing their emissions and wastes. However, the need for a broad and comprehensive approach to the sound management of chemicals requires recognition of different capacities and commitments of governments, institutions and industries that today manage chemicals. To carry out these responsibilities there exist a broad range of legal, professional and program instruments and approaches, which may be regulatory, economic, or technical, and which can be categorized by various goals:

**First is controlling Chemical Pollution which may include** pollution control activities such as end of pipe solutions with emission limits and chemical waste fees. These approaches frequently take a chemical-by-chemical or single environmental media approach. This is what the Kenyan standards are based on.

**Second is preventing Chemical Pollution.** In the early 1990s, Kenya Government institutions began to deploy policies that looked upstream to prevent pollution and reduce the use of toxic products, rather than control downstream emissions or remediate contamination. These instruments include pollution prevention planning, chemical accident prevention and cleaner production assessments within the technical category, as well as economic instruments such as chemical use fees and taxes and chemical leasing. The launch of the United Nations Environment Programme (UNEP)/United Nations Industrial Development Organization (UNIDO) Cleaner Production Program was also a significant initiative in chemicals pollution prevention which has seen many institutions awarded by the Kenya Cleaner Production Centre.

**Third is r**

One obstacle to reducing the use of toxic chemicals is the perceived lack of effective safer alternatives. In assessing alternatives, issues include the functional requirements for various uses, cost, availability, and environmental health and safety considerations. Decision-making on chemicals of elevated concern and their alternatives tend to require extensive collection and analysis of information of chemical characteristics, including chemical screening and characterization. Assessment, characterization, and prioritization of chemicals are important for governments with limited budgets to target their resources effectively. That is why in recent years, a new approach to the manufacture and use of chemicals has emerged. Green Chemistry, or Sustainable Chemistry, seeks to reduce risk by generating chemicals that are inherently safer, rather than looking at the potential downstream impacts of chemicals. While the greatest concentration of green chemistry activity is taking place in the developed nations, efforts are being made to cooperate with middle-income countries, developing countries and countries with economies in transition on green chemistry approaches. UNIDO's programs on chemical leasing as a business model

## 1.1 The Stockholm Convention

The Stockholm Convention on persistent organic pollutants (POPs), which was adopted in May 2001 and entered into force in May 2004, has the objective of protecting human health and the environment from POPs. The full text of the Convention and its annexes<sup>1</sup> is available on the Stockholm Convention website ([www.pops.int](http://www.pops.int)). Parties to the Stockholm Convention are required to develop national implementation plans (NIPs) to demonstrate how the obligations of the Convention will be implemented, and to review and update their NIPs, as appropriate, periodically and to address new obligations under the Convention. The Convention is guided by the Conference of Parties (COP) that meets every two years. The POPs Review Committee (POPRC) provides guidance on scientific, technical and economic issues regarding the chemicals to be controlled. Another expert group under the convention addresses best available technologies and best environment practices (BAT and BEP).

Kenya is a party to the *Convention* which it ratified in 2004 and transmitted her first NIP in 2007. The amendment having entered into force on 26<sup>th</sup> August, 2010, created new compliance and implementation obligations for Kenya - to review and update its NIP and transmit it to the COP within two years of the date of entry into force. In addition the new dispensation created by the Constitution of 2010<sup>2</sup>, requires Kenya to update its NIP.

### 1.1.1 Obligations to Parties

At its fourth meeting held from 4 to 8 May 2009 the CoP to the Stockholm Convention on POPs adopted amendments to Annexes A, B and C to the Stockholm Convention to list nine new POPs.<sup>3</sup> The above-mentioned amendments entered into force on 26 August 2010 for all parties, except those that had submitted a notification of no acceptance in accordance with the provisions of paragraph 3 (b) of Article 22, or that had made a declaration in accordance with paragraph 4 of Article 25, in which case such amendments enter into force on the ninetieth day after the date of deposit of those parties' instruments of ratification, acceptance, approval or accession with regard to such amendments.

In the light of the above, pursuant to Article 7 paragraph 1 (c) of the Convention and taking into account decisions SC-1/12 and SC-2/7, those parties, for which the 2009 amendments entered into force on 26 August 2010, should transmit their revised and updated national implementation plans to the COP by 26 August 2012. Each remaining party will need to transmit its revised and updated national implementation plan within two years of the date on which the amendments enter into force for it.

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<sup>1</sup> The Convention was amended at the first meeting of the CoP to add a new Annex G on arbitration and conciliation procedures. The Convention text was also amended in 2009 and in 2011 to include 10 new POPs to its Annexes A, B and C.

<sup>2</sup> The constitution devolved some issues related to POPs such as minimising emissions to counties and the titles of implementing agencies and institutions also changed

<sup>3</sup>Decisions SC-4/10 to SC-4/18.

At its fifth meeting, held from 25 to 29 May 2011, the COP adopted an amendment to Annex A to the Stockholm Convention to list technical endosulfan and its related isomers, with specific exemptions.<sup>4</sup> The amendment entered into force on 27 October 2012 for all parties, except those that had made a declaration in accordance with paragraph 4 of Article 25, in which case such amendment enters into force on the ninetieth day after the date of deposit of those parties' instruments of ratification, acceptance, approval or accession with regard to such amendment.

Likewise, those parties for which the amendment entered into force on 27 October 2012 should transmit their revised and updated national implementation plans to the COP by 27 October 2014<sup>5</sup>. Each remaining party will need to transmit its reviewed and updated national implementation plan within two years of the date on which the amendment enters into force for it<sup>6</sup>.

### **1.1.2 The risks posed by POPs**

POPs are organic, natural and anthropogenic compounds which are persistent in nature. Most of them are pesticides while others are industrial chemicals and by products such as POPs have been identified by the world community as dangerous to health and environment and therefore requiring urgent and immediate action at national, regional and global levels. The negotiation started in 1998 and ended after five negotiating sessions leading to the diplomatic conference this May 2001 in Stockholm in Sweden. The biggest problem with POPs is that they:

- Have high toxicity to man and animals
- Resist degradation in the environment
- Are not easily soluble
- Are highly soluble in animal fat (e.g. fish, meat)
- Bio-accumulate in fatty tissues
- Are highly mobile in regional and global environment.

The Stockholm Convention on POPs is a global treaty signed by 151 States and regional economic integration organizations with the objective to protect human health and the environment from POPs. Parties to the Convention are required to develop and endeavor to put into practice a National Implementation Plan (NIP) setting out how they will implement their obligations under the Convention. This plan should be submitted within two years of the date on which the Convention entered into force for that Party.

### **1.1.3 The need to update NIP**

This updated NIP for Kenya was produced in response to the dynamic nature of the convention. Since 2004, 10 additional POPs have been listed, the fact that Kenya has a new constitution, and new emission factors for unintentionally Produced POPs (UPOPs) have been established.

The updated Kenya NIP has been developed by the Ministry of Environment, Water and Natural Resources (MEWNR), State Department for Environment and Natural Resources (DENR) in close collaboration with the other relevant Government Departments and Agencies

### **1.1.4 Chemicals covered by the Convention**

The Stockholm Convention currently focuses on reducing and eliminating releases of 22 POPs which include the initial 12 POPs and 10 additional new POPs. Nine of the initial POPs listed in Annex A and are destined for elimination with specific time-limited exemptions. These include the agricultural chemicals such as aldrin, chlordane, dieldrin, endrin, heptachlor, mirex, and toxaphene, as well as the industrial chemicals hexachlorobenzene (HCB), and polychlorinated biphenyls (PCBs). POPs listed in

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<sup>4</sup>Decision SC-5/3.

<sup>5</sup> For Kenya it was required to deposit in August 2012

<sup>6</sup> Thereafter it will report every two years and review its POPs emissions every 4 years

Annex B are subject to restrictions on production and use, but eligible for specific exemptions for acceptable purposes. These include the pesticide DDT. Annex C contains POPs that are unintentionally produced, for example as industrial byproducts and combustion processes, and include polychlorinated dibenzo-p-dioxins, polychlorinated dibenzofurans, PCBs, and HCB. The newly listed POPs include chemicals added to the Convention in 2009 and 2011. These include: chlordecone, lindane, alpha hexachlorocyclohexane, beta-hexachlorocyclohexane, endosulfan, commercial pentabromodiphenyl ether, commercial octabromobiphenyl ether, hexabromobiphenyl, perfluorooctane sulfonic acid (PFOS), its salts, and perfluorooctane sulfonyl fluoride (PFOSF), and pentachlorobenzene.

#### **1.1.5. Listed chemicals**

The list of the chemicals is in Table 1.

#### **1.1.6 Risks of not complying**

- It is against current constitution.
- The continued pesticide use is a risk to human health and the environment
- Fish Products can be affected thus impacting Kenyan and international trade
- POPs residue in horticulture could affect Kenya trade
- It does not reflect well on Kenya Internationally

Table 1. POPs listed in Annexes A, B and C<sup>7</sup>

Article	Nature of provision			Measure to Take	Action taken	
3 and 4	Intentionally produced POPs	Pesticides	Annex A	Aldrin	Eliminate	Done
				<b>Alpha hexachlorocyclohexane*</b>		<b>Done</b>
				<b>Beta hexachlorocyclohexane*</b>		
				Chlordane	Eliminate	Done
				<b>Chlordecone*</b>		<b>Done</b>
				Dieldrin	Eliminate	Done
				Endrin	Eliminate	Done
				Heptachlor	Eliminate	Done
				Hexachlorobenzene	Eliminate	Done
				<b>Lindane*</b>		<b>Initiated</b>
				Mirex	Eliminate	No
				<b>Pentachlorobenzene*</b>		<b>No</b>
				Toxaphene	Eliminate	Done
				Annex	DDT	Exception
	Industrial chemicals	Annex A	<b>Hexabromobiphenyl*</b>	<b>Minimize</b>	<b>None</b>	
			<b>Hexabromodiphenyl ether and heptabromodiphenyl ether*</b>	<b>Minimize</b>	<b>None</b>	
			Hexachlorobenzene	Eliminate	None	
<b>Pentachlorobenzene*</b>			<b>Minimize</b>	<b>None</b>		
Polychlorinated biphenyls			Eliminate			
<b>Tetrabromodiphenyl ether and pentabromodiphenyl ether*</b>				<b>None</b>		
Annex			<b>PFOS, its salts and PFOSE*</b>		<b>None</b>	
5	Unintentionally produced POPs	Annex C	Dioxins	Minimize	Some	
			Furans	Minimize	Some	
			Hexachlorobenzene	Minimize emissions	none	
			<b>Pentachlorobenzene*</b>	Minimize emissions	None	
			Polychlorinated biphenyls	Minimize	Some	
* Added at the fourth meeting of the CoP and entered into force on 26 August 2010.						

Source: Text of the Convention

The Stockholm Convention establishes a strong international framework for promoting global action on POPs, which are divided into three groups according to their mechanism of production and level of restriction as follows.

- a) Nineteen of the intentionally produced chemicals are subject to a ban on production and use except where there are generic or specific exemptions.
- b) The production and use of DDT is severely restricted.
- c) Parties are required to take measures to reduce releases from the unintentional production of dioxins, Hexachlorobenzene (HCB) and pentachlorobenzene (PeCB) with the goal of minimizing and, where feasible, ultimate elimination. The main tool for this is the development of source inventories and release estimates as well as plans for release reductions. The use of Best Available Techniques (BAT) to limit releases of unintentionally produced POPs from the major sources, as categorized in the Convention, is also required.

<sup>7</sup> Initial 12 POPs and the new 10 POPs

- d) There are special provisions for those Parties with regulatory assessment schemes to both reviewing the existing chemicals for POP characteristics and to take regulatory measures to prevent the development, production and marketing of new substances with POP characteristics.
- e) The Convention also makes provision for the identification and safe management of stockpiles containing or consisting of POPs.
- f) Waste containing, consisting of or contaminated with POPs should be disposed of in such a way that the POPs content is destroyed or irreversibly transformed. Where this does not represent the environmentally preferable option or where the POP content is low, waste shall be otherwise disposed of in an environmentally sound manner.
- g) Disposal operations that may lead to the recovery or re-use of POPs are forbidden.

The Convention recognizes the particular needs of developing countries and specific provisions on technical assistance, and the Global Environment Facility(GEF) has financial resources and mechanisms included in the general obligations for parties in developing regions.

#### **1.1.6 Objectives of the convention**

The key objectives of the convention are to:

- a) Eliminate production and use of aldrin, edrin, toxaphene at entry into force of the convention.
- b) Control use of Chlordane, dieldrin, heptachlor, mirex, HCB and review sometimes.
- c) Eliminate production of DDT for all except public health uses e.g. malaria but continue review of alternatives developed.
- d) Eliminate PCB production for all new uses but permit use of PCB in equipment and phase out as soon as possible by 2025.
- e) Minimize emission of unintentionally produced POPs such as dioxins and furans
- f) Monitor environmental and health impacts of POPs.
- g) Address social and economic issues.

#### **1.1.7 Implementation activities for Kenya.**

Under this convention in their implementation efforts, parties are to take the following action:

- i. Designate a National Focal Point
- ii. Promote and facilitate a wide range of public information, awareness and education measures
- iii. Encourage/undertake research, development, monitoring and cooperation on all aspects of POPs and their alternatives
- iv. Report to the Conference of Parties (COP) on:
  - a. Measures taken Kenya to implement the Convention
  - b. Effectiveness of measures taken
  - c. Data/estimates for total quantities of POPs in Annex A and B that are traded, and list of States involved and status of Intentionally Produced POPs

### 1.1.8 Specific requirements for intentionally produced POPs

Intentionally produced POPs (industrial chemicals and pesticides), production and use will be either eliminated or restricted and, in each case, trade will be restricted.

- Nine (9) chemicals are slated for eventual elimination (Annex A of the convention):
- They are Aldrin, chlordane, dieldrin, edrin, heptachlor, hexachlorobenzene (HCB), mirex, polychlorinated biphenyls (PCBs) and , toxaphene
- For PCBs, all Parties must: Cease production of new PCBs immediately (entry into force); and eliminate use of in-place PCB equipment by 2025; and make best efforts to identify, label and remove from use equipment containing > 50ppm, with higher priority given to equipment containing higher levels of PCBs.
- For DDT, Kenya must eliminate production and use except when needed for disease vector control programs and only when locally safe, effective and affordable alternatives are not available;

### 1.1.9. Trade issues:

Most of the POPs to be controlled have trade implications. The convention provides that trade will be restricted for all POPs in Annexes A and B and imports and exports are limited to shipments and intended for environmentally sound disposal. In each case the Convention Secretariat will be informal.

### 1.1.10 Unintentionally Produced POPs (UPOPs)

Hexachlorobenzene, pentachlorobenzene, polychlorinated biphenyls, and polychlorinated dibenzo-*p*-dioxins and dibenzofurans are unintentionally formed and released from thermal processes involving organic matter and chlorine as a result of incomplete combustion or chemical reactions. The following industrial source categories have the potential for comparatively high formation and release of these chemicals to the environment; The two classes are detailed herebelow

#### Class I

- Waste incinerators, including co-incinerators of municipal, hazardous or
- (a) medical waste or of sewage sludge;
- (b) Cement kilns firing hazardous waste;
- (c) Production of pulp using elemental chlorine or chemicals generating elemental chlorine for bleaching;

#### Class II

Category 3 are diffuse sources including:

- a) Open burning of waste, including burning of landfill sites;
- b) Thermal processes in the metallurgical industry not mentioned in Part II;
- c) Residential combustion sources;
- d) Fossil fuel-fired utility and industrial boilers;
- e) Firing installations for wood and other biomass fuels;
- f) Specific chemical production processes releasing unintentionally formed POPs, especially production of chlorophenols and chloranil;
- g) Crematoria;
- h) Motor vehicles, particularly those burning leaded gasoline;
- i) Destruction of animal carcasses;

- j) Textile and leather dyeing (with chloranil) and finishing (with alkaline extraction);
- k) Shredder plants for the treatment of end of life vehicles;
- l) Smoldering of copper cables;
- m) Waste oil refineries.

According to Article 5 of the Convention, action plans shall include evaluations of current and projected releases using UNEP Dioxin Furan Toolkit, assessing those that are derived through the development and maintenance of source inventories and release estimates, taking into consideration the Source Groups addressed in Annex C and best available technologies and practices.

#### **1.1.11 Information exchange:**

According to article 9 of the Stockholm Convention (SC), each party is obliged to facilitate and undertake exchange of information relevant to reduction and elimination of the production, use and release of POPs (POPs), and alternative to POPs, including their risks and economic and social costs.

#### **1.1.12 Public information, awareness and education**

According to Article 10, each party to the Convention is required, within its capabilities, to promote public information, awareness and education regarding POPs among its policy and decision makers and the general public. Each party should develop and implement education and public awareness programmes on POPs and their health and environmental effects, as well as alternatives to POPs; ensure public participation in programmes addressing POPs and their health and environmental effects and in developing adequate responses. Each party is required to train workers, scientists, educators and technical and managerial personnel; develop and exchange educational and public awareness materials at the national and international levels; and develop and implement training programmes at the national and international levels.

In implementing its obligations Kenya is required to ensure that information on POPs is kept up to date, and to encourage industry and professional users to promote and facilitate exchange of information related to POPs at national and, as appropriate, at regional and global levels. In addition, there is need to provide information on POPs alternatives using safety data sheets, mass media among other means as deemed appropriate, including establishment of information centers at national and regional levels, and developing mechanisms for collection and dissemination of information on estimates of the annual quantities of the chemicals listed in Annex A, B or C that are released or disposed.

#### **1.1.13 Research, development and monitoring**

Article 11 on research, development and monitoring encourages each party to the Convention to undertake appropriate research, development, and monitoring and cooperation pertaining to listed POPs, their alternatives and candidate POPs. Priority research activities include production of POPs data on their: 1) Sources and releases into the environment, 2) Presence, levels and trends in human and environment, 3) Environmental transport, fate and transformation; 4) Effects on human health and environment; 5) Socioeconomic and cultural impacts; 6) Release reduction and and/or elimination, and 7) Harmonized methodologies for making inventories of generating sources and analytical techniques for the measurement of releases.

Each party to the Convention is encouraged to support and further develop international programmes, networks and organizations aimed at defining, conducting, assessing and financing research, data collection and monitoring, taking into account the need to minimize duplication, support national and international effort to strengthen national scientific and technical capacities, undertake research geared

to alleviate effects of POPs on reproductive health, support publication of their research, development and monitoring activities on timely and regular basis, and encourage and/or undertake cooperation with regard to storage and maintenance of information generated from research, monitoring and development activities.

## **1.2. Why NIP needs updating**

The first Kenya NIP was endorsed in March 2007. Since then, the convention parties have added ten new chemicals and made new requirements to the management of POPs. They include:

- Additional 10 POPs
- Revised the emission factor for UPOPs
- Drafted new guidelines for source point emissions
- Designated ICIPE as an the African Regional centre for developing non chemical alternatives to pesticide POPs

These require revision of the national action plans.

### **1.2.1 Newly Listed POPs**

The new POPs are the substances that were listed in the Stockholm Convention at the 4th and 5th CoP (COP) to the Stockholm Convention held in May 2009 and in April 2011, respectively,

Annex A substances, Pesticides (chlordecone, alpha and beta hexachlorocyclohexane (HCH), endosulfan and lindane (gamma HCH))

#### **a) Alpha hexachlorocyclohexane**

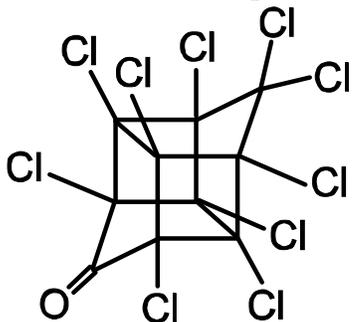
Listed in Annex A. No exemptions, it is a by-product of lindane. Use of this chemical as an insecticide was phased out years ago worldwide. Its formula is as shown below.

#### **b) Beta hexachlorocyclohexane**

Listed in Annex A. No exemptions, it is also a by-product of lindane and use of this chemical as an

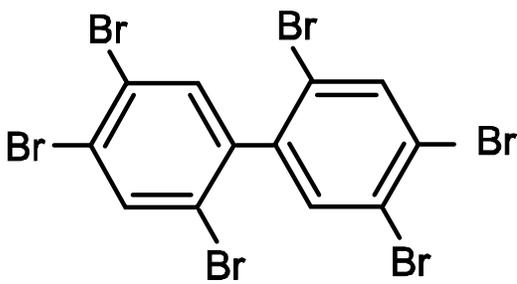
**c) Chlodecone**

Listed in Annex A . No exemptions it is an organo-chlorine pesticide, chemically related to Mirex, used since 1950s but phased out.



**d) Hexabromobiphenyl**

Listed in Annex A. No exemptions. It is an industrial chemical used as a flame retardant. Mainly used in the 1970s.



**e)6 Hexabromodiphenyl ether and heptabromodiphenyl ether**

Listed in Annex A with specific exemption is use in recycling of articles containing these substances. Registered parties can use these substances for this purpose until 2030 components of commercial octabromodiphenyl ether (OctaBDE) and brominated flame retardants.

**f) Lindane**

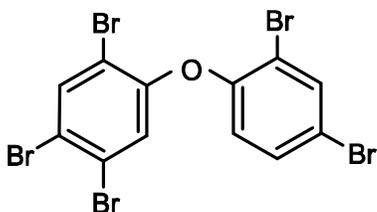
Listed in Annex A, with a specific exemption, for use as human health pharmaceutical for control of head lice and scabies as second line treatment. Initially used in Kenya as a broad-spectrum insecticide for seed and soil treatment, foliar applications, tree and wood treatment and against ecto-parasites in both veterinary and human applications. Registered parties can continue using lindane for this purpose for five years from the date of entry into force.

**g) Pentachlorobenzene**

Listed in Annex A and C it has no exemptions. Previously used in PCB products, in dyestuff carriers, as a fungicide and a flame retardant, chemical intermediate for the production of quintozene. Could be released unintentionally.

**h) Tetrabromodiphenyl ether and pentabromodiphenyl ether**

Listed in Annex A with specific exemption for use in recycling of articles containing these substances. Registered parties can use these substances for this purpose until 2030. Components of commercial pentabromodiphenyl ether (PentaBDE) brominated flame retardants are as shown below.



**i) Perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride**

Listed in Annex B with acceptable purposes and specific exemptions for production and use. Current intentional uses of PFOS are widespread. Acceptable purposes that are allowed for registered parties to continue to use and produce are:

**1.2.2. Emissions of dioxins and furans and revised emission factors**

In accordance with the iterative revision process set forth in the Toolkit, emission factors are periodically verified, updated and supplemented via targeted projects and research. Furthermore, as the focus of the Toolkit is exclusively on unintentional POPs, it can be regarded as a comprehensive compilation of emission factors for POPs releases to air, water, soil, products and residues.

The default emission factors presented in the Toolkit are drawn from a variety of data sources, ranging from laboratory experiments, peer reviewed literature and dedicated experimental projects to governmental or institutional reports. The emission factors for each class are best estimates, based where possible on data measured at well-documented sources taking into account technology, process characteristics and operating practices, or estimates based on expert judgment. Dioxin emission factors have been revised or newly developed for the following source groups: 2 – Ferrous and non-ferrous metal production; 3 – Power generation and heating; 4 – Mineral products; and 6 – Uncontrolled combustion processes.

**1.3 Mechanism used to review and update the NIP**

The NIP update was initiated by the MEWNR with the support of the Global Environment Facility. The MEWNR established a coordination office to guide the process. Situated in the Directorate of Environment, Department of Multilateral Environmental Agreements (DMEAS) an inter-ministerial coordinating committee was established.

**a) Phase I – Establishment of coordinating mechanism and process organization**

This phase raised awareness within Government ministries and agencies of the POPs issue, the Stockholm Convention and the need to develop updated NIP achieving political commitment to allow the successful development of the NIP. It involved formation of updated NIP team and a mechanism to involve all relevant stakeholders in particular building on work with SAICM(annex 2), developed the structure, framework and procedures for the development of the updated NIP using the services of necessary experts, resources and facilities and initiated an information dissemination campaign.

An inception workshop was held in April 2013 which brought in the principal institutions and selected possible experts to carry out the process of updating.

**b) Phase II – Establishment of POPs inventories and assessment of national infrastructure and capacity**

This phase involved production of an updated background information on the POPs issue, including a summary of the situation within Kenya since the last NIP and how the NIP issue is currently understood and a summary of the requirements of the amended Stockholm Convention. It made a preliminary assessment of relevant sectors and activities which are likely affected by measures required by the Convention and determine the stakeholders to be targeted. It had the following activities. This phase will endeavor to:

- i. Carry out specific assessments, including targeted data generation and data gathering, required to provide the necessary background information and POPs baseline to stakeholders understand the scope of the POPs issue and to complete a NIP. These assessments built as much as possible on existing information sources.
- ii. Identified gaps in resources, capacity and knowledge which prevent the complete assessment of the status of POPs and
- iii. Identified Kenya needs in terms of technical expertise and other assistance to implement the NIP.
- iv. Facilitated coordination and integration with national sustainable development, chemicals management and pollution control policies.
- v. Facilitated coordination, as appropriate, with activities addressing other regional, sub-regional and international environmental agreements e.g. Rotterdam Convention especially for the Eastern Africa Region.



*Figure 1: Team consulting with staff of Oserian Flowers*

The inventories were supported by field visits to the Central Region, Coast Region, Rift Valley, Western and Nyanza Regions. The reports of the stakeholder consultations form part of the inventories’

The following inventories for an Annex to this updated NIP

- i. POPs pesticide inventory
- ii. Industrial Chemicals
- iii. e-Waste
- iv. Unintentionally Produced POPS and BAT and BEP
- v. Research, Monitoring and Public Education
- vi. Legal, Policy and Institutional issues
- vii. Social Economic Assessment

The inventories were validated in a workshop.

**Phase III –**

## CHAPTER 2. COUNTRY BASELINE AND THE POPS ISSUE

### 2.1 Policy Framework

The Government of Kenya recognizes the importance of managing risks posed by POPs through the development of policies and action plans as well as building the capacity for comprehensive chemicals management. In addition, the NIP responds to the existing and potential impacts of POPs on human health and the environment. It specifies Kenya's POPs management priorities and includes appropriate short, medium and long-term interventions to mitigate such impacts. The ministry (MEWNR) recognizes the fact that the implementation of the SC will result in improved quality of life for our people in terms of better health, job creation, poverty reduction, and an improved environment. The NIP commitment is contained in the State of Environment, 2008, the Kenya chemicals Policy and the Policy on Environment and Development.

The implementation of this NIP is also an important step towards meeting the commitments of the World Summit on Sustainable Development whose goal is to ensure that, by 2020, chemicals are produced and used in ways that do not endanger human health and the environment.

#### 2.1.1 Country Data Profile

Kenya has a current population estimated at about 42 million and along with Ethiopia and Tanzania is one of the most populous countries in Eastern Africa. It has the biggest and most advanced economy in East and Central Africa with significant industrial manufacturing, agro processing and services development when compared to neighboring countries.

Table 2 Selected Human Development

Indicator	Unit	2000 – 2010
Population	Millions	43 (2010)
Population Growth	%	2.7% (2010) per year
Poverty (pop living < USD1.25 per day)	%	45% (2005)
GDP per capita	USD	850 (2010)
GDP Growth	%	5 – 6 (2011 est)
HDI	-	0.509 (2011) (ranking 143)
Agriculture (contribution to GDP)	%	20 - 22

Source: The World Bank (accessed November 2012); IMF (accessed November 2012); UNDP Human Development Report 2011

#### 2.1.2 Economic Baseline and POPs issue

Though Kenya was just recovering from a 25 year economic slump at the time when the first NIP on the POPs was prepared in 2007, the economy has since grown at an average of 4.6% per annum against a global average rate of about 3 per cent in 2012. This growth was expected to reach 4.5% in 2013 and 5.2% in 2014. The growth may be attributed to the Government's efforts to stabilize the economy and as well as increased domestic demand and growth in credit and notable growths in agriculture, wholesale and retail trade as well as Transport and Communication sectors. It has not seen pesticide import grow. But industrial POPs listed have grown and industries are more environmentally friendly, waste has increased and industries are more environmentally friendly, waste has increased and more waste is being disposed in an environmentally sound manner.

### **2.1.3. Kenya's Policy on Chemicals Marketing**

Kenya's general policy objective encourages a more open regime, strengthening, increasing market access and integrating Kenya into the world economy. Kenya's domestic and international trade is agro-based goods and other products from the industrial and manufacturing sectors which involve POPs.

Kenya is involving the private and public sectors in decision making and sound chemicals

Table 4. POPs and their potential sources

Chemical	Potential stakeholders or information sources
Alpha hexachlorocyclohexane; Beta hexachlorocyclohexane; Chloredecone; Lindane	Pesticides manufacturers, importers and distributors; pesticide registration agencies; farmers associations; pharmaceutical manufacturers, distributors and retailers (for lindane); drug licensing and administration agencies (for lindane).
Hexabromobiphenyl; Hexabromodiphenyl ether and heptabromodiphenyl ether; Tetrabromodiphenyl ether and pentabromodiphenyl ether	Plastics industry; electrical and electronic equipment industry; furniture, textiles and packaging material industry; construction industry; industry for the recycling of electrical and electronic equipment, plastics and PUR foam.
Dioxins and Furans	Incinerator, Cement manufacturers, pulp and paper Mills, ferrous , textile, transport, crematoria and waste dump sites
Pentachlorobenzene	Manufacturers and users of pentachloronitrobenzene (quintozone) (Pentachlorobenzene is also listed under Annex C of the Stockholm Convention; Parties are required to identify and address releases from unintentional sources. These include incineration of waste, barrel burning of household waste, waste streams from pulp and paper mills, iron and steel mills, petroleum refineries and activated sludge from wastewater treatment facilities).
Perfluorooctane sulfonic acid, its salts a and perfluorooctane sulfonyl fluoride	Sectors related to the following applications: Firefighting foams, carpets, leather/apparel, textiles/upholstery, paper and packaging, coatings and coating additives, industrial and household cleaning products, floor polishes, denture cleanser, shampoos, industrial and household cleaning products, hydraulic fluids, anti-erosion additives, anti-reflective coatings, surfactants, photography, photolithography, photo microlithography, adhesion control, metal plating and termite and ant bait.

Source: UNEP Guidelines 2012

#### 2.1.4 Agricultural Sector

The agricultural sector as a tradition has remained the highest contributor to Kenya's GDP (24%) and the main source of employment. It is also highly dependent on chemical fertilizers and pesticides. Horticulture produces being the most sensitive to use of toxic chemicals. The importance of horticulture to Kenya's economy is very high. While the impacts of increased generation of POPs are almost obvious in the agricultural sector, it is not the same in the wildlife especially fish and livestock sectors hence the need for increased protective measures to this otherwise valued sector of the economy.

##### a) Horticulture

Horticulture is among the leading contributors to Kenya's agricultural gross domestic product (the market value of all officially recognized final goods and services produced within a country in a year, or other given period of time) at 36 per cent, and continues to grow at between 15 and 20 per cent per year, employing over six million Kenyans directly or indirectly. Of the total horticultural production, about 95 per cent is consumed or utilized locally, while the remaining 5 per cent is exported; yet in terms of incomes, the export segment earns the country huge amounts of foreign exchange. Horticulture earns the country approximately Sh90 billion every year.



*Figure 2: Horticulture facility in Naivasha*

#### **b) Pyrethrum production.**

Pyrethrum is an important crop in Kenya's economy since it offers livelihood to approximately 200,000 households. It is also a major foreign exchange earner ranking fifth after tea, horticulture, tourism and coffee. It makes Kenya the leading world producer of natural pyrethrum producing 65-75% global annual produce<sup>8</sup>.

The Pyrethrum Board of Kenya has the monopoly of purchasing the produced pyrethrum and processes the flowers and markets the products. The local market consumes about 5% of the annual production while 95% is exported *exclusively* to an American company (Johnson and Wax). The current acreage under pyrethrum is about 10,000 hectares. Pyrethrum grown requires only fertilizers as chemical inputs. The sub sector products are alternatives to synthetic chemicals used for pest control.

#### **c) Fisheries**

Fishery products are an important source of protein, employment and foreign exchange earner particularly for Kenyans living in the Lake Victoria region and the Indian Ocean Coastal Area. Fish catches totaled 115,747 tonnes in 2004<sup>9</sup> but unfortunately the catches have been declining due to over fishing. Lake Victoria is one of the most important sources of fish accounting for 93 % of the national catch.<sup>10</sup> Fish stocks are constantly exposed to chemical pollutants in the water. <sup>11</sup>The main reason why there are water quality standards is to protect fish stocks from accidental and deliberate release of toxic chemicals into the water courses. Water quality standards have been gazetted recently to protect human health and the environment.

<sup>8</sup>Investment Promotion Centre , sector profile on agriculture 2005

<sup>9</sup> Kenya NIP 2006

<sup>10</sup> MENR -Lake Victoria Environment Project Report of the Economic Potential of the Lake Basin Area

<sup>11</sup> NEMA : Water Quality Regulations, 2007

The water quality standards specifically have guidelines for discharges to the water systems to protect fish but they do not include POPs.

There are 25 registered Fish Processing industries. The installed capacity is about 25000 tones/year. Most of the products are for export market. The fisheries sub-sector contributes about 5% of GDP and employs over 60,000 people directly with an additional 5, 000 people dependent on the fish industry indirectly (IPC, Sector Profile Agriculture). There are 3 types of fish farming practices in Kenya; warm water fish (tilapia, bass and common carp), cold mountain farming (trout), and coastal saline water fish farming mainly of prawns. Lake Victoria produces over 90 % of the fish in Kenya. The dominant species is the Nile perch, used for filleting in fish processing factories.

#### **d) Sugar Factories and Refineries**

Kenya currently produces about 70% of her domestic sugar consumption. There are six registered sugar factories with annual production capacity of 550-600,000 tonnes and four registered sugar refineries. The registered sugar factories are Mumias, Sony, Nzoia, Chemelil, Muhoroni (under receivership) and Miwani (under receivership). There is also Ramisi at the coast, closed, but its revival is underway. A new factory has been proposed at Busia while Western Kenya is a Juggery and the Agrochemical Food Corporation (Muhoroni) produces alcohol from Molasses.

These factories consume large volumes of water drawn from adjacent rivers. The effluents are pre-treated through use of stabilization ponds, which require extensive land area, before being discharged into the watercourse.

#### **e) Tanneries and Leather Finishing**

There are about seventeen registered leather-tanning industries in the country. Of these only eight are operational. Others have closed down. The leather tanning process requires various chemicals whose reaction generates hazardous chemicals as well as emitting offensive smells.

Most of the Kenyan leather industries process rawhide to the wet blue stage. They have serious environmental problems with respect to the management of leather trimmings, chrome effluents and lime effluents from their operations. Most tanneries have effluent pretreatment plants whose efficacy varies broadly. Their capacity to recover chrome and properly dispose the solid wastes is inadequate. Odour from tanneries has been a major cause of complaints from residents near such factories.

The government through KIRDI organizes awareness programs for management of hazardous wastes and related offensive smells.

#### **f) Textiles Finishing, Spinning and Weaving**

Textiles, garments and apparel manufacturing have a very high potential in Kenya. The basic raw material inputs such as dyes and chemicals are imported, as are all textile equipment and most spare parts.

There are 52 fabric manufacturers and 110 large-scale garment manufacturers registered with the Registrar of Industries. The mills have a combined installed capacity of 115.0 million square meters whilst the garment manufacturing sector, has a combined capacity to process fabric into garments with a total installed manufacturing capacity equivalent to 85% of the total national demand. It is estimated that the total fabric demand in the country is at least 225.0 million square meters annually. The activities discharge effluents containing dyestuffs and solvents.

The leading textile industries are: Thika cloth mills ltd, premier bags and cordage Ltd, spinners and spinners Ltd, as well as JAR Kenya (EPZ) Ltd.

### **2.1.5 Energy**

The energy sector plays a critical role in the socio-economic development of a country<sup>12</sup>. In Kenya, petroleum and electricity as sources of energy are the main drivers of the economy, while biomass is mainly used in rural communities and a section of the urban population. Currently the energy sector relies wholly on the importation of all petroleum requirements. However, with the discovery of oil in Northern Kenya this trend is likely to change. Electricity generation is predominately hydro, supplemented by geothermal and thermal sources. Apart from wood fuel which is overexploited, the other renewable energy resources, though abundant, have not been fully exploited.

About 80% of the population lives in rural areas where majority of these households still use traditional biomass-based energy sources such as wood fuel (fuel wood and charcoal) as sources of domestic energy. Fuel wood accounts for about 70% of all energy consumed in rural areas amounting to 20 million m<sup>3</sup> annually out of which, 95% is wood-fuel harvested from forests and rangelands. The sources and consumption is as detailed below;

#### **a) Coal**

Coal is an affordable, competitive, reliable and easily accessible source of energy, especially for electricity generation. Extensive coal exploration has taken place in the Mui Basin of Kitui County where a total of 76 wells have been drilled with 42 wells intercepting coal seams of various thicknesses at different depths. More wells are being drilled to appraise the coal reserves in the basin of which Block C has been appraised to have 400 million tonnes. More coal exploration is going on in other parts of the country. These resources are expected to provide about 1,900MW of electricity generation by 2016 and 4,500MW by 2030.

#### **b) Petroleum**

Both refined petroleum products and crude oil are offloaded at the Kipevu Oil Terminal (KOT). The refined products are routed to the Kipevu Oil Storage Facility (KOSF) and crude oil to Kenya Petroleum Refineries facilities in Mombasa. KOT handles over 90% of the country's imports, some of which are transit products for Uganda, Northern Tanzania, Rwanda, Burundi, Eastern DRC, and South Sudan. KPRL has been refining 1.6 million metric tonnes per annum (mmtpa) against a nameplate capacity of 4mmtpa of crude oil. The refinery produces premium motor spirit (PMS), regular motor spirit (RMS), automotive gas oil (AGO), dual purpose kerosene (DPK), liquefied petroleum gas (LPG), fuel oil, grease and bitumen.

In July 2009 there was an attempt to modernize the refinery and for this reason the Government entered into an agreement with Essar Energy Overseas Limited. The modernization would entail full capacity utilization, residue conversion, construction of an LPG handling facility, address environmental concerns and product quality requirements, and installation of a power plant

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<sup>12</sup> Ministry of Energy, Energy Policy, 2012

### **c) Renewable Energy**

Renewable energy, derived from the naturally occurring resources including geothermal, hydro, solar, wind and ocean energy, biomass, biofuels, biogas and municipal waste can supply

Renewable energy has the potential to enhance energy security and reliability; generate income and create employment; enable the country to make substantial foreign exchange savings by reducing dependence on imported fuels and its attendant price volatility, and mitigate climate change as it has minimal adverse effects on the environment.

### **d) Biomass**

According to the Economic Survey 2013 biomass provides 69% of the country's overall energy requirements while petroleum accounts for about 22% and electricity 9%. 74.5% of the electricity component is generated using renewable energy sources with fossil fuels providing the balance of 25.5%. Heating and cooking in residential households with biomass is common practice in Kenya. Over 74% of the people in the rural areas rely on biomass energy for cooking and heating. Wood fuel provides the bulk of total primary energy (about 70%) and meets 93% of the rural household energy requirements. Agricultural and forest wastes are also used as fuel.

### **e) Waste**

Livestock (cattle, sheep, goats, donkeys) waste produces substantial quantities of methane, in most areas with high potential for agriculture, especially where farmers practice zero grazing. Unfortunately, in this inventory, methane production could not be quantified. In many urban areas, sawdust is used as fuel and so are plastics. In all these cases, 90% of the combustion takes place on the traditional 3 stone fireplace designs and not the conventional Jiko (Kituyi *et al.*, 2001). Table 18 shows the biomass consumption.

Energy consumption and production covers use of fossil fuels and plant matter mainly biomass for production of electricity heat and light. Fossil fuels and biomass naturally contain trace concentrations of mercury which is released when fuel is burnt into the air but in big facilities in air pollution control systems which releases it into water systems.

<i>Table 5. Energy Production</i>	
Process	Activity rate
	Annual consumption/production
Coal combustion in large power plants	0
Other coal uses	90,000
Combustion/use of diesel, gasoil, petroleum, kerosene	118,799,200
Biomass fired power and heat production	11,512,000
Charcoal combustion	1,000,000
Fuel production	
Oil refining	81,452,900

Source: The World Bank, 2012); IMF, 2012); and UNDP, 2011.

As demonstrated in Table 2.2, the agricultural sector has recorded a steady growth of 3.8 per cent and contributing about 24% to GDP in 2011 as compared to 21.4% in 2010. The increased contribution is mainly due to increased production of key horticultural crops.

It will be noted in this NIP that whereas the national accounting for energy concentrates on the big two electricity and petroleum and somewhat just mentions biomass through cogeneration, the NIP brings forward the importance of the fossil and household energy burning using low technology cook stoves. Further many of the tea factories drying tea are turning to wood and doing so using best available technologies. Therefore wood and other biomass from sugar, rice continues to be important sources of energy.

This NIP notes that the contribution of the 3 stone cook stove to UPOPs is very high contributing largely to disease of the upper respiratory tract infections. Introduction of BAT and BEP therefore becomes the most urgent in view of its linkages to health and the environment.

#### **2.1.6 Trade, Industry and Services Sector**

Trade, industry and services play a vital role in the country's economy. Kenya being an open market economy, imports and exports goods and services from both developed and developing countries. The expanding regionalization demands an integration of regional economic blocks mainly, COMESA (Common Markets for East and Southern Africa) and East African Community (EAC) which has led to an increased momentum of growth of imports and exports of goods and services in the country, including regulated chemicals, some of them POPs Industries, trade and services will benefit by adopting environmental management systems that not only address production processes but also promote waste minimization, treatment and disposal.

## **2.2 Vision 2030**

Kenya aspires to be fully industrialized by year 2030, opening up job opportunities and value addition to agricultural produce and natural mineral resources for export and local consumption. This trend of development is expected to initiate industrial enterprises, which would in turn result in increased quantities and complexity of pollutants, including POPs. In order to reap the full benefits of this mode of economic development while conserving the environment, there is need to plan and develop the associated infrastructure to handle increased effluents and wastes. Some of the environmental challenges facing the industry include; generation and management of solid, liquid and hazardous waste and e-waste; gaseous emissions, occupational health and safety, adoption of Cleaner production technologies and compliance with EIA/EA, Waste and Water regulations.

### 2.2.1 Kenya's Imports of Chemicals.

Kenya is not a major producer of synthetic chemicals. But 2011 data<sup>13</sup> reveals that extensive extraction of minerals contributes to manufacturing like soda ash, fluorspar, diatomite, limestone and titanium prospects. In 2008 imports, 16.5% were for chemicals and 24.8% for oil which were mostly chemicals, fertilizers and plastics. Major chemicals were in small quantities. The transport and energy sectors use chemicals and petroleum products and generate toxic waste through service stations and garages, while the energy sector uses chemicals in power generation – fossil fuels, batteries, oil, refrigeration/metal treatment, etc. Kenya's imports from chemical related products is shown in Table 2.3,

Most of the POPs will be included in pigments, plastics and agrochemicals. Table 2.5 shows the amounts of chemicals imported from 2003 to 2008.

Table 6: Imports of chemicals related

Articles	2008	2009	2010	2011	2012	2013
<b>Chemicals</b>						
<b>Pigments, paints, varnishes etc</b>	7 728	10,301	10,416	10,937	13,107	15,434
<b>Soaps and cleansing preparations, perfumes</b>	7,884	10,154	11,949	13,165	11,508	10,044
<b>Waxes, polishes paste etc</b>	366	286	436	796	374	489
<b>Manufactured fertilizers</b>						
<b>Nitrogenous</b>	69,122	167,986	105,600	177,404	117,853	129,057
<b>Phosphate</b>	221	27,950	117	2,986	10,306	14,716
<b>Other formulations</b>	315,311	326,486	330,013	299,023	216,827	331,932
<b>Other Compounds</b>						
<b>Synthetic plastic materials</b>	175,380	175,433	170,703	193,985	219,818	222,761
<b>Insecticides, fungicides, disinfectants etc.</b>	7,216	8,394	8,984	9,735	10,215	9,972

Source: KNBS Statistical Abstract, 2010

As shown above pesticide imports into the country show an upward trend especially in the insecticides group of compounds. More recent data was not available.

Table 7: Volume of pesticide imported from 2006/2007 - 2009/2010

Category	2006/2007		2007/2008		2008/2009		2009/2010	
	Quantity in tons	Value in million (Kshs)	Quantity in tons	Value in million (Kshs)	Quantity in tons	Value in million (Kshs)	Quantity in tons	Value in million (Kshs)
<b>Insecticides</b>	2475	1181	2887	3909	2995	2079	3181	2493
<b>Fungicides</b>	3190	1251	2651	602	2340	3153	2415	3874
<b>Herbicides</b>	1859	324	2289	206	2933	944	1840	939
<b>*Others</b>	1225	362	1330	191	1413	1167	1396	918
<b>TOTAL</b>	8749	3443	9157	4908	9681	7343	8832	8232

\*\*Source: PCPB Annual Report, 2009/2010.

\*Include growth regulators, surfactants and bio pesticides.

<sup>13</sup> KNBS: Startiscal Abstract,2011

From the table above, approximately 8,832 metric tons of pesticides valued at Kshs. 8.2 billion were imported into the country in 2009/2010. During this period, insecticides represented the largest quantities of pest control products imported, indicating an increase from the previous years. It is important to note that over four years the demand for the chemicals have been constant.

## 2.3 Manufacturing

Manufacturing is critical for formulation and generation of POPs as pesticides, industrial POPs and unintentionally produced POPs. The key ones are cement manufacturing, tanneries, plastics, textiles, tanneries etc

### 2.3.1 Cement Manufacturing

The UNEP Toolkit (2011) refers to other minerals with mercury impurities such as cement production, pulp and paper production, burnt lime production, cement, pulp and paper and burnt lime as sources of mercury emissions are all produced in Kenya.

There are three cement plants whose combined production capacity is 1.87 million tonnes per year. They are East Portland Cement Co Ltd in Athi River, Bamburi Portland Cement Co Ltd, and Kaloleni Cement Company in Kaloleni, Mombasa. The main raw materials for cement production are limestone, pozzolana and gypsum which are available in adequate quantities in various parts of Kenya especially in the Athi Plains and also plenty in the North-Eastern Province. In addition there is one clinker grinding plant with a combined production capacity of about 1 million tonnes/year. All the plants engage cement kilns for cement manufacture by dry process.

Table 8: National Cement Production Levels.

Name of the Company	Production(tonnes/annum)
<b>East African Portland Cement company (EAPCC)</b>	1,200,000
<b>Bamburi Portland Cement Company (BPCC)</b>	1,800,000
<b>Rhino Cement Co limited</b>	500,000
<b>Athi River Mining</b>	650,000
<b>Others</b>	420,000
<b>Total</b>	3,320,000 <sup>14</sup>

Source:(Yager Mining Yearbook,2010)

### 2.3.2 Pulp and Paper Production

Pulp and Paper manufacturing is a source of mercury emissions, from trace level of mercury in the wood raw material, in fuels used for energy production and in the chemicals applied in the processes (UNEP, 2005) A particular contributor to the manufacture of chlorine and caustic soda using the mercury cell chlor-alkali process. It has been reported that chlor-alkali process is no longer used in Kenya and elemental chlorine is no longer used for bleaching pulp and paper. However, because the alternative technologies applied have not been indicated as completely phased out, the emission estimates have been made. Based on the information collected, only air distribution was applied because only the air emission factor was used. Plastic products from Kenya are marketed locally and to the preferential Trade Area region in Africa now called Common Market for Eastern and Southern Africa, COMESA.

<sup>14</sup> T Yager:2009, Minerals Yearbook. Kenya

### 2.3.3 Plastics Manufacturing

This is a major investment of Ksh50 Billions and having influence in all sectors of the economy in 2011<sup>15</sup> it was estimated that production was 2247800 tonnes which is a major contribution. About 10% of it goes back to the environment. There are about three hundred formal establishments and twenty three registered manufacturers of plastics of various grades there are several other enterprises not members of the Kenya Association of Manufactures because some are very small scale association. Of the total only seventy have the capacity to recycle their factory waste. About twenty enterprises do recycle street plastic waste but only two do recycle street polythene waste. The latter is a major environmental nuisance due to its persistence in the environment leading to loss in property values, livestock deaths, drainage blockage, and mosquitoes breeding sites receptacles. These wastes adversely affect the aeration of the soil leading to decreased land productivity.

The plastics industry is well developed and produces goods made of polyvinyl Chloride (PVC), polyethylene, polystyrene, and polypropylene. All raw materials are imported in the form of granules.

There are other attempts to recycle plastics through different approaches resulting in varied environmental compliance requirements. Some are associated with serious environmental and health implications.

The major players in recycling and production of plastics are: Acme Container ltd, packaging industries, prestige packaging and specialized fiberglass ltd. Roto Molders ltd reported waste generation of 5-10 kg/month and average noise levels slightly above the 90 Bb limit.

There are more than 10 plastic industries in Kenya with capacities ranging from 1000 to 8000 tonnes per year. Most of them are located in Nairobi and Mombasa with a few in Kisumu, Nakuru, Eldoret, and Thika. The plastics industrial subsector has benefited from the advance technology changes that have occurred in the manufacturing industry resulting in increased production and diversity of plastics products. The plastics subsector in Kenya mainly produces:

- Polythene Packaging Bags,
- Plastic Crates and Bottles,
- PVC Pipes And Fittings, Floor Tiles and mats
- Plastic Shoes
- Household Plastic Wares (plates , cups)
- Plastic Containers for Domestic and Industrial use, and.
- Films and sheets for green house stationery and electronics after use they are either burnt or dumped.

The plastics sector currently constitutes approximately 150 industries, and has an annual growth rate of 6%; currently, there are about 17 firms that recycle plastics locally. Plastics contribute 28% of all cadmium found in municipal solid waste and approximately 32% of all lead; substances that are highly toxic to humans and the environment in general.

### 2.3.4 Tyres/ Rubber products

The plastic industry is also categorised with rubber products the main being tyres. Tyres are a composite of styrene-butadiene copolymer or natural rubber, chloroprene, polyamide, steel wire, carbon black and numerous other organic and inorganic additives. Tyres contain low concentrations of chlorine; they also contain significant sulphur, similar to that of medium sulphur coal, as a result

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<sup>15</sup>Kenya Association of Manufacturers-Manufacturing Survey 2012

of vulcanization. Sulphur inhibits formation of POPs in combustion; the probability for generation of chlorinated POPs in this waste is probably lower than for mixed waste. However, poor combustion of large volumes of tyres in open burning situations is a source of PCDD/PCDF and will certainly be a prodigious generator of other hazardous pollutants, including SO<sub>2</sub> and polycyclic aromatic hydrocarbons. Removal of tires from waste stream is therefore useful. Depending on their size and utilization, tyres vary in design, construction and total weight. As an example, the weight of a used passenger tyre in Europe is about 6.5 kg and that of a truck tyre is about 53kg.

### **2.3.5 Pesticides & Fertilizers**

The rapid expansion of the agricultural sector has resulted in increased demand for agrochemicals. Kenya does not have pesticide-manufacturing facilities but only formulates. There are about 32 registered enterprises involved in this formulation. The active ingredients are imported and the formulation carried out locally. This activity is associated with dust; offensive smells and related air pollution issues. Most of the industries have incorporated dust control equipment for the indoor environment.

Operations focus on treating /recovering the collected dust which is part of their products. These products impact on the environment during usage. The accompanying wastes comprise organo-chlorines or organophosphate compounds, which are indiscriminately disposed in the environment.

## **2.4. Review of NIP 2007**

The NIP 2007 is available in the convention website [www.pops.int/countries](http://www.pops.int/countries).

### **2.4.1 Expectations of NIP 2007**

The following are actions for intentionally produced POPs like pesticides, DDT, PCBs and Hexachlorobenzene:

- i. Ensure that in future Kenya does not produce any intentionally produced POPs pesticides;
- ii. Search for alternatives to DDT especially from Pyrethrum flower;
- iii. Controlling illegal entry of POPs by banning those not yet banned;
- iv. Adopt legislation banning or restricting the use of PCBs;
- v. Prepare institutions, such as Kenya Power and Lighting, KENGEN, etc., for labeling of the PCB equipment in use consistent with the provisions of the Convention;
- vi. Comprehensive inventory of PCBs undertaken using better analytical technology to identify equipment containing PCBs in concentrations of 50ppm or greater and labeling such equipment accordingly;
- vii. Give special focus to abandoned industrial sites that still contain disused power transformers and/or capacitors and in what is an environmentally sound manner;
- viii. Monitoring those POPs currently in use and with POPs like characteristics.
- ix. Promoting awareness on international regulations on DDT
- x. Finalizing policy on DDT and streamlining political consultation;
- xi. Developing alternatives to DDT.
- xii. Defining linkages between potential DDT and other multilateral environmental agreements;
- xiii. Mobilizing resources for alternatives to DDT

#### **2.4.2 Annex A pesticides**

In the NIP 2007 it was noted that the national level of technological systems were inadequate in terms of capacity to minimize releases of existing POPs –pesticides. Additionally, the workers and population exposed to these chemicals were not adequately educated on the health risk and not adequately protected from the hazards. The NIP also took note of the fact that the communities/public were at risk of exposure to the POPs-pesticides because the legal and institutional frameworks were weak and not keen in implementation because of low levels of awareness. In addition, it was established that there were inadequate facilities such as laboratories and equipment for the analysis and monitoring of POPs. The MEWNR is mandated to protect, conserve and sustainably manage the environment and natural resources in the country. The Pest Control Products Board (PCPB) is a statutory organization of the Kenya Government established under the PCPA, Cap 346, and Laws of Kenya regulating the importation, exportation, manufacture, distribution and use of Pest Control Products (Pesticides). The summary of information of the situation of new pesticides POPs, stock piles, obsolete/ wastes and contaminated sites gathered during the site visits and indicates the remedial measures that need to be undertaken. Key actions noted were:

- i. PCPB has listed Banned and Restricted chemicals in the country;
- ii. The Pest Control Products Act is undergoing revision to include new pops
- iii. Some roles and responsibilities of institutions identified in NIP 2007 have been revised;
- iv. No stockpiles or obsolete pesticide POPs reported in all the areas visited except for a few expired chemicals not necessarily POPs that were reported in two sites;
- v. No registers kept for expired chemicals and some had no labels;
- vi. Some workers reported getting sick after spraying certain chemicals;
- vii. Lack of adequate facilities for proper identification of POPs;
- viii. Laboratories not properly equipped and capacity to do some analysis lacking;
- ix. Lack of understanding of some stakeholders e.g. those holding obsolete POPs – detailed required information not given;
- x. There was suspicion (unconfirmed) that there is a possibility of some banned chemicals entering the country from the neighboring countries and repackaged; and
- xi. Some of the banned pesticides formulated with others ( not POPs) and sold to non suspecting farmers

The updated NIP builds on the successes of the NIP 2007 in its implementation, as detailed below.

#### **2.4.3 Legal Measures already undertaken**

Kenya has taken legal and administrative measures necessary to eliminate the use pesticide POPs in compliance to the Stockholm Convention.

- Awareness creation by training and publication
- Putting in place necessary mechanisms for compliance monitoring and enforcement;
- Comprehensive study of all pesticides POPs alternatives should be undertaken;

*Table 9 Current legal status with regard to initial POPs*

Chemical Name	Stockpiles, Contaminated Sites and Wastes	Action and Measures	Legal Framework
<b>Aldrin</b>	None	Banned in 2004	PCPA
<b>Chlordane</b>	None	Banned in 1986	PCPA
<b>Dieldrin</b>	None	Banned in 2004	PCPA
<b>Endrin</b>	None	Banned in 1986	PCPA

#### 2.4.4 DDT

- Since NIP 2007 no DDT has been imported, though there has been no request for its reintroduction.
- The need to gradually shift from DDT to alternatives was also recommended in the NIP 2007.
- Efforts have been made to search for alternatives.

#### 2.4.5 Pyrethrum as DDT Alternatives

Pyrethrum was identified as the most effective environmentally sound and locally available substitute to DDT. Kenya was the largest producer of pyrethrum accounting for over 80% of the world's production and was expected to be able to supply between 7,000 and 10,500 tonnes of dry flower equivalent per annum. The NIP report recommended enhancement of research in pyrethrum towards increasing its production. It also called for pilot studies in order to "determine their efficacy and applicability".

The Pyrethrum Board of Kenya had the monopoly for purchasing produced pyrethrum, process the flowers and market the products. The local market consumed about 5% of the annual production with the remaining 95% being exported exclusively to an American company (Johnson Wax). There are plans to expand the export market to other regions (IPC, 2009).

#### 2.4.6 PCBs

NIP 2007 found that Kenya had stopped importing PCB products. It only needed to manage the transformers with PCBs. Since then obsolete stocks of PCBs that had been buried have been exported for destruction according to the guidelines provided under the Basel Conventions<sup>16</sup>.

As part of the action plan in this updated NIP, a more comprehensive inventory of industrial POPs should still be concluded with the aim to capture those facilities that were not included in the NIP2007 and those in the preliminary list that were not visited. The Kenya Power and Lighting, KENGEN and Webuye Paper Mills had the largest stocks.

#### 2.4.7. Unintentionally produced POPs (UPOPs)

The NIP also established that the major source categories of UPOPs were incineration of medical wastes; open burning of municipal and agricultural waste and pulp and paper production. However, since then, the emission factors have been revised.

NIP 2007 highlighted disposal of medical waste as a critical source of emissions. Since then all the major hospitals in Nairobi have incinerators but still there is need for attention to this source category. On the handling and disposal of medical waste, there has been action to train current personnel and upgrade the incinerators in use; It was also established that there were inadequate air

<sup>16</sup> Basel Convention has guidelines that deal with waste that contain POPs. The guidelines are available on [www.basel.int](http://www.basel.int)

pollution control measures in place and that efforts were being put in place to control discharge of UPOPs to rivers the operators was generally low.

#### **2.4.8. Waste and Stockpiles of DDT**

It was established that there were significant quantities of waste and stockpiles not only of the stockpiles but also of POPs contaminated wastes.

The first POPs inventory done in 2006 indicated that most of the residual DDT was held by the Kenya Farmers Association in Nairobi, the Rift Valley and Central Provinces. The total amount of obsolete DDT identified nationwide was then 1,338 kg, which has now been disposed of together with other wastes (PCPB).

#### **2.4.9. Public Awareness**

Awareness raising of the public especially small scale farmers of the innovation in alternatives not wide; however for the international corporations it is good.

#### **2.4.10. Linkages between health and environment**

Though no comprehensive studies specific to the chemicals in question were evident, the increasing awareness of the impacts of chemicals to human health were evident. The NIP noted that there were reports of increased cases of cancer and chemical related diseases in the country, but there is not cause/effect relationship. Lack of data should not stop precautionary action.

The Ministry of Health through the Division of Malaria Control has been committed to achieving the targets of Roll Back Malaria initiative, the Abuja Declaration, and the Millennium Development Goals through the Economic Recovery Strategy. This commitment was expressed through the National Health Sector Strategic Plan (2008-2012) and the National Malaria Strategy (2009-2017). The goal of the new National Malaria Strategy is to reduce morbidity and mortality caused by malaria by two thirds of the baseline in 2007/2008 among the Kenyan population by the year 2017.

Though not in significant magnitudes, the 2007 NIP took note that Pesticides residues were found in fish especially in shallow inland Rift Valley lakes of Nakuru and Naivasha. Increased use of pesticides was blamed for the death of flamingos and reduced bird life in Lake Naivasha (Mogaka *et al.*, 2006). The levels of DDT, DDE and other organochlorine were also noted as potentially hazardous if not addressed as well as increased agricultural activities in the various ecosystems feeding the two lakes. The impacts of disused facilities like the Pan-paper Ltd and the Kenya Petroleum Refineries will need to be closely monitored. Currently it is still not documented.

### **2.5. Pesticides – Positive Gains**

Pesticides received much attention in the 2007 NIP.

- a) The recommendation of NIP 2007 for alternatives to POPs pesticides has been successful. A visit to Naivasha area with 56 flower farms showed that none is using any of the listed pesticides. Companies like Oserian, Finlay Flowers and other have almost commercialized non chemical alternatives using purely private resources.
- b) Capacity building - Initiatives by the Government agencies were supported by development partners through specific programs. Specific mention may be made of the Universities e.g. Maseno, Masinde Muliro and Nairobi Universities (annex 12 1nd 4) that have made tremendous efforts to build the national capacity to train and monitor POPs but also to develop cost effective alternatives. This implies that the capacities of these Universities and institutions to handle new POPs must be strengthened. Capacities are still massing for analysis of sophisticated POPs such as PBDEs, PFORS, Dioxins and furans.

- c) Residue Monitoring POPs Pesticides - The private laboratories sector e.g. SGS Kenya Ltd, Government chemist and universities can now analyze a wide range of POPs pesticide. But the requests for POPs analysis are not many. To be able to harness these initiatives and for efficiency and effectiveness, the country may wish to develop and equip zonal laboratories as centre's of excellence with the state of the art equipment in national research institutions, universities and regulatory bodies to monitor POPs in environment and products.

### **2.5.1. Summary of the Pesticides Action Needed**

The following are the priorities for stockpiles and wastes: -

- i. Dispose of about 15,000 tones of obsolete pesticides distributed across the nation in various different conditions of storage in an environmentally sound manner;
- ii. Rehabilitate obsolete pesticides at sites detailed in the POPs Inventory and especially at Wajir, Kitengela, Dandora dumpsite and Nakuru;
- iii. Evaluating efficacy of alternatives to POPs;
- iv. Reduce risks associated with hazardous chemicals through the use of safe chemical practices;
- v. Provide necessary advice and guidance to stakeholders involved in cleanup and disposal operations for stockpiles and wastes;
- vi. Partner with sector organizations especially the Agrochemical Association of Kenya and Pest Control Products Board to address POPs;
- vii. Participate in Global POPs Monitoring Program;
- viii. Manage PCB waste stockpiles already identified.

### **2.5.2 Reduction of UPOPs Emissions**

For UPOPS these were the priorities;

- i. Developing regulations on dioxins and furans which has started
- ii. Developing mechanisms for minimizing emissions from open burning process in which a few studies have been undertaken
- iii. Introduction of Best Available Technologies and Best Environmental Practices to priority areas in incineration, open burning, industries
- iv. Assessment unintentional production of PCBs and hexachlorobenzene which could not be made because the guidelines are not available ;
- v. Give priority to the source categories in Annex C of the convention having high dioxin emissions as identified in the dioxin and furan inventory;
- vi. Train personnel involved in the handling and disposal of medical wastes which has largely been a success.
- vii. Upgrade incinerators to meet emission levels consistent with the BAT/BEP guidelines and other regulations which is ongoing
- viii. Support to public awareness programmes on proper waste handling, especially biomass and municipal wastes, and the need to discontinue open burning practices of waste; which is ongoing.
- ix. Regulate governing environmental monitoring of contaminants, discharges and emissions from pulp and paper industries should be developed and enforced.

Various improved methods of POPs related waste disposal are in place. The National Health and Sanitation policy as per the NIP had recommended construction of standard incinerators. It is observed that there are incinerators(Annex 3) located in various institutions especially medical facilities. KEMRI has continued to operate efficient incinerators in Kisumu and Nairobi but their capacity was said to be increasingly over-stretched from other sources of medical waste. The county of Nairobi with support by UNEP and Japanese International Cooperation Agency have developed an integrated solid waste management programme which took into consideration recommendations contained in the BAT and BEP guidelines by UNEP. Nakuru and Kisumu County have programmes with the French Government for construction of sanitary landfills but have not succeeded yet.

### **2.5.3 Social Economic Measures**

The NIP had recommended use of economic and environmental tools and instruments. Their use requires compliance to BAT and BEP guidelines appropriate design to enhance awareness including social acceptability, cost effectiveness and their economic feasibility. It can be appreciated that training in use of these tools has been on-going albeit not focused to POPs and POPs alternatives.

- The use of economic and environmental tools and instruments including financial incentives for consideration towards mobilizing of resources for the implementation of the NIP such as Property Rights (Ownership, Use and Development rights), market creation, fiscal instruments – pollution and resource taxes, investment tax credits and subsidies, charge systems (user charges, impact and access fees), Financial instruments – (soft loans and grants, green funds), liability systems – (legal liability and liability insurance) and bonds and deposit refund systems – (land reclamation bonds, environmental accident bonds and deposit refund systems) were proposed in the NIP. These have been tried with a measure of success for the plastic e-waste. Initiatives by Greenbelt Movement, Practical Action, iLIMA and many communal based organizations have tried to use a mix of this with some level of success.
- The appreciation of use of environmental and economic instruments for costing purposes remains largely not appreciated. The review noted that most of the above recommendations remain largely unaccomplished. During this assessment, there was some evidence that these financing mechanisms were applied at some point since 2007. There is, therefore, a need to enhance the country's ability to appreciate and use these tools.

## CHAPTER 3:LEGAL POLICY ISSUES SITUATION FOR POPS MANAGEMENT IN KENYA

### 3.1 Background

The Constitution of Kenya, 2010 has effectively changed the mode of government for example devolving overall governance matters to the counties. It has also created new administrative and legislative structures thereby necessitating the rationalization of the new dispensation by new centers of power like Governors, new institutions at national and county levels, the merging or proscribing of some implementing institutions and sectors. Some of these new interventions have been juxtaposed on the old multiplicity of implementing institutions and sectors. This has resulted in confusion with respect to jurisdictional and coordination issues. Additionally, new policy, legislation, regulations and standards are also in the process of being enacted to address the emerging governance agenda, thereby replacing some of the existing and introducing new, regulatory framework.

#### 3.1.1. New Institutions

The rationalization of institutional and sectoral roles and mandates is still in the pipeline. The National Environment Management Authority (NEMA), which has the national mandate of coordination and supervision of all matters of environmental management including POPs, has devolved some of its national mandate to the counties, but it is not clear whether the scope of devolved powers is adequate to deal with the counties'/regions' environmental mandate exhaustively at their level. A case in support of 2) above is with regard to EIA/EA: the region office can only license construction projects of only up to the cost of Kshs. 100 million, while any projects involving chemicals and petrol products are licensed at headquarters in Nairobi. Licensing of transportation and incineration of hazardous waste is also done from Nairobi. Regional offices only license transportation of municipal waste.

#### 3.1.2 New Institutional Roles for POPs

The roles of all institutions with a mandate in chemicals management, NEMA included, are not clearly defined and coordination structures. For example, the Governor's office and NEMA will be put in control of the Stockholm Convention, regarding compliance, enforcement and coordination of all those stakeholders.

- i. Some of the relevant MEAs have not been domesticated
- ii. Generally, except for a few stakeholders, all other stakeholders which are key in implementing the Stockholm Convention and the Kenya NIP, including NEMA County Office, Kisumu Office, KARI, Kenya Seed Company, LEVMP, were not aware of the SC and the NIP
- iii. Almost all stakeholders engaged complained of lack of information sharing generally on chemicals management
- iv. Those with some small stocks of expired and/or obsolete chemicals like KARI, Kitale and Kenya Seed, Kitale did not know how to dispose of them (lack of information sharing e.g. by NEMA and the Medical Services and Dental Practitioners Board
- v. Pollution control rests on credible research. Universities can carry out this role, but the country has issues of information sharing and coordination
- vi. Regional offices have serious capacity issues – human resources, technical expertise in POPs management, facilitation to handle trans-boundary issues, among others. NB: We discovered that in the POPs list under the East African Customs Act is missing some of them (evidence of inadequate stakeholder consultation in the legislative process) and needs to be updated
- vii. Concern regarding transportation of banned chemicals from the region, where they are not controlled
- viii. Regional profiling, currently are only for regions and should be extended to authorities and counties and Conventions like the SC

## 3.2 International Agreements

This updated NIP should also consider how best to integrate commitments under the MEAs into the compliance measures. This may be done through a comprehensive legal framework for chemicals.

### 3.2.2 Multilateral Environmental Agreements

Kenya is party to the following multilateral and bilateral of agreements of the environment:

Regarding the international regulatory regime, the following were identified as key international organizations in chemicals management, and synergies with them should be strongly encouraged: ICIPE, FAO, WHO, UNEP, UNIDO, UNDP, NEPAD, the Global Environment Facility, COMESA and the secretariats of MEAs

In addition to the Stockholm Convention, a number of other agreements and instruments also address different aspects of the range of risks caused by hazardous chemicals over their life cycle. They also need to be implemented in the Kenya national legal framework. It will be more efficient for such a law to be developed, an integrated approach, incorporating all MEAs should be used.

- The Stockholm Convention on POPs
- The Basel Convention on the Control of Trans boundary Movements of Hazardous Wastes and their Disposal;
- The Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade;
- The Convention on the Marine pollution currently being implemented under the New Partnership for Development (NEPAD);
- The Framework Convention on Climate Change (FCCC);
- The Montreal Protocol on substances that deplete the ozone layer and
- The Cartagena Protocol on Biotechnology.

### 3.2.3 Institutions

The following institutions are important in chemicals management:

- i) National Environment Management Authority (NEMA)
- i) The Government Chemists Department (GCD)
- ii) Kenya Medical Research Institute (KEMRI)
- iii) Kenya Plant Health Inspectorate Services (KEPHIS)
- iv) The Kenya Cleaner Production Centre (KNPC)
- v) The Department Of Occupational Health And Safety Services (DOHSS)
- vi) Kenya Bureau Of Standards (KBS)
- vii) Kenya Association Of Manufacturers. (KAM)
- viii) Kenya Mission to UNEP (KMUNEP)
- ix) The Pest Control Products Board.

### 3.2.4 Legislation

Kenya mainly relies on international norms and practices when it comes to issues of chemical safety, regulation of production, importation, use and registration of Chemicals including pesticides in Kenya., local legislation include;

- i. Pharmacy and poison Act Cap 245.
- ii. Public health Act Cap 242
- iii. Food drugs and chemical substance Act Cap 254
- iv. Environmental management and co-ordination Act of 1999

- v. Malaria Control Act.
- vi. Pests Control Products Act Cap 346
- vii. The Use of Poisonous Substances Act Cap 247
- viii. Public Health Act 264
- ix. Water Act Cap 271
- x. Fertilizers and Animal food stuffs Act Cap 345

Table 10: Institutions and their roles in chemicals management

No	Institution	Role in POPs Management	Chemical Sector
1	Customs and Exercise Department	The Department regulates international trade and collect tax revenue for the government.	Importers and exporters Revenue agencies
2	Kenya Ports Authority	Manages all the sea ports of Kenya. It is an Enforcer, regulator and user of Chemicals	Import/ export Transboundary movement
3	National Environment Management Authority	Under the EMCA (1999), NEMA is mandated to ensure a healthy environment in Kenya. It is an enforcer and regulator.	Environmental Regulation in all sectors
4	Pest Control Products Board	The controls the pesticides used in Kenya.	Pesticide products
5	Agro-chemical Association of Kenya	controls the agro-chemical usage in Kenya	Agrochemical usage only. Trade association
6	Counties	The county governments manage wastes in all counties and sub-counties.	Waste management Fire risk
7	Kenya Industrial Research and Development Institute (KIRDI)	The Institute conducts industrial research in the country.	Research in industrial processes and technology..
8	Kenya Medical Research Institute (KEMRI)	Undertakes medical research in the country. It has very efficient incineration facilities.	Research on Impact of chemicals on human health
9	Kenya Marine and Fisheries Research Institute (KEMFRI)	Undertakes marine and fisheries research in the country.	Research and Monitoring.
10	National Council of Science and Technology (NCST)	Regulate science and technology developments in Kenya.	Research
11	Kenya Agricultural Research Institute (KARI)	Undertakes all Agriculture related research in the country.	Research and Monitoring
12	Kenya Plant Health Inspection Services (KEPHIS)	Inspects and supervises all agronomic research in Kenya to ensure that they conform to international standards and benchmarks.	Monitoring and Laboratory analysis.
13	Universities and Other research institutions	They are involved in academic and research capacity building	Capacity building/Training/ monitoring
14	Ministry of Health (Malaria Control Programme)	The Ministry provides policy guideline son human health in Kenya.	User
19	Kenya Flower Council	Is an apex body in charge of all flower farmers in Kenya.	Agrochemicals
20	Horticulture Crops Development Authority (HCDA)	Horticultural development in the country.	Agrochemicals
21	International Centre of Insect Physiology and Ecology (ICIPE)	Research on alternatives to Chemicals.	Alternatives to chemicals
22	Fresh Produce Exporters Association of Kenya (FPEAK)		Agrochemicals
22.	Government Chemist		
23.	ICIPE (Regional Center for Stockholm Convention)		
24.	National Cereals and Produce Board		
25	Kenya Seed Company & private companies treating seeds.		
26.	Kenya Bureau of Standards		

### **3.3 Compliance issues for Kenya:**

In complying with its obligations under the Stockholm Convention Articles 3, 5 and 6 relating to the measures to be taken to reduce, or eliminate production, use, and releases of the new POPs and to report these efforts to the Secretariat, some long-term goals need to be clearly defined when designing strategies to accomplish Kenya's obligations under the Convention; setting a consultative mechanism to include all stakeholders towards developing policies and laws and to improve capacities.

#### **3.3.1 The legal, policy and institutional capacity inventory**

The current legal framework will need to be updated and appropriate policy instruments be put in place. For example, the comprehensive *National Environment Policy, 2008* is still in draft form as are the *regulations* more particularly intended to address POP issues, like the e-waste Draft Regulations 2012 and Air Quality Regulations, 2012. Generally no specific and/or integral law is in place to address chemicals management including POPs. Such a law is strongly recommended. Although most Multilateral Environmental Agreements (MEAs) have now been domesticated in Kenya, the environment protection agenda still remains with the overarching framework legislation, the *Environment Management and Co-Ordination Act (EMCA)* and sector specific statutes which have yet to be harmonized with EMCA. Regarding the institutional arrangements, the chemicals management infrastructure is distributed according to mandates over various institutions and harmonization of their roles and mandate(s) at national and regional levels is still outstanding.

#### **3.3.2 Inventories**

With the amendments coming into force, Parties are obligated to develop inventories in order to avail information on the new POPs at the national level. National inventories are an important tool in reporting on priority chemicals like POPs. They are also a source of public information. They identify major sources of releases and provide estimates of amounts of chemicals used, released and disposed of. Inventories of new POPs were therefore conducted to identify their production, use and imports and then to prioritize which ones needed national actions, like BFRs, due to their wide use.

#### **3.3.3 Monitoring**

One of the properties of POPs is their potential for long-range transport and therefore measurement and monitoring of their levels in the environment is important. Strategies data obtained from monitoring will enrich policy and the country's regulatory framework. It will also feed into the Global Monitoring Plan (GMP) of the Convention.

#### **3.3.4 Reporting**

One of the requirements of the Stockholm Convention is for Parties to report on measures taken to implement relevant provisions of the Convention and their effectiveness. This includes Measures to reduce or eliminate releases from intentional production and use, as well as unintentional releases of POPs; Identification of articles in use and wastes containing chemicals listed in Annexes A, B and C; and Production, import and export of these chemicals. Article 15 has established an Online Electronic Reporting System (online ERS) and the government officers for reporting, in this case the ministry of Environment, Water and Natural Resources, which is spear-heading this updating of the NIP. Use of Pollutant Release and Transfer Registers (PRTRs) is increasing. This NIP contains the report for 2013.

#### **3.3.5 Capacity building**

This NIP has included capacity building activities to contribute to compliance measures and to develop risk reduction measures under the Convention. It has identified technical assistance and funding needs. Programmes, policy, legal framework and institutional capacity under the current NIP will be revised and upgraded to address new POPs, for example strengthening the Customs Department and KRA and their operational context, to enable them to handle POPs more

appropriately. The development of tariff codes specific for POPs can improve on tracking them at points of entry and provide more accurate data on imports and exports of POPs.

Universities and research institutions will be strengthened to provide data on chemicals of concern. Scientific expertise will be developed. Kenya will take advantage of guidance, expertise, assistance and training support from international and regional organizations like OECD, WHO, FAO, UNITAR, UNEP, ICIPE, etc. In implementing its updated NIP, Kenya will also participate actively in bilateral, regional and global cooperation programmes that offer capacity training activities for the assessment of chemicals, including POPs.

### **3.3.6 Awareness Raising**

Article 9 of the Convention requires Parties to exchange information, facilitate public information, awareness and education (Article 10), report to the Convention Secretariat (Article 15) and periodically update implementation Plans (Article 7). When updating the Kenya NIP, a mechanism for exchange of information on emerging chemicals issues that was geared towards initiating action on new chemicals POPs for example the SAICM was recommended. Communication and awareness-raising on new POPs will facilitate public participation, including the civil society and the private sector, business community, academia, government organizations at national and county levels, legal and policy experts and indigenous communities towards the sound management of POPs.

## **3.4. Adoption of International Treaty Law**

The Constitution of Kenya incorporated all Conventions and Treaties, to which Kenya is party to, into Kenyan law, are usually inter-related and more often than not the preceding Agreements form a background for those that follow. Kenya stands to have a comprehensive system of dealing with POPs by adoption and domestication of the provisions of Stockholm Conventions. The Stockholm Convention recognizes this, and in its preamble, it recalls the pertinent provisions of the relevant international environmental conventions, and in particular Rotterdam Convention.

### **3.4.1 Synergy**

As discussed, Kenya's POPs management system would benefit from the synergy of legislation with the *Stockholm Convention* and other international and regional agreements with related content. In line with the *Synergies Agreement*, National harmonization of POPs management is of the essence. In the first instance, chemical policy focuses on developing a nationally accepted and environmentally friendly sound chemicals management procedure. To achieve this, it is important to involve key stakeholders in development, improvement and implementation of the policy. As Kenya moves towards industrialization by 2020 the chemicals industry will be as important as the agricultural industry in POPs management.

The POPs management policy must be acceptable, based on universally accepted scientific risk-based assessment of POPs management and should incorporate core principles of safety and environmental conservation.

Some of these principles include:

- a) **Sustainable management and development** which focuses on risk reduction management where plausible and emphasis on development that meets the needs of the present generation without compromising the ability of future generations to meet their needs by maintaining the carrying capacity of the supporting ecosystems;
- b) **The precautionary approach**, which prescribes that where there are threats of damage to the environment, whether serious or irreversible, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation;

- c) The “**cradle to grave**” approach to chemical safety relates to the management of risk throughout the process of chemicals management from start to finish. This is realized in the domestication of international treaties that provide for chemicals management in various stages of the process. With regard to POPs the three are the Rotterdam Convention, Stockholm Convention and the Basel Convention.

### **3.5 RECOMMENDATIONS**

Addressing the legal, policy and institutional aspects of POPs management in Kenya therefore makes the following recommendations:-

- a) The overall operational context - legal, policy and institutional aspects of POPs and other hazardous and chemicals management at county and therefore grassroots level needs to be improved in order to give effect to the devolution agenda as per the mix of the new constitutional dispensation requiring devolution of environmental and administrative management to the counties has established new administrative structures.
- b) Relevant regulatory literature such as conventions, laws, protocols, regulations, standards, research results, etc., need to be widely availed to institutions and the public
- c) On institutional capacity generally, all institutions need enhancement and facilitation to handle all processes and procedures of POPs management
- d) County offices with a trans-boundary mandate need support in acquisition of necessary equipment and local expertise to be able to comply and collect accurate data, analysis, carry out surveillance, identification of and credible response to chemicals issues e.g. by NEMA and Customs dept – case of oil spill and other disasters
- e) There is need to encourage and enforce control audits – self-regulation. For example, the NEMA office in Kisumu, in implementing the current NIP, in promoting self-regulation is encouraging self audits in EIA/EA. Self-regulation should be extended to other problems e.g. regarding improper use of pesticides by farmers, fellow stakeholders should impose sanctions on culprits
- f) The greatest challenge for Kenya is to develop a legislative framework that comprehensively domesticates the relevant provisions relating to POPs as set out in the Stockholm Convention and other chemical MEAs.
- 1) The development of regulations for the management of Ozone Depleting Substances (ODS) has now provided a precedent for the formulation of subsidiary legislation on chemicals management in Kenya.

## CHAPTER 4: ASSESSMENT OF THE 10 POPs ISSUE IN THE COUNTRY

Assessment of POPs pesticides (Annex A, Part I chemicals): 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.

### 4.1 New Pesticides

Below are the new pesticide POPs and convention requirements

Table 11: The new Pesticide POPs in Annex I

Chemicals	Annex	Specific exemptions/Acceptable purposes
Alpha hexachlorocyclohexane	A	Production: none/use: none
Beta hexachlorocyclohexane	A	Production: none/use: none
Chlordecone	A	Production: none/use: none
Lindane	A	Production: none/use: none
Pentachlorobenzene	A and C	Production: none/use: none
Endosulfan	A	production :none/use:none

This assessment shows that;

- Importation, export and use of pesticides are regulated under PCPA, cap 346, Laws of Kenya while stockpiles and wastes containing pesticides POPs are controlled under both PCP Act, 1982 and EMCA, 1999.
- Pesticides have been widely used for vector control, crop production and for public health purposes.
- Report from PCPB indicates that there was also an increase of the volume of pest control products exported to the neighbouring countries evidenced by an increase in the number of processed applications for export (PCPB, 2009/10).

### 4.2 Production, use, import export in Kenya

Currently none of the listed POPs pesticides are produced in Kenya

#### 4.2.1 Additional information on endosulfan and lidane

In Kenya, endosulfan has been widely used as a broad based insecticide against agricultural pests namely, the cotton ball-borer and maize stalk-borer. From 2006 to 2010, 17,480 tons of endolsulfan was imported in the country (PCPB,2009). Endosulfan and its isomers were banned for use in Kenya in 2011, following the listing by the SC committee for elimination of production and use and its isomers by all Parties. Kenya has not registered any exemptions at the COP meeting. There was no sufficient information on its direct replacement.

There are about ten firms in Kenya (report 2007) formulating and distributing various pesticides in the country. The companies import active ingredients and undertake formulations locally. The Companies are mainly multinationals. There are other pesticides companies that import large volumes of pesticides and repack them locally including Orbit Chemicals, Murphy Chemicals, and Osho Chemicals etc.

#### 4.2.2 Assessment of POP-PBDEs and HBB

Much of this detailed discussion is contained in volume 2 on industrial POPs and Vol. 3 on electrical and electronic waste attached. It gives details of PBDE, HBB and PFOs.

#### 4.2.3 PBDEs

In Kenya, PBDEs was used in different resins, polymers, and substrates at levels ranging from 5 to 30% by weight. The quantities used for each specific application are not publicly available. Table 2-1 shows the use of c-PentaBDE in various materials and applications. The use and application of PBDEs in

products in Kenya is heavily dependent on import materials. This is because PBDEs are not manufactured in Kenya. Therefore the history of production in producing countries where Kenya imports these materials or products is important in order to provide estimates of the amounts of PBDEs in circulation in Kenya. Example, the origin country of import of motor vehicles, their category will vary among global regions of manufacture mainly, Central America, Europe and Asia. Some toxicological effects associated with PBDEs include: neurodevelopmental effects, Neurobehavioral effects, cancer, thyroid problems.

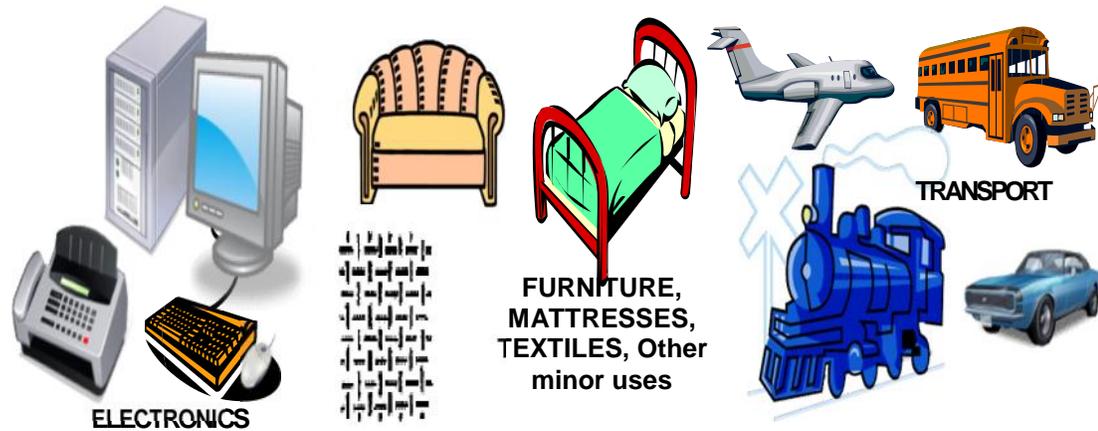


Figure 3: Products where PBDEs were used as flame retardants.

Another example is in the imports of polyurethane foam whose ingredients Kenya has been importing for the production of foam cushioning and other uses. There is no data available on the proportions of use of c-PentaBDE for the different applications in the US. Table 9 is the use and application of PBDES

Table 12: Use and Application of c-PentaBDE in various materials and applications in Kenya

Materials/polymers/resins	Applications	Commercial commodities for the applications	Main Kenyan Companies/Institutions
Epoxy resins	Circuit boards, protective coatings	Computers, ship interiors, electronic parts.	Cables and Electronic Companies
Polyvinylchloride (PVC)	Cable sheets	Wires, cables, floor mats, industrial sheets.	Cables and Electronic Companies
Polyurethane (PUR)	Cushioning materials, packaging, padding	Furniture, sound insulation packaging, padding panels, wood imitations, transportation.	Mattresses manufacturers
Unsaturated (Thermosetting) polyesters	Circuit boards, coatings	Electrical equipment, coatings for chemical processing plants mouldings, military and marine applications: construction panels.	Electronics importers
Rubber	Transportation	Conveyor belts, foamed pipes for insulation.	Cable companies
Paints/lacquers	Coatings	Marine and industry lacquers for protection of containers	Paint and Ink Companies

#### 4.2.4 PBDEs (tetra, penta, hexa and hepta BDE) Production, Import and Export

Polybrominated diphenyl ethers (PBDEs) were additives in many electronic goods as flame retardants. It is therefore important to assess the quantities of electronics products imported into Kenya as Kenya is not a major producer of electrical and electronic products but is a major importer.

#### **4.2.5 Current production, use, control and release pathways**

Most vehicles assembled before 2005 had PBDEs additives in various parts. Kenya assembles motor vehicles but majority of cars in Kenya are imported as ready-made. The major assembler companies in Kenya are the Kenya Vehicle Manufacturers (KVM) which also assembles for Hyundai Motor Corp and is located at Thika town, [General Motors East Africa \(GMEA\)](#), Honda Motorcycle Kenya Ltd, Associated Vehicle Assemblers Ltd (AVA) which also assembles for Toyota (East Africa), Toyota Kenya Ltd (TKL) and TVS Motors Kenya. Major retailers are the Toyota (East Africa)/ Toyota Kenya Ltd (TKL), Cooper Motor Corporation, General Motors East Africa (GMEA), Simba Colt and DT Dobie. The assembling or body building is mainly done for buses and other mini buses. Cars imports from Asia are estimated to take the highest percentage of POP PBDE input in Kenya (see figure 7).

This is generally because Kenyan main vehicles imports are from Asia. Enhanced trade with Asia is predicted to increase the POP PBDE to Kenya if the source countries do not restrict the use of PBDE additives in vehicles furnishes.

#### **4.2.6 Emission sources and release pathways**

The source of the PBDEs is likely from trace amounts that leach into air (indoor and outdoor) and sewage from products. PBDEs flame retardants tend to be additive, which means they are held in place physically, rather than chemically bonding to the polymer (plastic material) or fabrics as with reactive flame retardants. As a result, over time, PBDE molecules can be released will also depending on the environmental parameters and the property of the product. Recent research support the presence of PBDEs in offices and homes thus indicating emission through air ((Björklund., 2009, Björklund *et al.*, 2011 and Thuresson *at al.*, 2011).

#### **4.2.7 Stockpiles**

Data on e-Waste stockpiles in Kenya were reported Vol. A and B elsewhere as 11,400 tonnes are generated from refrigerators, 2,800 tonnes from TVs, 2,500 tonnes from personal computers, 500 tonnes from printers and 150 tonnes from mobile phones (UNEP & UNU, 2009). The same report (UNEP & UNU, 2009) showed that 1,513 tonnes of electronics entered the market. The consumer in addition to receiving 1489.4 tonnes also received 151.3 tonnes from the second hand market. It was also revealed that consumers are likely to dispose 1,210.4 tonnes in the second-hard market, and 18.6 tonnes to collectors or as general waste which is sent to refurbishers. The consumer disposes a further 18.6 tonnes directly to recyclers. Refurbishers and recyclers then send 605.2 tonnes for disposal. Alternatives for flame retardants in electronic products exist, though imports from other countries that have not affected the PBDE ban is a major pathway to PBDE in Kenya.

#### **4.2.8 Electrical and electronic waste**

Volume 3 report gives an insight of how industrial POPs management is a challenges and calls for interventions. The PBDE released from these estimates can be calculated. The following Table below shows the amount of E-waste and the respective POP-PBDEs in stocks of EEE in Kenya.

*Figure 4 Waste and the respective POP-PBDEs in stocks of EEE in Kenya*

*Table 13: e-waste amount and the respective POP-PBDEs in stocks of EEE in Kenya annually*

Product type	Amount of E-waste in tonnes/year	POP-PBDEs in stocks of EEE in Kg/year
<b>Fridge</b>	1400	50.4
<b>TVs</b>	2800	2133.6
<b>Computers</b>	2500	236.25
<b>Printers</b>	500	47.25
<b>Mobile phones</b>	150	5.4
	7350	2472.9

Bereau B & G (1993) used the following approach calculating EEE articles entering the waste stream or WEEE flows, respectively (Streicher-Porte, 2006). The two key inputs for this calculation are (i) the amount of EEE stockpiled (see 4.3.1.2) by consumers and (ii) the average life span (combined time of being used and stored by consumers). These numbers were assessed through the consumer questionnaires as



Figure 5(a) ewaste from computers



Figure 5(b) E- Wastes from monitors

Table 14: POP PBDE release to the waste stream annually 2012

Product	POP PBDE released in tonnes/year
<b>PC+ Monitor</b>	29.5 to 47.25 (Average 38.38)
<b>Printer</b>	9.45
<b>Mobile Phones</b>	1.35
<b>TVs</b>	91.35
<b>Refrigerators</b>	41.04
<b>Total</b>	143.19

#### 4.3 Annex B substances, Industrial chemicals

Perfluorooctane sulfonic acid (PFOS) is both intentionally produced and an unintended degradation product of related anthropogenic chemicals. PFOS is used as a surfactant in a number of firefighting foams and many other industrial applications (Kissa 2001). In Kenya, it comes in the formulations called fluoro-protein foam and aqueous firefighting Foams (AFFF). Firefighting forms could be a significant source of PFOS in the Kenyan environment. The other significant source of PFOS is the use domestic market

products, particularly as a stain repellent in furniture and other furnishing items. These items, which are still being used, are likely to remain a source of PFOS emissions for an extended period.

#### 4.3.1 Current production, marketing, use and control

Table 12 shows extracted data from the KNBS on reported quantities of imports and in-transit exports of PFOS-based fire-fighting foams since 2005.

Table 15: Import and Export data of Firefighting foam containers in Kenya between the years 2005 to 2012.

Year	Imports	Exports/transit to other countries
2005	1156150	47257
2006	1304651	101635.6
2007	1373201	38172
2008	1190848	117381
2009	1249051	153513
2010	5895383	117348
2011	1591617	103211
2012	1701403	82354
	15462304	760871.6

Source: KNBS and KPA, Year 2011

Between 2005 to 2012, Kenya imported a total of 15462304 containers of firefighting foams.

There are two major firefighter companies in Nairobi. These include the Nairobi County and the G4S security company. The two companies offer training services to various firefighting companies. In average, the amount of firefighting foam used by G4S is 12000 liters. The amount of PFOS and related chemical released in the environment per year is therefore between 60 kg to 180 kg per (average =120 kg). The Nairobi county uses 4000 and 30000 of the Fluoroprotein and AFFF, respectively. That will release a range of between, 20 to 60 (average of 40 kg per year) and 150 to 450 (average of 300 kg per year) kg per year of fluoroprotein and AFFF respectively, giving a total 340 kg per year. A total 460 kg/year of PFOS and related chemicals release are notified by the two companies.

#### 4.3.2 Emission sources and release pathways

The release of PFOS and related chemicals in Kenya is mostly through firefighting and during training of firefighting personnel. It is expected that major contamination site will be at firefighting training facilities. One such facility is based at Naivasha. It is likely that PFOS-based foam has previously been more widely used, but it is not possible to make a quantitative estimate of emissions at this point.

In the Kenya, current use of PFOS includes metal plating activities in the chrome industry, the use of small quantities in semi-conductor manufacture and limited applications in the photographic industry. In Kenya, the main environmental release pathways are believed to be to water through the waste water treatment works.

### 4.4. Assessment with respect to DDT

#### 4.4.1. Historical use of DDT

Since 2007 there have been initiatives to reintroduce DDT to address the frustrations posed by malaria. In 2012 the DDT expert group under SC, having recognized the continued need for DDT for disease vector control, recommended, among other things, that the use of DDT in indoor residual spray should

be limited only to the most appropriate situations based on operational feasibility, epidemiological impact of disease transmission, entomological data and insecticide resistance management. It also recommended that countries should undertake further research on and implementation of non-chemical methods and strategies for disease vector control to supplement a reduced reliance on DDT. Pyrethroid based alternatives have been used for Indoor Residual Spraying in malaria endemic areas such as Kisii with positive results. No need to apply DDT has been found. This has catalyzed Kenya to search for alternatives to DDT.

Kenya has continued to indicate a strong commitment to developing alternatives to DDT. ICIPE and KEMRI continues to provide this as partners in an USA affiliated Centre for disease Control and ICIPE. The first NIP recommended activities that would target the further development and commercial roll-out of alternative disease vector control strategies that avoid the use of DDT. Since then, several alternatives have been initiated, chief among them being the use chemical alternatives, plant-based alternatives and Integrated Vector Management (IVM) practices.

The Kenya Medical Research Institute that has been monitoring the resistance of major malaria vectors to the insecticides used for indoor residual spraying and in bed nets reported high levels of resistance to pyrethroids, used for malaria control in Kenya, and recommended that Bendiocarb which belongs to the carbamate class of insecticides be used for IRS .

Bendiocarb is highly effective against resistant mosquito populations and its mode of action is different from pyrethroids. The mode of action of bendiocarb compared with pyrethroids makes this insecticide a suitable alternative for mosquito vectors which are resistant to pyrethroids. Community acceptability was high at 95% as evidenced in the study conducted in western Kenya in 2011 (Mbogo 2013 personal communication). However, there are other factors that make it less favorable compared to pyrethroids. It is less persistent which makes it more expensive compared to pyrethroids and slightly higher toxic thus require more stringent measures for environmental protection and human safety.

#### **4.4.2 Chemical alternatives to DDT and endosulfan**

A list of alternative chemicals for DDT and endosulfan was presented. Currently, 11 chemicals have been suggested as potential alternatives for DDT and 110 chemicals as alternatives for endosulfan. The alternatives are evaluated for efficacy, persistence and POPs like properties. DDT alternatives include: Bifenthrin, chlorpyrifos, deltermethrin, fenitrothion, malathion, etc.

##### **a) Non- Chemical Alternatives to DDT**

Stakeholders recommend that studies should continue to identify more compounds of insecticides to make up a pool of efficacious insecticides to be considered for alternate and rotational use as part of resistance management. A good monitoring plan for vector resistance to different classes of insecticides is necessary in our settings and, more specifically, in areas with a high level of agricultural pesticide use

##### **b) Bio-pesticides in Kenya**

Bio-pesticides are derived from micro-organisms (bacteria, fungi, viruses, etc), plants (neem, pyrethrum, etc) and natural enemies of pests (parasitoids, predators and pathogens). Also included under bio-pesticides are semi-chemicals (e.g. insect sex pheromones), enzymes (proteins) and natural plant regulators and insect growth regulators. Table 1 and Table 2 depict bio-control agents (products derived from micro-organisms and natural enemies) and botanical pesticides

(derived from plants), respectively. These bio-pesticides are registered in Kenya by the Pesticide Control Products Board ([www.pcpb.or.ke](http://www.pcpb.or.ke)).

**c) Plant based pesticides available in Kenya**

Trade names of products Active substances of products Target pest/disease Agent / distributor are all given in the Annex 5 and a list of bio-pesticides (bio-control agents) available in Kenya (PCPB register 2013).

**d) Integrated Vector Management (IVM)**

Since the development of the last NIP, various integrated vector management (IVM) programmes were initiated in Kenya particularly for the control of malaria as an alternative to the use of DDT. IVM is a rational decision-making process for the optimal use of resources for vector control. It includes five key elements: evidence-based decision-making; integrated approaches; collaboration within the health sector and with other sectors; advocacy, social mobilization, and legislation; and capacity-building. Some of the IVM approaches include the use of insecticide-treated nets (ITN), proper use of mosquito nets and environmental management for malaria vector control, including draining, filling and covering of mosquito larval habitats, use of bio-larvicides and mosquito proofing of houses. In 2004, the WHO adopted IVM globally for the control of all vector-borne diseases. IVM initiatives have been initiated in Kenya by various institutions including the Ministry of Health, research institutions and Universities and the Stockholm Regional Centre in Kenya based at ICIPE.

#### **4.5 Assessment of releases of UPOPS**

For unintentionally produced dioxins, furans, hexachlorobenzene, and PCBs. The 2007 NIP indicated that Kenya releases 4,000TEQ g/year mainly from open burning of waste and recommended a range of actions to reduce the emission including:

- i. Developing mechanisms for minimizing emissions from open burning process;
- ii. Introduce Best Available Technologies and Best Environmental Practices to priority areas in incineration, open burning, industries;
- iii. Assess unintentional production of PCBs and hexachlorobenzene which could not be made because the guidelines are not available;
- iv. Give priority to the source categories in Annex C of the convention having high dioxin emissions as identified in the dioxin and furan inventory;
- v. Train personnel involved in the handling and disposal of medical wastes;
- vi. Upgrade incinerators to meet emission levels consistent with the BAT/BEP guidelines and other regulations;
- vii. Support to public awareness programmes on proper waste handling, especially biomass and municipal wastes, and the need to discontinue open burning practices of waste;
- viii. Implement fossil fuel regulations No. 121 of 2006. of EMCA on fuel additives;
- ix. Ensure the phase-out of lead in gasoline is on course;
- x. Regulate governing environmental monitoring of contaminants, discharges and emissions from pulp and paper industries should be developed and enforced.

Some actions that have been initiated and progressed and therefore the update were thus done in this context.

#### 4.5.1 Calculating UPOPs emissions

From the UNEP Toolkit it was established that Kenya releases a total of 2872 g TEQ/a. That is there is a decrease in emissions. Waste Incineration, Heat and Power Generation, Disposal and Open burning processes are the major UPOs emitters with a combined total of 95% of the total national releases. It was also established that 76% of these releases end up in Air the remaining 24 % being found in residues.

Table below shows the total releases from the ten source groups.

Table 16: Total Releases from all Source Groups

Source Groups		Annual Releases (g TEQ/a)				
Group		Air	Water	Land	Product	Residue
1	Waste Incineration	837.1	0.0	0.0	0.0	170.9
2	Ferrous and Non-Ferrous Metal Production	125.4	0.0	0.0	0.0	15.9
3	Heat and Power Generation	964.1	0.0	0.0	0.0	2.1
4	Production of Mineral Products	5.3	0.0	0.0	0.9	0.3
5	Transportation	0.3	0.0	0.0	0.0	0.0
6	Open Burning Processes	241.1	0.0	6.6	0.0	0.0
7	Production of Chemicals and Consumer Goods	0.5	0.0	0.0	11.1	0.0
8	Miscellaneous	0.0	0.0	0.0	0.0	0.0
9	Disposal	0.0	0.1	0.0	0.0	490.7
10	Identification of Potential Hot-Spots				0.0	0.0
1-10	<b>Total</b>	<b>2173.8</b>	<b>0.1</b>	<b>6.6</b>	<b>12.0</b>	<b>679.8</b>
	Grand Total			<b>2872</b>		

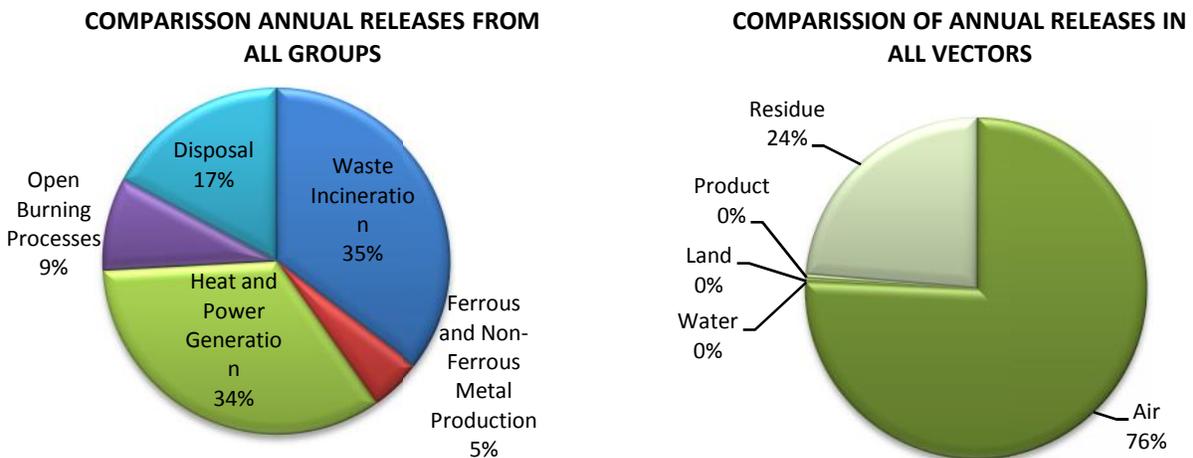


Figure 6: Percentage Contributions from all source categories

**a) Priority emission sources**

From the inventory, Waste Incineration, Heat and Power Generation, Disposal and Open burning processes emerged as the most significant source groups for the release of U-POPs

Table 14 UPOPs generation by category

Source Group	Activity (ies) generating the releases	(%)
1 Heat and Power Generation	Virgin wood/biomass fired stoves; Charcoal fired stoves Open-fire (3-stone) stoves (virgin wood) Simple stoves (virgin wood)	33%
2 Waste Incineration	Incineration of Hazardous waste	28%
3 Disposal	Mixed domestic and industrial inputs: sewage sludge treatment	17%
4 Open burning processes	Open burning of domestic waste	8%

It is notable that sources 2, 3 and 4 all consist of activities related waste management; this points to the need of programs to address matters pertaining to waste management. Source 1 is significant in that the largest numbers of people affected are women and children as these are the ones who are most likely going to be involved in this activities mainly cooking. This is a very vulnerable population whose health needs to be given serious attention.

**4.5.2 Measures to Reduce or Eliminate Releases of U-POPs Pursuant to Article 5 of the Convention**

The measures that need to be taken in order to reduce or eliminate releases of U-POPs include the review of laws and policies covering activities that lead to generation of U-POPs and where necessary, introduce new ones, education, training and awareness-raising of the dangers of U-POPs and their management and, development of strategies for periodic review and updating of the inventory. The waste incineration category needs special mention. The composition of waste is shown in figure below.

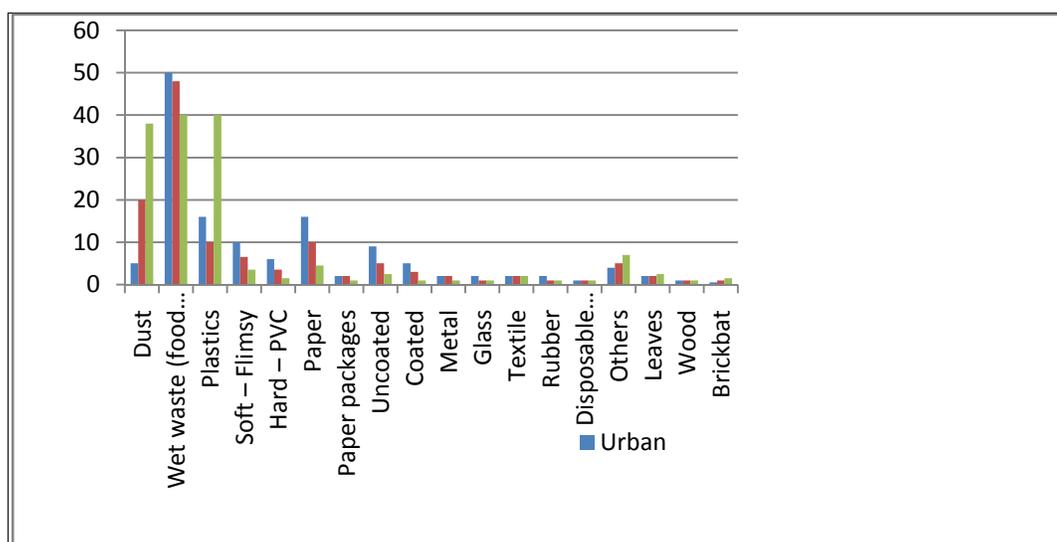


Figure 7: The waste incineration category

### 4.5.3 Category 1-Incineration

The Waste incineration category was found to generate 1008 g TEQ which is the highest of all the categories. This amounts to 35% of the total national release. There are no municipal waste incinerators however there are isolated hazardous waste incinerators but these are located mainly in Nairobi and its environs. In this category, medical waste burnt in fabrications were assumed to be a form of open burning and hence the EF of 40,000  $\mu\text{g}$  TEQ. However because facilities utilizing this mode did not have any form of waste segregation the proportion of plastic containing chlorine, metals etc is high and hence higher EF would need to be adopted in estimation of releases. Perhaps what authorities need to focus is the fact that any industries mainly textile and leather also routinely practice open burning and the continued and increase in the use of plastic packaging has great implication on values reported for this category. It is likely that the true levels are significantly higher.

#### a) Medical Waste

The various equipments normally operate in a batch-type mode. In one of two, cases, the larger centralized medical waste incineration facilities are found to operate for eight hours a day, five days a week. The mode of operation involves manually feeding the waste into the incinerators followed by manual removal and disposal of residues. Automatic feed incinerators were not encountered. They need to be introduced. Kenyatta National Hospital, generating the highest quantity of waste, works for only 16 hrs a day. The next best Nairobi Hospital works only for 8 hours. In Kenyatta hospital, there is capacity to handle a higher volume if the two incinerators on site were to operate simultaneously. Currently, only one single incinerator is operated at a given time. The project will be used to upgrade this.





*Figure 8 Sample of small burners used for incineration of wastes*

**b) Hazardous Waste**

Incineration of Hazardous waste is also worth noting. It is the second most significant source of releases, 829 g TEQ/annum which is equivalent to 28% of the total national release. In Kenya, medical waste disposal is regulated strictly by local authorities and the hospitals authorities. It was found that the most common way to get rid of these wastes is by thermal treatment within the hospital or facility. However, it has been shown that incineration of medical waste in small and poorly controlled incinerators is a major practice and a potential source of PCDD/PCDF (UNEP 1999).



*Figure 9 Wastes packed waiting for incineration at the Provincial Hospital Incinerator*

Disposal generated 490.7 g TEQ equivalent to 17% of the total national releases

**c) Combined Hazardous and Medical Waste**

Hazardous waste (HW) refers to residues and wastes, which contain hazardous materials in significant quantities. Materials including consumer goods, which require special precautions and restrictions during handling and use, belong to this group. It includes solvents and other volatile hydrocarbons, paints and dyes, chemicals including pesticides, herbicides, other halogenated chemicals, pharmaceutical products, batteries, fuels, oils and other lubricants, as well as goods containing heavy metals. Materials contaminated with these materials such as soaked rags or paper, treated wood and production residues, etc., are also considered as hazardous waste.



*Figure 10 Nakuru Provincial Hospital Municipal Solid Waste Incineration*

There are isolated incinerators dedicated to general municipal waste across the country In Mombasa, Kisumu, Nakuru and Garissa which also deal with medical waste and hazardous waste. The inventory established that in the hazardous waste incineration accounts for the bulk of releases for this category. This is because of the growth occurring in the chemicals manufacturing sector that has led to a sharp increase in the amounts of hazardous waste that needs to be incinerated. It is also notable that government district hospitals and other health facilities in Kenya operate incinerators that are of low technology levels. These incinerators do not have effective air pollution control systems (APCs).

#### **4.5.4 Heat and Power Generation**

This includes fossil fuel power stations and household. Heat and power generation category has a notable contribution 966.1 g TEQ/a amount to 34% of the total national releases. With regards to individual activities, household heating and cooking using biomass, a subcategory under Heat and Power Generation category is the most significant source of PCDD/PCDF releases. It generates 962 g TEQ/a which is equivalent to 33% of the total national releases.

#### 4.5.5 Open burning of waste and landfills



*Figure 11 Open burning at Dandora landfill; Sources: Maina Greenbelt Movement*

Open burning is typically a poor combustion process, and is a significant source of PCDD/PCDF. Open Burning Processes generated 247.6 g TEQ equivalent to 9% of the national releases.

There are two main subcategories: i.e. open burning of agricultural and natural vegetation and open burning of waste and landfills.

Open burning of agricultural and natural vegetation usually results in lower formation of PCDD/PCDF than combustion of mixed waste from man-made materials. Higher releases result from mixed wastes due to poorer combustion, lack of homogeneity and poorly mixed fuel materials. Presence of chlorinated precursors, humidity, and catalytically active metals also contribute to the higher levels. In all cases the primary release vectors are to air and into the residue.



*Figure 12 Accumulated Waste at Giotto landfill Nakuru: source assessment team*

#### **4.6 Implication of the emissions by category**

Acute respiratory infections (ARI) are the leading cause of the global burden of disease,<sup>1, 2</sup> accounting for more than 6% of worldwide disease and mortality, mostly in less-developed countries. Between 1997 and 1999, acute lower respiratory infections (ALRI) caused 3.5–4.0 million deaths worldwide<sup>1–3</sup>—more than that caused by any other infectious disease. Exposure to indoor air pollution, especially to particulate matter, from combustion of bio-fuels (wood, charcoal, agricultural residues, and dung), has been associated with respiratory disease in less-developed countries. There more than 2 billion people who use biomass as their main source of domestic energy; hence international development and public-health organizations have sought to implement preventive measures to reduce this exposure. The exposure-response relation between indoor air pollution from biomass combustion and ARI is important for assessment of the benefits and effectiveness of preventive measures such as design and dissemination of improved stoves and fuels.



*Figure13 High exposure to pollution during cooking*



#### **4.6.1 Ferrous and non-ferrous metal**

For the ferrous and nonferrous category the total release from this sector was 141 g TEQ. There is potential for this figure to increase since the technologies employed in the category are very basic with the main source being foundries which use metal scrap and have no APCs installed. In addition, the discovery of iron ore deposits in the eastern region of this country could lead to a further increase if the ore is mined.

#### **4.6.2 Production of Mineral products**

The Production of Mineral Products contributed a relatively small amount 5.6 g TEQ, mainly from the production of Lime. Similarly, the introduction of BAT would be pivotal in the control of releases in this sector.

#### **4.6.3 Transport**

The transport category contributed 0.3 g TEQ. Further reductions can be achieved by introducing emission control regulations that address actual levels of pollutants.

#### **4.6.4 Open Burning**

Open burning of waste and landfills generates 247 g TEQ which is about 7% of the national releases. Though it is not the highest source, it should be noted that this form of release is widespread and thus has the potential to affect far more people. The lack of controls in open air burning and indeed its encouragement for purposes of reducing the volume of waste is a key concern. Use of BEP especially in agriculture would greatly reduce the amounts released.

#### **4.6.5 Production of chemicals**

Production of chemicals and consumer goods category contributed 12 g TEQ. This may seem like a small amount but it is going to grow as the country continues to develop. Introduction of BAT and BEP would be significant in reducing the levels and ultimate elimination of the releases.

#### **4.6.6 Disposal category**

For the disposal category, its contribution amounting to 491 g TEQ/comes mainly from disposals arising from waste water treatment. This is expected to increase with increase in population that is connected to sewerage systems. Adequate control in this area can be achieved by introducing BAT and BEP.

#### **4.6.7 Hotspots**

Several Hot spots were identified but quantification was not done. Thus although their contribution is currently 0, it is likely to change after detailed assessment as been done.

### **4.7 Information on the state of knowledge on stock piles, contaminated sites and wastes**

#### **4.7.1 Pesticides**

The contaminated sites in Kenya include Kitengela, Menengai, Wajir and Madera. The sites were contaminated through burial of pesticides. Although Kitengela and Menengai have undergone natural decontamination, there is no conclusive evidence that they are still not a threat.

There are no activities currently being carried out to clean up contaminated sites before the ban of the said pesticides. Follow up studies by PCPB have been done to assess the level of contamination, and reveal high levels of pesticide residues in contaminated soils. Along with the disposal process, a number of activities are being implemented to prevent future pesticides accumulation. These activities include:

- Development and enforcement of pesticide policy on obsolete pesticides,
- Development and the implementation of Integrated Pest Management (IPM)
- Development and implementation plan of Integrated Vector Management (IVM),
- Capacity building in terms of providing professional trainings at medical and paramedical facilities,
- Creating awareness among stakeholders, and
- Enforcement of national legislations and policies related to pesticides use.

The agricultural, veterinary and public health pesticide stakeholders namely (PCPB, AAK, Cleanfarms, Syngenta, MoH) in the pesticide industry continued support clean the farms of unwanted pesticides, reducing both environmental and human risk. There is, therefore, a need to encourage farmers, distributors, stockists, ranchers and other stakeholders to surrender the obsolete stocks to the Clean Farms Safeguarding Project for safe disposal in licensed facilities.

#### 4.7.2 New Pesticide Pops

The Table below gives a summary of information of the legal; situation of new pesticides POPs, stock piles, obsolete/ wastes and contaminated sites gathered during the site visits and indicates the remedial measures that need to be undertaken.

Table 17: Stockpiles, contaminated sites and wastes

New Pesticide POPs	Contaminated sites	wastes	Quantity	Relevant regulations	Guidance/remedial measures
<b>Alpha hexachlorocyclohexane</b>	none	N/A	N/A	PCPA	Environmental monitoring
<b>Beta hexachlorocyclohexane</b>	none	N/A	N/A	„	„
<b>Lindane</b>	none		N/A	„	„
<b>Chlordecone</b>	none	N/A	N/A	„	„
<b>Technical endosulfan and related isomers</b>	none	N/A	N/A	„	„

Detailed information of the situation of New Pesticides POPs, stock piles, obsolete/ wastes and contaminated sites were gathered during the site visits.

In conclusion there were no stockpiles, contaminated sites and wastes reported in all the areas visited except in Nakuru where lindane (last stock) for seed dressing was reported. However there is need to carry out monitoring studies with regard to residues in the environment especially in agricultural premises and farms where lindane and endolsulfan has been used. Lindane and endolsulfan stocks can be used since only new imports are banned, no more stocks will accumulate

There is need to have a mechanism of distributing the NIPs to all stakeholders or make the information public, maybe have a chemical website and occasionally reviewed.

There are therefore no releases for new pesticide POPs

#### 4.7.3 PCBs

The NIP 2007 required for PCBs that Kenya

- i. Adopts legislation banning or restricting the use of PCBs;
- ii. Prepare institutions, such as Kenya Power and Lighting, KENGEN, etc., for labeling of the PCB equipment in use consistent with the provisions of the Convention;
- iii. Comprehensive inventory of PCBs undertaken using better analytical technology to identify equipment containing PCBs in concentrations of 50ppm or greater and labeling such equipment accordingly;
- iv. Giving special focus to abandoned d industrial sites that still contain disused power transformers and/or capacitors and in what is an environmentally sound manner;
- v. Monitoring those POPs currently in use and with POPs like characteristics.
- vi. No action seems to be taken and transformers with PCB stocks still dot the country.

#### 4.7.4 Industrial POPS Stockpiles, compliance activity and alternatives

Nairobi County's total stockpiles of PFOS-based foam are estimated at 40000 litres and it is in open storage facility at the premises in industrial area of Nairobi (See figure 4-1). Most fire and rescue services reported that they had no stockpiles of PFOS-based foams, while a few had small quantities. The inventory did not include all Kenya's fire and rescue services, but the information received is believed to be representative of this category as a whole. The Kenyan Armed Forces also have considerable remaining stocks of PFOS-based foam. It is estimated that the total content of PFOS-related substances in foam stockpiles in all municipal councils in Kenya is approximately 80 tonnes. There are no requirements for new stocks

Figure below shows open storage of AFFF at a Nairobi's industrial area facility.



Figure 13 Open storage of AFFF at a Nairobi's industrial area facility.

##### 4.7.4.1 Disposal of products containing industrial POPs in Kenya

Lack of information by all sectors stakeholders has led to improper disposal of waste containing PFOS and related substances. Proper disposal and handling of E-waste in Kenya goes hand in hand in reduction of PBDE in the environment. For e-waste, Kenya has a number of projects geared towards recycling and disposal. They include the following;

- Computer for Schools through their refurbishment programme
- WEEE Compliant Recycling at Athi River, Nairobi (the HP project. See Figure 5-1)
- Support of individual companies in their projects. Examples are the Nokia Company through their recycling scheme. Companies such as IBM and XP have a program where e-waste from their products is transported back to their homeland.

##### 4.7.4.2 e-waste handling

At the East African compliant recycling, 6000 kg per day of CRTs and 6000 kg per day of LCDs are sorted out. Different plastic polymer types separated for either recycling or disposal. Hazardous parts are sent to the UK for disposal. Apart from the CRTs and LCDs, 30000kg of other electronics are sorted per year. Collection centers that feed the facilities within Nairobi are at Mukuru, Ngara, Dandora, Eastlands, Kibera . The Hazardous waste is sealed in containers and transported back to the UK for further treatment and disposal.

The practices for managing e-waste are mostly handled by the informal sector (*Jua Kali*). Most of these operators have inadequate skills, are neither registered nor authorized and operate in a secretive manner. These operations are well connected to the supply chain processes of sourcing the raw material to finding markets for the recovered materials during post-recycling operations. The processes are highly toxic and impact adversely to both the environment and human health.

#### **4.7.4.3 Landfills and Waste Dumps**

The wastes that end up in landfills and waste dumps come from both domestic and commercial sources. The inventory indicated that many of the industrial facilities generating both hazardous and non hazardous waste use open burning as the mode of waste disposal. In the City of Nairobi for example, the County Governments' employees after sweeping will often burn them. Households also practice open burning although in a majority of cases especially in the rural areas, composting is done.

There is no sanitary land filling in Kenya and nearly all local authorities use dumping as a method of disposal which is often followed by open burning. Calculations on releases were considered under open burning.

#### **4.7.4.4 Sewage /Sewage Treatment.**

There are some 30 sewerage treatment plants in Kenya. Generally people are served by main sewer, septic tanks and pit latrines. It involves the conventional activated sludge process and oxidation ditches. There are sometimes no separate sewage lines for industrial and domestic. The sewage treatment works treat mixed effluent, industrial and domestic. There are 142 gazetted urban centres. Of these, only 30 % have sewerage systems. There are treatment plants that can be considered as major facilities in category although they may not be connected to other external sewerage systems. Some of the key facilities are listed below:

Athi River Export processing Zone; Sugar Factories; Leather Factories; Textile Factories; Paper Factories; Sisal Factories; Slaughter houses; Food Processing Facilities. Table 26 below gives the national water demand projections up to 2010. Currently only 70% urban is supplied with water and 48% rural. Only 70% of the supplied water is treated in formal treatment works after it has been used. The remaining 30% is dumped. It can thus be estimated that approximately 573,443,008 m<sup>3</sup> of water is treated in formal treatment works while 245,761,289 m<sup>3</sup> is dumped. Some have conventional treatment works,

It was noted that sludge generated from the treatment works was normally sold out to farmers as farm manure. Using data from the Nyeri Treatment works, 1,000,000 m<sup>3</sup> of water treated would generate about 200 tons of sludge. It can thus be estimated that nationally the 573,443,008 m<sup>3</sup> of waste water treated annually in the different sewage works, would generate approximately 105,000 tons of sludge

#### **4.7.4.5 Open Water dumping.**

All waste water discharge that is not connected to sewers is disposed into rivers with or without treatment. Most septic tanks in urban areas are emptied with exhausters and the waste disposed of into the nearest sewer system. However for the purpose of this inventory, it was assumed that all facilities in rural areas can be assumed to be dumping their water. A total of 245,761,289 m<sup>3</sup> of water is dumped. The estimated amount of sludge from the two facilities would be approximately 16 tons per annum. Non-thermal treatment of waste oil does not lead to any generation of dioxins and furans. Contamination and exposure to humans would thus arise from improper handling of the waste oil, spills and improper disposal. Site specific inspection would need to be done in order to establish exposure pathways.

#### **4.7.4.6 Landfill Leachate.**

Most of the dumps are located in valleys within the urban areas. It can be assumed that they leach especially during the rainy season. The key ones are in Nairobi. However Landfill leachate was not quantified due to inadequate data.

#### **4.7.4.7 Hot Spots**

Several Hot spot areas were identified. These sites have the potential of becoming sources of PCDD/PCDF releases in future. They include

- Pan Paper mills factory site is a potential Hot spot
- Athi River pesticide store
- Dandora dumpsites
- Some sites have been cleaned as in Juja where PCPs were removed.

*Figure 14: A site where PCPs were buried has been rehabilitated in*

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

Table 18: Summary of future production use and releases.

Category	Chemical Name	Use	Releases	Exemptions
<b>Pesticide</b>	Aldrin	Insecticide	form stockpile	none
<b>Pesticide</b>	Chlordane	Insecticide	from stockpiles	none
<b>Pesticide</b>	Dieldrin	Insecticide	stockpiles and waste	none
<b>Pesticide</b>	Endrin	Insecticide	waste	none
<b>Pesticide</b>	Heptachlor	Insecticide	waste	none
<b>Pesticide/Industrial Chemical</b>	Hexachlorobenze (HCB)	Fungicide released during manufacture of certain chemicals	None	none
<b>Pesticide</b>	Mirex	Insecticide	None	none
<b>Industrial Chemical</b>	Polychlorinated Biphenyls (PCBs)	Coolant for electrical transformers and capacitors	obsolete equipment	none
<b>Pesticide</b>	Dichlorodiphenyl Trichloroethane (DDT)	Mosquito Control	stockpile	Possible
<b>Unintentional by-products</b>	-Dioxins -Furans	-The use of chlorine in the paper making -Released during incineration of medical waste.	incineration, hazardous waste, landfills and open burning	None

## CHAPTER 5: EXISTING PROGRAMMES FOR MONITORING RELEASES

### 5.1.Pesticides

Pesticide POPs are the most dispersed. They are also easiest to monitor.

#### 5.1.1. HCH

The beta-isomer of HCH is the most persistent and bio accumulative form. The alpha- and gamma-isomers of HCH are converted into the beta-isomer in living organisms. As a result of this conversion, as much as 90 percent of HCH detected in human tissues and breast milk is the beta-HCH. As with many other POPs, HCH attaches to soil and sediment particles. However, fungi and bacteria can break HCH down into less harmful substances. HCH isomers, including Lindane, are broken down quickly in water. All HCH isomers can accumulate in the fatty tissue of fish and other animals. Work of Gichuche etc has shown the presence of POPs in water and sediments

Table 19 Mean concentration ( $\pm$  SE) of Hexachlorocyclohexane (HCH) pesticide residues in water and sediment samples from Yala/Nzoia Basin

Pesticide	Water (dry & rainy)	Sediment ( $\mu$ gkg/l (dry)	
-HCH	ND	4.41	1.81 $\pm$ 0.006
-HCH	ND	2.76	0.92 $\pm$ 0.017
-HCH	ND	16.03	6.43 $\pm$ 0.012

(Musa et al., 2011)

The presence of lindane in sediment indicates that it is significantly used in the region despite the fact that it is restricted for seed dressing only in Kenya. The concentrations of lindane in sediments were much higher than levelsof water probably because of accumulation in the sediments with time. Decomposition of large amounts of biomass enriches the surface sediments with organic carbon which promotes adsorption. This, therefore, could suggest previous use of this pesticide for other agricultural purposes apart from seed dressing.

A study carried out in two counties (Kiambu and Machakos) compared levels of the HCH group of compounds in different fish organs as shown in Tables 5 and 6 below.

Table 20: Mean concentration of Organochlorine pesticide levels ( $\mu$ g Kg<sup>-1</sup>)  $\pm$ SD in various fish organs in Kiambu County.

Organochlorine	Muscle	Liver	Gonad	brain
-BHC	ND	0.236 $\pm$ 0.266	0.383 $\pm$ 0.15	0.025 $\pm$ 0.024
-BHC	0.072 $\pm$ 0.011	0.013 $\pm$ 0.033	0.169 $\pm$ 0.45	0.022 $\pm$ 0.046
$\beta$ -BHC	ND	ND	ND	ND

ND: Not Detected/below detection limit. Source: Omwenga, 2013

#### 5.1.2 Lindane

Lindane had the highest frequency of occurrence and was detected in 36 samples (16.9%) with a mean concentration of 0.0723  $\pm$  0.011, 0.013 $\pm$  0.033, 0.169 $\pm$ 0.45 and 0.022 $\pm$ 0.046 in muscle, liver, gonad and brain respectively in Kiambu County. -BHC was detected in 19 samples (8.92%) and ranged between not detectable to 0.236  $\mu$ g Kg<sup>-1</sup> with a mean concentration( $\mu$ g kg<sup>-1</sup>) of 0.236 $\pm$ 0.266, 0.383 $\pm$ 0.15 and 0.025 $\pm$ 0.024 in liver, gonad and brain respectively in Kiambu County.

Table 21: Concentration of Organochlorine pesticide ( $\mu\text{g Kg}^{-1}$ )  $\pm$ SD levels in various fish organs in Machakos County.

Organochlorine	Muscle	Liver	Gonad	brain
-BHC	ND	ND	0.013 $\pm$ 0.19	0.011
-BHC	0.013 $\pm$ 0.008	0.073 $\pm$ 0.01	0.017 $\pm$ 0.029	0.029 $\pm$ 0.041
-BHC	ND	ND	ND	ND

Fish flesh muscle is the edible part of fish and frequently employed in assessing human health risks in relation to fish consumption.

Lindane had the highest frequency of detection in all samples analyzed. This is an indication that some farmers might be illegally using lindane. Lindane was initially used for seed dressing to protect crops against termites. However, its agricultural use has been banned in the country due to persistence and toxicity to the untargeted organisms. The contamination pathways into water bodies are likely to be nonpoint sources via runoff, atmospheric deposition and leaching due to past agricultural applications and vector control as the above tables show that levels were higher in Kiambu which is a more intense agricultural area than Machakos County.

Table 22: Mean and range of pesticide residue levels ( $\mu\text{g/kg}$ ) in Nile perch liver and muscle samples from Lake Victoria, February – June 2001.

Period of sampling 2001		
Pesticide residue	February-June Liver (n=51)	February-June Muscle (n=52)
	Mean(range)	Mean(range)
r-BHC	12.9(2-37)7/51	9.08(1.0-21.8)6/52
s-BHC	31.1(9.3-52.9)5/51	14.8(4.6-40.0)13/52
$\alpha$ -BHC	5.0(0.9-12.3)14/51	8.23(1.6-75.0)19/52

Residue levels are given on wet weight basis. Mean calculated for the positive samples only. Positive samples are given as a reciprocal. (-) Below detection limit. Source: Mwangi, 2001

The mean level of  $\beta$ -BHC found in the liver was about two times higher than in the muscle.  $\beta$ -BHC is the environmentally most persistent isomer and may have higher ability to accumulate in liver tissue than  $\gamma$ -BHC. However,  $\gamma$ -BHC has also been used as an insecticide in Kenya both in agriculture and livestock as a cattle dip and this may be the reason of its detection in more samples than  $\beta$ -BHC

### 5.1.3 Presence in human Milk

Increase in human settlement and activity along the shoreline is a major contributor to pollution in the lake ecosystem which requires extensive use of pesticides to produce enough food. Vector control within the lake region, and industrial and sewage effluents draining into the lake adds to the lake pollution.

These residues were detected during the month of March and April when highest rainfall was recorded and possible discharge of polluted water to the lake. However, since Nile perch are migratory fish, the detection of these chemicals might reflect the general level of contamination of the lake rather than just a local contamination. The samples were, however, not representative of the entire population. Nile Perch are also known to be bottom swimmers, feeding mainly on deposit material which may have

residues adsorbed to the bottom and suspended sediments (Bulkley *et al.*, 1981) especially those that have been used in the past for a long time in the area.

Studies looking at HCH contamination of human breast milk have been conducted in many countries and technical grade hexachlorocyclohexane and its isomers have been found in breast milk throughout the world. HCH levels vary widely across the globe, with the highest values found in areas of extensive use. However many countries have not conducted multiple studies over a range of time, which makes it difficult, to draw conclusions about trends or to assess the effects of bans and restrictions. This happens to be the situation in Kenya for all pesticide Pops. In May 2005, WHO and UNEP entered into a memorandum of agreement for coordination of human milk surveys in Kenya and other countries for the purpose of the Stockholm. Convention

Table 23: Result of Human Milk Surveys in Kenya

Hexachlorocyclohexane (HCH) group	Concentration ng/g lipid weight
alpha-HCH	ND
beta-HCH	2.8
gamma-HCH	2.3

Source:(Report on WHO/UNEP human milk survey on POPs (POPs))

The presence of POPs in mothers' milk reflects environmental contamination and use of POPs in the country. Most mothers indicated consumption of mixed diet including fish, eggs and other animal products which are major source of POPs. Levels of POPs indicated may form baseline levels against which future trends may be evaluated

#### 5.1.4 Endosulfan

Baseline data on levels of endosulfan and its isomers obtained from published research reports. Water bodies are the main repositories of most pollutants and rivers are there mode of dispersal. Lake Naivasha lies in a fertile semiarid basin and is the only freshwater Rift Valley Lake in Kenya; the Lake has no surface outlet. Over 50% of Kenya's horticultural industry is located around the Lake. Its main catchment area is located in the Nyandarua and Kinangop Ranges (1,730km<sup>2</sup>). The remaining fresh water discharge is through rainfall, ground water seepage and ephemeral streams; main contributor being the Gilgil river which drains the Bahati highlands (Kamau *et al.*, 2013). The levels of endosulfan and its isomers in Lake Naivasha waters are reported in Table24

Table 24: Concentration (ng/L) of Endosulfan and Metabolites in Lake Naivasha

Sites	Endosulfan $\gamma$ -isomer	Endosulfan $\alpha$ -isomer	Endosulfan Sulfate	Endosulfan	Mean $\pm$ Std dev
S1	23.0 $\pm$ 2.3	41.7 $\pm$ 2.4	16.2 $\pm$ 1.2	80.9	26.9 $\pm$ 13.2
S2	20.1 $\pm$ 2.1	44.2 $\pm$ 3.1	78.4 $\pm$ 4.3	142.7	47.7 $\pm$ 29.3
S3	46.1 $\pm$ 3.4	51.1 $\pm$ 4.3	133.0 $\pm$ 4.2	230.2	76.7 $\pm$ 48.8
S4	57.9 $\pm$ 4.5	92.8 $\pm$ 5.1	195.5 $\pm$ 9.2	346.2	115.4 $\pm$ 71.5
S5	21.2 $\pm$ 1.9	84.3 $\pm$ 6.5	60.2 $\pm$ 3.2	166.7	55.2 $\pm$ 31.8
S6	42.9 $\pm$ 3.1	61.9 $\pm$ 5.5	345.2 $\pm$ 6.7	450	150 $\pm$ 169.3

Source: Njogu *et al.* (2011). (n=6)

**a) Lake Victoria**

Werimo and coworkers (2009) reported having detected less than  $0.5 \mu\text{g L}^{-1}$  of  $\alpha$ -Endosulfan in Lake Victoria waters at Ndere Island, the reported levels were low and posed no unacceptable risks from endosulfan contamination.

**b) Other River Systems**

A number of rivers in Kenya drain into the sea, River Uмба is the only Transboundary River its catchment area covers some section of Tanzania. River Ramisi is a coastal river with a catchment spanning within the coastal region. Rivers Tana and Sabaki are the two major rivers the catchment areas drain through agricultural and urban areas. Table 21 reports on pesticide concentrations in seaweed and marine sediment, the reported endosulfan concentration was higher compared to the other pesticides analyzed.

Table 25: Mean concentration of organo-chlorine pesticides in sediments and seaweed.

Site/Sample	Pesticide conc. ( g/g)
English Point	
Marine sediment-BHC	0.004±2.1
Nyali Bridge	
Marine sediment-BHC	0.025±0.01
Marine sediment-Endosulfan	0.322±0.01
Port Reitz Creek	
Sargassum-BHC	0.193±0.01
Makupa Creek	0.045±0.01
Thalasadendron-BHC	

Source: Oyugi et al. 2008

Table below reports on POPs detected in estuarine and marine environment of interest is to note that both Sabaki and Ramisi estuaries recorded the lowest  $\alpha$ -endosulfan water concentrations, an indication of less use in their catchment area (Table 22). Kilifi and Mombasa on the other hand recorded high levels, the high levels in Kilifi can be attributed to the Goshi River, which flows through Taita Hills and enters the Indian Ocean at Kilifi Creek. This might imply high use of endosulfan in the catchment area of Taita Hills.

Table 26: Endosulfan and Lindane residues detected in water samples at different sites

Sites	Mean (residues in water (ng/ml±sd))			
	Sabaki	Kilifi	Mombasa	Ramisi
Lindane	0.241*	0.503±0.361	BDL	BDL
$\alpha$ -Endosulfan	<b>0.166±0.015</b>	<b>0.239±0.142</b>	<b>0.397±0.223</b>	<b>0.155±0.057</b>

\*detected in one sample only; sd: Standard deviation; BDL: Below detection limit

Source: Wandiga et al. 2002

Fish sampled from the Tana estuary contained very low endosulfan levels, these samples were however sampled five years earlier, whereas the others were sampled in 2008 these were sampled in 2003. Possible cause of the variant could be that endosulfan use in the catchment area might have been low in the period prior 2003. The fish sampled from Sabaki estuary contained twice as much endosulfan concentrations compared to the other sites sampled (Table 23).

Table 27: Mean POPs concentrations ( $\sim$ g Kg<sup>-1</sup>) in fish sampled in 2008 and 2003

Sites	Endosulfan	Lindane
Sabaki <sup>a</sup>	40.2	61.2
Kilifi <sup>a</sup>	22.9	26.5
Mombasa <sup>a</sup>	12.0	57.3
Ramisi <sup>a</sup>	10.4	281
Tana <sup>b</sup>	<0.042	131.2

Sources: <sup>a</sup>Barasa et al (2008), <sup>b</sup>

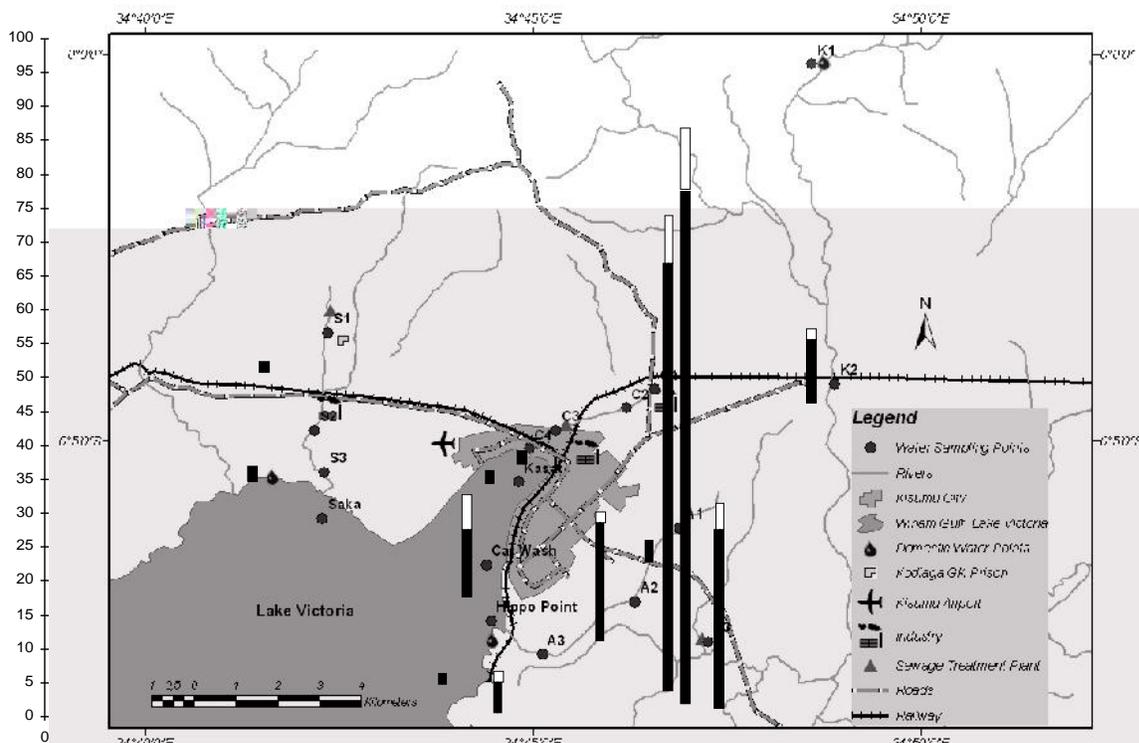


Figure 15: Concentrations (ng/L) of PFOA (black bars) and PFOS (White bars) in water in Kisumu Kenya

No levels have been monitored for POPs-PBDE and HBB in any environmental matrices in Kenya. The need to monitor these levels is therefore recommended.

### 5.3. Impacted populations or environments

#### 5.3.1 Assessment of Impacted Populations by POPs pesticides

Kenya does not have a nationally established programme to monitor POPs in environmental media, food stuff or human samples. The existing POPs data has been produced through participation in international programmes such as the Global monitoring Plan, UNEP/GEF supported activities, and locally through research activities. Review of the existing national documents including the POPs inventory of 2006, and related reports such as the Africa POPs monitoring report and reports of the UNEP GEF capacity enhancement activities have revealed the presence of POPs pesticide residues in environmental media.

#### a) POPs pesticides in environmental samples

The results of analysis of environmental samples reveal the presence of POPs pesticides such as aldrin and dieldrin in fish and sediments, DDT and DDE in soil samples, whereas ambient air reveal high levels of aldrin, DDE and DDT in samples from Kabete. However, *o,p*-DDT is considerably lower than their *p,p'*-DDT counterparts for most of the air samples. Other OCPs detected, but in low levels, are chlordanes, heptachlors and endrin. Based on the observed levels across the seasons, the residues measured in air could be attributed to local air circulations rather than point source contamination (Table 2.1). Soils from contaminated site in Kitengela has revealed high concentrations of dieldrin, endrin, *p,p'*-DDT, *p,p'*-DDE, *p,p'*-DDD, *o,p'*-DDT, *o,p'*-DDE and *o,p'*-DDD. The presence of large stocks of contaminated soil in the country is of concern and appropriate decontamination strategies need to be employed to restore the soils.

Table 29: POPs pesticides and PCBs concentrations in ambient air, soil and fish samples

POPS	Air (PUF ng/PFU)	Dried Sediments (ng/g)	Dried soil (ng/g)	Fish (ng/g ww)
<b>Polychlorinated Biphenyls</b>				
<b>PCB 28</b>	<0.37	*0.02	<0.09	*0.03
<b>PCB 52</b>	<3.2	<0.02	<0.09	*0.02
<b>PCB 101</b>	<1.6	*0.04	<0.09	<0.01
<b>PCB 118</b>	<1.2- *0.34	*0.06	<0.09	<0.01
<b>PgCB 138+PCB 163</b>	<1.3- *0.36	0.15	<0.09	<0.01
<b>PCB 153</b>	<1.2- *0.36	0.12	<0.09	*0.02
<b>PCB 180</b>	<0.59- *0.15	0.08	<0.09	<0.01
<b>Organochlorine pesticides</b>				
<b>HCB</b>	2.9-4.3	*0.05	<0.09	*0.01
<b><i>a</i>-HCH</b>	<3.2	*0.06	27	<0.05
<b><i>b</i>-HCH</b>	<3.2	<0.03	<0.02	<0.05
<b><i>g</i>-HCH</b>	*2.3-7.3	*0.09	120	<0.05
<b>Heptachlor</b>	<0.79	<0.02	<0.09	<0.01
<b>Aldrin</b>	<2.4	<0.02	1200	<0.01
<b>Dieldrin</b>	21-44	0.74	1104400	*0.06
<b>Endrin</b>	<1.6	<0.03	12800	<0.05
<b><i>O,p'</i>-DDE</b>	<1.2-1.9	0.07	360	<0.01
<b><i>P,p'</i>-DDE</b>	10-14	1.5	5200	*0.03
<b><i>O,p'</i>-DDD</b>	<1.6	0.27	<0.02	<0.05
<b><i>P,p'</i>-DDD</b>	<1.7	1.2	210.0	<0.05
<b><i>O,p'</i>-DDT</b>	1.7-5.6	0.12	2700	<0.01
<b><i>P,p'</i>-DDT</b>	8.2-9.4	0.71	10500	<0.04
<b><i>cis</i>-Chlordane</b>	<1.6-2.1	<0.03	150	<0.05
<b><i>Trans</i>-chlordane</b>	1.3-2.7	<0.03	190	<0.05
<b>Mirex</b>	<0.05	<0.02	<0.009	<0.01
<b>Extractable lipids</b>	n/a	n/a	n/a	0.73%

n/a = not applicable; \*value between LOD and LOQ; <(value) = <LOD

#### b) POPs pesticides in Mothers milk

Human milk studies have been conducted in Kenya since the 1980s (Kanja *et al.*, 1989). Additional studies have been conducted under the UNEP/WHO project under the Global Monitoring Plan (UNEP, 2009). In both cases, DDT and its congeners (especially the *p,p'*-DDE congener) has remained the most abundant in the mothers' milk compared to other POPs pesticides (Table 26). Other pesticides detected at significant levels were dieldrin and the HCHs, especially the *b*-HCH and *g*-HCH congeners. POPs pesticide such as aldrin, chlordanes, heptachlors, mirex, toxaphenes (26, 50 and 62) and endrins were not detected in mothers' milk analysed during collected in 2009/2010. In addition, data is missing on the levels of new POPs pesticides such as endosulfan and chlordecone.

Table 30: POPs pesticide concentrations in mothers' milk sample

<i>Pesticide</i>	<i>Concentration ng/g lipid weight</i>
<i>Chlordane group</i>	<i>Nd</i>
<i>Alpha-chlordane</i>	<i>Nd</i>
<i>Gamma-chlordane</i>	<i>Nd</i>
<i>Oxy-chlordane</i>	<i>Nd</i>
<i>Trans-nonachlor</i>	0.7
<i>Dieldrin</i>	5.1
<i>DDT Group</i>	289.3
<i>O,p'-DDE</i>	<i>Nd</i>
<i>P,p'-DDE</i>	1.8
<i>O,p'-DDD</i>	<i>Nd</i>
<i>P,p'-DDD</i>	249.5
<i>O,p'-DDT</i>	1.4
<i>P,p'-DDT</i>	7.6
<i>P,p'-DDE</i>	<i>Nd</i>
<i>Endrin group</i>	<i>Nd</i>
<i>Endrin</i>	<i>Nd</i>
<i>Endrin ketone</i>	<i>Nd</i>
<i>Heptachlor group</i>	<i>Nd</i>
<i>Heptachlor</i>	<i>Nd</i>
<i>Heptachlor epoxide cis</i>	<i>Nd</i>
<i>Heptachlor epoxide trans</i>	<i>Nd</i>
<i>Hexachlorobenzene</i>	3.1
<i>HCH group</i>	
<i>Alpha-HCH</i>	<i>Nd</i>
<i>Beta -HCH</i>	2.8
<i>Gamma-HCH</i>	2.3
<i>Toxaphene group</i>	<i>Nd</i>
<i>Palar 26</i>	<i>Nd</i>
<i>Palar 50</i>	<i>Nd</i>
<i>Palar 62</i>	<i>Nd</i>
<i>Mirex</i>	<i>Nd</i>

Source Vol.1&4

### 5.3.2. Assessment of PCBs

In ambient air, light PCBs have been detected at higher levels than the heavier congeners. Figure below illustrates the levels of PCBs measured in the ambient air from the background site and gradient site. In addition, the results of pilot study comparing PCBs in the ambient air from waste disposal sites have revealed much higher concentrations in the waste disposal sites compared to the concentrations measured in the background sites away from the disposal sites

Indicator PCBs in human milk have been reported in levels ranging from 0.167-1.29 ng/g lipid, whereas the sum indicator PCBs was 4.32 ng/g lipid. Mono-ortho PCBs have been detected at significantly high concentration compared to the non-ortho congeners.

Table 31: PCBs in mothers' milk

PCB Congenors	Concentration in mothers' milk
<b>Indicator PCBs</b>	<b>(ng/g lipid weight)</b>
PCB 28	0.842
PCB 52	0.430
PCB 101	0.167
PCB 138	0.992
PCB 153	1.29
PCB 180	0.602
<b>Sum PCBs</b>	<b>4.32</b>
<b>Mono-ortho PCBs</b>	
PCB	0.252
PCB	0.029
PCB	0.737
PCB	0.009
PCB	0.178
PCB	0.036
PCB	0.057
PCB	0.012
<b>Non-ortho PCBs</b>	
PCB 77	0.006
PCB 81	0.001
PCB 126	0.006
PCB 169	0.017
WHO mono-ortho PCB TEQ	0.22
WHO non-ortho PCB TEQ	0.66
WHO PCB-TEQ (upper bound)	0.88 ± 0.16
WHO PCB TEQ (Medium bound)	0.88 ± 0.16
WHO PCB TEQ (Lower bound)	0.88 ± 0.16

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### 5.3.3 Assessment of PBDEs in Kenyan Environment

Limited work has been done on the levels of PBDEs in environmental samples in the country. Preliminary data on PBDEs has been established in ambient air in Kenya through the MONET monitoring programme. Figure 15 below show the concentration of PBDEs in ambient air from a background and hotspot sites in the country. The results reveal that hotspot sites are releasing high concentrations of PBDEs into the national environment and hence there is need to put in place mitigation measures to control these releases.

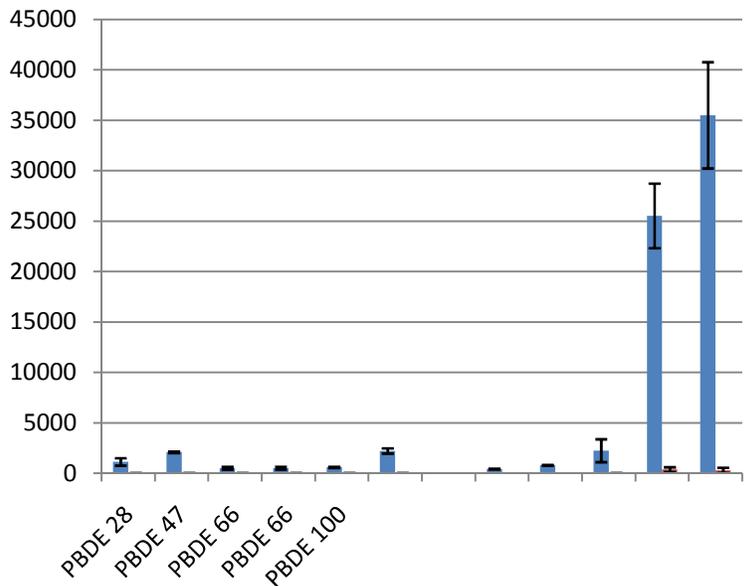


Figure 16 Comparison of PBDEs concentrations in dumpsite and background site

Preliminary data has been established on PBDE levels in ambient air in Kenya through the MONET monitoring programme.

### 5.3.4 Assessment of DDTs

Assessment of DDT in gradient site and background site has revealed elevated concentrations in the gradient site. The Figure 2.2 below illustrates the concentrations measured in the two representative sites for background and national hotspot.

Figure 18: Comparison of pesticide levels in background and hotspot site

### 5.3.5 Assessment of PFOs and its salts and PFOSF

Limited data exist on PFOS and PFOSF from research activities on these compounds in fish, water and sediments collected from Lake Victoria (Orataet *al.*, 2008, 2009, 2011). In a study screening perfluorooctanoic acid and perfluorooctanesulfonate in Lake Victoria Gulf and in its source rivers, levels of perfluorinated alkylated substances were detected. The concentration of perfluorooctanoic acid or perfluorooctanesulfonate in river waters ranged 400-96,400 for perfluorooctanoic acid and <400-13,230 pg/L for perfluorooctanesulfonate. The levels in the river samplers were found to be higher than those detected in the lake water samples for which the perfluorooctanoic acid ranged from 400-11,650 and perfluorooctanesulfonate from <400-2,530 pg/L. The measured levels and trends suggested generalized point sources such as domestic and industrial waste (Orata, *et al.*, 2009).

### 5.3.6 Assessment of UPOPs

Polychlorinated dibenzo-p-dioxins and dibenzofurans have been reported in mothers' milk from the rural areas at picogram levels. Furans concentration varied from 0.045-1.4 pg/g lipid, whereas dioxin concentrations ranged from 0.268-52.3 pg/g lipid. Table 28 shows the concentrations of different congeners of dioxins and furans measured in mothers' milk samples.

Table 32: Dioxins and furans measured in mothers milk samples

<b>2,3,7,8-substituted PCDD/PCDF</b>	<b>Concentrations (pg/g lipid weight)</b>
<b>2,3,7,8-TCDF</b>	0.551
<b>1,2,3,7,8-PeCDF</b>	0.230
<b>2,3,4,7,8-HxCDF</b>	1.05
<b>1,2,3,4,7,8- HxCDF</b>	0.398
<b>2,3,4,6,7,8- HxCDF</b>	0.440
<b>1,2,3,7,8- HxCDF</b>	0.251
<b>1,2,3,4,6,7- HpCDF</b>	
<b>1.2.3.4.6.7.8- HpCDF</b>	0.0045
<b>OCDF</b>	0.206
<b>2,3,7,8,-TCDD</b>	0.268
<b>1,2,3,7,8-PeCDD</b>	0.493
<b>1,2,3,4,7,8-HxCDD</b>	0.381
<b>1,2,3,6,7,8- HxCDD</b>	1.89
<b>1,2,3,,7,8,9- HxCDD</b>	0.894
<b>1,2,3,4,6,7,8-HpCDD</b>	9.75
<b>OCCDD</b>	52.3
<b>WHO-PCDD/F-TEQ (upper bound)</b>	1.89 ±0.37
<b>WHO-PCDD/F-TEQ (medium bound)</b>	1.89 ±0.37
<b>WHO-PCDD/F-TEQ (lower bound)</b>	1.89 ±0.37

Dioxins and furans concentrations in the air samples have revealed high concentrations in gradient samples compared to national background sites used in the Global Monitoring Plan. This is illustrated in the Figure below.

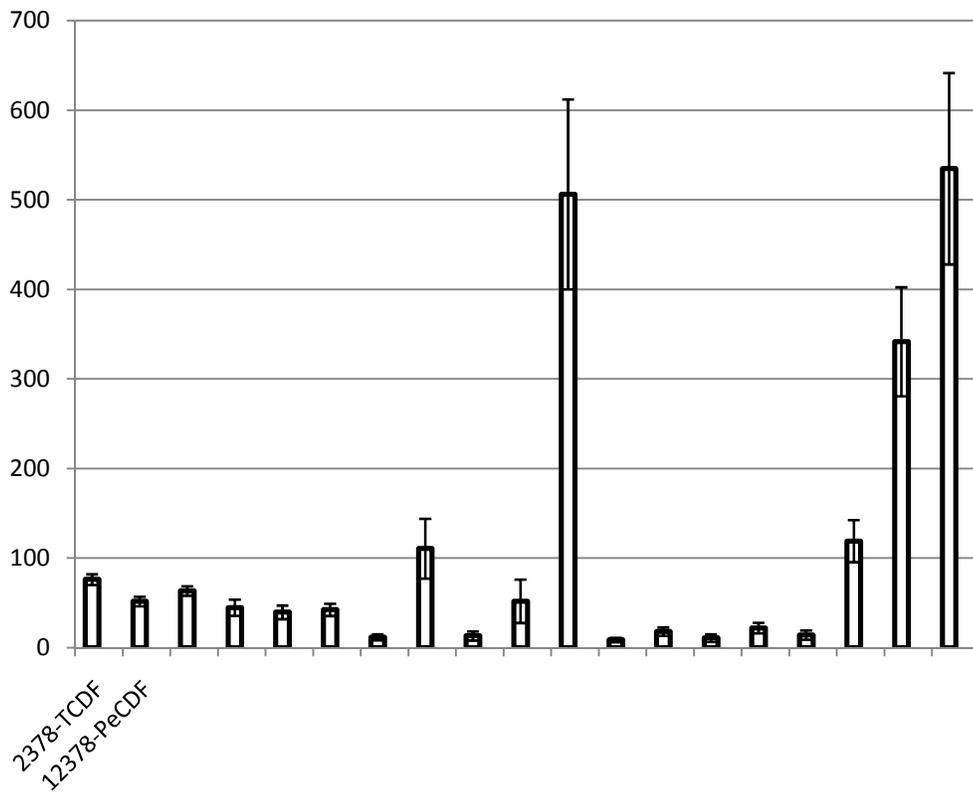


Figure 16: Comparison of dioxin concentrations in gradient and background sites

From the data illustrated, it is apparent that the country needs to control the releases of dioxins into the national environment. Although the various sources of dioxins have been documented, it is important to identify the national priority hot spots in the country followed by control measures and continuous monitoring to assess the impact of the employed strategies.

**5.3.7 Existing programmes for monitoring releases and environmental and human health impacts, including findings.**

Kenya does not have an established national monitoring programme for assessment of POPs in the environment. The existing POPs monitoring data in the country have been produced from GMP monitoring activities since 2008 under the MONET Africa, UNEP/WHO mothers’ milk survey and UNEP GEF project on capacity enhancement to monitor and analyze POPs. Under the MONET Africa programme, monitoring data on POPs in ambient air has been established for pesticides, PCBs and dioxins/furans for GMP background site in Kenya (Mt. Kenya). In 2008, additional data was produced for Kitengela, Industrial area, Kabete and Dandora, in an exercised conducted to establish POPs levels in the gradient sites. The country has also participated in the 4<sup>th</sup> round of UNEP/WHO mothers’ milk sampling where POPs data has been established for mothers’ milk samples. In 2010/2011, Kenya participated in the First phase of the UNEP GEF project where some monitoring data has been established for ambient air, soil and fish samples. Additional POPs data has been produced from individual research activities on water, air, soil and biota samples across the country.

The available data reveal the presence of POPs in environmental samples. However, compared with the initial data generated through research activities, there is indication that POPs levels especially pesticides are decreasing in environmental samples. The priority areas of concern remain to be contaminated soils from obsolete pesticide dumpsites and waste disposal sites. In order to strengthen POPs management in the country, it is necessary to develop national POPs monitoring programme to assess the levels of these chemicals in the priority hotspots such as obsolete pesticide sites, waste disposal sites and industrial and agricultural sites.

## **CHAPTER 6:PUBLIC AWARENESS AND EDUCATION**

Public information and awareness activities in the country are mainly conducted by the MEWNR, MoH, MoA and the private sector through NGOs. The MEWNR has conducted several awareness creation activities during the development of the Kenya national Chemical Profile and the updating of the National Implementation plan.

### **6.1. Current level of information, awareness and education among target groups**

Several training workshops, meetings and symposia have been held such as:

- Meeting at the PCPB to review and revised the list of banned and listed chemicals.
- Series of workshops organized by Greenbelt Movement in Nairobi, Nakuru, Thika, Mombasa and Kisumu to promote minimization of open burning of plastic waste
- Open Burning Programme in Nyeri Municipality.
- Training on the Global Monitoring of POPs.
- Stakeholder meetings during development of the National Chemical Profile and Updating of the NIP.

However, POPs awareness among the stakeholders and special groups in the country is still low and seem to be limited at national levels among the inter-ministerial agencies involved in developing the national policies, regulations and environmental standards.

The priority areas for awareness creation identified during stakeholder meetings held in different regions in the country, such as Kisumu, Central and Rift Valley regions have been included in the action plan.

### **6.2. Awareness and education among target groups;**

There are no appropriate educational materials on POPs for training the target groups such as women and children, policy makers, civil society, and even the implementing agencies at the grass-root levels among others. NIP has also been anchored in the SAICM national Action Plan.

### **6.3 Current level of information**

Exchange information on POPs is generally lacking among the local stakeholders at regional and county levels. This seems to hamper their active participation and execution of their expected mandates on POPs management. It is therefore important to ensure that appropriate communication strategies are developed to enhance exchange of information on POPs to stimulate active participation of the government agencies and the general public in POPs management activities.

### **6.4 Relevant activities of non-governmental stakeholders**

NGOs play a key role in the realization of the goals of the SC and other chemicals safety agreements. In order to ensure success in the implementation of these Conventions the role that NGOs play is vital especially with regard to advocacy and introduction.

The main NGO having activities on NIP includes:

- Ecoethics in Mombasa
- The Greenbelt Movement in Mombasa
- iLIMA, Nairobi

Professional organizations include:

- Agrochemicals Association of Kenya
- Kenya Association of Manufacturers

## **6.5. Intergovernmental Organizations**

Kenya interacts closely with intergovernmental organizations that have mandate on chemicals and especially;

- United Nations Environment Program (UNEP) with its headquarters in Nairobi, Kenya, plays an active role in chemicals management. UNEP has under its wing most of the chemical and waste management programs and Kenya should take advantage of this proximity.
- Food and Agriculture Organization (FAO). This is the principle agent covering pesticide use particularly with regard to the agricultural industry, which is its primary focus.
- The International Labor Organization (ILO) steps in where issues of human health and in particular employee safety in work environments where POPs and other potentially harmful chemicals are exposed to the employees.
- The World Health Organization (WHO) participates also in the protection of human health and will carry out research into eliminating health risks resulting from chemicals. In Kenya WHO is involved in finding alternatives to POPs that are detrimental to human health such as DDT.

Working with these organizations is important as it benefits the country by easing access to information, human resources and financial resources.

Involvement in programs and projects organized by these organizations also encourages cooperation with other countries, which is effective in the realization of the objectives of the Convention.

## **6.6 Strategies for the Implementation of Awareness Creation and Communication**

Several strategies will be embraced in the implementation of the component activities. These include;

### **a) Internal communication Strategy:**

This strategy will be used to enhance knowledge on NRBP among staff and policy-makers within the larger Ministry of Environment & Mineral Resources. Capacity building of the staff will broaden communication on NRBP to the public in order to avoid conflicting messages.

### **b) Establishing public participation mechanism Strategy:**

This strategy will provide a platform for all stakeholders to be involved and contribute to the achievement of the NRBP across the 10 point intervention plan contained in 5 major components. An elaborate advocacy plan will be undertaken aimed at changing peoples' perception and understanding of the NRBP and why the proposed decisions have been taken. The advocacy framework will identify issues/problems, identify solutions, identify "gatekeepers" who make decisions, identify resources, define strategies and create action plan and implement and monitor.

**c) Media campaign Strategy:**

The strategy will promote accurate and analytical media coverage of the NRBP activities. Various mediums of communication will be applied including TV documentaries, talk shows, advertisements, radio interactive,

## **6.7 Enhancing Awareness and Communication**

In order to ensure coordination of the various strategies, the following is recommended:

**i) Establishment of a central official communication point on the NRBP:**

The identification of an overall coordinator and specific spokes persons will ensure that all official messages are delivered by authorized persons. It is advisable that the heads of implementing institutions or their designate be formally appointed as spokespersons for the programme.

**ii) Developing a branded communication platform:**

The component has developed a slogan for the NRBP namely; *A Clean Environment for Improved Livelihoods*. The slogan will be applied in all the awareness materials produced thus providing a coordinated platform for communication. This will enhance coherence of messages and create synergy across the different communication activities.

The development and production of awareness and communication materials will be developed and printed under the close supervision of the Component Committee for dissemination among various stakeholders. This will ensure accuracy in technical content, relevance and appropriateness. The awareness materials will enhance effective communication and awareness creation. The Committee will receive feedback from the various audiences on the appropriateness of the materials.

**ii) Dissemination of Information Materials:**

This comprises of the distribution of materials among the intended audiences as well as local communities. Other materials will be displayed at strategic points such as bus stops, market places, bill boards aimed at creating awareness to a large portion of the public.

**iii) Media Placement**

A media plan for the public announcement will be put in place based on current media research data. The Project Spokesperson will release regular and accurate updates on the collective milestones achieved by the various components on the NRBP. In addition, media houses will be lobbied to offer bonuses and other lucrative coverage arrangements as a way of making a contribution of the media to the Programme.

The Component identified major audience segments to target communication. In this regard, the key audiences and the rationale for their involvement is tabulated below. The coverage of these audiences will broaden the information and understanding of the programme.

**7.1 Assessment of NIP institutional infrastructure sharing of research information and monitoring**

Proper management of POPs requires production and sharing of POPs information at national and human capacity building to analyze POPs in environmental samples. In addition most of the new POPs such as lindane has been used in seed dressing and therefore their listing under the POPs requires the country (Kenya) to build capacity for alternatives in seed dressing, malaria control among others.

**7.1.1 Review of existing infrastructure for POPs research activities in the country**

There exist a number of national and international research and higher education research institutions that conduct research in various areas of POPs. Research on chemicals in the country is mainly conducted by the national research institutions and universities for specific purposes but the facilities are low.

**7.1.2 Activities of Universities**

All public universities in the country have chemistry departments that spearhead the training and research on chemical management. The research activities are diverse ranging from environmental risk assessment, chemical fate and transport studies, soil and water decontamination to monitoring and capacity building activities in POPs and general chemical management.

**7.1.3 University of Nairobi**

The Department of Chemistry University of Nairobi is at the forefront of coordinating the capacity building of national and regional institutions to monitor POPs under the Global Monitoring Plan (GMP) under the SC. In collaboration with UNEP SC and the RECETOX in Masaryk University Czech Republic the Department has been coordinating the ambient air POPs monitoring programme called Monitoring Network for Africa (MONET Africa). Currently the Department of Chemistry in collaboration with RECETOX under the MONET Africa monitoring programme is participating in testing of passive water samplers for trapping POPs chemicals in water using Semi-Permeable Membrane Devices using Silicon Rubber, and XAD polymer.



*Figure 17: Photo showing sampler employing Semi-Permeable Membrane Devices*

The Department of Chemistry has recently acquired a Low Volume active air sampler for calibration of the passive air samplers used in the Region. The active sampler will be used to air monitoring of POPs in ambient air (Figure 15).



*Figure 18 Active air sampler for POPs at the Department of Chemistry, UON.*

The Department of Chemistry University of Nairobi has coordinated several trainings of the national institutions on POPs analysis in different environmental matrices such as ambient air, water, soil sediments and biota. Figure 4.1 below shows participants during one of the training workshops on POPs.



*Figure 19: Training of POPs analysis at the University of Nairobi*

Department of public Health and Pharmacology, University of Nairobi which is located in the College of Agriculture and Veterinary Sciences undertakes research on DDT and metabolites in

human breast milk. In 2009, the institution carried out human breast milk sampling for analysis of POPs in collaboration with WHO and UNEP. Since 1978 the department together with other international and national collaborators has also undertaken research and training to advanced knowledge and capacity building in analysis of chemical residues in the environment including foods of animal origin and other environmental studies. It is also one of the departments with the capacity to carry out toxicity studies and the impact of these POPs in human/animal health and in various ecosystems.

#### **7.1.4 Masinde University of Science and Technology (MUST)**

Masinde University of Science and Technology undertakes research on organo-chlorine pesticides and PFOS and PFOSF in water, sediments, fish and wastewater treatment plants effluents. The University is in possession of GC-ECD and GC-MS equipment for research.

#### **7.1.5 Maseno University**

The Department of Chemistry, Maseno University is conducting research on organo-chlorine pesticide residues in soil, water and sediments and decontamination of contaminated soils. The Department is in possession of GC-ECD, HPLC, and greenhouse gas measuring equipment to facilitate research activities in this area.

#### **7.1.6 Jomo Kenyatta University of Agriculture and Technology**

Department of Chemistry located in Jomo Kenyatta University of Agriculture and Technology has progressively engaged in various research activities including POPs pesticide. The department has been in constant collaborations with the public and private universities and research institutions such as ICIPE, KEFRI, KEMRI, KARI amongst others. Through Pan African chemistry Network (PACN) the Royal Society of Chemistry identified JKUAT through the department has hosted international training workshops on GC-MS. The training workshops have attracted participants drawn from different parts of Africa.

#### **7.1.7 University of Eldoret**

The Department of Chemistry University of Eldoret conducts research on organo-chlorine pesticides in environmental media. The Department is in possession of GC and GC-MS to support its research activities.

#### **7.1.8 Kenyatta University**

Kenyatta University conducts research on organo-chlorine pesticides in environmental media. The University is in possession of HPLC and LC-MS instruments.

#### **7.1.9 Other Universities working on POPs**

Other Universities that carry out research on chemicals include Moi University and Egerton University.

## **7.2 National research institutions**

The main national research institutions that address chemical issues include Kenya Medical Research Institute (KEMRI), Kenya Agricultural Research Institute (KARI), and Kenya Industrial Research Development Institute (KIRDI)..

**a) Kenya Medical Research Institute (KEMRI)**

KEMRI conducts research on effects of pesticides among formulators/store-men and farm workers (Wanja, 2007). It also has pesticide inventories for the work carried out in 1990's (Mbakaya *et al.*, 1994). Other research activities at KEMRI include effectiveness of malaria vector control such as bed nets, larviciding, IRS, and other insecticides of public health importance. The institution is also KEMRI is working with Pyrethrum Board of Kenya to evaluate the quality of their products for vector control. In collaboration with ICIPE, KEMRI is working on research to use biological agents for Malaria control.

**b) Kenya Agricultural Research Institute (KARI)**

The Kenya Agricultural Research Institute (KARI) is a premier national institution bringing together research programmes in food crops, horticultural and industrial crops, livestock and range management, land and water management, and socio-economics. It promotes sound agricultural research, technology generation and dissemination to ensure food security through improved productivity and environmental conservation.

The KARI e-repository accesses large collection of world literature covering all aspects of agricultural sciences and technology, including grey literature which is not available through normal publication and distribution channels.

KARI deals specifically with efficacy trials of Agricultural pesticides for field and stored crops (Mutambukiet *al.* 2002) and fertilizers. In general, research activities in the country are targeted to specific needs of the society. However, there are limitations of funding, technical equipment and adequate human capacity as well as lack of information and networking/collaboration amongst above institutions.

**c) Pyrethrum Board of Kenya**

Pyrethrum has been grown in Kenya since 1928 and the Pyrethrum Board of Kenya was established in 1934 to oversee to all activities related to the production and processing of pyrethrum for the benefit of growers and consumers. By the end of Second World War, Kenya had become a major source of pyrethrum, accounting for more than 65% of the global supply, a leadership which the country has steadfastly maintained to the present time. Today, the Pyrethrum Board of Kenya remains firmly committed to serving its international clientele of distributors, manufacturers and ultimate consumers of end-use products.

**d) Kenya Fisheries Research Institute (KEMFRI)**

Kenya Marine and Fisheries Research Institute (KMFRI) is a State Corporation in the Ministry of Fisheries Development of the Government of Kenya. It is mandated to conduct aquatic research covering all the Kenyan waters and the corresponding riparian areas including the Kenyan's EEZ in the Indian Ocean waters. The research mandate of KMFRI is defined by article No. 4 of the Science and Technology Act of 1979, Cap 250. The Institute is empowered to carry out research in Marine and Freshwater fisheries, Aquatic biology, Aquaculture, Environmental Chemistry, Ecological, Geological and Hydrological studies, as well as Chemical and Physical Oceanography. The institution conducts research on organo-chlorine pesticides in the estuaries and marine environment. It is in possession of GC-ECD equipment for analysis of POPs.5)

#### **e) Kenya Industrial Research and Development Institute (KIRDI)**

Kenya Industrial Research and Development Institute (KIRDI) is a national research institute established in 1979 under the Ministry of Trade and Industry and mandated to undertake multidisciplinary research and development in industrial and allied technologies. The Research and Technological Innovation (RTI) department handles the institute's core objectives. The major RTI divisions are: Engineering, Energy and Environment, ICT, Leather & Textiles, and Food Technology Divisions. Its Research, Technology and Innovation (RTI) Department of KIRDI is in charge of undertaking multidisciplinary research and development in industrial and allied technologies. Research forms the core business of the Institute and contributes significantly to development in all industrial and allied technologies through innovation, adoption, adaptation and transfer of technologies to support the industrial development process. The Institute's Research Scientists are the key players in research technology and innovation of industrial knowledge and technologies in areas such as: Engineering, Materials Science/Ceramics, Energy, Leather, Textile, Food Science & Technology, Microbiology, Information Science / Technology, Computer Engineering, Socio-Science / Economics and Environmental Sciences. The vision of the department is to be a centre of excellence in applied research, technology and innovation. Our mission is to: apply science, technology and innovation that advance industrial research and development towards realization of vision 2030. It could make inroads on BATs and BEPs.

#### **f) Environment Management**

The Environment Management Division is one of the research, technology and innovation (RTI) departments in KIRDI. The division undertakes environmental research and development and consultancy work for industry, community organizations, research institutions, and government agencies, among others in line with country's Vision 2030. Technologies and innovations developed by the division are transferred through business incubation, development of pilot plants, and provision of common manufacturing facilities.

#### **g) International Centre for Insect Physiology and Ecology (ICIPE)**

ICIPE was established in 1970, to develop and transfer technology on alternatives to chemicals. It has trained 600 PhDs & 700 Msc. students in 29 African countries. It conducts research on eco-friendly methods for controlling disease vectors and crop pests, and for preservation and use of beneficial insects. Most of the work related to POPs has been on development of alternatives to POPs for human disease vector control, especially developing alternatives for DDT for malaria control. It was nominated in 2010 and endorsed 2011 as a Regional Centre for the Stockholm Convention. Currently there are 15 regional centres globally, and an additional centre has been proposed in Jakarta, Indonesia. At the moment there are four regional centers in Africa. These are: the SC regional Centre in Algiers-Algeria, ICIPE in Nairobi-Kenya; the Centre in Dakar-Senegal, and the regional Centre in Pretoria-South Africa.

The regional Centre has had various activities which include:

Regional workshops: Workshops in 8 African countries on IVM as alternative to DDT.

Training activities which include:

- a) Training of communities.
- b) Application of mosquito nets.
- c) Training of children in the use of IVM.
- d) Habitat management.

- e) Eco-friendly bio-pesticides for controlling mosquitoes BTI.
- f) Malaria prevalence reduction.
- g) Control of cereal stem-borer pests and Striga weed.
- h) Bio-pesticides.
- i) Fruit-fly control using fungus.
- j) Diamondback moth biological control-on cabbages, 75% reduction.
- k) Odour-baited traps for control of tsetse flies –developed eco-friendly traps that attract tsetse flies based on shape, colour and smell.
- l) Repellent collars for control of tsetse flies using repellants compounds identified from wild animals like water buck.
- m) Entomopathogenic fungi for control of ticks.

Chemical alternatives to POPs are being addressed in collaboration with the following organizations: Ministry of health, Ministry of agriculture, Ministry of Environment, Kenya Agricultural Research Institute, Universities, Research organizations; CIAT-international, the private sector such as Real IPM, and institutions promoting organic farming.

The following were identified as priorities with regard to updating the NIP:

- a) Need to outline the technical assistance received from UNEP Secretariat and Assistance from GEF.
- b) Outline the trainings held and workshops- this can be provided as link to the web resources or a reference to the published documents.
- c) Strategic plan for the Centre.
- d) Collaboration activities with the POPs Focal Point.
- e) Policy Commitment agreed at the Board to accept it as regional Centre.
- f) Project concepts.
- g) Collaboration with KEMRI, KARI etc.
- h) Activities on alternative of POPs other than DDTs.

The following were identified as additional activities that the ICIPE Regional Centre could get involved in:

- a) Partnering with other organizations and Ministry of Health e.g. UNEP and WHO seeking to help the country to work with IVM-
- b) Collaboration with PCPB to promote the use of bio-pesticides
- c) Developing joint projects to in the area of alternatives especially in the Eastern Africa Region.
- d) Interrogating COP decisions e.g. COP 6, and developing projects for resource mobilization to address the proposed activities- technical assistance,
- e) Seek financial resources from TRUST funds-as part of resource mobilization.
- f) Set up a unit for MEAs at ICIPE to facilitate continuity and sustainability of activities.

The Department of Behavioural and Chemical ecology conducts on the development of environmentally-sound methods to reduce/suppress target pest populations, and to increase populations of beneficial insects including natural enemies of these pests. Research is also carried out to conserve beneficial insects such as honeybees. Central to the department's activities are identification, formulation and evaluation of pheromones, kairomones, allomones and hormones mediating insect/arthropod behaviour. The department is well equipped with various analytical chemistry instruments including volatile collection systems (VCS), gas chromatographs (GCs),

coupled gas chromatography-electroantennographic detection (GC-EAD) system, GC-mass spectrometer (GC-MS), and a liquid chromatograph-mass spectrometer (LC-MS) to carry out its research objectives. The department is also equipped with various instruments to study insect behaviour. Capacity building is an integral part of research activities in the department.

#### **h) Non Governmental Organisation**

Several non-governmental bodies and entities are involved in activities that can support management of POPs and chemicals in general.

#### **i) Kenya Association of Manufacturers**

KAM has environmental subcommittee which is in charge of reviewing regulations regarding industry on environment, the committee also participates in the formulation of environmental regulations.

KAM conduct seminars to enlighten members on new and upcoming regulations these forums help members understand better and give views on the regulation to enhance their levels of compliance. However, different companies have different programmes / activities on chemical management however through capacity building; the Association may be instrumental in conducting programs so as to improve chemical management amongst industries.

#### **j) iLima Kenya**

iLima is a non-governmental organization established in the year 2004 and specializing in promoting a toxics-free future and sustainable development approaches. 'iLima' is a word of South African origin meaning '*collective action*'. Since inception, iLima programmes and projects has been focusing on awareness creation, capacity building of communities and civil societies on chemical safety. The following are some of the programmes and projects.

#### **a) Programme on Persistent Organic Pollutants (POPs)**

POPs are a class of highly hazardous chemical pollutants that persist in the environment for many years and bio-accumulate in the food chain. Some POPs are pesticides, industrial chemicals and some are produced unintentionally as by-products during certain combustion and chemical industry processes.

iLima carries out projects within key component areas of the NIP to achieve implementation of the convention in the country. The main aim of these projects is to:

- Raise awareness on the Stockholm Convention and possible sources of POPs and their effects on Health and Environment.
- Carry out education and capacity building on the convention and application of the BATs and BEPs such as Zero waste program as an alternative to practices that produces POPs.
- Carry out studies and inventories on sources and amount of POPs released into the environment.
- Establish national and regional NGO coordination and capacity in all regions of the world in support of longer-term efforts to achieve chemical safety.
- Promote public participation in the implementation of the convention through organizing skill-share on how NGOs and relevant stakeholders from across the country can utilize and reference the Stockholm Convention in their work.
- Demonstrate applicable Best Available Technologies and Environmental Practices to minimize production of POPs.

Table 33: Summary table showing analytical research capacities for institutions

No.	Region	Identified institutions	Existing research and capacities
1	Western Kenya	MasindeMuliro University of Science and Technology	GC-ECD, GC-MS
2	Nyanza	Maseno University	GC-ECD, HPLC
3	Rift Valley	Egerton University Moi University	GC-ECD GC-ECD, HPLC, GC-MS
4	Nairobi	Nairobi University ICIPE KIRDI	GC-ECD, HPLC, GC-MS GC-MS, LC-MS, HPLC GC-ECD, HPLC
5	Central	JKUAT Kenyatta University	GC-MS HPLC, LC-MS
6	Coast	KEMFRI	GC-ECD

### 7.3 System for the Assessment and listing of new chemicals

#### 7.3.1 National Environment Management Authority (NEMA)

The National Environment Management Authority (NEMA), is established under the Environmental Management and Co-ordination Act No. 8 of 1999 (EMCA) as the principal instrument of Government for the implementation of all policies relating to environment. The supreme objective underlying the enactment of EMCA 1999 was to bring harmony in the management of the country's environment. NEMA has developed several regulations addressing environment. These include noise, wetland, water quality, waste management, biodiversity and coastal zone regulations.

#### 7.3.2 Pest Control Products Board (PCPB)

The Pest Control Products Board is a Statutory organization of Kenya Government established under an Act of parliament, the PCPA, Cap 346, Laws of Kenya of 1982 to regulate the importation and exportation, manufacture, distribution and use of pest control products. The law requires that new pest control products are tested for efficacy before they are registered for use in Kenya. Other studies that are required to be conducted overseas or locally in accordance with the principles of Good Laboratory Practice (GLP) include physical chemical properties, toxicology, ecotoxicology and residues studies. PCPB has accredited several institutions to carry out Efficacy, Toxicological, Physical and Chemical Studies of Pest Control Products.

The service provides information on the various types of pesticides that can be administered on the respective pest. The board also offers training to formulators, applicators, distributors and pesticide users. The Board is responsible for licensing and banning or restricting pesticides used in the country.

## CHAPTER 8: FINANCIAL AND TECHNICAL RESOURCE REQUIREMENTS

While environmental conservation has been viewed primarily as a Government affair, it has been realized that inputs from the stakeholders are vital to the successful management of the environment and natural resources. It is important that capacity building and training of these stakeholders be done in order to enable them take up the roles previously performed by the Government. Further, the private sector will be engaged through collaborations and partnerships to invest and develop value addition industries for natural resources in the rural areas. This would greatly improve their marketability and returns.

### 8.1 Financing Environmental Activities

As the MEWNR implements the strategic plan, it recognizes the critical role that the communities and the CBOs play in joint natural resource management. The Ministry will intensify public awareness and sensitization on the projects and services it is providing in the country. The ministry will develop stronger environmental indicators with real assessment, to show contribution of environmental resource base to overall GDP. The funding Sources to be utilized for NIP will include;

- National public budgets;
- Bilateral development assistance agencies;
- Multilateral dev. assistance agencies including specific environment funds;
- Basel Convention Technical Coop. Trust Fund;
- Funds, foundations, NGOs, charities;
- Corporate sector participation

### 8.2 The Conventions Financial Mechanism

Paragraph 6 of Article 13 of the Stockholm Convention on POPs establishes a financial mechanism for the provision of adequate and sustainable financial resources to developing countries Parties on a grant or concessional basis to assist in their implementation of the Convention. The mechanism functions under the authority, as appropriate, and guidance of, and be accountable to the CoP for the purposes of the Convention. (e). The modalities for the provision to interested Parties of assistance with needs assessment, information on available sources of funds and on funding patterns in order to facilitate coordination among them is available on [www.gef.org](http://www.gef.org).

The guidance to the financial mechanism adopted by the CoP at its first meeting and set out in the annex to decision SC-1/9 states in relation to the determination of funding:

### 8.3 Kenya's eligibility to GEF funding

The GEF is the convention's financing mechanism. Its criteria are discussed below;

- i. **Country eligibility:** Kenya is eligible to receive funding from the financial mechanism as it is a developing country; and A Party to the Convention.
- ii. **The Eligible activities:** Activities that are eligible for funding from the financial mechanism are those that seek to meet the objectives of the Convention, by assisting Kenya to fulfil its obligations under the Convention, in accordance with guidance provided by the CoP.

This NIP will seek to mobilize adequate and sustainable financial resources on a grant or concessional basis to be allocated to meet the agreed full incremental costs of implementing measures that:

- a) Meet the eligibility criteria listed in paragraph 1 above, are country-driven and are endorsed Kenya GEF Focal Point
- b) Assist Kenya in meeting its obligations under the Stockholm Convention and are in conformity with, and supportive of, the priorities identified in the Kenya national implementation plan;
- c) Are in conformity with the programme priorities as reflected in the BAT and BEP guidance
- d) Build capacity and promote the utilization of local and regional expertise available at County offices;
- e) Promote sustainable national socio-economic development, poverty reduction and activities consistent with existing national sound environmental management programmes geared towards the protection of human health and the environment.

#### **8.4 Programme priorities**

In accordance with paragraph 7 (d) of Article 13, the CoP will provide on a regular basis to the entity or entities entrusted with the operation of the financial mechanism pursuant to paragraph 6 of Article 13 of the Stockholm Convention on POPs, assessments of the funding needed to ensure effective implementation of the Convention.

The Global Environment Facility (GEF) is an international financial organisation that operates in collaboration and partnership with the three implementing agencies UNDP, UNEP and the World Bank for the purpose of achieving global environmental benefits. The GEF is administratively supported by, but functionally independent of, the World Bank. The GEF provides grant and concessional funding for projects and programmes within six areas: biodiversity, climate change, international waters, ozone depletion, land degradation, and POPs (POPs). The GEF is also the designated financial mechanism for international agreements on biodiversity, climate change, and POPs.

NIP will promote the development by Kenya institutions projects that

Minimize emission of dioxins and furans

- i. Develop and implement activities identified in the NIP as national or regional priority activities that support or promote capacity-building, including human resource development and institutional development and/or strengthening for institutions in the implementation matrix and capacity improvement for designing, developing and enforcing action plans, strategy, and policies;
- ii. Activities that promote and provide access to technical assistance through appropriate arrangements;
- iii. Activities that promote transfer of technology adapted to local conditions, including best available techniques and best environmental practices;
- iv. Activities that promote education, training and awareness-raising of stakeholders and the general public;
- v. Technology demonstration projects that are responsive to priorities identified in the national implementation plans of eligible Parties and take fully into account the relevant guidance of the CoP;
- vi. Activities that enhance information exchange and management;
- vii. Development and promotion of non-chemical alternatives to POPs.

## **CHAPTER 9:OBJECTIVES AND STRATEGIES**

### **9.1 Formation of a NIP Coordinating Committee**

A National SAICM Steering Committee will be formed and will consist of representatives from Government - Permanent Secretaries (or their representatives) from the Ministries of Environment and Mineral Resources, Planning, National Development and Vision 2030, Finance, Ministry of Agriculture (Pest Control Products Board), Industrialization, Trade Environment water and Irrigation.

The committee will have powers to co-opt additional members if necessary. The committee will meet at least twice yearly. Extraordinary meetings may be convened as needed. The Plan will be managed by a Program Management Unit (PMU) if a funded project is made or a section within DMEAS which will be headed by a full time National Program Coordinator (paid through the program) or officer who will report to the Director MEAS. Among other responsibilities, the National Program Coordinator will promote the Program among other Government institutions, Non-GOK institutions and donor agencies. This will require development of a capacity building project to be funded by GEF and GoK.

### **9.2 Responsibilities**

The Directorate of Environment and NEMA will provide logistical and administrative support for program activities such as meetings. The GoK and the donor(s) will ensure that sufficient time and resources are allocated to the National Program Coordinator to carry out functions effectively.

For effectiveness, development of this strategy will aim at strengthening efficient utilization of current capacities while addressing the deficiencies identified in the NIP. Furthermore, as part of the NEMA

- Use existing POPs and waste institutional structure (ODS Committee, NIP Committee, etc from government and KAM, AAK to carry out activities in the plan)
- Implementing national joint plans of action with ministries and other organizations and institutions working in Kenya on POPs and waste management agenda, as well as the synergy between initiatives and/or Convections activities

This activity will be lead by the MEWNR

### **9.3.2 Objective 2. Promoting Technology Transfer, Cleaner Production, industry and civil society participation in POPs management**

Through industry associations and their representatives in the NIP Implementation Committee, industry and private sector will undertake the following activities:

- In the implementation period mobilize private sector contributions through business associations such as the petroleum, agriculture and manufacturing at the East African regional level, as appropriate through the Common Market for Southern and Eastern Africa
- Formulate programmes for upgrading technologies for small scale enterprises for continuous minimization of releases of highly toxic POPs for partnership in the POPs lifecycle
- Through industry associations and through command and control mechanisms, introduce cleaner production and green technology into the informal sector and services for ferrous/nonferrous scrap reuse, waste management by 2015
- Hold training activities workshops and demonstration projects on BATs /BEPs guidelines to implement and assess what is practical emphasising on recycling, reclamation and re-use of wastes
- Cooperate with public and the informal sector in the management of identified obsolete pesticide, industrial product stockpile and their disposal of hazardous substances as products or as wastes
- Continuous training and certification of custom officers at ports of entry.

### **9.3.3 Objective 3. Enhancing Laboratory services, research for monitoring of POPs pollutants and assessment of alternatives to toxic POPs**

This activity will promote monitoring and will;

- Acquire, generate, store and disseminate information and see operationalisation of POPs database by 2012
- Build information technology infrastructure capacity to use CD ROMs as POPs literature libraries, and at the Provincial and district levels by 2012
- Provide audio visual programs at national level to be distributed to provinces (8) and districts (70) as well as local authorities by 2013;
- Develop research and training capacity on POPs to academia's and polytechnics throughout the plan period.
- Run training programmes in local institutions e.g KIRDI, KEMRI, KARI, KEPHIS so that they can develop training materials/modules, curricula development etc. specific to their POPs mandate;
- Procure laboratory equipment that can analyse all the listed POPs, maintenance and servicing at universities in every province especially for analyzing PCBs, dioxins and furans;
- Put in place cost effective analytical methodology to be adopted and adapted to local needs especially for field and hand held equipment

- viii. Organizing training of trainers workshops

**9.3.4 Objective.4. Establishing effective financing mechanisms through inclusion of POPs programme in Medium Term Expenditure Framework process.**

This activity will seek to mobilise domestic sources of finances by ensuring that the regular budget archives the target of Kshs3.5billion estimates plan through activities that will:

- i. Ensure POPs and hazardous regulatory agencies for understand the country's internal decision-making processes for international environmental governance on POPs by holding at least one workshop of 30 people every year
- ii. Each NIP stakeholders studying technical assistance guidelines under various MEAs and aggressively developing project concepts on them for the intergovernmental institutions dedicated to SC implementation.
- iii. Develop capacities on project formulation to enable access to international funds so as to develop at least two POPs projects annually
- iv. Hold at least two training workshops every year and putting finances aside for co financing
- v. Develop systems for socio-economic considerations such as social indicators that will promote an understanding and *enhance* systems for liability and compensation.

This activity will initially be triggered by MEWNR and other will get the cue.

**9.3.5 Objective 5.Promote safer POPs alternatives as suggested by the National Implementation Plan,.**

All stakeholders each by their own relevance, capacity, mandate and preparedness will undertake the following activities:

- i. Develop programmes to deal with relevant part of SC.
- ii. Enforcement activities of regulations on POPs, handling, development of regulations on transportation of POPs and development of new ones on toxic POPs,
- iii. Strengthen enforcement of OSHA by holding more training programmes and worker protection clothing
- iv. Promote non-chemical alternatives to POPs especially at farm level (pyrethrum growing), use of compost
- v. Develop programmes that promote safe alternative to POPs and ecologically sustainable agricultural practices, non-chemical use and especially good agricultural practices;

**9.3.6. Objective 6. Address governance and advocacy issues**

Under the review the following will be undertaken:

- i. Review of existing legislation to make them more comprehensive for NIP.
- ii. Promote voluntary initiatives in the private sector by increasing more ISO 14000EMS Certification or GREENDOT that adopt the principles of the SC.
- iii. Throughout the Plan Period, build capacities of civil society on chemical issues and mobilize a critical mass of NGOs and industries to participate in the NIP process and seek adequate financial resources.

**9.3.8. Objective7. Capacity Building and Technical Cooperation**

This objective will address capacity building and technical cooperation needs. The following will be undertaken:

- i. Hold awareness raising workshops

- ii. Train identified and recruit more inspectors and prosecutors who will be trained using the Basel Convention Judicial Manual
- iii. Initiate collaborative mechanism to address technology information sharing and research among all stakeholders activities so as to tap technical assistance programmes of the Intergovernmental Organisations on Management of POPs

### **9.3.9 Objective 8. Technical and Financial Resource Mobilisation**

The use of economic instruments has been identified as a possible strategy in the mobilization of resources for the implementation of the NIP. It is envisaged that the application of such instruments, collaboration with private sector associations, will go a long way towards achieving environmental conservation targets.

- i. Review the ongoing POPs management programmes and projects, management options and related financial requirements against possible financing sources and budgeting processes with a view to give a coherent guidance to project formulation, co financing, partnership and leverage
- ii. Explore national budgeting possibilities with the parastatals concerned through the MTEF process mainstreaming POPs and waste issues into ongoing and future bilateral activities starting with 2014/2015 printed budget ,
- iii. Use of ministries and other agencies responsible for coordination of assistance from international funding agencies and bilateral donors to each develop a funding request,
- iv. Maintain contact with the relevant financing agencies to explore the potential for cooperation
- v. Include POPs management initiatives into relevant Kenyan bilateral development programmes activities and initiatives.

### **9.3.10 Objective9. Resource Mobilisations at Local and enterprise levels**

This activity will help local authorities and enterprises fill the financing gaps while addressing risks posed by POPs. Although many of them are going on, they need to be accelerated by the following actions:

- i. Put current provisions of EMCA incentives (e.g the plastics initiative) into practice
- ii. Address issues of cost-effectiveness of products of processes and alternatives through introduction of environmental economic instruments as has been done with plastic waste;
- iii. Mobilizing private sector contributions in awareness, publicity and POPs database activities
- iv. Mobilizing international funds through project concepts;
- v. Ensuring the inclusion of national POPs management into bilateral and multilateral development programmes.

### **9.3.11 Objective 10. Develop, finance and implement Partnership Projects**

Capacity to implementNIP will be strengthened through partnerships directly and indirectly with stakeholders. The activities to be carried out are.

- i. Establishment of local, national and regional cooperation and technical assistance networks, with the NIP, Climate Change, Rotterdam, Basel and Stockholm Conventions \secretariats
- ii. Promoting the sound POPs management through the Global Environment Facility in partnership with UNEP,WHO, UNDP, FAO, UNIDO supported by UNITAR through the development of a capacity building project to address priority areas addressed in this plan and which are within the POPs structure financed by the GEF;
- iii. Mobilizing specialized and bilateral agencies and other intergovernmental organization funds and

programmes to support the plan.

This activity will be coordinated by SIC institutions led by the NIP Coordination Office.

## CHAPTER10: ACTION PLANS

### 10.1 Policy Statement

This NIP outlines the Kenya Government's commitment to addressing the POPs issue, for effective and efficient implementation as well as ensuring that all POPs matters and issues/concerns (legal, policy and institutional capacity especially) are addressed and integrated into the development process.

The NIP will as much as possible be mainstreamed into National and County Environmental Action Plans, strategic plans, the Medium Term Expenditure Framework and the National Development Plans starting at institutional and sector level

The Implementation matrix formulated will ensure definite and specific action is taken by all involved taking into consideration activities to respective institutions and stakeholders, time and detail attendant costs.

### 10.2. Activities, strategies, and action plans for intentionally produced POPs

Action planning leads to better decisions fosters acceptance of decisions and promotes accountability and credibility in the Stockholm Convention. In this regard, Articles 7 (Implementation plans) and 10 (Public information, awareness and education) explicitly call for stakeholder involvement in implementing the Convention. The preparation of Action Plans thus necessitated identifying and involving stakeholders.

Within the government these stakeholders included such Ministries as the ones responsible for Agriculture, Finance, Foreign Affairs, Health, Industry, Justice or Legal Affairs, Labour, Planning, Science and Technology, Trade and Transport.

Other stakeholder categories for consideration included industry association & industrial Enterprise (KAM and AAK), Retailers/ distributors (pesticide), Public interest groups, Public health professionals, Women's organizations, Communities, Agricultural sector professionals and individual Citizens.

#### 10.2.1 Activity: Production, import and export, use, stockpiles, and wastes of Annex A POPs pesticides.

The following are actions to address intentionally produced pesticides;

- i. Ensure no production, import and export and use of Annex A pesticides
- ii. Use or dispose all stockpiles
- iii. Dispose all pesticide wastes
- iv. Carry out more comprehensive inventory to address any more stockpiles and wastes.

#### 10.2.2 Activity 2: Production, import and export, use, identification, labeling, removal, storage, and disposal of PCBs and equipment containing PCBs.

The following are actions to address PCBs;

- i. No production, import and export of PCBs,
- ii. Identify and label all transformers with PCBs,
- iii. Where possible dispose all PCB containing transformers.
- iv. Identify contaminated sites

#### 10.2.3. Activity 3: Production, import and export, use, stockpiles, and wastes of DDT

- i. Ensure no production, import and export of DDT through legislation.

- ii. Dispose all 100 tones stockpiles and waste of DDT.
- iii. Promote search for alternatives

#### **10.2.4 Activity4: Production, import and export, use, stockpiles, and wastes of Industrial POPs**

Fine-tune policy issues that address, (i) controlling and the use (ii) eventual release to the environment, of the newly listed industrial POPs.

- i. Restrictions on *Mitumba* (second hand clothes) that contain or is coated with PFOS and related substances.
- ii. Prohibits the importation of electronic products and vehicles that are at or almost at their end of life.
- iii. Projects such as computer for schools must be regulated. This should include storage, disposal and recycling of these products parts.
- iv. An inventory that captures also the already existing sources of industrial POPs release in Kenya needs to be done. This is mainly to capture informal sectors like cottage industries.
- v. Research on industrial POPs especially per fluorinated compounds need to be supported and to start immediately.
- vi. Monitoring be made mandatory in order to understand the sources, trends and success in regulating the industrial POPs

#### **10.2.5 Activity5: Measures to reduce releases from unintentional production (Article 5)**

The following measures will be taken in order to reduce or eliminate releases of U-POPs;

- i. Review of laws and policies covering activities the lead to generation of U-POPs and where necessary, introduce new ones,
- ii. Education, training and awareness-raising of the risks of U-POPs and their management incorporated in education curriculum;
- iii. Development of strategies for periodic review and updating of the inventory for each source category,
- iv. Enforcement of legislation/ by laws and practices of handling waste,
- v. Keeping and maintaining records of waste generated, treatment and disposal methodologies at each site
- vi. Ensuring health and safety for workers in potentially high emission facilities
- vii. Installation of air pollution control equipment in line with EMCA for household
- viii. Promoting and enforcing of standards and guidelines for thermal equipment such as incinerators, boilers, quality, crematoria etc.
- ix. Provide guidelines on feed materials especially fuels containing chlorine.
- x. Ensure local authorities to restrict and regulate open burning
- xi. Enforce regulations that ensure that hazardous waste is handles in the proper manner and by qualified personnel.
- xii. Upgrading of ferrous and nonferrous metal production that are using low state technologies.

#### **10.2.6. Activity6: Measures to reduce releases from stockpiles and wastes (Article 6)**

- a) Start operational sing the ewaste guidelines.
- b) Creating public awareness on electronic waste and the hazards posed by unsafe disposal.
- c) Government to re-commit sound management and sustainable use of chemicals with the objective of reducing exposure to the harmful effects of chemicals in electronic equipment through the prevention and reduction of anthropogenic releases in the environment.
- d) The government should work towards strengthening the national and regional programmes on sound management of chemicals and hazardous wastes in electronics.
- e) The government should adopt stringent regulations on the goods being imported in terms of setting a time frame for the phasing of toxic chemicals e.g. brominated flame retardants in electronic equipment.

#### **10.2.7 Activity 7: Manage stockpiles and appropriate measures for handling and disposal of articles in use**

In addition, those dealing with waste consisting of, containing or contaminated with POPs will be subject to the other waste controls, as appropriate, such as duty of care and controls for hazardous waste. The concentration limits in the POPs regulation are listed in the Table below:

#### **POPs concentration Limits in waste**

##### **Low POPs concentration limits**

##### **Substance Concentration Limit**

Dioxins/Furans 15µg/kg

PCBs 50mg/kg

Other POPs 50mg/kg

#### **10.2.8 Activity8: Identification of contaminated sites and remediation**

A study will be undertaken to assess levels of emissions of polybrominated diphenyl ethers and PFOS from consumer products. Depending on the results of this work consideration will be given to potential methods for controlling emissions.

#### **10.2.9 Activity 9: Facilitating or undertaking information exchange and stakeholder involvement**

- i. The Ministry website [www.environment.go.ke](http://www.environment.go.ke) and NEMA website [www.NEMA.go.ke](http://www.NEMA.go.ke) contains a wide range of information on what the Government is doing to protect the environment in a range of areas such as chemicals, air quality, soil and contamination and water quality. It includes news on national, and international chemicals policy, Government position statements, advisory committee papers and reports, and developments in research.
- ii. NEMA's state of Environment Report is an annual record of pollution in Kenya. One of its main objectives is to provide the public with easily accessible information about pollution from industrial and other sources in their local area and nationally. It records pollution that is released into air, discharged into rivers or the sewerage network, or is transferred off site as waste. It will ensure that every year contains the report for that year.
- iii. Multi-media source inventories will be established to provide a more comprehensive assessment of dioxin, PCB and HCB emissions to air, water and land. Kenya Government will to reduce the frequency of monitoring for these pollutants.
- iv. The Mount Kenya, baseline station will be included in the monitoring network.

- v. Making information about the environment publicly available is essential in achieving sustainable development. By providing access to environmental information the public is able to take decisions in the full knowledge of the likely environmental implications and to participate more effectively in decision-making processes that affect the environment. Openness also promotes transparent decision-making and greater public accountability of how authorities undertake their duties and responsibilities in Kenya.

#### **10.2.10 Activity 10: Public awareness, information and education (Article 10)**

Lack of awareness indicated in the County Regional Offices will be addressed as below:

- i. NEMA will continue to secure reductions in emissions from processes and activities regulated by local Authorities through EIAs and E.A.
- ii. Kenya Government and devolved administrations will also work with the Local Authorities to explore opportunities to build on existing efforts to improve public awareness of the current regulatory regime on open burning of domestic waste to reduce emissions of UPOPs.
- iii. Kenya shall within its capabilities promote and facilitate *inter alia* 'training of workers, scientists and educators, policy and decision makers'.
- iv. In Kenya it is standard practice when developing decision making on environmental policy to consult stakeholders and make information publicly available through a range of media including publications of *consultation* documents, research reports and the internet. This will be enhanced for POPs.

#### **10.2.11 Activity 11: Effectiveness evaluation (Article 16)**

Through the current institutions and convention secretariat, Kenya will;

- i. To determine the effectiveness of national actions on POPs management, Kenya will continue to assess the POPs levels in the environment to ascertain whether the action taken are effective in reducing releases of POPs into the environment.
- ii. As a Party to the Convention and as called for under Article 16, Kenya will cooperate with the CoP and the Secretariat in evaluating the effectiveness of the Convention, including assisting with the development of comparable monitoring data and implementation of any ensuing arrangements, in accordance with its technical and financial capabilities.

#### **10.2.12 Activity 12: Research, development and monitoring (Article 11)**

Article 11 requires that Parties facilitate and encourage research, development and monitoring of POPs on their sources, releases, transport levels and trends and effects in humans and environment and support international obligations aimed at research, data collection and monitoring. Kenya will;

- i. Continue to support a substantial amount of scientific research to underpin policy development on POPs. Government funded monitoring is commissioned and carried out by a range of organizations for a variety of purposes. These include compliance monitoring for the Global Monitoring of POPs GMP.
- ii. A number of other Government Departments and agencies, including Department of Public Health (e.g. Environmental Health, Air Pollution), NEMA, KEMRI, have significant research portfolios on chemicals including POPs and information on will be further strengthened to utilize information gathered on POPs alternatives.
- iii. NEMA has supported air monitoring for various pollutants over the years including POPs. This will be accelerated.
- iv. Environmental monitoring and modeling of air pollution will be reinforced to provide reliable

information on air quality and to satisfy statutory requirements for Lake Naivasha, Victoria, Nakuru and for contaminated sites.

**10.2.13 Activity 13: Technical and financial assistance (Articles 12 and 13)**

Kenya will continue to participate in international assessments of POPs and plays an active role to input into the work of technical committees under both the Stockholm Convention

- i. Article 12 requires Parties to recognize that rendering timely and appropriate technical assistance in response to requests from developing country Parties and Parties with economies in transition is essential to the successful implementation of the Convention.
- ii. Much of Kenya's regional and bilateral development assistance is focused on helping developing countries to mainstream sound management of chemicals including POPs in poverty reduction strategies and development assistance. The principal routes for providing assistance to developing countries and countries with economies in transition.

**ANNEXES.**

**Resources**

Article	Nature of provision		Resources needed for 2014–2019 (United States dollars)			Grand total	
			Baseline	Incremental	Total		
3 and 4	Intentionally produced POPs	Pesticides	Annex	0	700	700	
			Annex	0	574	574	
		Industrial chemicals	Annex	0	27	27	54
			Annex	0	20	20	40
5	Unintentionally produced	Annex	70	300	370	740	
6	Stockpiles and wastes			0	10	10	20
6.1 (e)	Contaminated sites			10	30	40	80
7	Implementation plans			0.5	50	50.5	107
8	Listing of new chemicals in			0.5	0.5	1.0	2
9	Information exchange			0.5	200	200.5	401
10	Public information, awareness and			5	200	225	430
11	Research, development and			0	800	900	1700
12	Technical assistance			0	150	150	300
13	Financial assistance			0	0.1	0.1	2
15	Reporting			0	10	10	20
16	Effectiveness evaluation			10	90	100	200
<b>Total</b>					<b>3221.6</b>	<b>3438.1</b>	<b>5849</b>

**REPUBLIC OF KENYA**



**MINISTRY OF ENVIRONMENT, WATER AND NATURAL RESOURCES**

**REPORT OF THE ENDORSEMENT WORKSHOP  
KENYA NATIONAL IMPLEMENTATION PLAN FOR THE  
STOCKHOLM CONVENTION ON PERSISTENT ORGANIC  
POLLUTANTS**



**May 2014**

## **1.0 Background**

After the drafting of the updated National Implementation Plan 2014, a stakeholders endorsement workshop was organised for 24<sup>th</sup> May, 2013 at Utalii Hotel in Nairobi. It was attended by representatives of government institutions, the private sector, intergovernmental organisations. The complete list of the attendees is annex 1.

The objectives of the workshop were:

- To communicate clearly the scope, need for, purpose, and value of the NIP.
- To consult with stakeholders on the proposed NIP, as appropriate.
- To finalize the NIP, taking account of stakeholder input.
- To secure political support and endorsement by the relevant authorities for the NIP and its implementation.
- To transmit an agreed NIP to the COP of the Convention within two years of entry into force of the Convention for the Party, or when the review and updating of a NIP has been undertaken in order to comply with changes in the obligations under the Convention occasioned by amendments to the Convention or its annexes, transmit an agreed revised and updated NIP to the COP within two years of the entry into force for that Party of the amendment.
- To establish and put into practice a mechanism for periodic updating and review of the NIP in accordance with Article 7 of the Convention.
- To establish a mechanism for reporting to the COP as required.
- To put in place the mechanism for implementation of the NIP.

## **2.0 Opening**

The chair Mr. Richard Mwendandu who is the Director of Multilateral Environmental Agreements welcomed participants to the KNIP endorsement workshop. He informed the participants on the objectives of the workshop which was mainly for stakeholders to endorse the NIP and agree on the implementation.

He emphasized the need to up measures that guarantee sustainability of environment throughout the value chain, noting the need for concerted efforts by all stakeholders in safe and sound management of chemicals. He highlighted that the importance of the NIP as a tool for management of chemicals.

## **2.1 NIP Update Process**

Mr. Francis Kihumba, Coordinator NIP Project gave a brief on the NIP update process. He applauded the GEF who funded the process and are also willing to support the implementation. He informed the stakeholders that the NIP 2014 is an update of the version of 2007. Since the last NIP, the Stockholm Convention has listed other 12 new POPs, thus the need to review the Kenyan NIP to include the new additional POPs. This would aid Kenya in the control and management strategies of this additional POPs and also address the new emerging issues.

The NIP updating process started with a review of the progress/implementation status of the old NIP. Consultants were hired based on expertise to identify the gaps and challenges and give possible way

forward. He noted that chemicals are used in all sectors, however the challenge on chemicals in their management. He noted that the NIP 2007 mainly dwelled on Pesticides and PCBs. Since 2007, there has been great improvement on the introduction and use of NON chemical alternatives on pesticides. This was confirmed the representative of the Pest Control Products Board and ICIPE who were both present for the endorsement of the NIP. Kenya Power and Lighting Company also informed the meeting that they have since banned use of PCBs in their transformers and informed the stakeholders that a big percentage of the old transformers that used PCBs have since been replaced.

## **2.2 Statement by UNEP Regional Office for Africa**

UNEP ROA representative Dr. Abdouraman Bary thanked the Ministry for having invited him for this endorsement process. He reiterated UNEP's commitment in sustainable management the environment. He applauded the NIP 2014 as a good tool for chemicals management in Kenya. He pledged that UNEP would continue to support the Ministry in spearheading management of chemicals and the environment as a whole.

## **3.0. Key note address by the Principal Secretary, State Department of Environment and Natural Resources**

Engineer Kyengo read the key note address on behalf of the Principal Secretary. (Annex 2).

## **4.0 Discussion on Nip Implementation Activities**

The stakeholders reviewed the implementation matrix and committed them to the specific activities as attached below)

## **5.0 Way Forward**

The Director MEAs commended the stakeholders for their active participation throughout the NIP updating process and also thanked the consultants for their efforts in completing the task on time despite the challenges that had engulfed the project at the initial stages due to the restructuring of government and change in financial systems. He reiterated the ministry commitment in spearheading the process on chemicals management in striving to meet the SAICM goal of sound chemicals management by the year 2020.

- Endorsed with amendments the matrix on Pesticide POPs, Industrial POPs, and unintentional POPs, Monitoring and Public awareness. The legal and policy matrix would be reviewed further by legal experts in order to get the actual current position on legislation and policy. The amended and endorsed matrix tables are Annex 1 below.
- Stakeholders emphasized the need to have the NIP and Policy document sent to all stakeholders.
- The need to institutionalize the chemicals management through a memorandum of understanding with all relevant sectors was recommended.
- It was emphasized on the need to have periodical meetings to assess the progress on implementation of the NIP by different sectors.

## **Workshop Outputs**

The workshop endorsed the following

- i. A pamphlet conveying in summary the contents, intentions, and need for and benefits of the NIP for stakeholders.
- ii. Established a consultation system for the implementation process to ensure that stakeholders within and outside Government are made aware of the NIP and that feedback is gathered and collated for assessment.
- iii. Review the feedback from the consultation and adapt the NIP as appropriate.
- iv. Agreed that a NIP Committee will be formed which will include mechanisms for periodic review and updating as needed and appropriate in accordance with Article 7 of the Convention.
- v. Edit the final NIP and submit it to the Minister for Environment Water and Mineral Resources for endorsement
- vi. Set up a mechanism and structure for implementation of the NIP.
- vii. The endorsed NIP will be submitted to the COP as required.

## Implementation Matrix(s)

### Coordination and Programme Management Matrix

	Strategic objective	Activities	Performance indicators	Responsibilities	Budget (Mi Ksh)	14	15	16	17	18	19
1	Establish a NIP Coordination Mechanism at National and County levels as appropriate	-Prepare necessary policy and legal documentation for consideration approval -Recruit staff	- Cabinet approval Budgets allocation Staff in position	SDE <sup>18</sup> , AG	50						
2	Build capacity for developing and promotion of additional POPs alternatives	Strengthen training of researchers in POPs alternatives.	POPs research activities Number of POPs alternatives developed	Universities <sup>19</sup> , (UoN taking lead role), PCPB, KEMRI, ICIPE, KARI, AAK	30						
3	Build and strengthen knowledge management	-Support a centre for online access publications -Develop and operationalize information networks within the partner institutions	Chemicals Database and information network established and equipped Networks operationalized POPs website Networking arrangement	SDE NEMA, PCPB GCD Universities,	20						
4	Ensure timely response to Convention SecrettBuild capacity of zonal laboratories as centres of excellence in training and monitoring POPs	Facilitate Reporting Facilitate access to technical assistance Facilitate access to Financial Mechanism(GEF)	Number and variety of project that cover all POPs Amount of funds mobilized Counterpart funds	SDE, NEMA, Universities	30						
5	A Communication Strategy developed and implemented	Selection and distribution of convention matrial, information and resources	Communication Strategy Developed Number of institutions using the strategy	SDE, NEMA	5						
6	Monitoring and evaluation of the NIP										
	<b>Subtotal</b>				<b>135</b>						

<sup>18</sup> State Department of Environment in the MEWNR

<sup>19</sup>Dpt PHPT,Kabete, UoN

### Pesticides POPS

	Strategic Objectives	Activities	Performance indicators	Responsibility	Budget Ksh M	14	15	16	17	18	19
1	Collection and disposal of POPs stockpiles	Dispose current 200 tons POPs stockpiles	Disposal of already collected stockpiles of approx 200 tons by 2015. Disposal certificate	NEMA, PCPB , MoA, AAK, KARI, Veterinary	30						
2	Public awareness on current situation of pesticide POPs in the country and their alternatives.	Workshop for all stakeholders and county reps on POPs pesticide	Mainstreaming pesticide issues in institutional strategies completed	NEMA, PCPB, KARI, AAK, Livestock and Fisheries ICIPE, MOH, KRA Customs Stockholm Convention Region Centre	10						
3	To strengthen the national capacity and capability to perform POPS analysis.	Invest and sustain resources both in human and financial terms – training, acquisition of equipment, transfer of technology at each of 5 key institutions etc. Establish partnerships.	Procure High performance analytical equipment for POPs and the same be availed in regional centres	MEW&NR, KARI, PCPB, Government Chemist, NEMA, Universities and Private Sector Partnership with donor countries. All the counties	100 <sup>20</sup>						
4	Complying with Article 8	Collaborative studies and analyses among laboratories, both at national and international levels. Create for a for exchange of research and data	Routine analysis for POPs Pesticides in KARI, Universities, ICIPE	Selected universities, IGO and private sectors participating	50						
5	Research, development implementation and programme	Review continuing activities on research, application promotion and capacity support to institutions. Ensure sharing of results after every 2-4 years through bulletins, questionnaires and workshops/seminars /training etc	Research work and findings documented annually workshops and seminars Bulletins every 2 years Questionnaires	MEW&NR, National Treasury, NEMA, ICIPE Private sector, Universities KEMRI	150						
6	Development and promotion of alternative to POPs	Continued research on IVM and BEP Promoting IVM / IPM, BATS programmes in Kenya.  Hold regional training at all counties ICIPE	Complete replacement of all banned and listed POPs by 2016	Involving all relevant government agencies Synergy with PIC Convention KARI	300						
7	Enforcement of law and regulation	Border surveillance will be enhanced to minimize illegal imports of banned and restricted POPs	Regular surveillance of POPs pesticide starting 2014	NEMA, MoA MoH, KARI, PCPB KEMRI, ICIPE, Private sector, KEBS, PCPB, Customs, Radiation board Pharmacy and Poisons	200						
<b>TOTAL</b>					<b>700</b>						

<sup>20</sup> 1 HPLC/GC Ksh Ksh 10M approximately

## DDT and its alternatives

	Objectives	Activities	Performance Indicators	Responsibility	Budget KshM	14	15	16	17	18	19
13	Update knowledge on extent of use of DDT alternatives	Identify the alternatives used especially in malaria prone areas effectiveness, social and health impacts	List of alternatives developed	ICIPE KEMRI MOH , PCPB PBK, KARI	5						
14	Development and promotion of alternatives to DDT	Identify socially acceptable and efficacious alternatives to DDT and other Pesticide POPs Carry out institutional and stakeholder financing needs assessment	No of alternatives successful. No in use	MOH ,, NEMA, WHO, UNEP ICIPE/ KEMRI, MOA PCPB	100						
15	To strengthen malaria control performance monitoring and evaluation system	Build partnerships between MOH and DDT alliance Enhance capacities at grassroots levels for sustainable non chemical alternatives Sensitize policy makers on the need for allocation of financial and technical resources for alternatives	No. of activities with partners.  Funds mobilized from Global malaria  Forums organized	NEMA, MENR, WHO Treasury, KEMRI ,ICIPE, MOH, PBK MOH Malaria Rollback programme	200						
16	Capacity building for planning and , monitoring performance of chemical/ non chemical alternative Environmental monitoring	Development of adequate human resources, training and career structures at national and local level to manage IVM programmes, development of essential physical infrastructure, provision of financial resources to market alternatives.	Number of trained level of residue POPs in different media	MOH, DOMC KEMRI, ICIPE, NEMA, MEWNR Universities Research institutions Private Sector	300						
17	Strengthen research development and monitoring illegal imports.	Development of appropriate monitoring tools s and a clear monitoring system incorporated into the program, with budgets allocated. Monitoring on health and environmental impacts.	Monitoring  Clear monitoring system  Reports of health impacts	ICIPE, KEMRI, MOH NEMA Universities Research institutions -Private Sector KPA and Customs PCPB	30						
18	Information Exchange and creation of public awareness	Update of existing database Develop modalities for inform nation exchange programs.	No of forums organized.  No of articles published internationally	NEMA, MOH, MOA, ICIPE Universities Research institutions -Private Sector	50						
19	Policy and regulatory framework	Harmonize the existing regulations and legislation	Draft regulations	MEWNR, NEMA, MOH, WHO, UNEP, MOA, KEMRI, .PCPB,	7						
	<b>Subtotal</b>				<b>692</b>						

## Industrial POPs

	Objective	Activity	Performance Indicator	Action	Cost (Ksh M)	14	15	16	17	18	19
1	Develop Policy framework for management of industrial POPs	Develop Policy and implementation on industrial POPs Develop Regulatory standards for industrial POPs. Strengthen enforcement of standards for industrial POPs Regulation/ban of second hand products containing banned industrial POPs	Policy KEBS Standards Gazetted regulations Number of compliant industries Regulated second hands goods	NEMA, AG office, KEBS, KAM, MoIED	50						
2	To put in place material and raw products analysis and monitoring program	Establish quality control and quality assurance laboratory systems in industries	Number of laboratories and quality assurance systems in industries	NEMA, KEBS, Universities, KAM	120						
3	Minimize industrial POPs emissions in industries to meet the BAT & BEP guidelines	Include industrial-POPs emissions as part of industrial annual audits Train industry personnel on alternatives Enhance BEP and BAT	Number of industries that have carried out industrial POPs analysis Number of industries using alternatives Number of industries upholding BEP and BAT	NEMA; Ministry of Industry, KAM	50						
4	To use alternatives to industrial POPs.	Educate manufacturers on available alternatives Encourage importation of alternatives	Number of industries using the alternatives to POPs Number of imported alternatives for industrial use	NEMA/Ministry of commerce and industry, KIRDI, KAM	100						
5	Eradication of banned industrial POPs	To introduce alternatives to industrial POPs Ban importations from non-compliant import countries Educate users	Number of alternatives in use increase No imports of banned industrial POPs allowed Number of complying stakeholders	NEMA, KIRDI,	40						
6	Educating stakeholders on industrial POPs	Establish data bank for users Regulate findings and publications Networking and information	Databank houses and operational Number of publications and ICT materials Number of institutions and	NEMA, Ministry of education, Ministry of information	30						

		sharing for stakeholders	industries networking on industrial POPs information							
7	Research and monitoring	To research on the levels of industrial POPs in industrial materials and products including food stuffs Establish Research on alternatives	Data on industrial POPs in products Number of produced alternatives	KIRDI, Universities	50					
8	Destruction of Stockpiles	To destroy existing stockpiles	No know stockpiles of industrial POPs	NEMA, (Universities)	10					
					<b>450</b>					

**UPOPS**

	<b>Strategic Objectives</b>	<b>Activity</b>	<b>Performance indicators</b>	<b>Responsibility</b>	<b>Estimated Cost</b>	<b>14</b>	<b>15</b>	<b>16</b>	<b>17</b>	<b>18</b>	<b>19</b>
1	Increase the efficiency of heat and power Generation systems for industry and household systems.	<ol style="list-style-type: none"> <li>1. Create awareness on benefits of increased efficacy of heat and power generation systems.</li> <li>2. Upscale the introduction of energy saving stoves.</li> <li>3. Promote the use of alternative cleaner energy sources in industry.</li> </ol>	<ol style="list-style-type: none"> <li>1. Number of industries and institutions trained on increased efficacy of heat and power generation systems.</li> <li>2. Number of industries compliant with reduced emissions.</li> <li>3. Increased number of households with improved energy saving stoves.</li> </ol>	MoE, MOH Counties Governments, NEMA, DOHSS, KCPC	<b>50</b>						
2	Minimize releases from waste incineration	<ol style="list-style-type: none"> <li>1. Ensure incinerators meet NEMA guidelines.</li> <li>2. Training on proper management of incinerators in all sectors.</li> <li>3. Encourage development of locally manufactured incinerators at county levels.</li> <li>4. Promote uptake of BEP.</li> </ol>	<ol style="list-style-type: none"> <li>Number of incinerators that meet NEMA standards</li> <li>Number of trainees on incinerator management.</li> <li>Number of locally manufactured incinerators that meet NEMA standards.</li> <li>Number of enterprises applying BEPs</li> </ol>	NEMA  KIRDI  MoI (at county governments)	<b>120</b>						
3	Sludge Disposal: Achieve good environmental practices in the management of sewage sludge	<ol style="list-style-type: none"> <li>1. Introduce BEPs in the management of sludge.</li> <li>2. Ensure industries install wastewater treatment facilities.</li> <li>3. Ensure industrial compliance to NEMA effluent standards.</li> <li>4. Conduct assessment of contaminants in sludge.</li> </ol>	<ol style="list-style-type: none"> <li>No of Sewage treatment plants not burning sludge</li> <li>Number of wastewater treatment facilities meeting standards</li> <li>No of analyses carried out</li> </ol>	KIRDI, SDW r, WRMA, GCD, UON ,	<b>50</b>						
4	Eliminate open burning of solid wastes	<ol style="list-style-type: none"> <li>1. Introduction of Interrogated solid waste management systems</li> <li>2. Awareness raising and education on proper waste management methods</li> <li>3. Enforcement of waste disposal regulations</li> <li>4. Enforcement of air quality regulations</li> </ol>	<ol style="list-style-type: none"> <li>ISWM plans put in Place in all counties in solid waste generating facilities</li> <li>Training sessions on ISWM</li> <li>Air Quality regulations and Standards in place</li> </ol>	NEMA, MoH, County Governments	<b>100</b>						

5	Minimise UPOPs emissions in industries	<ol style="list-style-type: none"> <li>1. Include U-POPs emissions as part of industrial annual audits</li> <li>2. Train industry personnel on how to use the UNEP UPOPs Toolkit</li> </ol>	<p>Number of industries that have carried out UPOPs analysis</p> <p>Number of personnel trained in application of UPOPs Toolkit</p>	NEMA; Universities	<b>50</b>						
		1.			<b>370</b>						

### Monitoring Research and Public Awareness

	Strategic objective	Activities	Performance indicators	Responsibilities	Budget		14	15	16	17	18	19
1	Develop capacity for POPs research and monitoring in the country	Procure laboratory equipment for analysis of POPs Train Technical staff to analyse POPs chemicals in environmental and industrial samples. Develop POPs monitoring programme for food stuff, water, air and biota samples	Number of laboratories well equipped to monitor POPs. Number of technicians trained to analysed POPs. High quality monitoring data on POPs generated. Number of priority sites and matrices being monitored	KEBS, Government Chemist, Universities, KEMFRI, KARI, PCPB, KRA, LVEMP, KEPHIS	5 years	500						
2	Build research capacity for POPs and POPs alternatives	Training of researchers in POPs alternatives. Conduct research on environmentally friendly alternatives for POPs. Commercialise POPs alternatives in the country.	Number of trained POPs experts in the country. POPs research activities on POPs alternatives. Number of POPs alternatives developed	Universities, KEMRI, ICIPE, KARI, NACOST, KIRD	5 years	300						
3	Build capacity for information exchange on POPs	Establish POPs information exchange and coordination center. Provide infrastructure for information exchange. Establish POPs thematic groups for information exchange. Conduct POPs awareness workshops.	Information exchange structures in place. POPs thematic group established. Information exchange activities on POPs.	NEMA, PCPB, KARI, KEMRI, Universities, Civil society, KIRDI, KEPHIS	2 years	200						
4	Build capacity for POPs awareness creation	Develop communication strategy for POPs awareness creation Develop and disseminate POPs awareness materials. Develop POPs awareness programmes.	Number of awareness creation activities Programmes and materials developed Level of POPs understanding among special groups	NEMA, PCPB, KARI, KEPHIS, DOSH, KIRDI, NGOs, Civil Society,	2 years	100						
						<b>1100</b>						

### Legal and Policy Issues

No	Activity	Responsibility	Ksh Million	14	15	16	17	18	19
1	Submission of updated NIP/Apply for exemption/s	MEWNR	2						
2	i) Completion of regulation for the the new	MEWNR, KRA & Customs, NEMA, KEBS, AG, Academia, Private sector, civil society, public, judiciary, Parliament, Int'l orgs, bilateral partners, MEAs Secretariats	250						
3	iii) Needs Assessment for Implementation/Drawing of Implementation Strategy of new POPs and Alternatives	Coordinated by MEWNR, Academia, Industry, public, civil society etc.	175						
4	Putting in place regulatory framework	MEWNR, NEMA, Judiciary, AG, legal fraternity, academia, industry, public, civil society, etc	575						
5	Formulating interim framework and Awareness creation	All stakeholders	500						
6	Capacity building for critical mass of implementers	All stakeholders	600						
7	Monitoring mechanisms	Coordinated by MEWNR	300						
			<b>2402</b>						



**MINISTRY OF ENVIRONMENT, WATER AND NATURAL RESOURCES  
NATIONAL IMPLEMENTATION PLAN FOR UPDATED PERSISTENT ORGANIC  
POLLUTANTS ENDORSEMENT**

**KEYNOTE ADDRESS BY DR. RICHARD LESIYAMPE, PRINCIPAL SECRETARY,  
STATE DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES  
UTALII HOTEL, 21<sup>ST</sup> MAY 2014**

**Representatives of UNEP  
Representatives of the Government Departments  
Representatives from Private Sector,  
Ladies and Gentlemen**

It is a privilege and great honor to be with you and to welcome you all to this important workshop that seek to endorse the updated National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants (POPs). The updating has been comprehensive and participatory. During the consultation process a sample of stakeholders in the chemicals sector have given their views on what is priority in addressing this group of toxic and hazardous chemicals that the whole world has decided to act.

The purpose of this workshop is to set up national priorities for the POPs issues that are important to Kenya, come up with objectives for addressing those priority issues, allocate responsibilities and agree on the timing for those actions. We believe that each one of you have a role to play on this.

Let me on the onset make a few observations about POPs. We all appreciate the role played by chemicals in development. However, some like the POPs are harmful to health and the environment, thus the world has collectively said no to them. This is why the Stockholm Convention on POPs was formulated and is now ratified by 179 countries reflecting its universal acceptance and deciding that 22 chemicals listed should be banned, restricted or their emissions minimized or eliminated in the shortest time possible.

In 2007, Kenya endorsed the NIP. That time, pesticides, dioxins and furans were identified as priority chemicals and consequently, Kenya banned or restricted nearly all the pesticides originally listed. Dioxins and Furans were mainly identified to come from medical waste and open burning. . It is now common to find that every reputable hospital has acceptable segregation, recycling and eventual thermal disposal though over 80% have not done so. They need to be revitalized to cover not only hospitals but industry and services also.

I am also happy to note that Kenya has addressed the contribution of POPs form open burning of waste which not only emits common air pollutants, it is also a major source of dioxins and furans from the plastics and flame retardants contained in plastics, textiles and electronic waste. . We now have the draft e-Waste guidelines which will be gazette soon to ensure that less waste containing chlorine, bromates and fluorine are burnt in the open.

**Ladies and Gentlemen,**

Kenya has been taking part in global monitoring of POPs. We now have baseline data for the originally listed POPs. Our major markets for fish and horticulture are perennially reviewing the residue levels of these chemicals. The trend is clear that chemical products are under increasing global scrutiny and Kenya cannot be left behind. It is in our interest that we keep abreast with global action to ensure that we protect Kenya's environment, health, economic and social being.

Further we note that the new calculations for POPs emissions indicate that our traditional three stones cook stoves are some of the major emitters of many air pollutants, as well as dioxins and furans. This raises concern as over statistics show that 29% of the diseases cannot be categorized; perhaps because they cannot be diagnosed easily. Such diseases may include cancers, asthma, immunodeficiency endocrine disruption, etc. These are all attributed somewhat to POPs. In any case most countries have moved from dirty fuels to clean fuels with households devising safe ways to dispose fumes. We have a duty to inform and assist to promote 30 million Kenyans using Stone Age cooking to dwellings with better ventilation, less exposure to emission.

**Ladies and gentlemen,**

I invite you to consider the proposed strategies and the actions and especially those in your sector or mandate and probably improve them. Our estimate of Kshs 5 billion to implement the convention over five (5) years or at least 1 (one) billion every year is conservative. My Ministry will ensure that in the upcoming years, both the national and county governments regularly allocate funds that address relevant parts of the NIP. In this regard, let me conclude by thanking Global Environment Facility for the financial support to update the NIP.

I am happy that our development partners; WHO, UNDP, UNEP and World bank will journey with us to meet the objectives of the convention.

**Thank you.**

**STAKEHOLDERS PRESENT AT THE NIP ENDORSEMENT**

**MINISTRY OF ENVIRONMENT, WATER AND NATURAL RESOURCES  
STATE DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES  
NATIONAL IMPLEMENTATION PLAN ENDORSEMENT**

**HELD AT UTULI HOTEL ON 21<sup>ST</sup> MAY 2014**

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**MINISTRY OF ENVIRONMENT, WATER AND NATURAL RESOURCES**  
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**MINISTRY OF ENVIRONMENT, WATER AND NATURAL RESOURCES**  
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**HELD AT UTALII HOTEL ON 21<sup>ST</sup> MAY 2014**

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	Mr. Ezekiel Bowen	Naivasha Sub-County	
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12.	Stela Kamasi	Environment Officer, Kisumu East	
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19.	Peter W. Wanjohi	Ministry of Health	Unintentional POPs
20.	Lulu Hayanga	State Law Office	Legal and Policy
21.	Muitungi Mwai	NEMA	Unintentional POPs
22.	Caroline Wamai	Government Chemist	Pesticide POPs
23.	Lawrence Kalawa	Pest Control Pesticide Board	Pesticide POPs
24.	Dr. Faridah H. Were	Kenya Industrial Research Institute	Industrial POPs
25.	Dr. Wilber Lwande	ICIPE	Pesticide POPs
26.	J. W. Chege	Department of Water and Natural Resources	Unintentional POPs
27.	David Rono	Department of Water and Natural Resources	Policy
28.	Francis Kombe	Kenya Ports Authority	Legal and Policy



**Other Stakeholders Consulted**

1. Commission on the Implementation of the Constitution
2. Environmental & Combustion Consultants, Kitengela
3. Customs Departments, Mombasa, Kisumu and Nairobi
4. National environmental Trust Fund
5. National Environmental Tribunal
6. Kenya Intellectual Property Institute
7. Kisumu Water Services Company
8. Kenya Bureau of Standards
9. Office of the Attorney General, Department of Justice, Nairobi
10. Agricultural Finance Corporation
11. Nairobi University
12. Masinde Muliro University
13. Maseno University
14. Pan Paper Mills, Webuye
15. Mumias Sugar Factory
16. KARI, Mtwapa
17. KEMRI, Kilifi
18. SGS, Mombasa
19. Kipevu Sewerage Plant, Mombasa

**Annex 4: MEASURES TAKEN TO MANAGE POPS IN KENYA**

Category	Chemical Name	Convention Annex	Use	Action. Measures taken to Eliminate/Restrict the use in Kenya	Law/Regulatory Policy Governing Act
Pesticide	Aldrin	A	Insecticide	Banned in 2004	(PCPB) Pest Control Products Act (PCPA)
Pesticide	Chlordane	A	Insecticide	Banned in 1986	PCPB under the PCPA
Pesticide	Dieldrin	A	Insecticide	Banned in 2004	PCPB under the PCPA
Pesticide	Endrin	A	Insecticide	Banned in 1986	PCPB under the PCPA
Pesticide	Heptachlor	A	Insecticide	Banned in 1986	PCPB under the PCPA
Pesticide/ Industrial Chemical	Hexachlorobenze (HCB)	A	Fungicide released during manufacture of certain chemicals and as a result gives rise to dioxins and furans.	Banned in 2004 None	PCPB under the PCPA NEMA to take necessary action.
Pesticide	Mirex	A	Insecticide	None	PCPB to take necessary action.
Industrial Chemical	Polychlorinated Biphensyls (PCBs)	A	Coolant for electrical transformers and capacitors	None	PCPB under the PCPA
Pesticide	Dichlorodiphenyl Trichloroethane (DDT)	B	Mosquito Control	Restricted in 1986 for use in public health only for mosquito control in mosquito breeding grounds Banned in 1986 for agricultural use and livestock in 1976	PCPB under the PCPA

	DDT trichloroethane (Dichlorodiphenyl)	Restricted	Insecticide, restricted use to Public Health only for mosquito control for indoor residual spray by Ministry of Health. Banned for agricultural use.
	Ethyl Parathion	Restricted	Insecticide, capsule suspension formulations allowed in 1998
	Lindane-pure gamma – BHC	Restricted	Insecticide, restricted use for seed dressing only
	Methyl parathion	Restricted	Insecticide, capsule suspension formulations allowed in 1998
	Monocrotophos	Restricted	Insecticide/acaricide, soluble liquid formulations of the substance that are below 600g active ingredient/L
	Phosphamidon	Restricted	Insecticide, Soluble liquid formulations of the substance that is below 1000g active ingredient/L

### Cross cutting issues

No	Objectives	Activities	Responsibility	Action Taken
1	Capacity building to communities to dispose exiting stocks	Conduct stakeholders Workshops, investment projects, consultative meeting for target Communities.	NEMA, PCPB, KARI, MoA AAK, KEPHIS, KIRDI, KETRI KNCPC.	Trained 4 PCPB pesticide inspectors, 2 lab analysts from PCPB. 2 currently post graduate diploma in pesticide management and Capacity building to PCPB stakeholders (farmers, stockiest and distributors).
2	Building inspection capability for POPs to ensure compliance	Verify DDT sites Remediate DDT Contaminated sites. Quantify and Mark known sites Mark Hot spots Document Status Clean-up 100% of sites Promote adoption of BAT/BEP in disposal and transportation methods	NEMA, PCPB, KARI, Ministry KEPHIS, KIRDI, KETRI KEBS	PCPB carried out further awareness on contaminated sites.  Soil samples collected for analysis  Menengai site has self-reclaimed Collected and disposed 100 tonnes of composite pesticides Collection of obsolete pesticide ongoing in Mt. Kenya region. Enforcement of disposal regulation by PCPB, NEMA, County Governments
3	Strengthen existing analytical laboratories to assess low POPs content	Provide equipment Train staff and lead agencies Develop common monitoring Access to GMP  identification and strengthening of existing laboratories having trained personnel that can coordinate and initiate collaborative studies and analyses and train others	KARI, KEPHIS, KIRDI, KETRI and Consultants GC, KEBS GOVERNMENT CHEMIST UNIVERSITIES.	Capacity building and training of personnel at University of Nairobi, chemistry Dept. and Provision of consumer items and small scale analytical item to UoN.  Personnel from Dept PHPT trained. Ongoing analysis of individual mother's milk
4	Support to private analytical laboratories to undertake the same	Provide support to University and referral laboratories Registered in line with EMCA	NEMA, PCPB, KARI, Ministry of Agriculture, AAK, KEPHIS, KIRDI, KETRI and Consultants, KEBS and KIRDI	
5	Monitoring Program	Carry out surveillance of contamination of Lake Victoria	Fisheries Department KEFRI, NEMA/GCD/UON?KEMRI	Global Monitoring Programme by UoN Through LVEMP the Govt is addressing waste management, sewage work for the

				catchment, pollution control on rivers flowing to the lake Global monitoring
6	Research, Development And Monitoring	Identify research activities on POP	NEMA, PCPB, AAK KARI, KEPHIS	Research on non chemical alternatives by KEMRI, ICIPE, Real IPM in Thika, Dudutech in Naivasha and Timau Research on general pesticide traces around Lake Naivasha PCPB
7	Legal/policy /regulations	Need to harmonize the legislation regulating chemicals use  Amend current laws to avoid duplication or conflicts in the law.	NEMA, PCPB, KARI, Ministry of Agriculture, AAK, KEPHIS, KIRDI, KETRI and Consultants KNCPC,	NEMA Draft chemical policy developed, MEMR (Quick Start Programme) Draft Chemical Regulations Developed, NEMA Banning of listed pesticides, PCPB Disposal regulations developed by PCPB, NEMA, County Governments. Regulation for Procedures for registration of Biopesticides developed by PCPB, Draft IVM policy Guidelines for licencing of incinerators developed by
8	Enforcement of law and regulation	Intensification of border surveillance involving all relevant government agencies		Licensing of Incinerators by PCPB and NEMA

## References

1. Alternatives Project Report DOMC/KEMRI (2012). Alternatives to pyrethroid insecticides for indoor residual spraying (IRS) in Kenya
2. M.W. Barasa J.O, Lalah and S.O. Wandiga. (2008). Seasonal variability of persistent organochlorine pesticide residues in marine fish along the Indian Ocean coast of Kenya. *Toxicological & Environmental Chemistry Vol. 90*, No. 3 535-547
3. Mbogo C Policy Brief on Insecticide Resistance in Kenya (draft 2009)
4. MPH&S, WHO 2009 Kenya IVM Policy guidelines (Draft)
5. GOK/UNEP 2002. Final Draft Country Report on Selection, Design and Implementation of Economic Instruments in the Kenyan Solid Waste Management Sector
6. Government of Kenya (2007) Kenya Vision 2030, a globally competitive and prosperous Kenya.
7. Government of Kenya, Draft report of national research, monitoring and public awareness activities on POPs, Ministry of Environment, Water and Natural resources. (2014)
8. Government of Kenya: Identification and Quantification of dioxins and furan releases in Kenya, March 2006
9. Government of Kenya: Kenya Draft Chemical Policy for Implementing the Strategic Approach
10. Government of Kenya: Kenya National Implementation Plan, March (2007).
11. Guidelines For Reviewing And Updating The NIP Under The Stockholm Convention on Pops; Global Environment Facility [www.pops.int/NIP](http://www.pops.int/NIP)
12. Investment Climate Kenya, November, (2004. pp 10-11)
13. Kenya National Bureau of Statistics (KNBS), (2010). Population & Housing Census Results 2009. Minister of State for Planning, National Development and Vision 2030, Kenya.
14. Kenya National Profile To Assess the Chemicals Management (2011)
15. Kenya-Economic-Update-June-2013, World Bank
16. Madadi O.V., S.O. Wandiga, (2006) *The status of POPs in Lake Victoria catchments*. 11th World Lake Conference proceedings,(2): 107-112.
17. Madadi O.V., Wandiga S.O., Njogu J.M., Mutie T., Mavuti. K.M., Jumba I.O, Shiundu P.M, and D. Haper (2014) Occurrence of and distribution of organochlorine pesticides residues in Lake Naivasha catchments. (In press).
18. Mogaka, H., Gichere, S., Davis, R. and Hirji, R. (2006). Climate variability and water resources degradation in Kenya: improving water resources development and management, World Bank. Working Paper No 69, Washington DC.
19. Musa, J. W.Gichuki, P. O.Raburu., C Mulanda Aura 2011 Organochlorine and organophosphorus pesticide residues in water and sediment from Yala/Nzoia River within Lake Victoria Basin, Kenya. *Journal of Ecology and the Natural Environment* 3 392-39
20. Njogu P.M, Kitetu J.J, Wanjau R.N and Keriko J.M. (2011). Application of the PERPEST Model in the prediction of environmental risks of endosulfan on *Oreochromis leocostictus*; A case study of Lake Naivasha, Kenya
21. Orata, Francis , Maes, Ankes , Werres, Friedrich and Wilken, Rolf Dieter(2011) '*Perfluorinated Compounds Distribution and Source Identification in Sediments of Lake Victoria Gulf Basin*', *Soil and Sediment Contamination: An International Journal*, 20: 2, 129 - 141
22. Omwenga I. M (2013) Assessment Of Pesticide And Heavy Metal Residues In Tilapia Fish From Machakos And Kiambu Counties, Kenya MSc, Thesis UoN.
23. Pest Control Products Registered for use in Kenya. Revised Edition July 2013  
PCPB (Pest Control and Products Board) (2 List of pest control products provisionally registered by the pest control productboard for use in Kenya.
24. Report on WHO/UNEP Human Milk Survey on POPs (POPS) 2010.
25. Resources Management Seminar (in Kenya pp.44. January 22-25).

26. Socio-economic, health and environmental impact study of pops pesticide use in agriculture, international pops elimination project – IPEP
27. Startup Guidance For The 9 New Pops (General Information, Implications Of Listing, Information Sources and Alternatives) December 2010, Stockholm Convention on POPs (POPs)www.pops
28. Stockholm convention on POPs as amended in 2009. Texts and annexes
29. The Egg Report: Contamination of chicken Eggs from 17 countries by dioxins, PCBs
30. Wandiga S. O., V. O. Madadi, B. T. Kiremire, and M. A. Kishimba, (2006) *Lake Victoria: Will it support life tomorrow?* A case for abatement of pollution and eutrophication of fresh waters. In UNEP/PASS: Environment for Development: An Ecosystem Assessment of Lake Victoria Basin Environmental and Socio-Economic Status, Trends and Human Vulnerabilities. (Pg. 61-76.)

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