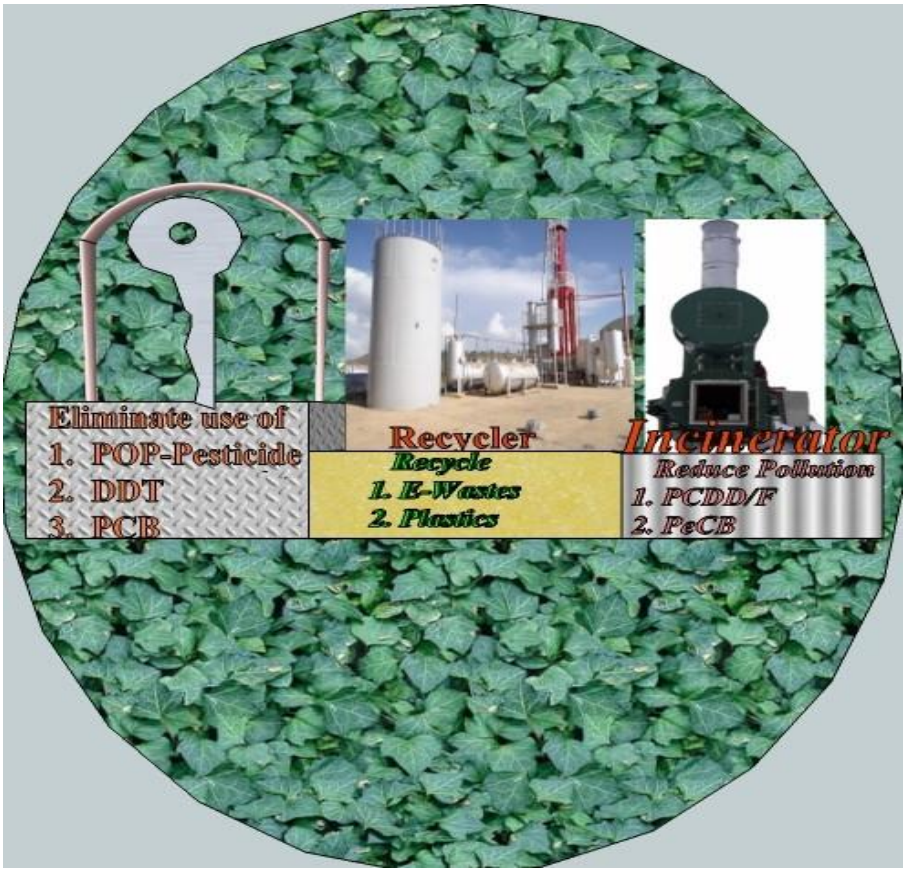
The State of Eritrea

Ministry of Land, Water and Environment

Department of Environment

Enabling Activities to Review and Update the National Implementation Plan (NIP) for the Stockholm Convention on Persistent Organic Pollutants (POPs)



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FOREWORD

Chemicals are an integral part of modern life. There is hardly any industry or service sector where chemicals are not used. They provide societies with a wide range of benefits including increased agricultural and industrial productivity, improved public health services, control of diseases etc… However, mismanagement of chemicals in general and hazardous chemicals and their wastes in particular could trigger irreversible damage to human health and the environment. Cognizant of this, Eritrea developed its initial National Implementation Plan (NIP) on POPs and submitted it to the Stockholm Convention Secretariat in 2012.

After the submission of the initial NIP, 10 new POPs were identified and the COP decided to add them to the Convention's annexes. This decision necessitated Eritrea to update its initial NIP. This updated NIP document is key milestone for Eritrea to address outstanding issues related to the management of the original and new POPs and ensures the country's commitment to the implementation of the Stockholm Convention.

The updated NIP was prepared through a consultative and participatory process, where valuable inputs were gained from stakeholders, including government institutions, academia and the private sector. The national POPs inventory revealed that Eritrea does not manufacture POPs chemicals nor does it use them in the production of other materials. It is in the imports of various materials such plastic products, electrical and electronic goods (Computer and TVs), foams and flame retardants that form the newly listed persistent organic pollutants (POPs) occur.

The updated NIP has indentified priority activities and strategies that Eritrea will address to ensure the elimination of POPs and implement the Stockholm Convention on POPs including the newly added POPs chemicals listed in the Convention annexes A, B and C, and the provisions the Eritrean Environmental Protection, Management and Rehabilitation Framework Procalamtion179/2017. The Ministry of Land, Water and Environment as a national focal point, will continue playing pivotal role in engaging all stakeholders in the implementation of the updated NIP and the development of relevant policies and legal instruments for the proper management of POPs. Moreover the Ministry will see to it that best available technologies and practices in environmental management are adapted in the country in order to avoid the use of POPs and to minimize the release of unintentionally produced ones.

In conclusion, on behalf of the Government of the State of Eritrea and myself, I would like to take this opportunity to acknowledge and thank the United Nations Industrial Development Organization (UNIDO) and the Global Environmental Facility (GEF) for their supportive contribution in the development of this document. I would also like to underscore Eritrea's commitment to the implementation of the Stockholm Convention.

Tesfai G.Selassie Sebhatu

Minister of Land, Water and Environment

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I wish to express our gratitude to the Bureau of Standard and Evaluation in general and the team of consultants along with task team members in particular, for delivering appreciable consultancy services on the preparation of the NIP update document

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Mr. Mogos Woldeyohannes,
Director General,
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LIST OF ACRONYMS

ASP	Africa Stockpiles Programme
BAT	Best Available Technologies
BEP	Best Environment Practices
CoC	Chamber of Commerce
CoP	Conference of the Parties
CRTS	Cathode Ray Tubes
DDT	Dichlorodiphenyltrichloroethane
DoC	Department of Customs
DMT	Department of Maritime Transport
EA	Enabling Activities
ECLC	Eritrean Crop and Livestock Corporation
EEC	Eritrea Electric Corporation
EEE	Electrical and Electronic Equipment
EIT	Eritrea Institute of Technology
ESI	Eritrean Standard Institute
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GEF	Global Environment Facility
HAC	Hamelmalo Agricultural College
HCB	Hexachlorobenzene
ICT	Information and Communications Technology
IHL	Institute of Higher Learning
IPM	Integrated Pest Management
MoA	Ministry of Agriculture
MoE	Ministry of Education
MoEM	Ministry of Energy and Mines
MoH	Ministry of Health
MoI	Ministry of Information
MoJ	Ministry of Justice

MoLG	Ministry of Local Government
MoLWE	Ministry of Land, Water and Environment
MoMR	Ministry of Marine Resources
MoND	Ministry of National Development
MoPW	Ministry of Public Works
MoTC	Ministry of Transport and Communication
MoTI	Ministry of Trade and Industry
NEA	National Executing Agency
NEMP-E	National Environmental Management Plan-Eritrea
NGO	Non-Governmental Organisation
NIP	National Implementation Plan
NPC	National Project Coordinator
NRS	Northern Red Sea
OECD	Organisation for Economic Cooperation and Development
PAHs	Polycyclic Aromatic Hydrocarbons
PBDE	Polybrominated-Diphenyl-ethers
PCB	Polychlorinated Biphenyls
PCDD	Polychlorinated dibenzo p-dioxins
PCDF	Polychlorinated dibenzofurans
PCU	Project Coordination Unit
PeCB	Pentachlorobenzene
PFOS	Perfluorooctanesulfonate/sulfonic acid
PFOSA	Perfluorooctanesulfone amide
POP	Persistent Organic Pollutant
POPRC	POPs Review Committee
PPE	Personal Protective Equipment
PVC	Polyvinyl chloride
SRS	Southern Red Sea
RSC	Red Sea Corporation
SC	Stockholm Convention
TEF	Toxic Equivalence Factor

TEQs	Toxic Equivalents
UNEP	United Nations Environmental Program
UNIDO	United Nations Industrial Development Organization
U-POPs	Unintentional POPs
WEEE	Waste of Electrical and Electronic Equipment
α-HCH	Alphahexachlorocyclohexane
β-HCH	Beta hexachlorocyclohexane

EXECUTIVE SUMMARY

Persistent Organic Pollutants (POPs) are toxic substances, persistent, bio accumulate and can be transported over long distances and pose a risk of causing adverse effects to human health and environmental damage. In order to manage the threats posed by the trans-boundary movement of POPs, it was decided that an international binding agreement was required. The Stockholm Convention (SC) is thus a global treaty on regional economic integration organizations with the objective to protect human health and the environment from POPs. Parties to the SC are required to develop and endeavour to put into practice a National Implementation Plan (NIP) setting out how they will implement their obligations under the Convention.

This document is compiled in accordance with article 7 of the SC on POPs. It describes the NIP for the management and phase out of POPs in Eritrea. In an attempt to address the global challenge, the SC on POPs was adopted at a Conference of Parties (CoP) on 22 May 2001 in Stockholm, Sweden and entered into force on 17 May 2004.Eritrea became a Party and acceded to the SC on 10 March 2005, which entered into force on June8, 2005.

The SC initially addressed the dirty dozen POPs of pesticides (aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, mirex and toxaphene), industrial chemicals (PCBs and hexachlorobenzene) and unintentional POPs (dioxins, furans, HCB and PCB). In 2009, the COP listed nine additional POPs namely, pesticides: chlordecone, lindane and related waste isomers alpha-hexachlorocyclohexane and betahexachloro- cyclohexane; industrial chemicals: hexabromobiphenyl, tetrabromodiphenyl and pentabromodiphenyl ether, hexabromodiphenyl and heptabromodiphenyl ether, penta-chlorobenzene, perfluorooctane sulfonic acid and related substances; and by-product penta-chlorobenzene.

Some of the main objectives of the NIP are:

- Improve the knowledge about the POPs in order to be able to eliminate/reduce their local resources and wastes in quantities;
- Enact adequate national legislation policies aiming specifically at POPs and ensure its implementation;
- Reinforce the institutional capacities of the parties involved in the rational ecologic management of POPs and coordinate their activities; and
- Ensure exchange of information in terms of implementation and participate with international cooperation in the fight against POPs.

Eritrea developed its first NIP in 2012 and the document was updated to address the 10 newly added POPs chemicals in the annexes of the Convention. The updated NIP document describes the review of the original POPs and current status of the new POPs listed in Annex A, B and C of SC. The review of the original POPs revealed that all POPs pesticides including DDT have been completely safeguarded and no new importation was made. Further the document gives an overview on the situation of the new listed POPs in the country and how Eritrea is planning to address the new listed POPs in an integrated manner. Therefore, priority setting considerations and all strategies and actions, which need to be undertaken in order to eliminate use of POPs and reduce the release of unintentional release of POPs are thoroughly described in this NIP.

Eritrea has shown its commitment at ensuring sound management of chemicals by taking certain measures to achieve sustainable environmental protection and economic development. One of the recent measures taken was the development of the Eritrean Environmental Protection, Management and Rehabilitation Framework Proclamation No. 179/2017 and Environmental Protection and Management Regulations (Legal Notice No. 127/2017).

The preparation of the document was undertaken through five steps described below. :

Step 1: Inception phase to establish a national coordinating mechanism;
Step 2: Establishment a national POPs inventory;
Step 3: Setting of priorities and national objectives;
Step 4: Formulation of draft NIP involving all stakeholders; and
Step 5: Approval of the NIP at the level of institutions and stakeholders involved.

According to the data reported in the 2012 NIP of Eritrea, there were about 335.4 tons of obsolete pesticides. As part of the overall tally, there were some imported old and new POP-pesticides including DDT (36.16 tons), endosulfan (2.54 tons), heptachlor (0.30 tons) and lindane (17.75 litres) in the country. Therefore, the percentage of POPs pesticides was 11.6. The total quantity of obsolete and POP pesticides (364 tons) was thus exported to UK for incineration and this was done in three different shipments by Veolia Environmental Services. The current national inventory on POP-pesticides was carried out from August 22, 2017 up to September 25, 2017. The inventory included POP pesticides, obsolete and active pesticides stocks, and contaminated sites. Currently, there are about 35.86 tons of obsolete pesticides left over in the stores.

The status of the 27 stores was assessed and the current condition of the stores in the country are below the standard; most of the stores were originally built for other purposes and thus don’t satisfy the standard requirements. Moreover, the storage, use and handling of the pesticides are far from desirable; some of the stock of pesticides is old, often badly deteriorated and stored in unsuitable conditions. Moreover, according to previously conducted inventory, 21 potentially contaminated sites were identified and assessed at national level. Most of the sites were contaminated with unknown pesticides and this can be considered high risk of POP pesticides. During the current assessment, it was observed that some of the contaminated sites have been washed away by rain and wind. It is highly important that detailed assessment and urgent safeguarding procedures should be undertaken to prevent human health and environmental risks.

Eritrea doesn't manufacture, import and/or export DDT. As reported in the previous NIP, a significant amount of DDT was imported to the country. The Malaria Control Unit of the MoH was the only importer of DDT in Eritrea. DDT was used only for public health, particularly for vector control and complies with WHO's position and the SC. As reported in the 2012 NIP, the total amount of active and obsolete DDT in the different stores of the country was about 52 tons. Based on the data reported from the current inventory, about 40.2 tons of DDT were used in Northern Red Sea between 2012 and 2013. All the remained DDT in the country was disposed along with the obsolete and POP pesticides. Thus, the current inventory confirms that, neither active nor obsolete DDT exist in the stores of MoH and MoA. Currently, the MoH is using other safer and effective alternative pesticides for the malaria control.

Currently, in Eritrea, there are about 4810 and 240 PCB containing transformers and capacitors respectively and most of the transformers in use are new and PCB free. Around 770 PCB containing and decommissioned old transformers have been and are still in open areas at Tsaeda-Chrstian, Girar and Denden electric power sub-stations. Most of the PCB-containing transformers and capacitors in the country were already identified but so far there has no any action taken in terms of safeguarding and disposal. Besides, the current inventory identified about 23 barrels (4600 Litres) of PCB containing oils, collected from old electric transformers, in Aget Technical public services. Open applications like hydraulic oil, paints and sealants were not addressed in this inventory but will be considered in the future.

Eritrea does not have any facility for producing POP-PBDEs or using them as raw materials nor a facility recycling or reusing polymers from used articles. It is, therefore, the importation of electrical and electronic equipment's (EEE), vehicles, foams and flame retardants that form the majority of the newly listed POP-PBDEs. The main targets of the current inventory were EEE, related waste (WEEE) and old vehicles in the country produced before 2005. The main purpose of the inventory was to evaluate the existing information on the importation and use of POP-PBDEs and articles containing POP-PBDEs in the country. Sample of CRTs analysed were about 242 pcs and 62.9 %

of the samples analysed were beyond the standard (standard of POP-PBDE per appliances is 1000 ppm). Therefore 1638 tons of the EEE (CRT) were highly contaminated with PBDEs (c-octaBDE). The range of c-OctaBDE in CRT devices for 2017 was estimated and therefore, based on primary inventory the Mc-OctaBDE is 5712 Kg. Therefore, the total estimated quantity of PBDEs contained in CRTs (computers and televisions) in Eritrea is about 5.71 tons for 2017. Based on in-depth inventory of the overall stock of CRTs (2604. 86 tons), the calculated c-OctaBDE was about 1586 Kg. Besides, the quantity of PBDEs in the current use of vehicles was calculated to be 0.72 tons for 2017.

Eritrea does not produce PFOS and its related substances, but PFOS containing materials for various applications has been imported. In pursue of this, specific domains of fire-fighting foam applications, metal plating, tanneries, textile industries, rubber and plastic sectors, photographic, synthetic carpets and others were inventoried in order to estimate the quantities and releases of PFOS. The quantity of PFOS and its salts, released from these different industries was estimated for 2017 and ranges from 253.28up to2532.8 Kg per year. Moreover, additional 65.48 tons of firefighting foams containing 1.96 tons of PFOS are still in stock.

Unintentionally produced POPS (U-POPs) assessment in Eritrea includes waste incinerations, open burning of wastes, heat and power generations, transportation, and others. The analysis of U-POPs was done using the standardized Toolkit (2013 version) for identification and Quantification of Dioxins and Furan. Based on the analysis, Eritrea releases a total of 562.3g TEQ/a in the year 2017. The three major contributors (93 %) to the overall air emissions of U-POPs are open burning processes (234.6 g TEQ/a), heat and power generation (149.8g TEQ/a) and waste incineration (65.3 g TEQ/a).

In the Updated NIP document priority areas have been set and 10 strategies and action plans that could go parallel to the stakeholders' strategic plans are developed. For each action plan various activities and their corresponding budget are prepared.

1. GENERAL INTRODUCTION

1.1 Persistent Organic Pollutants

"Persistent Organic Pollutants (POPs) are a group of chemicals that are characterized by their Persistence (the ability to resist degradation in various media like air, water, sediments and organisms for months and even decades), Bio-accumulation (the ability to accumulate in living tissue at levels in higher than those in the surrounding environment) and potential for long range transport from their source across international boundaries and toxicity (pose a risk of causing adverse effects to human health and environmental damage)[1-2]. Some specific effects of POPs are including cancer, allergies and hypersensitivity, damage to the central and peripheral nervous system, reproductive disorders, disruption of the immune system and endocrine disrupter. They were and are widely used in agriculture and industrial practices, and they are unintentionally released from many anthropogenic activities around the globe. These toxic compounds are transported to different regions even they have never been used or produced. In order to manage the threats posed by the trans-boundary movement of these POPs, it was decided that an international binding agreement was required[3-4]. The Stockholm Convention on Persistent Organic Pollutants, which was adopted in May 22, 2001 in Stockholm, Sweden and entered into force in May 17, 2004. Eritrea became a Party and acceded to the Stockholm Convention on 10 March 2005, which entered into force on 8 June 2005. The main objective of the Convention is to protect human health and the environment from POPs by reducing and/or phasing them out.

[1] http://www.pops.int/

[2] Bjermo, H. et. al. (2013). Fish intake and breastfeeding time are associated with serum concentrations of organochlorines in a Swedish population. *Environment International*, 51, 88-96.

[3] http://chm.pops.int/Home/tabid/2121/Default.aspx

[4] Bordajandi, L. et. Al. (2008). Occurrence of PCBs, PCDD/Fs, PBDEs and DDTs in Spanish breast milk: Enantiomeric fraction of chiral PCBs. *Chemosphere*, 70, (4), 567-575.

1.2 Overview of Chemicals and their Management

Proper management of chemicals is the responsibilities or mandates of governments and private sectors. As a result, many nations and private sectors have created competent authorities and established effective processes and practices for of their appropriate use and sound management of their emissions and wastes to prevent human health and environment. Recognition of different capacities and commitments of governments, institutions and industries that today manage chemicals is of great significance for the broad and comprehensive approach to the appropriate management of 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:

- *Controlling chemical pollution*. This may include pollution control activities such as end of pipe solutions with emission limits and chemical waste fees.

- *Preventing chemical pollution*. This consists of instruments such as pollution prevention planning, chemical accident prevention and cleaner production assessments within the technical category. Moreover, economic instruments such as chemical use fees and taxes and chemical leasing are also included under this category. Specific example includes the United Nations Environment Programme (UNEP)/United Nations Industrial Development Organization (UNIDO) Cleaner Production Programme which was launched as a significant initiative in chemicals pollution prevention.

- *Remediating contaminated sites and managing waste chemicals:* Technical and economic approaches are among the significant requirements that accompany currently instruments for the pollutants control for cleaning up contamination. Some of the significant instruments among these categories are:
    - ✓ emergency response and spill management programs,
    - ✓ site clean-up programs,
    - ✓ post clean-up management and,
    - ✓ legacy chemical storage management and treatment.

Specific examples are the United States Superfund program (which requires responsible Parties to either perform remediation activities or reimburse the government for clean-ups), the Global Environment Facility, World Bank, Food and Agriculture Organization, Africa Stockpiles Programme (ASP), and the Organization for Economic Cooperation and Development (OECD) guiding principles for chemical accident prevention, preparedness and response, intended to assist in the safe design and operation of chemical plants and to plan for response action in the event of accidents.

- *Managing chemicals in products*: Increasing attention is being paid to the issue of toxic substances in products or articles and their life cycles. Efforts to manage chemicals in products or articles began to be developed during the 1990s in a variety of countries. Various instruments were developed as a result of the more attention given to the issues of toxic substances (chemicals) in products or articles and their life cycle and efforts made for their management since 1990s. Product design, product declarations, eco-labelling, product standards and certifications, environmentally preferred product procurement policies and product stewardship and take-back programs within appropriate regulatory, voluntary, technical and product management frameworks were the key instrument developed.
- *Managing chemical information*: Enough information about chemicals should always be available and easily accessible for safety during handling, transportation and use. There is so much information in the world for chemicals; however, access to that information is critical. Pollutant Release and Transfer Registries, product ingredient registries, chemical hazard characterization and labelling systems, chemical manufacturing and use inventories, and systems for disclosing chemicals in the supply chain are instruments for chemical information management devised by individual countries and group of nations. A major international system for managing chemical information is the Globally Harmonized System (GHS) of Classification and Labelling of chemicals. Its goal is to ensure that information on physical hazards and toxicity from chemicals is made available during handling, transport and use.

One drawback that hinders the reduction of the usage 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 higher concern and their alternatives 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 which lack enough financial resource 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.

1.3 The Stockholm Convention

The Stockholm Convention (SC) on POPs is a global treaty signed by 181 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 endeavour to put into practice a National Implementation Plan (NIP) setting out how they will implement their obligations under the Convention. The SC requests Parties to protect the citizens and the environment from POPs through activities stipulated in the articles of the treaty. Article 7 of the SC calls for the development of the NIP that discusses how Parties aim to meet their obligations under the SC. This document has been developed to provide an understanding of what measures Eritrea as part of the Convention, aims to undertake in this regard. Parties to the Stockholm Convention are required to develop 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 recognizes the particular needs of developing countries and specific provisions on technical assistance, and the Global Environment Facility (GEF) established to serve financial resources and mechanisms included in the general obligations for Parties in developing regions.

The Stockholm 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 techniques (BAT) and best environmental practices (BEP).

The key objectives of the convention are:

- Prohibit and/or eliminate the production and use, as well as the import and export, of the intentionally produced POPs that are listed in Annex A (Article 3).
- Annex A allows for the registration of specific exemptions for the production or use of listed POPs, in accordance with that Annex and Article 4, bearing in mind that special rules apply to PCBs. The import and export of chemicals listed in Annex A can take place under specific restrictive conditions, as set out in paragraph 2 of Article 3.
- Restrict the production and use, as well as the import and export, of the intentionally produced POPs that are listed in Annex B to the Convention (Article 3).
- Reduce or eliminate releases from unintentionally produced POPs that are listed in Annex C to the Convention (Article 5).
- Promotes the use of best available techniques and best environmental practices for preventing releases of POPs into the environment.
- Ensure that stockpiles and wastes consisting of, containing or contaminated with POPs are managed safely and in an environmentally sound manner (Article 6). This include: -
  - ✓ The eliminate of the production and use of POPs pesticides
  - ✓ The elimination of the production of DDT for all except public health uses (e.g. malaria for vector control) with continuous review of alternatives;
  - ✓ The elimination the industrial production of PCB but permit the use of PCB in transformers, capacitors and breakers oil equipment until the phase out as soon as possible by 2025;

- ✓ Minimize emission of industrial products and their source such as PBDEs and PFOS;
- ✓ Minimize emission of unintentionally produced POPs (U-POPs) such as dioxins, furans, PeCB and HexaCB;
- ✓ Monitor environmental and health impacts of POPs and,
- ✓ Address social and economic issues.

1.4 Purpose and Structure of the National Implementation Plan (NIP)

The NIP is a strategy document for the implementation of the SC on POPs and outlines several policies and action plans that a country or a nation intends to employ for effective management of POPs[5]. It is a product of the project titled "Enabling activities (EA) to facilitate early action on the implementation of the SC on POPs in Eritrea". The objective of this EA as a project was to review and update the NIP by incorporating the newly listed ten POPs and current status or state of the previously inventoried twelve POPs in Eritrea. The NIP document elaborates upon the current situation on POPs and expresses the country's commitments and the actions that it intends to be done with respect to the management and control of POPs. This updated NIP for Eritrea is produced in response to the dynamic nature of the Convention as additional 10 new POPs have been listed and added to the Convention in 2009 and 2011. The NIP, in application of Article 7 of the SC, has a general objective of improving the management of POPs with the aim to protect human health and environment from harmful effects of chemical products and specifically aims to achieve the following specific objectives[6]:

- To provide a national policy instrument and framework within which POPs issues are to be addressed as a part of national policies on chemicals management, environmental protection, public health and sustainable development;
- To present a baseline and associated analysis supporting the development and implementation of effective action plans and strategies to achieve reduction and

[5] "Parties" may include a State or regional economic integration organization that has consented to be bound by the Convention and for which the Convention is in force.
[6] Guidance for Developing, a National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants, March 2014

elimination of POPs with associated improvement of environmental quality and human health;

- To provide an operational and institutional framework for eligibility for financial assistance that might be provided under the SC's permanent financial mechanism for actions on POPs;
- To provide a basis for monitoring the country's progress in addressing POPs issues, and specifically the effectiveness of the actions it had committed to in reducing or eliminating POPs use and release into the environment;
- To facilitate public awareness, education and participation with respect to POPs issues and overall improvement in environmental and public health protection;
- To facilitate on-going efforts in dealing with broader environmental issues such as the control of pollution, overall pollutant releases, and hazardous wastes, as well as the development and strengthening of national sustainable development strategies;
- To demonstrate the commitment of the Government to SC objectives and to achieve compliance with the obligations required as a Party to it; and
- To facilitate the country's overall efforts in coordinating national approaches to other chemicals-related regional and international agreements and international processes on chemicals management.

1.5 Obligations to Parties

At its fourth meeting, held from 4 to 8 May 2009 in Geneva, Switzerland, the Conference of the Parties, by its decisions SC-4/10 to SC-4/18, amended Annexes A, B and C to the Convention to include additional nine chemicals. On 26 August 2010, i.e. one (1) year after the date of the communication of their adoption by the depositary for the Convention, the amendments to the Annexes entered into force for all Parties, except for those that had submitted i) a notification of non-acceptance in accordance with the provisions of paragraph 3 (b) of Article 22, or ii) a declaration in accordance with paragraph 4 of Article 22 and paragraph 4 of Article 25 of the Convention, in which case such amendments shall enter into force on the ninetieth day after the date of deposit with the depositary of its instrument of ratification, acceptance, approval or

accession with respect to such amendments. 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.

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. Each remaining Party was required to transmit its reviewed and updated national implementation plan within two years of the date on which the amendment enters into force for it.

1.6 Chemicals Covered by the Convention

By 2011 the Stockholm Convention focused 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 slated for elimination with specific time-limited exemptions. These include the agricultural chemicals such as aldrin, chlordane, dieldrin, endrin, heptachlor, mirex, and toxaphene, as well as the industrial chemicals hexachlorobenzene (HCB), and polychlorinated biphenyls (PCBs).

POPs listed in Annex B are subject to restrictions on production and use, but eligible for specific exemptions for acceptable purposes. These include the pesticide DDT. Annex C to reduce release of POPs that are unintentionally produced, for example as industrial by-products and combustion processes, and include polychlorinated dibenzo-p-dioxins (PCDD), polychlorinated dibenzofurans (PCDF), PCBs, and HCB. Moreover, the newly added POPs are alpha hexachlorocyclohexane (α-HCH); beta hexachlorocyclohexane (β-HCH); chlordecone; hexabromobiphenyl; hexabromodiphenyl ether and heptabromodiphenyl ether; lindane; pentachlorobenzene; perfluorooctane sulfonic acid, its salts and perfluorooctanesulfonyl fluoride; and tetrabromodiphenyl ether, pentabromodiphenyl ether and endosulfan. The brief summary of the Old and New POPs and their respective Annexes is presented in Table 1.

Table 1: Asummary of the application/source and action taken of the Old and New POPs listed up to 2011

Nature of provision			Global Historical Use/Source	Action taken
Application	**Annex**	**Name of POP**		
Pesticides	Annex A	Aldrin	Insecticides used on crops such as corn and cotton; also used for termites	Done
		Alphahexachlorocyclohexane* Beta hexachlorocyclohexane*	Although the intentional use of alpha- and beta-HCH as an insecticide was phased out years ago, these chemicals are still produced as unintentional by-products of lindane	Done
		Chlordane	Insecticide used on crops, including vegetables, small grains, potatoes, sugarcane, sugar beets, fruits, nuts, citrus, and cotton. Used on home lawn and garden pests and also used extensively to control termites	Done
		Chlordecone*	Chlordecone is mainly used as an agricultural pesticide. It was first produced in 1951 and introduced commercially in 1958	Done
		Dieldrin	Insecticides used on crops such as corn and cotton; also used for termites	Done
		Endrin	Insecticide used on crops such as cotton and grains; also used for rodents	Done
		Heptachlor	Insecticide used primarily against soil insects and termites. Also used against some crop pests and to combat malaria.	Done
		Hexachlorobenzene	Fungicide used for seed treatment. Also an industrial chemical used to make fireworks, ammunition, synthetic rubber, and others. Also unintentionally produced during combustion and the manufacture of certain chemicals	Done
		Lindane*	It has been used as a broad-spectrum insecticide for seed and soil treatment, foliar applications, tree and wood treatment and against ectoparasites	Initiate
		Mirex	Insecticide used to combat fire ants, termites, and mealy-bugs. Also used as a fire retardant in plastics, rubber, and electrical products	None
		Toxaphene	Insecticide used to control pests on crops and livestock, and to kill unwanted fish in lakes	None
	Annex B	DDT	Insecticide used on agricultural crops, primarily cotton, and insects that carry diseases such as malaria and typhus	Done

Industrial Chemicals	Annex A	Hexabromobiphenyl*	Hexabromobiphenyl is an industrial chemical that has been used as a flame retardant, mainly in the 1970s	Some
		Hexabromodiphenyl ether and heptabromodiphenyl ether*	Recycling of articles that contain or may contain hexabromodiphenyl ether and heptabromodiphenyl ether, in accordance with provisions of Part IV of Annex A	None
		Pentachlorobenzene*	This is used in PCB products, in dyestuff carriers, as a fungicide, a flame retardant and as a chemical intermediate. This is also produced unintentionally during combustion, thermal and industrial processes and is present as impurities in products such as solvents or pesticides	None
		Polychlorinated biphenyls	Used for a variety of industrial processes and purposes, including in electrical transformers and capacitors, as heat exchange fluids, as paint additives, in carbonless copy paper, and in plastics. Also unintentionally produced during combustion	
		Tetrabromodiphenylether and pentabromodiphenylether*	Recycling of articles that contain or may contain tetrabromodiphenyl ether and pentabromodiphenyl ether, in accordance with provisions of Part V of Annex A	None
	Annex B	PFOS, its salts and PFOSF*	Both intentionally produced and an unintended degradation product of related anthropogenic chemicals. Intentional production include in electric and electronic parts, firefighting foam, photo imaging, hydraulic fluids and textiles	None

*= Newly added POPs

Annex A = Eliminate

Annex B = Restrict

Annex C = Minimize/ Reduce emission (by BAT/BEP)

1.7 Sources and Pathways of POPs

There are various ways of POPs released into the environment[7].

a. Direct emissions like combustion by-product or other process;
b. Release as a result of direct introduction into environment;
c. Release as a result of product containing this pollutant as impurity use;
d. Release as a result of re-emission from substrates polluted with POPs (reservoirs - soils, waters, waste, and sewage residues) or products.

Pesticide POPs are released, as a result of plant protection chemicals usage. Some other chemicals (PCBs, Pentachlorophenol) are used as oils, as dielectric and cooling fluids in capacitors and transformers, for wood preservation, etc. These POPs are released into the environment as a result of spills and evaporation. A number of substances (dioxins/furans, polycyclic aromatic hydrocarbons (PAHs), hex-chlorobenzene are by-products of many processes, mainly, thermal (fuel combustion and waste incineration, ferrous industry, coke and aluminium production, road and maritime transport, chemical synthesis of chlorinated substances, etc.) and are emitted directly into the air.

1.8 The Risks Posed by POPs

Persistent organic pollutants (POPs) are highly toxic chemicals that adversely affect human health and the environment around the world and therefore require urgent and immediate action for their sound management at national, regional and global levels. Because they can be transported by wind and water, most POPs generated in one country can and affect people and wildlife far from where they are used and released. They persist for long periods of time in the environment and can bio-accumulate in fatty tissues and thus pass from one species to the next through the food chain. Some of the health risks caused by POPs include:

- Affect Enzymes that are involved in the biosynthesis of heme in the blood and may lead to a disease called porphyria[8],

[7]Lallas, P. (2002). The Stockholm Convention of Persistent Organic Pollutants. *The American Journal of International Law* 95, 692-708.
[8]AMAP (Arctic Monitoring and Assessment Program).(1997). Arctic Monitoring and Assessment Program, Oslo.

- Affect Vitamin A metabolism and may cause an inclination towards infection and cancer,[9]
- Many POPs can cause drastic inhibiting that affects to the immune system,[10]
- POPs may affect reproductive development through several different avenues. Chemicals such as DDT, specific dioxins and PCBs have the capability to diminish the survival of offspring, decrease fertility and disrupt reproductive function and reproductive cycles.[11]

1.9 Unintentionally Produced POPs (U-POPs)

The main sources that generate unintentionally produced POPs are listed in Annex C. Hexa-chlorobenzene (HCB), penta-chlorobenzene (PeCB), polychlorinated biphenyls (PCBs), and polychlorinated dibenzo p-dioxins and dibenzofurans (PCDD and PCDF) are unintentionally formed and released from thermal processes involving organic matter and chlorine as a result of incomplete combustion or chemical reactions. Some of the main potential sources that form and thus release U-POPs include:

i. Open burning of waste, including burning of landfill sites, residential combustion sources;
ii. Waste incinerators of municipal, hazardous or medical waste of sewage sludge;
iii. Motor vehicles, particularly those burning leaded gasoline;
iv. Thermal processes in the metallurgical industry;
v. Textile and leather dyeing (with chloranil) and finishing (with alkaline extraction);
vi. Cement kilns firing hazardous waste and;
vii. Fossil fuel-fired utility and industrial boilers;
viii. Firing installations for wood and other biomass fuels;
ix. Specific chemical production processes releasing unintentionally formed POPs, especially production of chlorophenols and chloranil; and
x. Burning of animal carcasses.

[9]Brouwer, A. et al. (1989). Polychlorinated biphenyl (PCB)-Contaminated Fish Induces Vitamin A and Thyroid Hormone Deficiency in the Common Seal (*Phocavitulina*). *Aquatic Toxicology*, 15:99-106.
[10]Bidleman, T.F. et.al. (1997). Persistent Organic Pollutants: General Characteristics and Continental Pathways in North America. Draft Interim Report to the Secretariat of the Commission for Environmental Cooperation.
[11]http://www.chem.unep.ch/pops/POPs_Inc/proceedings/Iguazu/STONE.html

The term 'Dioxin' covers a wide range of halogenated aromatic compounds, including polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDDs and PCDFs). These compounds are formed as a result of incomplete combustion of hydrocarbons in the presence of chlorine e.g. metal processing, domestic waste incineration, etc. They have high melting points and are stable to acids and bases; these characteristics make them very persistent in the environment.[12] PCDD/Fs can be found in many environmental matrices such as soils, air, and water. 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. 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.

The toxicity of these compounds is measured in Toxic Equivalence Factor (TEF), which is an internationally recognised calculation that weighs the toxicity of each individual congener against the most toxic compound in that family, in the case of PCDD/PCDF, this is 2,3,7,8-TCDD.[13] The closer the ratio is to unity, the greater the toxicity of that congener. Calculation of the total toxicity of a sample is achieved by multiplying the concentrations of the individual target compounds by their respective TEFs. These values are known as Toxic Equivalents (TEQs); and the total TEQ of a sample is obtained by summing the individual TEQs. Dioxin releases are estimated in terms of g I-TEQ per year (grams International-Toxic Equivalent per year).TEQ is then calculated by[14]:

$$TEQ = \sum_{i=1}^{n} (C_i \times TEF_i)$$

- *C_i Individual TCDD or DLC concentration in environmental media*
- *TEF_i Toxicity Equivalence Factor assigned for TCDD or the DLC*

[12]Martens, et al. (1998).Chemical impact of uncontrolled solid waste combustion. *Chemosphere*, 36(14), p. 2855-2866.

[13]Huang, et.al.H.(1996).De novo synthesis of polychlorinated dibenzo-p-dioxins and dibenzofurans proposal of a mechanistic scheme.*Science of the Total Environment*, 193(2), p. 121-141.

[14]http://www.epa.gov/osa/raf/hhtefguidance/

1.10 Trade Issues and Information Exchange

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. According to Article 9 of the 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, and alternative to POPs, including their risks and economic and social costs.

1.11 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. Training 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 are among the most important mandates that each party must address at the national and international levels.

1.12 Research, Development and Monitoring

Article 11 on research, development and monitoring give support each Party to the Convention to undertake appropriate research, development, and monitoring and cooperation relating to listed POPs, their alternatives and candidate POPs. Priority research activities include production of POPs data on their:

- Sources and releases into the environment;
- Presence, levels and trends in human and environment;
- Environnemental transport, fate and transformation ;
- Effects on human health and environment;
- Socioeconomic and cultural impacts;

- Release reduction and and/or elimination; and
- 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 intended to alleviate effects of POPs on reproductive health, support publication of their research, development and monitoring activities on timely and regular basis.

2. COUNTRY BASELINE

2.1 Country Profile

Eritrea, a country in the horn of Africa, its formation as a country was the result of European colonialism, which took place at the turn of the 19thcentury. Eritrean coastal environment attracts the attention of different foreign powers and lead to successive colonization by Turkey, Egypt, Italy and Britain and Ethiopia. Even though, the Eritrean people have a long history that goes back to ancient times, the modern Eritrean history however, starts with the coming of Italian colonizers in 1890 through the port of Assab which they demarcated borders with the current neighbouring countries. In 1890, Italy declared Eritrea as its colony. After the defeat of Italians during the Second World War (after 50 years of colonization), Eritrea was forced to remain under the British military administration (1941-1952). Later on, under the supervision of UN, Eritrea was federated with Ethiopia for the next 10 years by the decision of the UN General Assembly Article 390A(V) in 1950, which was ended in 1962. This has further led to the 30 years (1961-1991) of armed struggle for independent from annexation of Ethiopia. Thirty years' war of independence culminated in1991 with the liberation of the country. In 1993, Eritrea became a sovereign country.

2.1.1 Geography and Climate

Eritrea is located in North East Africa (Horn of Africa) and lies north of the equator between latitudes 12º22' N and 18º02' N, and longitudes 36º26' E and 43º13' E, and includes the Dahlak Archipelago and other islands along the western coast of Red Sea. The total surface area of the country is about 124,324 km² and a mainland coastline of approximately 1,200 km and islands in the Red Sea is 1,083 km.[15]Eritrea has uneven land forms, which offers raged topography (hilly side) that exposes it to massive soil erosion at the high land and eastern and western escarpments and flat land at the high land and western and eastern lowlands with great potential for agricultural productivity. The elevation of the country ranges from 116 m below sea level (Danakil Depression) up to 3,010 m above sea level in the high land. The country is classified in to six administrative Regions or Zobas; Southern Red Sea, Northern

[15]Breuil, C. G, Damien. (2014). Baseline Report Eritrea. Smart Fish Programme of the Indian Ocean Commission,FisheriesManagementFAO component, Ebene, Mauritius. 25 pp

Red Sea, Anseba, Gash-Barka, Debub, and Maekel (Figure 1). Eritrea is divided into three physiographic regions, namely, the central highlands, the mid lands and the lowlands.

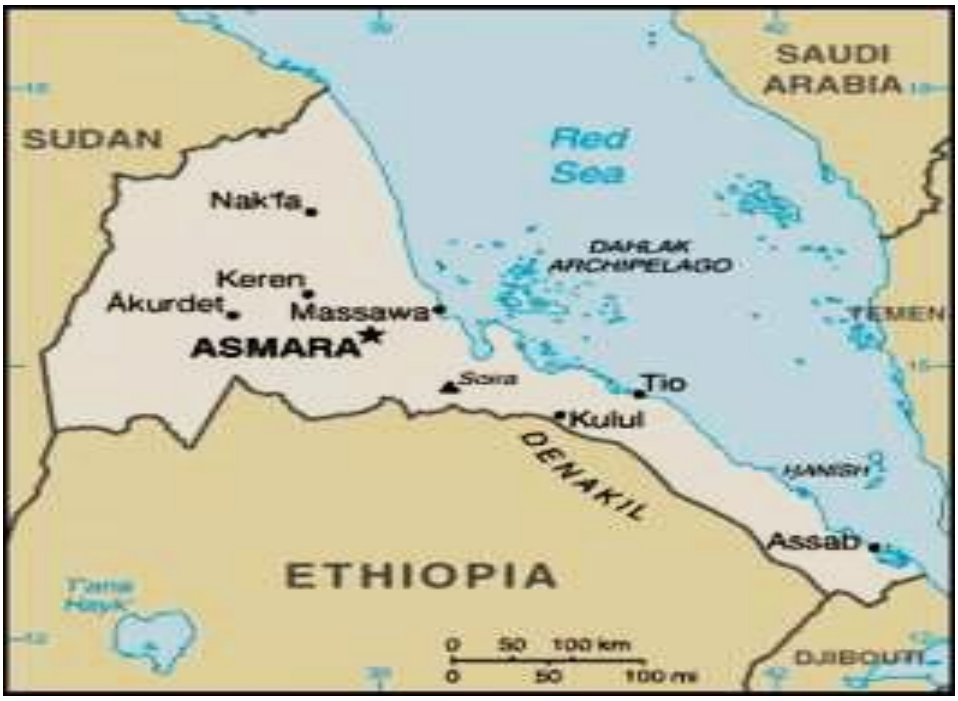


Figure 1: Map of Eritrea and its major towns

The climate ranges from hot and arid near the Red Sea to sub-humid in isolated micro catchments along the eastern escarpment. There are two rainfall regimes, summer and winter, whose pattern is affected by the physiographic regions. The central highlands have a semi-arid climate. Most of the year's rain falls within a short time, resulting in soil erosion and runoff.[16]

2.1.2 Population, Culture and Language

The population of Eritrea was estimated at approximately 3.2million in 2010 with an annual growth rate close to 2.91 percent (Ministry of National Development). About 50–60 percent lives in highlands that comprise only about 10 percent of the country's total area. Eritrea is an ethnically heterogeneous country with nine recognized ethnic groups. Eritrea's population consists of various languages and cultural traditions. In addition to the languages spoken by the various ethnic groups, Arabic and English are

[16]Bissrat, G. et al. (2012). East African Agriculture and Climate Change: A Comprehensive Analysis-Eritrea. International Food Policy Research Institute. Washington, DC, USA.

widely understood, where English is commonly used as a medium of instruction in academic institutions and international relations.

2.1.3 Socio- Economic Profile

Eritrea's economy is dominated by the service sector, including public administration, as well as trade, restaurants and hotels. The industrial sector is gradually taking a significant share of the national economy.[17]The agricultural sector up-on which more than 70 % of the total population involved in relies mainly on rain. The sector's contribution to GDP, however, has been moderate and declining, reflecting challenges that include recurrent droughts in the Horn of Africa, and rudimentary farming method.[18]The contribution of agriculture, including fisheries, is minimal (approximately 20 percent of GDP). Yet, the country has significant development potential in animal husbandry and livestock as well as in fisheries. Moreover, it has abundant natural resources including arable land (26 percent of the total area), mineral resources, and beautiful landscape with sea resorts and historical sites that augur well for the tourism industry.

Eritrean's economy in recent years has been driven by mineral resources, the mining sector being one of the promising assets for the economic development of the country, especially with the start-up of commercial mining activities at the Bisha mine in early 2011 and Zara in 2015. The sector has attracted about 20 listed companies of which the Bisha mining company has been involved in the production and sales of gold, copper and zinc. The growth rate, which reached a maximum of 3 percent over the period 2000-2010, has ranged between 7-8 percent since 2011[19].

[17]http://www.undp.org/content/dam/rba/docs/Reports/Africa.pdf

[18]The World Bank. (2017). The World Bank in Eritrea; The World Bank supports Eritrea's efforts to create broad-based economic growth, improve education and implement critical economic and governance reforms.

[19] https://en.wikipedia.org/wiki/Economy_of_Eritrea

2.1.4 Profiles of Economic Sectors

2.1.4.1 Agriculture

Agriculture is the key sector in most developing countries like Eritrea. It is a determinant sector that enables them to accomplish developmental goals, including self-reliance, growth and equity. Food production is a fundamental problem in many developing countries including Eritrea. The critical need for increasing food production in developing countries like Eritrea is through modern technology. Eritrea has substantial and varied natural resources that can be developed to sustain socioeconomic development. Generally, the country possesses modest land and water resources. An estimated 2.1 million hectares (17% of the total land area) is arable land suitable for crop and horticultural production. Out of this, only 0.6 million hectares is suitable for irrigation, while 0.5% of the total land area is forest. The rest is very marginal and barren arid land, at best suitable for browsing and grazing. Currently, about 520,000 hectares are under rain-fed agriculture, while about 40,000 hectares are under full service irrigation, and about 63,000 hectares are under spate irrigation. The major food crops grown in Eritrea are sorghum, millet and barley.[12]

2.1.4.2 Fishery

The Eritrean marine and coastal environment provides a diversified range of ecosystems including coral reefs, sea grasses, seaweeds, and mangroves which provide nursery, shelter and feeding grounds for thousands of species including fish, crustaceans, sponges, algae and molluscs. Eritrea's coral reefs are amongst the best preserved and healthiest in the world and mangrove forests are present in about 380 km of coastline and cover an area of about 74 km².[20] The main commercial species which are found in Eritrean marine includes: reef demersal fishes such as groupers, snappers, emperors, grunts and job fish; demersal fishes such as lizardfish, threadfin breams and catfish; small and medium pelagic such as sardines, anchovies and mackerels; tuna and tuna-like species and sharks; shell fishes such as shrimps, crabs and lobsters; cephalopods such as squids, octopus and cuttlefish; and other aquatic species such as sea cucumber, snail nail and trochus.

[20]IFAD. 2010. The State of Eritrea Fisheries Development project. Project design Report. 127 pp.

2.1.4.3 Industry

Industrialization in Eritrea started with the Italian colonization and was the leading industrial development in Africa. However, it was collapsed with emergence of the British Military Administration (1942-1952). Most of the Industries along with the infrastructures were completely destroyed and dismantled by Derge regime of Ethiopian during its 30 years annexation of Eritrea. During the liberation the remaining plants were generally inefficient, and most of these industries required significant investment and since then, there has been a growth in industry. The main items manufactured include beverages, processed foods, tobacco, leather, textiles, metal products, printing, non-metallic minerals, construction materials, salt, paper, and matches. The government sought privatization of these industries, and issued incentives such as exemptions from income tax, preferential treatment in allocation of foreign exchange for imports, and provisions for remittance of foreign exchange abroad. Currently, there are large numbers of manufacturing companies operating in the country.[21]

2.1.5 Infrastructural Profile

Eritrea owns wet and dry weather roads for land transportation that connect different parts of the country. The wet weather roads are from Asmara to Massawa to the east, Asmara-Mereb to the south and Asmara-TalataÁsher to the west, and Asmara-to Ser'ha to the south-eastern part of the country. Dry weather roads are distributed throughout the rest of the country and are unpaved. Currently, a paved road construction from Forro to Assabis being undertaken. Moreover, renovation of steam railway between Massawa and Asmara, with primarily intention to serve tourism, is almost completed. The national Eritrean Airlines provide air transport to Africa, Middle East, Europe and others. Most Administration Zones have electricity, while others are being electrified. Mobile phone services are available in most urban and rural locations of the country. However, fixed telephone services are available in cities and towns only.

[21]Wikipedia. (2017). Economy of Eritrea. Wikimedia Foundation, Inc.

2.2 National Policy, Regulatory and Legal Frame Works

2.2.1 National Policy and Regulatory Frame Works

The State of Eritrea has been dealing with the conservation and protection of the environment. In its Macro Policy of November 1994, the Government iterated that one of the principal national development objectives is "an upgraded and safeguarded environment that is free from pollution". Other important national document pertinent to environmental protection and conservation have been developed. In line with these policy frameworks, Eritrea has issued several regulatory frame works as shown in Table 2. However, the country further needs to update and place appropriate policy instruments intended to address POP issues.

2.2.2 National Legal Frame Work

In Eritrea, there are legislations which are applicable in one way or another in the current legal framework which might still need to be updated. Generally, there is no specific and/or integral law in place to address the management of chemicals including POPs. One of such legislations that have direct relevance is Legal Notice No. 114/2006 and was issued to determine the import, handling, use, storage and disposal of pesticides. The National List of 81 Pesticides which is annexed to this legislation includes DDT and Endosulfan, being restricted for controlling malaria and cotton use respectively.

Table 2: The national legal framework pertinent to POPs and environmental protection

Sector	Existing National Regulatory Regime	Year	Present Status
Environment	The Eritrean Environmental Protection, Management and Rehabilitation Framework Proclamation No. 179/2017	2017	Issued
	Environmental Protection and Management Regulations- Legal Notice No. 127/2017	2017	Issued
	Regulations for the Issuance of Permit for the Importation or exportation of Ozone Depleting Substances (ODS) and ODS Based Equipment or Products	2010	Issued
	The ban on importation of thin plastic bags by a Legal Notice 99/2004	2004	Issued

	Existing National Regulatory Regime	Year	Present Status
Environment	National Environmental Assessment Procedures & Guidelines	1999	Adopted
	Proclamation on Biological Diversity	1998	Draft form
	National Environmental Management Plan for Eritrea (NEMP-E)	1997	Adopted
	Eritrean National Code of Conduct for Environmental Security	1995	Adopted
Agriculture	Pesticide legislation	2014	Drafted
	Plant Quarantine Proclamation,N0.156/2006	2006	Issued
	Legal Notice N0 114/2006, Regulation for Importation, Handling, Use, Storage and Handling and Disposal of Pesticides	2006	Issued
	Agricultural Sector Policy and Strategy Framework	2002	Adopted
Health	Guidelines for indoor residual spraying	2017	Adopted
	Training manual for indoor residual spraying	2017	Adopted
	Insecticide Resistance Monitoring and Management plan	2015	Adopted
	Policy and Guidelines For Malaria Control in Eritrea	2003	Adopted
	Environmental Health Policy and Guidelines	1998	Adopted
Trade and Industry	Eritrean Standard Institute Proclamation	1995	Issued
	Regulation to Declare Eritrean Standards Institute	1997'2000 /2004	Issued
Transport and Communications	The Eritrean Port Regulation	2005	Issued
	Transportation of Goods Regulation	2002	Issued
	Land Transport Proclamation	2000	Issued
Science and Technology	The Eritrean Science and Technology Development Agency Establishment Proclamation	1993	Issued
Finance	Customs Proclamation	2002	Issued
	Customs Regulation, Legal Notice No.52	2001	Issued
	Reporting of Imported Goods, Legal Notice No 54	2002	Issued
	Regulations of the Storage of Goods in Customs Post, Legal notice No 77	2003	Issued
	Free Zones Proclamation	2001	Issued
Maritime Transport	Regulation for Prevention of Pollution from Ships	2005	Drafted
	Regulation for Prevention of Pollution by Sewage	2005	Drafted
	Environmental protection of the entire coastal zone	2006	Drafted

Source: NIP-Eritrea, 2012 with some modifications

2.2.3Roles and Responsibilities of Relevant Governmental Institutions

Pertinent Ministries and agencies that have key roles and responsible in the management of chemicals are summarised below.

Ministry of Land, Water and Environment (MoLWE)

MoLWE is responsible for the development of regulation, directives, and guidelines as related to the sound management of Chemicals in general and POPs in particular. MoLWE is the focal point of various multilateral environmental agreement including chemical-related Conventions such the Stockholm Convention on POPs, the Rotterdam Convention on Prior informed consent on hazardous chemicals, the Basle convention on the transboundary movement of hazardous wastes. As the National Executing Agency (NEA) for Eritrea's SC, DoE coordinates the overall preparation of the NIP update. Further, to ensure participatory approach, in consultation with key stakeholders, it establishes multidisciplinary task teams representing different key stakeholders. It also appoints the Project Coordination Unit (PCU) and the National Project Coordinator (NPC) and recruits supporting staff and other national consultants as required. The Department also reviews and approves the document before it is being communicated to stakeholders and submits it to SC secretariat for depository.

Ministry of Agriculture (MoA)

The MoA is responsible for the overall management of Agrochemicals and controls the import and use of POPs pesticides; provides the PCU with relevant information on research findings, applications, and environmental impacts and conducts research on alternative options like Integrated Pest Management (IPM). It also assists the PCU and NEA on the risk management of pesticides and endorses the import of pesticides that are not POPs.

Eritrean Crop and Livestock Corporation (ECLC)

The ECLC is engaged in the investment undertaking to accelerate the development of the agricultural and livestock domain of Eritrea. The corporation, along with the MoA, also monitors and regulates the importation and application of POP pesticides in the country.

Ministry of Health (MoH)

The MoH is responsible for the sound management of Public health pesticides. MoH conducts continuous awareness campaigns on the proper use of chemicals utilized in the public health for vector control and undertakes research works on safe alternatives to DDT. It managed the restricted use of DDT for indoor spraying for controlling mosquitoes and as of 2012 has shifted to use of parathyroid insecticides and later on to carbamates. The Ministry of health is responsible to provide annual data and information on the status of DDT use to the DoE.

Ministry of Finance/ Department of Customs (DoC)

The DoC is responsible for the control of import and export of chemicals. It registers the legal import of pesticides. Moreover, DoC monitors the importation of old and used electronic equipments and vehicles which are the main sources of POP-PBDEs.

Ministry of Transport and Communication (MoTC)

The MoTC is responsible for the safe transport of chemicals by air, water and land. It prepares, submits and upon approval, implements standards relating emission from vehicles with a view discourage the import of second hand vehicles which are potential sources of PBDEs, PCDD and PCDF.

As per the MARPOL convention which is incorporated in the draft regulations for the prevention of pollution from ships, the Department of Maritime (DMT) of the MoTC issues International Air Pollution Prevention Certificate to all ships registered under the Eritrean Flag It also inspects compliance of foreign flagged ships which transit/dock in the Massawa Port

Ministry of Trade and Industry (MoTI)

Along with other activities, the MoTI is responsible for the issuance of permit and control of Industrial chemicals. To this end it has developed a licensing system for importers of all chemicals. The ministry also, regulates the production, use, and the unintended emission of chemicals and encourages the application of clean technology (BATs/BEPs).

Ministry of Labour and Human Welfare (MoLHW)

MoLHW is responsible for matters pertinent to occupational safety and health of chemicals including POPs and deals with the occupational health implications of chemicals management in the work place. The ministry gathers data and information on health and safety of workers and investors; acts as a bridge between the DoE and the industry.

Ministry of Foreign Affairs (MFA)

The MFA is the political focal point for all environment-related conventions; offers legal and political support; communicates the exchange of information to and from as the international partners.

Ministry of Energy and Mines (MoEM)

The MoEM, specifically the Eritrean Electric Corporation (EEC) is responsible for the management of PCB and PCB containing electrical equipments. It also ensures the overall management of PCB containing old transformers and capacitors until proper safeguarding.

Ministry of Justice (MoJ)

The MoJ assist institutions in the development of regulatory mechanisms such as, legislations, directives, guidelines and standards. It also approves the national regulation and oversees the coherence of sector regulatory instruments before approval.

Eritrean Standards Institute (ESI)

The ESI develop standards for different products and service. Moreover, ESI ensures whether national standards are met by organizations and business sectors and issues standard certificate. For such purpose the ESI owns various analytical tools for the assessment of different products and imported items.

2.2.4 Relevant International Commitments

Eritrea is a party to a number of global environmental conventions as shown in Table 3, and specifically to the following four international conventions are pertinent sound management of chemicals and hazardous wastes.

The Rotterdam Convention, Prior Informed Consent (PIC)

Eritrea signed the Convention in March 2005. The objective of the Convention is to promote shared responsibility and cooperative efforts among Parties in the international trade of certain banned or severely restricted hazardous chemicals and severely hazardous pesticides formulations, in order to protect human health and the environment from potential harm.

The Basel Convention on Trans-Boundary Movement of Hazardous Waste and their Disposal

Eritrea became a party to the Convention in March 2005. Objectives of the Convention include ensuring environmentally safe transfer, disposal of hazardous wastes, and limiting "toxic trade" in hazardous wastes. In compliance to the requirements of the Basel Convention Eritrea has transported and disposed 364 tons of obsolete pesticides including POPs pesticides in an environmentally sound manner. Currently the country is developing national compliance action plan including preparation of the legislation on hazardous wastes and other wastes.

The Stockholm Convention on Persistent Organic Pollutant

Eritrea became a party to the Convention in March 2005. The objective of this Convention is to protect human health and the environment from POPs. The Convention originally covered 12 chemicals. However, in May 2009, nine additional chemicals were listed as POPs and in May 2010, endosulfan was listed as the twenty-second POP chemical. In accordance with Article 7 of the convention Eritrea prepared its Initial NIP and implementation Plan in 2012and implemented some of the proposed actions plans as mentioned the Basel Convention above.

The Vienna Convention and the Montreal Protocol on Substance that Deplete the Ozone Layer (ODS)

Eritrea became a party to the Convention in March 2005.The objective of the protocol is to protect the Ozone layer depletion by phasing ozone depleting substance (ODS). Eritrea has undertaken several measures to ensure sound management of ODS. The Country promulgated the first ODS regulations to control imports and phased out the first group of ODSs (Chlorofluorocarbons) and appreciably reduced the import/use of hydro-chlorofluorocarbons (HCFCs). Moreover, Eritrea trained and equipped

refrigeration and air-conditioning technicians with necessary tools and also established three training centres.

MARPOL, International Convention for the prevention of Pollution from Ship

Eritrea is not a party to MARPOL, but has accessed the contents of the international agreement and thus drafted some national laws on the protection of marine environment. The drafted laws are indicated in Table 2. MARPOL was developed in 1973 and modified by the 1978 and 1997 protocols and various Annexes.

By being a Party to various international environmental conventions listed in Table 3, Eritrea gains the following benefits:

- Allow Eritrea to dispose of hazardous waste especially obsolete pesticides, in countries that have suitable technologies to treat such wastes;
- Prevent Eritrea from becoming a dumping ground for hazardous chemicals produced elsewhere in other countries;
- Prevent accumulation of hazardous waste in Eritrea;
- Develop capacity for the sound management of chemicals management-capacity in Eritrea; and
- Enable Eritrea to contribute to the global efforts in the elimination/reduction of hazardous chemicals pollution.

Table 3: International Conventions and Agreements to which Eritrea is a Party*

Convention	Description	Date of Accession	Present Status
CCD	Convention to Combat Desertification	1994	Acceded
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora	22 January 1995	Acceded
UNFCCC	United Nations Framework Convention on Climate Change	24 April1995	Acceded
CBD	Convention on Biological Diversity	21 March 1996	Acceded
WHC	World Heritage Convention	2001	Acceded
IPPC	International Plant Protection Convention	6 April 2001	Acceded
Montreal	Protocol on Substance that Deplete Ozone Layer (ODSs)	2 March 2005	Acceded

Convention	Description	Date of Accession	Present Status
CPB	Cartagena Protocol on Bio-safety to the Convention of Biodiversity	10 March 2005	Acceded
Kyoto	Protocol on Climate Change	27 July 2005	Acceded
CMS	Convention on Migratory Species	November 2005	Acceded
FAO Code of Conduct	Agreement for the Distribution and Use of Pesticide	1995	Voluntary

*** Adopted from the 2012 NIP of Eritrea**

2.3 Assessment of the POPs Issues in Eritrea

The inventory related to all POPs was conducted in the six Zobas and the inventory strategy and information selection used involved the following procedures: -

- The different types of questionnaires prepared by UNEP, for the inventory of POPs, were adapted to match with the national circumstances;
- A desk study was conducted to analyse the potential stakeholders that have a role in the management of POPs (Figure 2);
- The questionnaires were distributed out to different stakeholders, including consumer groups, governmental and non-governmental organisations and industries. Moreover, the site visits and interview key informants were conducted by the respective task team; and
- The data collected using the questionnaires and direct interviews was analysed using the standard UNEP Toolkits. The identity and quantity of the different POPs present in the country are thus reported.

The report of the inventory focused on:

a) POPs Pesticides: this provides information on the status of the old and new POPs pesticides, and DDT;
b) Contaminated sites: this addresses the contaminated sites related to Pesticides and PCBs;
c) PCBs: this describes the current status of PCBs from the Eritrean Electric Corporation (EEC);

d) Industrial POPs: this provides detailed information related to PBDEs and PFOS generated from industries, transportation, and importation of EEE/ WEEE; and
e) Unintentionally produced POPs(U-POPs): this provides the estimation on the assessment of U-POPs in different sectors.

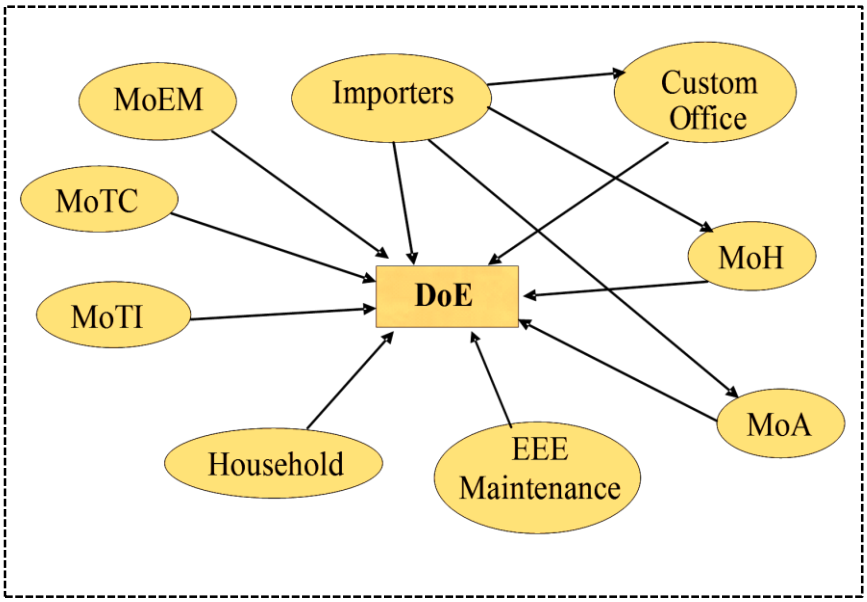


Figure 2: A flow chart of the collection of data from different ministries and sectors

2.3.1 Assessment of Annex A, part I chemicals (POPs pesticides)

Currently, the imports of pesticides to Eritrea are mainly purchased by the Ministry of Agriculture (MOA), Marketing and Credit and Eritrean Crop and livestock Corporation (ECLC) and the Ministry of Health (MOH) through the Red Sea Corporation (RSC). Furthermore, few quantities of pesticides are imported by private pesticides dealers and illegally imported from neighbouring countries like Sudan. Usually, the level of importation of pesticides falls short of the demand of the different agricultural sectors, and encourages illegal market.

According to the data reported in 2012 NIP of Eritrea, there were about 335.4 tons of obsolete pesticides, 56 tons of usable pesticides and 163.4 tons of unidentified pesticides in Eritrea[22].The data obtained from MoA confirmed that, as part of the overall tally of the previous inventory, there were some imported old and new POP-pesticides including DDT (36.16 tons found in six Zobas), endosulfan (2.54 tonnes

[22]National Implementation Plan for the Stockholm Convention on POPs. (2012), Eritrea

found in four Zobas), heptachlor (0.30 tons found in three Zobas) and lindane (17.75 litres found in a private veterinary store in Keren) in the country. The data analysis confirmed that there were only 11.6 % of POPs-pesticides among the disposed pesticides.

The current national inventory of POP pesticides was carried out in prioritized stores in the six Zobas of the country and 27 pesticides stores were assessed. The national inventory on POP-pesticides was carried out from August 22, 2017 up to September 25, 2017.The inventory included POP pesticides, obsolete and active pesticides stocks, and three contaminated sites.

Based on the data analysis and general assessment, there are only few quantities of obsolete pesticides left over for disposal. This is because the country has recently completed the national safeguarding and disposal of obsolete pesticides. The total quantity of obsolete and POP pesticides exported to UK for incineration was 364 tons and this was done in three different shipments by Veolia Environmental Services based in UK. Therefore, the current pesticide stock is trivial in quantity and the current national inventory on the status of POPs confirms that there are no old or new POP pesticides in the country. Currently, according the inventory data, the amount of obsolete pesticides still remaining in the stores of MoA are about 35.86 tons and thus it is necessary to properly dispose these hazardous chemicals. Moreover, if the remaining usable pesticides cannot be exhausted on due time, sooner before the expiry date, the quantity of obsolete pesticides will increase more. Based on the analysis of the inventory data, the quantities of pesticides are summarised in Table 4.

Table 4: Summary of the inventory of all pesticides

Description	Amount (in tons)
Total Pesticides entered in the country from 2012-2017	269
Total amount of Pesticide used from 2012-2017	166
Pesticide remaining in the stores currently (usable)	103
Obsolete pesticides	35.86
POP Pesticides	None

Figure 3 describes a comparison of the current status of pesticides with the one reported in the 2012 NIP and it indicates there were large stock of obsolete pesticides previously and the number of stores has decreased to a larger extent because of the disposal of most of the obsolete pesticides.

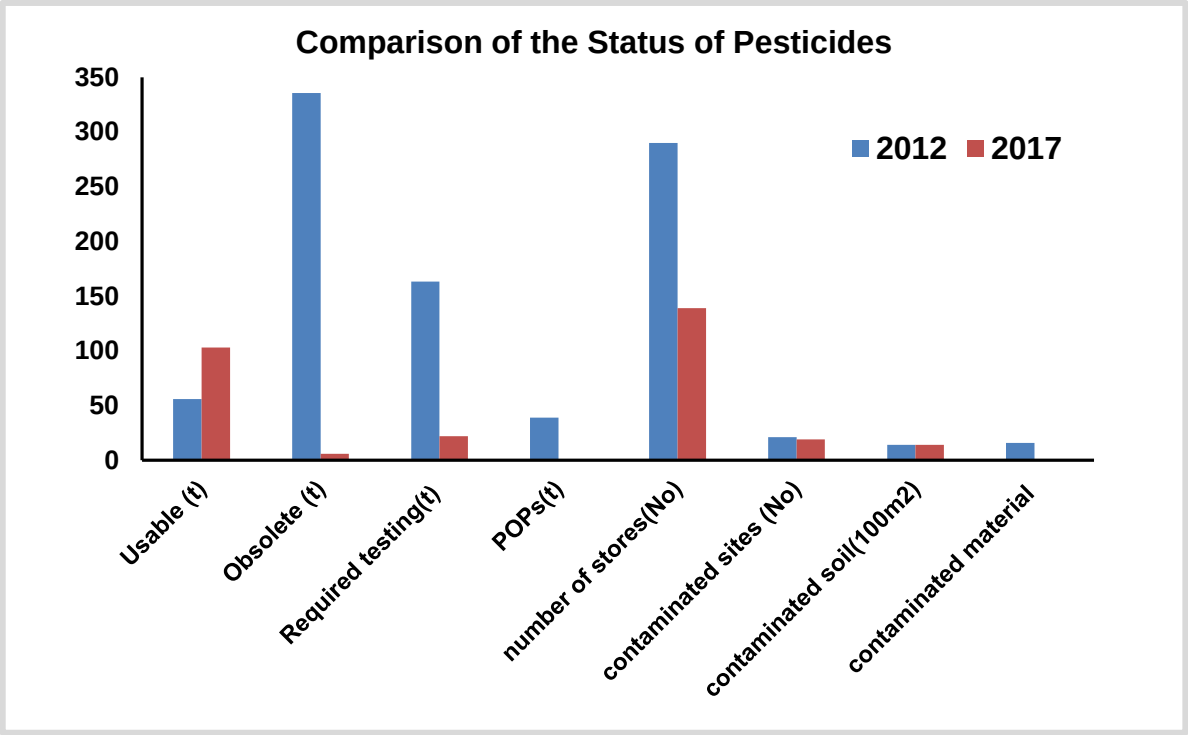


Figure 3: Comparison of the status of pesticides between 2012 and 2017

2.3.1.1 Conditions of Pesticide Stores

Based on the analysis of the questionnaires and site visits, the status of the pesticide stores can be summarised as follows:

- The general stores conditions in the country are below the standard; most of the stores were originally built for other purposes and thus don't satisfy the standard requirements;
- The storage, use and handling of the pesticides are far from desirable; some of the stokes of pesticides are old, often badly deteriorated and stored in unsuitable conditions;

- As indicated in Figure 4, most often pesticides are stored with other agricultural materials and other equipment's; usually farm tools, seeds, irrigation pipes and animal feed are stored with the pesticides and can easily be contaminated;
- Many of the stores are close to habitation and water sources. Therefore, there may be a high risk of impact on human health and the environment;
- There are few private stores of agricultural chemicals including pesticides and the store are well organized and properly monitored;
- Occasionally there are cases of misuse of pesticides for agricultural pest control;
- Almost all the store keepers don't use protective personal equipment (PPE) as a safety precaution for handling of the pesticides; and
- Though there are occasional trainings given to the store managers, often there is little or else no supervision and inspection of the stores and their managements.

Figure 4: Examples of poorly managed pesticide stores

The status of the 27 stores inventoried were analysed and the current condition of the stores is summarised in Table 5. Even though some of the stores don't contain complete walls, almost all the stores have lockable doors, roofs, and impermeable floors.

Table 5: Pesticide Store conditions

Stores	Number of stores	Percentage (%)
Stores with lockable door	27	100
Stores with complete walls	24	88.8
Stores without roof or leaking roof	0	0
Stores without solid or impermeable floors	0	0
Stores where other things are stored with pesticides	27	100
Stores without store keeper	0	0
Stores close to houses and public facilities	27	100
Stores where public complain about smell	21	78
Stores close to water sources	18	67

Source: RSD of MOA

2.3.2 Assessment of Annex A, part II chemicals (PCBs)

Polychlorinated Biphenyls (PCBs) are either oily liquids or solids; they are colourless to light yellow, tasteless and odourless. They are relatively insoluble in water but are freely soluble in non-polar organic solvents and biological lipids. Some PCBs are relatively volatile and may exist as a vapour in air. An important property of PCBs is their general inertness. PCBs resist reaction with both acids and alkalis, and are thermally stable, making them useful in a wide variety of applications including dielectric fluids in transformers and capacitors, heat transfer and hydraulic fluids, lubricants and as plasticisers in paints, sealants and plastics.

The Eritrea Electric Corporation (EEC) is the sole vendor of electrical equipment's and there are about 4810 and 240 PCB containing transformers and capacitors respectively. According to EEC, most of the transformers currently in use are new and PCB free. The current storage for PCB containing transformers is with concern to human health and environment. Some 770 PCB containing and decommissioned old transformers have been and are still in open areas at Tsaeda-Chrstian, Girar and Denden electric power sub-stations. The exposure to precipitation and sunlight would trigger soil contamination which could further result in water source pollution through wash by rain and wind. The PCB-containing transformers and capacitors in the country were already identified in the 2012 NIP but there has not been any action taken in the safeguarding. Some of the old transformers found in Tsaeda-Christian are shown in Figure 5. New transformers are clearly labelled as ONAN (meaning: oil natural- air natural) to reveal that specific transformer is PCB free (Figure 6). However, the current

inventory identified about 23 barrels (4600 Litres) of PCB containing oils, collected from old electric transformers, in Aget Technical public services (Figure 7). Open applications like hydraulic oil, paints and sealants were not addressed in this inventory but will be considered in future.

Figure 5: Some of the PCB oil containing old transformers

Figure 6: Representative PCB free transformers in use in the country

Figure 7: PCB oil containing barrels at Aget Technical Public Services

2.3.3 Assessment of Annex B Chemicals (DDT)

DDT is a pesticide that was used heavily worldwide in the 1950s and 1960s both in agricultural production and for malaria control. Concerns about impacts on wildlife populations-particularly predatory birds - led to the phase-out of DDT in many countries in the 1970s. The Stockholm Convention includes special provisions for the phase-out of DDT. Therefore, the production and use of DDT for disease vector control (malaria) is accepted under the SC with the prerequisite that Parties are encouraged to reduce and ultimately eliminate the use of DDT through the development of an action plan. Eritrea doesn't manufacture, export of DDT and the no importation has been recorded since 2012. As reported in the previous NIP, a significant amount of DDT was imported in the country. The Malaria Control Unit of the MoH was the only importer of DDT in Eritrea. DDT was used only for public health, particularly for vector control and complies with WHO's position and the SC.

The 2012 NIP revealed, the total amount of active and obsolete DDT in the different stores of the country was about 52 tonnes. Based on the data reported from the current inventory, about 40.2 tonnes of DDT were used in Northern Red Sea between 2012 and 2013. All the DDT in the country was safeguarded along with the obsolete pesticides safeguarding project. Thus, the inventory confirms that, neither active nor obsolete DDT exist in the stores of MoH and MoA. As mosquitoes have already developed resistance to DDT, the importation and application ceased since 2012. Thus, the MoH is using other safer and effective alternative pesticides for the malaria control. The pesticides that have been used as alternative to DDT include Bendiocarb

80%WP (Ficam®) and lambdacyhalothrin 10%WP (Icon®). The MOH has indicated that, as of 2018, bendiocarb 80%WP and pirimiphose-methyl 300CS insecticides will be used in annual rotation for vector control purposes.

2.3.4 Assessment of Polybrominated-Diphenyl Ethers (PBDEs)

Eritrea does not have any facility producing POP-PBDEs or using them as raw materials nor a facility recycling or reusing polymers from used articles. It is, therefore, the importation of electrical and electronic equipment's (EEE), vehicles, foams and flame retardants that form the majority of the newly listed POP-PBDEs. The main targets of the current inventory were EEE, related waste (WEEE) and old vehicles in the country produced before 2005. The main purpose of the inventory was to evaluate the existing information on the importation and use of POP-PBDEs and articles containing POP-PBDEs in the country. Relevant data was obtained from the stakeholders including the national data on imports/exports, importers and exporters of electronics and retailers of electronics and second-hand electronics.

2.3.4.1 Inventory of PBDEs in EEE/WEEE

Currently, all cathode ray tube (CRT) computers, laptop computers, CRT-TV and other electronic equipment's are imported. The custom office monitors the importation of EEE to the country and Table 6 describes some of the electronic equipment's imported to the country between 2008 and 2017.Despite the fall in 2014 and 2015, the overall Importation of EEE as indicated in Figure 8 reveals an increasing trend.

Table 6: Types of electronics imported via Custom Office in the country

Year	Laptop*	Computer	Printer	Television	Refrigerator
2008	698	1898	1185	4558	1646
2009	78	1106	264	267	147
2010	91	126	101	201	60
2011	51	170	62	254	64
2012	1815	788	259	4825	2559
2013	1022	647	257	5677	3579
2014	181	481	150	4178	2837
2015	356	501	202	3572	2472
2016	109	660	306	7823	4545
2017	57	240	129	8392	5612

As indicated in Table 6, the custom office has permitted tax free entrance of laptops to the country and thus most of the laptops entering are not registered. Therefore, the quantity shown doesn't represent the real figure of imported laptops to the country.

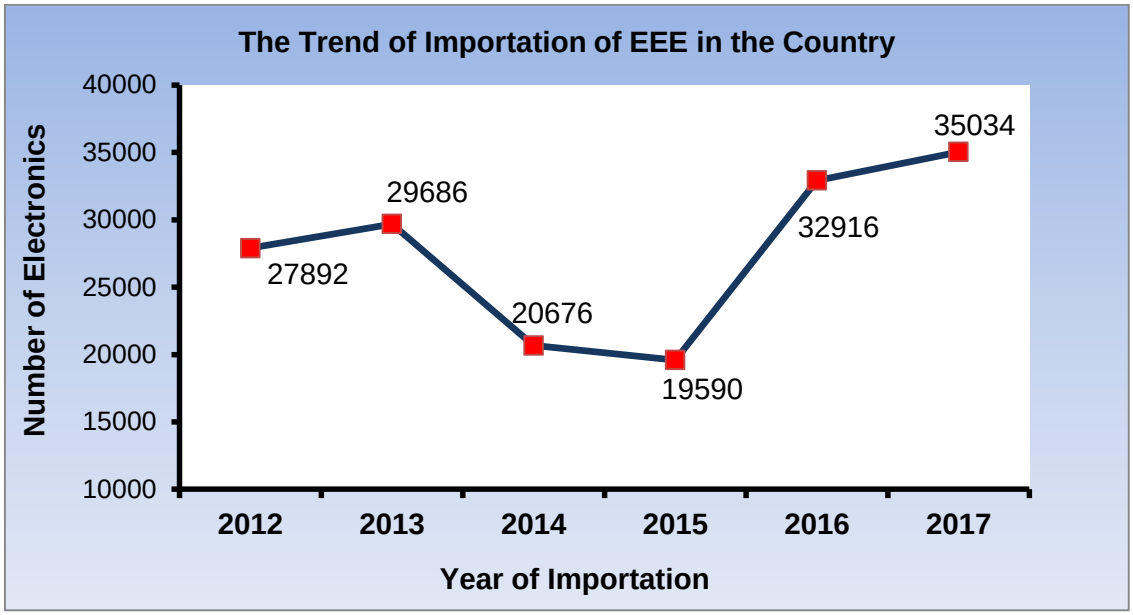


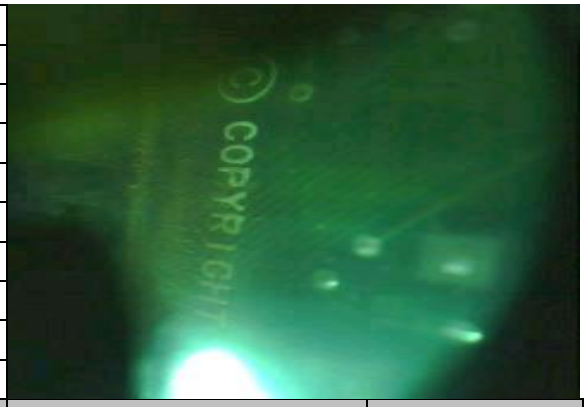
Figure 8: Imported electronics through Eritrea Customs Authority(2012-2017 inclusive)

There are large quantities of old CRTs and WEEE stocks in different private and governmental institutions. Figure 9 displays old computers stored in some colleges where sample analysis by using Genius3000XRF instrument was carried out to determine the level of PBDEs.

Figure 9: Samples of stores of old and damaged EEE including CRTs

Table 7 and Figure 10describe the measured value of bromine (Br) and other elements in a sample circuit of Fujitsu 1993 computer's mother board. The measurement reveals high concentration of Br (27,869 ppm) was found in a sample of computer circuit of Fujitsu.

Table 7: Bromine concentration determined in a sample of Fujitsu computer circuit

Sample Caption	Fujitsu 1993		
Supplier	Asmara University		
Operator	Teame Tekleab		
Date	2017-10-16 09:40:21		
GPS			
Testing time	40s		
Volt	45kV		
Curr	80uA		
Mode	PE		
Specification	No Grade		
Element	**Content**	**Detection limit**	**Error**
As(ppm)	599.3674	0.0000	8.1866
Br(ppm)	**27869.7014**	**0.0000**	**55.7046**
Cd(ppm)	16.0329	0.0000	5.0435
Pb(ppm)	4401.2481	0.0000	52.6967

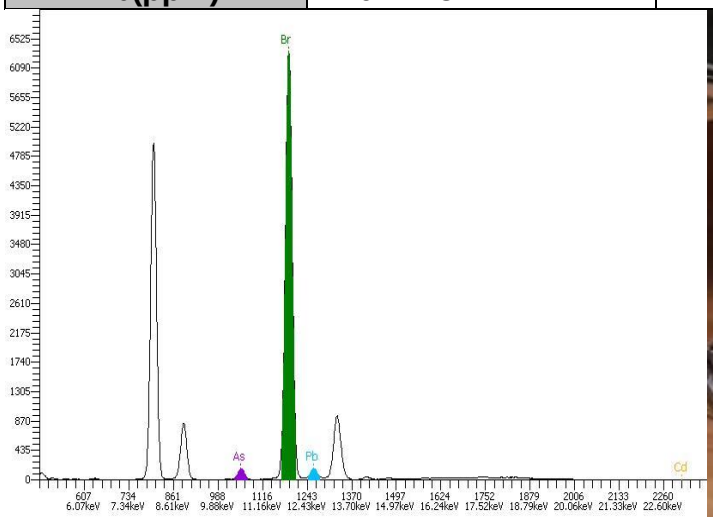


Figure 10: Graphical representation of the concentration of Bromine in a sample of Fujitsu Computer circuit using Genius3000XRF

In line with the UNEP toolkit, to estimate the POP-PBDEs, the following points were taken into account during the inventory of the identified sectors:

1. Number of new and second-hand EEE imports in the inventory year and the previous years during which possibly POP-PBDE containing EEE/WEEE were/are imported (as a basis for estimating EEE stocks);
2. Stocks of EEE devices with possible POP-PBDE content (in use, stockpiled and on the market); and
3. EEE entering the waste stream i.e. WEEE.

A preliminary assessment was used to estimate the inventory of POP -PBDEs in electrical and electronic equipment (EEE) and waste of electrical and electronic equipment (WEEE). The E-waste assessment was also conducted in order to establish the magnitude of the flow of EEE and generation of E-waste and subsequently identifying suitable measures to be put in place for sustainable E-waste management (Figure 11). Inventory on EEE/WEEE has not been done before and hence a preliminary inventory of POP-PBDEs content in CRT monitors was estimated using penetration data (number of CRTs/capita) of CRTs from the region and population as recommended in the guidance manual. E-waste assessment focusing mainly on computers and other ICT equipment was conducted for the year 2017. The e-waste assessment addressed the three stages in the life cycle of EEE (i.e. imports of new and second hand, EEE stocks and EEE entering the waste stream). Once the per capita data was estimated, the POP-PBDEs content in CRT casings (TVs and computer monitors) was calculated taking into consideration the data given in Table 8.

Table 8: The different parameters and assumption used for calculating POP-PBDEs

Indicator	Year	Value	Reference
Population of Eritrea (million)	2010	**3.2**	Public health statistical (PHS),
Number of CRT units per capita	2017	**0.14**	CRT inventory in Eritrea
Weight of CRT monitor (kg)		**25**	Section 4.2.1 PBDE Inventory Guidance
Amount of polymer fraction in CRT Monitor (%)		**30**	(Table 4-11) PBDE Inventory Guidance
Amount of c-OctaBDEs in CRT monitors average (kg/ton)	2010 (EU)	**0.87 to 2.54**	(Table 4-11) PBDE Inventory Guidance
Average Bromine content in CRT	2017	**11944.46ppm**	Obtained from sample analysis using genius-3000XRF

Assessment of the importation of ICT products were drawn from the statistical databases collected mainly from the National Customs Office. Since the data did not distinguish clearly the new from second-hand EEE, the team of experts conducted a survey in selected retailers of computers in order to establish the share of second-hand products. Based on the survey, share of second-hand computers in the total importation of EEE was found to be 11%.

The c-OctaBDE in CRT was calculated using the following equation:

Mc-OctaBDE = No of CRTs/capita$_{Region}$ x population x weight of CRT x % polymer/CRT x c-OctaBDE content

***Mc-OctaBDE (i) is the amount of c-OctaBDE**

By putting all the data shown in Table 8, the value of c-OctaBDE in CRT devices for2017was approximately at5712 Kg. According to the UNEP guidance document, in the Mc-OctaBDE, the heptaBDE homologue and hexaBDE homologue distribution account to approximately 43% and 11% respectively. Based on this the total distribution of homologues in c-OctaBDE in Kg is 3084.48(Table 9).

Table 9: POP-PBDE in CRT monitors

Homologues	Distribution homologues c-OctaBDE	Total distribution of c-OctaBDE(Kg)
Inventoried c-OctaBDE		
HexaBDE	11% x 5712	628.32
HeptaBDE	43% x 5712	2456.16
Total		**3084.48**

Therefore, the total estimated quantity of PBDEs contained in CRTs (computers and televisions) in Eritrea is about 5.71tonsin 2017. Figure 11 describes flow of POP PBDEs from CRTs in Eritrea. The total quantity of PBDEs in the inventory years was estimated based on the imported, stocked, and entered to the waste and recycled EEE and WEEE (Table 10). During the in-depth assessment, about 242 pcs of CRTs sample were analysed using the handheld x-ray fluorescence (Genius3000XRF)in different part and found to be an average per one CRT is 11944.46 ppm of bromine concentration and 62.9% were found above1000 ppm. The total bromine content on the 242 samples was estimated 72.264 kg. According to the in-depth assessment, the

total calculated c-OctaBDE of the overall CRTs was 2604.86 tons in the country using the UNEP toolkit it gives about 1489.43 Kg of c-OctaBDE in EEE of CRTs and the overall polymer calculated 781.46 tonnes

Table 10: The quantity of HexaBDE and heptaBDE present in EEE and WEEE

Homologues	Distribution homologues c-OctaBDE	POP-PBDEs in import for inventory year 2017 (Kg)	POP-PBDEs in stocks for inventory year 2017 (Kg)	POP-PBDEs entering the waste stream year 2017 (Kg)	POP-PBDEs in recycled polymers for inventory year 2017
Inventoried c-OctaBDE		**0.38**	**1483.10**	**5.95**	NA
HexaBDE	11%	0.042	163.14	0.65	NA
HeptaBDE	43%	0.16	637.73	2.56	NA

*** NA stands for not available (there is no recycling apparatus in the country)**

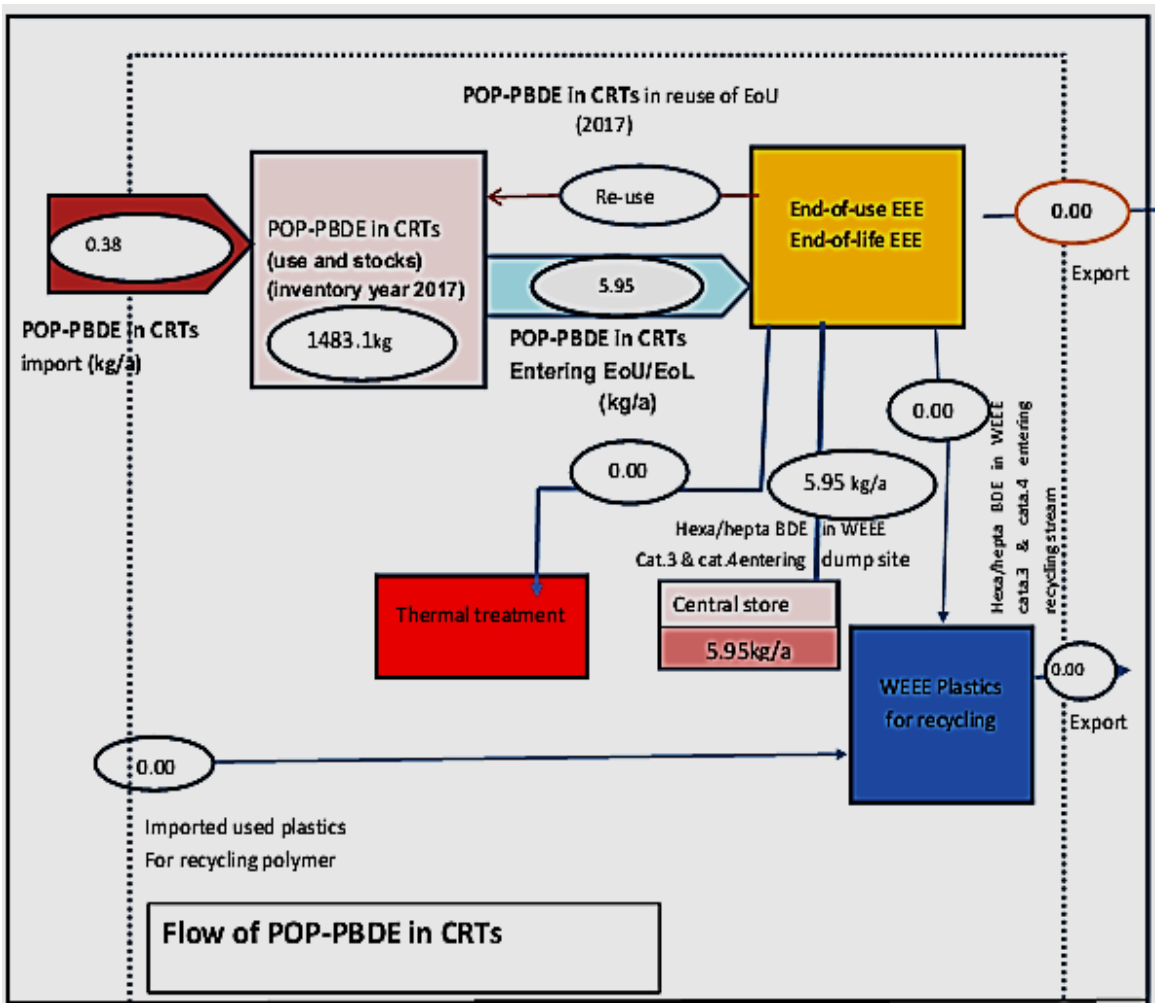


Figure 11: Flow chart that describes the lifecycle of POP-PBDEs in CRTs in Eritrea

2.3.4.2 Inventory of PBDEs in Vehicles

The inventory of vehicles was done with a special emphasis to the old vehicles. However, as shown in Figure 12, the importation of overall vehicles has decreased largely in the last three years. Moreover, recently imported vehicles are latest models and are made after the reference year (2005) used for the calculation of the POP-PBDEs in vehicles. As summarised in Table 11, most of the importation of vehicles in the country are from Europe and Asia. According to the Toolkit, the US and non-US vehicles have different factors for calculation.

Table 11: Importation of vehicles from different regions (2008-2017)

Region of importation	Number of vehicles	Percentile (%)
Asia	3569	23
Europe	7230	47
US	169	2
Other regions	4575	28
Total in pcs	**15543**	**100**

Figure 12 also indicates that the quantity of imported second hand vehicles has been decreasing and thus indirectly decreases the PBDEs calculated from vehicles. The calculation of POP-PBDEs has become almost insignificant for the years 2015, 2016 and 2017 and thus the overall tally of PBDEs from vehicles in the years 2008 up to 2017 is largely due the imported vehicles before 2015.

Figure 12 reveals the number of imported second hand vehicles is almost negligible and the quantity of PBDEs decreases accordingly. Recalculation of POP-PBDEs present in the transport sector to the listed POP- PBDEs homologues (tetraBDE, pentaBDE, hexaBDE and heptaBDE) for the relevant life cycle stages are summarized in Table 12. The total quantity of PBDEs in the current use of vehicles was calculated to be 0.72 tonnes in the inventory year. The POP-PBDE of PUR foam in vehicles in Eritrea is described as also shown in Figure 13.

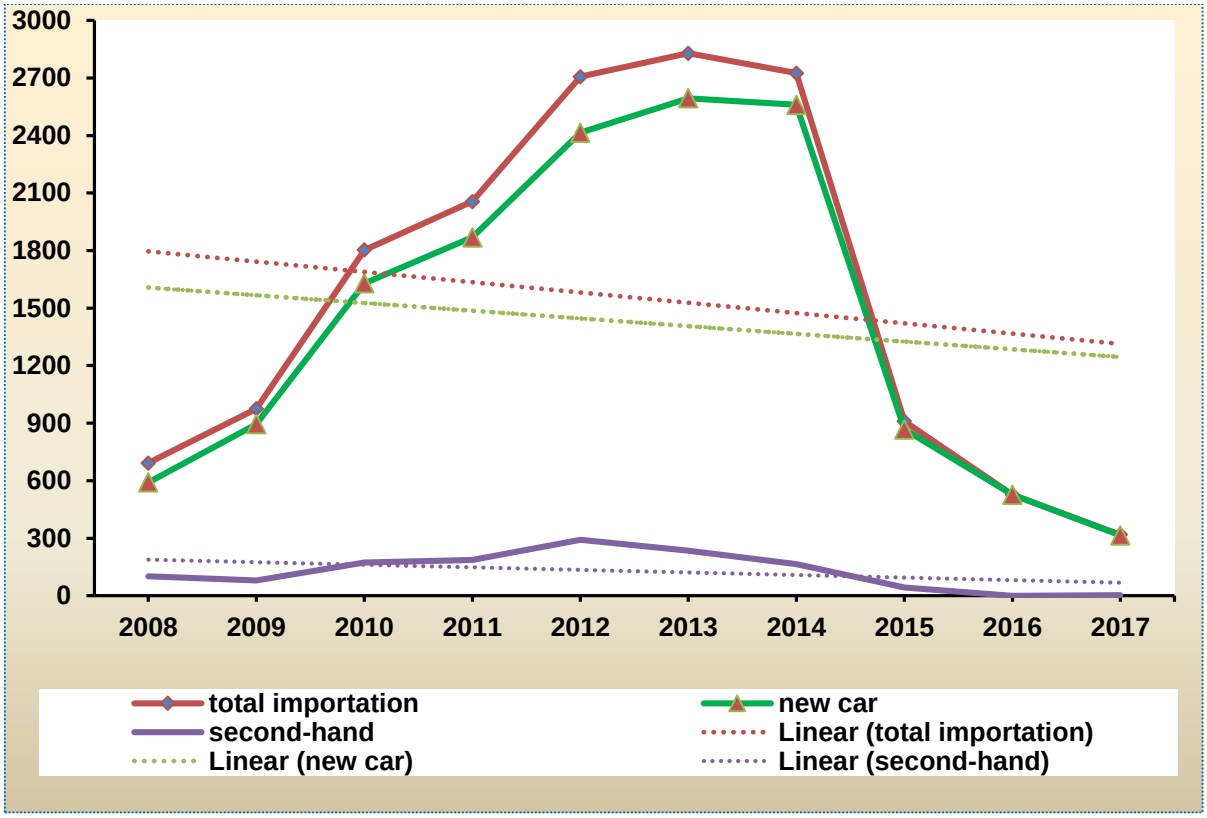


Figure 12: Graphical representation flow of importation of vehicles (2008-2017)

Table 12: Estimation of the various POP-PBDEs from vehicles in Eritrea

	Distribution homologues c-PentaBDE	**POP-PBDEs in vehicles currently in use in inventory year 2017 (in kg)**	**POP-PBDEs imported in vehicles in the inventory year 2017 (in kg)**	**POP-PBDEs in end-of-life vehicles in the inventory year 2017 (kg)**	**POP-PBDEs disposed of in the past from the transport sector (in kg)**
Inventoried c-PentaBDE		∑ c-PentaBDE **751.17**	∑ c-PentaBDE **4.28**	∑ c-PentaBDE **0.21**	∑ c-PentaBDE **1.06**
tetraBDE	33%	247.89	1.41	0.07	0.35
pentaBDE	58%	435.68	2.48	0.12	0.61
hexaBDE	8%	60.09	0.34	0.02	0.08
heptaBDE	0.50%	3.76	0.021	0.001	0.005

Based on the analysis of the data collected, the following summary conclusion can be made about the status of POP-PBDEs in Eritrea.

- Eritrea imports and uses significant quantity of articles and products that could contain POP-PBDEs, particularly used EEE and used vehicles;
- Eritrea does not manufacture POP-PBDEs and articles containing POP-PBDEs
- Mostly the E-wastes in the country are old computers (CRTs);
- There is no recycling mechanism of WEEE and thus mostly the WEEE is kept in different private and governmental stores;
- There is lack of comprehensive national inventory on EEE and WEEE;
- There is no penetration data of CRTs (from TVs and PCs) and,
- Generally, there is limited awareness about the hazardous effects of EEE and WEEE.

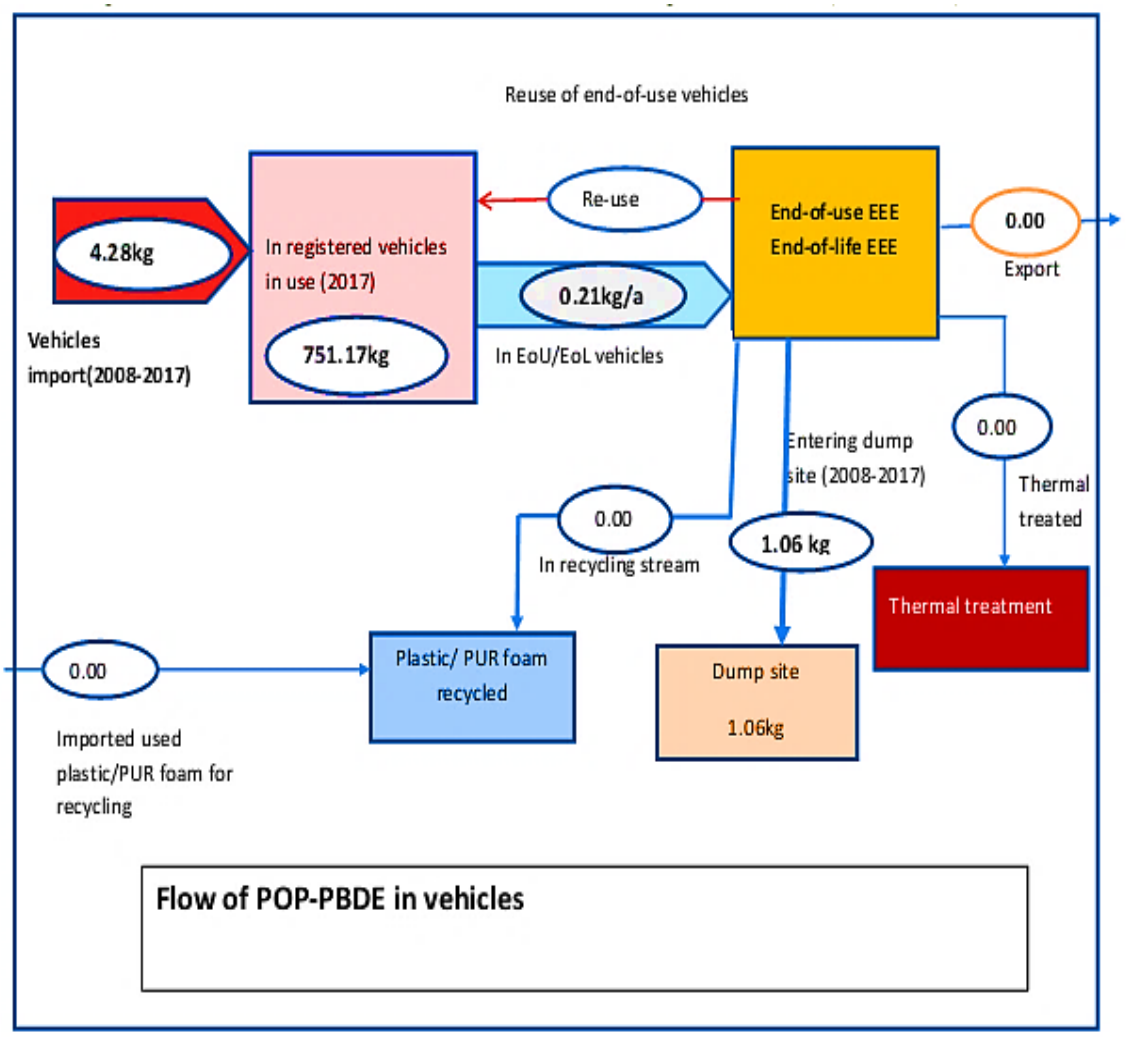


Figure 13: Flow chart that describes the POP-PBDE of PUR foam in vehicles in Eritrea

2.3.5 Assessment of Perflourooctane Sulfonic Acid & Its Salts (PFOS)

Generally, Eritrea does not produce PFOS and its related substances, but PFOS containing materials has been imported for various applications. In pursue of this, specific domains of fire-fighting foam applications, metal plating, tanneries, textile industries, rubber and plastic sectors, photographic, synthetic carpets and others were inventoried in order to estimate the quantities and releases of PFOS.

2.3.5.1 Fire Fighting Foams

Currently there is no importation of fire-fighting foams but there are significant quantities stocked in different sectors (listed in Table 13). Municipal fire-fighting service, refineries, airport, gas and fuel suppliers, like TOTAL and TAMOIL, and other relevant industrial enterprises were included in the inventory. According to the inventory reports, most of the municipality of the towns and/or cities in Eritrea use water pressure and powder for firefighting. However, stocks of firefighting foams were found in the municipalities of Asmara (2200 L) and Assab (500 L), (Figure 13). Moreover, big quantities of stocks of firefighting foams were found in Assab Petroleum Refinery (28,975 L), Asmara International Air Port (15,000 L) and TOTAL (10,000 L). With the exception of the firefighting foam used by TOTAL, all contain 3 up to 6 % of PFOS. Even though there are stocks of firefighting foams, consumption of fire-fighting foam is low in most sectors (Table 13), and training on application of PFOS-based foam is very limited. Table 13 shows the quantity of PFOS-based foams in different sectors containing firefighting foams.

The total quantity of PFOS in firefighting foams consumed yearly and in stockpiles was calculated by using the following equation:

$$T=L * X$$

Where:

T = Total quantity of PFOS in firefighting foam consumed yearly (in t/a)
L = Percentage of PFOS in the grade of firefighting foam (wt %)
X = National consumption of firefighting foam or in stockpiles (in t/a)

Table 13: Stockpiles of fire fighting foams and calculated PFOS content

User category	Stockpiles of PFOS-based foam, litres	Quantity PFOS-related substances in stockpiles, kg*	Historical emissions of PFOS-related substances, kg	Remark
Asmara Municipality	2200	66	400	Expyrol F-15, 3%
Air Port	15,000	900	1000	AFFF flouroprotein
TOTAL	10,000	300		TFFF flouroprotein
TAMOIL*	1000	30	0	FP70 (6%) flouroprotein
Massawa Port	2000	60	0	FP70 Plus (3%) flouroprotein
Private sectors	25	0.75	0	
Assab municipality	500	15	0	
Assab Petroleum Refinery	28,975	1738.5	75	FP70 (6%) flouroprotein

* The PFOS quantity was estimated from the percentage of PFOS in the different grades offire-fighting foam.
** The fire-fighting foams were imported in 2016 and are PFOS free.

Figure 14: Fire-fighting foams containing PFOS in the municipality of Assab

2.3.5.2 Coating and Impregnation

This sector includes paper and packaging, synthetic carpets, leather and apparel and textiles and upholstery. Currently, the total quantity of PFOS produced from these sectors is estimated 0.25 up to 2.5 tonnes /annum. However, this figure doesn't reflect the full capacity of the different sectors. The main contributions are from tanneries and leather finishing, textiles and rubber and plastic manufacturing. Furthermore, it is not clear if the sector use PFOS or other PFAS. Therefore, this is an upper estimate and needs further assessment in future (NIP implementation).

2.3.5.3 Tanneries and Leather Finishing

There are about five registered tanneries and twenty-nine leather products in Eritrea. Of these only few are currently operational. Others have not been functional to their full capacity and some are closed down. The leather tanning process requires various chemicals whose reaction generates hazardous chemicals as well as emitting stink smells. Most of the Eritrean leather industries process rawhide to the wet blue stage. They have serious environmental problems with respect to the management of leather trimmings, chrome and lime effluents generated from their operations. Generally, tanneries don't have chrome recovery and effluent pre-treatment plants and hence the disposal is inadequate. Among the sectors that make coating and impregnation, tanneries and leather processing sectors contribute biggest portion of PFOS.

2.3.5.4 Textiles

There are only six textile industries throughout the country. The textile sector in the country has been facing mounting problems including lack of raw materials, export prohibition, and effluent discharge standards. In recent years, several tanning industries have shut down and only few are functional with a minimum capacity. The textiles use chlorine-containing chemicals throughout the dyeing process. Therefore, with the existing capacity of the textile industries in the country only small quantities of PFOS are estimated to be released.

2.3.5.5 Rubber and Plastic Manufacturing

There are about twelve registered manufacturers of rubber and plastics of various grades with various capacities. Most of the plastic industries are located in Asmara with a few in Debaruwa and Massawa. Mostly the plastics industries produce goods made of polyvinyl chloride (PVC), polyethylene (high density and low density), polystyrene, and used gericans. The plastics subsectors in the country mainly produce household plastic wares (plates, cups), PVC pipes and fittings, floor tiles and mats, plastic containers for domestic and industrial use, and plastic shoes, plastic crates and bottles. All raw materials are imported in the form of granules. There are also other attempts to recycle plastics through different approaches resulting in varied environmental compliance requirements. Usually used gericans are collected from various sites of the country, properly cleaned and thus processed as a starting material for different purposes (Figure 15). The data analysed estimates that total amount of PFOS produced is 1.31 -13.1 tons/annum.

2.3.5.6 Metal Plating

The metal plating process by means of chromium baths is a relatively stable process in which the composition is maintained constant by additions of chromium acid, and sulphuric acid and a low dose of PFOS. The inventory on metal plating was conducted in order to examine whether detectable levels of PFOS exist in the effluent of decorative chromium electroplating facilities. In Eritrea, there are mainly two metal plating plants and thus the small sample size limits the ability to draw conclusions beyond the observation that PFOS as well as other PFCs appear to be discharged from decorative chromium electroplating facilities through wastewater discharge.

Figure 15: Used plastic by-products for recycling purposes

The overall estimation of PFOS for the different sectors was done based on the statistics of the imported items; manufacture and export of PFOS are not available. As indicated in Table 14, the overall quantity of PFOS is estimated between 253.28 up to 2532.8 kilograms per year. Moreover, the estimated quantity of PFOS from stocked fire-fighting foams is about 1.96 tons. A summary of the annual net release of PFOS and its related substances is furnished in Table 15. Currently, the metal plating industry and photographic sectors are releasing insignificant quantities of PFOS.

Based on the standard toolkit, the quantity of PFOS in different sectors was estimated as follows:

Annual net consumption of PFOS in [country] = [manufacture + import – export] of PFOS containing products or articles x PFOS content*

* PFOS content for different articles are different

Table 14: Total Estimated PFOS and its salts from different sources

Category of article or preparation	Import (kg per year)	Manufacture (kg per year)	Export (kg per year)	PFOS content *Approximate values* (mg PFOS/kg article or preparation)			PFOS quantity (kg per year) lowest / highest		
Photographic sector	925	0	0	100	-	1000	0.093	-	0.925
Metal plating	100	0	0	50000	-	500000	5	-	50
Coating and impregnation	496370	0	0	500	-	5000	248.2	-	2481.9
TOTAL quantity of PFOS per year (kg)							**253.28**	**-**	**2532.8**

2.3.6 Assessment of Unintentionally Produced POPs (Annex C Chemicals)

Unintentionally produced POPS include: dioxins, furans and pentachlobenzene. Now, in Eritrea, the range of sources of environmental releases of dioxins and furans incorporates open burning of municipal wastes, accidental and uncontrolled fires, heat and power generations, wood and charcoal fuel burning, transportation, production of construction materials, etc. The calculation of Dioxin emission was done with the UNEP toolkit 2013. Moreover, the calculations for all kinds of U-POPs were done for the inventory year (2017).

2.3.6.1 Medical Waste Incineration

Currently, the incineration facility in Eritrea is mainly due to the medical waste incineration. Therefore, the data analysis related to the emissions of PCDD/PCDF was done accordingly. Medical waste is known to contain materials such as polyvinyl chloride (PVC) plastics, mercury from broken thermometers as well as many other potential POPs materials. These wastes are mostly generated from hospitals, health cares and medical laboratories and include chemical wastes, pathological wastes, and highly infectious wastes. Frequently, apart from sharp objects, pharmaceuticals wastes and wastes arising from laboratories are disposed with the regular non-infectious wastes. Therefore, the burning of PVC products and other wastes can release dioxins which can be harmful to patients, the environment and public health generally.

Currently, most of hospitals in the country have medical waste incinerators. Some of the incinerators are electrical and others are manual. However, most of the incinerators are not working properly. The incinerators found in Zoba Debub mainly in Mendefera and Dekemhare are shown in Figure 16. The overall quantity of medical waste incinerated is about 1679 tonnes annually.

Figure 16: Electrical (left) and manual (right) incinerator facilities

The overall emission of U-POPs to air from all kind of waste incinerations is estimated to be 65.3 g TEQ/a.

2.3.6.2 Heat and Power Generation

This includes fossil fuel power plants, biomass power plants, household heating and cooking and natural gas or LPG fired stoves. The main contribution is from fossil fuel power plants because there is large consumption of fuel by power boilers of different industrial sectors. Biomass such as wood, charcoal, dung and agri-residue are commonly used for household heating and cooking in most rural areas in Eritrea. Figure 17 shows an example wood and charcoal collected for local consumption. From the inventory, heat and power generation, has emerged as one of the significant

source groups for the release of U-POPs. These sectors generate about 149.3 g TEQ/a which is equivalent to 30 % of the total national releases of U-POPs to air.

Figure 17: Charcoal and virgin wood deposited for local consumption

2.3.6.3 Production of Mineral Products

The production of mineral products contributed a relatively small amount as compared to the other sources of emissions of U-POPs. This category includes cement kilns, lime, brick and asphalt mixing processes. Currently, the cement kiln is the main contributor to the emission of U-POPs. Industrial processes like cement production are sources of mercury emissions. Gedem Cement Plant has a full production capacity of about 360,000 tonnes per year. Moreover, it also consumes about 50,000 tons of coal annually at its full capacity. The factory uses local raw materials such as coral, limestone and gypsum which are available in adequate quantities in various parts of the country. The plant engages cement kilns for manufacture of its product using dry process. The cement plant like many other production plants contributes large emission of dioxins and furans. The cement plant in Massawa has not been upgraded to include enhanced environmental controls. Using the standard Toolkit, the total emission of U-POPs to air from the cement factory was 1.8 gTEQ/a. Moreover, in the

production of mineral products though not significant contribution, there are quantitative emission from lime and brick factories, and asphalt mixing.

2.3.6.4 Transportation

In Eritrea, transportation relies heavily on the combustion of gasoline (leaded and unleaded), diesel (also known as light fuel oil) and Kerosene (JetA1). Higher emissions have been associated with the use of leaded gasoline. At this time the importation of leaded gasoline is stopped and thus the emissions of PCDD/PCDF from unleaded gasoline and kerosene are negligible. Therefore, emissions from gasoline and kerosene are incorporated in the overall calculation.

As shown in Table 15, the estimation was done based on annual diesel fuel consumption of passenger cars, buses and trucks. Around 40 % of the total passenger cars are estimated to use diesel.

Table 15: Annual fuel consumption in the transportation sector

Type of Vehicle		**Number**	**Annual road performance (Km/a)**	**Fuel Consumption (Km/Litre)**	**Litres/ Annum**
Passenger Car		**38,470**	**4500**	10	**21,862.6**
Bus	**Size**				
	large	863	28,888	2.0	12,465,172
	medium	1313	7488	3.0	3,277,248
	small	2603	12,711	8.0	4,135,842
Truck	**Size**	**Number**	**Annual road performance (Km/a)**	**Fuel Consumption (Km/Litre)**	**Litres/ Annum**
	heavy	13,478	19,320	1.2	216,995,800
	medium	7653	13,800	1.6	66,007,125
	light	4427	12,600	5.0	11,156,040
Total		**30,337**			**314,059,089.3**

The release from the combustion processes associated to the transport sector contributed 31.4 g TEQ/a.

2.3.6.5 Open burning processes

This category includes mainly the fires at waste dumps and other sources like forest fires, domestic wastes, and agricultural residues. Municipal dumping sites in major cities and towns are considered as potential sources of releases of dioxins and furans. Most of the municipal dumping sites (cities and towns) including the capital city are closer to the residential areas and are accessible by livestock and wildlife. Various wastes including, plastic, glasses, metal scraps …etc. are dumped along with municipal solid waste and upon open burning lead to unintentional releases of dioxins. Figure 18 describes the daily open burning of the municipal wastes in Asmara dumping site (Skariko). Occasionally, medical wastes and hazardous chemicals are disposed in the open landfill along with the municipal wastes.

Figure 18: Continuous burning of the dump site around Asmara (Skariko)

Even though the assessment of damage from accidental fires is not properly done, it is estimated that there is significant emission of dioxins and furans annually from the accidental fires (Table 16).

Table 16: Reported accidental fires occurred in houses and factories in Asmara and its vicinities

Year	Number of Fire-accident	Estimated loss (Millions in Nakfa)
2009	43	7.50
2010	42	2.63
2011	56	1.30
2012	73	8.30
2013	53	3.00
2014	49	4.80
2015	56	3.15
2016	50	2.90

The total PCDDs/PCDFs emission from the open burning including accidental fire is estimated to be 234.6 g TEQ/a. This comprises of 48.5 % of the total emission PCDDs/PCDFs to the air.

2.3.6.6 Total Estimation of U-POPs and Comparison to the Baseline Inventory

The Standardized Toolkit (2013 version) for identification and Quantification of Dioxins and Furan releases was used to estimate the quantity of all the sources of U-POPs. Based on the analysis of the data collected, it was established that Eritrea releases a total of 562.3g TEQ/a in the year 2017. Table 17 shows the total releases of U-POPs from different sources. The three major contributors (93 %) to the overall air emissions of U-POPs are open burning processes (234.6 g TEQ/a), heat and power generation (149.8g TEQ/a) and waste incineration (65.3 g TEQ/a). Besides, it was also calculated that 86.0%, 12.3 % and 1.35% of these releases end up in air; product and land respectively. The emissions to water and residue are almost insignificant. As indicated in Figure 19, there has been a large increase in the total emissions of U-POPs as compared to the baseline inventory presented in 2012 NIP. i.e. 352 g TEQ/a. However, the baseline inventory data was calculated using a different Toolkit; emission factor of 2013 was greater than 2005.

Table 17: Estimates of the emission of U-POPs (in g TEQ/a) from different sources in 2017

Group	Source Groups	Annual Releases (g TEQ/a)				
		Air	Water	Land	Product	Residue
1.	Waste Incineration	**65.3**	0.0	0.0	0.0	0.3
2.	Ferrous and Non-Ferrous Metal Production	0.0	0.0	0.0	0.0	0.0
3.	Heat and Power Generation	**149.8**	0.0	0.0	0.0	0.7
4.	Production of Mineral Products	2.6	0.0	0.0	0.2	0.1
5.	Transportation	**31.4**	0.0	0.0	0.0	0.0
6.	Open Burning Processes	**234.6**	0.0	7.6	0.0	0.0
7.	Production of Chemicals and Consumer Goods	0.0	0.0	0.0	**67.6**	0.0
8.	Miscellaneous	0.0	0.0	0.0	0.0	0.1
9.	Disposal	0.0	0.4	0.0	0.0	0.0
10.	Identification of Potential Hot-Spots	0.0	0.0	0.0	1.6	0.0
1-10	**Total**	483.7	0.4	7.6	69.4	1.2
Grand Total 562.3 g TEQ/a						

As indicated in Table 17, relatively large emission of U-POPs was found from the production of chemicals and consumer goods (67.6 g TEQ/a). Figure 20describes the major sources for the release of U-POPs to the air.

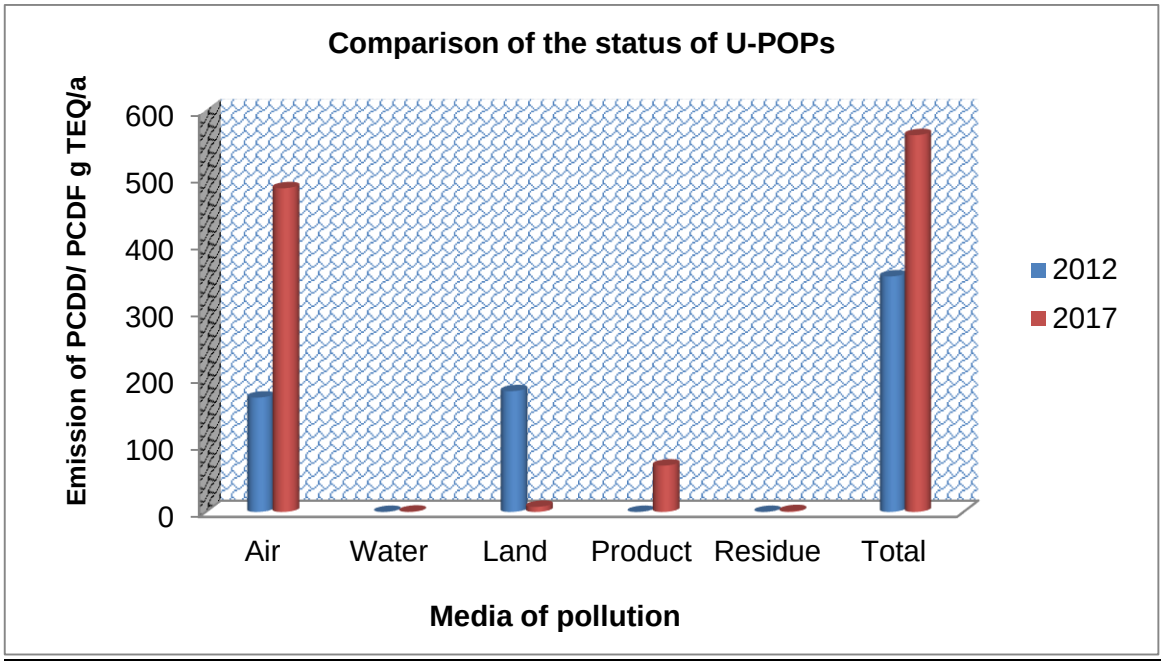


Figure 19: Status of PCDD/ PCDF in 2012 and 2017

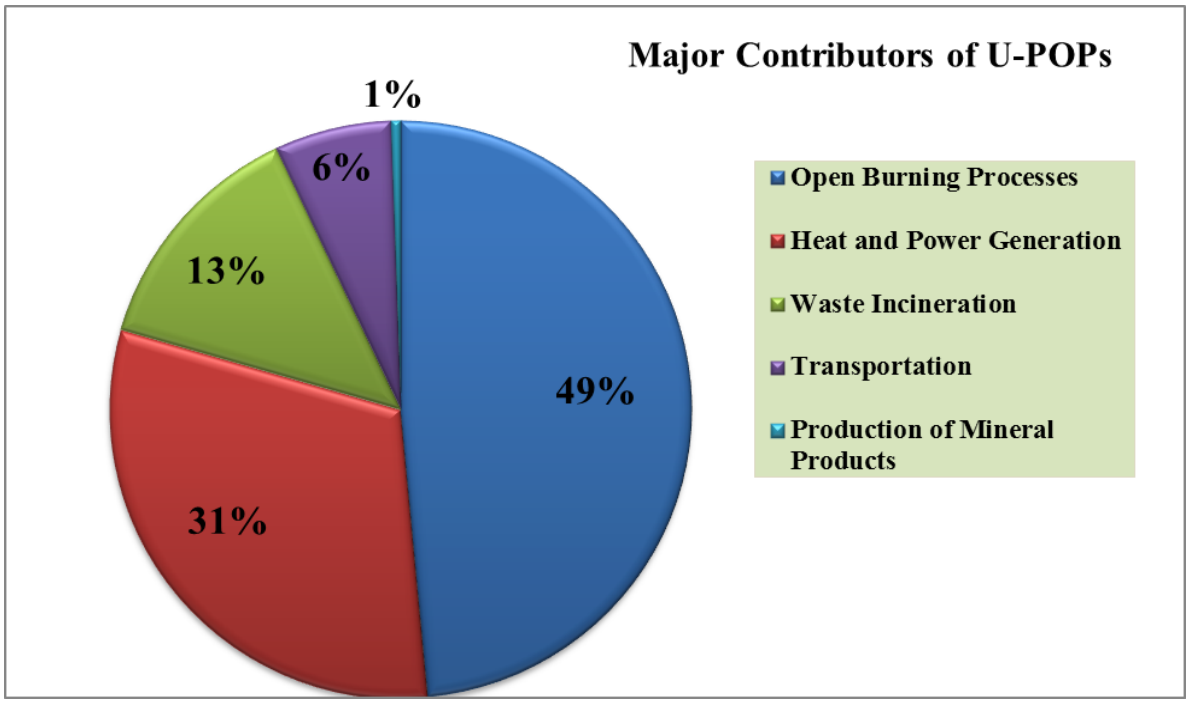


Figure 20: The major U-POP contributors to the Air

2.3.7 Information on the state of knowledge on stockpiles, contaminated sites and wastes

Currently, basic risk assessment of most of the potentially contaminated sites related to pesticides was carried out to determine the level of contamination. Accordingly, 21 potentially contaminated sites were identified and assessed at national level. Most of the contaminated sites are easily accessible to people and often animals graze close to the contaminated area (Figure 21). Most of the sites were contaminated with unknown pesticides and this can be considered high risk of POP pesticides. During the assessment it was observed that some of the contaminated sites have been washed away by rain and wind. It is highly important that detailed assessment and urgent safeguarding should be undertaken to prevent human health and environmental risks. In one of the contaminated sites, Massawa old airport, the contaminated soil was properly identified and efforts are underway to dispose it (Figure 22). Likewise, the contaminated site in Alighider Agro industry is partially safeguarded and requires complete safeguarding process. There has been no action taken to protect and safeguard the other potentially contaminated sites listed in Table 18.

Figure 21: Animals grazing near one of the contaminated sites

Figure 22: Temporary safeguarding activity in contaminated site at Massawa

Some samples from the potentially contaminated sites labelled as unknown in Table 18 were sent for analysis and most of them were identified as non-POPs. Based on the inventory of the status of POPs-pesticides, the following recommendations can be done:

- There is a need for standardized (FAO Standard) stores and good management system in the country;
- There should be adequate stores for pesticides;
- The necessary safety equipment's (PPE) along with the proper training should be provided to the storekeepers and;
- The regulatory body which control the status of the existing stores and controls illegal importation of pesticides needs to be strengthened;
- A national strategy for disposal of empty containers should be developed;
- Further assessment on the disposal of contaminated sites need to be conducted;
- Promote public awareness concerning the impact of POP pesticides on human health & the Environment; and

- Introduce supervision and monitoring mechanism on pesticide & store management.

Table 18: Current status of the contaminated sites

S.N	Name of contaminated site	Zoba	Pesticide type	Status
1	Ghelaeo	N.R.S	Unknown	No action
2	Harsile	S.R.S	Dursban	No action
3	Foro(ECLC)	N.R.S	Unknown	No action
4	Sheib (APDD)	N.R.S	Unknown	No action
5	Sheib(ECLC)	N.R.S	Unknown	No action
6	Foro general store (Site 1)	N.R.S	Dursban	No action
7	Maihmet (Plant protection)	N.R.S	Dursban	No action
8	Massawa international airport	N.R.S	Unknown	No action
9	Maihmet (Store 3)	N.R.S	Unknown	No action
10	Massawa old airport	N.R.S	Fenithrothion, Dursban&Malathion	Landfill identified
11	Maihmet contaminated soil (Site 1)	N.R.S	Unknown	No action
12	Maihmet contaminated soil (Site 2)	N.R.S	Dursban	No action
13	Alighider Agro Industry	Gash Barka	Unknown	Partial safeguarding
14	GolujMoASubZoba	Gash Barka	Malathion	No action
15	Akurdet (Site 2)	Gash Barka	Unknown	No action
16	SerejekaMoA (Plant protection)	Maekel	Malathion	No action
17	Gejeret (DLCO)	Maekel	Unknown	No action
18	Barentu (Plant protection Store 2)	Gash Barka	Unknown	No action
19	BarentuMoH (Store 2)	Gash Barka	DDT 75%W/W	No action
20	SenafeMoA Office	Debub	Unknown	No action
21	Adi-Keyih (Maelewia)	Debub	Unknown	No action

*taken from the report of the project "Prevention and Disposal of Persistent Organic Pollutants (POPs) and Obsolete Pesticides in Eritrea.

2.3.8 Summary of future production, use and releases of POPs – requirements for Exemptions

Currently, Eritrea is not producing any POP pesticides, DDT, PCBs and other industrial POPs. Apart the PCBs and industrial POPs, which are available in different sectors, POP pesticides and DDT are not currently in use. However, though technically not in use, there is still possibility of using DDT for the purpose of vector

control. Therefore, there is no immediate plan to request for exemption and/or possibility of manufacturing any of these chemicals in the country.

2.3.9 Existing programmes for monitoring releases and environmental and human health impacts

In Eritrea, information related to health and environmental effects of releases from POP pesticides, PCBs, industrial POPs and U-POPs is not available. The indoor spraying of DDT for malaria control was one of the highest releases of POPs in the country. However, currently DDT is not in use and instead alternatives are used for vector control. According to the preliminary survey conducted, storekeepers working in different pesticide stores, farmers using pesticide sprayers, groups of people living around pesticide stores, scavengers staying longer time around the dump sites and fire-fighters working in municipality are on top list of potentially vulnerable groups to POPs chemicals. However, the capacity to undertake monitoring activities to determine on the releases of POP chemicals to the environment and their impact to human health remains very limited.

2.3.10 Current level of information, awareness and education among target groups; existing systems to communicate such information to the various groups; mechanism for information exchange with other parties

In Eritrea, there was only information about the use and application of pesticides, DDT, PCBs and industry chemicals in agriculture, vector control, electrical transformers and industrial sectors respectively. Since the inception of the project on developing the NIP on POPs, awareness workshops were held for various stakeholders. The NIP developed in 2012 has already brought some level of awareness and information to different parties of the society. Moreover, the current project related to the update and review of the initial NIP has also brought additional information among the stake-holders.

A number of workshops related to assessment of the current status of POPs, priority setting and development of action plan have been carried out. A number of participants from government organisations, stakeholders and individuals attended the above workshops and thus obtained better understanding on the types, effects of

POPs and on the going activities to ensure sound management. The national inventory conducted by the experts in the six zobas also provided the opportunity to transfer knowledge to store keepers, municipality, hospitals and industries in major towns of the country. However, still remains a lot to be done to promote the awareness of the larger population about POPs and their harmful effects. There is lack of focused and coordinated effort to challenge the issue of POPs particularly relating to information, awareness and education, compared to other environmental areas.

2.3.11 Relevant activities of non-governmental stakeholders

In order to meet the requirements of the SC, the NIP should contain a brief summary on the current activities and expertise of NGOs in the field of POPs. The main local NGOs identified that could indirectly be involved in the POPs issue include the Chamber of Commerce, National Confederation of Eritrean Workers (NCEW), Eritrean Social Marketing Group and Toker, a local agricultural NGO. Moreover, associations found to engage in chemicals management, advocacy services related to chemicals and research and development include the Eritrean Chemical Society and Eritrean Agricultural Society. Moreover, the higher learning and research institutions like Hamelmalo Agricultural College, Eritrea Institute of Technology and College of Health Sciences are partners in relation to research activities related to POPs.

As reported in this NIP document, almost all the previous obsolete pesticides (including POPs) were shipped to a suitable High Temperature Incineration (HTI) facility for incineration. Eritrea has been eligible recipient of FAO, World Bank (IBRD and/or IDA) and/or UNDP technical assistance. FAO has served as GEF implementing agency in a project related to prevention and disposal of POPs and obsolete pesticides in Eritrea. The national executing partners were the MoA and MOLWE. The support of the above mentioned international NGOs has been very significant and further provision will enhance the implementation of the updated NIP

2.3.12 Overview of technical infrastructure for POPs assessment, measurement, analysis, alternatives and prevention measures, management, research and development

Appropriate technical infrastructure is mandatory for the assessment, management and analysis of POPs. Proper management of POPs requires sharing of POPs information at national level and human capacity building to analyse POPs from different sources. The survey on national infrastructure capacity for POPs management and analysis was undertaken along with the assessment of the status of POPs availability. This was based on the national circumstances and available resources.

As reported in the 2012 NIP, screening of samples of PCBs from different transformers and capacitors were carried out using the L2000 Analyser found in the laboratory of the Department of Water Resources Laboratory (DoWS). The Analyser is not currently working well and thus maintaining the instrument might help in the analysis of organochlorides including PCBs. Currently, an experience and equipment (Genius3000XRF) available in the Department of Environment (DoE) were employed in the Analysis of PBDEs from CRTs and vehicles. However, there has been neither previous experience nor specific equipment for the analysis of the other POPs (Pesticides, Dioxins, Furans, and PFOS) in the country. Thus, the Ministry of Agriculture (MoA) has been sending samples of contaminated soils to abroad for analysis.

The current assessment on technical infrastructure related to POPs can be summarised as follows:

- there are inadequate infrastructures for the sound management of POPs including obsolete pesticides and their contaminated sites. Mostly, the condition of pesticide stores is deteriorating and is below the standard. There is no proper remediation capacity of contaminated sites;
- to date no obsolete POPs or stockpiles have been destroyed in Eritrea as there is no dedicated facility for POPs or other hazardous waste destruction. Thus, most the disposed obsolete pesticides are usually send abroad for incineration;

- there is no proper interim storage for PCB containing transformers and capacitors and there are no PCB disposal facilities. It has been observed that technicians engaged in handling and repairing these electrical equipments have not been using the necessary safety equipments and thus are exposed to dermal contacts;
- there are no proper landfills to manage solid wastes which will also provide additional opportunities to manage POPs waste;
- there are no experts in the Academia, who can be pooled as part of human resource, with the requisite experience and skills in the area of POPs analysis;
- some activities have been conducted in training staffs handling pesticide stores. However, no training has been conducted yet on PCB management or new POPs management;
- there are no accredited laboratories in the country to carry out POPs analysis. The existing laboratories are not fully equipped for analysing POP pesticides and PCBs. The country also lacks proper equipment's for monitoring PCDD/PCDF emission levels;
- there are no occupational physicians, nurses or clinical toxicologists with the knowledge on human health impacts related to POPs chemicals;
- there has been little attempt in the research related to POPs. The higher learning institutions, non-governmental organizations and public health institutes have not been engaged in any study and research of the effects of POPs chemicals;
- researches on chemicals in the country are mainly conducted by Research Institutions and Colleges targeting specific purposes but still the available facilities are low; and
- basic information on specific chemicals, such as pesticides and other agrochemical are available in the Country; however, such data regarding industrial chemicals are not available. The majority of national data is kept in paper files or with individuals who conducted the survey.

Therefore, based on the preliminary survey concerning the availability of analytical infrastructure to manage POPs, it has been found that Eritrea has very limited capacity to measure POPs in terms of both laboratory capacity as well as trained and skilled staff.

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

Socio-Economic Analysis (SEA) is necessary part of the chemical risk management. SEA is important to predict all necessary preventive measures and perform them on time in order to manage the risk. Socio-economic impact analysis is one of the key components of the complex management process in which risks from environmental contamination by chemicals are identified and assessed. The process includes all stakeholders affected by environmental contamination, since only comprehensive approach in risk management would provide sustainable development.

Currently, Eritrea needs to eliminate obsolete pesticides, PCBs and other POPs. It has taken limited measures to control PCDD/PCDF releases. Thus, the presence of POPs could place the Eritrean population and the environment at potential risk. To date, no comprehensive socio-economic assessment has been done to determine impact of POPs on local populations. There has not been a record that any change in the health of technicians was traced back to any form of exposure to POPs chemicals. Hospitals and public health institutions have not taken any study to prove the presence of POPs in the blood of workers. However, persons who involve as users, dealers, distributors etc... usually tend to avoid the use of appropriate personal protective equipments. Thus, there is high demand for studies dealing with POP chemical exposure, especially among industrial workers and locals who live near industrial areas.

The following assessments related to the socio-economic can be done:

- Store managers handling the pesticide stores are liable to direct exposure of POPs;
- Export of POP and obsolete pesticides for incineration cost is very high (about USD 3300/ton);
- The management and analysis costs related to PCB-containing equipment's, pesticide stockpiles, contaminated soils and site remediation are very high;

- Decommissioned transformers in Denden camp, Tsaeda Christian and Ghedem release PCBs, placing the local population around those places at potential risk;
- Technicians who deal with electrical equipment's without any protective clothing are exposed to skin contact with PCBs;
- Indoor exposure (including heating/cooking) producing PCDDs/PCDFs emissions is likely;
- Fire fighters and industrial workers are directly exposed to POPs such as PFOS, PBDEs and U-POPs;
- There are huge amounts of organic matter accumulated in the dumping sites and thus can be used as compost. Composting is a well-known process, widely applied for the reuse of all kinds of organic wastes in agriculture. This could help to improve the physical, chemical and biological soil properties and thus increase the yield which may positively impact on our food production; and
- Generate income from the recycling of plastic and other materials.

Though there is no reliable data related to the environmental effect of POPs, however pesticides have been contaminating the soil and plants, industrial sewages polluting waters, burning of wastes affecting the atmosphere. Thus, through soil, water and air POPs are absorbed by plants, water and insects that serve as food to birds, fish and mammals and people absorb POPs through foodstuffs, air, water and other means. This requires further investigation and detailed research.

2.3.14 Details for Any Relevant System for the Assessment and Listing of New Chemicals

In Eritrea, though there are no mechanisms based on a systematic approach for the assessment and listing of new chemicals, the Legal Notice on regulation for importation, handling, use, storage and handling and disposal of pesticides (No. 114/2006) includes a list of pesticides. The Legal Notice lists 81 pesticides cleared for import into Eritrea. However, it needs to be reviewed and updated since some of the pesticides in the list are banned, and new, effective and safe pesticides are

currently available in the market. Moreover, the implementation of this Legal Notice on the ground needs to be strengthened. Furthermore, there is an urgent need to establish a system for assessing and listing of new pesticides and chemicals with the collaboration and coordination of all stakeholders.

3. STRATEGIES AND ACTION PLAN ELEMENTS OF THE NATIONALIMPLEMENTATION PLAN

This section describes the policy statement of Eritrea and the implementation strategy of the NIP. The implementation strategy describes the individual action plans or strategies derived based on the current inventory of old and new POPs.

3.1 Policy Statement

This NIP outlines the Eritrea's commitment to addressing the POPs issue, for effective and efficient implementation as well as ensuring that all issues pertinent POPs management (legal, policy and institutional capacity especially) are addressed and integrated into the development process. The NIP will as much as possible be mainstreamed into the National strategic development plans. 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.

3.2 Macro-Economy Policy

As per the Macro economy policies the guidance for commercial and business activities in Eritrea is provided by the Cabinet of Ministries of the State of Eritrea. These policies, altogether with national legislation and international agreements, provide an overall framework for development of Eritrea. At the same time, they help determine priorities for action as the country emerges from prolonged war.

The National Environmental Management Plan-Eritrea (NEMP-E) was developed in accordance with the National Macro-Economic Policy and tries to address the environmental dimensions of the policy. With respect to the service orientation of the economy, proper environmental management is likely to play a critical role. Adequate and competitive levels of services cannot be developed in a deteriorating environment. The services include the development of tourism, insurance, banking, recreational and transit facilities.

Sound environmental management is expected to provide a comparative advantage for the development of the services. Eritrea's economy cannot attract regional climate if the environmental context is neglected and the Eritrean ambiences is dirty, despoiled or squalid. Moreover, the terrestrial environment and coastal zone of Eritrea, together with the sources generated by these natural systems, are highly interconnected. These systems are exploited directly and indirectly by a range of human users.

3.3 Environmental Policy

The main components of the environmental policy relevant to pollution include the following: -

a. Environmental consequences of every intended investment will be studied as a necessary component of the overall feasibility of the venture;
b. Water will be treated as a strategic commodity and its use for domestic, industrial and agricultural purposes will be regulated and measured will be taken to protect water sources from pollution;
c. Efforts will be made to protect the country from environmental hazards that may result from failure or breakdown of industrial establishments;
d. Safety standards will be sat for the various technological establishments;
e. Measures will be taken to safeguard against and fight pollution of the Red Sea in collaboration with the other littoral states;
f. Proper industrial and urban waste disposal system will be established and recycling measures will be taken for maximum utilization and for reduction of environmental consequences; and

3.4 Eritrea's Commitment to the SC

Eritrea has ratified the SC in recognition of the adverse effects of POPs on human and environmental health, both nationally and globally. It has developed its first NIP in 2012 and is currently reviewing and updating the NIP to demonstrate how the country will address the POPs issue and how it will implement the requirements set out under the Convention. The country is convinced on the importance of

undertaking gradual reduction, and where feasible elimination, of emissions and releases of POPs in the country. Subsequent to the ratification of the SC, Eritrea has taken the following steps towards fulfilling its commitments under the Convention and the development of the NIP.

- Establishment of the POPs focal points and National Steering Committee;
- Holding of an Inception Workshop on POPs for high- level commitment;
- Carrying out a preliminary inventory and assessment of POPs chemicals and assessing the national capacity, infrastructure and legal infrastructure to manage POPs chemicals;
- Prioritizing national POPs issues and objectives and developing national action plans in order to address the national POPs issues; and
- Finally carrying out an endorsement workshop of the final document in the presence of all stakeholders.

Eritrea, apart to the Stockholm Convention, is also a party to the Basel Convention, Rotterdam Convention and other international Conventions and thus has been engaged in fulfilling its mandated and obligations related to the managements of POPs, hazardous chemicals and pollution. This reflects Eritrea's commitment to the internationally coordinated environmental and human health protection through the implementation of various action plans. Following upon the abovementioned commitments to SC and other Conventions, Eritrea:

- commits itself towards the implementation international agreements related to environment, hazardous wastes, and chemicals management;
- engrosses the review, update and development of legislative frameworks applicable to the implementation of the SC and other conventions;
- identifies the role and partnership of different stakeholders in the development, review and update of the NIP for SC;
- reinforces the management programs related to infrastructures and strengthens policy instruments related to POPs;
- works to the ultimate reduction or elimination of releases of POPs and other pollutants upon the endorsement of the updated NIP;

- continues its collaboration with the international community in dealing with issues of POPs and other pollutants;
- mainstreams the priorities of the NIP into the national development plans; and
- demands international support to address technical and financial gaps in order to accelerate the implementation of prioritised actions.

3.5 Implementation Strategy

3.5.1 General Overview

The systematic examination of the current status of POPs in Eritrea, on the basis of the available documents and records, is an essential element for taking appropriate measures targeting at the successful implementation of the provisions of the SC.

3.5.2 Gaps and Shortages Identified

The data obtained from the previous NIP and the current preliminary inventory reports identified the following gaps and shortages:

- Lack of reliable data, some institutions don't have proper documentation and others were not able to provide available raw data;
- There are no structured legal and regulatory frameworks focusing on the management of new POPs and new POP containing articles;
- There is lack of institutional and intergovernmental cooperation mechanisms related to POPs;
- Continuous monitoring of POPs is almost absent often due to insufficient financial resources, technical infrastructure and skilled human resources;
- Absence of well-equipped national laboratories that could be used in chemical analysis;
- Lack of precise emissions data and insufficient or lack of on the level of environmental and food contamination by POPs;
- No national health assessment studies are available rendering it more difficult to set national health priorities;
- Low public awareness related to threats caused by POPs;
- Limited published information regarding chemical pollution within the different sectors in the country; and

- Lack of database on imported and used chemicals in the country makes it unfeasible to determine the location of handling and storage of certain hazardous chemicals.

3.5.3 Mandates for implementation of NIP

The mandate for implementation of the NIP remains with the DoE the MoLWE. Therefore, the National Focal Point (NFP) for Stockholm Convention has the overall mandate for the protection of the environment and natural resources conservation. However, all other sectors and ministries will have their own mandates to mainstream respective parts of the NIP into their plans and programmes.

3.5.4 Endorsement of the NIP

NIP development process involved the active participation of different stakeholders, including Ministry of Agriculture, Ministry of Health, Ministry of Trade and Industry, Ministry of Energy and Mines (Eritrean Electric Corporation), Ministry of Finance (Customs), Ministry of Transport and Communication, Ministry of Local Government (Municipality), Eritrean Crop and Livestock Corporation, Red Sea Corporation, Eritrean Standards, Non-Governmental Organisations (NGO's),Higher Learning Institutions and other Research Institutions. The NIP has been reviewed, commented upon and endorsed the pertinent stakeholders presented at the endorsement workshop.

3.5.5 Coordination Mechanism of the Action Plan

The implementation program of the NIP will initialise once the NIP has been approved and the post-NIP project prepared. The DoE of the MoLWE will be the coordinating for the implementation of all facets of the action plan. The National Steering Committee for the Plan will be multi-stakeholder in composition involving relevant ministries of government, private sector, civil society organisations including NGOs. The various sectors in the country including the national and local administrations will be active participants in the implementation of the different activities. National Coordination will look at the macro-management of the NIP in a holistic and integrated manner consistent with national development plans. Each action plan shall have its monitoring and evaluation unit. Financial reporting and

technical evaluation will be used to monitor and evaluate the success of NIP implementation projects.

3.5.6 Criteria and National Priorities Settings

Priorities were identified based on the inventory validation and national priority setting workshops. The priorities were thoroughly discussed among the participants of the workshops and thus the priorities identified are the following:

- Update the existing legislations and draft a new legislation based on the gaps and weaknesses of the existing legal frameworks;
- Strengthening of human and institutional capacity for the management of POPs;
- Promote integrated approach of all concerned institutions and stakeholders on POPs issues;
- Disposal of stockpiles of obsolete pesticides and remediation of contaminated sites;
- Environmentally sound management and disposal of PCBs and PCB containing equipment's;
- Promoting improved technologies and practices to reduce unintentional POPs release;
- Conducting risk assessment of POPs on human health and the environment;
- Carrying out public awareness, sensitization, training and education;
- Effective monitoring, research and development concerning POPs; and
- Mobilizing Human and financial resources for NIP implementation.

The evaluation criteria were employed to screen and prioritise the issues and actions related to the management of POPs. For each priority area, a set of objectives were formulated to better define the proposed activities, and each objective generating a number of actions. Therefore, the priority settings were based on the following criteria:

1. ***Technical feasibility***: how feasible it is to implement the priority area. It describes the availability of human and technical (technology) resources.
2. ***Financial requirements***: examines the financial requirements of the priority area including capital as well as operational and management costs.

3. ***Relevance to the provisions of the Stockholm Convention***: designed to differentiate priority actions that are directly related to the Convention (i.e., the priority area is clearly embedded in one of its Articles) from those that are not.
4. ***Ability to generate socio-economic benefits***: the ability of each priority area to generate socio-economic benefits.
5. ***Urgency:*** describes if the priority area can be immediately implemented or if the priority can wait

Each evaluation criterion obtained 1, 2 or 3 points. The highest obtainable score would then be 15 points (5 criteria, 3 points each), whereas the lowest would be 5. The evaluation criteria are listed in Table19 and already described above in more details to facilitate the priority-setting exercise. To differentiate high priorities from medium and low priorities, the following grading levels were proposed:

1. High Priority- issues that have received a score between 12-15 points
2. Medium Priority- issues that have received a score between 10-12 points,
3. Low Priority- issues that have received a score below 10 points,

Table 19: Evaluation Criteria and Scoring System for Priority Setting

Criteria	**Scores**		
	3	**2**	**1**
1. **Technical feasibility**	Highly Feasible	Moderately Feasible	Poorly Feasible
2. **Financial requirements**	Low	Moderate	High
3. **Relevance to provisions of the SC**	Highly Relevant	Moderately Relevant	Poorly Relevant
4.**Ability to generate socio-economic benefits**	High	Moderate	Low
5. **Urgency**	Very Urgent	Moderately Urgent	Poorly Urgent

Additional criteria including chemical risk, higher amount during the inventory, high exposure to susceptible populations, and low hanging fruit were also further considered in final decision of the priority setting exercise.

3.5.7 Conditionality for Implementing the Updated NIP

The successful implementation of the updated NIP can be realised if the following conditions can be provided:

- Government fund, human resources, logistic and technical support;
- International assistance required as described in the action plan; and
- Effective integration of the different stakeholders

3.6 Activities, Strategies and Action Plans

3.6.1. Activity: Institutional and Regulatory Strengthening Measures

This section outlines strategies and actions to be undertaken by Eritrea, with the view to actualising effective and efficient implementation of the National Implementation Plan as well as ensuring that all identified POPs issues and concerns are addressed and integrated into the national development process. These activities are based on Eritrea's situation, verified in various inventory exercises as well as at the intervention priorities that were determined during the Priority Setting Workshop.

The Updated NIP, with the support of National Council on Environment, will as much as possible be mainstreamed into National Strategic Plans, 2019 - 2025. The tabulated implementation matrix capture information about the status of specific planned activity, responsible institution(s) and stakeholders for implementing this Plan, implementation timeframe, funding mechanism, required assistance (technical, logistic, etc.), performance indicators, detailed attendant costs and potential sources of enabling resources.

The following Measures and Action Plans are covered in the Updated NIP:

- Measures to strengthen the national institutional capacity and the legal framework for POPs management;
- Action Plan for Production, import and export, use, stockpiles, and wastes of Annex A POPs pesticides (Annex A, Part I chemicals);

- Action Plan for Production, import and export, use, stockpiles, and wastes of POPs of Industrial use;
- Measures to reduce releases from unintentional production (Article 5);
- Action Plan for Identification of contaminated sites (Annex A, B, and C Chemicals) and remediation in an Environmentally Sound Manner;
- Action Plan for Facilitating or undertaking information exchange and stakeholder involvement; Measure to increase Public awareness, information and education (Article 10);
- Action Plan for Effectiveness evaluation (Article 16);
- Action Plan for Research, development and monitoring (Article 11); and
- Action plan for Technical and financial assistance (Articles 12 and 13).

The overall objective of the action plan is to update, review and reinforces of the existing and new legislation mechanisms related to POPs chemicals.

The specific objectives of the action plan include:

- Update the existing legislation based on the gaps and weaknesses of existing legal framework;
- Draft new legislation to complement the existing ones and lead to full compliance with SC's requirements;
- Develop mechanisms to reinforce of legal frameworks and strengthening of institutional mechanisms;
- Identify and propose mechanisms to improve the communication among key ministries and stakeholders; and
- Strengthening of technical infrastructures and capacity building for POPs management.

Table 20: Action Plan on Institutional and Regulatory Strengthening Measures

Action Plan and Related Activities	Priority Ranking	Performance Indicator	Responsible Institution/s	Main Stakeholders	Time frame	Budget (in USD)
1.1 Coordination of NIP Implementation • Strengthen the coordination group among the main stakeholders • Continuous fellow up of the different activities of the NIP	2	Coordination group strengthened Follow up conducted	MoLWE	MoA, MoH ECLC, MoTI MoEM (EEC) MoJ, MoTC ESI, MoLG (Municipality) MoF (Customs)	2019 - 2022	20,000
1.2 Strengthening of legislations on POPs chemicals • Review and update of the existing legislative mechanisms of environmental safety related to POPs • Prepare and validate new legislative and regulatory texts to address the problem of entry and management new POPs	1	A comprehensive legal system addressing all aspects of POPs issues legislated	MoLWE MoA	MoJ ECLC MoTI MoH ESI Municipality	2019 - 2022	30,000
1.3 Guidelines and standards related to the management of POPs • Develop standard mechanisms to strengthen the environmental management programs • Reinforce the existing protocols used by the customs office to control the import of pesticides and other	1	Guidelines and standards for POPs chemicals issued Inspection and controlling mechanisms	MoLWE MoA MoTI	MoJ ESI ECLS MoF (Customs) MoH MoEM (EEC) RSC	2019-2023	50,000

industrial chemicals • Implement efficient controlling procedures of illegal entry of POPs • Develop standards and indicators to assess the socioeconomic impacts • Establish guidelines for new POPs wastes management and include the new POPs in the missions/ mandates of concerned institutions		of legal and illegal entry of POPs implemented - Standards for socio-economic assessment developed - New POPs waste management guidelines established		MoTC MoLG (Municipality)		
1.4 Establishing of the institutional framework with clear mandates and coordination mechanisms • Strengthen the existing institutional frameworks by improving the coordination between the DoE and other institutions • Strengthening the capacity building for effective and efficient implementation of the NIP	2	The existing institutional frameworks and capacity strengthened	MoLWE	MoJ MoA MoH MoTI MoLG (Municipality) MoEM MoF (Customs) MoTC	2019 - 2021	30,000
1.5 Strengthening of technical infrastructure for POPs management • Equipping the laboratories in the MoLWE and/or MoA with the appropriate instrumentation required for the analysis of POPs	1	Laboratories equipped with relevant instruments	MoLWE MoA	MoH ESI RSC ECLS MoTI MoE MoMR	2020-2025	2,000,000

• Establishing accredited laboratories at national level • Monitoring and surveillance of potential impacts of new POPs and conducting risk assessment of POPs on human health and environment		Accredited lab established for the analysis of POPs Health and risk impact assessments conducted				
Total budget						**2,130,000**
Source of Fund: Government, multilateral and bilateral donors						

3.6.2. Activity: Measures to Reduce or Eliminate Releases from Intentional Production and Use

In Eritrea there is no intentional production of POP chemicals. However, POPs pesticides and industrial chemicals have been imported for different purposes. The requirements of Article 3 of the SC demands Parties to take legal and administrative measures to reduce or eliminate releases from intentional production and use of POPs. Thus, various measures to reduce or eliminate releases from the intentional use of POPs chemicals are included in other sections of the NIP including section 3.3.1, 3.3.3, 3.3.4, 3.3.5 and 3.3.6.

3.6.3. Activity: Import, Use, Stockpiles and Wastes of Annex-A POP Pesticides (Annex A, Part I Chemicals)

The data from the previous NIP and current inventory disclosed that there is no production and export of Annex A POPs pesticides. However, different types of pesticides have been imported and used in the country. Some of them were considered as obsolete because they are already expired.

The overall goal of this action plan is the elimination of the use, import, stockpiles and wastes of obsolete pesticides.

The specific objectives of the action plan include:

- Develop comprehensive and accurate information data on the use, import, stockpiles and wastes of obsolete pesticides;
- Reinforce the proper management and handling of the existing stockpiles and wastes of pesticides including obsolete ones;
- Institute temporary storage to properly manage the stockpiles and wastes of obsolete pesticides until proper disposal;
- Develop safeguarding strategy for obsolete pesticides and contaminated materials; and
- Asses the health and environmental effects of obsolete pesticides.

Table 21: Action Plan for Use, Stockpiles, Wastes and Release of Annex A POPs Pesticides (Annex A, Part I Chemicals)

Action Plan and Related Activities	Priority Ranking	Performance Indicator	Responsible Institution/s	Main Stakeholders	Time frame	Budget (in USD)
3.1 Develop comprehensive and accurate data base • Conduct annual national inventory on the status of obsolete pesticides (POPs if found) in different pesticide stores found in the country • Develop a data system on the past and exiting import, use, stockpiles and wastes of POPs pesticides	2	Regular annual inventory conducted Comprehensive database for POPs pesticides developed	MoA MoLWE	ECLC MoF (Customs) RSC MoH MoLG MoND Private -dealers State farms	2019-2021	50,000
3.2Proper management and handling of stockpiles and wastes of obsolete pesticides • Implementation of a national sampling and analysis plan for the detection and management of obsolete pesticides • Strengthening of the management and infrastructure of the regulatory body which controls the status of the existing pesticide stores • Develop monitoring and evaluation format and periodic reporting system of the status of the pesticide stores	2	Sampling and analysis plan implemented Management and infrastructure of stores reinforced Periodic evaluation of stores conducted Standard stores built	MoA MoLWE	MoH MoLG MoF (Customs) MoEM RSC MoTI ECLC	2019 - 2025	5,000,000

• Building of standard stores (FAO standard) for the different pesticides at appropriate sites • Develop national strategy for disposal of contaminated empty containers • Procurement of safety equipments (PPE) and thus equip the workers at risk with the equipments • Give training related on the safety and health issues to store managers		in appropriates sites Strategy for disposal of wastes developed Safety equipments procured Several trainings conducted				
3.3 Assessment and monitoring of the health and environmental impacts • Develop a mechanism to regularly monitor the health and environmental effects of pesticides • Conduct environmental impact assessment related to the current status of pesticide stores	1	Monitoring mechanisms developed Environmental impacts assessed	MoLWE MoA	MoH MoTI MoLG MoEM MoLG (Municipality) IHL	2019 - 2022	75,000
3.4 Disposal of stockpiles and wastes • Disposal of the existing 36 tons of obsolete pesticides and their wastes	2	Existing obsolete pesticides disposed	MoA MoLWE	MoLWE ECLC MoH ESI	2019 - 2025	1,000,000

• Conduct regular inspection of the infrastructures which are sources of wastes and contaminations • Carry out training in risk assessment and safe working methods		Regular inspection of sources of wastes assessed Trainings carried out		MoTI MoLG RSC MoF (Customs)		
Total budget						6,125,000
Source of Fund: Government, multilateral and bilateral donors						

3.6.4. Activity: Import, Use, Identification, Labelling, Removal, Storage, Release and Disposal of PCBs and Equipment containing PCBs (Annex A, Part II chemicals)

Based on the current inventory and information obtained from Eritrean Electric Corporation (EEC) there are power transformers and capacitors which contain PCBs. The PCB - containing transformers and capacitor in the country are about 376 and 240 respectively. Even though, the amount of PCB oils in the transformers and capacitors are estimated to be about 45 tons, there is lack of adequate data on PCB and the existence of significant PCB releases from the use, stockpiles and wastes. Therefore, comprehensive inventory and additional assessment are required on the PCB-containing electrical equipment's in the country.

The overall objective of this action plan is reduction and ultimate elimination of PCBs releases into the environment from PCB use, stockpiles and wastes.

The specific objectives of the action plan include:

- Prohibit the import and use of PCBs and PCB containing articles;
- Develop safe management of PCB containing equipment's;
- Promote measures to reduce exposure to human health and the environment from PCBs releases;
- Identify and safeguard of equipment's containing PCBs; and
- Develop a plan on the safe disposal and replacement of all PCBs and PCB containing equipment's.

Table 22: Action Plan on Import, Use, Identification, Labelling, Removal, Storage, Release and Disposal of PCBs and Equipment containing PCBs (Annex A, Part II chemicals)

Action Plan and Related Activities	Priority Ranking	Performance Indicator	Responsible Institution/s	Main Stakeholders	Time frame	Budget(in USD)
4.1Conduct comprehensive inventory and analyses of PCBs • Review and update the preliminary data on the existing import, use, stockpiles and wastes of PCBs • Conduct in-depth inventory and labelling of PCBs, PCBs containing equipment and wastes • Conduct analyses on PCBs found in equipments and establish database of the analyses results	2	Data on PCBs reviewed and updated Inventory on status of PCBs conducted Sample analyses conducted	MoLEW MoEM (EEC)	MoL MoTI MoF (Customs) MoLG (Municipality) ESI MoLHW MoND	2019 - 2022	150,000
4.2 Proper management of PCBs in use, stockpiles and wastes • Reinforce sound management of PCBs and PCB containing transformers and capacitors • Further assessment of the old transformers and capacitors that contain PCB oils and thus safeguard the articles	1	Management of PCBs reinforced Instruments were further assessed Central collection	MoLWE MoEM (EEC)	MoH MoLG (Municipality) MoND RSC MoTI ESI MoND MoF	2019 - 2025	1,500,000

• Arrange appropriate central collection store for old and decommissioned transformers and place warning notices near PCB containing equipment's • Provide training to personnel involved in handling and managing of equipment's with PCBs		store arranged Trainings conducted		(Customs) Local Administrations		
4.3 Disposal and Phasing out of PCBs in Use • Develop procedures for removal of PCBs from equipment's in use and transfer to temporary storages until proper disposal • Develop environmentally sound disposal of PCBs and PCB containing transformers and capacitors • Planning and organizing the phase out and replacement of electric equipment's with PCBs	2	Removal of PCBs from equipment's conducted PCBs and their articles disposed Replacement of electric equipment's conducted	MoLWE EEC	MoEM MoTI RSC MoLG (Municipality) MoH MoLHW MoND MoF (Customs) Public sectors	2020-2028	5,000,000
Total budget						**6,650,000**
Source of Fund: Government, multilateral and bilateral donors						

3.6.5. Activity: Production, Import and Export, Use, Stockpiles, Wastes and Release of DDT (Annex B chemicals)

In Eritrea, currently there is no production, use, import or export of DDT and the inventory report shows the absence of stockpiles and wastes of DDT in the country. Therefore, an action plan related to this activity has not been developed. However, similar to the Annex A pesticides, DDT can be included if this activity is undertaken.

3.6.6. Activity: Production, Import and Export, Use, Stockpiles, and Wastes of Industrial POPs

This activity involves the import, use and stockpiles and wastes of the new POPs associated to PBDEs, PFOS and related compounds and thus this information is reported for the first time. Currently, though there is no export of industrial POPs, there has been importation and use of industrial chemicals and articles containing the new POPs.

The overall objective of this action plan is to control the use and eventual release, to the environment, of the newly listed industrial POPs including PBDEs, PFOS and related compounds.

The specific objectives include:

- Conduct a comprehensive national inventory and assessment of the status of the new industrial POPs;
- Reinforce the management and disposal of the existing articles containing the new industrial POPs; and
- Prohibit the importation of articles containing the new industrial POPs.

Table 23: Action Plan on the Import, Use, Stockpiles, and Wastes of Industrial POPs

Action Plan and Related Activities	Priority Ranking	Performance Indicator	Responsible Institution/s	Main Stakeholders	Time frame	Budget (in USD)
6.1 National inventory and assessment of the status of the new industrial POPs • Conduct a comprehensive inventory of the new POPs in different articles found in different industrial sectors • Conduct in-depth inventory of computers and other CRTs in different government and private sectors • Identify and thus label the equipment's or store rooms according to the type of the new POPs present	2	Inventory of industrial POPs conducted In-depth Inventory of computers and CRTs conducted Equipment's and stores identified and labelled	MoLWE MoTI	MoEM MoA MoH MoE IHL MoND MoLG MoTC MoF RSC Chamber of Commerce	2019 - 2022	75,000
6.2 Management and disposal of the existing articles containing the new industrial POPs • Periodically monitoring of industrial stores and implement management practices related to the new POPs • Develop an operational guideline for the management of e-wastes • Export currently stored old computes and other CRTs for recycling	2	•Stores periodically monitored •Guideline for e-wastes developed •Old computers and CRTs disposed	MoLWE MoTI MoTC	MoEM RSC MoTI MoH MoF (Customs) MoLG	2020-2025	2,000,000

• Safeguarding of the fire-fighting foams, containing PFOS, found in different sectors and industries • Take appropriate measures to the old decommissioned vehicles found in different places of the country • Assess the health status related to the effect of POPs in people dealing with POPs in their daily life		•Fire-fighting foams with PFOS safeguarded •Old vehicles managed •Health status assessed		(Municipality) Chamber of Commerce All other ministries		
6.3. Prohibition of importation of articles containing the new POPS • Prohibit the importation of articles consisting of industrials POPs except the exempted by the convention • Adopt rigorous regulations on the goods imported and prohibit the importation of electronic products and vehicles that are manufactured before 2004 • Restrict use of fire-fighting foams containing PFOS and related substances	1	Importation of articles containing POPs prohibited Importation regulations developed Use of firefighting foams restricted	MoLWE MoTI MoTC	MoEM (Municipality) RSC MoF (Customs) Chamber of Commerce	2019-2022	20,000
Total budget						**2,095,000**
Source of Fund: Government, multilateral and bilateral donors						

3.6.7. Activity: Register for Specific Exemptions and the Continuing Need for Exemptions

Eritrea did not register any exemptions to Annex A and Annex B chemicals, and may likely do so in the future. Therefore, no action plan has been developed to address this issue under Article 4 of the SC. This Activity will be elaborated in the future if Eritrea files for exemption.

3.6.8. Activity: Measures to Reduce Releases from Unintentional Production (Article 5)

According to the current inventory, the identified major sources of U-POPs in Eritrea include waste incineration, heat and power generation, transportation, open burning processes, and production and use of chemicals and consumer goods. The total U-POPs annual release in 2017 from the major source categories was about 562.3 gTEQ, with open burning processes being the major source contributing about234.6gTEQ/annum. Mostly, the dumpsites in the country are uncontrolled and there are no appropriately built landfills. Frequent and random burning of solid wastes observed in the dump-fills are becoming the major sources of releases dioxins and furans.

The overall objective of this activity is to take appropriate actions to reduce the unintentional releases of PCDD/PCDF, HCB and PCBs formed as a by-product of different unintentional processes.

The specific objectives of this activity are the following:

- Update and characterisation of the national sources of unintentional production of PCDD/PCDF, HCB and PCBs and their releases;
- Develop data management system for the different sources of U-POPs;
- Develop and apply a mechanism to monitor the releases of U-POPs;
- Find out substitutes or modified materials, products and processes in order to reduce/eliminate emissions from uncontrolled combustion; and
- Promote the adoption of best available techniques (BAT) and best environmental practices (BEP).

Table 24: Action Plan on Measures to Reduce Releases from Unintentional Production (Article 5)

Action Plan and Related Activities	Priority Ranking	Performance Indicator	Responsible Institution/s	Main Stakeholders	Time frame	Budget (in USD)
8.1. Inventory and complete assessment of U-POPs • Update and review the current data on U-POPs and identify data and information gaps regularly • Keeping and maintaining records of waste generated, treatment and disposal methodologies at each dumping site • Develop strategies for periodic inventory to review and update of each source category of U-POPs • Conduct comprehensive survey to identify sites of production of textile and leather using chlorinated dyes	2	Data on U-POPs updated Records of wastes in all dumping sites monitored Periodic inventory of U-POPs conducted Textiles and leather productions surveyed	MoLWE MoLG (Municipality)	MoTC MoA MoH MoTI MoEM (EEC) MoND IHL	2019-2022	75,000
8.2. Management and strategies to reduce releases • Strengthening the national waste management mechanisms • Restrict and regulate open burning activities occurring at different localities	1	Waste management strengthened Open burning regulated BAT and BEP	MoLWE MoTI MoLG (Municipality)	MoTC MoEM RSC EEC MoF (Customs)	2019 - 2025	3,000,000

• Implement the Best Available Technology (BAT) and Best Environmental Practices (BEP) strategies for elimination/reduction of the emission of U-POPs • Developing proper methodologies on the segregation of the solid wastes during collection and afterwards • Management of PVC plastic wastes and thus promote recycling procedures • Proper disposal of bottom ashes and residues resulted from the incineration • Ensuring health and safety for workers in potentially high emission facilities • Strengthen the regular control measures on the importation of lead free fuels and minimise the importation of illegal petroleum in the country		practices implemented • Solid wastes segregated • Plastic wastes managed/recycled • Incineration by-products disposed • Health and Safety of workers ensured • Importation of leaded fuels controlled		MoH MoLHW MoI MoND		
8.3. Develop the infrastructure facilities • Improve the status of all the dump sites in the country • Select appropriate sites and thus build standard land-fills • Asses the status of all medical waste incinerators, purchase additional ones and make them work efficiently.	2	• Status of dump-sites improved • Proper land-fills built • All incinerators assessed and new ones purchased	MoLWE MoTI MoH	MoLC MoEM MoLG (Municipality) RSC MoTI	2020 - 2025	5,000,000

• Promote environmentally sound management of medical wastes by building appropriate sites • Provide alternatives to incinerations like sterilization, microwave treatment, alkaline hydrolysis, or biological treatment, each followed by land-filling		• Medical wastes properly managed • Alternatives to incinerations delivered		MoEM (EEC) MoF (Customs)		
Total budget						**8,075,000**
Source of Fund: Government, multilateral and bilateral donors						

3.6.9. Activity: Measures to Reduce Releases from Stockpiles and Wastes (Article 6)

This activity involves the identification and management of the release from stockpiles and wastes of Annex A and B of POPs chemicals in Eritrea. Therefore, actions needed to reduce releases from stockpiles and wastes of POPs pesticides, and PCBs from transformers, substations and other potential sites have been assessed. Moreover, according to Article 6 of the SC, wastes sites contaminated with chemicals listed in Annex C are also incorporated. Thus, action plans that address releases from stockpiles and wastes for each of these groups of POPs chemicals are already provided under sections 3.3.3, 3.3.4 and 3.3.5.

3.6.10. Activity: Identification of Stockpiles, Articles in Use and Wastes

Actions essential for identifying stockpiles, articles in use and wastes of POPs pesticides, and PCBs are already encompassed under sections 3.3.4 and 3.3.5 respectively.

3.6.11. Activity: Manage Stockpiles and Appropriate Measures for Handling and Disposal of Articles in Use

Activities required in the management of identified stockpiles of POPs pesticides and PCBs and the appropriate handling and disposal of articles in use are addressed under sections 3.3.4 and 3.3.5.

3.6.12. Activity: Identification of Contaminated Sites and Remediation

The current inventory identified about 27 contaminated sites related to pesticides and agrochemicals. Analysis of few contaminated sites was done and there is no confirmation if the contamination is due to POP pesticides, obsolete pesticides or other chemicals. Besides, little attempts have been taken in the managements of the identified contaminated sites. According the demands of Article 6 of the SC, appropriate strategies for identifying status of the sites contaminated by POPs chemicals and undertaking remediation of contaminated sites in an environmentally sound manner are of paramount importance.

Therefore, an action plan is proposed to address the gaps and problems identified. Thus, the overall objective of the action plan is to properly identify all the contaminated sites in the country, manage and ultimately remediate the contaminated sites .

The specific objectives of this action plan include:

- Conduct further inventory to identify and asses the status of all the contaminated sites by POPs chemicals;
- Analyse and categorise the contaminated site based on the presence or absence of POPs chemicals;
- Promote proper management and safeguarding procedure to the contaminated sites of interest; and
- Remediation and disposal of contaminated sites by POPs chemicals phase by phase.

Table 25: Action Plan on Identification of Contaminated Sites and Remediation

Action Plan and Related Activities	Priority Ranking	Performance Indicator	Responsible Institution/s	Main Stakeholders	Time frame	Budget (in USD)
12.1. Inventory to identify and assess contaminated sites • Conduct in-depth inventory and assessments of the contaminated sites related to POP pesticides, PCBs and other chemicals • Undergo qualitative and quantitative analysis of POPs chemicals related to the contaminated sites • Secure and label the different categories of contaminated sites	2	•In-depth inventory of contaminated sites conducted • Status of POPs in contaminated sites analysed • Contaminated sites properly secured and labelled	MoLEW MoA MoEM (EEC)	MoH ECSL ESI MoTI MoLG (Municipality)	2019 - 2022	100,000
12.2.Safeguarding and remediation programs • Undertake risk assessment of contaminated sites and prioritise sites for clean-up. • Upgrade the human capacity by giving relevant trainings related to safeguarding and disposal of contaminated sites	1	Risk assessments undertaken Training on human capacity given	MoLWE MoA	ECSL MoEM (EEC) MoTI MoH MoLG(Municipality)	2019-2025	2,000,000

• Develop and implement an appropriate remediation plan to the identified contaminated sites • Carry out disposal of contaminated sites according the recommended remediation plan		Remediation program undertaken Disposal of contaminates sites carried out				
Total budget						**2,100,000**
Source of Fund: Government, multilateral and bilateral donors						

3.6.13. Activity: Facilitating or Undertaking Information Exchange and Stakeholder Involvement

The Stockholm Convention puts an obligation on parties of the Convention to facilitate or undertake the exchange of information related to the reduction or elimination of the production, use and release of POPs, alternatives to POPs, health and environmental risks, socioeconomic impacts of POPs. Eritrea has ratified to the Stockholm Convention and endorsed its first NIP in 2012, and thus has been sharing information with other countries and the Secretariat. These activities will also continue to remain on the updates related to the newly added POPs. The overall goal of the action plan is to facilitate and undertake relevant information exchange systems at national and international levels.

The specific objectives of the action plan include:

- Create a national focal point, with properly defined mandates, that centralises the exchange of information on POPs chemicals both locally and internationally; and
- Create coordination mechanism among the stakeholders on the information about the new POPs managements and implementation of the NIP.

3.6.14. Activity: Public Awareness, Information and Education (Article 10)

In Eritrea, the level of awareness and information about POPs among decision makers, institutions, and the general public has been low. Therefore, there is a great demand of public awareness programs in order to inform and educate the different sectors of the society about the health and environmental effects related to POPs. The country, according Article 10 of the Convention, is required to promote and facilitate public information, awareness and education about POPs chemicals.

The overall objective of this activity is to progressively rise in the level of knowledge and consciousness about the issue of POPs in different levels of the society.

The specific objectives of this activity include:

- Conduct an assessment on the current status of public awareness related to POPs;
- Promote national programme on information exchange and communication among the different sectors of the community; and
- conduct training and education to promote public awareness related to the different categories of POPs.

Table 26: Action Plan on Public Awareness, Information and Education (Article 10)

Action Plan and Related Activities	Priority Ranking	Performance Indicator	Responsible Institution/s	Main Stakeholders	Time frame	Budget (in USD)
14.1. Assessment on status of public awareness • Conduct a national assessment on the status of the current public awareness related to the emissions, health and environmental effects caused by the different categories of POPs • Identify and update, among the general public, the list of main target groups at risk	2	Current public awareness assessed Main targets identified	MoLEW MoA MoH	MoEM MoE MoTI MoI MoLG MoMF MoLG (Municipality)	2019 - 2022	20,000
14.2. Promote national programme of Information and Communication • Create coordination mechanism with stakeholders on the awareness about risks related to new POPs • Sensitising of decision makers on the best management practices needed to reduce emissions of POPs	2	Coordination mechanisms created Policy makers sensitised	MoLWE MoI	MoE MoH MoTI MoLG (Municipality) Chamber of Commerce All ministries	2019-2022	20,000

14.3. Conducting training and education on public awareness • Conduct training activities by preparing informative material or use ready material for information dissemination at different levels • Publication of research data of new POPs to increase the public awareness • Popularise green technologies and increase tree planting in order to curtail deforestation; • Creating public awareness on electronic waste and the hazards posed by unsafe disposal and open burning of solid wastes • Draft a curriculum to introduce toxic chemicals and environment related subjects in primary, secondary and higher learning institutions • Conduct a comprehensive awareness to the main stakeholders on the existence, consequences as well as management of PBDEs and PFOS	2	Training conducted and Informative materials distributed Research articles published Green technology popularised Awareness on e-wastes and open burning created Curriculum developed Awareness programs to stakeholders arranged	MoLWE	MoA MoEM MoE MoTI MoI MoLG (Municipality) Public sectors	2019-2022	150,000
Total budget						**190,000**
Source of Fund: Government, multilateral and bilateral donors						

3.6.15. Activity: Effectiveness of Evaluation (Article 16)

According to Article 16 of the Convention, Eritrea 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. The action plan can be developed based on the request of the secretariat for collaboration and research related to the effectiveness of evaluation.

3.6.16. Activity: Reporting (Article 15)

According to Article 15 Parties, Eritrea is required to report periodically on the measures taken, and on their effectiveness in meeting the objectives of the Convention to the Secretariat. The country will use the webinars access on reporting and training provided by the secretariat to all Parties in fulfilling their reporting obligation.

The overall objective of this action plan is to produce and share information related to the obligation of the country under the Stockholm Convention.

The specific objectives of this activity include:

- Reinforce a national system of information exchange on POPs chemicals;
- Establish and put into practice a mechanism for periodic updating and review of the NIP to the CoP as required; and
- To put in place, the mechanism for implementation of the NIP.

Table 27: Action Plan on Reporting (Article 15)

Action Plan and Related Activities	Priority Ranking	Performance Indicator	Responsible Institution/s	Main Stakeholders	Time frame	Budget (in USD)
16.1 Develop information exchange on POPs chemicals	2	Information exchange developed	MoLEW	MoA, MoTI, MoH	2019-2022	20,000
16.2 Conduct periodic updating and review of the NIP to the CoP as required	1	Updating and review conducted	MoLWE	MoA, MoTI, MoH	2019-2025	20,000
16.3 Implementation of the NIP	1	NIP implemented	MoLWE	MoA, MoTI, MoH	2019-2025	20,000
Total budget						**60,000**
Source of Fund: Government, multilateral and bilateral donors						

3.6.17. Activity: Research, Development and Monitoring (Article 11)

In Eritrea, there has been insufficient data on the different sources and releases of POPs. Moreover, there were no systematic monitoring mechanisms of the levels of POPs in humans and the environment, and their socio-economic impacts. According to Article 11 of the Convention, Parties are required to encourage and/or undertake research, development and monitoring activities pertaining to POPs. The research related to finding out of alternatives to pesticides from plant origins and/or animal wastes are not yet fully exhausted. Moreover, the use of certain chemicals like DDT for vector control are still permitted but currently the vectors have developed resistance to DDT and thus finding better alternatives to DDT are mandatory.

The overall objective of this action plan is to minimize and ultimately eradicate the negative impacts of POPs chemicals by systematically monitoring their sources, levels in human and the environment and impacts and by making available the alternatives

The specific objectives of the action plan include:

- Undergo screening of the release from sources and wastes containing old and POPs in the environment;
- Establish the presence and levels of POPs in human and the environment and thus Establish the health, environment and socio-economic impacts of POPs; and
- Promote of alternatives to POPs from natural sources.

Table 28: Action Plan on Research, development and monitoring (Article 11)

Action Plan and Related Activities	Priority Ranking	Performance Indicator	Responsible Institution/s	Main Stakeholders	Time frame	Budget (in USD)
17.1 Conduct continuous studies on sources and releases of POPs • Promote locally adapted methods for ecologically rational elimination of POPs and their sources	2	Elimination methods promoted	MoLEW	MoE MoTI MoA MoH IHL	2019-2022	30,000
17.2Research on presence and levels of POPs in human and the environment • Conduct compressive studies related to the levels of POPs in human and environmental effects	1	Studies on levels of POPs conducted	MoLWE	MoE MoTI MoA MoH IHL ESI	2019-2025	75,000
17.3 Research related to POPs alternatives • Promote research activities related to plant based bio-pesticides as viable, eco-friendly, bio-degradable alternatives to POPs pesticides • Conduct research in the higher learning institutions related to the various areas of POPs	2	Research related to pesticide alternatives promoted Research related to various POPs conducted	MoLWE	MoE MoTI MoA MoH IHL MoLG	2019-2025	100,000
Total budget						**205,000**
Source of Fund: Government, multilateral and bilateral donors						

3.6.18. Activity: Technical and Financial Assistance

Eritrea is one of the low income countries and has been going through various economic challenges and thus lacks the financial and technical capacity to successfully implement its NIP and thereby fulfil its obligation under the SC. Technical and financial assistance are required, especially for the development of institutional capacities, management and monitoring of the different POPs, establishment of research laboratory, training and human capacity building, awareness and information technology and other activities.

The overall objective of this action plan is to secure technical and financial assistance required for the successful accomplishments of the implementation of the action plans contained in this NIP and the country's commitment to the Convention.

The specific objectives of this activity include:

- Assess the technical and financial assistance needs for each term - short, mid and long term;
- Find out potential sources of financial and technical assistance; and
- Draft a project document for technical and financial assistance and submit requests of the project support to potential donors.

Table 29: Action Plan on Technical and Financial Assistance

Action Plan and Related Activities	Priority Ranking	Performance Indicator	Responsible Institution/s	Main Stakeholders	Time frame	Budget (in USD)
18.1 Assess the technical and financial assistance	1	Assistance assessed	MoLWE MoA, MoTI MoEM	MoF, MoND, NGO's	2018 - 2020	10,000
18.2 Find potential sources of financial and technical assistance	1	Potential sources identified	MoLWE MoA, MoTI MoEM	MoF, MoND, NGO's	2018 - 2020	10,000
18.3 Draft a project document for technical and financial assistance	1	Project document drafted	MoLWE MoA, MoTI MoEM	MoF, MoND, NGO's	2018 - 2020	20,000
Total budget						40,000
Source of Fund: Government, multilateral and bilateral donors						

3.7 Timetable for NIP Implementation

The estimated timeframes required for the implementation of the individual action plans are described from Table 20 up to Table 29. Accordingly, the implementation strategies are divided into short term (2-3 years), medium term (4-5 years) and long term (> 5 years).For some part of the implementation plans, Eritrea anticipates funding from international organisations and thus the time frames depend largely on approved projects based on the availability of funding.

3.8 Resource Requirements

As listed in Table 20 up to Table 29 of Section 3.3, the total fund required to implement the updated NIP amounted to a net present value of about **27,670,000**USD when not subject to a discount rate of any sort. This amount is based on cost assessment of individual action plans and strategies described. This is not only to eliminate the POPs quantities found in the inventory but also to modernize the industry in order to reduce and/or eliminate their non-intentional releases. It is important to note that not all tasks were given estimated costs where cost will have to be determined as some of them and others have no direct cost. In conclusion, Eritrea does not have sufficient financial resources to implement the foreseen activities. Therefore, financial support from different international organizations and bodies of the Stockholm Convention is expected once the updated NIP is endorsed. Besides, for the effective implementation of the NIP: strong institutions and capacities to coordinate NIP implementation; harmonisation of regulations concerning hazardous substances and hazardous wastes management particularly related to POPs; active participation of all relevant stakeholders; and effective enforcements of laws related to POPs are mandatory.

Appendix

1. National project-executing organization

Department of Environment of the Ministry of Land, Water and Environment, Director General of the Department of Environment (GEF Focal Point), Mr. Mogos Woldeyohannes and Director of Environmental Assessment and Studies, Mr. Kibrom Asmerom

2. Project coordination and task teams

The Bureau of Standards and Evaluation (BS & E) coordinated the consultancy work by involving different local experts and established task teams with the assistance of the Department of Environment

2.1 Local Consultants:

Dr. Mussie Sium, Coordinator, EIT
Mr. Okbagaber Andom, HAC
Mr. Daniel Brhane, HAC

2.2 Members of the Task Teams:

Eng. Teame Tekleab, MoLWE (DoE) (Mr)
Mr. Aman Saleh, MoLWE (DoE)
Mr. Berhane Kidane, MoTI
Ms. Leula Mekonen, MoA
Mr. Daniel Semere, MoJ
Eng. Asmait Hadish, MoJ (Ms)
Mr. Ferah Hassen, MoEM (EEC)
Mr. Tekle Berhane, MoH
Eng.Timnit Ghirmai, ESI (Mrs)