National Implementation Plan (NIP) Update for the Stockholm Convention on Persistent Organic Pollutants (POPs) for Belize

January 2019

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Prepared on behalf of:

The Government of Belize
Ministry of Agriculture, Fisheries, Forestry, the Environment and Sustainable Development, Department of the Environment in fulfilment of its obligations under the Stockholm Convention

and

The Basel Convention Regional Centre for Training and Technology Transfer for the Caribbean Region (BCRC-Caribbean)

Acknowledgements

The Caribbean Public Health Agency, the consultant under the Global Environment Facility (GEF) funded consultancy assignment – "GEF 5558 Update of National Implementation Plans (NIPs) including Persistent Organic Pollutants (POPs) Inventories and Related Capacity Development for Eight (8) Caribbean Countries" - would like to acknowledge the implementing agency, the United Nations Industrial Development Organisation (UNIDO) and the executing agency the Basel Convention Regional Centre for Training and Technology Transfer for the Caribbean (BCRC-Caribbean) for the support provided in the execution of the Persistent Organic Pollutants (POPs) inventory in Belize. The contributions of the Department of Environment of the Government of Belize and the GEF 5558 Project Working Committee are recognised. The contributions of all other agencies and stakeholders that provided information during the consultations that guided the NIP update process on POPs in Belize are recognised and acknowledged.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS AND ACRONYMS

AFFF	Aqueous Film-Forming Foams
AGM	Attorney General's Ministry
ALIDES	Central American Alliance for Sustainable Development
Alpha-HCH	Alpha-hexachlorocyclohexane
APC	Abatement Pollution Control System
APCS	Air Pollution Control System
AR-AFFF	Alcohol-resistant aqueous film-forming foams
AR-FFFP	Alcohol-resistant film-forming fluoroprotein foams
ASYCUDA	Automated System for Customs Data
BAHA	Belize Agricultural Health Authority
BAPCOL	Blair Athol Power Company Limited
BASEL	Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal
BAT	Best Available Techniques
BCRC- Caribbean	Basel Convention Regional Centre for Training and Technology Transfer for the Caribbean Region
BCWMP	Belize Chemicals and Waste Management Project
BDF	Belize Defence Force
BEB	Belize Electricity Board
BECOL	Belize Electric Company Ltd
BEL	Belize Electricity Limited
BELCOGEN	Belize Co-Generation Energy Limited
BEP	Best environmental practices
Beta-HCH	Beta-hexachlorocyclohexane
BNE	Belize Natural Energy
BPT	Best Practical Treatment
BRS	Basel Rotterdam Stockholm
BSI	Belize Sugar Industry Limited
BSWaMA	Belize Solid Waste Management Authority
BVWB	Benque Viejo Western Border
BWC	Belize Waste Control
BWSL	Belize Water Services Limited
c-decaBDE	Commercial decabromodiphenyl ether
c-pentaBDE	Commercial pentabrominated diphenyl ether
CARDI	Caribbean Agricultural Research and Development Institute
CARICOM	Caribbean Community
CARPHA	Caribbean Public Health Agency

CBD	Caribbean Development Bank
CDEMA	Caribbean Disaster Emergency Management Agency
CDM	Comprehensive Disaster Management
CEHP	Caribbean EcoHealth Programme
CFE	Comisión Federal de Electricidad (Mexico)
CIL	Central Investigation Laboratory
CITES	Convention on International Trade of Endangered Species
COP	Conference of Parties
CP	Chlorinated Paraffins
CROSQ	CARICOM Regional Organization for Standards and Quality
CRT	Cathode ray tube
CSO	Central Statistical Office
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
DecaBDE	Decabrominated diphenyl ether
DOE	Department of the Environment
ECP	Environmental Compliance Plan
EEE	Electrical and electronic equipment
EIA	Environmental Impact Assessments
ELV	End-of-life vehicle
EPA	Environmental Protection Act
EPS	Expanded polystyrene
ESM	Environmentally Sound Management
FAO	Food and Agricultural Organization
FFFP	Film-forming fluoroprotein foams
FLPC	Farmer’s Light Plant Cooperation
GDP	Gross Domestic Product
GEF	Global Environment Facility
GOB	Government of Belize
HBB	Hexabromobiphenyl
HBCD	Hexabromocyclododecane
HCB	Hexachlorobenzene
HCBD	Hexachlorobutadiene
HCH	Hexachlorocyclohexane
HDI	Human Development Index
HeptaBDE	Heptabrominated diphenyl ether
HexaBDE	Hexabromodiphenyl ether
HHPs	Hazardous Household Products

HRR	Hazard Risk Reduction
IARC	International Agency for Research on Cancer
ICM	Integrated Chemical Management
IFCS	Intergovernmental Forum on Chemical Safety
IICA	Inter-American Institute for Cooperation on Agriculture
IPCS	International Programme on Chemical Safety
IPM	Integrated Pest Management
IVM	Integrated Vector Management
KHMH	Karl Heusner Memorial Hospital
LIC	Land Information Center
LPG	Liquified Petroleum Gas
MAF	Ministry of Agriculture and Fisheries
MAFFESD	Department within the Ministry of Agriculture, Forestry, Fisheries, the Environment and Sustainable Development
MEA	Multilateral environmental agreement
MOA	Ministry of Agriculture
MOE	Ministry of Environment
MOH	Ministry of Health
MOW	Ministry of Works
MSDS	Material Safety Data Sheet
MSW	Municipal solid waste
MW	Megawatts
NEMO	National Emergency Management Organization
NFS	National Fire Service
NGO	Non-governmental organization
NIP	National Implementation Plan
NIWRA	National Integrated Water Resource Authority
NPC	National Project Coordinator
NRMS	National Malaria Eradication Service
NSWMA	National Solid Waste Management Authority
OIRSA	Inter-Regional Organization for Plant and Animal Health
OPs	Organophosphate pesticides
OSH	Occupational Safety and Health Administration
OSPESCA	Central America Fisheries and Aquaculture Organization
PA	Polyacryl
PAHO	Pan American Health Institute
PAHs	Polyaromatic Hydrocarbons
PBB	Polybrominated Biphenyl
PBDE	Polybrominated diphenyl ether

PCA	Pesticides Control Act
PCBd	Pesticides Control Board
PCBs	Polychlorinated biphenyls
PCDDs	Polychlorinated dibenzo-p-dioxins
PCDFs	Polychlorinated dibenzofurans
PCNs	Polychlorinated naphtalenes
PCP	Pentachlorophenol
PCT	Polychlorinated Terphenyls
PeCB	Pentachlorobenzene
PentaBDE	Pentabrominated diphenyl ether
PFAS	Per- and polyfluoroalkyl substances
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctane sulfonic acid
PFOSF	Perfluorooctane sulfonyl fluoride
PGIA	Phillip Goldston International Airport
PHA	Public Health Act
PHB	Public Health Bureau
PIC	Prior Informed Consent
PMU	Project Management Unit
POP-BFR	Persistent organic pollutant-brominated flame retardant
POP-PBDE	Persistent organic pollutant- polybrominated diphenyl ether
POPs	Persistent Organic Pollutants
PPP	Polluter Pays Principle
PUR	Polyurethane
PVC	Poly Vinyl Chloride
PWC	Project Working Committee
RUP	Restricted Use Pesticides
SAICM	Strategic Approach to International Chemical Management
SC	Stockholm Convention
SCCPs	Short-chain chlorinated paraffins
SDG	Sustainable Development Goal
SEA	Socio-economic assessment
SENB	Santa Elena Northern Border
SFLP	Spanish Look out Farmers Light Plant
SIB	Statistical Institute of Belize
SICA	Central American Integration System
SIDS	Small Island Developing State
SIMIS	Sugar Industry Management Information System
SIRDI	Sugar Industry Research & Development Institute

SSB	Social Security Board
SSEL	S.S. Energy Ltd.
SWaMA	Solid Waste Management Authority
TEQ	Toxic Equivalence
TetraBDE	Tetrabrominated diphenyl ether
TV	Television
UB	University of Belize
UN	United Nations
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
UPOPs	Unintentional persistent organic pollutants
USA	United States of America
VCU	Vector Control Unit
WEEE	Waste electrical and electronic equipment
WHO	World Health Organization
WTO	World Trade Organization
XPS	Extruded polystyrene

EXECUTIVE SUMMARY

Persistent Organic Pollutants (POPs) are chemical substances that persist in the environment, bioaccumulate through the food chain, and cause adverse effects to human health and the environment. These POPs not only pose threats to the regions in which they are produced and used, but they also threaten other regions where they have never been used or produced as they are transported via air and water, posing an even greater threat to the global population and environment.

The Stockholm Convention on POPs was developed out of an international awareness that POPs posed major and increasing threats to human health and the environment, and an international commitment to take measures to protect human health and the environment. The Convention was adopted and opened for signature in May 2001 in Stockholm. This convention marked the third Multilateral Environmental Agreement (MEA) to address chemicals management, following the Basel Convention on the Transboundary Movement of Hazardous Chemical Waste and the Rotterdam Prior Informed Consent (PIC) Convention. Currently there are 28 POPs (16 of which have been added up until 2017) covered by the Convention. The current National Implementation Plan (NIP) update does not address POPs newly listed in 2017 (short-chain chlorinated paraffins-SCCP and Decabrominated diphenyl ether-DecaBDE). The goal of the Stockholm Convention is to provide the necessary technical and financial resources to assist Parties to take measures to eliminate or reduce releases and to prevent and minimize adverse effects on human health and the environment.

Recognizing that:

1. POPs pose major and increasing threats to human health and the environment in Belize;
2. Belize is a Small Island Developing State (SIDS) that does not produce any of the group of POPs chemicals under control by the Stockholm Convention and may be unintentionally producing POPs;
3. Belize may be using POPs and chemicals of this nature and products/equipment containing POPs;

Belize signed the Convention on May 14, 2002 and ratified it on January 25, 2010 and it later came into force (legal effect) on April 15, 2010. In 2008 the Government of Belize, as part of its obligations under the Stockholm Convention developed a NIP. The NIP demonstrated how the convention would be implemented in Belize and outlined priorities, actions and strategies to improve the management of POPs in the country. Another obligation under the Stockholm Convention (Article 7) is that Parties shall review and update their NIPs to evaluate the effectiveness of the action plans and strategies in the first NIP, toward improvement of the management of POPs.

The NIP update in Belize was part of the GEF #5558 project for the Development and Implementation of a Sustainable Management Mechanism for POPs in the Caribbean, to advance the commitments of participating States to the Stockholm Convention and improve their capacities and capabilities to manage POPs and toxic chemical substances. In 2015, the Global Environment Facility (GEF) approved funding for the project. The project was implemented by the United Nations Industrial Development Organization (UNIDO), executed by the Basel Convention Regional Centre for the Training and Technology Transfer for the Caribbean Region (BCRC-Caribbean) and the Caribbean Public Health Agency (CARPHA) was contracted as the technical consultant to execute Output 1.1 of the project (update of the NIP including conduct of in-country inventories of new POPs added to the Stockholm Convention).

Commitment to implementation of NIP

The development and implementation of a NIP is evidence of Belize's commitment to:

1. remain compliant with the obligations of the Stockholm Convention on POPs
2. reduce and eventually eliminate the unintentional release of POPs
3. protect human health and the environment

Under the Stockholm Convention, Parties seek to:

a. identify and implement measures to reduce or eliminate releases from intentional production and use;
b. establish a register of specific exemptions that Parties which have the need of continuing use of POPs with exemption might further use these POPs and register for exemption;
c. identify and implement measures to reduce or eliminate releases from unintentional production;
d. identify and implement measures to reduce or eliminate releases from stockpiles and wastes;
e. develop and implement a plan for the implementation of the obligations under the Stockholm Convention;
f. submit proposals for the listing of chemicals in Annexes A, B and/or C;
g. facilitate or undertake exchange of information relevant to the reduction or elimination or production, use and release of POPs and exchange information regarding alternatives to POPs;
h. promote and facilitate awareness among policy and decision makers, the public and other stakeholders regarding POPs; and
i. undertake appropriate research, development, monitoring and cooperation pertaining to POPs, within each Party's capabilities and resources.

National Priorities and Key Issues

No POPs pesticides are manufactured in Belize. All POP pesticides are prohibited for importation and use in Belize except for dichlorodiphenyltrichloroethane (DDT), lindane, pentachlorophenol, and sulfluramide that have restricted importation and use designations under the Stockholm Convention. The Ministry of Health maintains a policy of reserving the right to import DDT for emergency use during the outbreak of malaria. Apart from DDT, pentachlorophenol was last imported into Belize back in 2000. Lindane is still used as a human health pharmaceutical for control of head lice and scabies (for which Belize has exemptions) and sulfluramide is the most extensively used POPs pesticide in Belize (unknown if there are exemptions for its use).

The principal use of polychlorinated biphenyls (PCBs) in Belize was dielectric fluids in electrical transformers by Belize Electricity Limited (BEL), which is responsible for the generation, transmission and distribution of electricity in the whole country. Since the inception of a phase out program for PCB containing equipment in the 1990s, BEL has continued to identify and remove transformers that may contain PCBs from its network. Currently, BEL imports PCB-free transformers. Other companies also produce and distribute energy in Belize, though on a smaller scale. Farmer's Light Plant Cooperation (FLPC), one of the country's largest self-generating energy companies, has 600 transformers in use, 36 unused, 89 used awaiting re-use/decommissioning with PCB levels of <50 ppm, 29 transformers of unknown PCB status and two (2) PCB-free capacitors (PCB status was based on nameplate/label). A few companies own transformers which are PCB-free based on the nameplate/label. These are The Belize Electric Company Limited (BECOL) which owns 34 PCB-free transformers; Belize Co-Generation Energy Limited (BELCOGEN) which owns 18 PCB transformers; and Blair Athol Power Company Limited (BAPCOL) which owns one (1) PCB-free transformer. The inventory (2016) identified only a few decommissioned capacitors at FLPC and BEL; however, an assessment of capacitors and other equipment was not conducted in the inventory (2016) and it is a gap that needs to be addressed in the future.

Assessment of the newly listed POP groups perflurooctane sulphonic acid (PFOS) its salts and related chemicals, and polybrominated diphenyl ether/hexabromocyclododecane (PBDEs/HBCD), showed the need for awareness, legislation and or regulation to address their management in an environmentally sound manner.

The assessment of PFOS/PFOS related chemicals showed that the only entity that definitively uses PFOS/per- and polyfluoroalkyl substances (PFAS) firefighting foams in Belize on a semi - regular basis is the National Fire Service. The usage of firefighting foam for all the stations combined (for 2016) was estimated at 378.45 L/389.8 kg. The emission of PFOS/PFAS from firefighting foam by these fire stations could not be quantified due to the uncertainty of the presence of these compounds and the lack of data on the quantities stockpiled.

The focus of the assessment on PBDEs/HBCD was on electrical and electronic equipment/waste electrical and electronic equipment (EEE/WEEE) (specifically, cathode ray tube computer monitors and televisions), plastics/polymers from end-of-life (ELV) vehicles (specifically those manufactured before 2004 and from the United States of America). The assessment showed that while imports were low, the in-use and stored EEE/WEEE by consumers (households, Government institutions/agencies, private sector companies) warrants attention. Likewise, proper management and disposal of potentially impacted ELVs is needed. An inventory into HBCD uses in the construction sector for insulation (Expanded polystyrene (EPS) and Extruded polystyrene (XPS)), in textiles and other products was not conducted. However, it not expected that buildings would contain EPS or XPS since insulation is not commonly used in constructing buildings. A Tier III analysis would be required to determine the presence of HBCD in products.

Generally the assessments of all POPs groups showed that POPs containing products may be prevalent in a range of consumer products (textiles, carpets, paints, clothing, kitchen utensils, etc.) agricultural and industrial chemicals and the proper management and disposal of these products have to be addressed. Similarly, potentially contaminated POPs sites (landfill/waste management/dump sites, storage sites, etc.) are present in Belize and must be managed.
In implementing the Stockholm Convention on POPs in Belize, the following is a summary national priorities and budget:

Table 1: Estimated budget for quantifiable priority activities for POPs management in Belize.

National Priorities (detailed are in sub-chapter 3.3)	Estimated Budget USD
Strengthening of the Stockholm Convention Focal Point (175,000 USD)	
Implement a coordinating body for the Stockholm Convention.	175,000
Development/Amendment of specific (existing) legislation/legal instruments on sound management of chemicals and hazardous waste (5,525,000 USD)	
Restrict or prohibit import of Annex A & B chemicals.	45,000
Develop/Amend existing legal instrument and strengthen pesticides (including POPs) laws and its enforcement	205,000
Develop legal instruments and technical guidelines for managing PCBs.	105,000
Establish a regulatory frame for the management of POP-BFRs articles (end-of-life vehicles, EEE and HBCD) and waste categories.	55,000
Establish policy and regulatory framework for the use, management and substitution of PFOS and related substances and PFAS in industrial uses and in products and waste (SAICM synergy); Revise the Hazardous Waste Regulations.	3,940,000
Establish an informed registration process for needed exemptions.	185,000
Develop policy and legal framework for the management of UPOPs and other hazardous waste.	820,000
Establish a regulatory framework for contaminated sites.	170,000

National Priorities (detailed are in sub-chapter 3.3)	Estimated Budget USD
Education, and awareness-raising on chemicals management issues including hazardous and chemical waste (2,650,000 USD).	
Strengthen the capacity to handle POP pesticides and contaminated sites	595,000
Education and awareness raising (stakeholders, policy makers, farmers, customs officers) on POP pesticides/HHPs waste and contaminated sites.	385,000
Build capacity for public awareness.	90,000
Apply BAT/BEP in exempted uses.	35,000
Awareness raising for relevant stakeholder groups on POP-BFR.	100,000
Public awareness and community participation for DDT.	55,000
Build knowledge and capacity for management of PFOS/PFAS containing products and waste.	550,000
BAT/BEP applied in exempted uses	180,000
Training and awareness raising for stakeholder groups on PFOS and PFAS and establishing approach for information exchange.	100,000
Build capacity and technical support (UPOPs).	385,000
Public awareness, technical networking and awareness of major stakeholders on dioxin/furans and other UPOPs	175,000
Improvement of waste management and introduction of waste hierarchy towards a circular economy and reduction of unintentionally formed POPs from open burning (3,585,000 USD).	
Assess the current use of POPs and reducing and eliminating releases and use of POPs.	300,000
Sound Life Cycle Management of POPs Pesticides HHPs (handling, storage, transfer and disposal of POPs pesticides and POP pesticides wastes).	340,000
Environmentally sound management (ESM) for in use equipment (PCBs).	30,000
Sound Life Cycle Management of PBDE and HBCD product and waste categories (EEE/WEEE, end-of-life vehicle, insulation foam, and possibly textiles, furniture etc.)	190,000
Seek an exemption for POP chemicals.	15,000
Promote municipal and hazardous waste management.	460,000
Reduce and minimize release of dioxins /furans and other UPOPs from waste incinerators.	500,000
Reduce releases from open burning of wastes (private burning & landfill fires) and biomass burning by improvement of waste management (waste hierarchy; circular economy).	430,000
Manage/monitor medical wastes.	1, 110,000
Reduce landfill and hazardous waste co-incineration	210,000
Assessment, management and remediation of contaminated sites (3, 800,000 USD).	
Identify, secure and remediate POPs pesticides contaminated sites.	225,000
Develop methodology to identify, assess and prioritise sites contaminated with Annex A, B and C chemicals.	275,000
Secure POPs contaminated sites, and where feasible conduct remediation.	255,000
Identify, secure and remediation of POPs pesticides contaminated sites.	795,000
Identify, assess, secure and possibly remediate PCB contaminated sites.	550,000
Identify, assess, secure and possibly remediate of POP-PBDE contaminated sites.	200,000

National Priorities (detailed are in sub-chapter 3.3)	Estimated Budget USD
Identify, assess, and manage PFOS and PFAS contaminated sites and secure/remediate if needed.	1,370,000
Assess, management, database of potentially PCDD/PCDF and other UPOPs contaminated sites and secure /remediate if needed.	130,000
Monitoring of POPs, initiating research and collaborations (1,490,000 USD)	
Establish monitoring and analysis of POPs pesticides and HHPs (products, environment, food, exposure).	560,000
Analyse and monitor POP-BFR in priority areas	475,000
Monitor and evaluation of DDT Alternatives in the context of Belize.	105,000
Establish monitoring of PFOS and other PFAS in priority areas.	100,000
Establish monitoring of PCDD/F and other UPOPs and sources of human exposure	100,000
Develop countrywide database for POPs contaminated sites considering relevant co-pollutants.	150,000
Management of POPs stockpiles, waste and articles in use, and appropriate measures for disposal (POP-PBDEs, PFOS) (235,000 USD).	
Undertake Ecologically Sound Measures to Eliminate Obsolete POP Pesticides.	170,000
Environmentally sound management (ESM) of obsolete equipment (PCBs).	65,000
Update and refining of inventories of POPs (945,000 USD).	
Conduct an inventory of equipment, accessories and articles consisting of, containing or contaminated with PCBs.	150,000
Update and refine inventory of PBDEs (with DecaBDE) and HBCD containing articles and wastes; Develop or update appropriate databases for information management.	60,000
Update and refine inventory of PFOS and PFAS use, articles and wastes and develop/updated databases for information management.	295,000
Update and refine Inventory of UPOPs.	440,000
Assessment of alternatives to POPs (475,000 USD).	
Assess POPs pesticides and HHPs and alternatives and implement IPM and organic farming.	110,000
Assess PFOS alternatives in exempted uses and substitution for sustainable chemical and non-chemical alternatives.	150,000
Substitute chemicals and materials containing chlorine that are sources of unintentional releases of PCDD/F or other UPOPs.	215,000
Technical and Financial assistance (380,000 USD)	
Source technical assistance towards the successful implementation of the Convention.	150,000
Source financial assistance towards the successful implementation of the Convention.	200,000
Set up mechanism for article 15 reporting.	30,000
Estimated costs for quantifiable priorities	**19,260,000**

1 INTRODUCTION

1.1 OVERVIEW OF PERSISTENT ORGANIC POLLUTANTS (POPS)

Section one (1) outlines the purpose and structure of the National Implementation Plan (NIP), including a summary of the Stockholm Convention (SC), its aims and its obligations. It also describes the mechanism used to develop the NIP and the stakeholder consultation process. A summary of the Persistent Organic Pollutants (POPs) issue provides the context and background outlining the chemicals, their uses, and the problems they cause.

1.1.1 Definition of POPs

POPs are hazardous organic chemical compounds that are resistant to biodegradation and thus remains in the environment for a long time. They are resistant to environmental degradation through chemical, biological, and photolytic processes (US-EPA, 2018).

POPs possess a particular combination of physical and chemical properties such that, once released into the environment, they:

- resist degradation and remain intact for exceptionally long periods of time (many years);
- become widely distributed throughout the environment as they are transported, through air, water and migratory species, across international boundaries and deposited far from their place of release;
- bio-accumulate in the fatty tissue of living organisms including humans, and are found at higher concentrations at higher levels in the food chain; and
- are toxic to both humans and wildlife (US-EPA, 2018).

1.1.2 Why are POPs Harmful to Humans and Wildlife/Biota?

POPs are toxic chemicals that adversely affect human health and the environment around the world. Studies have linked POP exposure to population declines, diseases, or abnormalities in a number of wildlife species, including certain kinds of fish, birds, and mammals. In people, reproductive, developmental, behavioral, neurological, endocrine, and immunologic adverse health effects have been linked to POPs (Ashraf et al., 2015).

POPs work their way through the food chain by accumulating in the body fat of living organisms and becoming more concentrated as they move from one creature to another. This process is known as "bioaccumulation". When contaminants found in small amounts at the bottom of the food chain accumulate in body fats, they can pose a significant hazard to predators that feed at the top of the

food chain. This means that even small releases of POPs can have significant impacts (Chu et al., 2006).

1.2 THE STOCKHOLM CONVENTION ON POPS

1.2.1 Overview of the Stockholm Convention

In 1995, the Governing Council of the United Nations Environment Programme (UNEP) called for global action to be taken on POPs. In response to this invitation, the Intergovernmental Forum on Chemical Safety (IFCS) established an *ad hoc* working group on POPs. One of the conclusions presented in the working group's Final Report, in July 1996, was that

> "international action, including a global legally binding instrument, is required to reduce the risks to human health and the environment arising from the release of the 12 specified POPs" (IFCS, 1996).

In 1997, the Council took the decision to initiate negotiation of such an instrument. These negotiations commenced in 1998 under the auspices of UNEP and the result was the global treaty known as the Stockholm Convention on POPs. In May 2001, the European Union together with 126 countries adopted the Convention.

The Stockholm Convention on POPs entered into force in Belize on April 25, 2010. The country signed the Convention on May 14, 2002 and ratified it on January 25, 2010. The Stockholm Convention is an international legally binding agreement on POPs. In accordance with paragraph 1 of Article 7 of the Stockholm Convention, each Party shall develop and endeavor to implement a plan for the implementation of its obligations under the Convention and to transmit its plan to the Conference of the Parties within two (2) years of the date on which the Convention enters into force for it.

There are currently 28 POPs (16 of which have been recently added) covered by the Convention which requires that its Parties take measures to eliminate or reduce releases to prevent and minimize adverse effects on human health and the environment (Table 2). Note that the current NIP update does not address DecaBDE and SCCP, which were newly listed in 2017.

Table 2: The Stockholm Convention list of POPs under the specific Annexes.

● Pesticide ● Industrial Chemical ● Unintentional Production

POPs	Annex	Specific exemptions and/or acceptable purposes
Aldrin ●	A	None
Chlordane ●	A	None
Chlordecone ●	A	None
Decabromodiphenyl ether (commercial mixture, commercial decabromodiphenyl ether) ●	A	**Production:** As allowed for the parties listed in the Register **Use:** Vehicles, aircraft, textile, additives in plastic housings etc., polyurethane foam for building insulation, in accordance with Part IX of Annex A
DDT ●	B	**Production:** Use as vector control against diseases in accordance with Part II of this Annex **Use:** Use as vector control against diseases in accordance with Part II of this Annex
Dieldrin ●	A	None
Endrin ●	A	None
Heptachlor ●	A	None
Hexabromobiphenyl ●	A	**Production:** None **Use:** Articles in accordance with the provisions of Part IV of Annex A
Hexabromocyclododecane (HBCD) ●	A	**Production:** As allowed by the parties listed in the Register of specific exemptions. **Use:** Expanded polystyrene and extruded polystyrene in buildings in accordance with the provisions of part VII of Annex A
Hexabromodiphenyl ether & heptabromodiphenyl ether (commercial octabromodiphenyl ether) ●	A	**Production:** None **Use:** Articles in accordance with the provisions of Part IV of Annex A
Hexachlorobenzene (HCB) ● ● ●	A & C	None
Hexachlorobutadiene (HCBD) ● ●	A & C	None
Alpha hexachlorocyclohexane ●	A	None

POPs	Annex	Specific exemptions and/or acceptable purposes
Beta hexachlorocyclohexane	A	None
Lindane	A	**Production:** None **Use:** Human health pharmaceutical for control of head lice and scabies as second line treatment
Mirex	A	None
Pentachlorobenzene	A	None
Pentachlorophenol (PCP), its salts and esters	A	**Production**: As allowed for the parties listed in the Register in accordance with the provisions of part VIII of Annex A **Use**: Pentachlorophenol for utility poles and cross-arms in accordance with the provisions of part VIII of Annex A
Perfluorooctane sulfonic acid (PFOS), and its salts and perfluorooctane sulfonyl fluoride (PFOS-F)	B	**Production:** For the use below **Use:** Acceptable purposes and specific exemptions in accordance with Part III of Annex B
Polychlorinated biphenyls (PCBs)	A & C	None
Polychlorinated dibenzo-*p*-dioxins (PCDD)	C	None
Polychlorinated dibenzofurans (PCDF)	C	None
Polychlorinated naphthalenes (PCNs)	A & C	**Production**: For the use below **Use**: Production of polyfluorinated naphthalenes, including octafluoronaphthalene
Short-chain chlorinated paraffins (SCCPs)	A	**Production:** As allowed for the parties listed in the Register **Use:** Additives in transmission belts, rubber conveyor belts, leather, lubricant additives, tubes for outdoor decoration bulbs, paints, adhesives, metal processing, plasticizers
Technical endosulfan and its related isomers	A	None
Tetrabromodiphenyl ether & pentabromodiphenyl ether (commercial pentabromodiphenyl ether)	A	**Production:** None **Use:** Articles in accordance with the provisions of Part V of Annex A

POPs	Annex	Specific exemptions and/or acceptable purposes
Toxaphene	A	None

Annex A - Parties must take measures to eliminate the production and use of the chemicals listed under Annex A. Specific exemptions for use or production are listed in the Annex and apply only to Parties that register for them.

Annex B - Parties must take measures to restrict the production and use of the chemicals listed under Annex B in light of any applicable acceptable purposes and/or specific exemptions listed in the Annex.

Annex C - Parties must take measures to reduce the unintentional releases of chemicals listed under Annex C with the goal of continuing minimization and, where feasible, ultimate elimination.

1.2.2 Overview of the twelve (12) initial POPs under the Stockholm Convention

The IFCS and the International Programme for Chemical Safety (IPCS) prepared an assessment of the 12 worst offenders. Known as the Dirty Dozen, this list includes eight (8) organo-chlorine pesticides: aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, mirex and toxaphene; two (2) industrial chemicals: hexachlorobenzene (HCB) and the polychlorinated biphenyl (PCB) group; and two (2) groups of industrial by-products: dioxins and furans.

Pesticides:

- Aldrin – A pesticide applied to soils to kill termites, grasshoppers, soil and other insect pests.
- Chlordane – Used extensively to control termites and as a broad-spectrum insecticide on a range of agricultural crops.
- DDT – Perhaps the best known of the POPs, DDT was widely used during World War II to protect soldiers and civilians from malaria, typhus, and other diseases spread by insects. It continues to be applied against mosquitoes in several countries to control malaria.
- Dieldrin – Used principally to control termites and textile pests, dieldrin has also been used to control insect-borne diseases and insects living in agricultural soils.
- Endrin – This insecticide is sprayed on the leaves of crops such as cotton and grains. It is also used to control mice, voles and other rodents.
- Heptachlor – Primarily employed to kill soil insects and termites, heptachlor has also been used more widely to kill cotton insects, grasshoppers, other crop pests, and malaria-carrying mosquitoes.
- HCB – This chemical kills fungus that affect food crops. HCB is also an industrial chemical and can be released as an unintentional by-product of combustion processes.

- Mirex – This insecticide is applied mainly to soils to kill fire ants and other types of ants and termites. Mirex is also an industrial chemical.
- Toxaphene – This insecticide, also called camphechlor, is applied to cotton, cereal grains, fruits, nuts, and vegetables. It has also been used to control ticks and mites in livestock.

Industrial Chemicals:

- PCBs – These compounds are employed in industry as heat exchange fluids, in electric transformers and capacitors, and as additives in paint, carbonless copy paper, sealants and plastics. They are also released as an unintentional by-product of combustion processes.
- HCB – This chemical is used in the production of rubber, aluminium, munitions and dyes and in wood preservation and other manufacturing.
- Mirex – This chemical is used as a fire retardant in plastics, rubber, and electrical goods.

By-products:

- Polychlorinated dibenzo-p-dioxins (PCDDs) – Often referred to as Dioxins, these chemicals are produced unintentionally due to incomplete combustion, as well as during the manufacture of certain pesticides and other chemicals. It was an unfortunate contaminant in some of the herbicide, Agent Orange, used in the Vietnam War. In addition, certain kinds of metal recycling and pulp and paper bleaching can release dioxins. Dioxins have also been found in automobile exhaust, tobacco smoke and wood and coal smoke.
- Polychlorinated dibenzofurans (PCDFs) – These compounds are often referred to as Furans and are produced unintentionally from the same processes that release dioxins. They are also found in commercial mixtures of PCBs.
- HCB – A by-product of the manufacture of industrial chemicals and is released as a result of certain combustion processes.
- PCBs – These chemicals can also be unintentional by-products of combustion processes.

1.2.3 Overview of the sixteen (16) new POPs under the Stockholm Convention

The Conference of the Parties at its fourth (4^{th}) to eighth (8^{th}) meetings, held from 2009 to 2017, made the decisions to amend Annexes A, B and C to the Convention, by adding the following chemicals, several with exemptions (Refer to Table 1):

1. Alpha hexachlorocyclohexane (alpha-HCH); added 2009

2. Beta hexachlorocyclohexane (beta-HCH); 2009

POPs characteristics

Alpha- and beta-HCH are highly persistent in water in colder regions and may bioaccumulate and biomagnify in biota and arctic food webs. They are subject to long-range transport, are classified as potentially carcinogenic to humans and adversely affect wildlife and human health in contaminated regions.

Use and production

Use of alpha- and beta-HCH have no insecticidal property and have been produced as by-products of lindane. For each tonne of lindane produced, around 6-10 t of alpha- and beta-HCH are also produced. Therefore, there are large stockpiles around lindane production sites leading to site contamination.

3. Chlordecone (added 2009)

POPs characteristics

Chlordecone is persistent in the environment, has a high potential for bioaccumulation and biomagnification and based on physico-chemical properties and modelling data, chlordecone can be transported for long distances. It is classified as a possible human carcinogen and is very toxic to aquatic organisms.

Use and production

Chlordecone is a synthetic chlorinated organic compound, which was mainly used as an agricultural pesticide. It was first produced in 1951 and commercially introduced in 1958. Currently, no use or production of the chemical is reported, as many countries have already banned its sale and use.

4. Decabromodiphenyl ether (commercial mixture, c-decaBDE); added 2017

POPs characteristics

The decaBDE is highly persistent, has a high potential for bioaccumulation and biomagnification (in food webs), as well as for long- range transport. Adverse effects are reported for soil organisms, birds, fish, frog, rat, mice and humans.

Use and production

DecaBDE is used as an additive flame retardant and has a variety of applications including in plastics/polymers/composites, textiles, adhesives, sealants, coatings and inks. DecaBDE containing plastics are used in housings of computers and TVs, wires and cables, pipes and carpets. Commercially available DecaBDE consumption peaked in the early 2000's, but c-decaBDE is still extensively used worldwide.

5. Hexabromobiphenyl (HBB); added 2009

POPs characteristics

The chemical is highly persistent in the environment, highly bioaccumulative and has a strong potential for long-range environmental transport. It is classified as a possible human carcinogen and has other chronic toxic effects.

Use and production

Hexabromobiphenyl is an industrial chemical that has been used as a flame retardant, mainly in the 1970s. According to available information, hexabromobiphenyl is no longer produced or used in most countries due to restrictions under national and international regulations.

6. Hexabromocyclododecane (HBCD); added 2013

POPs characteristics

HBCD has a strong potential to bioaccumulate and biomagnify. It is persistent in the environment and has a potential for long-range environmental transport. It is very toxic to aquatic organisms. It is particularly harmful to human, as neuroendocrine and developmental toxicity has been observed.

Use and production

HBCD has been widely used as a flame-retardant additive on polystyrene materials in the 1980s as a part of safety regulation for articles, vehicles, and buildings.

7. Hexabromodiphenyl ether and heptabromodiphenyl ether (hexaBDE and heptaBDE respectively); added 2009

POPs characteristics

The commercial mixture of OctaBDE contains the listed hexaBDE and heptaBDE and non-listed octaBDE and nonaBDE homologues. The homologues hexaBDE and heptaBDE were found highly persistent, has a high potential for bioaccumulation and biomagnification in the food web, as well as long-range transport, and were listed as POPs. A main degradation pathway is through debromination and producing other bromodiphenyl ethers.

8. Hexachlorobutadiene (HCBD); added 2015 Annex A and 2017 also in Annex C

POPs characteristics

HCBD is persistent, bioaccumulative and very toxic to aquatic organisms and birds. It can be long-range transported leading to significant adverse human health and environmental effects, and it is classified as a possible human carcinogen.

Use and production

Most commonly used as a solvent for other chlorine-containing compounds. Hexachlorobutadiene occurs as a by-product during the chlorinolysis of butane derivatives in the production of both

carbon tetrachloride and tetrachloroethene. These two commodities are manufactured on such a large scale, that enough HCBD can generally be obtained to meet the industrial demand.

9. Lindane (gamma-HCH); added 2009

POPs characteristics

Lindane is persistent, bioaccumulates easily in the food chain and bioconcentrates rapidly. There is evidence for long-range transport and toxic effects (immunotoxic, reproductive and developmental effects) in laboratory animals and aquatic organisms.

Use and production

Lindane has been used as a broad-spectrum insecticide for seed and soil treatment, foliar applications, tree and wood treatment and against ectoparasites in both veterinary and human applications. The production of lindane has decreased rapidly in the last few years, due to regulations in several countries (also concerning its use and monitoring). However, a few countries are still known to produce it.

10. Pentachlorobenzene (PeCB); added 2009

POPs characteristics

PeCB is persistent in the environment, highly bioaccumulative and has a potential for long-range environmental transport. It is moderately toxic to humans and very toxic to aquatic organisms.

Use and production

Previously, PeCB was used in PCB products, in dyestuff carriers, as a fungicide and a flame retardant. It might still be used as a chemical intermediate (e.g. for the production of quintozene). It is also produced unintentionally during combustion, thermal and industrial processes, and present in the form of impurities, in products such as solvents or pesticides.

11. Pentachlorophenol (PCP) and its salts and esters; added 2015

POPs characteristics

PCP is detected in the blood, urine, seminal fluid, breast milk and adipose tissue of humans. PCP is likely, as a result of their long-range environmental transport, to lead to significant adverse human health and/or environmental effects.

Use and production

PCP has been used as herbicide, insecticide, fungicide, algaecide, disinfectant and as an ingredient in antifouling paint. Some applications were in agricultural seeds, leather, wood preservation, cooling tower water, rope and paper mill system. Its use has been significantly declined due to the high toxicity of PCP and its slow biodegradation. It was first produced in the 1930s; it is marketed under many trade names. The main contaminants include other polychlorinated phenols, PCDDs, and PCDFs.

12. Perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride (PFOS, its salts and PFOSF); added 2009

POPs characteristics

PFOS is extremely persistent and has substantial bioaccumulations and biomagnifying properties, although it does not follow the classic pattern of other POPs by partitioning into fatty tissues, but instead binds to proteins in the blood and the liver. It has a capacity to undergo long-range transport and also fulfils the toxicity criteria of the Stockholm Convention.

Use and production

PFOS is both intentionally produced and an unintended degradation product of related anthropogenic chemicals. The current intentional use of PFOS is widespread and includes: electric and electronic parts, firefighting foam, photo imaging, hydraulic fluids and textiles. PFOS is still produced in several countries.

13. Polychlorinated naphthalenes (PCNs); added 2015

POPs characteristics

While some PCNs can be broken down by sunlight and, at slow rates, by certain microorganisms, many PCNs persist in the environment. Bioaccumulation is confirmed for tetra- to hepta- CNs. Chronic exposure increases risk of liver disease.

Use and production

PCNs were added to cables for insulating coatings for electrical wires. Others have been used as wood preservatives, as rubber and plastic additives, for capacitor dielectrics and in lubricants. To date, intentional production of PCN is assumed to have ended. PCN are unintentionally generated during high-temperature industrial processes in the presence of chlorine.

14. Short-chain chlorinated paraffins (SCCPs); added 2017

POPs characteristics

SCCPs are sufficiently persistent in air for long-range transport to occur and appear to be hydrolytically stable. Many SCCPs can accumulate in biota. It is concluded that SCCPs are likely, as a result of their long-range environmental transport, to lead to significant adverse environmental and human health effects.

Use and production

SCCPs can be used as a plasticizer in rubber, paints, adhesives, flame retardants for plastics as well as an extreme pressure lubricant in metal working fluids. Chlorinated paraffins are produced by chlorination of straight-chained paraffin fractions. The carbon chain length of commercial chlorinated paraffins is usually between 10 and 30 carbon atoms. Short-chained chlorinated paraffins is between carbon 10 and carbon 13. The production of SCCPs has decreased globally as jurisdictions have established control measures.

15. Technical endosulfan and its related isomers; added in 2011

POPs characteristics

Endosulfan is persistent in the atmosphere, sediments and water. Endosulfan bioaccumulates and has the potential for long-range transport. Endosulfan is toxic to humans and has been shown to have adverse effects on a wide range of aquatic and terrestrial organisms.

Use and production

Endosulfan is an insecticide that has been used since the 1950s to control crop pests, tsetse flies and ectoparasites of cattle and as a wood preservative. As a broad-spectrum insecticide, endosulfan is currently used to control a wide range of pests on a variety of crops including coffee, cotton, rice, sorghum and soy.

16. Tetrabromodiphenyl ether and pentabromodiphenyl ether (tetraBDE and pentaBDE respectively); added 2009

POPs characteristics

The commercial mixture of PentaBDE containing the homologues tetraBDE, pentaBDE, hexaBDE and heptaBDE and is highly persistent in the environment, bioaccumulative and has a potential for long-range environmental transport (it has been detected in humans throughout all regions). There is evidence of its toxic effects in wildlife, including mammals.

Use and production

PBDEs inhibit or suppress combustion in organic materials and therefore are used as additives in flame retardants. The production of commercial PentaBDEs has ceased in the world.

1.3 BELIZE NATIONAL IMPLEMENTION PLAN FOR POPs

1.3.1 The objective of the NIP

In 1992, the world's governments met in Rio de Janeiro to collectively confront environmental problems that are now global in nature. Among those selected for long term planning and resolution was the problem of global pollution by a group of industrial chemicals known as POPs.

The Convention aims to protect human health and the environment from the effects of POPs with a range of control measures to reduce and, where feasible, eliminate POPs releases, including emissions of unintentionally produced POPs such as dioxins. The Convention also aims to ensure the sound management of stockpiles and wastes that contain POPs.

The Government of Belize, through a project funded by the Global Environment Facility (GEF), is charged with the creation of an enabling environment which supports Belize's own sustained capacity to meet its obligations in the context of the Stockholm Convention, including the NIP on POPs. The NIP will elaborate a strategy for the fulfilment of the convention obligations, as well as indicate actions for addressing stocks of pesticides and PCBs, and a strategy for carrying out environmentally sound management of chemicals and contaminated sites that pose high risks for health and the environment. This document details Belize's updated NIP.

1.3.2 Development of the NIP for the Management of POPs

The Focal Point within the Department of the Environment (DOE), supervises all activities with respect to the preparation of Belize's NIP, through technical and administrative support of the Project Management Unit (PMU). The Preliminary National POPs Inventory Report for 2016 which was completed in December 2017, formed the basis for the preparation of the Environmental Health and Socio-economic Impacts of POPs by first identifying potential sources and hence exposure of the Belize population to POPs. The POPs were categorised and specific inventories were conducted. The inventory report identified the POPs previously used in Belize, previous and current storage sites of POPs in Belize and provided estimates of unintentionally produced POPs.

In keeping with Article 7 of the SC, which calls for a review, and update of the NIP on a periodic basis, Belize's 2008 NIP Report was updated. The NIP update process was facilitated by the GEF 5558 Regional POPs Project and its National Coordinating Committee and supported by the services of consultants. The process included the formulation of Terms of Reference and work program for the NIP update process, as well as the allocation of financial resources to carry out activities supported by consultants and the POPs administrative efforts. Funding for the POPs project was the approved by the GEF in 2015. The Project is being implemented by the UNIDO

and executed by the BCRC-Caribbean in partnership with the DOE, and the CARPHA was contracted as the technical consultant for the update of the NIPs. The Activities related to the update of the NIPs commenced on October 2016. The project has been programmed for its implementation in five (5) phases as per the UNEP generic guidelines:

Phase I – Establishment of Coordinating Mechanism and Organization Process.

In order to successfully update a NIP it requires that an effective project planning and management structure be put in place. Phase I lays out steps to provide a firm base from which to update the NIP.

The key objectives of this phase of the project included:

- To raise awareness within Government departments, ministries, and agencies of the POPs issue, the SC, new POPs added to the Convention, and the need to update the NIP.
- To raise awareness of the POPs issue with non-governmental stakeholders.
- To achieve sufficient political commitment to enable the successful updating of the NIP.
- To establish a structure and mechanisms for planning, managing, and supervising the updating of the NIP.
- To produce a detailed project plan for the updating of the NIP.
- To plan, initiate, and sustain an information dissemination campaign.

Phase II – Establishment of POPs Inventories and Assessment of National Infrastructure and Capacity

The key objectives of this phase of the project included:

- To obtain, review and summarize information on the sources, use and production of POPs, including gathering information on presence in stockpiles and wastes, and determine the baseline situation.
- To identify the gaps in resources, capacity and knowledge that prevents the complete assessment of the status of POPs.
- To identify whether the requirements of the SC are met.
- To fulfill reporting obligations under the SC.
- To identify the technical and financial assistance needed to complete the update of the NIP as well as its implementation.
- To facilitate coordination and integration with national sustainable development, chemicals management, and pollution control policies.
- To facilitate coordination, as appropriate, with activities addressing other multilateral environmental agreements (MEAs), e.g. Rotterdam and Basel Conventions.

Inventories for the five (5) POP groups were developed based on the current situation of POPs in Belize, related to sources, use, production, presence of stockpiles and waste. Information was gathered from the key stakeholders and the national partners including public and private sector agencies, non-governmental organizations (NGOs) and regional partners. For each group of POP chemicals the gaps in resources, capacity and knowledge were included. Additionally, these inventories included information on general chemical management and pollution control and related polices in the countries. The guidance for the development of inventories came from the Stockholm Convention, United Nations Environment Programme (UNEP) guidance documents. The development the POPs inventories consisted of five (5) steps:

1. planning the inventory;
2. choosing the data collection methodology;
3. collecting and compiling data from key sectors;
4. managing and evaluating the data; and
5. preparing the inventory report.

The POPs initiation workshop in Belize (February 01, 2017) signaled the commencement of the development of the POPs inventories. The participants of the workshop came from Government, the private sector and NGOs. Personnel from CARPHA, the BCRC-Caribbean and the Department of the Environment facilitated the workshop. The objectives of the workshop were to raise awareness at the national level of POPs and provide exposure to stakeholders on the process and methodology for developing and updating the national POPs inventories (with special emphasis on the 14 newly listed POPs (2009-2015)).

The Regional POPs Inventories Validation Workshop (November 16-17, 2017) signaled the validation and endorsement of the POPs inventories for all participating countries. The important considerations during the inventory validation process were as follows: use of representative data, appropriate conclusions, address of reviewers' (CARPHA, Project Working Committee (PWC), BCRC-Caribbean) comments/queries and approval of draft reports by both the BCRC-Caribbean and the PWC.

Phase III – Priority Assessment and Objective Setting

The priority assessment of the individual POP groups was based on key information on POPs, the POP situations in the country (using the findings from the POPs inventories), the relevance to the region and where appropriate, relevance of available data on POPs levels in human milk or blood. The major criteria for the assessment of the individual POPs were toxicological relevance to human health and biota/wildlife, relevance of co-pollutants and affected waste, and socio-economic relevance.

The approach to priority assessment and objective setting was one which engaged the national partners and key stakeholders in priority setting and action planning for POPs during a two-day consultation workshop (February 06-07, 2018). Additional consultations and meetings were also conducted with specific stakeholder groups.

The key objectives of this phase of the project were:

- To develop country-specific criteria for prioritizing health and environmental impacts of POPs.
- To assess of the available information from phase II in order to identify priority areas for attention.
- To identify data and other gaps in the information available that prevents a full priority assessment from being carried out.
- To review national priorities and make adjustments accordingly.
- To set appropriate short- and long-tem objectives, goals and measurable indicators for the management of POPs in compliance with the SC as well as using the Rotterdam and Basel Conventions as a means for the identification and proactive/preventive action to effectively manage chemicals with POPs- like characteristics.

Phase IV – Formulation of National Implementation Plan

The objectives of the process were as follows:

- To identify and gather information on possible options for management of POPs to meet Belize's obligations under the Stockholm Convention with indication of the scope of application, limitations, costs and benefits of each.
- To prioritize the options available and actions necessary to meet the requirements of the Stockholm Convention and country objectives.
- To develop a NIP to enable Belize to meet its obligation under the SC, its country-specific objectives and priorities, coordinated with national activities on sustainable development where necessary and appropriate.
- To identify requirements for assistance in the completion of additional assessments and information gathering to complete and implement the NIP.
- The identification of financial mechanisms to implement the NIP and components of the national policy on chemicals management.

The methodology for the process included was designed to obtain information to prepare draft update and the final reports. These are:

1. Review of the first NIP and literature review;

2. Conduct of the Stakeholder Consultation Workshop and stakeholder meetings;
3. Identification of Management Options to meet the Obligations of the Convention;
4. Update of the financial mechanism and
5. Compilation of NIP update.

The review of the previous NIP and the literature review gave information on the status of previous work that has been done in Belize related to POPs. Other relevant documents such as 2016 inventory reports and the UNEP guidance document were also used.

Consultation involved meetings with the POPs PMU, the National Project Coordinator (NPC), stakeholders (National Stakeholder Consultation Workshop) and the Validation Workshop for the Update of the NIP. The process of consultation was on going throughout the life of the POPs project and the preparation of the NIP update.

Cost/benefit analyses of implementing the SC taking into account the option for environmentally sound management of POPs and other chemicals. This was concluded by a revision and analysis process where appropriate mechanisms for financing the implementation of the NIP update and the national chemicals management policy with an aim to making their implementation sustainable.

It should be noted that the prevalent impacts of POPs in Belize are hardly tangible. Therefore, the socio-economic as well as environmental impacts are shown only by indicating the areas where it is likely that the population may suffer from adverse impacts. It is difficult to define any detailed impacts or figures presenting the population exposed to POPs' adverse impacts. The priorities of the proposed actions have been discussed in the workshops.

Phase V – NIP Endorsement and Submission

The key objectives of this phase of the project included:

- To communicate clearly the scope, need for, purpose, and value of the NIP.
- To consult with all stakeholders on the proposed NIP, as appropriate.
- To finalize the NIP, taking account of stakeholder input.
- To secure political support and endorsement by the relevant authorities for the NIP and its implementation.
- To transmit an agreed revised and updated NIP to the Conference of the Parties (COP) of the Convention.
- To establish and put into practice a mechanism for periodic updating and review of the NIP in accordance with Article 7 of the Convention.
- To establish a mechanism for reporting to the COP as required.

- To put in place the mechanism for implementation of the NIP.

1.3.3 National Implementation Plans and Socio-Economic Assessment

A socio-economic assessment (SEA) is a systematic appraisal of the potential social impacts of economic or other activities on all sectors of society[1]. It provides information on the social, cultural, economic and political conditions of individuals, households, groups, communities and organizations. In the context of POPs, POPs-like chemicals and other toxic chemicals this is an assessment of the potential social impacts of economic or other activities that the management of POPs may have on all sectors of the society. It allows for the analysis and management of both positive and negative social impacts of the interventions undertaken (policies, programs, plans, and projects) and any social change processes invoked by those interventions.

The SC, Annex F- Information on socio-economic considerations, provides an indicative list of items to be taken into consideration by Parties when undertaking an evaluation regarding possible control measures for chemicals being considered for inclusion into the Convention. This annex also states that: "An evaluation should be undertaken regarding possible control measures for chemicals under consideration for inclusion in this Convention, encompassing the full range of options, including management and elimination. For this purpose, relevant information should be provided relating to socio-economic considerations associated with possible control measures to enable a decision to be taken by the Conference of the Parties".

Having assessed the potential impacts, a SEA assists in deciding on and choosing actions that are appropriate and correctly focused as well as monitoring their effectiveness. It also provides a basis for minimising the negative impact on populations and in improving equitable outcomes for the most vulnerable groups.

In the context of managing POPs, social and economic impacts might include:

- Vulnerability arising from exposure to POPs.
- Deterioration or improvement in health.
- Loss or improvement in livelihoods.
- Changes in cost of living.
- Changes in employment, income, and workplace protection.
- Levels of child labour.
- Changes in levels of equity of wealth distribution.
- Opportunities for enterprise development (including Small and Medium Enterprises).

[1] Guidance for Developing a National Implementation Plan for the Stockholm Convention" (UNEP)

- Changes in demand for public services, such as health, education, and infrastructure.

During the prioritization of POPs, many of the above social and economic impacts were addressed.

Impact on people as well as the environment

The socio-economic assessment ensures that the management of POPs takes into account the impact of proposed management strategies on the well-being of all sectors of a community, particularly the most vulnerable. The data generated by a SEA will inform the NIP and implementation teams, enabling them to analyze, monitor, and manage the social consequences of action on POPs.

Obligations under the Stockholm Convention

Throughout the text of the Stockholm Convention references were made to socio-economic assessment. These references indicate the importance of a socio-economic assessment when implementing the obligations under the Convention and when developing the updated NIP. Furthermore GEF 2020 long-term strategy suggests aligning global environmental objectives with national and global socioeconomic development priorities. This can also be considered, where appropriate, on a national scale.

1.3.4 Gender policy in the NIP development and implementation

It is important to understand and acknowledge that men and women, boys and girls have different experiences daily. Thus, they are exposed to different kinds of chemicals in varying concentrations. Biological factors, notably size and physiological differences between women and men and between adults and children, influence susceptibility to health damage from exposure to toxic chemicals. Also, social factors, primarily gender-determined occupational roles, also have an impact on the level and frequency of exposure to toxic chemicals, the kinds of chemicals encountered, and the resulting impacts on human health[2].

It is of utmost importance that these gender dimensions be reflected at both site and policy level interventions for sound chemical management. The gender analysis is used to identify, understand, and describe gender differences and the impact of gender inequalities in a sector or program at the country level. Gender analysis is a required element of strategic planning and is the basic foundation on which gender integration is built. Gender analysis examines the different but interdependent roles of men and women and the relations between the sexes. It also involves an

[2] United Nation Development Programme, Gender Mainstreaming. A Key Driver of Development in Environment and Energy, Energy and Environment Practice. Gender Mainstreaming Guidance Series;

examination of the rights and opportunities of men and women, power relations, and access to and control over resources. Gender analysis identifies disparities, investigates why such disparities exist, determines whether they are detrimental, and if so, looks at how they can be remedied[3].

In agreement with the GEF Policy on Gender Mainstreaming and the GEF-6 approach on gender mainstreaming, GEF projects funded under this strategy will not only acknowledge gender differences within their design but determine what actions are required to promote both women's and men's roles in chemical management, disproportionate chemical exposure and vulnerability, as well as sustainable alternatives. For the NIP update project efforts were made to balance genders during Consultation Workshops for prioritizing POPs and Action Planning.

1.3.5 Structure and content of the NIP

The development of the NIP was guided by the draft document, "Guidance for Developing a National Implementation Plan for the Stockholm Convention" (Secretariat of the Stockholm Convention, et al., 2015) and comprises of the following three chapters:

Chapter 1 provides an overview of POPs by defining it and explaining the harmful effects of these pollutants. This chapter also gives an overview of the SC, explains the listed POPs, discusses the purpose of NIP and details the process of its development.

Chapter 2 outlines Belize's demographic, political and economic status. It elaborates on the current status of the institutional, policy and regulatory framework for POPs and chemicals in general in Belize. The results of the assessment of POPs are also presented in this chapter; with specific focus on the import and export, production, current and future use, registration, release, storage, disposal, and the potential impact. The existing monitoring programmes, and the information exchange and awareness are also described in this chapter.

Chapter 3 presents an overview of recommended activities, strategies, and action plan elements of the NIP. In addition, there is a budget related to the activities of the action plan. It also presents development and capacity-building proposals and priorities, timetable for plan implementation and measures of success and resource requirements.

[3] United States Agency for International Development (2011), Tips for Conducting a Gender Analysis at the Activity and Project Level. Additional Help for ADS Chapter 201;

2 COUNTRY BASELINE

This chapter gives basic background information relevant to the NIP. It describes the current situation and the level of knowledge of POPs in the country and the status of institutional and other capacity to address the problem in Belize.

2.1 PROFILE OF BELIZE

2.1.1 Geography and Population

Geographical Context

Belize is located on the Southeastern edge of the Yucatan Peninsula (Northern Central America), being bordered to the North by Mexico, to the South and West by Guatemala and to the East by the Caribbean Sea (see Figure 1). Belize is located between 15° 52´ 9" and 18° 29' 55" North latitude and 87° 28" and 89° 13' 67" West Longitude. Using an offshore territorial limit of 20 km (12 miles), the national territory covers about 46,620 sq. km (18,000 sq. m), of which 49% is land. Belize's land mass includes more than 1,000 tiny islands known as Cayes, totalling about 690 sq. km (266 sq. m).

(Source: World Atlas, 2018)

Figure 1 Map of Central America showing the location of Belize.

The climate is sub-tropical, with temperatures ranging from 21° C from October to February and increasing to 32.2° C during May to September. The annual mean relative humidity is 81.8%, while total annual rainfall varies from 1,588mm in the north to 4,290mm in the south. There are two distinct seasons: the rainy season, which normally begins in late May and lasts until November, and the dry season, which begins in December and ends in early May. Topographic variations throughout the country are responsible for major fluctuations in air temperature, humidity and rainfall.

Belize has a relatively low topographic relief. Freshwater river systems and many perennial streams supply most of its water needs. The country is well endowed with both surface water, and water stored in aquifers. The Land Information Center (LIC) has identified thirty-two watersheds, although the National Hydrological Services classifies twenty-two major watersheds for Belize. Streams draining the southeastern and eastern slopes of the Maya Mountains have well-developed branching patterns with relatively steep, straight courses in the mountainous areas. On the coastal plain, streams become progressively more sluggish and drainage is less effective. Near the submerging coast, numerous lagoons, mangrove swamps, deep estuaries, and river-mouth bars are well developed.

The barrier reef, the second longest in the world and the longest in the Northern hemisphere, extends 200km (132miles) from the Mexican border to the Sapodilla Cayes; along Ambergris Caye it is only a few hundred meters offshore, whereas it is over 40km (25miles) offshore at Placencia. Seaward of the barrier reef, the continental margin is a series of discontinuous marine ridges with NNE-SSW orientation; two of these ridges have coral atolls upon them, known as Glover's and Lighthouse Reefs, separated by waters 360-1,100m deep. Seaward of the marine ridge supporting these atolls is an escarpment descending more than 4,000m into the Cayman Trough.

The northern half and southeastern fringe of the country comprise a plain of low relief. The Maya Mountains, 300-1,100 m in altitude, occupy the south centre and dominate much of the remainder of the country. They rise steeply to a maximum of 1,120 m at Victoria Peak in the Cockscomb Range, and they slope down to the Vaca Plateau in the west. The third major physiographic feature of the country comprises karst landscapes, sometimes hilly and sometimes rolling, on the north and west of the Maya mountains. Prominent discontinuous foothill ranges exist in the southern interior and comprise much of the hinterland of the Southern Toledo District.

Belize consists of six (6) districts, which are comprised of cities, towns and villages. The northern districts of Corozal and Orange Walk (see Figure 2) consist of predominantly Mestizo and Spanish-speaking ethnic groups. The Belize district is comprised primarily of English-speaking Creole. The Cayo district, located in the geographic centre of the country is more mixed, with Creole, Mestizo, Mayan, and Mennonite communities. Further south, the Garifuna dominates the

Stann Creek district, while more than 60% of the Toledo district is Mayan. Three (3) Mayan languages are spoken throughout Belize; Ket'chi, Mopan and Yucatec.

Population

Belize is the most sparsely populated nation in Central America. In 2017, the population was 387,879 (SIB, 2018). The Belize and Cayo Districts account for roughly half the population of the country. The two (2) municipalities that show the highest population growth are Belmopan and San Pedro (SIB, 2018).

Belize is an ethnically diverse nation with most Belizeans being of multiracial descent. There are at least ten (10) different ethnic groups in the country. The ethnicity with the highest representation is the Mestizo group, followed by the Creoles and the Maya. This is unlike in past years when the Creoles were the most prominent ethnicity in the country. About 80% of the population is Christian.

Belize is included in the World Bank's grouping of upper middle income countries, and was ranked 103 among 188 countries in terms of its composite Human Development Index (HDI), in 2016 (Pompey & Mendoza, 2018).

2.1.2 Membership in Regional and Sub-regional Organisations

Belize is a member of several regional and sub-regional organizations including the following:

a. The BCRC-Caribbean, which provides training and technology transfers for the Caribbean Region. Belize has benefited from a number of workshops and projects (Chemical profile 2015, Rotterdam PIC training, POPs project and the Minamata Initial Assessment) hosted by the centre on various chemical issues related to the Basel, Stockholm, Rotterdam and Minamata conventions.

b. The Caribbean Community (CARICOM), which rests on four main pillars: economic integration; foreign policy coordination; human and social development; and security.

c. The CARPHA a regional inter-governmental agency with the purpose of drawing together and building on public health knowledge and expertise across the Caribbean, preventing duplication of effort and resources. This will facilitate a coordinated approach to public health issues including managing the risk of disease outbreaks in the Caribbean region.

d. The United Nations (UN), an intergovernmental organization tasked to promote international cooperation and to create and maintain international order.

e. The CARICOM Regional Organization for Standards and Quality (CROSQ), a regional inter-governmental organisation established to facilitate the development of regional standards, promote the harmonization of metrology systems and support the sustainable production and trade of goods and services.

f. The Caribbean Disaster Emergency Management Agency (CDEMA), a regional inter-governmental agency for disaster management in the Caribbean Community. CDEMA is the regional disaster management body playing the role of facilitator, driver, coordinator and motivating force for the promotion and engineering of Comprehensive Disaster Management (CDM) in the region.

g. The Bolivarian Alliance for the Americas, an intergovernmental organization based on the idea of the social, political and economic integration of the countries of Latin America and the Caribbean.

h. The Commonwealth of Nations, an intergovernmental organisation of 53-member states that are mostly former territories of the British Empire. The Commonwealth operates by intergovernmental consensus of the member states, organised through the Commonwealth Secretariat and non-governmental organisations, organised through the Commonwealth Foundation.

i. The World Trade Organization (WTO), an intergovernmental organization that regulates international trade.

j. The Food and Agriculture Organization (FAO), of the United Nations a specialised agency that leads international efforts to defeat hunger.

k. Central American Integration System (SICA).

l. Central America Fisheries and Aquaculture Organization (OSPESCA)

2.1.3 Political and Economic Profile

Political Profile

Belize is a sovereign state having gained independence from the United Kingdom on 21 September 1981. It is governed by a representative democracy with bicameral legislature based on the Westminster model. The Prime Minister and Cabinet form the executive branch, while the National Assembly forms a bicameral legislature comprising of a 31-member elected House of Representatives and a thirteen-member appointed Senate.

Belize is a constitutional monarchy and parliamentary democracy on the Westminster model and is a member of the Commonwealth of Nations. Queen Elizabeth II is head of state and is

represented in the country by the Governor General. The primary executive organ of government is the Cabinet led by a Prime Minister (head of government). Cabinet Ministers are members of the majority political party in Parliament and usually hold elected seats in the National Assembly concurrently with their Cabinet positions (GOB, 2018).

Legislative power is vested in both the government and the Parliament of Belize. Constitutional safeguards include freedom of speech, press, worship, movement, and association. The Judiciary is independent of the executive and the legislature. Jurisprudence is based on English common law (GOB, 2018).

Economic Profile

Belize possesses a small open economy, which relies heavily on the services sector. "The country is currently recovering from a contraction of GDP recorded at 1.0% in 2016 by the Central Bank and is facing pressures from an extensive public sector external debt, and loss of correspondent banking relationships due to de-risking decisions taken by U.S. based banks" (Pompey & Mendoza, 2018).

The value of crops and agro-products in 2016 amounted to 8.4% of gross domestic product (GDP) whilst estimated tourism services earnings measured 22.5% of GDP (Pompey & Mendoza, 2018). Currently, sugar, citrus and bananas account for at least 60% of the earnings accruing from merchandise exports. Also, marine products (including seafood such as shrimp) and small manufacturing make notable contributions to exports. Significant proportions of these products are sold under preferential arrangements that ensure access to markets and generate higher than world market prices (SIB, 2016). Petroleum exports accounts for less than 1.0% of GDP and exhibited a steady decline over the five years beginning in 2012, when it measured 3.0% of GDP (Pompey & Mendoza, 2018).

(Source: Nations Online Project (https://www.nationsonline.org/oneworld/map/belize-political-map.htm)

Figure 2 Political Map of Belize.

2.1.4 Profiles of the Main Economic Sectors

Agriculture

Agriculture plays a significant role in the economic structure of Belize as it continues to form the foundation of the productive sector and the rural economy of the country. Agriculture and horticulture contributed over $190 million BZE in 2014 (SIB, 2016). This sector is also highly vulnerable because the country's major exports (sugar, citrus and bananas) are located in the narrow coastal belt.

Since agriculture production is an important contributing sector to the economy of Belize, small scale and large-scale production continues to grow in importance as large farms expand to satisfy external markets, while small farmers depend on cash crops as a means of earning a living. Belize has about 11,000 farmers using a total land area of 265,000 acres, or 5% of the total landmass, 146,000 acres being for crops and 119,000 acres for pasture.

Tourism

Tourism is one of the largest sources of foreign currency. Belize tourism product is highly dependent on the health of its natural resources, with feature attractions such as the extensive rainforests, the largest cave system in Central America, major Maya ruins, wildlife, the largest barrier reef in the Western Hemisphere, and three of the four true atolls in the Americas including the Great Blue Hole. More than 100 islands and beaches nestled inside the reef make for traditional sun, sand and sea attractions as well as world class SCUBA diving. Cruise ships arrivals have also increased in recent years.

2.1.5 Environmental Overview

Belize is located within the "hurricane belt" and as such has experienced many hurricanes and other systems over the years. The most notable hurricane to affect Belize was hurricane Hattie, which made landfall on October 31, 1961. This hurricane caused hundreds of deaths and has been recorded as the most severe to take place. This hurricane caused severe economic lost, destroying approximately 40% of buildings, leaving between 25-30% significantly damaged. Almost all the buildings in Belize had some damage. There have been several more hurricanes affecting Belize over the years, the most recent being hurricane Earl in 2016. Other hazards such as droughts, floods, forest fires and to a lesser extent, oil spills, have also affected Belize.

The dominant economic sector in Belize, agriculture is highly vulnerable because the country's major exports (sugar, citrus and bananas) are located in the narrow coastal belt, which is faced with environmental and geographical issues.

The water sector is another major area of concern. Historically, Belize has been considered a country with a relatively high level of water security, due to its 18 water catchment areas, high levels of forest cover and abundance of rainfall. However, challenges to the water sector have arisen from different sources. Pressures from population growth and the development of sectors such as agriculture and tourism have caused the water resources sector to be under stress and the intended growth of these sectors to aid in economic development will continue to do so.

Major impacts of climate change such as increased sea surface temperatures; sea level rise and increased frequency and intensity of storms are projected to exacerbate the challenges already faced by the country's coastal zone. Further to this, the management of the coastal zone also impacts several other key sectors, critical to the growth of Belize. The fisheries and tourism sectors, contributing significantly to the country's GDP, are also likely to be negatively impacted and as such coastal zone management is of utmost importance to Belize.

2.2 INSTITUTIONAL POLICY AND REGULATORY FRAMEWORK

This subchapter presents a description of the institutional, policy, and regulatory framework within which the NIP will be implemented. It also covers more detailed baseline information about the management of POPs chemicals such as key approaches and procedures for enforcement and monitoring requirements in Belize.

2.2.1 Environmental Policy, Sustainable Development Policy and General Legislative Framework

Environment and chemicals management in Belize are guided by several policies and plans, which provide overarching guidance or are directly connected to chemicals management.

1. **National Development Framework 2010 – 2030 (Horizon 2030)**

This Framework sets the longterm development objectives for Belize. Its vision includes achieving "a country of peace and tranquility, where citizens live in harmony with the natural environment and enjoy a high quality of life". Further, it includes Critical Success Factor 3, which is to reach "Sustained or Improved Health of Natural, Environmental, Historical and Cultural Assets".

2. **National Environmental Policy and Strategy 2014-2024**

This includes direct provisions for pursuing sound chemicals management.

3. **National Emergency Preparedness Plan for Oil Spills 2016**

This Plan makes direct provision for oil spills, particularly to ensure readiness considering Belize's oil drilling and export activities.

4. **National Hazard Mitigation Plan 2006**

The plan is described in part as a guide to decision makers, government agencies, developers, contractors, design professionals and citizens on what tools and techniques to decrease vulnerability to future hazards. It is built around the following mitigation actions:

a. Building Institutional and Legislative Capability to Manage Risk,
b. Building Hazard Risk Reduction (HRR) Information Management System,
c. Engaging in Environmental Management, and
d. Public Education, Training and Outreach.

5. **Belize National Solid Waste Policy**

This Policy facilitates improved waste management in part by reducing dumping and open burning of garbage, and thereby cutting back on emissions.

2.2.2 Roles and responsibilities of ministries, agencies and other governmental institutions involved in POPs life cycles (from source to disposal, environmental fate and health monitoring)

In Belize there is no single institution which is currently responsible for the management of chemicals including POPs. This is due in large part to the fact that Belize has no chemical framework legislation, which would have been expected to establish such an institution. In addition, the current legal and institutional framework for managing chemicals including POPs is disjointed and the responsibilities are scattered among various institutions.

The six (6) principal organizations with legal arrangements for the handling or management of POPs in Belize are:

1. Department of the Environment (DOE),
2. Pesticides Control Board (PCBd),
3. Public Health Department, Ministry of Health,
4. Belize Agriculture Health Authority (BAHA),
5. Belize Electricity Limited (BEL),
6. Belize Customs and Excise Department, and
7. Belize Port Authority.

The Department of the Environment

The DOE was legally established by the enactment of the Environmental Protection Act, 1992 (EPA). It is a Department within the Ministry of Agriculture, Forestry, Fisheries, the Environment and Sustainable Development (MAFFESD). The DOE has a wide function in matters pertaining to environmental protection and the control of pollution. It is responsible for monitoring all activities that impact on the environment and human health. The Environmental Protection Act also makes provisions for conducting Environmental Impact Assessments (EIA) for projects, undertakings, or activities that may significantly affect the environment. Through the EIA process both beneficial and adverse impacts are assessed and suitable recommendations are made to prevent, reduce and mitigate the harmful effects of any proposed action on the environment. These terms and conditions to safeguard the environment are then compiled into an Environmental Compliance Plan (ECP) that becomes legally binding once environmental clearance is granted. Some of the DOE's duties include: monitoring environmental health; advising the Government on the formulation of policies relating to the good management of natural resources and the environment; conducting studies and making recommendations on standards relating to the improvement of the environment and maintenance of a sound ecological system; through Inter-ministerial Cooperation, and to foster the prudent use and proper management of the natural resources of Belize (EPA, Chapter 328 of the Substantive Laws of Belize Re. Edition 2011).

Several Statutory Instruments have been passed under the EPA. One such instrument is the Effluent Limitations Regulations, 1995 as amended 2009, which, among other things, requires that Industry maintain a registry of pollutants and that industry meet certain standards for effluent discharges. The DOE also has representation on various national committees that have some relevance to environmental management, including the PCBd and the National Bio-safety Committee. In addition, the DOE is the national focal point for the Basel, Rotterdam & Stockholm (BRS) Conventions.

While the DOE laws and regulations do not specifically mention the management of POPs, they do participate in regulatory actions against the importation of prohibited substances (prohibited under the Pesticides Control Act), by supporting the institution at the Board level and Technical levels through its environmental clearance process and enforcement programmes.

The Pesticides Control Board

The Pesticides Control Board was legally established by the enactment of the Pesticides Control Act of 1985 (PCA); and is as a statutory body within the Ministry of Agriculture mandated with the regulation of pesticides in Belize. PCBd is headed by the Registrar to the Board and has six technical staff and two supporting staff in addition to the members of the Board. The Board membership is comprised of an inter-sectoral body with representation from various agencies. The Board and its sub-committees meet regularly to decide on matters such as registration and policy direction. It has a secretariat whose function is to carry out the decisions and administrative activities of the Board. The functions of the Board are as follows:

- Registration of pesticides,
- Licensing of pesticides imports and manufacture,
- Authorization for sale of restricted pesticides,
- Registration of premises for sale of restricted pesticides,
- Authorization for use of restricted pesticides,
- Classification of pesticides, and;
- All other aspects of pesticide manufacture, importation, packaging, preparation for sale, disposal and use.

The goals of the PCBd are:

- To safeguard the health of the Belizean people by promoting the availability of wholesome foods;
- To safeguard the environment by providing protection from the adverse effects of pesticides;
- To assist in economic development by enhancing the quality of agricultural production.

Public Health Department, Ministry of Health

The Public Health Department under the Public Health Act (Chapter 40, Revised Edition 2011) regulates matters concerning the general health of the public. The Public Health Act (Chap, 40) provides the Director of Health Services with the authority to make regulations regarding the performance of duties by Health Officers. The Ministry of Health (MOH) is empowered under the Act to appoint a Central Board of Health whose function is to act in an advisory capacity. Health Officers are responsible for the inspection of facilities such as dwelling buildings, workplaces, recreation sites, etc., that the public uses during the course of their day-to-day activities. The Public Health Bureau is the implementing agency of the regulations under this Act. The Act defines the duties of the Public Health Inspectors. The duties related to pesticide utilization and handling includes monitoring the use of chemicals, herbicides, insecticides, pesticides and industrial wastes; assisting in the Vector Control Programme; monitoring of water quality; and monitoring of sewage, and liquid waste management.

The MOH is a member of the Pesticides Control Board. The Ministry also has an Environmental Health Program. The purpose of this program is to contribute to the development and maintenance of a clean, safe and healthy environment, so as to reduce the prevalence of diseases that are associated with poor environmental conditions.

Belize Agriculture Health Authority (BAHA)

BAHA is a statutory body designed to modernize the Agricultural Health Services in Belize. It was established under the Laws of Belize "Belize Agricultural Health Authority Act, Chapter 211 of the Substantive Laws of Belize Revised Edition 2011". BAHA is governed by a Board of Directors, which is the policy making organ of the Authority, with representatives from both Government and the Private Sector.

BAHA's mission statement is "To serve Belize by providing efficient, competent and cost effective professional animal health, plant health, quarantine and food safety services that protect human health, animal health and welfare, plant health and the environment, ensure safe and wholesome food, strengthen national food security and facilitate trade and commerce".

BAHA's activities are oriented towards agricultural health monitoring at the national, transboundary and regional level, capacity building activities (e.g. international training and short-term external training), technical partnerships (e.g. Pan American Health Institute (PAHO), the Inter-American Institute for Cooperation on Agriculture (IICA)) and slightly less so towards replicable cases studies (e.g. BAHA itself (structure and operations), (Mealy Bug Project) and international initiatives (e.g. Caribbean Development Bank (CBD)-Biosafety and FAO projects). BAHA also participates as a primary supporting agency to the Pesticides Control Board and the

DOE in its POPs management via its participation at the Pan American Health Institute, and also offers laboratory services to agencies and individuals in the research of POPs.

Agricultural Health Programmes are administered by BAHA (e.g. Medfly Surveillance Programme). Exotic pest and disease introduction continues to be the foremost deterrent to free trade and this organization remains vigilant for the early detection of injurious pests and diseases. It is also integrated with the regulation of importation of plants and plant products with that of Pest and Disease Surveillance and the Quarantine Department of BAHA. The Mediterranean fruit fly and Pink Hibiscus Mealy Bug Programmes are two areas where early detection results in minimal economic loss to the agricultural sector.

The Plant Health Department ensures the agricultural health protection for plants from invasive pests and diseases. BAHA's role has become increasingly important in areas such as certification of wholesomeness of raw plant products for export; negotiation of phyto-sanitary measures, both bilaterally and multilaterally; crop loss assessment due to pests, diseases and natural disasters and in the regulation of all important plant and plant products through Pest Risk Analyses.

The Belize Electricity Limited (BEL)

BEL meets the country's peak demand of about 67 megawatts (MW) from multiple sources of energy. These sources include electricity purchases from Belize Electric Company Ltd. (BECOL), which operates the Chalillo, Mollejon, and Vaca Hydroelectric Facility in the Cayo District; from Comisión Federal de Electricidad (CFE), the Mexican state-owned electricity company; BELCOGEN, a co-generation power plant; BAPCOL; Hydro Maya and from BEL's gas turbine unit and diesel fired generators. All major load centers are connected to the country's national electricity system, which in turn is connected to the Mexican electricity grid, allowing BEL to optimize its power supply options.

Prior to 1992, the Government of Belize was the sole owner of the Belize Electricity Board. Under the Electricity Act, No. 13 of 1992, Belize Electricity Board (BEB) ceased to function as it was privatized and became BEL. In that year, the Minister of Energy and Communications issued a license under section 15 of the Electricity Act, 1992, granting BEL the exclusive authority to generate, transmit and supply electricity.

Under the license, BEL has exclusive power to:

- Generate electricity for the purposes of giving a supply to or enabling a premise in Belize;
- Transmit electricity for the purposes of giving a supply to or enabling a supply to be given to any premises in Belize; and
- Distribute and supply electricity to any premises in Belize as a public electricity supplier.

Belize Electricity Limited is the primary distributor of electricity in Belize, selling almost 360 GWh of electricity yearly, and 25 MW from Comisión Federal de Electricidad. BEL also owns and operates a 22 MW Gas Turbine Unit at its West Lake Generating Plant and Substation and operates 4 diesel plants and maintains 26 substations.

Belize Customs and Excise Department

The Custom and Excise Department's main objective is to develop and implement an integrated set of policies and procedures that ensure safety and security, as well as developing necessary platform to promote effective trade facilitation and revenue collection. In providing safety and security to the country, the department undertakes agency duties for other government ministries and departments.

The department has implemented, a customs based programme, the Automated System for Customs Data (ASYCUDA), with the ultimate goal of achieving a digital Customs and Excise Department. With the growing volume of transaction in international trade, the Belize Customs cannot afford the interruption of the supply chain and the department does not have the resources to check every consignment. The department is cognizant that security has become of paramount importance. This said, the customs controls are not only dedicated to collect and protect fiscal revenue, but also to support free and secure trade and to participate in the global fight against terrorism. This goal can only be achieved using modern, efficient and computerized tools that can allow Customs to record the information and to use it for targeting high-risk consignments.

One of the modules in the ASYCUDA World programme is the selectivity module. This module determines the selection on the basis of the information available in "criteria" files. The system will allocate the declared goods to one of the following control "channels":

- Green – release of goods without examination;
- Yellow – documentary check prior to goods release;
- Red – physical examination of the goods prior to goods release; or
- Blue – goods will be released but will be submitted to post-clearance audit control by Customs.

The "criteria" files are built using national and local file data. For instance, the Department of the Environment provided Belize Customs with a list of restricted goods that need clearance from DOE prior to being release into national territory. Based on the harmonized systems code, any shipment containing these goods, the shipments will either trigger red or yellow channels. The programme will prevent the release of these goods unless DOE approved them to be released.

Belize Port Authority

The Belize Port Authority, under the Belize Port Authority Act *(Chapter 233, Revised Edition 2011),* allows for the regulation and management of waste in Belize's ports. In particular the authority regulates air and water pollution via monitoring discharge from ships such as sanitary sewage, gaseous liquids and solids, carcasses, gasoline, oils, ballasts, butchers offal, garbage, residuum of gas, tar or refuse, trade waste or any other material that is capable of producing floating matter on the surfaces of water, sediment or obstruction on the bottom of the sea or odors of gas of putrefaction.

The Belize Port Authority collaborates with the International Merchant Marine Authority of Belize to enforce the Harbors and Merchant Shipping Act, which regulates the discharge of solid materials from a vessel.

2.2.3 Relevant international commitments and obligations

Belize has signed or ratified at least 25 regional and international conventions and agreements related to the environment:

- the Stockholm Convention on Persistent Organic Pollutants (signed 2002);
- the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals in International Trade (signed 1998);
- the Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal (BASEL) (acceded Apr. 21, 1997);
- the International Convention for the Prevention of Pollution from Ships and the 1978 Protocol MARPOL (ratified Aug. 26, 1995) the Convention on the Inter-Regional Organization for Plant and Animal Health (OIRSA);
- the International Plant Protection Convention (acceded May 14, 1987);
- the Vienna Convention for the Protection of the Ozone Layer and the Montreal Protocol on Ozone Depleting Substances (acceded Sept. 7, 1997);
- the UN Convention of the Laws of the Sea (ratified Aug. 13, 1983); and
- the 1992 Protocol to the International Convention on Civil Liability for Oil Pollution Damage (1972) and 1992 Protocol to the Convention Establishing the Fund for Compensation for Oil Pollution (acceded July 1, 1991).

Other agreements signed include the Convention on Biological Diversity on June 13 1992 in Rio de Janeiro, Brazil, ratified December 1993. Belize is also party to the Convention on International Trade of Endangered Species of Wild Fauna and Flora (CITES) since 1981; the Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar Convention) in

1989; the International Convention for the Regulation of Whaling (1982); the Convention on the Conservation of Migratory Species of Wild Animals, Bonn (The Migratory Species Convention); and the Convention Concerning the Protection of the World Cultural and Natural Heritage (The World Heritage Convention) (ratified Nov. 6, 1990).

Belize has also signed several important agreements on Biodiversity at the regional level. This includes the:

- Convention for the conservation of Biodiversity and the Protection of Priority Areas of Central America (1992);
- Central American Alliance for Sustainable Development (ALIDES) (1994);
- Inter-American Convention for the Protection and Conservation of Sea Turtles;
- Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (The Cartagena Convention);
- Protocol Concerning the Cooperation in Combating Oil Spills in the Wider Caribbean Region (ratified Dec. 11, 1997);
- Convention on Nature Protection and Wildlife Preservation in Western Hemisphere (The Western Hemisphere Convention); and
- Belize/Mexico Bilateral Agreement (signed September 1991).

In addition to the SC, the two (2) most relevant conventions signed by Belize are:

1. The Basel Convention

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal seeks to "protect, by strict control, human health and the environment against the adverse effects which may result from the generation and management of hazardous wastes and other wastes".

A central goal of the Basel Convention is the environmentally sound management of hazardous waste. To this end, the Convention establishes a system to control the transboundary movement of hazardous waste and requires all Parties to report on the generation, export and import of wastes covered by the Convention. Parties can also access, via the Secretariat or one of the Regional Centres Training and Technology Transfer, technical assistance and training in the management and minimisation of hazardous wastes.

All of the chemicals included in the SC, on becoming wastes, are subject to the controls of the Basel Convention. Specifically, the Basel Convention governs the management, movement and disposal of the following types of POPs wastes:

(a) PCBs, PCTs, PCN and PBBs

Waste electrical and electronic assemblies or scrap containing components such as accumulators and other batteries, mercury-switches, glass from cathode-ray tubes and other activated glass and PCB-capacitors; Wastes, substances and articles containing, consisting of or contaminated with PCB, PCT, PCN or PBB, or any other polybrominated analogues of these compounds, at a concentration level of 50 mg/kg or more.

(b) Pesticide POPs, including aldrin, chlordane, DDT, dieldrin, endrin, HCB, heptachlor, mirex, lindane, PCP, endosulfan and toxaphene.

Wastes from the production, formulation and use of biocides and phytopharmaceuticals, including waste pesticides and herbicides, which are off-specification, outdated, or unfit for their originally intended use.

(c) Unintentionally produced PCDD, PCDF, HCB, PCB, PeCB, or PCN

The Basel Convention Secretariat has issued a wide range of guidelines, guidance and training manuals to instruct and assist countries in the environmental sound management of hazardous wastes, including the *General technical guidelines for the environmentally sound management of wastes consisting of, containing or contaminated with persistent organic pollutants (POPs)*.

2. <u>The Rotterdam Convention</u>

The Rotterdam Convention was developed in response to the call, in Chapter 19 of Agenda 21, for a legally binding instrument on the Prior Informed Consent (PIC) procedure. The PIC procedure is "a means for formally obtaining and disseminating the decisions of importing countries as to whether they wish to receive future shipments of specified chemicals and for ensuring compliance with these decisions by exporting countries".

The Rotterdam Convention's aim is "to protect human health, including consumers and workers, and the environment against potentially harmful impacts from certain hazardous chemicals and pesticides in international trade". To achieve this aim, two main objectives have been identified:

- To promote shared responsibility and cooperative efforts among Parties in the international trade of certain hazardous chemicals in order to protect human health and the environment from potential harm; and
- To contribute to their environmentally sound use, by facilitating exchange about their characteristics, by providing for a national decision-making process on their import and export, and by disseminating these decisions to Parties.

The Rotterdam Convention establishes a first line of defense by giving importing countries the tools and information they need to identify potential hazards and exclude chemicals they cannot

manage safely. The Convention promotes the safe use of imported chemicals through labeling standards, technical assistance and other forms of support.

2.2.4 Description of existing legislation and regulations addressing POPs (manufactured chemicals and unintentionally produced POPs)

Presently, Belize has no legislation addressing POPs chemicals directly. There are two existing laws which partially address some of the POPs listed in the Annexes to the SC. The first law is the Pesticides Control Act, which has from its inception prohibited or restricted several POPs. The other piece of legislation is the Customs (Prohibited and Restricted Goods) (Consolidation Order), 1988, which includes a consolidated list of goods that are either prohibited or restricted under the Customs Regulation Act or any other law or regulation (Pompey & Mendoza, 2018).

Whilst there is no specific legislation addressing POPs chemicals, or for that matter chemical management in general, the DOE has taken significant strides to address this gap. Via the Strategic Approach to International Chemical Management (SAICM) II project, the DOE was able to develop a Draft Integrated Chemicals Management (ICM) Bill. The Fundamental objective of this draft legislation is to provide for the integrated and sound management of hazardous chemicals including their importation, export, production, formulation, processing, transport, distribution, use, storage, and disposal; to protect human health, property and the environment from the harmful effects of hazardous chemicals. The integrated management of hazardous chemicals is achieved by the establishment of internationally recognized minimum standards expressed in the registration, licensing assessment and classification, labelling, packaging, transportation, monitoring, record keeping, accident prevention, auditing and disposal systems and processes that are described in the legislation and its regulations.

The Pesticides Control Act (PCA)

The PCA grants authority to the Pesticides Control Board to control the manufacture, importation, sale, storage, transportation and use of pesticides in Belize. The Pesticides Control Board is an inter-sectoral body comprising of representatives from the Ministry of Agriculture, Ministry of Health, Department of the Environment, the Belize Agricultural Health Authority, Agriculture Producer Associations and the crop protection industry.

Pesticides registered for use in Belize are categorized as “general use” or “restricted use”. Restricted Use Pesticides (RUP)’s are defined in the PCA as those, which, “…if used in accordance with a widespread and commonly recognized practice, may generally cause, without additional regulatory action, unreasonable effects on the environment, including injury of the applicator”. It is required that persons purchasing these pesticides be certified pesticide applicators.

Prohibited pesticides are listed in Schedule IV of the PCA and are defined as those pesticides of which the possible effects on the environment, plants, animals or human beings are considered by the Minister to be too dangerous to justify their use. Most POPs pesticides have been listed as prohibited pesticides since the passing of the PCA. However, DDT has restricted use since the MOH currently has a policy of reserving the right to import DDT for emergency use during the outbreak of malaria. Prohibited pesticides also include those pesticides that have not been duly registered for use in Belize.

In 1989, the Government approved a Statutory Instrument, the *Registered and Restricted Pesticide (Manufacture, Import and Sale) Regulations, 1988,* S.I. No. 8 of 1989. This was followed by the *Registered and Restricted Pesticides (Registration) Regulations, 1995*, S.I. 77 of 1995. Further Legislation passed includes the *Registered and Restricted Pesticides (Manufacture, Import and Sale) (Amendment) Regulations, 1996*, S.I. 30 of 1996. These regulations provide the legal requirements for registration, labeling, importation and sale of pesticides.

An application for registration of a pesticide should be submitted to the Pesticide Control Board prior to importation and should be accompanied by chemical, toxicological and environmental impact data. Any person wishing to register any pesticide must also submit details of the labels of packaging. Duration of the certificate of registration is valid for five years.

Further legislation under the PCA has been enacted in order to expand the legal requirements of the PCA. These include *the Restricted Pesticides (Certified User) Regulations, 1996*, S.I. 112 of 1996 and the *Pesticides Control (Sale and Confiscation) Regulations*, S.I. 71 of 1998. S.I. no. 112 of 1996 required that formal training of farmers, applicators and retailers be conducted on safe and efficient pesticide management. The enactment of S.I. No. 112, of 1996, required the pesticide user to pass a written or oral exam. Schedule III of this legislation required that the trainee comply with a number of stipulations include the ability to read and understand labels, safely and adequately prepare mixtures of pesticides, the proper calibration and use of equipment, among others.

With the enactment of S.I. No. 71 of 1998, *Pesticides Control (Sale and Confiscation) Regulations 1998*, the PCB was granted further powers to enforce S.I. no. 112 of 1996. This S.I. required that establishments maintain a register of sales of restricted pesticides and may only sell RUP to persons in possession of a certified user's license.

Customs (Prohibited and Restricted Goods) (Consolidation Order) 1988

Customs (Prohibited and Restricted Goods) (Consolidation Order) 1988 expressly prohibits the importation of prohibited pesticides. Section 15 of Part I of the Schedule (Prohibited Goods) prohibits the importation of pesticides listed in the Fourth Schedule to the Pesticides Control Act.

The Order also restricts those pesticides, which are listed in the Third Schedule to the Act. The list of restricted goods in Part II of the Schedule (Restricted Goods) includes explosives, medicinal dangerous drugs and registered or restricted pesticides under the Pesticides Control Act.

As regards UPOPs, there is also no existing framework legislation in Belize. However, several provisions in the Pollution Regulations can be used to regulate the emission or discharge of contaminants which also can address/cover unintended POPs. For instance, regulation 6 of the Pollution Regulations provides that no person shall cause, allow or permit contaminants to be emitted or discharged either directly or indirectly into the ambient air from any source. Likewise, regulation 8 prohibits persons, installations, factories or plants from emitting or discharging air pollutants into the environment, in contravention of the permitted levels specified under regulation 6 or 7 unless specifically permitted by the Department.

In addition, regulation 12 states that no person shall within any urban area cause or permit the burning of refuse or other combustible material so as to cause a nuisance to any other person or the burning of refuse in a commercial area instead of making provision for adequate cleaning. Regulation 13 (1) also provides that the DOE may permit the use of disposal sites where burning may be carried out for the purpose of disposing of solid waste and combustible material at such times and under such conditions as it determines.

2.2.5 Key approaches and procedures for POPs chemical and pesticide management including enforcement and monitoring requirements

It is recommended that the Pesticides Control Board set up a system requiring that all major users (e.g. large farms, re-formulators) receive certification on pesticide management which must be periodically renewed and persons working in research laboratories be certified yearly to handle hazardous chemicals). This would be a good complement to ongoing efforts to educate farmers. Storage sites of recognized major users of pesticides must be approved and periodically inspected by Pesticides Control Board.

In addition, the enactment of the Integrated Chemicals Management Bill and its draft Industrial Chemicals Management Regulations would allow for improved management of POPs and other hazardous chemicals. Under this Bill, provisions are made for the establishment of a Secretariat of the National Integrated Chemicals Management Committee. This secretariat shall be the Chemical Management Unit of the Department of the Environment. The establishment of this unit, with its functions and powers outlined in the draft Industrial Chemicals Management Regulations would allow for that overall management of chemicals in Belize, including POPs.

2.3 ASSESSMENT OF THE POPS ISSUE IN BELIZE FOR THE YEAR 2016

The assessment of the POPs issue in the Belize is based on inventories of: pesticides, PCBs, and UPOPs: PCDD/PCDF, HCB and PCB. A summary of the information collected in the inventories is described in this sub-chapter. It presents information on the current POPs stockpiles, contaminated areas and waste, prediction of future POPs production, use and release, POPs monitoring capacity, and provisions for sharing information and raising public awareness.

2.3.1 Assessment with respect to Annex A, part I chemicals (POPs pesticides): historical, current and projected future production, use, import and export; existing policy and regulatory framework; summary of available monitoring data (environment, food, humans) and health impacts.

There were nine (9) POPs pesticides initially listed under the SC and seven (7) new POPs pesticides were added to the list, (see Table 3 for the names of the chemicals).

Table 3: POPs pesticides as listed in the Stockholm Convention.

Initial POP Pesticides	New POP Pesticides
Aldrin	Alpha-HCH
Chlordane	Beta-HCH
DDT	Chlordecone
Dieldrin	Lindane
Endrin	PeCB
Heptachlor	Technical Endosulfan and its related isomers
Hexachlorobenzene	PCP
Mirex	Sulfluramid (PFOS precursor)
Toxaphene	

(Source: Stockholm Convention website)

2.3.1.1 Production and/or use of the POP pesticides listed in the SC

Old POP pesticides

None of the initial listed POPs pesticides are produced in Belize and with the exception of DDT; their importation is prohibited under schedule IV (Section 13) of Statutory Instrument No. 100 of 1995 of the Pesticides Control Act of Belize (Pesticides Control Act, chapter 216, revised edition, 2011).

New POP pesticides

- Technical Endosulfan and its related isomers

Under the SC there are specific exemptions for crop-pest complexes. Endosulfan is prohibited for import and use under schedule IV (Section 13) of Statutory Instrument No. 100 of 1995 of the Pesticides Control Act of Belize (Pesticides Control Act, chapter 216, revised edition, 2011).

- Lindane (gamma-HCH)

Lindane (< 1% AI) has restricted use designation as a human health pharmaceutical for control of head lice and scabies as a second line of treatment under World Health Organization (WHO) guidelines (UNEP, 2010). Lindane is still used in Belize as a human health pharmaceutical for control of head lice and scabies.

- Alpha-HCH and Beta-HCH

These organochlorine insecticides are by products from the production of lindane. They are not explicitly listed on the prohibited pesticides list in the Pesticides Control Act and are considered irrelevant since lindane is not produced in Belize.

- PCP

In Belize, PCP has restricted use designation (Pesticides Control Act, chapter 216, revised edition, 2011). By 1996 numerous countries had prohibited the use of PCP, however, Belize retained its use for wood preservation by licensed applicators or under specific conditions. Currently in Belize, PCP is exempted for wood treatment of utility poles and cross arms. However, the recent inventory identified that none of the potential major users of PCP have used the chemical in recent years. According to the Pesticide Control Board the last known imports of PCP were in 2000.

- Chlordecone

Chlordecone was used in the past as an agricultural pesticide on banana plantations. Chlordecone is prohibited for import and use under schedule IV (Section 13) of Statutory Instrument No. 100 of 1995 of the Pesticides Control Act of Belize (Pesticides Control Act, chapter 216, revised edition, 2011).

- Mirex-S (sulfluramid)

Mirex-S (sulfluramid) is not a prohibited pesticide and has restricted importation and use designation in Belize (Pesticides Control Act, chapter 216, revised edition, 2011). In Belize, Sulfluramid (0.5%) is used for treatment of leaf cutting and fire ants. There are a number of registered alternative pesticides that can be used in its place for example boric acid, carbaryl and malathion (CARPHA, 2016d).

2.3.1.2 Regulatory and policy framework

Belize has a strong legislation and regulatory framework for the management of pesticides. As previously stated, the PCA includes provisions for the control of the manufacture, importation, sale, storage and use of pesticides, and related matters.

2.3.1.3 Monitoring data

Very limited studies have been done to monitor and assess the impacts of POPs pesticides on the environment and on human health in Belize, since the country lacks the capacity for such monitoring and research.

2.3.1.4 Potential health impacts

Exposure to pesticides can occur directly from occupational, agricultural and household use, and indirectly through the diet. Studies suggest that pesticides may be related to various diseases, including cancers, as well as having neurological, mental and reproductive effects. Children may be more susceptible to the effects of pesticides due to increased exposure via food and breast milk, underdeveloped detoxification pathways, and longer life expectancy in which to develop diseases with long latency periods (Cohen & Oates, 2007 and UNEP, 2015c).

2.3.2 Assessment of Polychlorinated biphenyls (PCBs) (Annex A Part II Chemicals)

2.3.2.1 Production and/or use of PCBs

Belize does not produce PCBs and importation has been banned in Belize since the 1990s. The principal use of PCBs in Belize was as a dielectric fluid in electrical transformers by BEL, which is responsible for the generation (other agencies generate electricity but sell the excess to BEL), transmission and distribution of electricity in the whole country (CARPHA, 2016b).

The first NIP reported that there may still be small numbers of transformers and other equipment that may contain PCBs contaminated oils (e.g. from maintenance) in use mainly by private companies but this was not confirmed. Therefore, as part of the recent inventory (2016), the power generating companies that supply energy to the grid in Belize were interviewed to determine the presence of PCB containing equipment and potential PCB contaminated sites within their facilities.

The results are as follows:

- The Belize Electric Company Ltd (BECOL)

BECOL that operates the Mollejon, Chalillo and Vaca Hydroelectric facilities (all located in the Cayo District) reported owning 34 transformers. None of the transformers contain PCB. Similarly, BECOL reported having no stockpiles of PCB containing transformer or PCB contaminated oil.

BECOL started operations fairly recent, as such all their transformers are modern transformers, which are PCB free (CARPHA, 2016b).

– Belize Co-Generation Energy Limited (BELCOGEN)

BELCOGEN operates a 27.5 MW biomass facility that burns sugar cane fibre (bagasse) as its primary fuel during both the in-crop period (December – July) and the out-of-crop period (August – November) and is supplemented with two diesel engines (4 MW) using No.6 fuel. BELCOGEN generates base load electricity of 13.5MW to supply the national grid (BEL) and to supply Belize Sugar Industries (BSI) with its electrical power (9MW) and steam requirements (CARPHA, 2016b).

BELCOGEN owns a total of 18 operable transformers, and one decommissioned transformer that is stored within their facilities. BELCOGEN reported that none of their transformers contain PCBs. Instead, their transformers use mineral based oil.

– Blair Athol Power Company Limited (BAPCOL)

BAPCOL operates an HFO fueled generating plant with 3 by 7.85 MW units. BAPCOL's generating capacity is approximately 10 MW. BAPCOL owns one transformer for internal use and remaining transformers belong to BEL. The BAPCOL owned transformer does not contain PCB. BAPCOL does not have any transformer stockpile (CARPHA, 2016b).

– Farmer's Light Plant Corporation (FLPC)

FLPC owns approximately 600 transformers that are currently in use (David Wright, Personal Communication). Additionally, FLPC owns 36 transformers unused and purchased within the last 24 months, 89 used and awaiting re-use or decommissioning and are noted as being <50ppm PCB and 29 transformers that are put aside under shelter as 'PCB unknown' and are awaiting testing and two capacitors.

FLPC reported that they are not sure if their transformers contain PCBs; however, given that the plant started operations in 1968 at a time that transformers containing PCBs were used, this warrants further investigation by the Department of the Environment. A site visit to the facility identified that it is highly likely that several of these transformers do contain PCB oils (CARPHA, 2016b).

2.3.2.2 Policy regulatory framework

Currently, there is no legislation or regulations specifically designed to address PCB management in Belize, elimination of PCBs and import of PCB-containing equipment. However, in 2009 the Hazardous Wastes Regulations was enacted which regulates the importation, transportation, storage, handling and disposal of hazardous waste in Belize.

2.3.2.3 Monitoring data

Belize has limited laboratory capacity for analysis of PCB congeners. This severely restricts in country research and monitoring activities related to health impacts of POP chemicals (in the environment, food and humans) including PCBs.

2.3.2.4 Potential health impact

Once in the environment, human exposures to PCBs can occur in the following manner:

- Eating contaminated food (fish from contaminated water ways);
- Breathing the air near PCB containing waste sites;
- Drinking contaminated water;
- During repair and maintenance of PCB transformers, or during accidents, fires, spills involving PCB transformers; and
- Burning of some municipal or industrial waste.

PCBs can cause such health problems such as liver damage, skin irritation, cancer, and reproductive system damage. PCBs have been listed in category 1 of cancer causing chemicals by the International Agency for Research on Cancer (IARC) in 2016.

2.3.3 Assessment of POP Polybrominated diphenyl ethers (POP-PBDEs) (Annex A, Part IV and Part V) and Hexabromobiphenyl (HBB) (Annex A, Part I)

2.3.3.1 Production and use

POP-PBDEs in EEE/WEEE (c-octaBDE)

A general inventory of electrical and electronic equipment (EEE) and related waste (WEEE) was done in Belize for 2016.

– Importation of new/second hand EEE/WEEE

This section presents information of POP-PBDE containing EEE and WEEE particularly in cathode ray tubes (CRTs) in imports into Belize. The total import of CRTs and other EEE give an indication of the total volume of EEE (including disposed WEEE).

The production of c-octaBDE was stopped in 2004 consequently; only second hand imported EEE would be partly impacted (not the new EEE) (UNEP, 2015a and Secretariat of the Stockholm Convention, 2015a) therefore it was assumed that the estimated share of second-hand EEE among the imports is 10% by weight.

The total quantity of CRT computer monitors and TVs imported for the inventory year (2016) was 3 t and that for the other EEE was 4,744 t. The total impacted polymer fraction in second hand imported CRT computer monitors and TVs was 1 t (equivalent to the amount of polymer to be newly managed) and the total estimated amount of c-OctaBDE in second hand imported CRT computer monitors and TVs was estimated at 0.23 kg. This demonstrates that hardly any old CRTs were recently imported to Belize (CARPHA, 2016a).

– EEE in current use

The total number of in use and stored EEE by consumers was gathered from three (3) main sectors: households, government institutions and private businesses.

Households

A total of 57 households were randomly selected from the census list. The households surveyed had representation from rural and urban areas of the six (6) districts in Belize. The total weight of household EEE in the sample surveyed was 4,107 t and that of CRT computer monitors and TVs was 234 t. The estimated POP-PBDEs in CRT casings of computer monitors and TVs was 120 kg and the estimated total amount of impacted polymer in household CRT computer monitors and TVs was 67 t.

Government Institutions

Data was gathered from schools (primary, secondary and tertiary) and government ministries. Schools were randomly selected from the Ministry of Education directory. A sample of thirty schools was inventoried: five (5) schools from each of the six (6) districts, representing both rural and urban areas. Additionally, a sample of twenty-six government ministries was inventoried.

The total amount of in use EEE in Government institutions was 282 t and the total amount of in use CRT computer monitors and TVs was 23 t. The total amount of impacted polymer in Government institutions' CRT computer monitors and TVs was 7 t and the total estimated amount of c-octaBDE was 13 kg.

Private businesses

A total of twenty private businesses were surveyed; one (1) bank, five (5) credit unions, two (2) insurance companies and twelve (12) hotels. The total amount of in stock EEE in the private businesses was 2,782 t and the total amount of in stock CRT computer monitors and TVs was 462 t. The estimated total amount of POP-PBDEs contained in stock CRT castings of TVs and computers for private businesses in Belize were 120 kg and the estimated amount of impacted polymer was 138 t.

Summary

For 2016, the total of in use and/or stored EEE from the consumers sampled (households, government institutions and private businesses) in Belize was 7,170 t. The total of amount of in use and/or stored CRT computer monitors and TVs for the consumers sampled (households, government institutions and private businesses) in Belize was 718 t.

The estimated total amount of polymer fraction POP-PBDE (c-octaBDE) contained in use and/or stored CRT casings of computer monitors and TVs for consumers sampled in Belize was 253 kg and the estimated total of the impacted polymer fraction was 212 t.

– <u>POP-PBDEs in EEE entering the waste stream</u>

For 2016, the amount of impacted CRT computer monitors and TVs entering the waste stream was 142 t. The estimated e-waste generated from CRT computer monitors (WEEE) was 15 t and e-waste generated from CRT TVs was 127 t. The estimated total amount of POP-PBDEs in EEE entering the waste stream (WEEE) was 44 kg. Total impacted polymer fraction entering the waste stream was 42 t.

The above inventory data considered the following assumptions about the life span of CRT computer monitors/TVs:

- Household - 10 years;
- Government agency – 6 years (UNEP, 2015a); and
- Private Businesses – 4 years

POP-PBDEs in the Transport Sector (c-pentaBDE)

In Belize, the number of vehicles registered for the inventory year (2016) was 38,221 (cars – 31,955, trucks – 4,641 and buses – 1, 625) (Project Management Unit, Road Safety Project). Imports for 2016 were 12,485 vehicles (cars - 11,175, trucks – 557 and buses – 753). The vehicles are mainly imported from USA (71%) followed by Asia (15%) and Europe (1%). To estimate the

quantities of vehicles that were imported and produced before 2005 the following assumptions (based on advice from local authorities) were made:

- 95% of the cars were produced before 2005;
- 98% of the trucks were produced before 2005; and
- 98% of the buses were produced before 2005.

The total estimated amount of POP-PBDEs (c-pentaBDE) in imported vehicles (historic imports) in use which were produced before 2005 was 2,212 kg, whilst the estimated amount of POP-PBDEs (c-pentaBDE) in imported vehicles produced before 2005 and imported in 2016 was 734 kg. The total inventory of c-pentaBDE in historic vehicle imports and vehicles imported for the inventory year (2016) and produced before 2005 was 3 t.

As it relates to polyurethane (PUR) foam, the stock in cars/ trucks and buses in use (historic imports), produced before 2005, was estimated to be 559 t and 5 t respectively. Thus the total estimated amount of PUR foam in historic imported vehicles produced before 2005 to be managed is 610 t. For the inventory year, 2016, the stock of PUR foam in imported cars/ trucks and buses, produced before 2005 is 179 t and 24 t, respectively, totaling 202 t.

The average polymers in vehicles to be managed in an environmentally sound manner including POPs and other pollutants are 7,969 t.

– PBDE in recycling

Two (2) recyclers (Belize Recycling Company and Orange Walk Metal Recyclers) which engage in the purchase and export of ferrous and non-ferrous metals (copper, aluminium, etc.) were interviewed. Their recycling activities include salvage of scrap metal from derelict vehicles. These recyclers do not maintain accurate records; therefore, obtaining estimates of total volume of POP-PBDE in recycling was not possible (CARPHA, 2016a).

2.3.3.2 Policy and regulatory framework

There is no legislation or policy specifically targeted at the management of POP-PBDEs in Belize.

2.3.3.3 Monitoring data

There is no available system in Belize for monitoring the health impacts of POP-PBDEs. Furthermore, there is lack of human and laboratory capacity to engage in monitoring or research activities related to POP-PBDEs. An Internet search for studies on POP-PBDEs and HBCD associated with Belize yielded very few studies (Shen et al., 2006; Metcalfe & Drouillard, 2009; CEHP, 2012). One of the most prominent studies was carried out in 2012 and reported the presence

of low levels of PBDE congeners in the blood of Belizeans sampled in the study (CEHP, 2012). Therefore, there is need for further assessment and monitoring of environment and health impacts from PBDEs.

2.3.3.4 Potential health impacts

A significant number of studies have confirmed the almost ubiquitous presence of PBDEs in the environment. PBDE exposure mainly occurs from the diet and the indoor environment, though some occupational exposure has also been documented. Among foods, fish, meats, and dairy products contain the highest concentrations of PBDEs (CARPHA, 2016a).
The toxicological endpoints of concern for environmental levels of PBDEs are likely to be thyroid hormone disruption, neurodevelopmental deficits and cancer (Costa et al., 2009).

2.3.4 Assessment of Hexabromocyclododecane (HBCD) (Annex A, Part I)

2.3.4.1 Production and use

HBCD is not produced in Belize; however, it may still be in use in HBCD containing products.

- HBCD and HBCD containing products in import and export

Belize does not export HBCD as chemical or in HBCD containing products. An attempt was made to obtain data on HBCD containing products such as firefighting suits and construction foams; however, this data was not available from Customs and Excise import data. The database containing information on imports is not specific enough to identify HBCD containing products.

- HBCD in polystyrene (EPS and XPS) in current use and stock

HBCD in EPS/XPS in construction (major use)
An inventory of the current use and stock of HBCD in EPS and XPS construction insulation material was not possible; however, it is expected that only small quantities are used given that residential buildings are not commonly insulated. Government buildings may be insulated; however, it was not possible to determine if the insulating material contains HBCD.

HBCD in textiles (minor use)
Potentially treated textiles could not be confirmed since textiles are not labeled (Secretariat of the Stockholm Convention, 2015b). During the inventory a screening of textiles (tier III) could not be performed due to the lack of screening and analysis capacity.

2.3.4.2 Policy and regulatory framework

There is no legislation or policy with explicit charge for the management of HBCD in Belize.

2.3.4.3 Monitoring data

There is no available system in Belize for monitoring the health impacts of HBCD. Furthermore, there is lack of human and laboratory capacity to engage in monitoring or research activities related to HBCD.

2.3.4.4 Potential health impacts

HBCD is very toxic to aquatic and soil organisms. New scientific findings have contributed significantly to our understanding of chronic, long-term effects of the toxicity and hazards of HBCD exposure both to wildlife and humans. The toxicological endpoints of concern for HBCD in humans are thyroid hormone disruption, neurodevelopmental deficits and cancer.

2.3.5 Assessment of polychlorinated naphthalenes (PCNs) (Annex A, part I)

2.3.5.1 Production and use

PCNs were mainly used between 1920 and 1960 but remained high volume chemicals until the 1970s (AMAP, 2004; Jakobsson & Asplund, 2000; Secretariat of the SC, 2017a). PCNs were used in the same applications as PCBs, however with different focus of products. PCNs were commonly used in open applications like sealants, paints and plastic additives; however, SCCP and other CPs have substituted PCNs and PCBs and are currently used in these applications.

2.3.5.2 Policy and regulatory framework

In the absence of a regulatory framework specifically for the control and management of hazardous and toxic substances, there is no legislation or policy in Belize governing the import, use or export of PCNs.

2.3.5.3 Potential health impacts

PCNs have health effects due to these ubiquitous chemical mixtures being resistant to decomposition in the natural environment. Human exposure to these contaminants is mainly through the consumption of food, particularly fish caught in contaminated waters, and to a much lesser extent through direct contact with contaminated water. Chemical induced toxicities include effects on the immune system, which may lead to diminish resistance to infectious agents.

2.3.6 Assessment with respect to Annex B chemicals dichlorodiphenyltrichloroethane (DDT)

2.3.6.1 Production and Use

DDT is not produced in Belize. It was first used in Belize in 1957 when the National Malaria Eradication Service (NRMS) was established and was used continuously (except for a short break from 1974-79) until 1995 for the control of vector that carries the agent that causes malaria and dengue fever. It was used briefly again in 1997 and has not been used since. DDT has never officially been used for agricultural purposes even though one or two farmers may have used it (Avella et al., 2008). Nonetheless, the Ministry of Health maintains a policy of reserving the right to import DDT for emergency use during the outbreak of malaria.

2.3.6.2 Policy and regulatory framework

DDT is a restricted substance in Belize, under the Pesticides Control Act, 1985. However, the Ministry of Health maintains a policy of reserving the right to import DDT for emergency use during the outbreak of malaria. There is no other agency with authorization to import DDT.

2.3.6.3 Monitoring data

Alegria et al. (2000) showed average levels of DDT concentrations of 970 pg/m^3 for Belmopan. In another investigation by Fernandez levels of organochlorine (DDT+ DDE + DDD) in environmental and biological sample were determined. Results showed that levels of DDT in breast milk ranged from 0.07 to 0.27 ppm (mg/l) while sediment samples tested showed levels of DDT ranging from 3.35 ppm from samples taken at the upper Macal River to 5.38 ppm (mg/kg) from samples taken at the mouth of the Belize River (Fernandez, 2001).

The data for breast milk was derived from only 5 samples and the fish samples (10) were equally small. Therefore, no firm conclusion should be drawn from them. There is however, a need for further studies to be conducted in these areas in light of the potential impact of the presence of these chemicals in the food chain and their potential impact on human health, coastal and marine resources, and the tourism industry.

2.3.6.4 Potential health impacts

Studies suggest that pesticides such as DDT may be related to various diseases, including cancers, as well as having neurological, mental and reproductive effects. Children may be more susceptible to the effects of pesticides due to increased exposure via food and breast milk, underdeveloped detoxification pathways, and longer life expectancy in which to develop diseases with long latency periods (Cohen & Oates, 2007).

2.3.7 Assessment of PFOS, its salts and PFOSF (Annex B, Part III chemicals)

2.3.7.1 Production and Use

Firefighting foam use (Current/historic use and stock)

Fire extinguishers imported into Belize for the last six (6) years is presented in Table 4. Imports of fire extinguishers were the highest during the years 2013 and 2016. In Belize, Fabrigas Belize Ltd. is the major importer and distributer of fire extinguishers. The major types that are imported and distributed by Fabrigas are non-PFOS containing, hand portable extinguishers. These are the ABC Multi- Purpose Stored Pressure Dry Chemical Extinguishers and the CO_2 – Models 320NM, 322NM. According to the information on the manufacturer's website[4] these are for use in Class A, B and C fires (ABC multipurpose line) and Class B flammable liquids (CO_2 models).

Table 4: Imports of fire extinguishers (non-PFOS/PFAS) in Belize from 2011 – 2016.

Year	Total Unit	Total weight (lbs)	Total Weight (t)
2011	239	3230.73	1.47
2012	2797	27457.58	12.45
2013	3997	42400.51	19.23
2014	3085	30015.48	13.61
2015	3864	36365.07	16.49
2016	3948	43360.43	19.67

(Source: Belize Customs Department)

All imports of firefighting foams over the period 2012-2016 came from the United States of America (USA) with the largest import in 2015 (Table 5).

Table 5: Countries and quantities of imports of firefighting foams in Belize in 2016.

Year	Country of Import	Weight (kg)	Quantity (Gallons)
2012	United States of America	618.25	163.32
2013	United States of America	102.31	27.03
2015	United States of America	1788.27	472.41
2016	United States of America	226.80	59.91

(Source: Belize Customs and Excise Department)

[4] (http://amerex-fire.com/products/?category=hand- portable-extinguishers)

Stock of PFOS/PFAS containing foams

The total stocks of potential PFOS-based firefighting foams imported into Belize for the inventory year was 39,164.6 L/40,399.5 kg. The major professional users of firefighting foams are the fire service stations (1,692 L/1,743 kg), the Phillip Goldston International Airport (PGIA) (4,996 L/5,146 kg), PUMA Energy (8,515 L/8,770 kg) and Belize Natural Energy (23,961 L/24,680 kg) in Belize. However, it is uncertain as to whether the stocks contain PFOS or other PFAS. Users and the firefighting foams that they use were identified following the inventory guide for PFOS[5] which states, "there are different types of firefighting foams and agents containing PFOS or related substances":

- Fluoro-protein foams: used for hydrocarbon storage tank protection and marine applications.
- Aqueous film-forming foams (AFFF): used for aviation, marine and shallow spill fires; developed in the 1960s.
- Film-forming fluoroprotein foams (FFFP): used for aviation and shallow spill fires.
- Alcohol-resistant aqueous film-forming foams (AR-AFFF): multi-purpose foams.
- Alcohol-resistant film-forming fluoroprotein foams (AR-FFFP): multipurpose foams; developed in the 1970s (UNEP, 2015c, Secretariat of the Stockholm Convention, 2015c).

During the inventory it was assumed that the five (5) firefighting foams contained PFOS or related substances (as stated in the guidance document). However, where possible the Material Safety Data Sheet (MSDS) was used to determine the presence of PFOS/PFAS in the firefighting foams. Due to this uncertainty, only where it was confirmed that the firefighting foam contained PFOS/PFAS was its content calculated. In Belize, based on the MSDS, only the National Fire Services had stocks of firefighting foam containing PFOS/PFAS. The low net PFOS content in these stocks were 0.12 kg and the high net content was 0.35kg, based on quantity of 22.73 L/23.41kg of foam.

– Belize Natural Energy (BNE)

BNE is the only company in Belize extracting petroleum. Currently BNE produces approximately 2,000 barrels of cruide oil per day, 1,800 gallons of Liquified Petroleum Gas (LPG) and 160 000 cubic feet per day (MCF/D) of fuel gas for electricity generation (internal use). BNE maintains the largest stock of firefighting foam in Belize. They have a stationary automated system designed to automatically out fires by spreading foam over targeted areas such as fuel storage tanks and other key infrastructure in the event of a fire outbreak. It should be noted that newer brands do not contain PFOS or related substances. BNE conducts fire drills every quarter at each of its main facilities at the Big Creek Port and at its main gathering and storage facility in Iguana Creek,

[5](http://chm.pops.int/ Implementation/NationalImplementationPlans/ Guidance/ Guidance fortheinventoryofPFOS/tabid/3169/Default.aspx)

Spanish Lookout Road. No foam is used during the drills, although firefighters simulate the connecting of the totes to the hydrants. In 2009, BNE imported 6,605 gallons of AR-AFFF firefighting foams and in 2015, BNE imported 275 gallons of AR-AFFF firefighting foams to replace the 275 gallons that were used in a fire incident in 2015.

– National Fire Service

The National Fire Service is responsible for establishing fire stations and overseeing the activities of fire services at a national level. Part of their responsibility is to import and distribute firefighting foams to all stations. This is the only entity that definitively uses PFOS/PFAS firefighting foams in Belize on a somewhat regular basis. The usage of PFOS/PFAS firefighting foam for professional users (for 2016) was estimated at 379 L/390 kg by all fire stations combined.

The National Fire Service maintains stocks of three (3) types of firefighting foams. Except for one type of foam (3M Light/Water ATC AR/AFFF 3% or 6% Hydrocarbon Fuels) these firefighting foams are fluorinated; however, they do not contain PFOS/PFAS. Upon importation, the National Fire Service stores their fighting foam stock at a storage area within the compound of the "South Side Fire Station" located on Dolphin Street Belize City. The stock of firefighting foam (one 55-imperial gallon drum and numerous 5-imperial gallon containers) is stored in a small room together with other firefighting gear. The room is secured with locks; however, it does not have proper ventilation. The fire station itself is located within a residential area; as such, the storage facility is near to human settlement. Upon request, small quantities of firefighting foams as needed are distributed to fire stations across the country. Therefore, only small stocks of firefighting foams are kept at fire stations across Belize.

– Phillip Goldston International Airport (PGIA)

The PGIA is the only international airport in Belize. The PGIA services both national and international flights. The PGIA has a fire station within its compounds that maintains a stock of PFOS-containing firefighting foams.

– PUMA Energy

PUMA Energy is the sole importer of petroleum products in the country. In addition to importing fuel, they distribute products throughout the country via their retail, aviation, business-to- business and supply outlets. PUMA Energy stores fuel at two terminals with storage capacity of 26,400 m located in Belize City. To protect their assets and as mandated by law, they have an automated system for extinguishing fire in the event that a fire breaks within its storage facilities. This automated system maintains stocks of firefighting foams (National Foams Centurion 3% Liquid Concentrate AR-AFFF). The MSDS for Centurion 3% Liquid Concentrate AR-AFFF states that the foam does not contain PFOS or PFOS related substances. PUMA Energy reports that they have

not used firefighting foams given that they have never had fire events occurring within their facilities. However, fire drills are conducted at the PUMA Terminal (Onsite) using small amounts of the AR-AFFF firefighting foams and washed off with water. Contaminated water drains into their oil water separator and released into the sea. No actual treatment is done to the wastewater produced.

There are two other major companies that offer petroleum products to customers in Belize, Sol Group and UNO Belize. Both companies do not import or store petroleum products and instead rely on PUMA Energy for importing and distributing their line of products to their gas stations. Consequently they do not use firefighting foams and instead only use non-PFOS containing fire extinguishers at their gas stations.

Aviation hydraulic fluid

In Belize, aviation hydraulic fluid is in the minor use category for PFOS. The Belize Defence Force (BDF) Air Wing, the PGIA and two national airlines - Tropic Air and Maya Island Air utilise aviation hydraulic fluid. The estimated yearly use of aviation hydraulic fluid by these stakeholders was 292 to 295 L, (301-304 kg) in 2016. An assessment of the MSDS of two brands at the hangers of the PGIA revealed that none of the products contain PFOS.

Sulfluramide (Mirex-S) insecticide for ants and termite

The Stockholm Convention exempts Sulfluramide, which is used as an insecticide for leaf cutting ants and red fire ants. Mirex-S 0.3 (Granules) is the only formation of sulfluramide registered for use in Belize for the control of leaf-cutting ants in citrus and other fruit tree orchards at a dosage of 15-30 grams per nest. Five-year imports statistics show an average equivalent of 3.88 kgs of sulfluramide imported into the country annually.

Synthetic carpets, textiles and leather and paper

- Synthetic carpets

Synthetic carpet (tufted carpets) was a major use area of PFOS. Synthetic carpets are considered a PFOS stockpile today. The main use was before 2002 (at the time of high PFOS production volumes). For the synthetic carpets mainly the nylon or polyacryl (PA) fibers were treated with a PFOS polymer. Final PFOS concentration is approximately 0.3% (GUT, 2011). Since synthetic carpets have a long service life of approximately 20 years and possibly longer, synthetic carpets from 2002 and earlier are still in use. For the 2014 – 2016, approximately 21.7 to 23.8 tonnes of synthetic carpet was imported every year (Belize Customs data). Assuming a similar historic importation then between 1980 to 2000 as an upper estimate approximately 400 tonnes of PFOS containing carpet might have been imported containing 1.2 tonnes of PFOS related substances. Considering the long service life PFOS containing synthetic carpets might still be in use. A share might have ended in landfills and dumpsites.

– Textiles, leather and paper

PFOS has been used in treated textiles like outdoor jackets, awning/sunblind, stain repellent furniture, umbrella etc. PFOS treated paper was used in fast food, pizza boxes, backing paper, muffin cups, popcorn package etc. PFOS treated textiles and papers have shorter service life and the PFOS treated textiles and papers mainly produced before 2002 have largely entered end of life and are in landfills and dumpsites with related releases.

Oil drilling

PFOS was and is still used in oil drilling operations. In Belize, only BNE has oil-drilling operations. According to BNE's Environmental Officer (Albert Roches, Personal Communication), BNE does not use surfactants to enhance oil or gas recovery in wells. Therefore, BNE does not use PFOS-containing surfactants.

2.3.7.2 Policy and regulatory framework

Currently there is no specific regulation on PFOS in Belize. However, the Environmental Protection Act and its regulations provide the basis for overarching responsibility for environmental protection and pollution control that covers all classes of chemicals including POPs such as PFOS.

2.3.7.3 Monitoring Data

There is no available system in Belize for monitoring the health impacts of PFOS from past and current use.

2.3.7.4 Potential Health impacts

PFOS like other POPs can have an adverse effect on human health, biodiversity, and ecosystems. They can lead to serious health effects including certain cancers, birth defects, dysfunctional immune and reproductive systems, greater susceptibility to disease, and damages to the central and peripheral nervous systems (UNEP 2010).

2.3.8 Assessment of Releases from Unintentionally Produced Chemicals (Annex C Chemicals)

UPOPs are organochlorine chemicals, which impact the health and impact the environment including biota. The UPOPs of concern listed in the Stockholm Convention include PCDD/PCDF, PCBs, PCNs, HCB, HCBD and PeCB (Secretariat of the Stockholm Convention (2017b)).

PCNs are unintentionally produced in the form of chlorine, during the production of chlorinated solvents and are also present in industrial PCB mixtures. Belize does not have productions of organochlorine solvents, chlorine or chlorinated paraffins. However, they are likely imported in products like Poly Vinyl Chloride (PVC), rubber, paints and industrial oils. In addition PCNs are present in PCB oils at mg/kg levels. Therefore PCNs are present to some extent in the remaining PCB oils.

There is no major unintentional formation/release of HCBD present in Belize. Due to the fact that they are formed in some specific organochlorine production such as organochlorine solvents (tetrachloroethane, tetrachloromethane, trichloroethane) and primary PVC production and some other organochlorine processes as well as aluminium and magnesium production. None of these processes were and are not present in Belize.

2.3.8.1 Source groups that release Unintentionally Produced Chemicals

Source group 1: Waste Incineration

- Medical waste

Only one incinerator owned and operated by Belize Waste Control (BWC) Ltd. is currently incinerating medical waste in the country. BWC is a private company that collects and incinerates municipal solid waste (MSW) from hospitals in Belize City. BWC operates a thermal oxidizer with capacity to burn 800 lb/hr. The incinerator operates at 3000 BTU. BWC collects red bag medical waste, on average 3,300 lbs weekly from the Karl Heusner Memorial Hospital (KHMH). This is equivalent to 171,600 lbs or 85.8 US tons (78 metric t). This represents a significant portion of the total estimated (188 tons) quantities of medical waste generated in the entire country (Hydea, 2016).

- Incineration of confiscated products

Incineration (as necessary) is done of confiscated high-risk products by Quarantine Inspectors at points of entry in incinerators owned by the BAHA. Of the six incinerator units owned and operated by BAHA at the Benque Viejo Western Border (BVWB), Santa Elena Northern Border (SENB), Elridgeville Toledo, Placencia Stann Creek, Central Investigation Laboratory (CIL), and at the Phillip Goldson International Airport (PGIA), three are used more frequently (at SENB, PGIA, and BVWB). The units are Shenandoah Model A6 – 10 Incinerator, used for incinerating waste products. Each unit is a batch type (200 lb/batch, 30 lb/hr) incinerator, and on average is operated three hours per week when high risk products are available. Therefore, incineration at the three major points of entry varies. In 2016, records show that approximately 3,000 pounds of confiscated high-risk products were incinerated. This decrease in incineration from past years was

a result of using freezers to store confiscated fruits and vegetables to kill pests and then these are buried.

While there is limited capacity to monitor emissions from incinerators in Belize, BAHA operates its incinerators using Best Practical Treatment (BPT) methods to control or reduce emissions to the lowest possible level. This includes operating their incinerators to maintain an operational temperature in the main furnace of 1300 F while that temperature of the afterburner /second burner is operated at or above 1600 F. The incinerators have an electrostatic precipitator type of air pollution control system (APCS). They generate bottom ashes that are transported and properly disposed in a landfill.

- Destruction of animal carcasses (open burning)

The two largest processors of meat in Belize were assessed and one company, which slaughters approximately 700 cows on a yearly basis sends their wastes to another company for disposal by burial. The second company, which slaughters approximately 900 pigs and 50 cows on a monthly basis disposes their waste (estimated to be 48% of the total weight of the animal) at a dumpsite in Georgeville Village, Cayo District. Here some of the waste is used to make leather (skin) and the remainder is incinerated.

Source group 2: Ferrous and non-ferrous metal production

In Belize, there are no industries that produce ferrous or non-ferrous metal. However, two recyclers are involved in the shipment of ferrous and non-ferrous metals (copper, aluminium, etc.). Their recycling activities include salvage of scrap metal from derelict vehicles and from buildings, collection (Belize Solid Waste Management Authority (BSWaMA)), purchase and storage. The metal is then shipped to Central America.

Depending on the location of the salvaging activity, there are different practices. Those companies that have environmental clearance are required to dispose of all plastics and foams at the sanitary landfill. However, there are instances where onsite salvaging is conducted and the plastics and foams would be left onsite.

– Thermal wire reclamation and e-waste recycling

Thermal wire reclamation and e-waste recycling was the only source category under source group 2 that was relevant to Belize. Thermal wire reclamation is not approved in Belize. Furthermore, the movement of scrap copper (tube and wire) is restricted. However, some illegal activities have been conducted in the past, which has promulgated the development of Belize's Scrap Metal Regulations. Thermal wire reclamation involves the recovery of copper from cables by burning. During the burning process PCDD/PCDF is generated since all the ingredients are present (carbon

(sheath), chlorine and a copper catalyst (UPOPs Toolkit, 2013). Facilities that are approved by the DOE are required to dispose of all non-ferrous material at the nearest approved disposal site.

The two biggest recyclers were assessed. One company estimates that they export 30 t of scrap metal to Guatemala on a weekly basis, 13 t of plastic bottles to Honduras on a monthly basis, 20 t of carton boxes/paper to either Guatemala or El Salvador on a monthly basis and 80% of derelict vehicles on a yearly basis. WEEE has never been exported but the company is exploring this waste stream and will likely export to either Panama or Japan. The second waste recycling company exports mostly scrap metal (90 t exported to Mexico on a monthly basis) and small amounts of aluminium cans and copper wire. There was no data on the percentage of derelict vehicles that they recycle. Wire reclamation is done manually.

Source group 3: Heat and Power Generation

The source categories relevant to Belize under source group 3 were: 3a) Fossil fuel power plant, 3b) Biomass power plants, 3d) Household heating and cooking – Biomass and 3e) Domestic heating- Fossil fuel.

– Fossil fuel power plants

According to the latest report on electricity generation in Belize (BEL, 2015), 42% percent of the electricity generation output in Belize is purchased on the spot market from Mexico's Federal Energy Commission (CFE). The remaining 58% of electricity is supplied as follows:

- Belize Electric Company (BECOL, 39%), (hydroelectric gas turbine 25 MW)
- Belize Co-Generation Energy Limited (BELCOGEN, 14%),
- Hydro Maya (2%)
- BEL's own diesel generation capacity (2%)
- Blair Athol Power Company Limited (BAPCOL, 1%)

Additionally, the Santander Group, generate 16.5 MW of electricity and like BELCOGEN, generate energy from co-generation from the burning of bagasse. BEL uses their fossil fuel generators only as a backup to power failure or during special instances when it may be required. Collectively, at their peak BEL's diesel generator and BAPCOL combined produced only 3% of Belize's 84.3 MW peak electrical energy demand in 2015 (BEL, 2015). Assessment of these two (2) fossil fuel plants was not possible due to the inability to retrieve information from the companies within this inventory reporting period.

Farmer's Light Plant Corporation (FLPC) has been providing power to the Spanish Lookout Community, approximately 3.8 MW at peak. The fuel consumption for FLPC in 2016 was

1,239,484 gallons of local light sweet crude (conversion unavailable).

BELCOGEN uses bagasse, heavy fuel oil and diesel to generate electricity for supply to the electricity grid and internal electricity needs. The quantities of bagasse are discussed in the following section, under biomass power plants. Data from 2010 indicated that approximately 229,420 gallons of heavy fuel oil was used in the steam turbines, 456,270 t of low-pressure steam (used in the boilers) and this was supplemented by 5,748 MW of electricity from diesel generators.

Other self-generators of electivity for their own use include the Citrus Products Belize Limited (CPBL) generated approximately 1,711 MW in 2011 with fuel ratio consisting of 75% crude oil and 25% diesel. BAPCOL also utilizes the same fuel ratio to generate 26, 705 MW of electricity (Tillet et al. 2012).
Belize Natural Energy (BNE) uses locally produced natural gas to generate 7,008 MW of electricity (Tillet et al. 2012).

- Biomass power plants

The combustion of biomass (sugarcane bagasse) is used for cogeneration (heating and electricity) and can lead to the formation PCDD/PCDFs.

In 2010, the BELCOGEN plant used approximately 75% of the 403,675 tof bagasse generated by the BSI Factory to generate electricity. This capacity is only available when there is available bagasse, i.e the sugar cane harvesting season. For the inventory year 2016, an annual growth of 4% was estimated to obtain the activity rate.

S.S. Energy Ltd. (SSEL), a subsidiary of The Santander Sugar Group currently provides 16 MWh of electricity by utilizing bagasse. This inventory identified that the biomass burnt in their cogeneration plant is approximately 30% of the harvested tonnage of sugar cane. For 2016 (February to June) Santander Sugar Group has harvested 381,136.29 t of sugar cane of which approximately 114,340.89 t is bagasse. Out of that bagasse total an estimated 12% (13,720.91 t) is not burnt and is kept to start/fire up the boiler the following sugar cane harvest cycle. Therefore, on an annual basis only 00,619.94 t are burnt for cogeneration.

The boilers are operated at a temperature ranging between 500 F - 800 F while the generator operates at temperatures 370 F – 410 F, depending on the required production. The system has a “scrubber” type of Abatement Pollution Control System (APC). Additionally, Santander Sugar Group uses a green harvest technology whereby cane is not burnt prior to harvesting as is practiced in the sugar cane production sector in Northern Belize. The bottom ash is collected and stored in assigned areas to be used in the field as fertilizers.

– Household heating and cooking with biomass

Large quantities of wood fuel (firewood) are used in Belize primarily for residential cooking and water heating in the rural areas and for producing lime that is used in fertilizers and for corn and flour tortilla-making. Data from circa 2010 indicate that approximately 15 – 20% of the households used wood or charcoal as the main type of fuel for cooking (SIB, 2010; Tillet et al. 2012) and UN Energy Statistics indicated that 121,000 cubic metres of fuel wood was consumed in 2014.

- Domestic heating with fossil fuels

Households, commercial and manufacturing industries as well as the hotels use liquid petroleum gas (LPG) for heating and cooking purposes. In Belize, the following LPGs are used: natural gas, propane, butane, ethylene, propylene, butylene and butadiene. However, propane and butane arethe LPGs mostly used in domestic settings. The activity rate for the use of propane gas (for 2016) was 480,798.10 US gallons = 400, 348.17 UK gallons (Belize Customs and Excise Department).

Source group 4: Mineral Production

– Brick production involving the use of high temperatures

For the 2016 inventory, the five cement blocks producers that were interviewed utilized the same process to make their cement blocks. This process involves mixing sand, concrete and water and pouring it into a mold and pressed using a cement block pressing machine. The blocks are then allowed to air dry. The use of furnaces/kilns and high temperatures for drying is not practiced in cement block making in Belize.

- Asphalt mixing

This could not be assessed for the 2016 inventory year due to inaccessibility to information.

– Lime production

To create lime, limestone is burnt at temperatures of 800-900°C (1472-1652°F); the limestone production process creates burnt lime also known as quicklime (calcium oxide). In Belize, burnt lime is used for neutralizing soil acidity on banana plantations, citrus orchards and earthen ponds used for culturing shrimp. For example, some 900 kilograms of burned lime are applied per hectare per year on banana plantations. The citrus, banana and shrimp Industries are concentrated in the South of the Country, mainly in the Stann Creek Districts. Similarly, lime production is concentrated in only one area of the country on the Humming Bird Highway that connects Belmopan the capital of Belize with the Stann Creek District.

In the 2016 inventory, an assessment of the lime production industry was not possible; therefore, calculating estimates of current releases of dioxins and furans from lime production was not possible. However, it can be said with a degree of confidence that the current quantities may be less than those reported in 2008 due to the drastic decline in production acreage of the agriculture sectors that use burnt lime.

Source group 5: Transport

- 4-Stroke engine

During the inventory, the activity rates for 4-stroke engine (which includes all types of 4-stroke vehicles, fuelled with gasoline but excludes ethylated gasoline) and 2-stroke engines (which includes all mopeds, small motorcycles, tuk-tuks, boats, jet-skis, lawnmowers, chain saws) were based on the yearly fuel consumption. Information on fuel imports was obtained from the Customs and Excise Department (Table 6 and 7).

Table 6: Import Data by year of Gasoline (Regular).

Year	Total Gallons
2014	6,694,063
2015	41,032,522
2016	**39,414,845**

Table 7: Import Data by year of Gasoline (Premium).

Year	Total Gallons
2014	4,575,830
2015	21,007,545
2016	**18,718,435**

Diesel engines (which include heavy trucks, light trucks, passenger cars, locomotives, heavy construction equipment, boats, diesel generators, pumps, farm equipment etc.) are fuelled with regular diesel (UNEP Toolkit, 2015). Information on the consumption of diesel was gathered from the Customs and Excise Department and is presented (Table 8).

Table 8: Import Data by year of Diesel Oil.

Year	Total Gallons
2014	12,995,823
2015	63,475,012
2016	54,378,649

Belize also imports heavy fuel engine burning for hips in the form of bunker C fuel oil (Table 9).

Table 9: Import Data by year of Bunker C fuel Oil.

Years	Total Gallons
2014	152,449
2015	458,000
2016	1,186,661

Source group 6: Open Burning

Different types of fires may contribute to the emission of dioxins in the environment (during optimal conditions for dioxin formation). Some of these types of fires are often unauthorized, not reported or documented. As a result, assessing the national activity was difficult, resulting in insufficient data to quantify emissions from open burning. However, an attempt was made to provide data from the main contributors of PCDD/PCDF emissions from open burning.

- Biomass burning

Biomass burning includes the open burning of agricultural biomass in the field under conditions that may favour increased PCDD/PCDF formation and release. (UNEP Toolkit, 2015). In Belize, the main sources of release of PCDD/PCDF from biomass burning are from the sugarcane production sector. The sugarcane production sector of Belize is comprised of approximately 5,300 independent sugar cane farmers in northern Belize, while the new entrant (Santander Group) operates its own sugar cane field (Santander Farm) in Western Belize.

In 2008, the burning of an estimated 68,000 acres of sugarcane fields in northern Belize produced 0.116 g TEQ in 2004 (Avella et al., 2008). In 2016, a total of 78,300 acres of sugarcane fields under production have been verified in the northern sugar belt of Belize through the Belize Sugar Industry Management Information System (SIMIS). A total of 100% of sugarcane fields are burnt during the harvesting season (December to June), prior to harvest.

Biomass burning from the traditional "slash-and-burn" farming system used in Belize may also be releasing significant quantities UPOPs to the air. As reported by a 2015 study, between 1980 and 2010, Belize lost 17.4%, or around 2,934 km^2 of forest area to deforestation due to unsustainable logging, and slash-and-burn agriculture (Nachmany et al., 2015). While this form of agriculture is still practiced among small scale farmers in Belize, an assessment of the total acres of land burnt on an annual basis for slash-and-burn agriculture in Belize was not possible.

– Forest Fires

In the late 2000 in Belize, the pine forests of the Maya Mountains were decimated by the Southern Pine Bark Beetle (*Dendroctonus frontalis*). The mortality of the pine trees has been so extensive that more than 90% of the pine stands are completely or almost completely dead (Orlando Ulloa, Forest Department of Belize, Personal Communications). Following the beetle outbreak, down woody debris fuel accumulated from pine mortality. Thickets of tiger bush (*Dicranopteris pectinata*) and dumb cane (*Tripsacum latifolium*) also increased in abundance following the beetle outbreak, both of which facilitated intense fires during the dry season (Colatskie, R. 2011). Therefore, fire caused by man and lightning, has and continues to be a common occurrence in the mountain pine forests of Belize. Although obtaining estimates of acreage of forest and forest biomass burnt in forest fires in Belize was not possible in the recent inventory (2017), best available data on major forest fires indicates that in July 2016 a fire burnt approximately 14,000 acres of forest while in May 2017, a huge fire burnt an estimated 44,000 acres of forest (Orlando Ulloa, Forest Department of Belize, Personal Communications).

– Open burning of waste and accidental fires

Data from the 2004, showed that an estimated 3% (2,169 tons) of all waste produced in urban Belize was burnt, mostly at landfill fires resulting in a release of 2.169 g TEQ/a and 1.301 g TEQ/a to the land, for a total of 3.47 g TEQ. The 2004 midyear population (265,000) and the rural solid waste production rate of 1.17 kg/person/day (CSO, 2006) was used to arrive at a total of 60,470 tons produced per year, resulting in 38,096 tons burnt per year (Avella et al., 2008). This was estimated based on an assumption that 63% of waste was burnt in rural areas due to the lack of disposal sites.

While the estimated total waste generation in Belize for 2015 was 130,000 t, only a portion of that waste can be considered in the calculation of releases of PCDD/PCDF from burning of waste at landfills. This is because after 2009, the majority of solid waste produced in the Western Corridor of Belize (Belize City, San Ignacio/ Santa Elena – Benque Viejo, San Pedro Ambergris Caye and Caye Caulker) was and is currently collected and taken to transfer stations for eventual proper disposal at the state of the art regional sanitary landfill located at Mile 24 on the George Price Highway. While on an annual basis some waste collected from the Western Corridor may be burnt through accidental fires at the transfer stations, most of the solid waste received at the transfer stations are sorted and transported to the sanitary landfill where it is spread in layers and compacted before being covered with soil.

- Accidental fires houses, factories, vehicles, etc

The National Fire Service of Belize reports that in 2016 the 14 fire service stations across the nation responded to a total of 2,478 fire calls.

- Open burning of wood/other materials in construction and demolition

The practice of burning wood and other material in construction and demolition is present in Belize. Such wood may be painted or treated with preservatives and pesticides, or waste material (including PVC, plastics, etc.) may be present during burning. As a result, the formation and emissions of PCDD/PCDFs during burning is possible. However, an assessment of the emissions of PCDD/PCDFs from open burning of wood/other materials in construction and demolition was not possible due to the lack of records of quantities of construction material burnt in Belize (UNEP Toolkit, 2015).

Source group 7: Chemicals and Consumer Goods

The pesticide 2,4-D amine is registered for use in Belize and is a widely used herbicide. There are 21 registered herbicide formulation containing 2,4-D in various concentrations, approved for the control of annual and perennial broadleaved weeds in sugarcane, rice, sorghum and maize. Unsubstantiated reports indicate minimal application of 2,4-D aerially by crop-dusters. Five- year import statistics show an average equivalent of 74,291 kgs of 2,4-D imported into the country annually. However, further assessment on contamination level is needed.

The source group category that was investigated as to its relevance to Belize was production of paper and recycling of paper. One paper recycler (Caribbean Paper Company) exists in Belize. Caribbean Paper Company recycles paper waste and converts it to tissue paper, paper towels, paper napkins, tying sheets and institutional line.

Caribbean Paper Company uses a continuous (24 hr/day), seven days per week operation that recycles paper waste on average 5.5 tonnes/day or 38.5 tonnes per week. This amounts to 2,002 tonnes per year. Water discharged is treated using a tertiary water treatment system while the 5 tonnes/month or 60 tonnes/year of sludge produced is disposed in a landfill within company property. The paper mill does not have an air pollution control system and the temperature of gases it releases is at 180 ^{o}C. Quantities of bottom ashes produced are unknown; however, bottom ash produced is disposed at a landfill within company property.

Source group 8: Miscellaneous

- Crematoria

Cremation of human remains is not widely practiced in Belize. Only one funeral home handles cremations mainly in the Belize District. The facility has been in operation from 1940. It possesses state-of-the-art crematory equipment with sophisticated air pollution control and monitoring systems. The operating temperature is 899 ^{o}C (1650 ^{o}F). Bodies are cremated in special cardboard boxes (free from plastics)

– Tobacco smoking

Total PCDD/PCDF emission from tobacco cigar and cigarette smoking from air and land was 0.001 g TEQ/a and 0.001 g TEQ/a respectively.

Source group 9: Disposal/Landfill

– Hazardous waste

Hazardous wastes are regulated under the Hazardous Waste Regulation of 2009. Information on the quantities generated, management and final disposal of hazardous waste, industrial waste, and medical waste in Belize, is limited. The largest generators of industrial waste are the citrus, sugar, banana, shrimp, construction, liquor, and transportation industries.

In cases when hazardous waste (pesticides, pharmaceuticals, asbestos, fiberglass, laboratory chemicals, biomedical waste, etc.) arrives at the regional sanitary landfill located at Mile 24 on the George Price Highway, it is disposed in the Hazardous Waste Cell (prior approval required from the Operator of the facility). This cell has two composite bottom liners to prevent the percolation of leachate or contaminated water to groundwater.

– Mixed waste

At the transfer stations along the western corridor of Belize, solid waste is first sorted into the different waste types e.g. residential, bulky/white waste, tires and comingle waste. Different types of waste each have specific areas for disposal. However, comingle waste, which may include many different type of waste types may be compacted with residential waste. Any scrap metals and electronics in the waste are sorted and are hauled away by recyclers.

– Domestic waste

Domestic waste is by far one of the largest quantities of solid waste that enters the Regional Sanitary Landfill facilities. The estimated total waste generation in Belize for 2015 was 130,000 t. 56% (72,000 t) of this waste is disposed via different routes to landfills. Assuming that there was similar activity in 2016 then the activity rate is 130,000 tonnes. Domestic waste that arrives at the Regional Sanitary Landfill is compacted and covered with soil.

– Composting

Organic material is not separated from regular waste at the transfer stations along the Western Corridor prior to final disposal at the Regional Sanitary Landfill. Therefore, no composting is practiced at the sanitary landfill. Composting at residential homes may be practiced at a small scale.

2.3.8.2 Policy and regulatory framework

The Pollution Regulation, 1996 addresses air emission control from both mobile and stationary sources. It sets standards for NOx, SOx, COx and particulate matter; however, the regulation does not address dioxins and furans.

2.3.8.3 Monitoring Data

To date no studies/monitoring have been carried out on the effects of UPOS on humans and the environment in Belize.

2.3.8.4 Potential Health impacts

PCDDs and PCDFs, because of their lipophilic and persistent nature, are accumulated in various organs of wild animals and the human body in adipose tissue and liver in particular, through the food chain. About 90–98% of the average exposure of humans to PCDDs and PCDFs results from dietary intake with food of animal origin being the predominant source. Most PCDD and PCDF congeners with a 2,3,7,8-chlorine substitution pattern are also strongly retained in human tissues, blood, and milk (Van den Berg, 2006). The toxic and biochemical responses induced by PCDDs and PCDFs include carcinogenicity, endocrine, reproductive, neurobehavioral and immune effects (Arisawa, 2005).

2.3.8.5 Comparison of the PCDD/PCDF 2008 revised baseline inventory and the 2016 emission inventory

A comparison of the PCDD/PCDF emission of the 2008 revised baseline inventory to that of 2016 showed a marked reduction in PCDD/PCDF emissions. The emission of PCDD/PCDFs for the 2016 was 4.47 g TEQ/a, while the revised 2008 were 66 g TEQ. These results may have been influenced to some extent by missing data (activity rates) from the 2016 inventory and the use of rough estimates of activity rates from past years.

The emission of PCDD/PCDF source group 1 (Waste Incineration) of the 2008 revised emission was high (48.195 g TEQ/a) compared to the 2016 emissions which may be due to the poor technology used for incinerators at the time (little to no Air Pollution Control System). Thus, the lower emission in the 2016 inventory can be partly attributed to improved incineration technology. Emission for source group 3 (Heat and Power generation) in the revised inventory was higher (1.285 g TEQ/a) compared to the 2016 inventory (0.51 g TEQ/a). The air emission from biomass power plants (1.159 g TEQ/a) and household heating (0.116 g TEQ/a) using biomass accounted for the higher emissions in the revised inventory. In contrast in the 2016 inventory the air emission from biomass power plants decreased substantially (0.013 g TEQ/a) and that for household heating increased substantially (0.501 g TEQ/a). The emissions for the transport source group were slightly greater in the 2016 inventory (0.020 g TEQ/a compared to 0.011 g TEQ/a). The total PCDD/PCDF and other UPOPs emission from the 2008 revised baseline inventory and for the inventory year 2016 are presented in Table 10 and 11 respectively.

Table 10: PCDD/PCDF and other UPOPs emissions from the revised baseline inventory (2008).

Group	Source Groups	Annual Releases (g TEQ/a)				
		Air	Water	Land	Product	Residue
1	Waste Incineration	48.2	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	1.3	0.0	0.0	0.0	0.0
4	Production of Mineral Products	0.1	0.0	0.0	0.0	0.0
5	Transportation	0.0	0.0	0.0	0.0	0.0
6	Open Burning Processes	2.3	0.0	0.1	0.0	0.0
7	Production of Chemicals and Consumer Goods	0.0	0.0	0.0	0.0	0.0
8	Miscellaneous	7.0	0.0	0.0	0.0	7.0
9	Disposal/Landfill	0.0	0.0	0.0	0.0	0.0
10	Identification of Potential Hot-Spots				0.0	0.0
1-10	**Total**	**58.9**	**0.0**	**0.1**	**0.0**	**7.3**
	Grand Total	**66**				

Table 11: PCDD/PCDF and other UPOPs emission for the Inventory year 2016.

Grp.	Source Groups	Annual Releases (g TEQ/a)				
		Air	Water	Land	Product	Residue
1	Waste Incineration	0.2473	0.0000	0.0000	0.0000	0.0744
2	Ferrous and Non-Ferrous Metal Production	0.0000	0.0000	0.0000	0.0000	0.0000
3	Heat and Power Generation	0.5147	0.0000	0.0000	0.0000	0.0126
4	Production of Mineral Products	0.0000	0.0000	0.0000	0.0000	0.0000
5	Transportation	0.0196	0.0000	0.0000	0.0000	0.0000
6	Open Burning Processes	2.8370	0.0000	0.0828	0.0000	0.0000
7	Production of Chemicals and Consumer Goods	0.0000	0.0000	0.0000	0.0200	0.0000
8	Miscellaneous	0.0010	0.0000	0.0000	0.0000	0.0010
9	Disposal	0.0000	0.0065	0.0000	0.0000	0.6500
10	Identification of Potential Hot-Spots					
1-10	**Total**	**3.6196**	**0.0065**	**0.0828**	**0.0200**	**0.7380**
	Grand Total	**4.4670**				

(Source: Inventory report of unintentionally produced persistent organic pollutants (UPOPs) in Belize 2016)

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

2.3.9.1 Assessment of POPs pesticide stockpiles and wastes

In January 2016, Belize completed the verification, classification and inventory of existing stockpiles of POPs (mainly pesticides and PCBs), under the Belize Chemicals and Waste Management Project (funded by GEF) (Table 12). This project has advanced action plans towards the management of POP pesticides including disposal of all the inventoried POP pesticide stockpiles in May 2017.

Table 12: List of obsolete POP pesticides stockpiles and wastes inventoried in 2016 in Belize.

POP Pesticide	Quantities	Units	Category
DDT	23.93	T (t)	Initially Listed
Aldrin	0.09	kg	Initially Listed
Dieldrin	1.80	kg	Initially Listed
Endosulfan	15.95	L	Newly Listed
Toxaphene	6.60	L	Initially Listed
Lindane	3.10	L	Newly Listed

(Source: Carrias A.A. & Alegria H., 2016)

– Amount, type and condition of POPs pesticide stockpiles and waste

Currently, there are no POP pesticides stockpiles in Belize as a result of removal and disposal in May 2017 by POLYECO S.A. of Greece. The company was responsible for packaging and transboundary shipment the chemicals to the Tredi Saint Vulbas incineration facility in France for final disposal (August 2017). Two hundred drums of packaged DDT powder (23.93 t) and solid pesticide (4.3 t) as well as liquid pesticide (2,000 L), including other non-DDT pesticides was disposed.

– Storage sites of obsolete pesticides

The 2016 inventory identified DDT stored at the Ministry of Health, Belmopan together with small quantities of POP pesticides (aldrin, dieldrin, endosulfan, toxaphene and lindane) stored and other obsolete pesticides stored at the Pesticides Control Board storage facilities in Central Farm (Carrias and Alegria, 2016). Additionally, 2.2 t and 77 L of unidentified pesticides were found stored at various storage facilities in Belize. The 2016 inventory indicated the storage conditions were generally poor to extremely poor (Figure 3).

Figure 3: Storage conditions of obsolete pesticide stockpiles inventoried in 2016.

– Disposal sites of POP pesticides

Belize does not have any approved facility for disposal of POP pesticides. However, BSWaMA has a Hazardous Waste Cell that is approved for the safe disposal of hazardous waste (with prior approval from the operator). These cells were used to dispose of pesticide packaging material generated from the repackaging of obsolete pesticides in 2017 (Lumen Cayetano (BSWaMA), Personal Communication).

– Management of empty containers

There are no guidelines for the management of empty containers. Therefore, this is a gap that needs to be addressed.

– Potentially contaminated sites

The Pesticides Control Board storage facility in Central Farm (17°11'7.79"N, 89° 0'6.50"W) and the MOH storage facility (compounds of Western Regional Hospital (17°15'15.71"N, 88°46'29.66"W) are potentially POP pesticide contaminated sites.

2.3.9.2 Assessment of PCB stockpiles, wastes and contaminated sites

– Stockpiles and wastes

PBC equipment likely containing contaminated PCB oils was identified in the 2016 inventory. A site in Spanish Lookout, Cayo District, within the compound of FLPC, currently stores 55 old (some manufactured pre-1970s) decommissioned transformers and two (2) capacitors. Only one (1) transformer (from a private company) was identified as contaminated PCBs. Twenty (23) 55-gallons capacity drum containing PCB contaminated oil were initially stored at FLPC (6 months) before placement inside a containment bond and subsequently shipped to France for final disposal (August 2017).

– Potentially contaminated sites

Transformers located at FLPC in the Spanish Lookout, Cayo District (Latitude: 17°15'1.65"N and Longitude: 89° 0'12.91"W) were tagged a contaminated with PCB. Currently there are 89 used, awaiting re-use/decommissioning transformers with concentrations of < 50 ppm PCB and 29 transformers with unknown PCB status awaiting testing. Some of these transformers were manufactured before the 1970s and thus are likely to be contaminated with PCBs. The stockpiles of transformers are exposed to the elements of the weather and have the potential for leakage. Additionally, these stockpiles are in business areas (Figure 4).

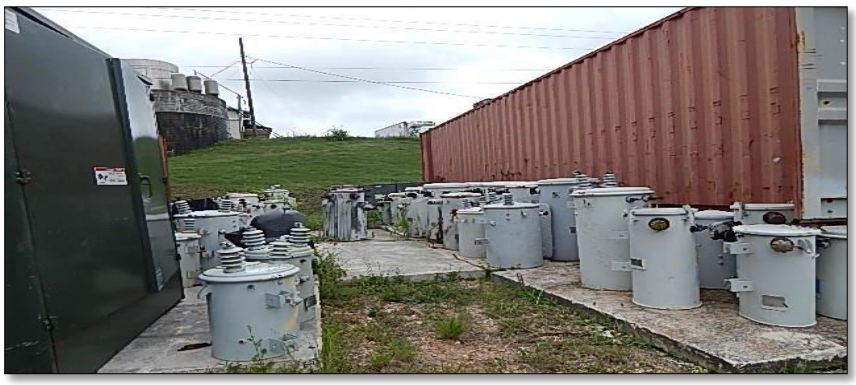

Figure 4: < 50ppm PCB Transformer stockpile at FLPC, Spanish Lookout, Cayo District.

The 2016 inventory reported one (1) storage site at BEL (old warehouse at Belize City). BEL indicated that transformers at their substations are PCB free. Currently, the BEL warehouse facility in Ladyville, Belize District (Latitude: 17°32'16.97"N, Longitude: 88°17'40.45"W), has a stockpile of decommissioned transformers and capacitors (Figure 5). The 2016 inventory confirmed these transformers were either PCB free or contained very low levels of PCBs.

Figure 5: Stockpile of decommissioned transformers at BEL's warehouse facility in Ladyville, Belize District.

The PCB contaminated oil in the transformer decommissioned by BEL belonging to ADM was disposed of in 2017. The inventory 2016 inventory indicated approved methods for disposal were used to avoid spills during sampling and transfer of oil.

2.3.9.3 Assessment of POP-PBDEs and HBCD stockpiles and wastes

– Potentially contaminated sites

Any sites including waste management facilities where POP-PBDEs and HBCD containing products or residues have been disposed of, has the potential of the release of these contaminants into the environment. Belize has numerous open or partially controlled dumpsites where waste is deposited. At these dump sites; it is common practice for waste to be burnt as a waste management strategy. These dumpsites are located within the Northern Corridor, which includes the Orange Walk and Corozal Districts and the Southern Corridor, which includes the Stann Creek and Toledo Districts. The major dumpsites are shown in the map in Figure 7 and the coordinates are presented in Table 13. The dumpsites at the Central Corridor (denoted by red circles in Figure 7) have been converted to transfer stations that serve as a transient station prior to transport to the state of the art regional sanitary landfill for proper disposal. These sites are properly managed and burning is not practiced at these sites.

Additionally, three (3) major recycling sites were identified as potentially contaminated (Table 13). Although these sites are not currently recycling WEEE or accepting non-ferrous material from derelict vehicles, a site visit confirmed the presence of WEEE (computer parts, cell phones etc.) and non-ferrous vehicle parts at one of the recycler's compounds (Figure 6). These recyclers reported that they do not engage in burning of circuit boards nor in thermal reclamation of copper wires.

Table 13: Coordinates of two major recyclers in Belize.

Company	Coordinates
Belize Recycling Company	17.4768919N, 88.293779W
Caribbean Paper Mill Company	18.081407N, 88.311038W
Orange Walk Metal Recyclers	18.075128N, 88.334519W

Figure 6: Waste from derelict vehicles and WEEE at Belize Recycling Company.

(Adopted with modifications from first NIP, Avella et al., 2008)

Figure 7: Approximate locations of major dumpsites in Belize.

Red circles denote dumpsites within the central corridor and yellow stars denote dumpsites within the northern and southern corridors

Table 14: Potential PBDE/HBCD contaminated dumpsites in Belize.

No.	Potentially/Contaminated Site	Notes
1	Caledonia Village, Corozal District	
2	Corozal Town Current dump Site	
3	Progresso Village, Corozal District Proposed Disposal site	
4	Sarteneja, Corozal District Dump Site	
5	Libertad Village, proposed disposal site, Corozal District	
6	Orange Walk Town Dump Site	
7	Guinea Grass Village, Orange District-Current Controlled Disposal site	
8	San Pablo Village, Orange Walk District	
9	Dangriga Town Dump Site	
10	Proposed Site for San Antonio Village, Toledo District	
11	Punta Gorda Town Dump Site	
12	Independence, Stann Creek District Dump site	
13	Placencia Village, Stann Creek District	
14	Hopkins Village, Stann Creek District Dump site	
15	Caye Caulker Village, Belize District Dump site	Site is closed and waste (e.g. branches) is being dumped in location to fill the site because it has been surveyed and given to the villagers.
16	San Pedro Dump Site	No full closure yet; however, it is not in use
17	San Familia, Cayo District	
18	Belmopan City, Cayo District	

While there are no major population centers in the immediate surroundings of potentially contaminated dumpsites, a recent assessment of these dumpsites shows that waste is disposed in open areas that may be prone to leaching (Hydea, 2016). The potential of leachates from these dumpsites contaminating soil and groundwater due to leachate leakages is possible. As an example, the dumpsite in Corozal District is prone to flooding (Hydea, 2016) and the dumpsite in Placencia is close to a water body. However, no studies have been performed to test the PBDE contamination levels of the soil in these potentially contaminated dumpsites.

2.3.9.4 Assessment of PFOS

- Potentially PFOS contaminated sites

PFOS contaminated sites are generated from fire-fighting use and industrial uses as well as releases from landfills and dumps. The related ground water contamination can lead to relevant contamination of drinking water as has been recently demonstrated for the United States (Hu XC et al., 2016). But soil can be also contaminated and lead to further contamination of food (Brambilla et al., 2015).

The potentially contaminated sites of major concern in Belize are those associated with use of PFOS-containing firefighting foams, sulfluramide application and dumpsites and landfills. To a minor extent, potentially contaminated sites from use of PFOS-containing aviation hydraulic fluid must be considered.

BNE used approximately 275 gallons of AR-AFFF, 1% or 3% AR-AFFF concentrate (Thunderstorm FC-601A, Chemguard, Inc., Avenue Mansfield, Texas USA) in 2015 to extinguish a tank fire caused by a lightning strike at Mike Usher 15 (one of the oil wells owned by BNE). According to the company that installed the stationary automatic firefighting system at BNE (Williams Fire and Hazard Control), Thunderstorm FC-601A concentrate is formulated from special fluorochemical and hydrocarbon surfactants, high molecular weight polymers and solvents and does not contain PFOS or Perfluorooctanoic acid (PFOA) substances. However, as a precautionary measure, the site where the foam was used is considered as a potentially contaminated site. The site is located at Mike Usher 15 (Figure 8). When the foam was used to extinguish the fire at MU #15 in 2015, the water/foam mixture was simply allowed to seep into the soil. Most of the mixture was contained inside the tank farm containment bund and later released. During the incident when the foam was being applied to the fire, some of the mixture did runoff into a nearby dry drainage area in a pasture (Figure 8).

Figure 8: Immediate surroundings and pasture near the tanks that caught fire in 2015 at Mike Usher #15.

PUMA Energy conducts fire drills on an annual basis at the PUMA Terminal (GPS Coordinates 1933282 N; 372743 E as recorded with GPS map 62stc using NAD 27, Zone 16Q Central Datum) using small amounts of the AR-AFFF and washed off with water. Contaminated water drains into their oil water separator and released into the sea. No actual treatment is done to the wastewater produced. PUMA's terminal is only a few feet away from the Caribbean Sea and it is highly likely that the water used to wash off the foam drains into the sea. Although, no major quantities have been used at PUMA's facilities, this facility was identified as a potentially contaminated site of interest due to its proximity to the sea.

The National Fire Service, firefighting training facility at Lord's Bank/Ladyville Belize District (16Q0311466, 1907893), has used minor quantities of AFFF firefighting foam during firefighting trainings in the past. Although, the use of AFFF firefighting foams are reserved for training of new fire fighter intakes, which are, rear events. The training area is near to a residential area (Figure 9) potentially posing risks to human health.

Figure 9: Training area at the National Fire Service training facilities at Lord's Bank Belize District.

– Potential contaminated sites from the use of sulfluramide

The potential contaminated sites from the use of sulfluramide include the citrus farming sector of Belize. The quantity of Sulfluramide that has been used in Belize since 2013 is 11.7 t (11,700 kg). Assuming that the content of PFOS is 0.5%, then the quantity of PFOS is 58.5 kg. While minor quantities of the chemical have been used in various places in Belize, the bulk has been used in the citrus industry, which is primarily located in the Stann Creek District. Therefore, soils potentially contaminated with sulfluramide are largely confined to the citrus industry.

– Wasted disposal facilities

Any sites including waste management facilities where PFOS containing products or residues have been disposed of, has the potential to release these contaminants into the environment (UNEP, 2015c). Belize has numerous open or partially controlled dumpsites where waste is deposited. The coordinates for major dumpsites are presented in Table 15.

Table 15: Coordinates for potential PFOS other POPs contaminated dump sites.

Name	Potentially/ Contaminated Site GPS Coordinates	
	Latitude	Longitude
Corozal dumpsite	18.26833	-88.205088
Orange Walk dumpsite	18.33840	-88.361599
Dangriga dumpsite	16.582093	-88.183850
Independence dumpsite	16.31245	-88.284738
Placencia dumpsite	16.411194	-88.215896
Punta Gorda dump site	16. 82999	-88.475365
PUMA Energy	17.2867	-88.115838
BNE	17.2510	-88.998480
National Fire Service training facility	17.331169	-88.182642

While there are no major population centers in the immediate surroundings of potentially contaminated dumpsites, a recent assessment of these dumpsites shows that waste is disposed in open areas that may be prone to leaching (Hydea, 2016). A description of the dumpsites is presented in Table 16. The potential of leachates from these dumpsites contaminating soil and groundwater due to leachate leakages is possible. As an example, the dumpsite in Corozal District is prone to flooding (Hydea, 2016) and the dumpsite in Placencia is close to a water body. However, no studies have been performed to test the PFOS contamination levels of the soil in these potentially contaminated dumpsites.

Table 16: Description of Dumpsites in Northern and Southern Belize (Adopted and slightly modified from Hydea, 2016).

District	Location of dumpsite	Brief description of dumpsites
Corozal District	Consejo Road	15 acres of flood prone area. About 15,000 cubic meters of waste piles irregularly deposited on the ground.
Orange Walk District	Chan Pine Ridge	40 acres irregularly covered by about 15,000 cubic meters of waste piles deposited on top of the ground
Stann Creek District	Dangriga	6 acres parcel entirely covered by excavated trenches backfilled with waste.
Stann Creek District	Placencia	The official dumpsite is a 6 acres area where the waste is deposited in excavated trenches. Waste piles are also present along the access road and in two nearby areas.
Stann Creek District	Independence	Waste is deposited in excavated trenches spread over a 4 acres area.
Toledo District	Punta Gorda	Waste is deposited in a single mass about 8 acres wide in a low-lying area. More waste piles are present along the access road.

2.3.9.5 Assessment of UPOPs

– Potentially PCDD/PCDF and other UPOPs contaminated sites

Table 17 gives a list of PCDD/PCDF potentially contaminated sites, which includes sites where historical activities could result in contamination. In Belize other potentially contaminated sites include sites where:

- PCB equipment has been used or stored or PCB containing oil has been managed;
- chlorinated phenols (PCP, 2,4,5-T or 2,4-D) have been used;
- fires have occurred (dumpsites and cane production areas);
- end-of-life vehicles are stored/disposal; and
- accidental fires with materials polluted with PCDD/PCDFs have occurred.

- Accidental fires

Accidental fires including landfill fires, bush /rubbish fires, dwelling houses and commercial fires, vehicular fires, are common during the dry season (February to May) and may be considered sources of PCDD/PCDF contaminated soot and residues. High levels of contamination may result from fires from structures buildings with flame retardant material.

- Storage and application sites of chlorophenol pesticides and other pesticides containing PCDD/F

In Belize, PCP (used as a wood treatment of utility poles and cross arms bars), has been discontinued. The last time it was imported and used in by BEL was between 2004 and 2006. Old poles were stockpiled at a location near the Phillip Goldson International Airport (Latitude: 17°32'16.97"N, Longitude: 88°17'40.45"W) and may be considered a potential contaminated site. The pesticide 2,4-D amine is registered for use in Belize and is a widely used herbicide. It can be assumed that expansive areas of Belize, mainly in rural areas where the agriculture sector is concentrated, are potentially contaminated sites from the use of 2,4-D amine.

- Dumps of wastes/residues

Any sites including waste management facilities where PCDD/PCDF containing products or residues have been disposed of, has the potential of the release of these contaminants into the environment. Belize has numerous open or partially controlled dumpsites where waste is deposited. At these dump sites; it is common practices for waste to be burnt as a waste management strategy. These dumpsites are located within the Northern Corridor, which includes the Orange Walk and Corozal District and the Southern Corridor, which includes the Stann Creek and Toledo Districts. The coordinates for major dumpsites are presented in Table 17.

Table 17: GPS Coordinates for potential PCDD/PCDF and other UPOPs contaminated dumpsites.

Site	Latitude	Longitude
Corozal dumpsite	18.26833	-88.205088
Orange Walk dumpsite	18.33840	-88.361599
Dangriga dumpsite	16.582093	-88.18385
Independence dumpsite	16.312450	-88.284738
Placencia dumpsite	16.411194	-88.215896
Punta Gorda dump site	16. 82999	-88.475365

The following figure (Figure 10) is a summary of the potentially POPs contaminated sites in Belize.

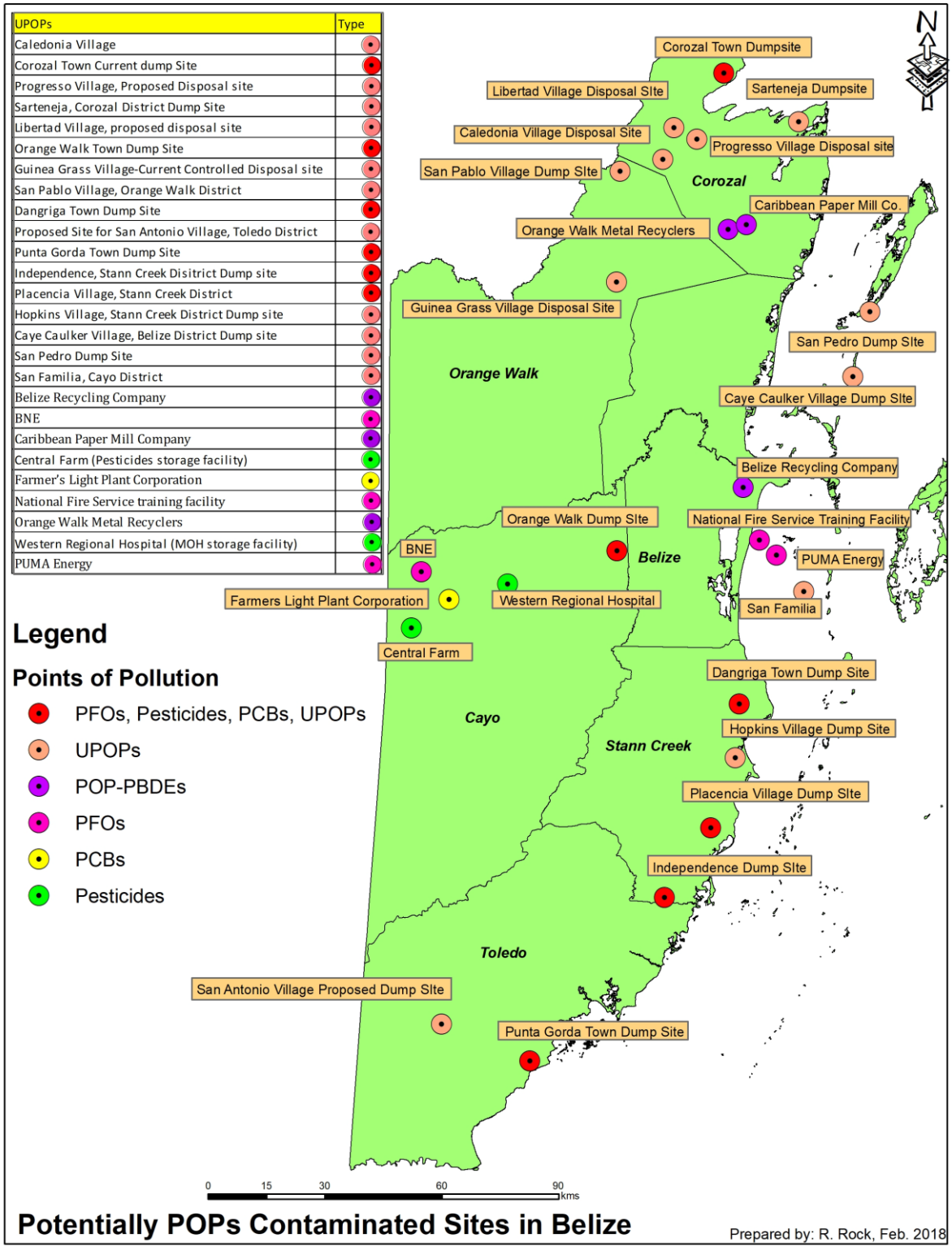

Figure 10: Potentially POPs Contaminated Sites in Belize.

2.3.10 Summary of Future Production, Use and Releases of POPs – Requirements for Exemptions

– Specific exemption for POP pesticides

The only POP pesticides that have restricted use exemptions in Belize are DDT, Lindane, PCP and Sulfluramid. The Ministry of Health maintains a policy of reserving the right to import DDT for emergency use during the outbreak of malaria. Currently, the Vector Control Unit (VCU) of Belize uses DDT alternatives deltamethrin, temophos and cyhalothrin for the malaria eradication program in Belize. According to the Pesticides Control Board (Ginnel Ozaeta, Personal Communication), pentachlorophenol has not been used in Belize recently and was last imported into Belize back in 2000. Lindane is still used in Belize as a human health pharmaceutical for control of head lice and scabies. Of all POPs pesticides with restricted use designation in Belize, Sulfluramid is the most extensively used POPs pesticide in Belize. It is recommended that a thorough assessment of alternatives to POPs pesticide be done to determine the needs for exemptions. This is especially true of sulfluramid due to its extensive use and possible alternatives for use in Belize such as Fipronil (phenylpyrazole).

– Specific exemption for POP PBDE

There is no need for exemptions for recycling of plastic containing POP-PBDE since this activity are not practiced in Belize.

– Specific exemption for HBCD

There is no need for specific exemptions for HBCD use in insulation for buildings. Insulation in buildings is not common in Belizean households. Additional assessment needs to be done in order to determine the need for specific exemption for use in specific buildings.

– Specific exemption for PFOS/PFOS related chemicals

Minor amounts of PFOS containing firefighting foams were documented in this inventory. These were not reported by users and were rather detected by chance during site visits. Therefore, further assessment should be done to determine the extent of PFOS containing foams still present in Belize from old stocks that were imported many years ago and may still remain in country. With the exception of one 5-imperial gallon container of PFOS containing firefighting foam, all other firefighting foams inventoried are fluorinated but do not contain PFOS/PFAS. This determination is based on the MSDS of the firefighting foam. Therefore, an assessment to determine alternatives available for use in Belize is not necessary.

2.3.11 Existing Programmes for Monitoring Releases and Environmental and Human Health Impacts, including findings

Currently there is no formal program of identification and monitoring of POPs chemicals in Belize. Monitoring of chemicals is carried out under the various laws and regulations and across the various institutions. The main agencies with inspectors or persons authorised to monitor and enforce regulations are the Department of the Environment, Public Health Department, Belize Agricultural Health Authority, Ministry of Agriculture Extension Services Department and the City and Town Council (Pompey & Mendoza, 2018).

Another key issue that impacts on effectiveness is a challenge faced in terms of analytical capabilities. While there are a range of laboratories with equipment that can perform the range of testing and analysis required for chemicals management, the Profile Report points to the issue of regular shortage of re-agents and other chemicals required for testing (Pompey & Mendoza, 2018).

Consequently, there is a lack of data on the impact of POPs on the health of the public. It has been determined that in Belize there are very limited studies on the public health impacts of POPs. The information gap exist on the health impacts of the general public, and especially among the exposed population with greater risks, i.e., the applicators, rural communities (especially agriculture based communities), the immigrant population, etc.

However, a few reports, not specific to POPs have revealed trace amounts of POPs chemicals in the environment. A 2002 report conducted by Mario Fernandez cited levels of DDT residue in breast milk. However, this report focused on the levels of DDT residue in media sampled and was not intended to determine potential health impacts of the residue levels. The results indicated that most of the DDT residue was washed out by sediments into the rivers and eventually into the sea. The samples tested revealed that blood samples indicated average residue levels of .08 ppm, 0.45 ppm in breast milk, 0.26 ppm in soils, and 4.16 ppm in sediments. With this type of basic background information, and the existing gap in the medical consequences of the DDT levels, the need for further investigation into the extent and consequences of POP residues is essential.

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

There is a general lack of information, awareness and education among target groups. This implies a need to expand and intensify public education in safe chemicals handling, and to develop mechanisms for the active engagement of the citizenry, policy makers, workers, NGOs, and

industrial associations in monitoring and alerting on incidents and practices that could undermine safety.

2.3.13 Mechanism to Report Under Article 15 on Measures Taken to Implement the Provisions of the Convention and for Information Exchange with Other Parties to the Convention

Similar to the development of the NIP, reporting under Article 15 on measures taken to implement the provisions of the Convention and for information exchange with other Parties to the Convention is an obligation for Parties.

The timeframe for the national reporting to the Stockholm Convention is every four years and in accordance with a format as established by the COP at its first meeting (decision SC-1/22). The 4th and next reporting cycle is in August 2018. Based on the information compiled for the NIP Belize intend to submit the report for Article 15 reporting. The establishment of the Chemicals Management Unit will improve reporting to the BRS Conventions.

Information exchange on POPs-related issues with other Parties to the Convention was weak in the past. However, contacts have been established in particular within the regional POPs project. Belize has developed close links with other countries in the Caribbean within the regional POPs project and information exchange is facilitated by regional workshops.

2.3.14 Relevant activities of non-governmental stakeholders (including industry, civil society, research community)

The non-governmental organisations (NGO) in Belize are very actively involved in the sustainable development agenda, and the conservation/environmental movement. The NGO community is involved at all levels of the conservation/environmental agenda, through established public consultation processes, community participation in government decision making on issues of importance to the protection of the environment, and in the planning and management of Belize's national system of protected areas. However, the NGO community has not prioritized the issue of Chemicals and Waste management, including POPs chemicals, as one of its area of importance.

Through the implementation of the national awareness program being developed, the NGO community and other social partners will be targeted for increased awareness of POPs chemicals, their impacts and the need to mitigate their impacts. The result of this awareness program is

expected to include greater awareness of POPs and its impact on the environment, and behavioral changes that benefits the society at large.

2.3.15 Overview of technical infrastructure for POPs assessment, measurement, analysis, alternatives and prevention measures, research and development – linkage to international programmes and projects.

There is no technical infrastructure or comprehensive guide for standard operating procedures for chemicals management in Belize. The following information on operating procedures was provided in the Belize Country Report (Pompey & Mendoza, 2018).

- The DOE is guided by the Hazardous Materials Guidelines in terms of responding to chemicals incidents.
- Generally, Government of Belize (GPB) DOE provides policies but no Standard Operating Procedures templates; companies tend to develop their own SOPs taking account of regulatory requirements.

However, under the Chemicals and Waste Management Project and through a consultancy, the DOE is developing a chemical management strategy and disposal plan for chemicals.

2.3.16 Overview of technical infrastructure for POPs management and destruction

The environmental compliance plans outline requirements for proper disposal and handling of agrochemical waste. While the operations of the sugar factory incorporate requirements of the company's environmental compliance plan, which stipulates development and submission of SOPS for solid waste management to the Department of the Environment (Pompey & Mendoza, 2018).

The DOE is also guided by international standards as it related to the overall management of hazardous substances. These standards are made legally binding upon users through the environmental clearance process.

2.3.17 Identification of Impacted Populations or Environments, Estimated the Scale and Magnitude of Threats to Public Health and Environmental Quality and Social Implications for Workers and Local Communities

Belize lacks capacity for monitoring and research to detect POPs in the environment and to assess their impacts on the environment and on human health.

2.3.18 Details of any Relevant System for the Assessment and Listing of New Chemicals

There are legal means to ban and prohibit POPs from entering Belize and most of the POPs have already been banned in the country. However, no system has been established to assess and determine new chemicals on the market as POPs.

2.3.19 Details of Any Relevant System for the Assessment and Regulation of Chemicals already in the Market

There is no system for the assessment of chemicals already in the market in Belize.

2.4 NIP IMPLEMENTATION STATUS

The level of compliance with SC requirements is compiled in Table 18.

Table 18: The Stockholm Convention requirements and NIP implementation and level of compliance of Belize.

Convention Article	Level of compliance	Comments
ARTICLE 3 Measures to reduce or eliminate releases from intentional production and use	For POPs pesticides refer subchapter 2.3.1	Belize has a strong legislation and regulatory framework for the management of pesticides. The PCA, which came into effect in 1988, includes provisions for the control of the manufacture, importation, sale, storage and use of pesticides, and related matters. No POPs pesticides are manufactured in Belize. Except for DDT, endosulfan, lindane, pentachlorophenol, sulfluramid that have restricted importation and use designations under the SC, all other POP pesticides are prohibited for importation and use in Belize.
	For PCBs refer to subchapter 2.3.2.	Belize does not produce PCBs and importation has been banned in Belize since the 1990s. The principal use of PCBs in Belize was dielectric fluids in electrical transformers by BEL, which is responsible for the generation, transmission and distribution of electricity in the whole country.
	For DDT refer to subchapter 2.3.6	DDT is not produced in Belize. It was first used in Belize in 1957 when the NRMS was established and was used continuously (except for a short break from 1974-79) until 1995 for the control of vector that carries the agent that causes malaria and dengue fever. It was used briefly again in 1997 and has not been used since. The usage pattern of DDT changed with the different strategies employed to control the incidence of malaria.
ARTICLE 4	Refer to subchapter 2.3.10	The only POP pesticides that have restricted use

Convention Article	Level of compliance	Comments
Register of exemptions		exemptions in Belize are DDT, Lindane, PCP and Sulfluramid.
ARTICLE 5 Measures to reduce or eliminate releases from unintentional production	Refer to subchapter 2.3.8 *where pollution control technology and Best Practical Treatment methods are used*	The Ministry of Health has installed a new incinerator in Belmopan, which is slated to commence operation shortly, and other incinerators to be purchased in during 2018 for installation at other district health facilities. In 2016, records show a decrease in incineration from past years. This was as a result of using freezers to store confiscated fruits and vegetables to kill pests and then these are buried. BAHA operates its incinerators using Best Practical Treatment methods to control or reduce emissions to the lowest possible level. In the agriculture sector, the second burning of cane fields has been significantly reduced and new harvesting method has also reduced the need for burning.
ARTICLE 6 Measures to reduce or eliminate releases from stockpiles and wastes	Refer to subchapter 2.3.9	In January 2016, Belize completed the Verification, Classification and Inventory of existing Stockpiles of POPs, Pesticides and PCBs, and other Chemicals. This work was an activity of the Belize Chemicals and Waste Management Project. This exercise identified POP pesticide stockpiles in Belize as well as any obsolete chemicals and pesticides. Currently, POPs pesticides stockpiles have been eliminated from their storage facilities. In May 2017, through the said project, DOE facilitated the removal and subsequent disposal a total of 23.93 t of packaged DDT powder (200 drums) and approximately 4.3 t (4,260 Kg) (solid pesticide) and 2,000 L (liquid pesticide) inclusive of other non-DDT POP pesticide.
ARTICLE 7 Implementation plans	Belize submitted its first NIP in 2011	The first NIP was completed in March 2008 but it was received by the Secretariat in 2011.

Convention Article	Level of compliance	Comments
ARTICLE 8 Listing of chemicals in Annexes A, B and C	Belize has never submitted a proposal on the listing of new chemicals in Annexes A, B and C to the COP.	
ARTICLE 9 Information exchange	Refer to subchapter 2.3.12	There is a general lack of information, awareness and education among target groups. This implies a need to expand and intensify public education in safe chemicals handling, and to develop mechanisms for the active engagement of the citizenry in monitoring and alerting on incidents and practices that could undermine safety.
ARTICLE 10 Public information, awareness and education	Refer subchapter 2.3.12	
ARTICLE 11 Research, development and monitoring	Refer to subchapter 2.3.11	There are no formal program of identification and monitoring of POPs chemicals in Belize. Reporting and investigations are ad hoc, and limited.
ARTICLE 12 Technical assistance	The organizations that have provided technical assistance to Belize are GEF, UNIDO, BCRC-Caribbean, FAO	
ARTICLE 13 Financial resources and mechanisms	Financial resources are needed for the implementation of the Convention. As of 30 November 2017, according to the Status of Contribution compiled by the SC Secretariat, Belize has unpaid pledges for prior years, 2016 &	

Convention Article	Level of compliance	Comments
	2017.	
ARTICLE 15 Reporting	Belize has not sent any report pursuant to Article 15 of the Convention.	
ARTICLE 16 Effectiveness evaluation	Belize did not participate in the WHO human milk study for the basic POPs (POPs pesticides, PCB, PCDD/F and HCB)	
ARTICLE 17 Non-compliance	The procedures and institutional mechanisms for determining non-compliance are not yet approved and developed, thus the country's compliance cannot be verified.	
ARTICLE 19 Conference of the Parties	Belize has only attended COP8	
ARTICLE 21 Amendments to the Convention	Belize has accepted all the Stockholm Convention amendments	
ARTICLE 22 Adoption and amendment of annexes	Belize accepted all the Stockholm Convention amendments of the annexes.	
ARTICLE 24 Signature	Belize signed the Convention on May 14, 2002.	
ARTICLE 25	Belize ratified the Stockholm Convention on January 25, 2010.	

Convention Article	Level of compliance	Comments
Ratification, acceptance, approval or accession		
ARTICLE 26 Entry into force	The Stockholm Convention entered into force in Belize on April 25, 2010.	

3 STRATEGIES AND ACTION ELEMENTS OF THE NATIONAL IMPLEMENTATION PLAN

This chapter has two (2) elements: a formal policy statement and the implementation strategy for the NIP. The implementation strategy sets out specific (updated or new, where relevant) action plans or strategies to achieve Convention obligations and additional priorities/objectives set by the country.

3.1 POLICY STATEMENT

The Government of Belize is a signatory to the Stockholm and Basel Conventions. As a member of the international community, Belize is contributing to manage, reduce, phase-out and eliminate the chemicals now regulated and those that may be regulated in the future following the international agreements, conventions and practices considered suitable and applicable to the sustainable development of Belize. Furthermore, the Government of Belize recognizes that the management and phasing out of the Persistent Organic Pollutants, within the framework of the Stockholm Convention and other agreements, requires international and regional cooperation, in which Belize is actively participating.

The use of pesticides and PCBs are largely based on importation of these chemicals from developed, and industrialized countries. Belize is not a producer of these chemicals and considers, therefore, that the adverse effects of these substances should be mitigated with the support of those countries, which, directly and indirectly have profited from the introduction of these chemicals. Belize has never produced or formulated POPs chemicals and has discontinued the importation and use of the regulated chemicals.

Belize naturally recognizes its role in the implementation of the SC and will act in a responsible and cooperative manner as a member of the international community. The unintentional production of dioxins and furans in Belize is linked to the economic development of the country, the unregulated incineration of medical waste, and the practices of burning agricultural residues, waste and wood. Dioxins and furans (in combination with particulate matter) are one of the most important health hazards. However, new energy sources as well as new sugarcane harvesting methods are alternatives to reduce the production of dioxins and furans, or at least reduce the future growth.

The newly listed POPs (POP-PBDE/HBCD and PFOS and related chemicals) places attention on the issues of proper management and disposal of EEE, the polymers/plastics and foams from ELV. Additionally, the import and use of PFOS/PFAS firefighting foams and stockpiles is also recognised as priority areas for future action in accordance to Belize’s Obligations to SC.

Belize aims to apply the Precautionary Principle and the Polluter Pays Principle (PPP) when mitigating the POPs generated problems. These principles would make a more direct link between the root causes and the corresponding financial phase-out costs. However, taking into consideration that the economic structure in the country is rapidly changing (as a result of international commitments such as WTO and CARICOM), the PPP has limited opportunities regarding the problems from the past, but the PPP is to be incorporated in the future activities. Belize is continuously revising and updating its regulatory framework regarding the environmental issues and environmental management. The POPs management, phase-out and elimination issues are being integrated in the environmental protection and solid waste agenda where appropriate, and in general as part of the framework for the management of chemicals and specifically under the waste management initiative.

The Government will review the National Implementation Plan for POPs reduction and/or elimination submitted by the DOE with the objective of seeking its adoption and is committed to undertaking the appropriate activities in order to comply with the tasks included in the NIP action plans while fulfilling the Stockholm Convention provisions.

3.2 IMPLEMENTATION STRATEGY

This implementation strategy serves as a road-map on how to fulfil the objectives set out in the Stockholm Convention. The main elements of the strategy, from a Belizean perspective, are as follows:

- Belize is prepared to eliminate the use of the eight (8) pesticides mentioned in Annex A. In practice this objective means that Belize will not allow the re-use or re-introduction of these substances, which are no longer in use and, further, will actively seek cooperation and means to manage and dispose of any existing obsolete stocks if any is either found or identified in the future. The pesticide strategy is supported by a concrete action plan.
- Belize will identify, label and remove from use the equipment using PCB and make all efforts to minimize the risk to health and safety from the exposure to equipment containing PCB, which are still in use. Further, Belize will make a concerted effort to manage and treat the PCB containing equipment and PCB substances by the agreed deadlines of 2025 and 2028, respectively. An accelerated phase-out of PCB is sought. The PCB elimination strategy is supported by a concrete action plan.
- Belize will restrict the application of DDT in disease vector control when in utmost need only, if ever, and apply it in accordance with the World Health Organization recommendations. However, Belize will actively continue to work on alternative methods

and substances to replace DDT. To safeguard against a national crisis, however, Belize will seek an entry of DDT in the register of exemptions as established by the Stockholm Convention. However, Belize is aware that entry to the register is a temporary action that doesn't replace the efforts to phase-out and eliminate the use of DDT.

- Belize will identify the known and assumed sources of the production of dioxins and furans and will further put extensive efforts and other resources to reduce the unintentional production by adopting the BAT and the BEP. The strategy is supported by concrete action plans covering the most important and critical emission sources.
- Belize will put the necessary regulatory framework for the proper management and disposal of WEEE and polymers/plastic/foams from ELV. Thus, eliminating POP-PBDE from the waste stream and recycling. Belize will also initiate educational and awareness campaigns with relevant stakeholder groups.
- Belize will make provisions to include PFOS as a parameter when testing ground water and other natural water sources. In this regard, the national capacity for water quality testing/analysis and resources within the relevant Ministry Laboratory must be augmented and will require financial assistance from external bodies. Additionally, attempts are continuing to restrict use of POPs potentially contaminated sites and closure of existing dumpsites.

Operational Objectives

The implementation strategy consists of seven (7) major components covering the operational objectives for the management, phase-out and elimination of POPs; these seven (7) components are:

a. Development and enabling of the necessary legal and administrative

   framework including public awareness of the affected stakeholders, as well as non-sector specific support activities such as information exchange, monitoring and reporting so as to inform the international community and the parties of the Stockholm Convention of the actions that Belize is taking to keep abreast of ongoing developments.

b. Management of POP pesticides and any other unknown obsolete stocks,

c. Management of unintentional production of dioxins and furans,

d. The management and elimination of PCBs and PCB containing equipment,

e. Management and/or elimination (as appropriate) of DDT in vector control,

f. Management of PFOS/PFAS and its related substances and stocks, and

g. Management of POP-PBDE/HBCD and waste categories.

The overall strategy to fulfil the objectives established above will consist of a combination of several measures including direct government involvement (regulations and law enforcement efforts), support to the local stakeholders, direct market instruments such as possible subventions and tax-breaks, as well as establishing international cooperation and co-funding.

An essential part of the POPs management and phase-out efforts is the regional and international cooperation regarding the impact assessment as well as the management and phase-out measures, both regulatory and technical. The major, tangible implementation strategies are supported by action plans and largely quantified programs and projects while some activities still require further elaboration and designing within the proposed strategy before being converted into more tangible actions and projects. Further, the important support activities such as monitoring, reporting and POPs related research and development are also addressed.

Coordination

The POPs chemicals are scattered over several economic sectors as well as over a very wide geographic area in Belize. The coordinating strategy is to have all the efforts coordinated and monitored by one institution within the Government, i.e. by the DOE, while at the same time allowing the various sectors (public and private) to implement the individual activities in a smooth and coordinated manner. The existing coordination unit (PMU) does not have any further mandate to coordinate the implementation of the NIP. However, as indicated in section 3.3.1 the DOE capacity should be strengthened to establish a POPs Program to safeguard the utilization of results already achieved and to serve as a coordinating body within the government and, as appropriate, within other agencies. Hence the DOE will be the lead agency in the implementation of the NIP and associated actions that include:

1. Undertaking regular monitoring and evaluation of the NIP implementation.
2. Updating the NIP after a period of five years or earlier if the prevailing political situation in the country necessitates this action.
3. Coordinate the execution of action plans.
4. Facilitate fund raising for the project proposals in the present NIP update.
5. Facilitate information exchange with the General Secretariat of the Convention and the other relevant agencies.
6. Act as a National Focal Point for all information database and dissemination pertinent to POPs.
7. Create linkages with international agencies to gain technical support on any recent advancement in the POPs issues.

Monitoring and evaluation

The DOE and the funding agencies (national and/or international) will undertake the monitoring and evaluation of the implementation of the NIP through consensus workshops. The purpose of the monitoring and evaluation process is to measure the impacts of the activities of the proposed action plans to determine the level of achievement that has been reached towards the elimination of POPs.

NIP updating and reporting

The DOE will report to the Stockholm Convention Secretariat on a regular basis or as required by the Secretariat. Updating will be every five (5) years or as the political situation dictates.

3.2.1 Integrated Approach of Implementing Chemical Conventions and other Conventions

Except for DOE, there are only a small number of departments that deal with chemical management. Considering this, the DOE attempts to maximize their resources and integrate activities over the different conventions to which they are a Party. However, for the most part, the Rotterdam Convention is the exception. Belize will try to collaborate with PCBd for inventories and control measures to fit into this Convention and integrate with other Conventions and SAICM. The Integrated Chemical Management Bill is an example of such integration over Conventions. This bill takes a holistic approach to chemical management. It deals with all aspects of chemical management (import, export, production, formulation and processing, distribution, use, storage, disposal) and encompasses many hazardous chemicals (Pompeo & Mendoza, 2018).

3.2.2 Integrating POPs/Chemical Management and Policy with Waste and Resource Management Considering the Waste Hierarchy

Belize has now moved developed Transfer Station in many communities to replace unauthorised /authorised dumpsites. Transfer Stations are controlled facilities and waste that arrive her are sorted and held for subsequent collection. These stations provide better opportunity for recycling and recollection of resources from waste. There are approved waste-collectors that operate at these facilities that engage in some recycling of metals, plastic bottles and aluminium cans. Such initiatives are consistent with Belize's priorities in moving away from disposal of waste (base of waste hierarchy) to waste recovery, recycling, and reuse and avoidance (top of waste hierarchy).

3.2.3 Addressing POPs Phase-out and use of Alternative Within Sustainable Consumption and Production Approach

Currently in Belize, there is no in-house capacity for the phase out and research on alternatives (chemical/non-chemical) to POPs. Belize must depend on external bodies for these resources. However, in the Agricultural Sector citrus and sugar cane industries, integrated pest management alternatives/strategies are widely utilised. These include biological control by itself and coupled with monitoring of insects' eggs as an early warning system, use of disease resistant varieties and good farming practices (CARPHA, 2016d). In this way, there is a reduction in the use and exposure of hazardous pesticides in Belize and it supports sustainable consumption and production (SDG12).

3.3 ACTION PLANS, INCLUDING STRATEGIES AND ACTIVITIES

The following sub-chapter outlines the national POPs management priorities, with respect to POPs - POP pesticides, PCBs, PFOS, PBDEs/HBCDs, dioxins and furans. These priorities are based on the two-day National Stakeholder Consultation Workshop (on the Update of the NIP on POPs in Belize on February 6 and 7, 2018); priorities reflected in the previous version of the NIP and other discussions/meetings involving the relevant stakeholders. Before setting the priorities, efforts were made to provide all stakeholders with complete information regarding the current status, the known facts, the criteria for prioritising POPs (CARPHA, 2016f), as well as the estimated impacts using legal and regulatory requirements. The priority setting was balanced, representing input from the PWC and key stakeholders thus covering the purposes expressed in Article 3, Article 7, Article 10, Article 11 and in Annex A of the SC. The set priorities aim to express also realistic implementation opportunities.

Priorities indicate the POPs categories and sources, which should be tackled. The priorities consider the risks and adverse impacts that POPs have or may have on people and the environment. Environmental impact usually includes the potential impact to humans but in a more indirect and long-term manner. Thus, the criteria used for setting the priorities were toxicological relevance to human health and that of biota/wildlife, relevance of co-pollutants and affected waste and socio-economic relevance (CARPHA, 2016f).

3.3.1 Activity: Institutional and Regulatory Strengthening Measures

Table 19: Action Plan: Institutional and Regulatory Strengthening Measures.

Priorities	Activities	Performance indicators	Time frame	Responsible Agencies	Budget (USD)
Strengthening of Stockholm Convention Focal Point					
Implement a coordinating body for SC.	Establish Chemicals Management Unit within the DOE.	Established unit within DOE	2020	Department of Environment (DOE)	175,000

3.3.2 Activity: Measures to Reduce or eliminate Releases from Intentional Production and Use (Article 3)

Article 3 of the Stockholm Convention requires Parties to take legal and administrative measures to regulate, with the goal of eliminating, the production, use, import and export of the chemicals listed in Annexes A and B of the Convention. In addition to exercising regulatory control over import, export, production and use, Parties with regulatory and assessment schemes for new or existing pesticides or industrial chemicals are required to include in these schemes consideration of a number of screening criteria listed in Annex D of the Convention.

In Belize, there is no intentional production of POPs chemicals. However, there are several POPs in use including POP-PBDEs in articles or PFOS in products and articles. Article 3 of the Convention summarizes activities that must be put in-place to reduce and eliminate releases from intentional production. These activities include legal and administrative measures. This action plan presented below identifies measures to reduce or eliminate releases from intentional production and use of POPs.

Table 20: Measures to Reduce or eliminate Releases from Intentional Production and Use (Article 3).

Priorities	Activities	Performance indicators	Time Frame	Responsible Agencies	Budget (USD)
Assess the current use of POPs and reducing and eliminating releases and use of POPs.	Update inventory of Annex A and B chemicals imported in Belize particularly POP-PBDEs (including DecaBDE) and PFOS.	Inventory of current chemicals (Annex A and B in use in Belize	5 years	DOE	300,000
Restrict or prohibit import of Annex A & B chemicals.	Actively continue to work on alternative methods and substances to replace restricted/prohibited chemicals (DDT, PFOS). Update regulatory framework for banning and regulating existent and newly listed chemicals.	Substitution with less toxic and or non-chemical alternatives Updated regulations/regulatory framework	5 years	Pesticide Control Board (PCBd), Ministry of Health (MOH) and DOE	45,000

3.3.3 Activity: Production, Import and Export, Use, Stockpile and Waste of Annex A POP pesticide (Annex A, Part I Chemicals)

POP pesticide stockpiles have been eliminated from their storage facilities. In May, 2017, a total of 23.93 t of packaged DDT powder (200 drums) and approximately 4.3 t (solid pesticide) and 2,000 L (liquid pesticide) inclusive of other non-DDT POP pesticides was removed and disposed of in France (at the Tredi Saint Vulbas incineration facility) (CARPHA, 2016d).

The country had two (2) storage sites containing obsolete POPs chemical stocks. According to the 2008 NIP, one site contained only DDT (~14 t) while the other site (managed by the Pesticides Control Board) had various unidentified chemicals including the 10 kg of POPs pesticide. All stockpiles at both sites have been disposed of in an environmentally sound manner. However, both sites may present a soil pollution problem, the extent of which depends on several factors like the site location, technical condition of the stores and also on the management practices imposed while handling the pesticides. There is no data on the volume of contaminated soils in the immediate vicinity of the stores.

A more difficult and far reaching problem is the issue of the POPs pesticides residues in the environment. The application of POP pesticides in agriculture and for vector control, the transportation and handling of these chemicals, and through the emission from storage by wind and floods etc. may have its effect on polluting the ecosystems. There have been few studies of

POPs residue concentration in environmental samples such as surface water, ground water, fish, animal and human tissues, milk and edibles.

The overall strategy regarding the management of Annex A POPs and their adverse impacts covers the following: Additional, local research (data collection, surveys, and analysis) on the current status in order to assess the extent of the problem and the actual extent of the impacts on the ecosystem and the people. Any future obsolete stocks should be carefully handled and managed to avoid any spillage and spreading. The abovementioned improvements can be achieved through regulatory measures, training, improved management practices and making people aware of the immediate risks pertaining to being in contact, directly or indirectly with the stock and the items stored or contaminated with these substances. Establishing a system of threshold values (adapting international accepted standards) for levels of these chemicals in foodstuffs and environmental media is important.

Based on the above strategies, the following four (4) actions are proposed for POP pesticides:

1. **Amendment of the Existing Legal Instruments and Strengthening Pesticides Law Enforcement**

The current legal instruments of interest are the Environmental Protection Act (Revised Edition 2011), the Public Health Regulations, and the Pesticides Control Act. These three (3) acts were promulgated before the issue of POPs and the international conventions covering them became a national issue. These existing legislations must be reviewed, assessed and amended by the competent authorities to include the management of POPs, improve their effectiveness in eliminating the use of POPS chemicals and to remove any conflicts that may hinder the implementation of the SC. Alternatively, a new legislation should be developed that takes an integrated approach on chemicals management, such as intended by the draft Integrated Chemicals Management Bill already developed by the DOE.

The FAO issued the International Code of Conduct on the Distribution and Use of Pesticides, which is a global guidance document on pesticide management for all public and private entities engaged in pesticide management and use. This code should be formulated into a statutory instrument within the PCA legal framework.

2. **Strengthening the Capacity to Handle POP Pesticides and Contaminated Sites**

The persons who are actively involved in the management of pesticides and related activities need extensive training and skill development programs. Such programs are very beneficial and can realistically introduce better practices at the operational level. The laboratory capabilities need to be upgraded to be able to offer the services needed to analyse for POPs. The pesticide outlet

workers as well as formulators need some level of training regarding the handling of POP pesticides. Table 21 gives the activities to be included for these actions.

3. Raising Awareness of POP Pesticides

The POPs pesticides have not been of great concern to most of the population of Belize. Pesticides are inherently benign, in the same way that medicines are. Wide-scale information and training is needed to increase the level of caution and gain support for the phasing out or ban of these chemicals.

All the good practices as well as mitigation options when introduced, are not enough to combat the adverse effects including the avoidance of risk if there is no public awareness of the problem. Those directly exposed (farmers, applicators, farm workers as well as people living in the areas where the obsolete stocks and contaminated soil occur) need to be sensitized to avoid risks, both current and future, and to contribute to the environmentally sound management practices. It is important that the information reaches all groups, including women and children particularly those who are working in agriculture. Training of schoolteachers and provision of appropriate teaching materials is, therefore, vital.

Actions to increase awareness of POPs pesticides in Belize might include erection of physical barriers, warning signs and advisories to the local people and especially children to avoid contacts with the contaminated substances and equipment. Table 22 gives the activities to be included for these actions.

4. Undertaking Ecologically Sound Measures to Eliminate Obsolete POP Pesticides

Obsolete pesticides, including POP pesticides, which were inventoried in 2008 and further inventoried in 2016, have been disposed of (CARPHA, 2016d). However, it may be possible that some stockpiles may still exist thus the need to conduct a more detailed and expansive inventory of obsolete pesticides. Assessment to determine contamination of stockpile sites was not conducted and is required to determine the quantities of contaminated soil, if any. There is also the need to have a mechanism in place to avoid the reoccurrence of obsolete stockpiles and where these occur to have an action plan for the effective and efficient management of these stocks.

Table 21 gives the activities to be included for these actions.

Table 21: Production, import and export, use, stockpiles and wastes of Annex A POPs pesticides (Annex A, part 1 chemicals).

Priorities	Activities	Performance indicators	Time Frame	Responsible Agencies	Budget (USD)
Manage and Eliminate POPs Pesticides and Mitigate their Adverse Impacts					
Develop/Amend existing legal instruments and strengthen pesticides (including POPs) laws and its enforcement.	Develop/Update the existing legislation and ban on traditional pesticides (including lindane, DDT) and developing proper instruments for pesticides. Develop regulatory measures to combat illegal traffic of banned/counterfeit pesticides. Develop a regulatory framework for GHS and related labeling.	Legislation on bans/prohibition Prohibitive fines and penalties incorporated into Legislative amendments	3 years 5 years	PCBd, MOH, DOE, Attorney General's Ministry (AGM) Customs, DOE, Labour, MOH	75,000 75,000
	Update the rules and regulations for the management of pesticides including the management of treated waste wood.	Code of Practice for the management of pesticides developed Developed best practices guidelines for wood treatment facilities	2 years	PCBd, DOE	30,000
	Assess the need for exemptions for DDT, lindane and PCP.	Assessment report on use of alternatives	2 years	PCBd, MOH	25,000
Strengthen the capacity to handle POP pesticides and contaminated sites.	Develop protocol for handling hazardous substances. Train front line officers to handle hazardous substances.	National protocol developed for the handling of hazardous substances by regulatory officers. Trained officers	2 years	PCBd, University of Belize (UB), Caribbean Agricultural Research and Development Institute (CARDI)	95,000

Priorities	Activities	Performance indicators	Time Frame	Responsible Agencies	Budget (USD)
	Upgrade the laboratory capacities in the relevant institutions (BAHA) and train laboratory staff in POP pesticide related analysis techniques, methodology and instrument use.	BAHA laboratory capacity built to conduct testing for presence of POPs	4 years	Belize Agricultural Health Authority (BAHA), DOE, Forensics, UB	500,000
Education and awareness raising (stakeholders, policy makers, farmers, customs officers) on POP pesticides/ HHPs waste and contaminated sites.	Prepare training materials with approved contents and practical aspects on management of POP pesticides.	Training manual developed	2 years	PCBd, Ministry of Agriculture and Fisheries (MAF), MOE	30,000
	Conduct media campaigns (TV, radio, newspaper).	Advertisements developed and aired	Annually	PCBd	80,000
	Train trainers in the agricultural sector. Train applicators (farm workers, foremen, local field managers). Strengthen the inspection capacity of pesticides for customs (including counterfeit and illegal pesticides). Strengthen the inspection capacity for other competent authority (storage, usage and disposal including counterfeit and illegal pesticides).	Training conducted for customs officers and BAHA personnel stationed at port entry Training conducted for farmers Agencies are trained on categorization of substances (identifying POPs and HHPs)	Annually	PCBd, Ministry of Agriculture) MOA, DOE	150,000
	Educate farmers on pesticides, HHPs counterfeit pesticides and the use of IPM and organic farming. Educate citizens and NGOs on POP pesticides, HHPs, counterfeit pesticides and organic farming and organic products.	Trainings conducted and development of awareness material	2 years	PCBd, MOA, DOE	40,000

Priorities	Activities	Performance indicators	Time Frame	Responsible Agencies	Budget (USD)
	Include pesticide management within the teaching curricula of the Faculty of Agriculture and Natural Resources of UB.	The topic Pesticide Management included on the teaching curricula of the Faculty of Agriculture and Natural Resources of UB	3 years	MOA, UB, Galen University, MOE, Association of Tertiary Level Edu.	85,000
Undertake Ecologically Sound Measures to Eliminate Obsolete POP Pesticides.	Establish and maintain an inventory of obsolete POPs and other pesticides.	Updated inventory of obsolete pesticide	2 years	PCBd, MOH, DOE, MOA	75,000
	Develop strategy to prevent the accumulation of obsolete POPs pesticides.	Strategy developed	2 years	PCBd, DOE, MOA	45,000
	Conduct training on handling of POPs and obsolete pesticides, damaged and empty containers and contaminated soil.	Number of trainings conducted	2 years	PCBd, MOA, DOE, MOH, UB	50,000
Sound Life Cycle Management of POPs Pesticides HHPs (Handling, storage, transfer and disposal of POPs pesticides and POPs pesticides wastes).	Improve the management of POPs pesticides and HHP and general pesticide.	Assessment of registered pesticides for the identification of HHPs Restricted-Use pesticides listing updated to include all identified HHPs Pesticide users sensitized on overall management	3 years	PCBd, DOE, MOA, MOH	75,000
	Establish proper POPs/HHPs and waste pesticide storages and securing of storages.	Establish centralized storage facility for POPs/obsolet es	3 years	PCBd DOE	150,000

Priorities	Activities	Performance indicators	Time Frame	Responsible Agencies	Budget (USD)
	Establish an empty containers collecting and management system, with specific attention to address the use of pesticides empty containers.	Legal provisions established for a collection and management system (empty pesticide containers)	3 years	PCBd, MOA, DOE, Solid Waste Management Authority (SWaMA), Industry	65,000
	Establish capacity to address emergencies and disasters relative to POPs pesticides and HHPs (poisoning, spillage, fires contamination).	Training of first responders to chemical emergencies and disasters	2 years	MOH, PCBd, DOE, National Fire Service (NFS), National emergency management Organization (NEMO)	50,000
Identify, secure and remediate POPs pesticides contaminated sites.	Identify all (former) POPs pesticides use and storage/disposal locations.	Assessment to identify potential contaminated sites completed	2 years	DOE, MOH, PCBd, MOA, SWaMA	75,000
	Identify and monitor the level of contamination of soil and ground water and potential receptors (remediate contaminated sites).	Samples from contaminated sites analyzed and results interpreted and recommendation for remediation provided, where applicable	3 years	DOE, MOH, PCBd,	75,000
	Develop a database and conceptual site models of potentially contaminated sites.	Mapping of contaminated sites completed	2 years	Lands and Survey Department, PCBd, DOE, MOH	50,000
	Prioritise the sites (risks) for further assessment and securing.	Prioritization of contaminated sites completed	3 years	PCBd, MOH, DOE,	15,000
	Educate policymakers on health hazards of pesticides and highly hazardous pesticides (HHPs) and	Policy makers are sensitized on HHP through	2 years	MOA, DOE, PCBd, MOH	10,000

Priorities	Activities	Performance indicators	Time Frame	Responsible Agencies	Budget (USD)
	the benefits of IPM and organic farming.	information papers			
Assess POPs pesticides and HHPs and alternatives and implement IPM and organic farming.	Support the implementation and research on IPM/IVM, including the use of alternatives as a measure for reducing POPs pesticides and HHP use.	Number of pilot projects and assessments completed on the use of IPM/IVM	5 years	MOA, PCBd, CARDI, UB, BAHA, MOH, DOE	200,000
	Select the most sustainable alternative chemicals and non-chemical solutions in the different applications and including promotion of good agricultural practices (GAP); PCBd promotes the rational use of pesticides.	Development of manual on alternatives in different applications	5 years	PCBd, MOA, CARDI	40,000
	Strengthen and develop laboratory capacity to analyse pesticides including POP and Highly Hazardous Pesticides (HHPs); the lab must have a sustainable plan.	Needs assessment of BAHA Laboratory completed. Number of personnel Trained. Resources sustainability program completed.	3 years	BAHA, DOE, MOA	70,000
Establish monitoring and analysis of POPs pesticides and HHPs (products, environment, food, exposure).	Monitor occupational exposure to POPs pesticides and HHPs Train medical practitioners on chemical intoxication	MOH surveillance system captures specific data on occupational exposure to POPs pesticides and HHPs;	2 years	MOH, Social Security Board (SSB), PCBd, Labour Department	100,000
	Establish a pesticide monitoring programme (food, soils/contaminated sites, water, consumers).	Pesticides Monitoring Programme completed	5 years	MOA, PCBd, MOH, DOE, BAHA	350,000
	Improve inventory update by monitoring approach where knowledge gaps have been identified.	Periodical updated of inventory conducted	2 years	PCBd	50,000

Priorities	Activities	Performance indicators	Time Frame	Responsible Agencies	Budget (USD)
	Develop knowledge, capacity, tools and indicators to better assess the risks and socio-economic impact of POPs and HHPs.	Capacity built in key agencies	2 years	PCBd, DOE, MOH, MOA	60,000

3.3.4 Activity: Production, Import and Export, Use, Identification, Labelling, Removal, Storage and Disposal of PCBs and Equipment Containing PCBs (Annex A, Part II Chemicals)

Information obtained during the 2016 inventory indicates that a stockpile of equipment containing PCBs may be present at FLPC. Also, the FLPC equipment at Spanish lookout should be secured to limit impacts to the environment and human health. To ensure that Belize meets its obligation under the Stockholm Convention it is recommended that the country continues implementing the activities outlined in the action plan of the NIPs 2008, related to sustainable management of PCB and PCB related equipment. Additionally, consideration should be given to PCNs, which were formerly used, and for open applications SCCP used today in a range of open applications of PCBs.

The Belize Electricity Limited (BEL) is responsible for the generation, transmission and distribution of electricity supply throughout the country, except for the Corozal Free Zone. Generation of electricity is also done by several companies; however, they sell excess electricity to BEL. For the most part, therefore, PCB related activities are derived primarily from the activities of BEL, which is administratively and technically quite competent to manage these activities.

BEL is a private company which previously was a Statutory Board called the Belize Electricity Board. They have continually been providing electricity to the country of Belize for the last 100 years. BEL owns most of the transformers in Belize (99%). Most of these transformers (approximately 5000) are for the distribution of electricity. A team of BEL personnel conducts technical management of PCBs and PCB related equipment. These management activities include:

- Supply of new PCB free transformers
- The purchase of mineral oils
- Maintenance of the equipment
- The removal of mineral oils from obsolete and damaged transformers
- Phasing out of the apparatus at the end of their lifetime
- Storage and disposal of equipment
- Storage and disposal of oil.

BEL has a formal environmental procedure regarding PCB management. Starting in the late 1970's the then BEB implemented a plan to gradually phase out the use of PCB containing transformers. This took the form of buying only PCB free transformers to use in new electrified areas as well as to replace damaged existing transformers. Therefore, the issue of PCB has up to this point only been a concern of BEL. The National POPs Inventory and the subsequent seminars and training have created an awareness of the need for the environmentally sound management of PCBs and PCB containing equipment.

The overall strategy regarding PCB containing and contaminated equipment is to include it as part of the overall environmental management plan of BEL. This plan will be modified as necessary so that it complies with the requirements of the Stockholm Convention and other environmentally sound practices as approved by the DOE.

BEL is charged with the responsibility of supplying electricity to the entire country. With a growing population and increasing demand for electricity, this means that BEL has to be continually expanding the generation, transmission and distribution of electricity to clients, households, and industries. This expansion necessarily involves the adoption of technical and technological improvements and new practices. Environmentally sound management will play an important role in the everyday business and the adoption of these new technologies should not result in an extra burden or cost. It is expected that BEL will continue to implement the PCB management and phase-out policy as an on-going component of its management plan in a manner, which will result in the achievement of the relevant goals of the Stockholm Convention earlier than may be required.

BEL policy requires that its customers using privately owned transformers replace these with PCB free transformers when they become inoperable. As part of its management plan BEL will only sell and use PCB free equipment. When PCB containing equipment is found the private owners are informed of the need to replace these equipment. This not a statutory requirement but enabling legislation is expected to be promulgated.

Based on the above strategy considerations the following five (5) actions are proposed. The actions elaborated are aimed to support BEL in their PCB management plan. The proposed actions do not include any equipment procurement or activities, which would subsidize the basic operations such as electricity generation, transmission and distribution. In consideration of the existing management plans, BEL operations can continue to achieve the objectives of the Stockholm Convention.

1. **Develop Legal Instruments and Technical Guidelines for Managing PCBs**

The issue with PCBs is primarily related to the interests to BEL and the DOE. The PCB issues, however, became a national issue with the Country signing the Stockholm Convention in 2002.

The various aspects of PCB management particularly import, export, use and restriction, and protection of health in general need to be defined and addressed within an existing legislation such as the EPA.

New laws and regulations may be necessary to address these issues. New enforcement and regulatory mechanisms may also need to be established to formalize the present PCB management plan within the mandate of the DOE. Refer to Table 22 for the proposed activities to develop the legislation addressing PCB management.

2. Inventory of Equipment, Accessories and Articles Consisting of, Containing, or Contaminated with PCBs

The phasing out program put in place in the late 1970's has resulted in most of the transformers in use today being PCB free. As part of the 2017 inventory of private companies suspected of owning transformers and other PCB contaminated oil, was investigated (CARPHA, 2016b). As of 2017, FLPC owned about 600 transformers, which are currently in use. 89 used transformers are awaiting re-use or decommissioning (< 50ppm PCB) and 29 are designated PCB unknown. BECOL is PCB-free based on the nameplate information and are awaiting testing. BELCOGEN reported that based on the nameplate information, none of their transformers contain PCBs (but they use mineral based oil). Likewise, BAPCOL does not have transformers containing PCB based on the nameplate information. In 2017, 1430 gallons of PCB contaminated oil was removed from Archer Daniels Midland Company (ADM). An assessment of capacitors was not conducted during the 2017 inventory and needs to be addressed in the future (CARPHA, 2016b).

3. Environmentally Sound Management (ESM) for in use Equipment

The on-going PCB management plan has resulted in virtually all the transformers in use today being PCB free. Several privately-owned transformers have however been identified as possibly containing PCBs. It is also possible that some of the BEL owned transformers might also contain PCBs. These would more than likely be those older transformers installed before 1980. BEL has also taken the policy to not repair PCB containing transformers. However, the handling, storage and disposal of PCB containing equipment needs to be done in an environmentally sound manner that will protect the health and safety of the worker as well as result in a minimization of any contamination.

The application of all technical requirements related to ESM and the Stockholm Convention is required for these PCB containing equipment. These will include the use of a retention tank for the storage of dielectric fluids, remove from use broken transformers or transformers with high corrosion, and analysis of dielectric fluids for absence of PCB before repairing. Refer to Table 22 for details on the activities.

4. Environmentally Sound Management (ESM) of Obsolete Equipment

Belize has limited capacity to manage obsolete electric equipment and articles containing or contaminated with PCBs. However, through the help of external organization (United Nations), can dispose of PCB-containing equipment in an environmentally sound manner. The major risk groups in the management of PCBs would be those involved in recycling metal scrap and the dielectric oil from unknown PCB contaminated obsolete equipment. The sale of equipment to scrap metal operators should be prohibited unless they are PCB free. Refer to Table 22 for the proposed activities.

5. Capacity Building for Public Awareness

Most of the population is unaware of the potential hazard to human health and safety posed using PCBs. This is compounded by the fact that Belize does not have the legislation to regulate the use of PCBs. The technical staff of BEL working with PCB containing/contaminated equipment as well as other workers may be exposed to unsafe working conditions. Under the SC reporting requirements Belize will have to provide periodic updated quantities of PCB in use, decommissioned and disposed of. In order to comply with this regular reporting to the SC, it is necessary to conduct a comprehensive identification and inventory of the number of transformers until 2025. Since BEL is in charge of the entire electrical distribution network, the management staff must be trained for this specific purpose. Beside this, the general population of Belize and especially the electrical equipment repair personnel are lacking the adequate information about PCB risk and their mitigation measures. Refer to Table 23 for the proposed activities.

Table 22: Production, import and export, use, identification, labeling, removal, storage and disposal of PCBs and equipment containing PCBs.

Priorities	Activities	Performance indicators	Time Frame	Responsible Agencies	Budget (USD)
Develop legal instruments and technical guidelines for managing PCBs.	Form a legal and technical working group including all PCB stakeholders, among other things, to study existing legal instruments related to PCBs management for further development and improvement.	Formation of legal and technical working group which consist of stakeholders	2 years	DOE	25,000
	Development of legal instruments, and formalization and or improvement of guidelines, standards, MOUs as required for the proper and effective management of PCB related issues.	Developed guidelines and standards for effective management of PCBs	2 years	DOE	80,000

Priorities	Activities	Performance indicators	Time Frame	Responsible Agencies	Budget (USD)
Conduct an inventory of equipment, accessories and articles consisting/, containing/ contaminated with PCBs.	Review of previous inventory reports (if available). Train the people needed for conducting the inventory. Make available the inventory equipment (GPS, sampling equipment, protective items). (Conduct Inventory.	Personnel trained in conducting PCB inventory; Updated Inventory completed; Inventory equipment available	3 years	DOE	150,000
Environmentally sound management (ESM) for in use equipment.	Apply ESM at selected sites (based on previous inventory).	Registry of sites where ESM is applied	3 years	DOE, (Belize electricity Limited) BEL, Spanish lookout Farmers Light Plant (SFLP)	20,000
	Develop the practice of replacing transformers contaminated with PCB.	Database of the decommissioned PCB contaminated equipment	1 year	DOE, BEL, SFLP	10,000
	Undertake initial assessment of electrical equipment and articles containing and/or contaminated with PCBs (capacitors).	Assessment report	5 years	DOE, BEL, SFLP	
Environmentally sound management (ESM) of obsolete equipment.	Identify and train stakeholders on ESM of the obsolete equipment (handling, transportation, storage, dismantling, pre-treatment, shipment of used PCBs abroad for disposal).	Training conducted for key stakeholders	2 years	DOE	25,000
	Develop a strategy for the destruction and disposal of the obsolete electrical equipment, articles and wastes containing and/or contaminated with PCBs in compliance with ESM requirements (handling, transportation, storage,	Developed strategies	2 years	DOE	40,000

Priorities	Activities	Performance indicators	Time Frame	Responsible Agencies	Budget (USD)
	dismantling, pre-treatment and final disposal).				
Build capacity for public awareness.	Identify the relevant information and awareness needs related to PCBs to be disseminated to the stakeholders.	Report addressing the relevant information and awareness needs related to PCBs	2 year	DOE	15,000
	Develop media material on PCB issues.	Media material on PCB issues	2 years	DOE	75,000

3.3.5 Activity: Production, Import and Export, Use, Stockpiles and Waste of hexaBDE and heptaBDE (Annex A, Part IV Chemicals) and tetraBDE and pentaBDE (Annex A, Part V Chemicals); HBCD (Annex A, Part I and Part VII) \

The main manufacturing industries in Belize that use POP PBDEs (hexaBDE, heptaBDE, tetraBDE and pentaBDE) include:

- Electrical and electronics industry;
- Transport industry;
- Furniture industry;
- Textiles and carpet industry;
- Construction industry.

Inventories for both the electrical and electronic industry (EEE/WEEE), and the transport industry were established for Belize (CARPHA, 2016a).

As a newly listed chemical in the SC, the major focus of activities in Belize are on regulation related to disposal and management of WEEE polymers/plastics/foam from derelict vehicles, and POP-PBDE-containing products as well as awareness among stakeholders and the public.

Table 23 Production, import and export, use, stockpiles, and wastes of hexaBDE, heptaBDE tetraBDE, pentaBDE and HBCD.

Priorities	Activities	Performance indicators	Time Frame	Responsible Agencies	Budget (USD)
Establish a regulatory framework for the management of POP-BFRs related articles (end-of-life vehicles, EEE and HBCD**)** and waste categories.	Develop national legislation on POP-PBDEs, including a regulatory framework for end of life vehicles and WEEE management, and HBCD management.	Specific legislation or legislative framework related to the management and disposal of POP-PBDE	5 years	SWaMA, DOE, MOH, Transport Department, Customs	55,000
Update and refine inventory of PBDEs (with DecaBDE) and HBCD containing articles and wastes; Develop or update appropriate databases for information management.	Conduct in-depth inventory of POP-PBDEs, including decaBDEs, and HBCD containing materials, as well as of the potentially contaminated sites.	Current inventory reports	4 years	DOE, Statistical Institute of Belize (SIB), Customs, Transport Department,	60,000
Sound Life Cycle Management of PBDE and HBCD product and waste categories (EEE/WEEE, end of life vehicle, insulation foam, and possibly textiles, furniture etc.)	Include the WEEE, end-of-life vehicles and waste from construction and demolition and textile in the overall waste management strategy.	Developed comprehensive waste management strategy for POP-PBDEs	3 years	SWaMA, DOE	35,000
	Manage and eliminate POP-PBDEs from the relevant material streams in an environmentally sound manner, considering the recommendations of COP5 on the elimination of brominated diphenyl ethers from the waste stream and from recycling.	% reduction of PBDE from material stream	5 years	SWaMA, DOE	100,000
	Manage relevant HBCD containing material streams in an environmentally sound manner including recycling of potential contaminated waste category (recycling of HBCD containing materials is not exempted if HBCD levels are above the low POPs content).	Database of HBCD contaminated materials and guideline for environmentally sound handling and disposal of contaminated waste	4 years	SWaMA, DOE	55, 000

Priorities	Activities	Performance indicators	Time Frame	Responsible Agencies	Budget (USD)
Apply BAT/BEP in exempted uses.	Promote and implement the BAT/BEP for the recycling and waste disposal of articles containing POP-PBDEs and for the production and use of HBCD.	BAT/BEP guides to recycling and disposal of POP-PBDE and HBCD contaminated articles	4 years	SWaMA, DOE	35,000
Analyse and monitor POP-BFR in priority areas	Strengthen the capacity to inspect and monitor the enforcement of the policy and regulatory requirements on POP-PBDEs and HBCD management in order to prevent waste dumping and unsound waste management	Inspectors/en enforcement officers are trained on the policies and regulatory requirement; Number of compliance monitoring programmes conducted	5 years	SWaMA, DOE	55,000
	Train custom officers and monitor to ensure that there are no POP-BFRs being imported and to prevent any from being imported in the future.	Training conducted for custom officers at port of entry on identification of POP-BFRs	5 years	DOE, SWaMA	60,000
	Create capacity for research, measurement and analysis of toxicity and levels of POP-PBDEs and HBCD in the environment and in humans.	Capacity established at one laboratory to conduct analysis of POP-PBDEs and HBCD; Number of research conducted	3 years	MOH, DOE, UB, Galen University	300,000
	Implement a monitoring program at the household disposal level and of possible incentive measures to prevent the EEE/WEEE dumping.	Monitoring programmes	2 years	SWaMA	60,000

Priorities	Activities	Performance indicators	Time Frame	Responsible Agencies	Budget (USD)
Awareness raising for relevant stakeholder groups on POP-BFR.	Conduct education and awareness campaigns on POP-PBDEs/HBCD for the different stakeholders (policy makers, industry, waste managers, public).	No. of education and awareness campaigns conducted	5 years	SWaMA. DOE	100,000

3.3.6 Activity: Production, Import and Export, Use, Stockpile and Waste of DDT (Annex B Chemicals)

Belize has not applied DDT in the control of malaria since 1997 but has instead relied on integrated vector control, careful monitoring of the malaria transmission parameters, public awareness in areas of high incidence, and international cooperation and information exchange, mainly with PAHO/WHO.

Belize is cooperating at the regional level with the other Central American Countries and Mexico in using a regional approach to combat the incidence of Malaria. Various factors affect the rate of malaria incidence in Belize including migration patterns, weather conditions, and creation of new communities in areas with high mosquito populations (such as marshlands) and the issue of self-medication and poor health seeking behaviour. Knowledge of these requirements stated above is fundamental to the development of integrated vector management, which bases itself on an ecosystems approach. Strategies aimed at reducing disease transmission while maintaining or restoring ecosystem integrity is therefore needed.

There is no record at the Ministry of Health or the Pesticides Control Board on request for exempted use of DDT for vector control purposes (if necessary). Currently, the Pesticides Control Board and the Department of the Environment is in the process of communicating with the Director of Health Services for an official position on DDT and based on feedback, possibly request that the Pesticides Control Board include DDT on the Prohibited List of Pesticides for Belize.

Belize has regulations in force as well as a mechanism under the Vector Control Program (regulated by the Ministry of Health and the Ministry of Agriculture, Pesticides Control Board), which ensures that DDT, if re-introduced, will be used for disease vector control only. The DDT/GEF project was completed in 2008. Belize is not conducting routine resistance testing using WHO methodology. A plan for the monitoring of insecticide resistance is being finalized and testing is only done through studies conducted by the local research entity, Belize Vector and Ecology Centre.

Environmental management, as a component of Integrated Vector Management (IVM), must receive great attention and concern. At the most the cost of anti-malarial drugs is about 3% of the annual recurrent budget.

Components of the Action Plan

1. **Country Needs Assessment**

DDT stockpiles in Belize have been inventoried and disposed of in an environmentally sound manner as of August 2017. However, there is need to build capacity in the assessment of possible contaminated sites and their remediation. In addition, the development and implementation of an action plan to strengthen integrated vector management (IVM) capacity in selected hotspots is also necessary.

2. **Institutional Operational Research**

Primary research is essential to the development of integrated pest and vector management strategies (IPM/IVM). Joint agriculture (FAO) and public health (WHO) initiatives should be developed, including research on alternatives to pesticides and pesticide resistance management.

3. **Monitoring and Evaluation of DDT Alternatives**

There is a need to ensure that the discontinuation in the use of DDT is not causing adverse impacts on the health status of the population. In addition, the efficacy and appropriateness of alternatives to DDT, including IVM, must be verified and validated.

4. **Public Awareness and Community Participation**

The Stockholm Convention is a global treaty to protect human health and the environment from the harmful impact of POPs. Community awareness and involvement in this respect is indispensable.

Table 24: Production, Import and Export, Use, Stockpile and Waste of DDT (Annex B Chemicals).

Priorities	Activities	Performance indicators	Time Frame	Responsible Agencies	Budget (USD)
Conduct institutional operational research.	Evaluate standardized integrated vector management control schemes (WHO: A Framework for Malaria Elimination) to determine their effectiveness in the Belize context.	A report shared with relevant agencies and the public	1 year	MOH, Public Health Bureau (PHB), Academia/ research institution	

Priorities	Activities	Performance indicators	Time Frame	Responsible Agencies	Budget (USD)
	Compare the cost effectiveness and sustainability with single method approaches.				
Monitor and evaluate DDT alternatives in the context of Belize.	Prepare training materials with approved contents and practical aspects of management of POPs pesticides.	Training Manuals and public awareness materials	3 years	MOH, PHB	80,000
	Monitor efficacy and appropriateness of alternatives (World Health Organization Pesticides Evaluation Scheme) to DDT, including IVM as part of the Global Vector Control Response (2017-2030).	Reports on efficacy trials	5 years	MOH, PCB, Academia	
	Prepare suitable and practical sensitisation material on malaria control.	Awareness Material (flyers, brochures, TV and radio advertisement, social media)	6 months	MOH, MOE	25,000
Public awareness and community participation.	Conduct appropriate educational campaigns on the impact of DDT on the environment and human health, and DDT alternatives for disease prevention and control, including Integrated Vector Management (IVM).	Distribution of awareness material and completion of monthly advertisements	5 years	MOH, MOE	55,000

3.3.7 Activity: Production, Import and Export, Use, Stockpile, and Waste of PFOS, its Salts and PFOSF (Annex B, Part III Chemicals) PFOA

PFOS, its related salts and PFOSF/PFOA is a newly listed POP group in the SC. The 2016 inventory revealed that the major professional use was in firefighting foam used by the fire service and two (2) energy companies. In some instances, the quantity of PFOS in the foam could not be quantified because of uncertainty of its presence and lack of data on quantities (CARPHA, 2016c). As such, the focus of the action plan was to amend the policies/legislation to include these POPs, update of the inventory, education/training/using BAT and BEP and monitoring/assessment of potential contaminated sites. Table 25 gives the details on the priorities and related action plan items.

Table 25: Production, import and export, use, stockpiles, and wastes of PFOS, its salts and PFOSF.

Priorities	Activities	Performance indicators	Time Frame	Responsible Agencies	Budget (USD)
Establish policy and regulatory framework for the use, management and substitution of PFOS and related substances and PFAS in industrial uses and in products and waste (SAICM synergy). Revise the Hazardous Waste Regulations.	Amend and enforce the National Integrated Water Source Act by making (i) provisions for testing of ground water sources for new parameters e.g. PFOS. (ii) enforcement of act by NIRWA to regulate existing/unregistered wells.	Amend NIRWA with provisions for ground water testing of registered wells	3 years	National Integrate Water Source Authority (NIRWA)	45,000
	Build national capacity for water quality testing, inclusive of new parameters, Ministry of Health Water Laboratory	Trained persons to collect, sample, package and analyze data	3 years	Public Health, DOE	30,000
	Monitoring of the water bottling companies to ensure that there is analysis and testing of water.	Package of regulations and standards for bottling and sampling	2 years	MOH, DOE, Belize Water Services Limited (BWSL)	90,000
	Use of hazardous waste cell at Mile 24 landfill.	Yearly report with volume and type of waste	1 year	SWaMa	150,000
	Lobby/Push for the enactment of the Integrated Chemical Management Bill.	Passage of ICM Bill	2 years	DOE	50,000

Priorities	Activities	Performance indicators	Time Frame	Responsible Agencies	Budget (USD)
	Plan for and incorporate into law possible confiscation/illegal imports, storage or disposal of PFOS.	Yearly report on confiscated legal action	3 years	DOE, Customs	35,000
	Establish specific criteria to avoid/restrict use of potentially contaminated sites.	Guide/criteria governing use of potentially contaminated sites	3 years	DOE, MOH, SWaMA, NEMO	40,000
	Close existing dumpsites and put regulation in place to prevent the future use of these sites.	Close dumpsite and installation of Transfer Station	5 years	SWaMA	3,500,000
Update and refine inventory of PFOS and PFAS use, articles and wastes and develop/ updated databases for information management.	Inventorise PFOS/PFAS items imported in Belize.	Inventory of items utilized	2 years	DOE	40,000
	Implement the GHS codes in Belize to deal with families of chemicals (use 10 digits).	National Data Safety Sheets developed and used	5 years	Customs, DOE	100,000
	Set up a centralized data gathering system via imports.	Establish an online permitting system for capturing imports	2 years	Customs, DOE	75,000
	Analyze and improve on the current inventory to get better database of what enters Belize.	Updated inventory completed	2 years	Customs, DOE	80,000
Build knowledge and capacity for management of PFOS/PFAS containing products and waste.	Lobby/Push for OSH Act to be enacted as soon as possible.	OSH Act enacted	5 years	Labour Department, AGM,	50,000
	Building capacity to use new technologies.	Training of key stakeholders	5 years	DOE, Labour Department, MOH	50,000
	Close all municipal dumpsites. In rural areas, closure of illegal dumpsites and proper assessments conducted for siting of new dumpsites (to areas less impacted from groundwater and surface water sources) and remediate contaminated sites.	Identification of sites	3 years	SWaMA, DOE, MOH, Local Government	500,000

Priorities	Activities	Performance indicators	Time Frame	Responsible Agencies	Budget (USD)
BAT/BEP applied in exempted uses	Identify the best water quality techniques to test for PFOS in water sources; will therefore need to build human capacity in a sustainable manner	Identify a technology that is most applicable	2 years	DOE, MOH	30,000
	Identify the best methods to remediate contaminated sites	Methods assessed, including with cost benefit analysis and preferred options identified and implemented where applicable.	5 years	DOE, SWaMA, MOH, Ministry of Works (MOW), Local Government	50,000
	Improve treatment plants	Bottled water is certified free of PFOS/PFAS	3 years	MOH, DOE	100,000
Assess PFOS alternatives in exempted uses and substitution for sustainable chemical and non-chemical alternatives.	Conduct research/educate to identify the best alternatives to PFOS firefighting foam through international/regional cooperation.	Report on the best alternatives based on existing information	5 years	DOE	100, 000
	Promote alternatives to firefighting foam containing PFOS and related substances.	Alternatives being used.	5 years	DOE	50,000
Training and awareness raising for stakeholder groups on PFOS and PFAS and establishing approach for information exchange.	Conduct public awareness initiatives for the water bottling companies, government agencies and the general public.	Execute awareness materials	5 years	MOH, DOE	100,000

Priorities	Activities	Performance indicators	Time Frame	Responsible Agencies	Budget (USD)
Establish monitoring of PFOS and other PFAS in priority areas.	Conduct monitoring of PFOS chemicals that enter the country; build capacity to enable verification and conduct of background checks into these chemicals.	Perform random sampling of items potentially containing PFOS and PFAS	5 years	Customs, DOE	100,000
Identify, assess and manage of potentially PFOS and other PFAS contaminated sites and secure /remediate if needed.	Monitor potentially contaminated sites where foams is/was used, including mapping/tracing of contaminated groundwater sources.	Collect soil and water samples and send abroad for testing	2 years	DOE	75,000
	Maintain a registry/profile of historic and current contaminated sites and restrict future use of such sites; remediate if necessary for future development.	Identify contaminated sites such as dumpsites and firefighting training sites	2 years	DOE, Fire Department, SWaMA	100,000
	Conduct vulnerability mapping to determine the potentially contaminated /risk sites e.g Corazal area dumpsites; conduct rehabilitation of identified contaminated sites and relocate sites in low lying areas; Improve on sites in the north and south of the country.	Mapping and charting of dump sites	3 years	SWaMa, DOE, Local Government	300,000

3.3.8 Activity: Register for Specific Exemptions and Continuing Need for Exemptions (Article 4)

Article 4 of the Stockholm Convention on POPs requires the establishment of a POPs register for parties that have specific exemptions listed in Annex A or B. Nine (9) POPs have been listed in the SC with specific exemptions and acceptable purposes; HBCD, DecaBDE, SCCP, PFOS, DDT, Lindane, PCP and recycling of POP-PBDEs.

A decision for the need of an exemption for use of a specific listed POP chemical can be made after an assessment of chemical and non-chemical alternatives (conducted by an appropriate technical/research institution or committee). If an exemption is needed the Secretariat of the

Stockholm Convention/COP is informed and the exemption is then registered. All registrations of specific exemptions are subject to periodic review.

The action plan activities establish an appropriate systematic procedure to seek exemptions for POPs in order to meet the obligations under Article 4.

Table 26: Register for specific exemptions and the continuing need for exemptions (Article 4).

Priorities	Activities	Performance indicators	Time frame	Responsible Agencies	Budget (USD)
Establish an informed registration process for needed exemptions.	Organize stakeholder consultation to establish criteria for assessment and selection of exemptions for chemicals listed under Annex A or B.	Stakeholder consultation held and outcomes documented	1 year	PCB, DOE, MOH,	85,000
	Assess if exemptions are needed for HBCD, DecaBDE, or SCCP and future listed PFOA.	Country assessment of current listed POPs with exemptions (report)	3 years	DOE, MOH, Customs	100,000
Seek an exemption for POP chemicals.	Inform Secretariat of the Stockholm Convention/COP on the exemption needed after thorough assessment of the need and the alternative options.	Notification submitted and exemption listed	As needed	DOE	5,000
	Periodic reviews to assess the need for continued exemptions and alternatives and stop exemption and use more sustainable alternatives as soon as feasible.	Review report	As needed	DOE	10,000

3.3.9 Activity: Measures to Reduce or Eliminate Releases from Unintentional production (Article 5)

Article 5 of the Stockholm Convention pertains to the measures to reduce and eliminate releases from unintentional production of POPs. This article states that each Party shall at a minimum take measures to reduce the total releases derived from anthropogenic sources of each of the chemicals listed in Annex C of the SC, with the goal of their continuing minimization and, where feasible, ultimate elimination.

The total emission of PCDD/PCDFs for Belize for the inventory year 2016, was 4.47 g TEQ/a which showed a drastic decrease in emissions compared to the revised 2008 inventory (66 g TEQ). These results may have been influenced by missing data (activity rates) from the present inventory and the use of rough estimates of activities from past years. Compared to source group 1 (Incineration) of the revised inventory, air emission for medical waste was high (48.20 g TEQ/a) due to the poor technology used for incinerators (little to no APCS). The lower emission in the 2016 inventory can be partly attributed to improved incineration technology. Open burning accounted for the highest emission of PCDD/PCDF and other UPOPs to air (2.84 g TEQ/a). The second highest emission was residue from Disposal/Landfill (0.650 g TEQ/a). The air and land emissions from the opening burning source group was slightly higher in the present inventory (2.84 g TEQ/a and 0.083 g TEQ/a respectively compared to 2.35 g TEQ/a and 0.078 g TEQ/a respectively). There was almost a doubling in the activity rate for open burning of domestic waste in the current inventory (64,959 t/a). However, there was no data for the activity rate for both fire at waste dumps and accidental fires in the present inventory (whereas these were present in the revised inventory). Thus, the total emission in the current inventory may be an underestimation of emissions for open burning (CARPHA, 2016e).

In 2008 the strategy to tackle UPOPs was based on actions which are more source-specific and make the releases from sources more accurate. Partially this requires new surveys and field measurements. However, all source categories are generally covered by existing BAT and BEP references, which can be successfully applied also to the Belize conditions.

Currently, Belize still lacks the necessary regulatory framework to manage dioxin and furan releases in general, and further has limited information and knowledge base to manage the operation of these source categories; the proposed strategy consists of general actions to strengthen the regulatory framework and institutional capacity.

Secondly, several source categories are run as industrial or commercial activities on which the established BAT and BEP guidelines and recommendations can be applied. Several of the industrial and similar sources can certainly benefit from the cleaner production concepts, the application of which doesn’t necessarily present cost increases but savings (in form of reduced raw material and energy inputs and reduced and/or effectively re-used waste) in a rather short time.

Waste management and proper waste treatment is the key to the reduction of dioxin and furan releases in Belize. Thus, based on the abovementioned general considerations; the following actions are proposed. The actions elaborated are aimed to principally support the Government in its regulatory, advisory and monitoring role, but also the owners and operators of these source categories.

1. Policy and Legal Framework for the Management of Unintentionally Produced POPs (UPOPs) and other hazardous waste

Belize has ratified the Stockholm Convention, developed inventories and preliminary assessments of the issue of the unintentional production of dioxins and furans. However, there is neither a policy nor a legal framework to manage, regulate or take other measures to control the UPOPs. The current regulatory framework consists of overall guidelines in the EPA and the Public Health Act (PHA), which at the moment have no enforcement capacity.

In order to develop a consistent policy and a legal framework to govern the key aspects of production, a long-term management and phase-out strategy for UPOPs is needed.
In formulating this section on POPs the following issues should be clearly highlighted.

The open burning of waste:

- In principle, open burning should simply be prohibited; however, there are practical considerations that speak to the wisdom of defining guidance for open burning with the provision that it should be minimized and eliminated as soon as, and wherever feasible. Those considerations include lack of alternative disposal or recovery methods due to non-existent or inaccessible infrastructure. In addition, sporadic open burning may be necessary for sanitary disposal of unusual material, to control pathogens or pests, or in the cases of imminent disasters or emergencies.
- The support for the establishment and implementation of a proper waste management system is a major task and should be a critical component in the action plan of the Stockholm Convention NIP for reduction of UPOPs in Belize. The Government at all level should work diligently to establish and implement sound practices including resource use reduction, reuse, recycling, composting, modern sanitary landfills, and BAT incineration. Convention implementation efforts and the Convention financial mechanism could be used to support the establishment of model waste management systems as alternatives to open burning.
- The industrial sources of dioxin and furan releases (BSI and medical waste incineration) are associated with production of flue gas, fly ash, bottom ash, dust and particulate matter emission. Therefore, all regulations, which address these mentioned emissions, but not necessarily the emissions of dioxins and furans, most likely affect these latter emissions, too, i.e. overall reduction of industrial waste will certainly reduce the volume of UPOPs.

The proposed activities (Table 26) will result in new regulations and enforcement strategies to make decisions on mandatory reduction of open burning practices of municipal wastes, for establishing a national body for continuous monitoring and reporting on UPOPs releases (under

the National Solid Waste Management Authority (NSWMA)), and to introduce health and safety protection and technical measures for existing installations.

2. Capacity Building and Technical Support

Since the UPOPs issue is relatively new for most institutions and organizations, more extensive technical background is necessary to handle the UPOPs issues to guarantee that the regulatory measures as well as BAT and BEP considerations are based on sound knowledge. Refer to Table 26 for the proposed activities.

3. Municipal and Hazardous Waste Management

Waste management and waste treatment are key issues in the UPOPs production in Belize. The open burning of waste accounts for some 38% of the total UPOPs production (CARPHA 2016e). Addressing this issue requires a combination of some regulatory interventions mainly in the field of personal behaviour and technical development. This is against the background that the increase of the waste volumes is unavoidable as well as the increase of hazardous waste.

Good practices in municipal waste management were initiated in all the District towns as well as in Belize and Belmopan City. At the moment this takes the form of having a garbage collection system in place. Details on the proposed activities are given in Table 26.

4. Public Awareness and Technical Networking

Several of the tasks related to the application of BAT and BEP can be supported through a public awareness program. In addition to raising awareness, specific issues such as waste management issues and open burning of waste should be addressed. In addition, a specific public awareness process should be initiated for decision makers and for the industry. This awareness raising program should be integrated into existing environmental education projects for the public (schools, television, flyers) and should not be conceived as a separate program specific only to POPs (refer to Table 26).

5. Landfills and Hazardous Waste Co-incineration

The present regulations are inadequate to prohibit disposal of hazardous, industrial and infectious wastes in the normal waste stream. At the moment all waste is handled in the same manner and the dumpsites are not equipped to separate waste (Refer to Table 26).

6. Inventory of Unintentionally Produced POPs

The inventory of the unintentionally produced POPs carried out for the NIP was a very preliminary one based on secondary data, estimates and calculations. It is necessary to plan and implement a more detailed inventory based on site assessment and interviews. This will result in concrete actions being developed including updating the inventory and creation of an operational database (Refer to Table 27).

7. Medical Wastes Management

The incineration of hospital waste must be evaluated carefully since hospital waste normally contain high concentrations of PVC (high chlorine and heavy metal content) and are located in sensitive areas (near the hospital and inside residential areas). In hospitals, waste management incineration should be given preference over chemical disinfection for reasons of efficiency and environmental considerations. However, when incineration of hospital waste is considered, a program needs to be developed to include:

- Use of a centralized incinerator.
- Implementation of a BAT/BEP operational policy.
- Reduction/minimization of PVC.

The KHMH already has an incinerator in place but is not being used due to it being located near a residential area. BWC operates an incinerator and provides services to medical providers in Belize District, including KHMH. Medical providers either use the service of BWC or transport their medical waste to the municipal dumpsites. Installation and operation of BAT/BEP at the regional landfill will allow for all medical waste to be transported to one site. In the districts smaller incinerators can be employed.

The key to hospital waste treatment is an organized hospital wastes management system and the separation of waste fractions so that finally only minimized waste streams fall into the classification of hazardous hospital waste. To this extent waste treated by autoclaving or incineration need further evaluation. Refer to Table 26 for the proposed activities.

8. Green Harvesting of Sugarcane

Approximately 65,000 acres of land are presently under sugarcane production. BSI has initiated a green harvesting of sugarcane project in the 3,000 acres of sugarcane that it owns. In addition, Sugar Industry Research & Development Institute (SIRDI), with the assistance of the Belize Chemicals and Waste Management Project (BCWMP), has also engaged cane farmers to commence the practice of green harvesting. Cane farmers associations have shown keen interest in this harvesting technology, and some farmers have volunteered to conduct trails in view of eventually transition to green harvesting in the future. Whilst the economic benefits resulting from this current harvest are fairly negligible, it will eventually improve. However, positive financial benefits will result from the fact that the sugarcane will last longer before it spoils and will have higher sugar content than the burnt cane.

This change from harvesting burnt cane to harvesting green cane requires a change in harvesting technique. There is a need for the preparation of the fields with long rows, more stalks per unit area such as planting double row on beds, slightly raised and uniformly levelled beds, debris free

fields, and so on. All this has to do with the efficiency of the harvest. Refer to Table 27 for proposed activities.

Table 27: Measures to reduce or eliminate releases from unintentional production (Article 5).

Priorities	Activities	Performance indicators	Time Frame	Responsible Agencies	Budget (USD)
Develop policy and legal framework for the management of UPOPs and other hazardous waste.	Situational analysis of the existing related regulatory mechanisms and the capacities of the concerned institutions.	Report on existing regulatory framework and needs assessment report	3 years	MOH, National Solid Waste Management Authority (NSWMA), DOE,	55,000
	Develop emission standards or limits for UPOPs in media considered relevant (air, soil, water, product, residue, food). Implement and broaden emission standards (e.g. incinerators, burning hazardous waste).	Identified limit of emission for each new POP in water, air, soil etc. Legislation for standards based on emission Legislation for specification for incinerators	5 years	NSWMA, DOE, MOH, AGM	150,000
	Identify gaps and requirement for sound management of UPOPs.	Studies (Data) for example on what is released on open burning, types of incinerators; new technology vs what is being used. Separation of types of waste	2 years	DOE, SWaMA, MOH	350,000
	Amend the existing regulations and/or formulate new ones based on the report findings.	Restrict open burning No open burning in	2-4 years	Sol Gen, MOH	55,000

Priorities	Activities	Performance indicators	Time Frame	Responsible Agencies	Budget (USD)
		town limits; of medical waste; household waste; industrial waste Open burning in rural areas subject to conditions Incinerators to comply with specifications Formulated regulations for industries so they are up-to-date with new POPs			
	Conduct workshops and seminars with participation of all stakeholders to endorse and disseminate the amended and the new regulations related to the sound management of UPOPs.	Training packages Advertisements and Campaigns (Tv Commercials and talk shows).	5 years	MOH, DOE	100,000
	Produce and disseminate guidelines for all stakeholders and conduct training for the appropriate personnel.	Specific guidelines on UPOP management. 2 Trainings per year at minimum on UPOPS	Yearly	MOH, DOE	110,000
Build capacity and technical support.	Assess the related needs in the different institutions and relevant sectors.	Report based on interviews conducted with industries and medical institutions	2 years	MOH, DOE	50,000

Priorities	Activities	Performance indicators	Time Frame	Responsible Agencies	Budget (USD)
	Establish efficient means to exchange information and technology with the relevant institutions abroad.	Website – section with UPOPS with updated information Regional networking – International networking – attendance at meetings on Conventions	2 years	MOH, DOE	60,000
	Encourage training/research, both locally and abroad, on environmental engineering, waste management, environmental policy, emission monitoring, waste water management and infrastructure planning.	Include waste management education in curriculum at all levels of schools At University level – research	2 years	DOE, MOH, UB, PAHO, MOE	75,000
	Build up a comprehensive monitoring programme.	Unit/ personnel within DOE with equipment and schedule for monitoring	2 years	MOH, DOE	200,000
Promote municipal and hazardous waste management.	Promote municipal solid waste separation and collection.	Waste management entity taking type of waste to specific location for proper disposal	5 years	Municipalities, DOE, MOH, PAHO, SWaMA	250,000
	Evaluate possibilities of reuse, reduce or recycle.	Studies	3 years	SWaMA	60,000
	Assess the present practice of landfill or dumping municipal waste.	Site visits and reports	3 years	SWaMA, DOE	150,000
	Develop landfill programmes.	Meetings with SWaMA and managers of land fill sites		SWaMA	

Priorities	Activities	Performance indicators	Time Frame	Responsible Agencies	Budget (USD)
Reduce and minimize release of dioxins /furans and other UPOPs from waste incinerators.	Monitor hazardous and municipal waste incinerators for releases and develop programs to meeting standards, and locate all incinerators in use (incinerator inventory).	Monitoring programme	3 years	DOE, SWaMA	50,000
	Educate operators and competent authorities on minimizing Dioxin/UPOPs release and emission control.	Training conducted for operators and competent authorities	As needed	DOE, SWaMA	100,000
	Implement a regulatory framework including BEP and/or BAT for meeting regulatory limits (considering integrated pollution prevention & control and appropriate time frame).	% Reduction of UPOPs release	3 years	MOH, DOE	150,000
	Implement BEP and where required BAT in existing medical waste incinerators; MOH working in collaboration with DOE (considering integrated pollution prevention & control).	Number of incinerators improved	3 years	MOH, DOE	200,000
Public awareness, technical networking and awareness of major stakeholders on dioxin/furans and other UPOPs	Prepare information and training materials.	Pamphlets and brochures for general public	As needed	MOH, MOE, UB	35,000
	Organize and conduct training courses and seminars for target groups on UPOPs issues.	Specify quantities per year of courses and seminars – target groups being regulators and industries	3 years	MOH, DOE	50,000
	Prepare publication, pamphlets and posters on topics requiring much public involvement, such as open burning.	Number of posters/banners	As needed	MOE, DOE, MOH	50,000
	Establish a network for scientific and technical information on UPOPs.	Special link on DOE website	2 years	MOH, DOE,	20,000

Priorities	Activities	Performance indicators	Time Frame	Responsible Agencies	Budget (USD)
		Communicati on – regional and international			
	Establish focal points for public awareness at the municipal level.	Establish a focal point post within municipality and villages	Every 3 years	Town/city/ village councils	20,000
Reduce landfill and hazardous waste co-incineration.	Conduct the feasibility of using waste fractions as secondary fuels and evaluate industries commitment in this regard.	Reports of Interviews with facilities	2 years	SWaMA, DOE	50,000
	Evaluate the options for separation from waste stream and collection methods.	Feasibility Studies of waste sites	5 years	SWaMA	160,000
Update and refine Inventory of UPOPs.	Conduct the inventory on regular bases of waste fraction.	Identify personnel and other resources	5 years	MOH, DOE	60,000
	Government agencies to consolidate information/data on UPOPs emission into a single data base under DOE.	Create database based on inventory	5 years	MOH, DOE	80,000
	DOE to develop a mechanism ensuring appropriate storage and management of data.	Designated server for information management and storage	5 years	DOE	100,000
	Quantify other co-pollutants (PAHs; carbon black) the gaps in open burning releases need to be addressed.	Monitoring of other emission parameters	5 years	DOE	200,000
Reduce releases from open burning of wastes (private burning & landfill fires) and biomass burning by improvement of waste management (waste hierarchy; circular economy).	Develop a regulatory frame for control of open burning and implementation; reduce releases especially in the sugar cane industry during both 1st and 2nd burning; focus on rural areas.	Increase the number of acreage conducting green harvesting and prevention of second burning	5 years	DOE, Sugar Industry Research & Development Institute (SIRDI)	250,000
	Awareness program for landfill operators on the impacts of open waste burning and implement	Landfill operators sensitized	2 years	SWaMA, DOE, MOH	80,000

Priorities	Activities	Performance indicators	Time Frame	Responsible Agencies	Budget (USD)
	education program for the control.				
	Assess and develop approach for reducing open biomass burning.	Strategies and action plan developed to reduce open burning	1 years	SWaMA, DOE, MOH	50,000
	Develop a national strategy of biomass use and Promote and implement the strategy by using biomass including agriculture residues: for energy production projects (biomass boilers, biogas etc.).	Strategy and Action Plan for use of biomass for energy production	2 years	MOE	50,000
Substitute chemicals and materials containing chlorine that are sources of unintentional releases of PCDD/F or other UPOPs.	Identify the use of chemicals containing chlorine and evaluate their release of UPOPs (e.g. PVC production/use, chlorine in industries and water treatment, pesticides/pigments containing UPOPs or resulting in UPOPs potential release); DOE and customs involvement is required.	Inventory of material sources containing PVC	5 years	Bureau of Standards, DOE, Customs	75,000
	DOE/PCBd to identify and promote feasible and affordable alternatives to chemicals and materials contributing to UPOPs release include chlorine chemicals.	Listing of alternatives based on uses.	5 years	DOE, Bureau of Standards, MOH, Association of Professional Engineers	80,000
	Develop phase out programmes for identified relevant sources.	Phase out dates established	5 years	DOE, MOH	60,000
Establish monitoring of PCDD/F and other UPOPs and sources of human exposure	Monitoring of chemicals and chemicals in products/articles known to potentially contain PCDD/F and other UPOPs.	Monitoring programme established and implemented	5 years	MOH, DOE, PCB	100,000
Manage/monitor medical wastes.	Improve and maintain better synergies to capture data to update inventory and reporting.	Personnel visit to medical facilities to interview,	3 years	MOH, PAHO, DOE	90,000

Priorities	Activities	Performance indicators	Time Frame	Responsible Agencies	Budget (USD)
		investigate and reports			
	DOE to develop a mechanism ensuring appropriate storage and management of data.	Based on info gathered on evaluation, the groups meet and develop the NAP	3 years	DOE, MOH, PAHO	70,000
	Quantify other co-pollutants (PAHs; carbon black) the gaps in open burning releases need to be addressed.	other co-pollutants are assessed, and standards legislated	5 years	MOH, DOE, SWaMA	150,000
	Implement project on medical waste management.	MOH % reduction in the emission of UPOPs from medical waste management	5years	MOH, PAHO	800,000

3.3.10 Activity: Identification and Management of Stockpiles, Wastes and Articles in use Including Release Reduction and Appropriate Measures for Handling and Disposal (Article 6)

Article 6 of the Stockholm Convention is concerned with the sound management of POPs stockpiles and POPs wastes. A stockpile may be defined as a stock of POPs chemicals or equipment or materials containing or contaminated with POPs for which there are still permitted uses in a country according to the register of specific exemptions and the list of acceptable purposes in Annexes A and B of the Convention. If the stock in question no longer has a permissible use under the terms of Annex A or B, it is considered to be a waste.

Parties are required to develop and implement strategies to identify (i) stockpiles consisting of or containing Annex A or B chemicals and (ii) wastes consisting of, containing or contaminated by chemicals listed in Annex A, B, or C. Stockpiles, when identified, should be managed in a safe, efficient and environmentally sound manner. Wastes should be handled, collected, transported and disposed of in an environmentally sound manner. No recovery, recycling reclamation or reuse of POPs waste is permitted. Wastes should not be transported across international boundaries without

considering relevant international rules, standards and guidelines, such as those of the Basel Convention.

The activities to manage stockpiles were considered for each POP category and are included in previous relevant subsections.

3.3.11 Strategy: Identification of Contaminated Sites (Annex A, B and C Chemicals), Securing and remediation in an Environmentally Sound Manner

The 2016 POP inventories for Belize identified potentially contaminated sites for the different POP chemicals (CARPHA, 2016a, b, c, d, e). It should be noted that identification of such sites were based on current or historic activities - no analysis of soil/sediment or water were conducted on these sites. Thus, potential POPs contaminated sites included all the locations where POP chemicals are used (PFOS, POP pesticides) and disposed of i.e. Landfills, unauthorised/authorised dumpsites, and storage areas. The potential POPs contaminated sites may be considerably larger than the preliminary compilation in the 2016 inventory since there are no available records of the areas where POPs has been historically used.

Potential PFOS contaminated sites in Belize include all the locations where PFOS firefighting foam was used (training, disposal and practical use). Landfill/dump sites contain PFOS and related substance (e.g. carpets, textiles, paper) with related leachate and ground water contamination and can be considered potentially PFOS/PFAS contaminated sites and reservoirs.

Potential POP PBDE contaminated sites include all major dumpsites. The dumpsites at the Central Corridor have been converted to transfer stations that serve as a transient station prior to transport to the state-of-the-art regional sanitary landfill for proper disposal. These sites are properly managed and burning is not practiced at these sites. Given the widespread use of DDT and other POPs pesticides it is possible that the soils of expansive areas of Belize may remain contaminated with pesticide.

The presence of stockpile of equipment that likely contains PCB was discovered in the inventory, however confirmatory assessment is required. Notably, is a site in Spanish Lookout, Cayo District, within the compounds of FLPC, which currently harbours 55 old (some manufactured pre-1970s) decommissioned transformers and two capacitors (CARPHA, 2016b).

Table 28: Identification of contaminated sites (Annex A, B and C Chemicals), securing and remediation in an environmentally sound manner.

Priorities	Activities	Performance indicators	Time frame	Responsible Agencies	Budget
Establish a regulatory framework for contaminated sites.	Develop/update legislation to set criteria for determining contaminated sites for relevant POPs.	Developed/updated legislation	5 years		55,000
	Review and strengthen the legislative framework to address liability related to contamination and clean-up procedures. (Polluter Pays Principle (PPP).	Updated legislation	5 years	DOE	55,000
	Establish guidelines for soil and ground water assessment and limits.	Guidelines for assessment	5 years	NIWRA, DOE, MOH	60,000
Develop methodology to identify, assess and prioritize sites contaminated with Annex A, B and C chemicals.	Develop methodology to identify, assess and prioritize POPs contaminated sites considering available guidance documents.	Developed methodology	2 years	PCBd, DOE, MOH	50,000
	Establish methodology for ground water and soil assessment.	Developed methodology	2 years	PCBd, DOE, MOH	50,000
	Develop list of potential contaminated sites (see individual POPs below).	Site assessments and identification of contaminated sites	5 years	PCBd, DOE, MOH	150,000
	Prioritise (Preliminary) POPs contaminated site. In the country.	Prioritized list of POPs contaminated sites	5 years	PCBd, DOE, MOH	25,000
	Participate in or to follow the UNEP working group on POPs contaminated sites.		3 years	PCBd, DOE, MOH	
Secure POPs contaminated sites, and where feasible conduct remediation of contaminated sites.	Develop standard procedures for registering and securing contaminated sites.	Developed procedures	5 years	PCBd, DOE, MOH	75,000
	Identify potential remediation technologies available. Develop strategies for the environmentally sound management of POPs contaminated sites.	Developed strategies	5 years	PCBd, DOE, MOH	80,000

Priorities	Activities	Performance indicators	Time frame	Responsible Agencies	Budget
	Train and upgrade skills of personnel in the assessment, securing and remediation of contaminated sites.	Personnel trained	5 years	PCBd, DOE, MOH	100,000
Develop a countrywide database for POPs contaminated sites considering relevant co-pollutants.	Assess database systems for contaminated sites in other countries Select a database approach and establish POPs contaminated site database considering co-pollutants integrated in a general contaminated site database.	Database Developed	5 years	PCBd, DOE, MOH	150,000
Identify and secure and remediation of POPs pesticides contaminated sites.	Train HAZMAT team members.	Personnel trained	3 years	PCBd, DOE, MOH	75,000
	Identify all (former) POPs pesticides use and storage/disposal locations including former use areas for PCP.	PCP used/storage sites identified	3 years	PCBd, MOH	30,000
	Identify the level of contamination of soil and ground water and potential receptors and exposure risk.	Contamination reports	5 years	PCBd, DOE, MOH	150,000
	Obtain for each site a tailor made site clean-up plan.	Site specific clean-up plan	5 years	PCBd, DOE, MOH	40,000
	Remediate, contain and monitor, farms with contaminated soil from hotspots and phytoremediation sites with contaminated soil.	Number of sites remediated	5 years	SWaMA, DOE	500,000
Identify, assess, secure and possibly remediate PCB contaminated sites.	Assess potentially PCB contaminated sites (storage, use and disposal PCB equipment) Secure sites and remediate of sites as appropriate.	Identity of PCB contaminated sites	3 years	DOE	50,000
		Remediate contaminated sites	5 years	DOE	500,000

Priorities	Activities	Performance indicators	Time frame	Responsible Agencies	Budget
Identify, assess, secure and possibly remediate of POP-PBDE contaminated sites.	Develop methods for risk assessment of sites where WEEE, End of life vehicles or other have been treated Assess and secure and possibly remediate contaminated sites.	Developed methods	5 years	SWaMa, DOE	200,000
Identify, assess, and manage potentially PFOS and PFAS contaminated sites and secure /remediate if needed.	Use guidelines to identify and assess PFOS/PFAS contaminated sites		5 years	SWaMa, DOE	30,000
	Develop a database and maps of potentially contaminated sites and prioritise the sites (risks) for further assessment and clean-up.	Mapping database of contaminated sites	5 years	SWaMa, DOE	90,000
	Conduct analytical confirmation of POPs contamination for the identified locations (according to prioritization list).	Analytical data on POP contamination	5 years	SWaMa, DOE	150,000
	Take measures to secure the contaminated sites to stop human exposure and environmental releases.	Safeguards established to address exposure and environmental releases	5 years	SWaMa, DOE	100,000
	Identify clean-up measures and initiate clean-up procedures considering priority sites.	Contaminated sites cleaned-up	5 years	SWaMa, DOE	1,000,000
Assess, management, database of potentially PCDD/PCDF and other UPOPs contaminated sites and secure /remediate if needed.	Use guidelines to define, identify and assess UPOPs contaminated sites.	Identity of UPOPs contaminated sites	5 years	PCB, DOE, SWaMA	50,000
	Conduct training in identification and management of UPOPs contaminated sites.	Personnel trained on the management of UPOPs contaminated sites	3 years	DOE, MOH	80,000

3.3.12 Activity: Facilitating or Undertaking Information Exchange and Stakeholder Involvement

Belize will actively participate and make use of opportunities available for the exchange of information provided by the Stockholm Convention. A crucial and instrumental information exchange forum is the WHO. It is envisioned that parts of the NIP will be implemented through the United Nations Development Programme (UNDP) and UNIDO; therefore, Belize is actively liaising with these agencies regarding the financial and technological opportunities to combine the POPs related mitigation and management activities with other (e.g. cleaner production) on-going and forthcoming activities. Information exchange was facilitated with other countries (workshops, consultations/meetings) in the region through the GEF 5558 project implemented by UNIDO (Objective 1.1). Regional cooperation with SICA calls for exchanging relevant information on disease vector control between countries.

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

The Stockholm Convention requires in Article 10 the promotion and facilitation of awareness, information dissemination, and training among various groups, including workers, scientists, educators, technical and managerial personnel, women, youth and the public. As mentioned earlier this NIP addresses more than just POPs but toxic chemicals as well. This broadening of the NIP is particularly true for this section of the action plan. Parties are also requested to encourage stakeholders, such as industry and professional users, to promote and facilitate the provision of information on POPs.

Public awareness in general is discussed above in subchapter 3.3.1 when presenting the sectoral and source specific implementation strategies. It is generally recognized that the public awareness as well as the availability of and access to the information will be very crucial in mitigating the adverse effects of the POPs. The main source categories of the unintentionally produced POPs, uncontrolled burning of waste and using wood and charcoal for domestic cooking, can be approached only through public awareness and information campaigns as indicated in the concerned sections above.

Awareness of other relevant stakeholders (custom officers, government officials, waste management officers, NGO, private business, etc.), on POPs has been facilitated through the workshops, meeting and national consultations during this project towards the update of the NIP. Training is also recognized as a key issue, especially at this early stage of the implementation, when there is need for monitoring, technical information collection and other basic information on

POPs. Training components are included in the action plans covering pesticides, PCB and unintentional production of POPs.

3.3.14 Activity: Effectiveness Evaluation (Article 16)

Table 29: Effectiveness evaluation.

Priorities/ Objectives	Activities	Performance indicators	Time frame	Responsible Agencies	Budget
Evaluate the effectiveness of the implementation of the Convention by other approach.	Develop further national performance evaluation criteria. Assess the implementation and progress performance.	Performance evaluation criteria to measure effectiveness of implementation of action items.		DOE	No funds needed

3.3.15 Activity: Reporting (Activity 15)

Under Article 15 of the Convention each Party is required to report to the Conference of Parties on measures taken to implement the Convention's provisions, and on the effectiveness of such measures.

The reporting and compilation of the national reports/information for use by the stakeholders will be regularized. It is expected that Belize will compile annual reviews/monitoring reports to be discussed with relevant stakeholders. These reports will also make the basis for the regulatory report as referred to in Article 15.1 of the Stockholm Convention ("Each Party shall report to the Conference of Parties on the measures taken to implement…").

Regarding the possible statistics to be provided to the Secretariat (Article 15.2) on the production, import and export of POPs, such reporting need is not foreseen (except in a very rare case that DDT should be imported for malaria/vector control). In case said occurrences happen the government will naturally provide the Secretariat with the appropriate information. In case the obsolete POPs pesticides and PCB are exported for final destruction the appropriate regulations of the Basel Convention will be followed i.e. any control actions or other activities will be notified to the Rotterdam Conventions as required.

Table 30: Reporting (Article 15).

Priorities	Activities	Performance indicators	Time frame	Responsible Agencies	Budget (USD)
Set up mechanisms for article 15 reporting	Develop a mechanism for complying with the reporting requirements by submission of reports within the given deadlines.	Report form	3 years	DOE	No funds needed
	Setting up responsibilities for data compilation and filling the reporting form.	DOE unit/personnel and assigned responsibilities	3 years	DOE	30,000
Comply with article 15 reporting.	Compile information for reporting (updated inventory and other information) Submit report to the secretariat (website).	Reports submitted	4 years	DOE	No funds needed
	Submit Statistical data of total production, import and export of the chemicals listed in Annexes A and B of the Convention, or reasonable estimates of such data.	Statistical data	5 years		
	Submit a list of States from which such substances have been imported and to which they have been exported.	Data reporting			

3.3.16 Activity: Research Development and Monitoring (Article 11)

The actual monitoring of releases (and potential releases) from all POPs sources (pesticides, PCB, unintentional production) is a key condition for the effective implementation of concrete management and elimination actions. However, Belize is not aiming to establish any comprehensive monitoring program at this time, but instead will enhance the technical capacity and training of the technical staff to be able to carry out the monitoring as indicated in the sectoral project proposals. Due to financial constraints the monitoring capacity to be developed will reflect the national priorities; uncontrolled combustion and waste incineration are to be monitored in the first instance. The active implementation of the Stockholm Convention provides more applied research in Belize. The research is closely related to the improvement of the monitoring capacity.

As mentioned above in subchapter 3.3.10 the monitoring capacity and the inadequate analytical equipment present one of the most serious obstacles.

3.3.17 Activity: Technical and Financial Assistance (Article 12 and 13)

The ability of the country to fulfil its obligations under the Stockholm Convention depends partly on the provision of adequate financial and technical assistance. The following actions would enable countries to obtain the needed financial and technical support required for the successful implementation of activities and actions to be carried out to achieve the Convention's overall objectives.

Table 31: Technical and financial assistance (articles 12 and 13).

Priorities	Activities	Performance indicators	Time frame	Responsible Agencies	Budget (USD)
Source technical assistance towards the successful implementation of the Convention (Article 12).	Assess technical needs. Identify sources of technical assistance.	Technical needs assessment and sources	2 years	DOE	150,000
Source for financial assistance towards the successful implementation of the Convention.	Assess financial needs. Identify sources of financial assistance. Request financial assistance through proposal writing.	Financial needs assessment and sources	2 years	DOE	200,000

3.4 PRIORITIES, DEVELOPMENT AND CAPACITY-BUILDING PROPOSALS

This subchapter details the priority areas where current capacity and capability need to be strengthened to achieve the objectives of the NIP update. Priorities based on the need to meet Convention obligations and country priority issues would be highlighted.
The following proposals are based on clearly expressed priorities as described in subchapter 3.3 above.

I. Development/Amendment of specific (existing) legislation/legal instruments on sound management of chemicals and hazardous waste.

There is a need to assess and develop/update the national legislative and regulatory framework for chemical management including all POPs. Of particular importance is the newly listed POPs, POP-PBDE/HBCD as it pertains to the management of ELV and WEEE; proper disposal/recycling of the polymers/plastics/foams in ELV. The newly listed chemical PFOS/PFAS and its related chemicals necessitate new laws related to the restriction on importation and control and an integrated approach to the management of these POPs and other hazardous chemicals and their waste. Effective, well-written and enforced legislation on chemical management will ensure sustainable management of both land and water resources and protection of the country's food supply using safer alternatives.

This priority area contributes to SDG 3, 4, 8, 9, 11, 12 and 16.

II. Education, and awareness-raising on chemicals management issues including hazardous and chemical waste

Education and awareness on all groups of POPs including the newly listed POPs (POP pesticides, PFOS, PBDE/HBCDs, PFOS, PCDD/PCDF and other UPOPs) has to be targeted towards the key stakeholders; public, government officials, policy makers, waste managers/officers, recyclers, custom officers, farmers, firefighters, etc. Additionally, training on the use of BAT and BEP for chemical and waste management among stakeholders is necessary. These initiatives will ultimately have an impact on human behaviour, which can lead to changes in consumption pattern, safety measures and disposal practices. Thus, the impact of POPs and other hazardous chemicals on relevant environmental media, water supply and food resources will be minimized and more sustainable. Education and awareness must be an integral part of any holistic and integrated approach to addressing Belize's priority areas.

The priority contributes to SDG 1, 2, 3, 5, 8, 9, and 12 and 16.

III. Improvement of waste management and introduction of waste hierarchy towards a circular economy and reduction of unintentionally formed POPs from open burning.

There is a need to change the perception of waste to that of a resource and embrace the concept of waste hierarchy towards a circular economy (e.g. recycling). It is important to improve management of waste from POPs (PBDE/HBCD, PCB, pesticides, etc.) relevant waste material streams. This priority will have far reaching impacts on interconnected environmental issues thus generating multiple benefits for the country. Such benefits may include jobs for waste-pickers (informal recyclers) and or recyclers. Additionally, reducing releases from open burning of wastes (domestic/private burning and landfill fires) through use of more integrated waste management strategies not only reduces exposure to POPs but also to other co-pollutants (PAHs, soot, particulates, dangerous gases, etc.) and thus reduces risks to human health and vulnerable environmental media.

General improvement in waste management and implementation of waste hierarchy towards a more circular economy will contribute to SDGs 2, 3, 6, 7, 8, 9, 11,12 and 13.

IV. Contaminated site assessment and management

Potentially POPs contaminated sites from all POPs groups due to historic or current POP related activities is a reality in Belize like the other Caribbean countries. Thus, activities related to assessment, identification, mapping, securing and remediation of such sites are considered as very high priority in Belize. Among the sites of highest priority are the various closed dumpsites (now transfer stations) and the authorised and unauthorised dumpsites spread across the country. Sound management of waste is urgently needed more so in the rural areas where facilities and resources are sparse. Potentially POPs-contaminated sites (PFOS) can threaten the safety of water sources (groundwater and surface water), aquatic organism (and associated food chains), grazing animals and humans that consume these animals. These potentially contaminated sites needs to be sampled and tested for the presence of POPs. The lack of capacity and financial resources would initially require external financial assistance with the hope of Belize becoming self-reliant in the near future.

The priority would contribute to SDG 3, 6, 11, 14 and 15.

V. Monitoring of POPs, initiating research and collaborations

Continuous monitoring of POPs in food, food products, environmental media (ground water, soil, sediment) and human breast milk has to be a priority in order to protect human life. Of equal

importance is research on specific sectors of the population where exposure to POPs is most likely; firefighters, solid waste management workers, recyclers etc. There is a lack of capacity for POPs monitoring in Belize thus heavy reliance on external sources and funding is essential. Information on POP levels in food, humans, water sources and soil will contribute to refining Belize's priorities and lead to effective implementation of the SC.

The priority contributes to SDG 1, 2, 3, 5, 8, 9, and 12 and 16.

3.5 TIMETABLE FOR PLAN IMPLEMENTATION AND MEASURES OF SUCCESS

This subchapter summarizes the principal targets contained in the detailed strategy, outlining specific targets, milestones, and performance indicators to allow progress to be reviewed and monitored.

The majority of the actual implementation activities and interventions are planned for the time period of 5-7 years from present to 2022. During this period most of the regulatory and other legal issues should be addressed. Also, the active POPs management and phase-out in the industry and businesses should be on-going for a few years.

The awareness activities, mainly addressed to the people in direct contact with the POPs chemicals and stocks, should be effectively implemented and result in such awareness and behaviour that help these persons to avoid the risks of exposure to POPs.

Waste management, including managed landfills and proper treatment of industrial and hazardous waste should have been initiated. The PCB issue, including the replacement of the PCB containing transformers as well as the environmentally sound management of the in-use and out-of use transformers should be in place.

It is expected that the proposed institutional strengthening and capacity building project within the DOE will develop performance indicators and milestones for the NIP Implementation. The performance indicators to be developed are to observe the development of the impacts of the projects (including the amended regulatory framework) on the POPs releases and the observed exposure risks. Initially these indicators will be general in nature such as the number of trained people, collected waste volumes, number and spread of dioxin/furan sources etc. Milestones to be developed should serve as a time-wise measure of the project implementation.

The development of the technical project documents for the proposed programs should include clear measurable and observable, quantitative performance indicators as well as time wise milestones clearly showing when such activities and other interventions are supposed to be accomplished.

The DOE (or other selected Focal Point) will continue its overall monitoring activities by arranging sessions/seminars at least annually reviewing both the implementation of the projects and the performance; i.e., the impact of the actions on the humans and environment and ecology. The DOE is also obliged to review the general POPs related policy and especially the development of regulatory framework and implementation of the subsequent legislation by the concerned governmental bodies. Furthermore, the DOE is supposed to review the priority order of POPs management and phase-out activities and to discuss and propose appropriate adjustments to it based on the actual development.

Table 32: Timeline for the National Implementation Plan for managing and phasing out of POPs in Belize.

Priorities/Time	2016	2017	2018	2019	2020	2021
Priority for Institutional measures						
1. Strengthening of the Stockholm Convention Focal Point					X	
Priorities for the management and phase-out of POP pesticides						
1. Develop/Amend existing legal instrument and strengthen pesticide (including POPs) law and its enforcement				X		
2. Strengthen the capacity to handle POP pesticides and contaminated sites			X			
3. Education and awareness raising of POP pesticides (stakeholders, policy makers, farmers, customs officers) on POP pesticides /HHPs waste and contaminated sites	X	X	X	X	X	X
4. Sound life cycle management of POP pesticides and other HHPs (handling storage, transfer and disposal of POP pesticides waste)				X		
5. Assess POP pesticides and HHPs and alternatives and implement IPM and organic farming					X	
6. Undertake ecologically sound measures to eliminate obsolete POP pesticides			X			
7. Establish monitoring and analysis of POP pesticides and HHPs (products, environment, food, exposure)						X
8.Identify, secure and remediate POP pesticides contaminated sites						X
Priorities for the management and phase-out of PCBs (within the operational framework of the Belize Electrical Limited)						

1. Develop legal instruments and technical guidelines for managing PCBs				X		
2. Conduct an inventory of equipment, accessories and articles containing, consisting of or contaminated with PCBs						X
3. Environmentally sound management (ESM) for in use equipment (PCBs)						X
4. ESM for obsolete equipment (PCBs)				X		
5. Capacity building for awareness raising			X			
6.Identify, secure and possibly remediate PCB contaminated sites						X
Priorities for the management and phase-out of DDT						
1. Conduct institutional operational research		X				
2. Monitor and evaluate DDT alternatives in the context of Belize				X		
3. Public awareness and community participation						X
Priorities for the management and phase-out of dioxins and furans						
1. Policy and legal framework for the management of unintentionally produced POPs (UPOPs) and other hazardous waste						X
2. Capacity building and technical support (UPOPs)			X			
3. Municipal and hazardous waste management						X
4. Public awareness and technical networking and awareness of major stakeholders on dioxin/furans and other UPOPs				X		
5. Reduce and minimize release of dioxin/furans and other UPOPs from waste incinerators				X		
7. Update and refine Inventory of UPOPs						X
8. Landfill and hazardous waste co-incineration						X
9. Substitution of chemicals and materials containing chlorine that are sources of unintentional release of dioxin/furans and other UPOPs						X
10. Reduce releases from open burning of waste (private burning and landfill fires) and biomass burning by improvement of waste management			X			
11. Establish monitoring of PCDD/F and other UPOPs sources of human exposure						X
12. Medical waste management supporting activities						X
Priorities for the management and disposal of waste from PFOS its salts and PFOSF						
1. Establish policy and regulatory framework for the use management and substitution of PFOS and related substances and PFAS in industrial uses and in products and waste; revise the Hazardous Waste Regulations				X		
2. Update and refine inventory of PFOS and PFAS use, articles and waste; develop/update databases for information management						X

3. Build knowledge and capacity for management of PFOS/PFAS containing products and waste						X
4. Establish specific zoning laws to avoid/restrict use of potentially contaminated sites						X
5. BAT/BEP applied in exempted uses						X
6. Assess PFOS alternatives in exempted uses and substitution for more sustainable chemicals or non-chemical alternatives						X
7. Establish monitoring of PFOS and other PFAS in priority areas						X
8. Training and awareness raising for stakeholder groups on PFOS and PFAS and establishing approach for information exchange.						X
9.Identify, assess and manage potentially PFOS and PFAS contaminated and secure/remediate if needed						X
Priorities for the management and disposal of POP-PBDEs/HBCDs						
1. Establish regulatory framework for the management o POP-BFR articles (end-of-life vehicles, EEE and HBCD) and waste categories						X
2. Sound life cycle management of POP-PBDE/HBCD products and waste categories (EEE/WEEE, end-of-life vehicles insulation foam and possibly textiles, furniture, etc.)						X
3. Update and refine inventory of POP-PBDE (with DecaBDE) and HBCD containing articles and waste; develop or update appropriate databases for information management					X	
4. Apply of BAT/BEP in exempted uses					X	
5. Analyse and monitor POP-BFR in priority areas						X
6. Conduct education and awareness campaigns on POP-PBDEs/HBCD for stakeholders (policy makers, industry, waste managers, public)						X
7. Awareness raising for relevant stakeholder groups on POP-BFR						X
8. Identify, assess, secure and possibly remediate POP-PBDE contaminated sites						X
Priority for identification of contaminated sites, securing and remediation in an environmentally sound manner						
1. Establish a regulatory framework for contaminated sites established						X
2. Develop methodology to identify, assess and prioritise sites contaminated with Annex A, B and C chemicals						X
3. Secure POPs contaminated sites and where feasible conduct remediation						X
4. Develop a countrywide database for POPs contaminated sites considering relevant pollutants						X

3.6 RESOURCE REQUIREMENTS

This subchapter details the projected costs of measures included in the NIP update. It also outlines the incremental costs for identified measures and potential sources of funding for both incremental costs and baseline costs are noted. In accordance with Article 13 of the Convention, alternate sources of funding would be considered, as appropriate, by countries that are seeking development assistance. The estimated costs for the implementation of the individual activities are included in the action plans above. The cost for elimination/disposal of DDT from Belize was through the BCWMP. The cost for efforts to find alternatives to DDT and introduction of IVM as an alternative was through the DDT/GEF Central American Project. However, the following considerations can be made regarding certain sectoral cost items:

Pesticides. The small amount of POPs pesticide present does not justify infrastructure improvement of the storage facility of the Pesticides Control Board. However, in enforcing the registration requirements, it may warrant that this facility be expanded to store confiscated products. In addition, if the FAO guidelines are regulated then this would require all establishments formulating, selling, or storing pesticides to upgrade their facilities.

PCBs. It must be highlighted that while the phase out program was initially only being implemented by Belize Electricity Limited, another entity was identified during the updating of the POPs inventory, being Farmers' Light Plant Corporation. The POPs update, however, did not allow for the screening/testing of in-line equipment. Hence, the phase-out program should seek to continue the screening of equipment as they are due servicing until all equipment have been tested and determined to be PCB free.

UPOPs. Unintentional production of POPs in the industrial sector can be often tackled by measures and investments, which increase efficiency and pay back very quickly. The budget estimates of the proposed projects presents capital costs as well as incremental cost of the activities related to the industries and it should be reviewed when the concerned project documents are prepared. Belize understands that the Global Environmental Facility has opportunities to finance the majority of the incremental costs of the proposed projects. For industry related projects and their costs Belize will seek funding opportunities, (through UNDP, FAO, UNIDO), aiming to run cleaner production programs. Bilateral funding will be sought as appropriate. It is obvious that the opportunity to involve bilateral donors will increase.

PFOS/PFAS and related substances. Budget estimates for this newly listed POP group would represent both incremental and capital cost.

POP-PBDE/HBCD. Before any cost can be put towards the management of WEEE and ELV detailed inventories must be conducted. Funding for such an activity may have to be sourced

externally. Budget estimates for this newly listed POP group would represent both incremental and capital cost.

Table 33 gives a summary of the quantifiable priorities and activities for POPs management in Belize.

Table 33: Estimated budget for quantifiable priority activities for POPs management in Belize.

National Priorities (detailed are in sub-chapter 3.3)	Estimated Budget USD
Strengthening of the Stockholm Convention Focal Point (175,000 USD)	
Implement a coordinating body for the Stockholm Convention.	175,000
Development/Amendment of specific (existing) legislation/legal instruments on sound management of chemicals and hazardous waste (5,525,000 USD)	
Restrict or prohibit import of Annex A & B chemicals.	45,000
Develop/Amend existing legal instrument and strengthen pesticides (including POPs) laws and its enforcement	205,000
Develop legal instruments and technical guidelines for managing PCBs.	105,000
Establish a regulatory frame for the management of POP-BFRs articles (end-of-life vehicles, EEE and HBCD) and waste categories.	55,000
Establish policy and regulatory framework for the use, management and substitution of PFOS and related substances and PFAS in industrial uses and in products and waste (SAICM synergy); Revise the Hazardous Waste Regulations.	3,940,000
Establish an informed registration process for needed exemptions.	185,000
Develop policy and legal framework for the management of UPOPs and other hazardous waste.	820,000
Establish a regulatory framework for contaminated sites.	170,000
Education, and awareness-raising on chemicals management issues including hazardous and chemical waste (2,650,000 USD).	
Strengthen the capacity to handle POP pesticides and contaminated sites	595,000
Education and awareness raising (stakeholders, policy makers, farmers, customs officers) on POP pesticides/HHPs waste and contaminated sites.	385,000
Build capacity for public awareness.	90,000
Apply BAT/BEP in exempted uses.	35,000
Awareness raising for relevant stakeholder groups on POP-BFR.	100,000
Public awareness and community participation for DDT.	55,000
Build knowledge and capacity for management of PFOS/PFAS containing products and waste.	550,000
BAT/BEP applied in exempted uses	180,000
Training and awareness raising for stakeholder groups on PFOS and PFAS and establishing approach for information exchange.	100,000
Build capacity and technical support (UPOPs).	385,000

National Priorities (detailed are in sub-chapter 3.3)	Estimated Budget USD
Public awareness, technical networking and awareness of major stakeholders on dioxin/furans and other UPOPs	175,000
Improvement of waste management and introduction of waste hierarchy towards a circular economy and reduction of unintentionally formed POPs from open burning (3,585,000 USD).	
Assess the current use of POPs and reducing and eliminating releases and use of POPs.	300,000
Sound Life Cycle Management of POPs Pesticides HHPs (handling, storage, transfer and disposal of POPs pesticides and POP pesticides wastes).	340,000
Environmentally sound management (ESM) for in use equipment (PCBs).	30,000
Sound Life Cycle Management of PBDE and HBCD product and waste categories (EEE/WEEE, end-of-life vehicle, insulation foam, and possibly textiles, furniture etc.)	190,000
Seek an exemption for POP chemicals.	15,000
Promote municipal and hazardous waste management.	460,000
Reduce and minimize release of dioxins /furans and other UPOPs from waste incinerators.	500,000
Reduce releases from open burning of wastes (private burning & landfill fires) and biomass burning by improvement of waste management (waste hierarchy; circular economy).	430,000
Manage/monitor medical wastes.	1, 110,000
Reduce landfill and hazardous waste co-incineration	210,000
Assessment, management and remediation of contaminated sites (3, 800,000 USD).	
Identify, secure and remediate POPs pesticides contaminated sites.	225,000
Develop methodology to identify, assess and prioritise sites contaminated with Annex A, B and C chemicals.	275,000
Secure POPs contaminated sites, and where feasible conduct remediation.	255,000
Identify, secure and remediation of POPs pesticides contaminated sites.	795,000
Identify, assess, secure and possibly remediate PCB contaminated sites.	550,000
Identify, assess, secure and possibly remediate of POP-PBDE contaminated sites.	200,000
Identify, assess, and manage PFOS and PFAS contaminated sites and secure/remediate if needed.	1,370,000
Assess, management, database of potentially PCDD/PCDF and other UPOPs contaminated sites and secure /remediate if needed.	130,000
Monitoring of POPs, initiating research and collaborations (1,490,000 USD)	
Establish monitoring and analysis of POPs pesticides and HHPs (products, environment, food, exposure).	560,000
Analyse and monitor POP-BFR in priority areas	475,000
Monitor and evaluation of DDT Alternatives in the context of Belize.	105,000
Establish monitoring of PFOS and other PFAS in priority areas.	100,000
Establish monitoring of PCDD/F and other UPOPs and sources of human exposure	100,000
Develop countrywide database for POPs contaminated sites considering relevant co-pollutants.	150,000
Management of POPs stockpiles, waste and articles in use, and appropriate measures for disposal (POP-PBDEs, PFOS) (235,000 USD).	
Undertake Ecologically Sound Measures to Eliminate Obsolete POP Pesticides.	170,000

National Priorities (detailed are in sub-chapter 3.3)	Estimated Budget USD
Environmentally sound management (ESM) of obsolete equipment (PCBs).	65,000
Update and refining of inventories of POPs (945,000 USD).	
Conduct an inventory of equipment, accessories and articles consisting of, containing or contaminated with PCBs.	150,000
Update and refine inventory of PBDEs (with DecaBDE) and HBCD containing articles and wastes; Develop or update appropriate databases for information management.	60,000
Update and refine inventory of PFOS and PFAS use, articles and wastes and develop/updated databases for information management.	295,000
Update and refine Inventory of UPOPs.	440,000
Assessment of alternatives to POPs (475,000 USD).	
Assess POPs pesticides and HHPs and alternatives and implement IPM and organic farming.	110,000
Assess PFOS alternatives in exempted uses and substitution for sustainable chemical and non-chemical alternatives.	150,000
Substitute chemicals and materials containing chlorine that are sources of unintentional releases of PCDD/F or other UPOPs.	215,000
Technical and Financial assistance (380,000 USD)	
Source technical assistance towards the successful implementation of the Convention.	150,000
Source financial assistance towards the successful implementation of the Convention.	200,000
Set up mechanism for article 15 reporting.	30,000
Estimated costs for quantifiable priorities	**19,260,000**

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