



REPUBLIC OF SEYCHELLES

STOCKHOLM CONVENTION ON PERSISTENT ORGANIC POLLUTANTS

NATIONAL IMPLEMENTATION PLAN

PREPARED BY THE MINISTRY OF ENVIRONMENT AND NATURAL RESOURCES

2007



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Abbreviations and Acronyms

ARPEGE	Appuis Regionale à la Promotion d'une Education pour la Gestion de l'environnement
BAT	Best Available Techniques
BEP	Best Environmental Practice
CFCs	Chlorofluoro Carbons
CH ₄	Methane
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
COI	Indian Ocean Commission
COPs	Conference of Parties
DDT	Dichlorodiphenyltrichloroethane
EECC	Environment Education Coordinating Committee
EEZ	Exclusive Economic Zone
EIA	Environment Impacts Assessment
EIC	Education Information and Communication Unit
EMPS	Environment Management Plans
EPA	Environment Protection Act
FAO	Food and Agricultural Organisation
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GHG	Green House Gases
GIS	Geographical Information System
GNP	Gross National Product
HCB	Hexachlorobenzene
HCS	Hydrogen Carbons
IFCS	International Forum on Chemical Safety
IOT	Indian Ocean Tuna
IOTC	Indian Ocean Tuna Commission
ISO	International Standard Organisation
LPG	Liquefied Petroleum Product
MEA	Multilateral Environment Agreement
MENR	Ministry of Environment and Natural Resources
MIAFI	Ministry of Agriculture and Fisheries
MoEY	Ministry of Education and Youth
MOH	Ministry of Health
MOU	Memorandum of Understanding
MPA	Marine Park Authority
MT	Metric Tonnes
N ₂ O	Nitrous Oxide
NATCOF	National Consumer Forum
NBF	National Biosafety Framework
NGO	Non Governmental Organisation
NIC	National Inter-ministerial Committee
NIE	National Institute of Education

NIP	National Implementation Plan
NMVOOC	Non Methane Volatile Organic Compound
NRA	Neighbourhood Recreational Activities
ONAN	Oil Natural Air Natural
PCA	Pesticide Control Act
PCB	Polychlorinated Biphenyls
PCDD	Polychlorinated Dibenzo-Dioxins
PCDF	Polychlorinated Dibenzo-Furans
POPs	Persistent Organic Pollutants
PRTR	Pollution Release and Transfer Registers
PSE	Personal and Social Education
PUC	Public Utilities Corporation
SADC	Southern African Development Countries
SAICM	Strategic Approach to Information Chemical Management
SBC	Seychelles Broadcasting Corporation
SBS	Seychelles Bureau of Standards
SCMRT	Seychelles Centre for Marine Technology
SEYPEC	Seychelles Petroleum Company
SFA	Seychelles Fishing Authority
SIB	Seychelles Investment Bureau
SMB	Seychelles Marketing Board
STAR	Société Traitement D'Assainissement Regionale
SWAC	Solid Waste and Cleaning Agency
TSP	Total Suspended Particles
UNDP	United Nation Development Program
UNEP	United Nation Environment Program
UNESCO	United Nation Educational Scientific Organisation
UNFCCC	United Nation Framework Convention on Climate Change
UNIDO	United Nations Industrial Developments Organisation
WHO	World Health Organisation
WIO	Western Indian Ocean

Executive summary

The National Implementation plan has been produced within the framework "Enabling Activities to Facilitate Early Action on the Implementation of the Stockholm Convention on Persistent Organic Pollutants (POPs) in the Republic of Seychelles" The Seychelles signed an agreement with UNIDO late in 2003, which committed the ministry to head a National Implementation Committee for facilitating the development of the country NIP together with stakeholders with the assistance of UNIDO consultants.

The Pollution Control and Environmental Impacts Division of the Ministry of Environment and Natural Resources was designated as the project development agency and implementer of the NIP and its Director General the National Focal Point. A multi stakeholder structure for implementation was initiated, with representation from most of the agencies involved in POPS management in the country.

The objective of the project was timely preparation of the National Implementation plan for control of the release of POPs chemicals into the environment as part of the requirements of the Stockholm Convention. A total of 22 months was allocated for the development, but to a late start, this was completed in 25 number of months

Work on the project covered the following phases:

- Phase I: Stakeholder identification, sensitization, starting-up
- Phase II: Inventory taking
- Phase III: Prioritization
- Phase IV: NIP development
- Phase V: Endorsement of the NIP

Requirements of the Stockholm Convention

The convention was adopted and signed on 23rd May 2001. It is directed to reducing or- where it is appropriate - eliminating the releases of 12 POPs (aldrin, chlordane, dieldrin, DDT, endrin, heptachlor, mirex, toxaphene, hexachlorobenzene, PCBs, PCDD/PCDFs) into the environment. The convention came into force on 17 February, 2004. The Convention prescribes the conditions to be fulfilled by the Parties in order to ban production, use, import, and export of POPs chemicals on a global level. As a consequence, the releases would be considerably reduced or even eliminated. . Seychelles has signed and is in the process of ratification of the Stockholm Convention.

Assessment of the POPs issue in Seychelles

1. Assessment for ANNEX A, part 1 POPs chemicals (POPs pesticides)

A number of POPs pesticides, namely, toxaphene, adlrin, dieldrin and chlordane were used in the past for control of pests in agriculture, for health reasons and control of termites in the construction industry. The last import dates back to 1993.

According to a case study done in 2001 and the recent inventory exercise, there is no production, import, export and use of POPs pesticides, which is in line with the current national legislation primarily the Pesticide Control Act (1996) which prohibits productions and usage of pesticidal pops. It is suspected that there could have been some illegal imports of pesticidal pops which has gone undetected in the past.

No stockpiles, waste or sites contaminated by pesticidal POPs were detected by the inventory carried out. However a total of 11.8 tons of obsolete and unwanted pesticides were exported to the UK for disposal by incineration in 1998, which included 225kg of DDT as the country does not have disposal facilities.

Information for the inventory was collected from primary sources (interviews with professionals and companies dealing with pesticides, field visits, etc) and secondary sources (review of documentations from customs, agriculture health and other bodies. Obtaining quantitative data on POPs was quite difficult as lots of gaps were identified.

2. Assessment for ANNEX A, part II Chemicals(PCB)

Current local legislation bans the import of PCBs and PCB's equipment though it is allowed in closed systems.

Since there is no production of PCB or PCB-containing equipment , the country does not export goods containing PCBs.

PCBs are not manufactured locally and most PCBs are used in electrical equipment as dielectric oil in transformers, capacitors and switchgears by the only power generation company, Public Utilities Company (PUC).

A total of 518 PUC transformers were identified locally, of which 145 are sub-station mounted and 173 are pole-mounted and their capacities vary up to 35,000 kVA. Of this figure 99 of the transformers were manufactured between 1963 and 1986 and therefore suspected of containing PCB, since the worldwide ban on production of PCBs was imposed in 1986. Eighty eight transformers were manufactured between 1987 and 2003, therefore assumed to be PCB-free whilst there were 331 (representing 64% of the total number of transformers in Seychelles) which their date of manufacture could not be determined. These transformers require testing.

Of the total of 145 sub-station mounted transformers, 9 of them, representing five different brands were tested for PCBs using test kits. (CHLORN-N-OIL 50 PCB screening kit) The results showed that only 1 transformer of the brand Treforest Glamorgan, manufactured in 1997 was tested for PCB level above 50 ppm and therefore it is assumed that the other eight transformers of the same make and year of manufacture are also assumed to be PCB contaminated. This represents a total volume of 4,813 litres which is considered to be containing PCBs.

PUC consumes around 6,000 litres of transformer oil for refilling and it uses ADNOC Transformer oil BS 148 Class 11 and according to its data sheets it does not contain any PCBs. Most of the oil from the transformers are disposed of by incineration at a small plant in the premises of PUC.

Two sites were found to be contaminated by transformer oil which may or may not contain PCB and are therefore considered as suspect contaminated sites.

Some of the main recommendations of the assessment are that there should be an immediate ban on the import of PCB containing equipment , immediate measures to prevent cross contamination of equipment(transformers) and oil, identification, labeling and record of PCB-containing or PCB-contaminated equipment.

3. Assessment for Annex B chemicals (DDT)

This assessment was done jointly with the assessment of POPs pesticides as DDT was the major POPs pesticides used in Seychelles. So far no DDT has been found in Seychelles following the exportation of a load of obsolete pesticides to UK in 1996 for disposal by incineration.

4. Assessment of releases from unintentional Production of Annex C chemicals(Dioxins and Furans)

The two main sources of dioxins and furans in the Seychelles are waste incineration primarily medical waste incineration and uncontrolled domestic waste burning along with vehicular emissions. Medical waste incineration produces 3.45 g TEQ/a(85.6 %), Domestic uncontrolled burning 0.36 g TEQ/a (9%), Hazardous waste incineration(waste oil) 0.2 g TEQ/a (5%) and vehicular emissions 0.02 g TEQ/a (0.5%)

The total annual release for 2003 was estimated at 5.4 gTEQ of which 4.1 g TEQ or 75/% is via atmospheric emissions and the rest is emitted via products such as compost. This total production compares well with similar countries such our neighbouring sister islands of Mauritius which range between 20 and 100 g TEQ/a and Brunei which has a minimum of 1.4 g TEQ/a and Argentina which has a maximum amount of 2111 g TEQ/a.

Though it is not an imminent threat, it is recommended that there should be reduction of emissions from medical waste incineration by providing more efficient and better incineration facilities, reduction of emissions of domestic uncontrolled burning and improvement of air quality in urban areas by stricter enforcement of existing regulations and standards when it comes to vehicular emissions.

5. POPs monitoring

Presently there is no systematic monitoring of POPs or any synthetic chemicals in the environment or in humans in Seychelles and this is largely due to a lack of resources and capacity to do so. Whilst there are

adequate monitoring programs for drinking water quality, food, wastewater, bathing water, there is nothing specifically targeting POPs.

It is very important that this is done as soon as possible in view of the fact that six POP pesticides have been used in the past and it suspected that few industries could be releasing dioxins and furans in the atmosphere at an increasing rate. There has also been some complains that workers dealing with waste oil have complained of skin rashes, itchiness and eye irritation following handling of waste oil and this calls for a good monitoring system. The accumulative amount of POPs imported could not be properly assessed due to unavailability and gaps in data.

6. POPs priority activities

- Improving the level of public awareness and enabling the better education of all interested groups and decision makers.
- Updating current or pass new legislation to better manage pops.
- Identification and accurate determination of PCB equipment quantities.
- Identification of POPs contaminated sites
- Monitoring of pops in the environment and population.
- Construction of new and improvement of facilities for better monitoring and testing.
- Better database and record keeping of POPs importation and movement

7. Action plans and strategies

- a) Implementation strategy
- b) Institutional and regulatory strengthening
- c) Measures for Annex A Part I chemicals
- d) Measures for Annex A Part 11 chemicals
- e) Measures for unintentionally produced pops
- f) Management of stockpiles
- g) Contaminated sites
- h) Facilitate information exchange
- i) Public awareness
- j) Reporting
- k) Research development and monitoring
- l) Technical and financial

8. Time schedule for NIP implementation

This is based on the implementation of the action plans and strategies described above, and includes the following:

- Organization and coordination of NIP activities
- Adjustment of legal regulations where necessary
- Development of technical instructions, and procedures for proper implementation of regulations and finally the implementation of the proposed action plans

9. Funds for the NIP implementation

Total implementation costs for the Seychelles NIP amounts to USD 6,227,650 and out of that the contribution of the government of Seychelles will be 1.3 million dollars.

Twelve main activities with 7 priority areas have been identified during the implementation phase of the NIP with a budget and time frame allocated to each activity. Out of the seven Seychelles has identified two activities which need to be tackled first namely: (1) research and development and (2) PCB. The activities include: sensitisation and information exchange, development of regulatory mechanisms for chemical management, capacity building for health and environmental monitoring institutions, improve information exchange between stakeholder, reduction of Annex C POP chemicals, proper management of PCBs, assessment of health impacts of POPs, strengthening Pesticide Control Board to work on chemicals as well, enforcement of current legislation, management of contaminated sites, initiate legal measures for liability and duty of care, establish well equipped documentation centres accessible to the public, find alternatives to POPs. Most of the activities hope to end within 5 years of commencement date apart from the activity related to PCB management which is forecasted to extend over 15 years. The total cost of the priority activities is estimated at US \$ 4, 649,400.

1 Introduction

The National Implementation Plan (NIP) for the implementation of the Stockholm Convention in the Republic of Seychelles was drawn up within the project "Enabling Activities to Facilitate Early Action on the Implementation of the Stockholm Convention on Persistent Organic Pollutants POPS GF/SEY/03/007". The project is financed by the Global Environmental Facility (GEF) in collaboration with the United Nations Industrial Development Organisation (UNIDO) as the implementation agency. The overall objective of the project is to strengthen national capacity and capability to prepare the NIP for the management of POPs. The NIP will provide a basic and essential level of information to enable policy and strategic decisions to be made and identify priority activities that Seychelles should undertake in order to meet the requirements of the Stockholm Convention.

The implementation of the project includes five phases, which are as follows:

- determining the co-ordinating mechanisms and organizational processes;
- establishing the POPs inventory and assessing national infrastructure and capacity;
- priority setting and determining objectives;
- formulating a NIP, and specific action plans on POPs; and
- endorsing of the NIP by stakeholders.

The Ministry of Environmental and Natural Resources (MENR) was nominated as the national focal point for this project in the Republic of Seychelles. Various local experts including representatives of government ministries, private institutions, non-governmental organisations as well as experts from UNIDO participated in the setting up and implementation of the project. A list of the stakeholders involved in the project is found in Annex 2 to this document.

1.1 The Stockholm Convention

The Stockholm Convention was adopted on May 23, 2001 and entered into force on February 17, 2004. Seychelles signed the Convention in 2002 and is currently in the process of ratification.

The objective of the Convention, mindful of the precautionary approach set forth in Principle 15 of the Rio Declaration on Environment and Development, is to protect human health and the environment from persistent organic pollutants (POPs). The aim of the Convention is directed at reducing or, where appropriate, at eliminating releases of the 12 POPs into the environment. The Convention provides for States party to the Convention to take includes measures to reduce or eliminate

releases from intentional production and use of POPs¹; measures to reduce or eliminate releases from unintentional production of POPs² as well as measures to reduce or eliminate releases from stockpiles and wastes of such chemicals³.

The chemicals subject to the provisions of the Convention are listed in the Annexes to the Convention. Annex A (Part I) lists POPs pesticides which State Parties to the Convention should eliminate and these include aldrin, chlordane, dieldrin, endrin, heptachlor, hexachlorobenzene, mirex, toxaphene and polychlorinated biphenyls (PCBs).

Annex A (Part II) specifies measures relating to the elimination on the use of PCBs in equipment by 2025. Annex B (Part I) lists chemicals the production and use of which should be restricted and (Part II) relates specifically to the elimination of the production and use of DDT (1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane). Annex C relates to the unintentional production of POPs chemicals, which include polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/PCDF), hexachlorobenzene (HCB) and PCBs. Annex D determines the requirements and criteria for entering new chemicals in the list. Annex E specifies information to be sought to determine the risk profile to evaluate whether a chemical is likely, as a result of its long range environmental transport, to lead to significant adverse effects to human health and/or the environment. Annex F specifies information on socio economic considerations to be sought to evaluate possible control measures for chemicals under consideration for inclusion in the Convention.

The Stockholm Convention requirements relating to POPs Pesticides.

Article 3 of the Convention requires States party to the Convention to prohibit and/or take all legal and administrative measures necessary to eliminate the production, use, import and export of POPs pesticides listed in Annex A.

The import of POPs pesticides shall be allowed only under the conditions specified under Article 4 of the Convention (exemptions registered with the Secretariat); under Article 6 para 1(d)⁴ for the purpose of

¹ Art. 3

² Art.5

³ Art.6

⁴ In order to ensure that stockpiles consisting of or containing Annex A, B Chemicals and wastes, including products and articles upon becoming wastes, consisting of, containing or contaminated with a chemical listed in Annex A, B or C, are managed in a manner protective of human health and the environment, each Party shall take appropriate measures so that such wastes are

- i. Handled, collected, transported and stored in an environmentally sound manner;
- ii. Disposed of in such a way that the POP content is destroyed or irreversibly transformed so that they do not exhibit the characteristics of POPs, or otherwise disposed of in an environmentally sound manner when destruction or irreversible transformation does not represent the environmentally preferable option, or the POP content is low, taking into account international rules, standards and guidelines, including those that may be developed pursuant to para. 2 and relevant global and regional regimes governing the management of hazardous wastes.
- iii. Not permitted to be subjected to disposal operations that may lead to recovery, recycling, reclamation, direct re-use or alternative uses of POPs; and

environmentally sound disposal of POPs pesticides; for a use or purpose which is permitted for that Party under Annex A and for quantities of such chemicals to be used for laboratory-scale research or as a reference standard.

Chemicals listed in Annex A, for which any production or use **specific exemption** is in effect, shall be **exported** only for the purpose of environmentally sound disposal as per Art 6 Para 1(d)⁵; to a Party which is permitted to use that chemical under Annex A and to a State not Party to this Convention⁶, which has provided an annual certification to the exporting State Party. For such chemical, for which production and use **specific exemptions** are no longer in effect for any Party, exportation will be allowed only for the purpose of environmentally sound disposal as per Art.6 Para 1(d)⁷.

States party to the Convention are also required to do the following:

- Develop and apply strategies for identification of stockpiles, products and articles in use, and waste containing POPs pesticides;
- Prohibit the use, recycling, recovery and direct or alternative uses of persistent organic pollutants;
- Manage stockpiles in a safe, efficient and environmentally sound manner upon their becoming waste;
- Take appropriate measures so that POP pesticides are handled, transported and stored in an environmentally sound manner, as well as disposed of, so that the POPs content is destroyed or transformed in a way that they do not exhibit the characteristics of persistent organic pollutants. Their disposal should be made in an environmentally sound manner taking into account international regulations, standards and guidelines.

The Stockholm Convention requirements relating to DDT.

Article 3 requires Parties to the Convention to restrict the production and use of chemicals listed in Annex B in accordance with the provisions of that Annex.

Accordingly, all parties, signatory to the Stockholm Convention are required to:

- Eliminate the production and use of DDT except for Parties that have notified the Secretariat of their intention to produce and/or use it.
- Each Party producing and/or using DDT shall restrict such production and/or use for disease vector control in accordance with the World Health Organisation (WHO) recommendations and

iv. Not transported across international borders without taking into account relevant international rules, standards and guidelines.

⁵ See above

⁶ Art. 3 Para.2 (d): Includes, with respect to a particular chemical, a State or regional economic integration organization that has not agreed to be bound by the Convention with respect to that chemical.

⁷ *ibid*

guidelines on the use of DDT and when locally safe, effective and affordable alternatives are not available to the Party in question.

- If a Party not listed in the DDT Register determines that it requires DDT for disease vector control, it shall notify the Secretariat as soon as possible to have its name added to the DDT Register and the WHO.

The Stockholm Convention requirements relating to Polychlorinated Biphenyls (PCBs).

Article 3 (1) (a) states that each party shall prohibit and/or take legal and administrative measures necessary to eliminate **production and use** of chemicals listed in Annex A subject to the provisions of that Annex⁸ as well as the **import and export** of chemicals listed in Annex A in accordance with provisions of para. 2 below.

Para 2 provides for each party to take measures to ensure that chemicals listed in Annex A or B is **imported** only for the purpose of environmentally sound disposal as per Art. 6 para 1(d) or for a use or purpose which is permitted for that Party under Annex A. Furthermore, a chemical listed in Annex A for which any production or use **specific exemption** is in effect, *or acceptable purpose* is in effect, will be **exported** only for the purpose of environmentally sound disposal as per Art 6 Para 1(d); to a Party which is permitted to use that chemical under Annex A; to a State not Party to this Convention⁹, which has provided an annual certification to the exporting Party. According to Para. 5, the restrictions on importation shall not apply to quantities of a chemical to be used for laboratory-scale research or as a reference standard.

All parties, signatories to the Stockholm Convention are required to:

- Immediately stop the production of PCBs (by the date of entry into force of the Convention);
- Eliminate the use of PCBs in equipment by 2025 (e.g. transformers, capacitors and other receptacles containing liquid stocks);
- Identify, label and remove from use the equipment containing greater than 10% PCBs and volumes greater than 5 litres;
- Identify, label and remove from use the equipment containing greater than 0.005% PCBs and volumes greater than 0.05 litres;
- Prohibit the export and import of PCBs and equipment containing PCBs (except for the purpose of environmentally sound waste management);
- Not allow the recovery of liquids with greater content of 0.005% PCBs for the purpose of their reuse in equipment, except for maintenance and servicing;
- Achieve the environmentally sound management of PCB waste as soon as possible, but not later than 2028;

⁸ Annex A Part I: PCBs is listed as a chemical scheduled for elimination and its production is banned.

⁹ Art. 3 Para.2 (d): Includes, with respect to a particular chemical, a State or regional economic integration organization that has not agreed to be bound by the Convention with respect to that chemical.

- Develop and implement strategies for identification of stockpiles, products and articles in use and waste containing PCBs;
- Manage stockpiles in a safe, efficient and environmentally sound manner upon their becoming waste;
- Take appropriate measures so that PCBs are handled, transported and stored in an environmentally sound manner, or disposed of so that the PCB chemicals in waste is destroyed or transformed in a way that they do not exhibit the characteristics of polychlorinated biphenyls. Their disposal should be made in an environmentally sound manner taking into account international regulations, standards and guidelines;
- Prohibit the use, recycling, recovery and direct or alternative uses of polychlorinated Biphenyls;
- Develop strategies for identifying contaminated sites and for their remediation in an environmentally sound manner; and
- Every five years make the report on development of PCB elimination and submit it to the Conference of the Parties pursuant to Article 15 of the Convention.

The Stockholm Convention requirements relating to the POPs compounds formed as by-products (PCDD/PCDF, HCB and PCB).

Article 5 of the Convention requires Parties to the Convention to take measures to reduce the total releases derived from anthropogenic sources of each of the chemicals listed in Annex C, with the goal of their continuing minimisation and, where feasible, the ultimate elimination of such chemicals.

Parties are required to develop and implement an action plan and subsequently implement it as part of its implementation plan¹⁰, designed to identify, characterise and address the release of the chemicals listed in Annex C. Parties are also required to facilitate the implementation of the following:

- Promote available, feasible and practical measures that can expeditiously achieve a realistic and meaningful level of release reduction or source elimination; and
- Promote the development and where appropriate, require the use of substitute or modified materials, products and processes to prevent the formation and release of the chemicals listed in Annex C, taking into consideration general guidance on prevention and release reduction measures in Annex C and guidelines to be adopted by decision of the Conference of Parties (COPs).
- Promote and require the use of best available techniques (BAT) for new sources within source categories which a Party has identified as warranting such action in the action plan, with particular initial focus on source categories identified in Part II of Annex C¹¹ (to be

¹⁰ According to Art. 7

¹¹ These include waste incinerators, including co-incinerators of municipal, hazardous or medical waste or of sewage sludge; cement kilns firing hazardous wastes; production of pulp using elemental chlorine or chemicals generating elemental chlorine for bleaching. The following thermal processes in the metallurgical industry: Secondary copper production; Sinter plants in the iron and steel industry;

phased in as soon as practicable and not later than 4 years after entry into force of the Convention). For the identified categories, promote the use of best environmental practices (BEP). In applying, the above Parties shall take into consideration the general guidance on prevention and release reduction measures in Annex C and guidelines on BAT and BEP to be adopted by decision of the COPs.

- Promote the use of BAT and BEP for the following:
 - o For existing sources, within the source categories listed in Part II and III¹² of Annex C; and
 - o For new sources, within source categories listed in Part III of Annex C

1.2 Persistent Organic Pollutants

Persistent organic pollutants (POPs) are a group of compounds that are toxic, are resistant to environmental degradation, and biomagnify as they move up the food chain. These substances have low solubility in water but very high solubility in fats which enables their bio-concentration in fatty tissues of animals and humans. POPs are widely spread at low levels in the global environment and have been found in places where they have never been used or produced. These substances are transported by air and water across international boundaries and all populations around the globe are at risk from these substances. Populations in the Polar Regions are particularly at risk because of bio accumulation.

Persistent organic pollutants consist of pesticides (e.g. DDT, Chlordane), industrial chemicals (e.g. Polychlorinated biphenyls, PCBs) and unintentional by-products of industrial and combustion processes (e.g. dioxins and furans). Organochlorine pesticides and polychlorinated biphenyls (PCBs) are two widely used members of that group. POPs have been linked to adverse effects on human health and animals, such as cancer, damage to the nervous system, reproductive disorders, and disruption of the immune system¹³.

POPs have high stability in the environment owing to their chemical structure.

Organochlorine pesticides, most of which are scheduled for elimination under the convention have long been recognized for having strong lasting effects. Their use increased heavily after the second World War as it was recognized that they had strong toxicity against insect pests, low mammalian toxicity and remain in the environment for a long time.

Secondary aluminium production; Secondary zinc production

¹² Open burning of waste, including burning of landfill sites; thermal processes in the metallurgical industry not mentioned in Part II; residential combustion sources; fossil fuel-fired utility and industrial boilers; firing installations for wood and other biomass fuels; specific chemical production processes releasing unintentionally formed POPs, especially production of chlorophenols and chloranil; crematoria; motor vehicle, particularly those burning leaded gasoline; destruction of animal carcasses; textile and leather dyeing (with chloranil) and finishing (with alkaline extraction); shredder plants for the treatment of end of life vehicles; smouldering of copper cables.

¹³ <http://www.epa.gov/oppfead1/international/pops.htm>

However their use was curtailed as negative effects was noticed. PCB are another group which have proven resistant, toxic and in need of elimination. The high chemical and thermal stability, good dielectric properties, water-insolubility, slow decomposition made these substance ideal for use in electrical distribution equipments, especially in cases where fire is a concern. . There are 209 polychlorinated biphenyl isomers, which represent different degrees of chlorination. Commercial mixtures are usually contain around 100 isomers and their names are indicative of the chlorine content: for example Aroclor 1221, Chlophen A60, Phenclor DPC, Kanechlor 600. Large scale production of PCb started in the USA and reached its peak by the 70's. Major producers of PCB are Monsanto (USA), Bayer (Germany), Rhone Poulenc and PCUK (France); Kanegafuchi (Japan), Cros (Spain), Cafaro (Italy) and also east European countries. PCB production started to be phased out by the 1980's, and by that time it is estimated that global production has reached over 1 million tons.

Polychlorinated dibenzo-p-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF) are unintentionally produced POPs, more commonly referred to as Dioxins and Furans. These compounds have never been produced intentionally, but exist in association with other compounds such as PCBs and also with incineration. The group Dioxins and Furans include 210 congeners, some of which are highly toxic and proven carcinogens. Dioxins (PCDD) and furans (PCDF) are formed as by-products from thermal processes and chemical reactions. They are formed through side reaction in the synthesis of chlorinated compounds especially pesticides such as 2,4,5 T, and may exist in the final products as contaminants. Dioxins and Furans are also formed through direct conversion or complex reactions under pyrolytic and other poor combustion conditions. Chlorinated compounds and PCBs are particularly prone to produce these compounds when heated to temperatures between 170 and 700 °C. In order to have complete destruction of these compounds in incineration facilities, combustion temperatures should be maintained above 800 °C.

2 Country baseline

2.1 Country profile

2.1.1 Geography and population

The Republic of Seychelles consists of over 116 islands scattered over 1 million square kilometres of sea in the middle of the Western Indian Ocean. The Seychelles archipelago is divided into two distinct collections: the Mahé group, 43 islands in all, granitic with high hills and mountains and the outlying islands; and the corraline group numbering 73 or more and for the most part only a little above sea-level. The most important island lies between 4 degrees south latitude and 55 degrees east longitude. The island is 27 kms long and 11kms wide rising abruptly from the sea to a maximum altitude of 905 meters in the mountain of Morne Seychellois. Two other islands of major importance as regards to size and population are Praslin, 33.6 kms from Mahé and home to the unique Coco de Mer and La Digue 48 kms away, with its bullock cart transport and the only remaining sanctuary of the veuve- the Seychelles Black paradise flycatcher. In spite of the close proximity of Seychelles to the Equator, the climate is healthy. The shade temperature varies little throughout the year and the hottest months being March to April and the coolest being July and August. The rainfall varies considerably from island to island and from year to year. Most of the rainfall occurs during the hot months when the northwest trade winds blows. The islands are outside the hurricane zone and thunder storms are rare and mild when they do occur.

SEYCHELLES

Capital: Victoria

Land area: 455.3sq km

Climate: (Average 1972-2003)

Rainfall: 2,942mm

Sunshine: 6.9hrs per day

Mean max temp: 30.1C

Mean min temp: 25.0C

Humidity: 78%

Maximum gust: 50 knots

Currency: Rupees (R) and cents

There is some evidence that Seychelles islands were known and visited as long ago as the 8th and 9th centuries. More recently in the 15th and 16th centuries, they were spasmodically inhabited by pirates but it was not until the middle of the 18th century that the first settlers established themselves on Ste Anne in 1771.

Seychelles has a small population of 82, 474 people¹⁴ with an annual growth rate of 1.4% and a sex ratio of 0.93 male(s)/female (2002 est.). A population of about 100,000 inhabitants is projected by 2016.¹⁵ The majority of the population live on the three main granitic islands of Mahé, Praslin and La Digue, with 90% of the population and infrastructure located on the main island of Mahé. The population density of Victoria increased from 450 people per sq. km in the late 1980s to 519 per sq. km in 1994. Mahé has a coastal population density in excess of 400 persons per sq. kms. The current national population density is 178 people per sq. km for the whole of the Seychelles.

¹⁴ as of 30/06/2004

¹⁵ MISD 2006

The demographics of the population are as listed in Table 2.1.1.1 below:

Table 2.1.1.1: Main Characteristics of the Population of Seychelles

Indicators	Mid 2004
Population, total	82,474
Under 20 years	34.2%
20-44 years	41.7%
45-64 years	16.1%
65+	7.9%
Net migration	-1174

Source: MISD (2004) Population and Vital Statistics No. 2 of 2004

Approximately more than 40% of the population is under eighteen years old and of retiring age, i.e.63 years old. Less than half of the population is of prime working age.¹⁶

The average life expectancy at birth is 71 years, an infant mortality rate of 10.3 per 1000 live births (1999 figures) and an adult literacy rate of 84%. The United Nations Development Programme (UNDP) Human Development Index Report 2003 places Seychelles in the 34th position. The net migration figure of -1174 persons for the period July 2003-June 2004 is composed of 627 males and 547 females¹⁷.

The number of persons in employment in the year 2002 was 34,017, showing an increase of 2.362% over the last year figure, with an unemployment rate of only 4.1% in 2002 and 3.2% in 2003. The private sector employs 48.2% of the population¹⁸. Table 2.1.1.2 shows the labour force in the year 1999 to 2002, whilst Figure 2.1.1.1 illustrates the percentage of persons employed in particular sectors of the economy in 2002.

Table 2.1.1.2: Employment by Sectors: 1999 - 2002¹⁹

EMPLOYMENT	1999	2000	2001	2002
Public Sector	10,325	10,309	10,695	11,242
Private Sector	16,467	17,179	17,472	17,675
Parastatal Sector	4,531	4,740	5,046	5,100
PRIMARY SECTOR				

¹⁶ ibid

¹⁷ MISD Population and Vital Statistics No. 2 of 2004

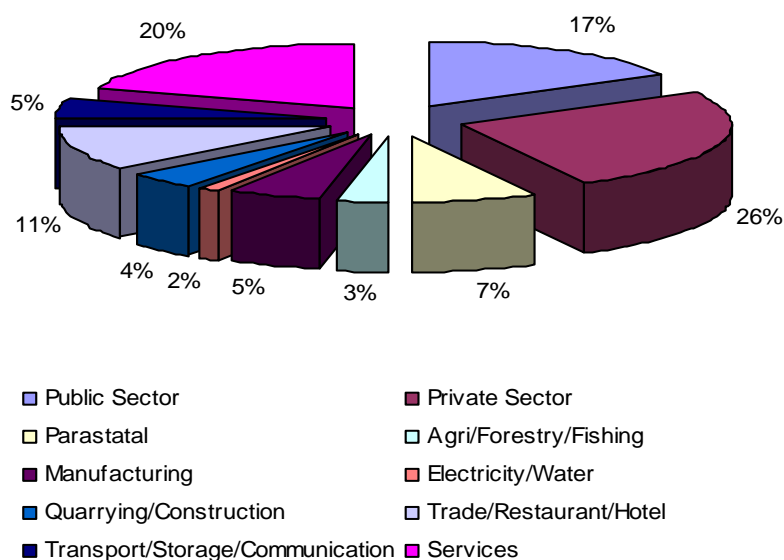
¹⁸ Year 2000 figures

¹⁹ MISD Seychelles In Figures 2003

EMPLOYMENT	1999	2000	2001	2002
Agriculture, Forestry, Fishing	2,158	2,129	2,143	2,122
SECONDARY SECTOR				
Manufacturing	3,669	3,814	3,748	3,656
Electricity , Water	880	972	1,022	1,034
Quarrying, Construction	2,786	2,538	2,542	2,778
TERTIARY SECTOR				
Trade, Restaurant, Hotel	6,667	7,107	7,452	7,406
Transport, Storage, Communication	3,325	3,358	3,625	3,693
Services	11,837	12,031	12,681	13,329

Source: Poiret and Sabury (2004) "Environmental and Human Health of POPS in Seychelles"

Figure 2.1.1.1: Percentage of Persons Employed in Specific Sectors of the Economy.²⁰



Source: Poiret and Sabury (2004) "Environmental and Human Health of POPS in Seychelles"

2.1.2 Political and economic profile

The country is a democratic state with a straightforward administrative structure. The Constitution (1992) is the supreme law of Seychelles. It establishes clearly the separation of powers between the three arms of

²⁰ Poiret et. al. (2004)

government: the Executive, the Legislature and the Judiciary. The Seychellois Charter of Fundamental Human Rights and Freedoms within the constitution guarantees to the citizen twenty five clearly defined rights which include when it comes to environment, the right to a "clean, healthy and ecologically balanced environment". The President of Seychelles is the Head of State, Head of Government and Commander-in-Chief of the Defence Forces of Seychelles.

The Cabinet of Ministers, comprising not less than seven or more than fourteen, is appointed by the President subject to the approval of a majority of the members of the National Assembly. For the environment sector, the development of policies and management of resources is given over to one ministry, the Ministry for Environment and Natural Resources. A multitude of approaches are used within the system to allow the ministry and its partners to exercise fully their allocated duties. Within commercial fisheries for example, the ministry only acts as overseer of the policies and actions of the Fishing Authority, whilst in forestry and forest products it is at the same time producer, retailer and enforcement agency.

The legislative power of Seychelles is vested in the National Assembly and is exercised subject to and in accordance with the Constitution. Presently the National Assembly is made up of 25 directly elected members and up to 10 members elected by a scheme of proportional representation based on the results of a general election held at least every five years. The elected legislature enacts legislation through the passing of Bills, which is made into law once given presidential assent. Judicial powers of Seychelles are vested in a Judiciary corpus comprising the Court of Appeal, the Supreme Court and other subordinate courts or tribunals established under the Constitution. The concept of the separation of powers, as defined by the Constitution, guarantees the independence of the Judiciary. The Supreme Court has original jurisdiction in matters relating to the application, contravention, enforcement or interpretation of the Constitution as well as civil and criminal matters. The Supreme Court exercises supervisory jurisdiction over subordinate courts, tribunals and adjudicating authorities.²¹

2.1.3 Profile of economic sectors

Ninety five percent of all socio-economic activities and other forms of development are concentrated mostly on the coastal plains of the three main granitic islands particularly Mahé. The main activities contributing to the countries economy include industrial and fishing and processing; tourism; services and petroleum sales and agriculture, as well as other traditional activities such as boat building, construction, printing, furniture making and production of beverages. The Seychelles economy is, however, predominantly based on tourism and fisheries. Both sectors are the main contributors to the economy, with both contributing to 42 % and

²¹ Virtual Seychelles www.virtalseychelles.sc

46% of its Gross National Products (GNP) respectively²². The country has a per capita Gross Domestic Product (GDP) of US\$ 7.800²³.

Tourism: Growth has been led by the tourist sector, which employs about 20% of the labour force and generates R756m. of foreign exchange, i.e. 30 percent of the country's foreign exchange earnings. Tourism and related services accounted for 19% of the GDP in 2004. Approximately 43% of all hotels and guesthouses are found on Mahé (52% of the country's 2759 available rooms), 32% on Praslin (30% of rooms) and 26% on other islands.²⁴ These are located principally along the coastal areas.

Fisheries: In the fisheries sector, the export of canned tuna, fresh and frozen fish constitutes about 83% of the value of Seychelles' exports of goods and about 10% of the total foreign exchange earnings. The manufacturing sector is dominated by tuna processing, which accounts for 25% of the GDP²⁵. However, the fisheries sector employs only 15% of the population. Seychelles serves as the regional hub for industrial tuna fisheries in the WIO region and hosts the secretariat of the Indian Ocean Tuna Commission (IOTC).

Although industrial fisheries constitute a major pillar of the economy, it is artisanal fisheries that remain of great importance in terms of food security, employment and cultural identity. This sector employs nearly 1800 people mainly within handline fisheries. The state of demersal resources, in particular inshore waters for the various types of artisanal fisheries, is considered to have nearly reached optimum level of sustainable exploitation. The total landings for the artisanal fishery have remained fairly constant for the last 20 years with approximately 4000 MT of fish landed annually. This catch supplies the local market demand, including hotels and restaurants.²⁶

Agriculture: The Agricultural sector employs approximately 3800 persons and accounts for 3.8% of the GDP.²⁷ Agriculture in Seychelles is characterised by small farms with an average size of 0.5 hectares and rarely exceeding 2 hectares, employing various levels of technology and management. Currently about 500 registered farms are dispersed throughout the major granitic islands of Mahé, Praslin and La Digue and they occupy both the coastal plateau and the slopes of the raised terrain. Currently out of a potential agricultural area of 2900ha. 600 hectares are under some form of agricultural production, of which only about 200 hectares are under intensive cultivation. The mountainous terrain and low soil-fertility place severe constraints on agricultural productivity.

²² MISD Figures 2004

²³ MISD Figures 2000

²⁴ Dogley (2005) Tourism Sector Study

²⁵ NCSA Project Document (2004)

²⁶ Aumeeruddy (2005) Fisheries Sector Report

²⁷ 1999 figures

There are about 400 registered crop farmers, some 1500 legal pig farmers and 55 licensed poultry farmers. In addition, a number of urban households engage in backyard vegetable production (estimated to equate to a total of 45ha. vegetables). Farming land can either be leased from the State, or are privately owned. Current agricultural production meets about 4% beef, 50% pork, 60%-70% vegetables and fruits, 80% poultry and 100% eggs. The cultivation and exploitation of traditional crops like cinnamon and coconuts along with patchouli and vanilla have dropped considerably in the last 10 years and hence contribute insignificantly to the sector.²⁸

Commercial manufacturing started in the early 1960s with the manufacturing of soft drinks, ice-cream, coconut oil and soap. Several industrial and manufacturing units have been set up in the coastal zone, around Victoria, at Le Rocher and mostly in the industrial area at Providence. The manufacturing sector is dominated by tuna processing, which accounts for 25% of the GDP²⁹. Manufacture of drinks soft drinks and alcoholic drinks have increased gradually and there has been increases in the production of bottled water. Other sectors of the economy such as construction remain important, contributing much in terms of employment as well as the GDP. Recent incentives for small businesses and tourism have kept these sectors buoyant, which could in the long run increase the importance of the later amongst local industrial mix.

2.1.4 Environmental overview

Air: Being an island state the Seychelles does not have any neighbours to have transboundary impacts of air pollution. However, incidents such as forest fires occurring as far as in Indonesia in the past have resulted in impacts on the air quality on the country. Fortunately such incidents are rare.

The main emission sources causing air pollution in the country are from the energy and transport sectors. The Initial National Communication³⁰ prepared in 2000 under the United Nations Framework Convention on Climate Change (UNFCCC), to which Seychelles is party, identified the following greenhouse gases being released into the atmosphere. The total CO₂ in 1995 was 191,290 tonnes of which 93% was from the energy sector. The per capita CO₂ emissions were estimated at 2.54 tonnes. In relation to energy activities related to fuel combustion, the total emission of CO₂ in 1995 was 178,736 tonnes of which 58% was from electricity generation, 31% from the transport sector, 8% from small combustion and 3% from industries. The emission of other GHG from fuel combustion was relatively low compared to that of CO₂³¹. The EMPS 2000-2010 stated that air quality is becoming a serious issue in the country.

²⁸ Racombo (2005) Agriculture Sector Report

²⁹ NCSA Project Document (2004) p.5

³⁰ Govt. of Seychelles (2000) Seychelles Initial National Communication under the UNFCCC

³¹ Carbon monoxide: 5,126 tonnes; nitrous oxides: 1.9 tonnes; methane (CH₄): 11.4 tonnes ; nitrogen oxides : 589.7 tonnes and non-methane volatile organic compounds (NMVOC) : 576 tonnes

As stated above, the CO₂ emission from the transport sector accounts for 31% of emissions from the energy sector, of which 84% originates from land transportation with the primary fuels being gasoline and gas oil (diesel). The number of vehicles is expected to increase from 6,050 in 1990 to 18,361 in 2020. Steps have been taken to reduce vehicle emissions. Standards for automotive vehicle emissions have been developed and enacted into law: **SS22:1997 Standard Specification for Automotive Vehicle Emissions**. The standard specifies the emission limits for carbon monoxide (CO), hydrocarbons (HC) and opacity from the engine exhaust as measured by means of specified instruments according to specified test procedures. Furthermore, the Vehicle Testing Station has been set up to ensure vehicles are compliant to the standards and vehicle testing is mandatory. However, the station has not been adequately performing its functions due to several reasons which include the lack of adequate equipment and the shortage of spare parts for vehicles. A feasibility study on the introduction of lead-free gasoline was conducted under the EMPS 1990-2000, with the introduction of the gasoline in early 1999. However, the impetus following the introduction has been slow to follow with lack of incentives to promote the use of the gasoline. Furthermore, the reduction of taxes on vehicles using gas oil (diesel) has prompted users to purchase such vehicles.

Emissions from industrial processes are not found to impact significantly on air quality in the country. Emission of non-methane volatile organic compounds (NMVOC) from the use of solvents in paint application, degreasing and cleaning amounted to 17.0 tonnes.³² Furthermore, strong odours from the IOT canning factory, dust from quarries, construction and transport are also considered as negative impacts on the air quality.³³ Other sources of air pollution include methane (CH₄) emission with a total emission of 2,563 tonnes, of which 91% is from biodegradable solid wastes in landfills³⁴ and anaerobic waste water treatment facilities³⁵; nitrous oxides (N₂O) emissions with a total emission of 76.9 tonnes, of which 97% was from the agricultural sector³⁶ (1995 figures)³⁷. Air has also been identified as the second most important route of release for dioxins and furans (POPs). Such emissions come mainly from two waste incinerators namely, the Victoria hospital medical waste incinerator and the waste oil incinerator at the PUC Power Station at Roche Caiman.³⁸

The Seychelles Bureau of Standards (SBS) conducted an Air Quality exercise in Victoria in 1998.³⁹ As part of the exercise they performed daily and monthly recordings of Total Suspended Particulate (TSP), nitrogen dioxide and Particulate Lead. The study concluded that the present ambient air quality of Victoria does not pose any health problems

³² See 20.

³³ EMPS 2000-2010

³⁴ 2,080 tonnes

³⁵ 270 tonnes

³⁶ 75.0 tonnes

³⁷ See 20

³⁸ Action Plan 3.3.7

³⁹ Final Report on the State of Ambient Air Quality of Victoria City Jan 1998 - Dec 2003

to the general population as the air pollutants measured are well below WHO guideline values.

Aquatic environment

Freshwater resources: The Seychellois population is supplied with water mostly from small streams and rivers, from the Public Utilities Corporation (PUC), the agency responsible to provide safe drinking water to the population. There are four treatment works on Mahé. To date 80% of the population receive treated water with the remaining using untreated water mainly from local streams. The average per capita consumption of water on Mahé is 140 litres a day (total net demand of 14.500 kilolitres (kl) a day). The EMPS estimates the deficit between water supply and demand at 4,141 kl a day and anticipates this to rise to 16,175 kl a day. Potable water is scarce in periods of drought when water has to be stored in reservoirs. According to the EMPS 2000-2010, only the catchment of the Rochon River has been exploited to date. The storage facilities available in the existing La Gogue and Rochon reservoirs are inadequate to cater for existing and future water demands. Furthermore there are no storage facilities in the South of Mahé which leads to severe water problems in that area and the west of the island.

To solve this problem, work on the transmission network throughout the island has started. It is operational in the South of Mahé linking it to the main system and work is ongoing to link up the west of the island. In addition to this 3 public desalination plants located in Providence, Anse Boileau and La Digue with a 4th being constructed on Praslin. These are managed by PUC. Several private plants have been also been commissioned (Ste. Anne, Banyan Tree and outer islands having hotels establishments) whilst others are being commissioned/proposed (Port Launay, Silhouette). Though there is no contamination in areas where water abstracted though development in up hill areas pollute watercourses and catchment areas.⁴⁰

Marine, including wetlands: The Seychelles has an extensive Exclusive Economic Zone (EEZ) of 1.374 million sq. km. with several designated marine protected areas⁴¹. Small isolated forests of wetlands are found on the islands of the Seychelles and account for 29 sq. km of forest areas. They occur primarily in the granitic islands of the Seychelles and most of them are found close to the sea along coastal plains though a few have developed at higher altitudes. Due to the high degree of reclamation and modification of wetlands the exact area of wetlands remaining is not known. On Mahé, it is estimated that only 50 to 60 hectares may remain, out of a total of about 100 hectares. Wetlands have no legal protection though they are considered **ecologically sensitive areas** under the EIA Regulations and development in such areas would require an Environmental Impact Assessment.

⁴⁰ EMPS 2000-2010

⁴¹ Ste. Anne, Curieuse, Port Launay and Baie Ternay, Silhouetter, Ile Cocos etc., Marine National Parks

The main activities posing a threat to the marine and coastal environment in the Seychelles include tourism, land reclamation/dredging, commercial and manufacturing industries, agriculture and coastal developments (tourism/ infrastructure). Discharges from industries⁴², desalination plants, petroleum from the SEYPEC storage facilities, raw effluent sewerage discharge as well as treated sewerage from the sewerage treatment plants and residues from the Providence landfill are the major causes of coastal and marine pollution particularly on the east coast of Mahé. Marine traffic within the port area and in the Providence area as well as sediment from inland, due to unregulated development particularly in steep areas, are also considered as threats to the coastal and marine environment.

Waste/Sanitation⁴³: On Mahé, there are four sewage treatment plants operated by PUC namely the Providence Sewage Treatment Plant, the largest plant in the country, is based on activated sludge process and started operation in 2001. The treatment plant is located at Providence and currently industries located in Victoria and the East Coast of Mahé are connected to it as well as a number of establishments, residential houses, businesses and institutions in Mont Buxton, Union Vale, part of English River, part of Majoie, St Louis, part of Bel Air, Hermitage, part of Mont Fleuri and Victoria are connected to the system. Industrial effluent from the Indian Ocean Tuna (I.O.T) is not treated at the Providence plant due to the numerous problems caused by the effluent (waste water from fish cleaning) in the past. Only the wastewater from the toilets of IOT comes into the PUC network. Seychelles Breweries is presently in the process of connection to the existing Greater Victoria sewerage network. Other industries in the Le Rocher industrial zone including Sodepak are likely to be connected in the future;

- The Beau Vallon Sewage Treatment Plant, based on activated sludge process which started operation in 2002. Most of the hotels in the North of Mahé are connected to the Sewerage Treatment Plant;
- The Pointe Larue Sewage Treatment Plant, based on activated sludge process;
- The Anse Aux Pins Sewage Treatment Plant located at the Flats, working on the principle of Rotating Biological Contactor, which started operation in 1995

On Praslin and La Digue, there are no public/ centralised sewage treatment plants. However, all hotels and industries have to put in place treatment systems.

The EMPS 2000-2010 found that though standards for effluent discharge exist, the **Environment Protection Effluent (Standards) Regulations⁴⁴** as well as compliance mechanisms, the industry is still far from meeting the prescribed effluent discharge limits and this leads to the degradation of the coastal waters. Furthermore, monitoring programmes

⁴² Including discharges from IOT canning factory into the port area, discharges from the abattoir and the paint factory at Le Rocher

⁴³ Inventory report by Razanajatovo: Unintentional Production of POPs 2005

⁴⁴ SI 38 of 1995

do not cover all parameters especially those requiring sophisticated equipment. At the moment bathing water is being tested for only its quality but not for contaminants. Such expansion is in the process of being developed.

Chemicals management: There is no legislation in place to deal with chemical. However, the *Pesticides Control Act, 1996* promotes the safe usage of pesticides. To this end the following Codes of Practice have been issued by SBS regarding hazardous or toxic substances used by industries and households: *SBS 1994 SS 36 94 Code of Practice for Handling, Storage and Disposal of Hazardous Chemicals & other Agricultural Pesticides*; *SBS 1995 SS 45 95 Code of Practice for the Disposal of Hazardous and Radio-Active Waste*. The Pesticides Act makes provisions for the establishment of the Pesticides Board with members from the Ministry of Environment and Natural Resources, Ministry of Agriculture and the Environmental Health Section from the Ministry of Health. The Board advises on health-related issues, assists in the national sensitisation and education campaigns as well as provides training in storage of chemicals. .

Cleaner production: Several initiatives have been undertaken with the aim of cleaner production within the country. The Seychelles Bureau of Standards (SBS) has conducted training for its staff in carrying out ISO certification in collaboration with the British Standards Institute (BSI). It has also been promoting ISO certification for establishments. To date Indian Ocean Tuna Ltd is ISO 14001 certified and compliant; and Seychelles Breweries is in the process of developing ISO 14001 certification. Other establishments such as Seychelles Bureau of standards, Masons Travels Pty Ltd, Travel Services Seychelles Pty Ltd. The Public Health Laboratory in the Ministry of Health is has been certified under the local (SS) ISO standard and the Seychelles Public Transport Corporation is developing its program for compliance to the same local standards. With regards to eco labelling, an eco-certification scheme for tourism establishments is currently being developed by the Seychelles Tourism Board and the Department.

Furthermore mechanisms are in place to ensure that new project proposals are developed to ensure cleaner production. These mechanisms include the EIA process which requires that an EIA study be carried out and that an environmental authorisation is obtained if any person commences, proceeds with, carries out, executes or conducts or causes to commence, proceed with, carry out execute or conduct any prescribed project or activity in a protected or ecologically sensitive area⁴⁵. The criteria, which establishes the necessity of an EIA is found in the EP (EIA) Regulations which lists categories of projects or activities requiring environmental authorisation.⁴⁶ The procedure established under the Seychelles Investment Bureau (SIB) for the approval of investment proposals ensures that all aspects of the development proposals are considered, including environmental concerns. The SIB acts as a one stop shop processing all investment proposals within the country and channels

⁴⁵ S 15 EPA

⁴⁶ Schedule 1 SI 39 of 1996

the proponent to the appropriate agencies. Other initiatives and policies include the Refrigerant Management Plan which implemented the Montreal Protocol into national law phasing out CFCs in refrigerants and replacing them with appropriate gases; the introduction of unleaded fuel and LPG.

Biological Safety: The National Biosafety Framework of Seychelles (NBF) 2005 is a combination of policy, legal, administrative and technical instruments that have been developed to ensure a high level of protection in the field of transfer, handling and Genetically Modified Organisms resulting from modern Biotechnology that may have adverse effects on the conservation and sustainable use of biological diversity, taking into account risks to human health.

Public health issues: Issues giving rise to public health concerns relate to sanitation and waste disposal particularly in residential areas especially in the recent increase of mosquito and other vector borne diseases. Other public health challenges include diseases transmitted through the expatriate workforce and the Seychellois population travelling to affected areas. Pollution of air, water and soil is also a public health concern. However, these are not properly recorded. Provisions exist under the Environment Protection Act (EPA) 1994 and the Public Health Act which offer some degree of protection in this area.

Noise: Nuisance issues relating to noise are dealt with under EPA 1994 the EP (Noise Emission Standards) Regulations⁴⁷. and the Penal Code. Noise emissions are mostly from various sources which include power generation, air-conditioning equipment, power tools, construction, heavy vehicular traffic.⁴⁸

Nature Conservation/Forests:

Total forest area of the Seychelles has been estimated at 40,600 ha with protected areas covering approximately 47% of the total area of the islands. The granitic group is made up of 43 granitic islands and is situated in the north of the archipelago, with a central range of high hills and mountains rising to 905 meters (2,950 ft) high having steep rugged or smooth-bare rock slopes "glacis" surrounded by narrow flat sandy and often marshy coastal strips. The granitic islands are a repository of over 80 endemic species of flowering plants, 10 endemic species of ferns and 62 endemic species of bryophytes. The latter are found mostly in the intermediate and mist forests of the interior mountains. The 72 low-lying coral islands consist of four groups: the Amirantes, Farquhar, Coetivy and Aldabra. While still diverse, they do not harbour the same degree of species endemism as the granitic islands. The coral islands have 15 known floral endemic species. The island of Aldabra is the largest raised coral atoll in the world, and is considerably older than the other coralline islands and accordingly has a higher degree of endemism.

⁴⁷ SI 49 of 1999

⁴⁸ EMPS 2000-2010

The following describes some of the additional key features of the terrestrial biodiversity⁴⁹:

- Of the some 250 indigenous floral species in Seychelles, as many as 54 taxa or almost 21 percent of the flora are now considered threatened.
- Thirty endemic taxa of birds occur, including 8 that are classified as globally threatened. The endemic birds of the granitic islands, e.g. Magpie Robin (*Copsychus sechellarum*) and Seychelles White-eye (*Zosterops modesta*) have been studied extensively and are the focus of ongoing conservation programmes.
- The archipelago has the highest ratio of amphibian endemics of any island group in the world. Two species of snakes, about 22 endemic species and subspecies of geckos and skinks and one chameleon are endemic to the islands.
- At least three endemic species of terrapins have been described from Seychelles.
- Aldabra has the largest surviving wild population of giant tortoises in the world, and the last remaining wild populations of Tortoises in the Indian Ocean.
- The river and wetland ecosystems of the granitic islands support a number of endemic aquatic species including the endemic crab genus *Seychellum*, certain species of mayflies and caddisflies, and the snail *Paludomus ajanensis*.
- Endemic fishes found in the freshwater habitats are *Pachypanchax playfairii* and *Parioglossus multiradiatus*, recently discovered in 2005.
- The terrestrial molluscs of Seychelles show high endemism on some granitic islands and on Aldabra.
- Endemism in scorpions, spiders and insects is very high. The biota includes the world's largest millipede. Many species are single island endemics.
- Some 7% of the invertebrate species can be considered threatened, and of these some 50% are critically endangered.

Although the marine fauna of Seychelles remains largely unexplored, and the inventory is incomplete, recent surveys have shown diversity to be high. Recent surveys indicate that earlier estimates of the area of coral reef (1,690 km²) may have been understated.⁵⁰ Species found in the marine and coastal environment includes contains different species of mangroves, seagrasses, algae, phytoplankton, zooplankton, sponges, corals, crustacea, molluscs, echinoderms, reef and pelagic fish, sea turtles, sea birds and marine mammals. The main threats to biodiversity include invasive alien species, physical land use and tourism leading to habitat alteration, unsustainable fishing practices, forest fires, global warming and ocean acidification.

Environmental protection priorities: The aim of the EMPS 2000-2010, which is main policy document relating to the protection of the environment in the Seychelles, is that the protection of the environment is

⁴⁹ Mainly reported by Keuffer & Vos, 2004 and Shah et al., 1997; SEY BD2

⁵⁰ Bijoux (2005)

undertaken in a planned and coherent manner involving all stakeholders. It further seeks to integrate environmental issues into all development sectors. This is also pursued through the EPA 1994 which provides for the protection, preservation and improvement of the environment and for the control of hazards to human beings, other living creatures, plants and property.

2.2 Institutional, policy and regulatory framework

Summary

The current legislation relating to the environment, chemicals, import and export have been assessed against the obligation under the Stockholm Convention as highlighted below.

The Environment Protection Act 1994 (EPA 94) provides *inter alia* for the protection, preservation and improvement of the environment; for the control of hazards to human beings and other living creatures; for ensuring proper coordination, implementation and enforcement of national policies on environmental management. The 1994 defines hazardous substance and makes it an offence not to handle any such substances in accordance with prescribed procedures and safeguards. However it does not

The Pesticide Control Act 1996 (PCA 96) regulates the manufacture, distribution, use, storage and disposal of pesticide for the protection of public health and the environment. However, it does not apply to the POPs pesticides listed in Annex A.

Seychelles already has a list of restricted goods requiring an Import Permit and Authorisation for importation as published in the Seychelles Nation dated 1st January 2005 by the Department of Finance. These include all the POPs chemicals in Annex A and B of the Convention. This list will need to be legalised under the Trades Tax Act.

Currently, there is no single comprehensive chemical law in Seychelles. Legislative authority is assigned to different agencies with each agency dealing with a specific substance on the basis of intended purpose.

Based on the inventory undertaken on the institutional and regulatory framework related to POPs as well as the enforcement mechanisms in place, the following initial observations were made and capacity gaps identified. It was highlighted that there is limited capacity nationally to deal with POPs management as well as the adequate implementation of the Stockholm Convention in the country. The gaps identified include:

- Lack of training is required for customs officers in identifying POPs;
- Inadequate recording of importers of chemicals;
- Lack of an adequate and organised database of chemicals imported;

- Lack of a network for exchange of info on chemicals specifically POPs;
- Lack of public awareness on issue of POPS;
- Limited research development in POPs, including limited of capacity nationally to carry out research in the field of POPs;
- Lack of proper technical infrastructure in place for monitoring and testing;
- Lack of an effective system of technology transfer in place;
- Inadequate mechanisms in place to deal with disposal of POPS/hazardous materials.

Introduction

The underlying policies for the environment are centred around implementing the Environment Management Plans for the country (EMPS 1990-2000; 2000-2010) and remains focussed on leadership in sustainable development, engagement in long term programs and decision making which takes into account the interest of all stakeholders. These have been further sharpened following recent reviews especially the EMPS decadal review and global sustainability assessments. There are, however certain policy areas such as hazardous chemicals management that would need to be further developed from the current framework in the EMPS.

Policy development and regulatory application in the field of environment is led by the Ministry of Environment and Natural Resources (MENR), in collaboration with its partners, both in the public and private sector.

The National Implementation Plan of the Stockholm Convention on POPs will expand the scope of operation of MENR to include hazardous chemicals management as well as to be more of a supervisory body. Updating of the relevant policy and regulatory framework will be required as well as adequate capacity building to accommodate practical implementation and monitoring of the Convention.

2.2.1 Environmental policy, sustainable development policy and general legislative framework

2.2.1.1 Government Profile

The form of government that exists in the Seychelles, its constitutional basis as well as its overall structure has been elaborated upon in 2.1.2 above.

The general decision making process that operates for the establishment of national policies and legislation within the country is detailed as follows. In relation to policies, the relevant institution, in the case of environmental policy and legislation it is MENR, will prepare and present a memorandum to the National Interministerial Council (NIC), the Cabinet of Ministers for their approval. The memorandum must detail the need for such policy and the obligations associated with it as well as the possible

ways and means of implementing and enforcing such policy. Upon approval the relevant institution then implements the policy. It should be noted that certain government departments have supervisory roles towards parastatal companies and agencies (for example the Seychelles Bureau of Standards is supervised by the Ministry of Industry). Relevant policies which apply to such agencies are normally implemented through this channel (e.g. National policy for sewerage is communicated to the Public Utilities Corporation by the MENR, and implementation is regularly monitored by that department)

In relation to legislation, the relevant institution, also prepares and presents a memorandum to the NIC, the Cabinet of Ministers and the National Assembly for their approval. Upon approval of legislation by the National Assembly, the relevant institution will prepare the relevant legislation in question in conjunction with the Attorney General's Chambers. Upon approval by the National Assembly and signature by the Minister responsible for the relevant institution or the President as may be required by law, the new legislation will be gazetted in the Government's Official Gazette in order to become effective.

2.2.1.2 Guiding Philosophies and Principles

One of the main objectives of environment protection in the country is to satisfy the constitutional right of every citizen to a healthy environment. Article 38 of the constitution in this regard stipulates that it is the right of every person to live in and enjoy a clean, healthy and ecologically balanced environment. The state undertakes to put in place measures to promote the protection, preservation and improvement of the environment; to ensure sustainable socio-economic development by judicious use and management of resources; and to promote public awareness of the need to protect, preserve and improve the environment. Similarly under Article 40, the constitution makes it a duty of every citizen to protect, preserve and improve the environment.

Seychelles' vision for environment, developed during the past years with the review of the Environment Management Plan aims for a broader integration of the constitutional requirements with local, regional and global concerns. It reads *"At the dawn of the 21st century it is the vision of the people of Seychelles that this second generation environment plan, the EMPS 2000 - 2010, will serve as a flexible yet robust vehicle for continued improvement of proactive environmental management excellence, so that by the year 2010 Seychelles will be firmly established globally as a committed leader in sustainable development."*

2.2.1.3 Environmental Policy, Legislative and Regulatory Overview

Sustainable development is a major aim of the country and several policy frameworks have been elaborated for its integration into the country's development. For the Environmental sector the country is at present

implementing its second, ten year Environment Management Plan (EMPS 2000-2010).

The primary goal of the EMPS 2000-2010 is the promotion, coordination and integration of sustainable development through its programs across all sectors. According to the EMPS these shall be integrated into the ten chosen thematic areas which are as follows: 1. Society, Population and Health (including Gender)

2. Land Use, Coastal Zones and Urbanisation
3. Biodiversity, Forestry and Agriculture
4. Energy and Transport
5. Fisheries and Marine Resources/Processes
6. Water, Sanitation and Waste
7. Tourism and Aesthetics
8. Environmental Economics and Mainstreaming, and Sustainable Financing
9. Regulatory, Policy and Institutional Mechanisms
10. Commerce, Industry and Production

It is to be noted that under the EMPS there is no separate consideration for cross cutting issues such as comprehensive chemical management or control of pollution. Rather these form part of the measures under each thematic area meant to protect the natural environment and human health. In view of the cross cutting nature of chemical (and POPs management in particular), a major challenge in this area shall be the creation of a coherent framework that spans all the EMPS thematic areas.

Other policy documents incorporating sustainable development as well as environmental protection principles include *Vision 21 (2001-2010)*, the current policy document on tourism development in Seychelles; the *Eco-tourism Strategy 2003 (SETS -21)*, the strategic document providing for general policy for eco-tourism development related to the natural environment and resources; the *Social Development Policy Beyond 2000* developed by the Ministry for Social Affairs as well as regular updates on implementation of Agenda 21 in the country.

The general legislative framework on environmental protection in the Seychelles is the *Environment Protection Act (EPA) 1994*⁵¹. The EPA 1994 provides for the protection, preservation and improvement of the environment and for the control of hazards to human beings, other living creatures, plants and property. The Act also provides for the coordination, implementation and enforcement of policies pursuant to the national objectives on environment protection. This Act is administered by the Department of Environment in the Ministry of Environment and Natural Resources, which has been designated as the Authority under the Act. The Act makes provisions for the Authority to co-ordinate the activities of other agencies concerned with the protection of the Environment. The Act provides for the prevention, control and abatement of environmental pollution.⁵² Section 6 gives the Authority to prescribed

⁵¹ Act 9 of 1994

⁵² Part III EPA 1994

standards for various media, including standards for the quality of air, water or soil; effluent limitations; air; noise; odours and pesticide residues. Accordingly the following standards have been issued: *Environment Protection (EP) (Standards) Regulations*⁵³ on effluent quality and the *EP (Noise Emission Standards) Regulations*⁵⁴.

*Part IV of the EPA and the Environment Protection (Impact Assessment) Regulations (EP) (EIA) Regulations*⁵⁵ deals with Environment Impact Assessment (EIA). The legislation requires that an EIA study be carried out and that an environmental authorisation is obtained if any person commences, proceeds with, carries out, executes or conducts or causes to commence, proceed with, carry out execute or conduct any prescribed project or activity in a protected or ecologically sensitive area⁵⁶. The criteria, which establishes the necessity of an EIA is found in the EP (EIA) Regulations which lists categories of projects or activities requiring environmental authorisation.⁵⁷ Schedule 1 of the EIA Regulations lists the prescribed projects and activities which necessitate an authorisation and these include the following activities: mining, agricultural production, forestry, fish and associated farming products, chemical industries, industry (construction), food and agro-industries, energy production and distribution, water reservoirs and distribution, sewage and wastewater treatment systems, solid waste management systems, the hotel industry (hotels, restaurants and tourism activities), transport (harbours, air transport infrastructure, roads and coastal defences); land reclamation, and housing development. Schedule 2 of the EIA Regulations lists the protected or ecologically sensitive areas. Furthermore, a set of thirteen Environment Assessment Guidelines exist for various sectors.

Provisions for monitoring and enforcement are dealt with in Part 2.2.5 below and provisions on assignment of compliance responsibility in Part 2.3.1.9 below. Two types of reporting requirements exist. The first type of reporting relates to the duty to furnish information. Under the EPA, any person who fails to furnish to any officer or other employee a report or any information required by them for the purpose of the Act is liable.⁵⁸ Furthermore, S 37 of the EPA empowers the Authority (MENR) to require any person, officer or other authority to furnish to it or to any prescribed authority or officer any reports, returns, statistics, accounts and other information that may be required for the purposes of this Act. The second type of reporting relates to the duty to report. The EPA imposes a duty on an owner or user of any land to immediately notify the Authority of any incidents of pollution of the soil or sub-soil owned or used by such owner or user.⁵⁹ Furthermore, any person who fails to notify the Authority of the occurrence of any incident or other unforeseen act is guilty of an offence under the Act.⁶⁰

⁵³ SI 38 of 1995

⁵⁴ SI 49 of 1999

⁵⁵ SI 39 of 1996 as amended by SI 36 of 2000

⁵⁶ S 15 EPA

⁵⁷ Schedule 1 SI 39 of 1996

⁵⁸ S 31

⁵⁹ S 7(5) EPA 1994

⁶⁰ S 31(e) EPA 1994

The PCA Act 1996 also states that any person who mixes or pours any pesticide shall take precautions to prevent spillage of the pesticide on the soil or floor and shall report any spillage to the Registrar within 24 hours of such spillage.⁶¹

Legislative amendments and measures that will update existing legislation or be in addition to what exists to enable Seychelles to comply to the requirements of the Stockholm Conventions will be detailed in the Actions Plans and Strategies in Part 3 of the NIP.

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)

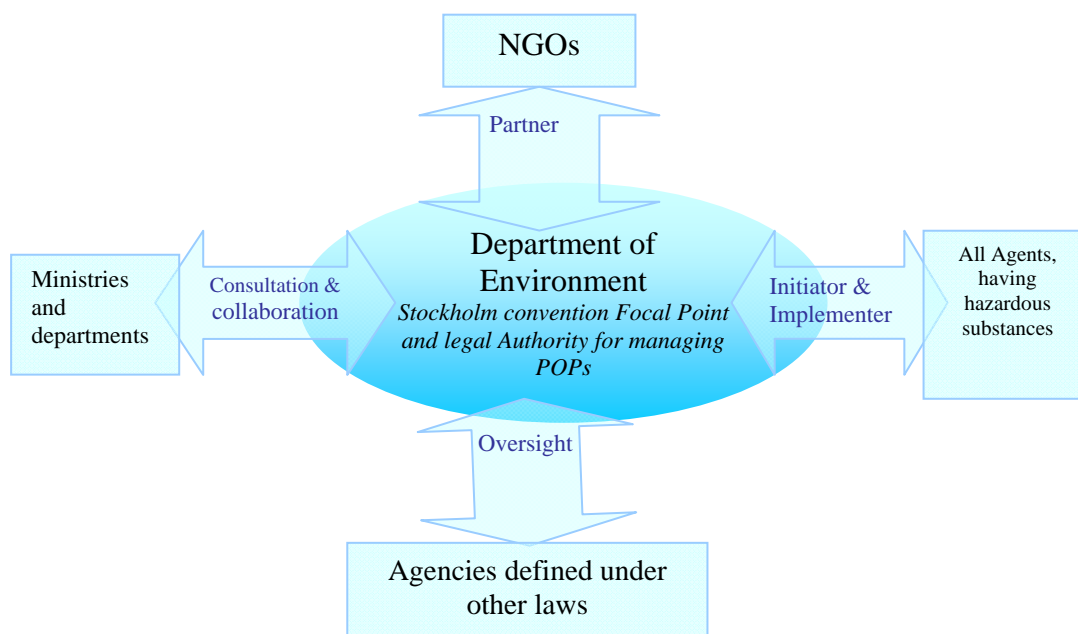
Ratification of the Convention, implementation of the POPs elimination process and ensuring compliance with agreed targets and regulatory measures in place shall remain with the Ministry for Environment. In order to satisfy the national requirement to develop programs in consultation with other agencies as well as satisfy the convention requirement for wider public/ non governmental organizations (NGO) participation, the convention shall also fall within the ambit of agencies dealing with health safety and environment, the Environment management plan steering committee, selected non governmental organizations and also utilities companies. This setup shall preserve the existing framework for the management of POPs and other chemicals (except pesticides) which currently exist and extend the collaborative process between the Department of Environment and related agencies.

The Environment Protection Act 1994 makes provision for the Department, "the authority" to be the controlling agency for all matters relating to substances which are hazardous (Section 14) or which might endanger the environment. Within the regulatory structure however, there is an obligation to consult in matters which have been under the tutelage of the specific government agency: this for example in the case of matters which cross over into worker safety under the employment regulations or which amounts nuisance under the public health act or Penal Code. Another type of relation which exists in this setup is a consultative one in the control of pesticides, where the ministry is part and parcel of the pesticide control board and its officers form part of the corpus of officers who intervene on site as PCA authorised officers. The department, still retaining its function as lead agency for the control of hazardous substances is also an oversight agency, where monitors self compliance to environmental norms by outside agencies. This is for example being done with the Public Utilities Corporation (PUC Water and Sewerage) Land Transport Division on maintenance of vehicular testing facilities, and the

⁶¹ S 16

waste collection company. Within this fold should be added PUC electricity with regards to the management of PCBs. Relationships within the system can be elaborated as shown in the figure 2.2.2.1 below :

Figure 2.2.2.1: Relationship between stakeholders in POPs management



The main government ministries, agencies and other institutions involved in POPs management and their responsibilities are given in table 2.2.2.1 below. It must be noted that the list would be expanded to include outside partners that for now have not been part of the stakeholders , process but which would be key in certain aspects of the project (such as the NGO Cancer Concern).

Other entities that are also directly or indirectly involved in the chain of activities that are related to the import, use and disposal of POPs pesticides. These include agencies such as the Ministry of Education involved in promoting environmental education in the national curriculum; NGOs on outer islands involved in the detection of POPs, Farmers' Association, and public interest groups such as NATCOF, National Consumers' Forum, Seychelles Chamber of Commerce and Industry.

Despite some inherent weaknesses in operations, the administrative structure in place in the country has coverage of most of the issues associated with POPs chemicals.

Table 2.2.2.1: Main government ministries, agencies and institutions involved in POPs management and their responsibilities.

Agency	Area	Relevant texts
Ministry of Health	<ul style="list-style-type: none"> • Safe use of pharmaceuticals and associated substances in the health sector • Oversight of wholesomeness of food supplied to the public including imported food items • Oversight of the wholesomeness of all potable water • Responsible agency for control of vectors of public health significance, Sole agency which may apply DDT and which can seek for DDT exemption • Operator of medical waste incinerator, and within the present system, only receiving agency for medical waste • Hosts the Pesticides Control Board • Instigator of child development and gender based health studies, • Surveillance and lab based collection of data on users of pesticides, workers and others • Administration of health and safety regulations concerning conditions of work and protection 	Public Health Act Pesticides Control Act
Seychelles Bureau of Standards	<ul style="list-style-type: none"> • Official laboratory for the country, with capabilities (potential and actual) for screening of most POPs species • Official coordinating mechanism for research in the country : SNRC • Development of standards for selection of imported goods, raw materials and for locally produced materials • Development of standards for releases to air, water land and guidance for management and disposal of hazardous substances • Environmental surveillance on behalf of national agencies; including analysis of fish samples, foodstuff, pesticide residues • CISTID: Collection and dissemination of reference documents and BAT/BEP information to professionals and the 	Public health act

Agency	Area	Relevant texts
	<ul style="list-style-type: none"> • public 	
Ministry of Environment and Natural Resources	<ul style="list-style-type: none"> • Natural Resources: training of farmers in crop protection measures and pesticide applications • Importer and distributor of vet drugs and pesticides • Technical advisor to farmers through extension services • Research and development in crop farming, agro forestry and animal husbandry, previously (as agriculture department) conducted research using POPs pesticides • Department of Environment: Monitoring and control of environmental pollution • Control of import/export/use and movement of hazardous substances and wastes • SWAC: Management of waste disposal sites, and maintenance of information on waste and these sites • Implementer of POPs related chemicals conventions (Basel, PIC etc) • Public education and dissemination in general and with targeted groups • Screen and applies controls on all projects and services through Environmental Authorisation process • 	.
ENR subsidiary bodies	<ul style="list-style-type: none"> • SCMRT/MPA: Coordinates and conducts marine research, hosts international researchers • SFA: Conducts research on the quality of fish of commercial importance and also on marine ecosystems • Waste Contractor - STAR Seychelles: Manages hazardous waste stockpiles, disposes and exports where necessary 	Solid and chemical waste management
Ministry of Finance (Customs Authorities)	<ul style="list-style-type: none"> • Collection of data on movement of goods • Control of movement of goods at ports airports and oversight of import/export transactions • Warehousing and disposal of confiscated goods including restricted 	Trade tax regulations, Governing laws

Agency	Area	Relevant texts
	and hazardous substances	
Public Utilities Corporation	<ul style="list-style-type: none"> • Operator of electricity generating plant and distribution network • Sole importer of transformer and high voltage apparatus for electricity distribution • Operates only local facility for incineration of waste oil 	
Employment Department	<ul style="list-style-type: none"> • Control of working conditions, and administration of laws for worker protection 	Employment Act
Ministry of Education and Youth	<ul style="list-style-type: none"> • Integration of environmental education into the national curriculum 	Education strategies

Committees	Main duty
Pesticide Control Board	Registering and regulating the use of pesticides, and the panel for information exchange between Environment, Health, Customs, Licensing Authority, SBS, NGOs
Environment Management Plan Steering Committee	Approval of environment projects and provide guidance to the ministry
Ecotoxicology Committee	Advisory committee to agencies dealing in foodstuff
Health and Safety Committee	Regulate health safety and environment issues at workplaces

2.2.2.1 POPs Pesticides

No POPs pesticides are in use in the Seychelles. The regulation and phasing out of those which were being used has come about through the action of the Pesticides control Board with the collaboration of the ministry

for Health and for Agriculture. Current management of pesticide products fall under the Pesticide Control Board, which incorporates these two plus another five agencies. Monitoring of compliance measures on all products including policing against the entry of restricted pesticides are done by agencies being part of the Board. There is however a separation of responsibilities: for example interception of imports depends heavily on action by the customs division whilst interventions in the field come mostly from Environment and Health. Budgetary allocation for these activities are also currently derived from the resources of the respective agencies, despite the fact that the pesticide control board originally had a budget allocation which came through the ministry for health.

The head of each agency represented on the board nominates personnel of sufficient skill who can represent the organization at the policy level. The chairman is specified in the PCA and in the current case is a medical specialist and all other members (except licensing) have a BSc or higher level education. The Board's human resources also include authorised officers, who are existing staff from departments who participate in inspectorate duties, and also extension staff of the Department of Agriculture who specifically target technical issues with local farmers. In the case where there is a need for collection of information or delivery of lecture sessions on certain topics, each member may call upon other resource persons within that department. One of the main technical setbacks for the control of pesticides is the differences in levels of pesticide specific between members of the board, which prevents a unified and critical assessment of risk, alternatives and regulatory measures.

2.2.2.2 PCB management

PCB has been the exclusive domain of the Public Utilities Corporation. Although there was provision for intervention on health or environmental grounds, it was previously unregulated. Much of the reduction measures was from decisions taken by the corporation itself, decisions which represented an appreciation of the direction of evolution in the electricity generation sector. With the development of the NIP, PCB management shall be developed formally as part of the responsibilities of the agency responsible for the Environment Protection Act.

PUC has the capacity to assess and implement measures regarding its use of PCB since this area is known amongst its specialized staff. On the regulatory side, there is a definite lack of capacity for the authorities to deal with PCB especially when it comes to specialization of inspectorate staff. PCB has not been part of normal field assignments for Environment or Health officers. There is a lack of knowledge on PCB amongst staff, particularly those who have not had higher education. (see appendix 1 below). With regards to detection and evaluation, the Seychelles Bureau of Standards, with some additional technical upgrades, can leverage the capacity for laboratory assessments.

Since PCB has not been a mainstream issue until present, none of the agencies have allocated budgets for dealing with the substance. It is expected nonetheless the government commitment shall be forthcoming

on the ensemble of measures necessary for elimination of all POPs under annexes A B and C.

2.2.2.3 PCDD/PCDF

Management of PCDD/PCDF is the responsibility of the ministry responsible for Environment through its mandate to regulate activities which cause emissions to the air. Major sources such as incinerators and sewage treatment plants are implemented under the approval of the ministry. Burning of biomass is also an activity requiring approval by this ministry, but these are in fact Penal Code provisions (Police) which has been carried over to the Environment portfolio.

In a similar way to PCB, the regulation of PCDD/PCDF emissions was not being consciously done. The main purpose of regulation was to reduce disturbance from smoke emissions. Differentiation between waste types in order to reduce production of these substances was being done haphazardly instead of part of a concerted effort directed at elimination.

Only a limited number of trained staff of the department can carry out reviews of technical aspects of incinerators or sewage treatment plants. People involved in inspectorate duties also lack the necessary knowledge in order to determine risks associated with burning.

2.2.2.4 Overview of laboratory Facilities

Seychelles Bureau of standards (SBS)

The Seychelles Bureau of Standard (SBS) was established in 1987 under the Seychelles Bureau of Standard Act to provide standardization in relation to commodities, processes and practices. SBS has a work force of well-trained employees ranging from documentation officers to scientists whereby they work as a team in a systematic approach in order to offer a quality service to the general public and advice the policy makers on pertinent issues, under their responsibilities. They work closely with the International agencies and organisations. Since its formation SBS has striven to promote the concept of quality throughout the country by the development of various standard documents, which are used as guidelines and even incorporated into the laws of Seychelles. In 1996, SBS attained Certification Status to ISO 9002 quality management system, which helped to place the organisation on the forefront of quality control management in the country.

SBS has, as principal mission to provide national and international capabilities to Seychelles in the area of standards, laboratory testing, applied science and technology and its strategic objective is to provide the

country with technology and scientific expertise, facilities and support in the area of:

- Standard services;
- Technological services;
- Industrial technological and scientific information services;
- National physical resources evaluation and development;
- Ocean based physical resources evaluation and development.

The Center for Science and Technology Division houses the Laboratory Testing Center. It provides test services in a wide range of fields. The designation of the laboratory is as per the activities performed in each laboratory and these are listed below:

- Chemical Analysis Laboratory
- Construction Materials Laboratory
- Environmental Pollution
- Food Chemistry
- Food Microbiology
- Gas Cylinder Testing
- Legal Metrology Unit

With all of the above, SBS is able to enhanced the country's development by ensuring that there is a solid base upon which enterprises can rely for technological and scientific services.

Public Health Laboratory

Public Health Laboratory (PHL) came into operation at the beginning of January 1998, within the Ministry of Health settings. It started as a "Food Control Laboratory", working closely with the Environmental Health Section and was often referred to as the "Food Laboratory" in the quest to the strengthening of the Food Control programmes in the country, originally effected through assistance from the Food Agricultural Organization's consultants who also played an administrative, technical and supervisory role. The staff was recruited from the Clinical Laboratory and due to manpower shortages at the time they still had to some extent shared the Clinical Laboratory work.

Prior to that, the existing Public Health Laws and Regulations had been reviewed in 1986 so as to accommodate the new Food Laws and Regulations. Under the Food Act (1987), the Seychelles Public Health Laboratory was designated as an official laboratory for the purpose stipulated.

It must be noted that before the Public Health Laboratory become operational in January 1998, the clinical laboratory conducted the testing of water samples for microbiology, during food poisoning outbreaks. However, it is important to note that prior to that no food samples were processed and analyzed in the country, because of the unavailability of essential equipment and technical competence. In some instances when the laboratory results were, a key factor upon which to base a critical decision samples were sent overseas for verification.

Over the years due to demands the role and function of the Public Health Laboratory became a pressing issue in view of other parties seeking to utilize its facilities and the need to incorporate other preventive health

activities amongst the services provided. Its main functions are as follows:

- Support Public Health Programmes, including the followings:
 - Environmental Health in particular, Water and Food control.
 - Communicable Diseases Control
 - Occupational Health, in particular the measurement and monitoring of worker's exposure to chemical and workers fitness in the food industry.
- Provide services to other organization such as the Police and Ministry of Environment.
- Support the Epidemiological and Research Division, assisting where applicable in various surveys.

It is not always easy to visualize and directly measure achievements in (Preventive Medicine) public health, therefore the Public Health Laboratory activities are not in the forefront but always playing an important/ critical supportive role. The management of the PHL intends to seek technical assistance to build capacity so as to broaden the scope of its monitoring programme.

2.2.3 Relevant international commitments and obligations

A major part of the environment vision is leadership on a global scale. Local implementation of MEAs forms part of this drive for excellence and leadership role. Seychelles continues to be pro-active in international forums and is one of the countries in Africa that have signed and implemented a large number of the global MEAs in recent years. It must be noted that a large proportion of the MEAs signed or ratified by the Seychelles cover biodiversity related interests (e.g. CBD, Cartagena Protocol on Biosafety, CITES, CMS). However, with corresponding developments at the international and regional level in areas of the environment such as waste, energy and environmental pollution, commitment and programs under implementation are changing. The ratification and implementation of the Stockholm Convention, together with the already ratified Basel Convention, the Montreal Protocol, the Rotterdam Convention and related initiatives under International Forum for Chemical Safety (IFCS), Strategic Approach to International Chemicals Management (SAICM) etc. will contribute to effective coverage of a large numbers of internationally and nationally relevant issues within that specific sector. On the national scale the significance of the ratification of this Convention and its successful implementation should therefore, not be underestimated. Global Environmental agreements signed by Seychelles are listed in figure 2.2.3.1.

The decision making process the government uses to make commitments to MEAS and to subsequently participate in meeting as well as maintain compliance with them is similar to the process for the establishment of policies and legislation nationally as detailed in 2.2.1 above. The relevant institution, in this case the MENR, will prepare and present a memorandum to the NIC, the Cabinet of Ministers and the National

Assembly (submitted in this order) for their approval. The memorandum must detail why Seychelles should ratify the Convention and the obligations associated with the ratification as well as the possible ways and means of implementing it. Upon approval the relevant institution will advise the Ministry of Foreign Affairs accordingly to prepare the ratification papers and initiate the ratification process. The relevant institution will at the same time prepare the relevant legislation and policies to implement the Convention.

Relevant legislation is prepared in conjunction with the Attorney General's Chambers. Any new legislation has to go to the National Assembly for approval. Upon approval by the National Assembly and signature by the Minister responsible for the relevant institution or the President as may be required by law, the new legislation will be gazetted in the Government's Official Gazette in order to become effective.

Participation in international Convention meetings has been inconsistent and often ineffective. This is firstly due to a lack of financial resources, especially within government, which limits participation to fully funded meetings and secondly due to a lack of involvement of non state actors in the national process. Compliance with the requirements of such agreements is monitored by the International Conventions Unit which has been set up within MENR

Figure 2.2.3.1: MEAs signed by Seychelles



Global MEAs signed by Seychelles

- Convention on the Wetlands of International Importance Especially as Waterfowl Habitat, Ramsar, Iran 1971 - Ratified 2004
- Convention on International Trade in Endangered Species – signed 1977
- United Nations Convention on the Law of the Sea, 1982 – Ratified 1991
- Vienna Convention for the Protection of the Ozone Layer, 1985 – acceded 1993
- Montreal Protocol, 1987 and its amendments – signed 1993
- Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal, 1989 - acceded 1993
- Convention on Biodiversity, 1992 - Ratified 1992
- Cartagena Protocol on Biosafety to the Convention on Biological Diversity, 2000 – Ratified 2004
- United Nations Framework Convention on Climate Change, 1992 - ratified 1992
- Kyoto Protocol, 1997 – Ratified 2005
- Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, 1998 – signed 1998
- Convention on Persistent Organic Pollutants (POPS), Stockholm, 2001 – Signed 2002
- MARPOL Convention - ratified 1984

Regional MEAs signed by Seychelles

Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region, Nairobi, 1985 and its Protocols – Ratified 1990

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

There is no legislation that addresses POPs specifically in the Seychelles. Legislative authority is assigned to different agencies with each agency dealing with a specific substance on the basis of intended purpose. Table 2.2.4.1 below lists all POPS related legislation and regulatory mechanisms within the Seychelles.

Table 2.2.4.1: POPs legislative and regulatory framework

Legislative/ Regulatory Framework	Implementation Agency	Area
Environment Protection Act, 1994	MENR: Department of Environment (DOE)	Pollution prevention, control and abatement
Environment Protection Designation of Solid Waste and Cleaning Agency (SWAC) Regulations, 1995	SWAC	Solid and chemical waste management
Environment Protection (Standards) Regulations, 1995	DOE: Pollution Control Unit	Setting of limits for effluent discharge
Pesticides Control Act, 1996	MENR: Department of Natural Resources	Safe use of pesticides
Occupational Safety and Health Decree, 1978	Ministry of Employment	Occupational Health and Safety issues regarding chemicals, hazardous materials etc.
Public Health Act, 1960	Ministry of Health	Public Health and Safety issues
Trades Tax Act/Customs Regulations	Customs Authorities	Control of imports and exports of POPS related chemicals
SBS 1994 SS 36 94 Code of Practice for Handling, Storage and Disposal of Hazardous Chemicals	SBS	Handling, Storage and Disposal of Hazardous Chemicals & other Agricultural

Legislative/ Regulatory Framework	Implementation Agency	Area
& other Agricultural Pesticides		Pesticides

Detailed below are the provisions of relevant POPs related legislation.

The EPA 1994 empowers the Minister responsible for Environment to prescribe Regulations for pesticide residues in the environment⁶², i.e. the Environment Protection (EP) (Standards) Regulations⁶³ on effluent quality.

Under the Act no person is allowed to discharge or place in to the ground or dispose in the subsoil or dig into the ground any polluting or hazardous substance or waste⁶⁴ or throw, deposit or place any polluting, or hazardous substance or waste in any watercourse or in the territorial waters.

Section 11 (4) further makes it an offence to release or cause to be released into a Coastal Zone, as designated under the Act, any polluting or hazardous substances by dumping or through the atmosphere. Under the EPA⁶⁵ "hazardous substance" is defined as any substance or preparation which by means of its chemical or physico-chemical properties or handling, is liable to cause harm to human beings, other living creatures, plants, micro-organisms, property or the environment. "Hazardous waste" is defined as being waste, which is poisonous, corrosive, irritant, noxious, explosive, inflammable, toxic or harmful to the environment.

Section 12 of the EPA 1994 provides specifically for the management of waste. The section states that the Minister shall prescribe standards for the classification and analysis of wastes and on the standard treatment and disposal methods and regulations on the introduction, production, possession, handling and storage, transportation, segregation and disposal of hazardous waste. Furthermore, the section provides for the Minister to designate the Agency responsible for the management of wastes. Accordingly, SWAC was designated under the Environment Protection (Designation of Solid Waste Agency) Regulations, 1995⁶⁶, which lays down the functions of the Agency. The Agency is responsible for the management of wastes; the designation, monitoring and regulation

⁶² S 6 EPA

⁶³ SI 38 of 1995

⁶⁴ S 7 (4)(a) EPA

⁶⁵ S 2 EPA

⁶⁶, S I 48 of 1995

of waste disposal sites and also to authorise the deposit and discharge of waste at the waste disposal sites.

Section 12 of the EPA further states that no person shall deposit or discharge on any land or cause or permit to be deposited or discharged on any land, any waste except as authorised by the Act⁶⁷. The Act states that no person is allowed to import any hazardous waste into Seychelles⁶⁸ or to transport hazardous waste within or through Seychelles or export hazardous waste to any country without an Authorisation from the Agency or the prior informed consent of the receiving country without an Authorisation from the Agency⁶⁹. Section 14 of the Act provides for the management of hazardous substances. It states that no person shall handle⁷⁰ or cause to be handled any hazardous substance except in accordance with such procedures and after complying with such safeguards as may be prescribed. Accordingly, the following documents have been issued by SBS: *SBS 1994 SS 36 94 Code of Practice for Handling, Storage and Disposal of Hazardous Chemicals & other Agricultural Pesticides*; *SBS 1995 SS 45 95 Code of Practice for the Disposal of Hazardous and Radio-Active Waste*.

The *Pesticides Control Act, 1996* regulates the manufacture, distribution, use, storage and disposal of pesticide for the protection of public health and the environment. Under the Act, no person shall manufacture, import, export, sell, offer for sale, supply, use, store, transport, possess, dispose or otherwise deal with any pesticide unless the pesticide is a registered pesticide under and for the purposes of this Act.⁷¹ A person who imports or exports a pesticide shall declare and offer for inspection the pesticide at the time of import or export to an officer authorised under a written law to inspect goods imported or exported.⁷² Furthermore, no person shall sell, offer for sale or supply any pesticide unless it is labelled in accordance with the Act.⁷³ Restrictions apply on the storage of pesticides.⁷⁴ Only suitably trained and qualified persons shall engage in a Scheduled Operation and such persons shall while so engaged wear protective clothing, approved by the Board, to prevent absorption of pesticide by skin or eye contact, inhalation or ingestion.⁷⁵ (Refer to Pesticide Control Act 1996 in annex 2). In addition to this, no person shall mix or pour any pesticide on an open ground within 9 meters of a water course.⁷⁶ The Act also states that any person who mixes or pours any pesticide shall take precautions to prevent spillage of the pesticide on the soil or floor and shall report any spillage to the Registrar within 24 hours

⁶⁷ S 12(3) EPA

⁶⁸ S 12(7) EPA

⁶⁹ S 12(8) EPA

⁷⁰ Handling means the manufacture, processing, treatment, package, storage, transportation, importation, use, collection, destruction, and conversion, offering for sale, transfer of any substance or the like of any substance: EPA Art 14(2)

⁷¹ S 10 PCA 1996

⁷² S 11 (2) PCA

⁷³ S 12 PCA 1996

⁷⁴ S 14 PCA 1996

⁷⁶ S 15

of such spillage.⁷⁷ Any person engaged in the spraying of any ground crop, trees, bushes or climbing plants with a pesticide, other than a household biocide or any such operation where a household biocide in excess of 250 grams or 1 litre is being used or dealt with, within an open area shall display in a conspicuous place in that area a notice.⁷⁸

It must be noted that POPs pesticides listed in Annex A do not feature on the list of registered pesticides to which the PCA apply.

All POPs chemicals listed in annex A and B of the Convention appear on a list of restricted goods requiring an Import Permit and Authorisation for importation as published in the Seychelles Nation as from 1st January 2005 by the Department of Finance. This list will have to be legalised under the *Trades Tax Act*. Several weaknesses have been identified in the existing legislative and regulatory framework in order for the Seychelles to effectively implement the provisions of the Stockholm Convention. There is no legislation that addressed POPs specifically in the Seychelles though there is an appropriate legally enforceable regulatory instrument in place i.e. the Pesticides Act. The provisions of the Act, however, do not apply to the POPs pesticides listed in Annex A. Furthermore, legislation on pesticides does not cover whole life cycle of chemicals. Refer to Annex 3 which details the weaknesses within the pesticides regulatory system.

Major setbacks of the regulatory mechanism is that there is no requirement on users to undertake an inventory of the stocks of pesticides and there is no requirement on suppliers and buyers prepare and make available reports on the application of pesticides (when and where it was applied and for what purposes). The existing provisions under Section 37 of the EPA 1994, which empowers the Authority to collect information, may be utilised to require such persons to report on their activities and pesticides used etc.

Under the PCA 1996, there is no legal requirement to register persons who use, import, export, sell, and offer for sale or supply pesticides. Only persons applying to register a pesticide under the Act shall be registered once the application has been approved by the Board.⁷⁹ This gap is further deepened by the fact that there is no legal duty under the PCA to maintain register of importers. The Act does not specify how new pesticides would be added to Schedule 1 of the Act.

The other legislative and regulatory frameworks addressing POPs that have been listed in Table 4 above will be detailed in the subsequent relevant parts of the NIP. Legislation that will be enacted or that will require amendment to address these deficiencies, in order to give effect to the provisions of the Convention, will be elaborated in detail in the Action Plans and Strategies in Part 3 of the document.

⁷⁷ S 16

⁷⁸ S 17

⁷⁹ S 9(3) PCA 1996

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

The key approaches and procedures for POPs chemical and pesticides management have been detailed through the detailed description of responsibilities of key institutions involved in the management of POPs chemicals and pesticides (Refer to Part 2.2.2 on “the institutional framework on roles and responsibilities of ministries, agencies and other governmental institutions involved in POPs life cycles (from source to disposal, environmental fate and health monitoring)”) and through the detailed description of the legislative and regulatory framework relating to POPs in the country(Refer to Part 2.2.4 on “description of existing legislation and regulations addressing POPs (manufactured chemicals and unintentionally produced POPs”). The management of POPs pesticides is further detailed in the Assessment 2.3.1.7.

Both the EPA and the PCA provide some form of legal background for enforcement and monitoring practices in relation to POPs. Authorised officers may be appointed under the EPA and the PCA for the proper discharge of any functions under the Acts. For the EPA, officers have been designated under the Environment Protection (Miscellaneous) Regulations, 1995⁸⁰.

Part V of the EPA provides for the enforcement of the Act where notices⁸¹ may be issued where there is a contravention or where there is likely to be a contravention of any provision of the Act. Officers designated under the EPA Act are also empowered with powers of entry, inspection, seizure and arrest (in cases of environmental emergencies) to further the objectives of the Act⁸². Officers designated under the PCA are empowered to inspect, examine, take samples of pesticides, order the disposal, including export of any unregistered pesticide; request any person concerned with pesticides to produce any permit, licence or any document relating to pesticides; enter, search, arrest and detain where there has been or is likely to be a contravention of the Act.⁸³

In relation to monitoring requirements, designated authorised officers have the power to take samples of air, water, soil or other substances from any factory premises or other place for the purpose of analysis.⁸⁴ The procedures for the taking of samples, for analysis and the submission of related reports have also been detailed. Government analysts as well as environmental laboratories have also been designated for the purposes of applying standardisation methods for sampling and analysis of various types of effluents and pollutants; analysing samples sent by authorised

⁸⁰ SI 84 of 1995 as amended by SI 118 of 1995; SI 74 & 84 of 1996 and SI 29 of 2000


⁸¹ Enforcement Notice: S 16; Prohibition Notice: S 17; Variation Notice: S 18 & Withdrawal Notice: S 19 EPA 1994

⁸² Sections 21, 22 and 24 respectively

⁸³ SS 20 & 21 PCA

⁸⁴ S 25 EPA

officers and for carrying out any other functions under the Act. The following laboratories have been accordingly designated; the Public Health Laboratory in the Ministry of Health, The Laboratory Section within PUC, the Environmental Laboratory of the SBS and the Soil and Plant Diagnostic Laboratory in the Department of Natural Resources.⁸⁵



⁸⁵ SI 84 of 1995 as amended by SI 118 of 1995; SI 74 & 84 of 1996 and SI 29 of 2000

2.3 Assessment of the POPs issue in the country

Introduction

Assessment of the POPs issue in the country was done through assignment of working groups decided in late 2003 and implemented throughout 2004 (table 2.3.1.). Seven working groups worked on different areas of the program and the allocation of work was done as follows. It must be noted that following discussions with the UNIDO consultant, it was decided that given the scope of POPs in the Seychelles, it was not necessary to carry out all the inventories mentioned in the guidance document, but rather to concentrate on those which were necessary. Information used to complete those inventories, not mentioned in the list below, are derived from the contents that were actually collected through the inventory process and also reviews in the action plans which appear later under heading 3.0.

Table 2.3.1: Assignment of the work groups for inventory taking

Working group	Stakeholders
1. Assessment of public information and awareness in the management of POPs	Ministry of Education, Ministry of Environment, NATCOF
2. Monitoring of releases and environmental and human health impacts of persistent pollutants	Ministry of Health
3. Assessment of emissions of dioxins and furans and PCB in the environment	Ministry of Industry and International Business, Electricity Company
4. Assessment of national infrastructure and institutional capacity to manage POPs	Ministry of Environment
5. Evaluation of import control of pesticides and other chemicals	Academic institution
6. Assessment of overall situation of POP pesticides and DDT in the Seychelles	Customs, Department of Natural Resources
7. Assessment of possible contaminated sites	Ministry of Environment, Seychelles Bureau of Standards, STAR (Waste Management Company)

A one day workshop on preliminary inventories was organised on 21st October 2004 by the POPs National Committee. The workshop included all the working group members and the national committee. The aim of that workshop was to discuss the main findings of each working group as discussed in their draft reports and ensure that the information therein were according to the terms of the contract. This also gave the working groups the opportunity to meet with the project coordinator and bring

forward any difficulties they were faced with, thus paving the way for the prioritization of issues to be included in the implementation plan.

The drafts were also circulated between all working groups for feedback and comments and a general discussion brought all the relevant points together to prepare the working groups for the final drafts to be submitted. The discussions during the workshop were mostly of technical nature: participants were encouraged to be critical of the work of each working group and to note areas of information where gaps were present. Some of the main points discussed the presentations included delays in obtaining information, mostly because of a lack of recorded information or unavailability of resource persons, or even lack of quantitative data for example in the case of contaminated sites.

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.

2.3.1.1 Summary

During the year 2001, a case study was undertaken to assess the situation of POP in the Seychelles. This report entitled *"Inventory of Persistent Organic Pollutants Pesticides"* focuses on the trade, use and distribution of POP pesticides in the Seychelles. The information was collected on the basis of primary and secondary data. It is to be noted however, that it has been difficult to obtain quantitative data on POP as gaps in information has been identified. The findings of the study have indicated that a number of POP pesticides were introduced in Seychelles for control of pest in agriculture, environmental health and for control of termites in construction.

It has been observed that despite the fact that the institutional and human capacity of the Seychelles is limited to cater for the monitoring of POP pesticides; there has been no importation of POP pesticides for use in the Seychelles. Stockpiles of POP pesticides have not been identified although a number of obsolete pesticides have been recorded on various sites visited. The present capacity of the country cannot face the emerging challenges in relation to POP pesticides unless the weaknesses are addressed.

2.3.1.2 Introduction

The study has been based mainly on the collection of information from primary and secondary data sources. Primary data collection would have been mainly through unstructured interviews with past workers of the

Department of Agriculture, Department of Health and private companies involved in the importation of pesticides. Field visits were also conducted to farms, private pest control operators, ministries, hotels and shops involved in the importation of pesticides. During the field visits, pesticide stores were inspected and informal interviews with the store supervisors were conducted. The information collected on the field was recorded in an Inventory Form as reproduced in Appendix 2 to Assessment 2.3.1.

The field visits were carried out to companies having a pesticide store based on information available from the Pesticide Board and documentation of the Trade Tax Import Division of the Department of Finance.

Some information was also collected from individuals who have an input and knowledge regarding the use of pesticide in the Seychelles. Informal, unstructured interviews were conducted with individuals from the Department of Agriculture and private companies involved in the importation of pesticides.

The secondary data sources would include mainly the review of past documents from the Departments of Health and Agriculture. Data was also collected from samples of bills of entry and import data collection from the Customs office within the Ministry of Finance.

Whilst conducting the inventory on POPs pesticide a number of difficulties and constraints were encountered. The most pertinent difficulties were associated to:

1. The absence of documents in relations to past studies and research conducted.
2. Poor documentation of documents thus creating gaps in information flow.
3. Methods of data captured leaving out essential information about the quantity of POPs pesticides being imported.
4. Wrong classification of data on POPs pesticides by importers. As a result POPs pesticides are not always detected by Customs and as such may impact on the statistical information extracted from the database.
5. There were gaps in information collected on POPs pesticides and simultaneously there were misinterpretation by past workers of the agricultural sector and the public in general.
6. Lack of human capacity with knowledge and skills in identifying POPs pesticides.

2.3.1.3 Legislative, Institutional and Regulatory Framework

The general legislative, institutional and regulatory framework relating to the regulation, approval, import and export, use, disposal and the mechanism for banning and managing POPs pesticides has been detailed Part 2.2.2 and 2.2.4 above.

The relevant legislation include the EPA 1994 , Environment Protection (EP) (Standards) Regulations⁸⁶ on effluent quality, SBS 1994 SS 36 94 Code of Practice for Handling, Storage and Disposal of Hazardous Chemicals & other Agricultural Pesticides; SBS 1995 SS 45 95 Code of Practice for the Disposal of Hazardous and Radio-Active Waste, Pesticides Control Act, 1996 and Trades Tax Act.

Legislation exists in relation to occupational health and safety measures. The *Occupational Safety and Health Decree, 1978* puts a duty on every employer to ensure the health and safety of his employees. These duties include arrangements for ensuring the safety and the absence of risks to health in connection with the use, handling, storage and transport of articles and substances as well as the provision of such information, instruction, training and supervision as is necessary to ensure health and safety at work for his employees.⁸⁷

The Pesticides Board, Established under the PCA 1996 is the institution responsible for the approval, banning and licensing for handling pesticides in the country. The functions and composition of the Board are detailed in Part 2.2.2 above.

The Seychelles Bureau of Standard (SBS) is the certified laboratory to undertake the necessary laboratory tests on pesticides as designated under the EP (Miscellaneous) Regulations, 1995.⁸⁸

The Seychelles Licensing Authority (SLA) is responsible for the issuing of licenses to importers⁸⁹ and it has the mandate to revoke a license in the event that the conditions of such licences are not being adhered to or if such a request is being made by the other bodies concerned.

2.3.1.4 Past, Present and Projected Production and Use of POPs Pesticides

There is no production of POPS pesticides in the Seychelles. Pesticides have been in use in the Seychelles since the early 1900s' mainly for the control of pest in agriculture and for the control of disease vectors in environmental health. Pesticides were mainly used in agriculture to protect crops and livestock from pest and as a result to increase food production. The health and environmental risks associated with the use of pesticides became a concern all around the world, during the mid 1900s'. Seychelles became more concern with the impact of pesticides to the human health and the environment as early as 1980s. Government decided to raise awareness of the authority and the general public regarding the use of pesticides. The ministry responsible for agriculture has published a number of documents to guide farmers and the public in general towards the safe use of pesticides. This initiative was further consolidated with the enactment of the *Pesticide Control Act* in 1996.

⁸⁶ SI 38 of 1995

⁸⁷ S 4 Occupational Safety and Health Decree, 1978

⁸⁸ SI 84 of 1995 as amended by SI 118 of 1995; SI 74 & 84 of 1996 and SI 29 of 2000

⁸⁹ S 6(3)(a) Licences Act 1986

Past Uses of POPs Pesticides in the Seychelles

POPs pesticides were used at various locations in Seychelles for control of pests in agriculture, environmental health and in construction. The POPs pesticides used were:

a) *Toxaphene*

Toxaphene is an insecticide used in various countries for control of pest in fields and in livestock. Its use in the Seychelles was recommended as an alternative for the control of buffalo flies and ticks in cattle and was used in the 1950s. The product was used as a spray on the cattle and the department of agriculture sold diluted Toxaphene and para dichloro benzene to the public for the control of buffalo flies in cattle. The products were used in the 1950s' unfortunately there is no records of the dosage and there is no records as of when the product was discontinued.

b) *Aldrin and Dieldrin*

In 1952 the experiment with insecticidal treatment of coconut trees for control of *Melitoma* beetles extended to Mahé and Praslin and the following pesticides were used: Paradichlorobenzene, Agrocide and Gammexane (*Lindane based products*) and Aldrex 10% solution and Dioldrex 10% solution. Paradichlorobenzene crystals were spread around the coconut trees. Agrocide and Gammexane were used as in the form of sprays and were applied to the base of the coconut palms. Aldrex and Dioldrex solutions were sprayed separately using water, or diesel oil or kerosene at the base of the coconut tree. These two products were also used as soil fumigants. The fumigation techniques were reported as being the most successful. Therefore it can be speculated that the two products might have been applied on various coconut plantation across the control area.

c) *Aldrin*

Aldrin was experimented for the control of melitomma beetle in coconut plantations on Mahe and other granitic islands in the 1950s and the experiment has proven to be successful.

Aldrin was also used in the mid 1960s for the control of crazy ants (*Anoplolepis longipes*) up to 1996. The product was primarily experimented in the form of a spray for indoor control. The results proved very effective with its effect lasting for 2 months. At a latter stage, Aldrin was used as bait. The bait contained Aldrin incorporated with coconut fibres, sugar, salt and Marmite yeast extract. The bait was used on over the country where the pest occurred. The product was sold to households, farms and other institutions for the control of crazy ants. This would imply that the distribution and use of Aldrin is wide spread.

Unconfirmed report of the ministry responsible for Agriculture would indicate that Aldrin was last imported in 1993. The production of bait for the control of crazy ants stopped in 1996 and since then no replacement has been found. The activity regarding the control of household pest, which was formally undertaken by the Ministry responsible for agriculture ceased, and this responsibility has been handed over to private pest control operators.

d) Chlordane

Although to date not much information has been obtained regarding the use of chlordane, it is widely being said that chlordane was used in construction as a preservative of wooden structures against termites and other soil insects.

Present Uses of POPs Pesticides in the Seychelles.

There are presently no POPs pesticides in use in Seychelles. Projected uses of Pesticides will be detailed in Assessment 2.3.6 entitled "Summary of future production, use and releases of POPs- requirements for exemptions". There is the possibility that Aldrin may be re-imported and used in the future to control the crazy red ants which are re-emerging.

2.3.1.5 Imports and Exports of POPs Pesticides in Seychelles

Past imports of POP Pesticides

Pesticides were originally imported into the Seychelles for use in agriculture, environmental health, household and construction. A Report from the Department of Agriculture, 1916, indicates that in 1916, there was the use of pesticide for the control of pest of agricultural importance. The import of pesticides took a wider scope in the 1950s'; new pesticides were introduced notably in agriculture for the control of the new emerging pests and diseases of agricultural importance. In the 1980s' agriculture in Seychelles moved from subsistence farming to a more business oriented activity and emphasis was put on the production of more food crops as opposed to plantation crops of the earlier years. With the diversification in agricultural crop production, the introduction of new technology and introduction of new plant varieties, there came along the introduction of new pesticides for use in crop protection.

During the early years of the introduction of pesticides into the Seychelles there were very few agencies involved in the import. The bulk of pesticides were imported by the department/ministry responsible for agriculture followed by the ministry responsible for health and later by a few private companies notably Seychelles Petroleum Co., Ltd. and BODCO LTD. A study conducted by the Food and Agricultural Organisation (FAO), from 1989 to 1990, reported that agricultural pesticides were imported by the Ministry of Agriculture and Fisheries (MIAFI) through quotations received largely from the original manufacturers of respective pesticides. The type of pesticides to be purchased was decided upon by MIAFI. The pesticides were imported in large containers and repacked into smaller units, a label affixed and distributed to the various agricultural stores for sales to farmers.

Up to the 70's, very few pesticides were imported. The agricultural census conducted in 1978 indicated that the amount of pesticides imported were minimal.

The pesticides and its products were imported mainly by:

1. The Ministry responsible for Agriculture,
2. The Ministry responsible for Health and
3. A few private companies.

POPs pesticides imported by the Ministry responsible for agriculture were for use to control pests in livestock production. Not much data is available on past imports of pesticides and it is therefore difficult to establish the true amount of POPs pesticides imported in Seychelles. However, based on available documents, it is known that amongst the POPs pesticides classified under the Stockholm Convention, a number of POPs pesticides were imported into the Seychelles and these include: aldrin, chlordane, dieldrin, toxaphene. Aldrin was used in the preparation of bait for control of crazy ants and the Ministry of Agriculture & Marine Resources last imported it in 1993.

Since the introduction of the Pesticide Control Act in 1996, the use and import of POPs pesticides has been regulated. Only pesticides listed under the Schedule to the Act may be imported subject to an authorisation from the Pesticides Board. POPs pesticides are not listed under the Schedule.

Present Imports of POPs Pesticides

The study so far has revealed that there are 32 licensed companies, registered with the Pesticide Board, involved in the importation of pesticides. However, records from the Trade Tax Department indicated that there were 442 pesticide importers during the year 2003. The number of authorised importers of pesticides represents only 7% of the total importers. This would indicate that there are a good number of unauthorised pesticide importers. The importers would be categorised as:

1. Hotels and restaurants,
2. Ministries and departments
3. Parastatal organisations
4. Farmers
5. Pest Control operators
6. Individuals

It is to be noted that the bulk of import of pesticides is made by the Ministry of Health, Ministry of Environment and Natural Resources, Pest Control Operators and Hotels.

Amongst the importers of pesticides, it has been noticed that a number of hotels, mainly the five star hotels are importing pesticides, either in the form of aerosol sprays or other formulations for pest control operations at their premises. For the year 2001-2003, it has been observed that 3% of the importers of pesticides are hotel and tourism establishments and the farmers represent only 1%. Farms also import a moderate amount of pesticides for local use. Very few of them are involved in importation of pesticides compared to the amount of farms in Seychelles. Data for the year 2003 shows that most farms are doing their imports through the appropriate authorised importers or are buying pesticides locally from the appropriate ministry. All licensed pest control operators are involved in the import of their own pesticides and this represents 21% of the

approved pesticides importers. The remaining importers are wholesalers (ministries and departments) and retailer shops. A few individuals have also been importing pesticides but these are mainly in small quantities for household use.

From the wide range of pesticides imported, insecticides are the most common and also the class imported in greater volume. Most of the imported insecticides are aerosol sprays such as the Baygon spray and Doom, which contain compounds such as permethrin and D-Allethrin. It is clear that imports vary according to the categories of importers. Individuals and outlet retailers stick strictly to the class of imports they are suppose to and are in compliance with the pesticides act. They are also importing relatively small amount of pesticides in terms of is monetary value.

Information collected from the database of the Trades Tax Import Division office (Customs) and from the field visits, showed no records of import of POPs pesticides. Nonetheless, a number of restricted pesticides have been imported by hotels and pest control operators. It has been observed that despite the fact that farmers utilise a large amount of pesticides for control of pest on the farms, very few farmers import pesticides, they benefit mainly from pesticides imported by the ministry responsible for agriculture. This inventory has established that most of the products imported are for agricultural and horticultural use in the form of sprays and baits and there are a large amount of aerosol sprays being used for household use.

Based on the data collected during the study, it would appear that there has been no import of POPs pesticides for use in the Seychelles since the introduction of the Pesticide Control Act of 1996.

Seychelles has been importing a wide range of pesticides for decades but very few importers were licensed to import pesticides. With the enactment of the Pesticide Control Act, the policy on agricultural development and recently the liberalisation of imports and reduction of Customs duty, more importers have shown interest in importation of pesticides. The inflow of pesticides and the number of importers is likely to increase. The present institutional and human capacity of the country may not be able to cope with the challenge. The present capacity of the Custom Division Service is unable to cope with an increase in the imports of pesticides and the handling of pesticides at the points of entry. There are no appropriate facilities to safely store consignments of pesticides. Custom officers have insufficient knowledge on pesticides products, which may impact negatively on the clearance of pesticides product, including POPs pesticides, through Customs.

Future imports of POPs Pesticides will be dealt with under **Assessment 2.3.6** on the summary of future production, use and releases of POPs- requirements for exemptions

As stated earlier, there is the possibility that Aldrin may be re-imported and used in the future to control the crazy red ants which are re-emerging.

Exports of POP pesticides

Seychelles does not manufacture pesticides. For decades the country has been an importer of pesticides. The only available information on the export of pesticides is recorded under the project on *“Obsolete and Unwanted Pesticide Stocks Disposed of in Seychelles⁹⁰”*. The project was funded by FAO, in 1997 and was aimed at identifying stockpiles of obsolete pesticides for disposal. Following this, the Seychelles exported a total of 11.887 tones of obsolete pesticide to UK for incineration. Amongst the pesticides exported were highly toxic products but no POPs pesticides were recorded other than DDT. A total amount of two hundred and twenty five kilos (225 kg.) of DDT from the Ministry of Health and Ministry of Agriculture (Grand Anse Research Station) sites was included.

Characteristics of Retailer and Utilisation Market

Whilst no study has been undertaken on the retailer and utilisation market, information provided on the import of pesticides above give a good insight in the current situation in the country. The biggest users of pesticides in the country are for household biocides such as mosquito repellents and these include institutions such as hotels and DMCs. This is followed by use of pesticides for agricultural purposes. Pest control operators represent a small number of users but they import a lot of a particular type of pesticide for their purposes.

Characteristics of Customs Control

The Customs office of the Department of Finance inspects all import and export of goods entering the country. Under the PCA 1996 a person who imports or exports a pesticide shall declare and offer for inspection the pesticide at the time of import or export to an officer authorised under a written law to inspect goods imported or exported.⁹¹ However, custom officers lack the technical knowledge, expertise and capacity to detect the entry of pesticides in the country as they have very limited knowledge on pesticides on the whole including knowledge of POP pesticides. Shortcomings in the classification of pesticides have been noticed in the database of the Customs office. Their Division also has limited suitable storage facility necessary for such product. Although training was held for some Customs officers by the Pesticide Board, there has been no follow-up to update their knowledge and to ensure that the training has been effective. The study conducted to prepare this inventory also noticed that there is a deficiency in the customs procedure for the clearance of pesticides related products

Customs Division is equipped with a number of documents, which should serve as guiding documents for the control of import of pesticides at the points of entry. The documents available are:

- a. The Pesticide Control Act;

⁹⁰ FAO (1997) *Obsolete and Unwanted Pesticide Stocks Disposed of in Seychelles*

⁹¹ S 11 (2) PCA

- b. The Standard Operating Procedure, which is a set of procedures to follow;
- c. The list of authorised importers
- d. Documents required by the importers

Despite the availability of these documents, it is to be noted that such documents are not readily accessible to all custom officers.

The inventory also noted that Customs is not regularly supplied with an updated list of approved pesticide importers. It is worth noting however, that since the year 2004, there has been remarkable improvement on the part of Customs. The Customs Officers are becoming more aware of their responsibilities in reporting and querying over the importation of pesticides.

Although Seychelles is surrounded by water there are only 2 official declared points of entry that are subjected to inspection by customs and these are the International Airport, and the Port in Victoria. However, due to limited surveillance on the open seas, the risk of illegal activities is high. Possibilities for illegal trade exist. It was reported that a consignment of chlordane was intercepted at the Victoria commercial port in the year 2002 and the authorities ordered the reshipment of the consignment. In 2003, 5 litres of lindane was intercepted. There is the possibility for small quantities of POPs to enter the country especially under false names particularly due to the lack of technical knowledge of customs officers on POPs pesticides. Furthermore, the system of inspection of containers entering the country is not comprehensive enough to detect any chemicals that may have been concealed within the container.

2.3.1.6 Identified Stockpiles of POPs Pesticides and POPs Pesticides Waste

In 1990 certain amounts of pesticides were found to be too old to be used. An estimated quantity of about 500kg of solids and liquids were found amongst the products identified but the listed products did not reveal the presence of POPs pesticides.

An inventory on obsolete pesticides was conducted in 1997. The preliminary report of the inventory revealed that there were a number of obsolete pesticides, stored at various locations on the island. An estimate of 10 tonnes of obsolete pesticides was reported.

Amongst the product listed there were no POPs pesticides other than DDT. These products were transported to the United Kingdom in 1998 for safe disposal.

Although there has been speculation that POPs pesticides were continuously being imported into the country, the inventory has not been able to confirm the identification of any stockpile of POPs pesticides. Stocks of obsolete pesticides were, however, identified in a few stores on Mahé with products manufactured since late 1980s' and early 1990s'. The

products were being adequately stored and the containers were in good conditions. However, with poor labelling of the products and inadequate information on labels in certain cases one cannot be certain of the content of some products. In other cases, we were made to understand by some storekeepers that some pesticides were imported without specification of the content of the products and there are no existing facilities to identify the products. It is to be noted that no obsolete stocks of POP pesticides were detected.

Very few empty containers were noticed on the sites visited. The main types of empty containers were plastic containers for rat bait and a few 1litre plastic containers of fungicides.

Disposal of pesticides has always been a concern for the Seychelles. The country does not have the facilities to dispose of unwanted stock of pesticides. However, it is said that a number of unwanted containers and unwanted pesticides were buried and in some cases, the empty packaging containers were burnt. This information has not been confirmed but it has led to believe that such practise could have been possible.

A study, conducted in 1989- 1990, proposed the disposal of unwanted pesticides in the following manner:

- i. Request the assistance of international agencies whereby pesticides can be moved to a foreign country for disposal preferably by incineration in specially constructed chemical incinerators;
- ii. Bury the pesticides in specially designated chemical disposal sites;
- iii. Construct a special disposal store near the agricultural Central Store at Grand Anse

Mahé. Empty the unwanted pesticides into large plastic tanks and keep them in the store. The plastic tanks should be opened at the top and contain soil which should be high in calcium carbonate of about pH 8.

Activity 2.3.5 on "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" will provide further information on the storage areas of POPS pesticides, the location of such areas and if environmental contamination is suspected.

2.3.1.7 Present Management (production, use, stockpiles and waste) of POPs Pesticides and Empty Containers

As early as 1916, pesticides were being used in the Seychelles for the control of pest mainly in agriculture. However, in 1925 with the enactment of the Plant Pest Act 1925, the use of pesticide was regulated for the fumigation of imported seeds plants, vegetables and fruits on Hodoul Island.

Up to 1996 there were no law on the registration, manufacture, repacking sale and use of pesticides in Seychelles. Most pesticides were imported by

MIAFI⁹² through permits issued by the Seychelles Marketing Board. The SMB⁹³ also issued licenses for the import of pesticides by other organisations such as pest control companies.

A study conducted during the year 1989 to 1990 noted that a large number of pesticides were used in the Seychelles especially in the domain of agriculture. The study revealed that there was a lack of awareness regarding the adverse effect of the pesticides and the products were not being applied properly. The study also revealed that safety measures were not being observed and there was no proper mechanism for the registration and control of pesticides. As a result, the government announced the revision of the list of pesticides for use in agriculture and the need to develop legislation for control of Pesticides. A "Control Scheme" for control of use and distribution and import of pesticides was proposed to the Ministry responsible for agriculture. The primary objective of the scheme was to provide the farmers and other users of pesticides with products that are effective against the target pests, which pose little or no threat to those handling the pesticides, consumers of food treated with pesticides and to the environment. The scheme also proposed that under the Seychelles Bureau of Standards Act, 1987 (Act 8 of 1987) a list of pesticides for use in agriculture, veterinary, household and Public Health be produced. Amongst the listed products a POP pesticide, chlordane was listed. Under this list:

- Chlordane was authorized for use in agriculture, (10% bait for control of red ants)
- Chlordane for use in structural and domestic by commercial pest control operators.

The proposed scheme made provision for:

- Storage of pesticides with specifications for stores.
- Sales of pesticides
- Safety and First Aid
- Procedure for cleaning up spills
- Decontamination of spilled area
- Disposal of pesticides and empty containers
- Selection and construction of disposal pit

The current practice for the management of POPs pesticides nationally has been detailed in 2.2 above.

The SBS 1994 SS 36 94 Code of Practice for Handling, Storage and Disposal of Hazardous Chemicals & other Agricultural Pesticides establish guidelines for the disposal of pesticides in Seychelles. However, it does not apply to empty containers of pesticides nor does it apply to POPs pesticides. It has been indicated, by private Pest Control Operators, that empty containers are shredded and disposed off at the Providence Landfill managed by STAR Seychelles. Some hotels dispose off their empty containers in the same manner that they dispose off other wastes. Some farmers revealed that they return their empty containers to the Agricultural stores. Upon investigation of the latter case it was found that

⁹² Ministry of Agriculture and Fisheries

⁹³ Seychelles Marketing Board

only glass and plastic bottles are returned to the store for repacking of the same product. The containers are then refilled with the same product as per its label for sales.

2.3.1.8 Current Capacity and Experience in the Field of POPs Pesticides

The capacity of the institutions involved in POPs management has been assessed in Part 2.2. above, elaborating on the human resource and technical infrastructure available. An assessment has also been made as to whether the current capacities are sufficient to incorporate the obligations of the Stockholm Convention incorporating the Convention-related measures and has also identified the areas where capacity building will be required.

2.3.1.9 Assignment of Responsibility and Liability

Pollution causes damages of various sorts. In addition to individual damages of a traditional type (e.g. personal injury, material damage to individual property) and ecological damage, the costs of clean-up of polluted site require specific attention. It should be noted that one of the major costs in cases of soil pollution concerns cleanup costs often incurred by public authorities in response to a pollution incident.

Liability rules for pollution should be distinguished from rules, which impose an administrative obligation upon certain persons to clean up sites.

Administrative rules, on the one hand, determine the obligation to clean-up polluted land. The administrative obligation becomes effective by a decision of the competent authority and is independent from a compensation claim by individual victims. It aims to prevent and remediate a dangerous situation and to appoint the person who will pre-finance such remediation. A legally organised clean-up obligation will allow the implementation of a systematic clean-up policy. Liability rules, on the other hand, determine the compensation of damages, which have been suffered by another person. They regulate to whom losses, which have been suffered by a private person or a public authority as a result of financing a clean-up operation, should be allocated. This obligation does not arise automatically, but only becomes effective where the victim successfully exercises a liability claim.

The legal framework applicable for the assignment of responsibility for the containment and disposal of POPs pesticides waste within the Seychelles has been detailed in Part 2.2.1 on the requirements for reporting under the EPA 1994 and the PCA 1996. Furthermore, the Pesticides Act 1996 authorises the Pesticide Board to determine conditions for the protection of plant material, public health and the environment in the disposal or use of any pesticides and to advise the Minister, and other government agencies on related matters⁹⁴ The application to register pesticides under the Act shall include the proposed method of storage of the pesticide as

⁹⁴ S 6 PCA

well as the intended method of disposal of the pesticide and its container.⁹⁵ Restrictions apply on the storage of pesticides under section 14. The Act also empowers authorised officers to order the disposal, including export, of any pesticide which is not registered under the Act, by the owner or the person in possession of such pesticide, at their own expense.

There is no legal framework for liability in relation to the containment and disposal of POPs pesticides waste. However, under the EPA civil liability provisions exist where the Court may, in addition to imposing a penalty for an offence arising under the provisions of the Act, order the person convicted to compensate for any loss or damage to the environment and to take such steps and within such time as may be specified in the order, to pay damages and to prevent, control, abate or mitigate any harm to the environment caused by the commission of the offence or to prevent the continuance or recurrence of the offence.⁹⁶

⁹⁵ S 9(2) PCA

⁹⁶ S 32 EPA

**Appendix 1: Stakeholders involved in POPs Pesticides Inventory/
Sites Visited**

NAME	LOCATION	STAKEHOLDER
Main Agricultural Store	Grand Anse	Ministry responsible for Agriculture
Retail Store	Grand Anse	Ministry responsible for Agriculture
Research Store	Grand Anse	Ministry responsible for Agriculture
Matombes' Farm	Anse Royale	Farmer
Forestry	Grand Anse	Dept of Environment
Forestry	Grand Anse Praslin	Environment
SMB Hydroponic	Anse Aux Pins	SMB
Indian Ocean Nursery	Barbaron	SMB
Pest A Rest	Bel Ombre	Pest Operator
Gill Pest Control	Ma Joie	Pest Control Operator
North Island Resort	North Island	Hotel
Lemuria Resort	Anse Kerlan Praslin	Hotel
St Anne Resort	St. Anne	Hotel
Amitie Agric. Retail Sore	Amitie Praslin	Agriculture
LUnion Estate	La Digue	Farm
New Port	Victoria	Ministry of Finance
Takamaka Beach Farm	Takamaka	Farmer

Appendix 2. Inventory Form

N o	Site	Active Ingredient	Commerci al name	Formulati on	Chemica l group	Toxici ty	Total quantity	Yr. of Manufac ture	Manufacturer	Pack type	No of units	Condi on of contain er

Appendix 3: References

1. **Balasubramaniam A.** Review and Improvement Proposed to Pesticide Management Procedures in the Republic of Seychelles. (1990).
2. **Haines H., Haines J.B.** Residual sprays for control of *Anoploplepis longipes* in the Seychelles
3. Medical Reports of the Colony of Seychelles (Unpublished report)
4. **Naiken Sherin.** Identification and Investigation of Illegal pesticides, which has entered the country for the past two years. (2004)
5. **P.R Dupont;** Agriculture Annual Report of the Conservator of Crown Land and the Botanical garden for year 1916.
6. **P.R Dupont;** Agriculture Annual Report of the Conservator of Crown Land and the Botanical garden for year 1920.
7. **Young A. R.** Farmers Guide to Pesticides (1981)
8. **Van Der Wulp H.P.,** United Nations, Food and Agricultural Organisation. Obsolete and Unwanted Stocks Disposal of Seychelles (Mission Report of July 1997)

2.3.2 Assessment with respect to Annex A, part II chemicals (PCBs)

2.3.2.1 Introduction

Polychlorinated Biphenyls or PCB is one of the first 12 persistent organic pollutants (POPS) scheduled for elimination by the Stockholm Convention. Some of the main issues of PCBs are that they biodegrade very slowly, persistent in the environment, able to accumulate in fatty tissues of the body, and suspected of being carcinogenic. They can lead to dangerous effects on human health such as failure of kidneys and other organs, headaches, sickness, etc if inhaled, and chlor-acne if absorbed through the skin. Due to limitations in resources (finance and human) and time, this inventory will not consider semi open and open applications of PCBs. The required action will be done as part of the proposed plan under section 3.3.4 below.

It should be noted that Seychelles signed the Stockholm Convention in May 2003. The Convention stated that Parties to the Stockholm Convention have to make determined efforts to *identify* and *label PCB containing equipment* and remove them from use by 2025. The following parts of the Convention are specifically dealing with PCB:

- Article 3, paragraph 1 (a), and 2 (b)
- Annex A- ELIMINATION, Part I: the last row of the table shows PCB as one of the chemicals scheduled for elimination and its production is banned.
- Annex A- ELIMINATION, Part II: Polychlorinated biphenyls, specifies the measures to phase out the use of PCB.

2.3.2.2 Present national regulations pertaining to PCBs

There are presently no regulations for PCBs and PCB containing equipment.

2.3.2.3 Aims of the Assessment

In line with the objectives of the Stockholm Convention, the study aims to assess the presence of PCB in Seychelles. The study would have liked to carry out a comprehensive inventory of PCB stocks but there are constraints in doing so. Due to data gaps and time constraints, it has targeted only

1. To identify equipments containing PCB
2. To estimate the national stock oil containing PCB
3. To estimate the total mass of equipments contaminated by PCB

Priority area of the assessment

The assessment has mainly focused on the electrical transformers of the PUC national electricity grid. This is because the main usage of PCB had been as dielectric oil for transformers. Other equipments such as capacitors and switchgears also use dielectric oil but they are only a few whereas transformers reach over 500. There are also minor applications of PCB such as cable-sheaths, cured caulk and painted objects as stated in Annex-A paragraph (f) of the Stockholm Convention, which are not covered in this study. All the transformers installed in PUC electricity grids, either pole-mounted or ground-mounted, on Mahe, Praslin and La Digue have been taken into account, and a database has been created.

Approach

As the production of PCB has already been banned worldwide for some time, it will not be necessary to sample oil in each and every transformer but only in those manufactured before the ban. All transformers manufactured after the ban (i.e.1986) are supposed to be PCB-free provided that they have not been later retro-filled or topped up with PCB oil or PCB-contaminated oil. PUC is recycling transformer oil in its transformer-workshop at Newport.

Specific Objectives

- To make an inventory of all existing transformers in the grids and in stores,
- To draw up a methodology for assessing PCB-containing transformers
- To test oil samples from suspected PCB-containing transformers
- To provide an interim estimation of national PCB stock,

2.3.2.4 Methodology for identifying PCBs and PCB-containing equipment

Step 1: An inventory of all the transformers

A database is to be created on **all** transformers presently used in Seychelles. There are two types of transformers in the electricity grid:

- ground-mounted transformers which are mostly in sub-stations,
- pole-mounted transformers which are scattered all over the electrified regions.

Transformers undergoing repairs or maintenance in the workshop as well as new spare transformers in store have also been taken into account. The database includes specific details such as location/site, size in kVA, type of installation (ground or pole-mounted), manufacturer/ make, year of manufacture, serial number, type of cooling, quantity of oil, etc.

Step 2: Grouping the transformers by age-interval

Group 1: Transformers manufactured before or in 1986, which **may contain** PCB

Group 2: Transformers manufactured after 1986, which are **assumed to be free** of PCB

Group 3: Transformers whose years of manufacture have not been identified, for which no conclusion can be made.

Step 3: Cross-checking the transformer brand names

The brand names of transformers containing PCB or companies manufacturing these equipments are listed in the UNEP publication [6], page 23, Table A.2. Once the brand names of the transformers are known, they should be cross-checked with the UNEP list.

Step 4: Sampling & Testing

An oil sample is taken from each brand name of Group 1. A few samples can be also taken from Group 2.

The samples are tested with the CHLOR-N-OIL test kit. A positive test result requires a second test for confirmation. Test results are recorded in the database of transformers.

Step 5: Assessment of results & Conclusion

If an oil sample from a transformer of a certain make tests positive, then all the transformers bearing the make are assumed to be PCB positive. And vice-versa, if an oil sample from a transformer of a certain make tests negative, i.e. below 50 ppm, then all the transformers of that make are assumed to be PCB-free. For confirmed PCB positive oil, further elaborated tests with Gas Chromatography and or Mass Spectrometry should be required to ascertain its exact concentration of PCB.

Inventory of Transformers

PUC has provided the following statistics on transformers as on October 2004 (table 2.3.2.1). The total number of pole-mounted transformers was 373, of which 322 on Mahe, 39 on Praslin and 5 on La Digue, and 7 new spares kept in store on Mahe. The total number of sub-station mounted transformers was 145, of which 123 on Mahe, 17 on Praslin and 5 on La Digue.

Table 2.3.2.1: Inventory of transformers in Seychelles

Location	Sub-Station-Mounted	Pole-Mounted	Total
MAHE	123	322	445
PRASLIN	17	39	56
LA DIGUE	5	5	10
(Spares stored in workshop on Mahe)	0	7	7
Sub-total	145	373	518

The capacities of pole-mounted transformers are usually **low** and in the range of 5, 10, 25, 50, and 100 to 200 kVA, whereas those of sub-station-mounted transformers are relatively **high** in the range of 300, 315, 500, 800, 1000, 1600, 7500, 15000, 25000 to a maximum of 35,000 kVA. Only

a few sub-stations have transformers with capacities in the range of 25, 50, 100 or 200 kVA.

As the quantity of oil in a transformer is proportional to the size or capacity. Sub-station-mounted transformers contain more oil than pole-mounted ones. The following table compares the specifications of two prominent brands found in Seychelles (table 2.3.2.2).

Table 2.3.2.2: Two Examples of Prominent Makes of Transformers found in the grid

Type of Installation	Make/Manufacturer	Year of Manufacture	Size (kVA)	Serial No.	Cooling Type	Oil Capacity (litre)
Sub-station	Bonar Long	1982	1000	LC81040	ONAN	645
Pole-mounted	Wooden	1964	50	76035	ONAN	135

ONAN (Oil Natural Air Natural) is the most common type of cooling for all the transformers. It means that the transformer is cooled by natural ambient air (without fan) and the dielectric oil inside the transformer is natural petroleum-based oil (without PCB).

Maintenance of Transformers and Switchgears

Transformers and switchgears are usually maintenance-free. Maintenance is carried out only in the case of an oil leak or at interval specified by the manufacturer. Every substation is inspected once a month according to an inspection schedule. A pole-mounted transformer is repaired when a leak is observed or when there is a failure on it. In case maintenance is required, the equipment is firstly isolated from the system, then removed and brought to the workshop where the oil is drained and tested. If the oil is found to be still in good condition, it will be re-used after cleaning in a filtration system otherwise it will be replaced with new oil, which is filled into the equipment. In case a top-up is only required, only new oil is used.

Oil samples are taken at specified interval, usually every 5 years, and tested. Depending on the result of the test, an oil change may be carried out. Used oil collected from transformers is temporarily stored in drums and later disposed by incineration in a sludge incinerator. PUC consumes annually around 6,000 litres of transformer oil for refilling equipments (Transformers and switchgears).

Maintenance staffs are provided with safety gloves for handling transformer oil. Oil spillages are kept to an absolute minimum as they are cleaned immediately.

Two locations at Newport near the PUC-Power Station B may be considered as hot spots due to their heavy contamination by transformer oil, which may or may not contain PCB. They are:

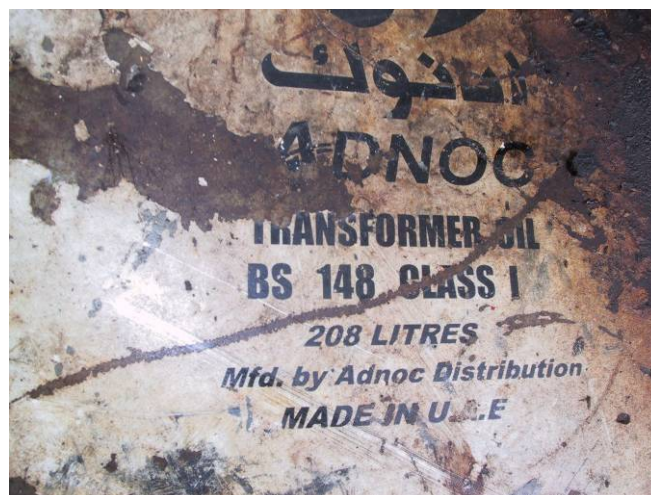
- The Transformer Workshop and surrounding areas,
- The PUC Scrap Yard where old unusable transformers and switchgears are stocked.

Specifications of Transformer Oil used by PUC

PUC Electricity is using only oils that are specified according to BS 148 for all its transformers and switchgears. Transformer oil is made from mineral oil. It has a boiling point between 250 and 300 °C. The refined oil is very pure and comprises only of liquid hydrocarbons. This oil is also used in switchgears such as circuit breakers. The main purpose of the oil is to act as an electrical insulator and also to conduct heat away from the active parts of the transformers/circuit breakers to the surrounding or cooling radiator.

PUC uses ADNOC TRANSFORMER OIL BS 148 CLASS II for refilling its transformers. The ADNOC LUBE Data Sheet specifies that this oil does NOT contain polychlorinated biphenyls or PCB. It should be also noted that this oil is imported by the Seychelles Petroleum Company (SEPEC) from ADNOC in the United Arab Emirates (figure 2.3.2.1).

Figure 2.3.2.1: Indication on a drum of transformer oil in the PUC workshop at Newport



2.3.2.5 Assessment of PCB stock in transformers

As the production of PCB was banned in 1986, it is assumed that all transformers manufactured after the year 1986 are PCB-free.

Transformers were grouped according to their year of manufacture (table 2.3.2.3).

Table 2.3.2.3: Breakdown of PUC transformers by the year of manufacture

Group	Quantity	Remark
Group 1: Transformers manufactured in 1963-1986	99	Suspected to contain PCB (Target Group)
Group 2: Transformers manufactured in 1987-2003	88	Assumed to be PCB-free
Group 3: Transformers with year of manufacture not identified	331	To be investigated later when data are available
Total	518	

331 transformers representing 64% of total still need to be checked for their years of manufacture. This may take some time as it may be difficult to access the transformers especially the pole mounted ones without special arrangements with PUC.

18 Makes of transformers have been identified for the Group 1, manufactured before or in 1986 (table 2.3.2.4). They are useful to give an indication on PCB containing transformers. It was adopted that when a transformer of one brand name is found to contain PCB, all the transformers bearing that brand name are assumed to contain PCB.

Table 2.3.2.4: Makes of transformers in Group 1 (manufactured in 1963-1986)

No.	Make	Quantity
1	ALSTOM	5
2	Babcock	1
3	Bonar Long	31
4	BrentFord-Electric	4
5	Brush	2
6	Crompton Greaves	3
7	DTL Transformer	2
8	English Electric	1
9	Foster	3
10	Hack bridge & Hewittic	1
11	Hawkers/Siddeley	2
12	London Transformer	1
13	Moris Awer Buch	1
14	Parson Peebles	2
15	South Wales	1
16	Treforest Glamorgan	6
17	Wooden	29
18	YORKSHIRE	3
	Total	99

Cross-checking

None of these makes are included in the list of PCB-containing Transformer Manufacturing Companies in the UNEP publication Table A.2 in page 23.

Sampling & Testing

11 sub-station-mounted transformers were selected for oil sampling and PCB test, of which 9 on Mahe (in Victoria), 1 on Praslin and 1 on La Digue. Due to the limited number of test kits available, only 9 oil samples taken from Victoria were tested (figure 2.3.2.3 and table 2.3.2.5). These represent 5 different Makes, including the two prominent ones_Bonar Long and Wooden. Samples were taken with the assistance of a technical person from PUC and in the presence of the study team and a representative from the Ministry of Environment as a witness.

Figure 2.3.2.3: Samples of transformer oil and results obtained with the PCB test kits at the laboratory of the Ministry of Environment, in December 2004



Table 2.3.2.5: Transformers selected for PCB-test in Victoria, Mahe

Sample #	Sub-Station	Year	Make/Manufacturer	Size in KVA	Serial Number	Cooling Type	Quantity of Oil in litre
1	Palais des sports	1971	DTL Transformer	300	IDA2405	ONAN	
2	Victoria B-Station Transf.2	1982	BONAR LONG	1000	02/81/1974	ONAN	645

Sample #	Sub-Station	Year	Make/Manufacturer	Size in KVA	Serial Number	Cooling Type	Quantity of Oil in litre
3	Victoria House	1975	WOODEN	500	HB 11537/1	ONAN	711
4	Kingsgate House	1982	BONAR LONG	1000	02/81/2018	ONAN	645
5	Church Street (Market)	1972	WOODEN	500	108674	ONAN	
6	Roche Caiman (Flats)	1974	HAWKERS/SIDDELEY	500	136601	ONAN	
7	Dental Clinic Transf.1	1974	TREFOREST GLAMORGAN	500	75290	ONAN	
8	Dental Clinic Transf.2	1978	WOODEN	500	118966/4	ONAN	550
9	Pointe Cabris (Bus Terminal)	1973	BONAR LONG	300	02/72/2393	ONAN	

Oil samples from the 9 selected transformers were tested for PCB in the laboratory of the Ministry of Environment in November 2004. A representative of the Ministry of Environment was present to witness the test results. The method used was the PCB screening test for transformer oil by using the CHLOR-N-OIL 50 PCB Screening kit.

Only the sample #7 corresponding to the Dental Clinic sub-station transformer No.1 tested PCB positive over 50 ppm. A second test confirmed the result. The specifications of this transformer were noted as:

Make/ Manufacturer: TREFOREST GLAMORGAN
Serial Number: 75290
Year of Manufacture: 1974
Size in KVA: 500
Cooling Type: ONAN

As a consequence of this result, and based on the methodology, all transformers having the Make 'TREFOREST GLAMORGAN' or including the name 'TREFOREST' or 'GLAMORGAN' are assumed to be PCB positive over 50ppm. Eight transformers have been identified to have the suspected brand name. The total quantity of oil in these eight transformers is **4,813 litres**, which is therefore considered to be containing PCB (table 2.3.2.6).

Table 2.3.2.6: Transformers considered to contain PCB

<i>Location</i>	<i>Installation</i>	<i>Name/Site</i>	<i>Size kVA</i>	<i>Year Manufact</i>	<i>Serial No.</i>	<i>Make</i>	<i>Cooling Type</i>	<i>Oil litre</i>
Mahe	Sub-station	Conference centre	800	1990	113149	South Wales/Treforest	ONAN	590
Mahe	Sub-station	Power Station A	800	1993	131731	Treforest Glamorgan	ONAN	595
Mahe	Sub-station	Beau-vallon Bay Hotel	1000	1972	72116	Treforest Glamorgan	ONAN	870
Mahe	Sub-station	Mahe Beach hotel	1000	1972	72118	Treforest Glamorgan	ONAN	870
Mahe	Sub-station	Les Mamelles Industrial	300	1974	75288	Treforest Glamorgan	ONAN	493
Mahe	Sub-station	Electricity Distribution	500	1974	75289	Treforest Glamorgan	ONAN	645
Mahe	Sub-station	Dental Clinic No 1	500	1974	75290	Treforest Glamorgan	ONAN	645
Mahe	Sub-station	L'Exile	100	1983	96816	Treforest Glamorgan	ONAN	105

All the transformers having other Makes are considered to be PCB-free.

2.3.2.6 Conclusions

As most of the equipment concerned with PCB is found in PUC, it is paramount that PUC is fully committed to participate in the project. The drafting and signing of a Memorandum of Understanding (MOU) or Terms of Reference on Cooperation on PCB between MENR and PUC would be the first step.

An immediate ban on the import of PCB containing equipment should be considered and Customs officers should be provided with the necessary information to implement the ban;

A National Committee for the Elimination of PCB and an Inspection Team comprising members from MENR, PUC, SBS, MOH, NGOs can be set up,

Immediate measures to prevent cross-contamination of equipment and oil with special focus on the PUC workshop for maintenance and repair of transformers should be taken.

All the equipment containing or contaminated with PCB, especially those with high concentration of PCB should be rapidly identified, labelled and properly recorded. Further elaborated tests with Gas chromatography (at SBS) and or mass spectrometry (abroad in Tanzania) can be considered in due course in view to ascertain the exact concentration of PCB in PCB-positive oil samples. However, such tests might be costly if done abroad.

2.3.3 Assessment with respect to Annex B chemicals (DDT)

The Assessment in relation to Annex B chemicals DDT was conducted together with that of POPS pesticides in Part 2.3.1 entitled: " 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". All relevant information to POPS pesticides in general are therefore found in Part 2.3.1

In general, within other ministries/departments in Seychelles, not much information on the past imports of pesticides is available. It is, therefore, difficult to establish the true amount of POPs pesticides imported in Seychelles. However, based on available documents, it is known that amongst the POPs pesticides classified under the Stockholm Convention, a number of POPs pesticides were imported into the Seychelles and this includes DDT. DDT was imported in 1967 and was used in the country between 1967 – 1980s by the Ministry of Health to control insect pests of medical importance, namely mosquitoes and midges and to control bedbugs and head lice. DDT was also imported by the major importers of that time, such as Jivan Imports and Temooljee. According to interviewees, it was imported in bulk as powder or liquid and also pre-packaged under several trade names, such as *Tick 20*. It was packaged and sold to individuals for uses described above and livestock farmers for control of livestock pests.

The only available information on the export of pesticides is recorded under the project on "Obsolete and Unwanted Pesticide Stocks Disposed of in Seychelles⁹⁷". The project was funded by FAO, in 1997 and was aimed at identifying stockpiles of obsolete pesticides for disposal. Following this, the Seychelles exported a total of 11.887 tones of obsolete pesticide to UK for incineration. Amongst the pesticides exported were highly toxic products but no POPs pesticides were recorded other than DDT. A total amount of two hundred and twenty five kilos (225 kg.) of DDT from the Ministry of Health and Ministry of Agriculture (Grand Anse Research Station) sites was included.

Chemical Control of Leptoconops in the Seychelles

*RESEARCH: Conducted by Dr.Reynolds D.G.and Vodot A
Entomology Unit Ministry of Health.*

The man – biting midge Leptoconops (Diptera: Ceratopogonidae) is a major nuisance on many beaches in Seychelles and with a developing tourist industry, control is required. Malathion, applied weekly as a spray at 1000 g a.i/ha or twice a week with u.l.v. equipment at 1750g a.i/ha was not effective; this finding was supported by laboratory studies. DDT exercised control for five months when applied as a spray at 2200 g a.i/ha, at 1100g a.i/ha control lasted less than a month. DDT residues were detected in Donax cuneatus, an intertidal filter-feeding mollus, 15 months after the last application. Diazinon applied as a spray at 6000 g a.i/ha produced good control for five months and applied at 600 g a.i/ha every two weeks gave excellent control. The importance of correlating times of spraying with the lunar tide cycle was confirmed.

⁹⁷ FAO (1997) Obsolete and Unwanted Pesticide Stocks Disposed of in Seychelles

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

2.3.4.1 SUMMARY

The total annual release of Dioxins and Furans in Seychelles for the year 2003 was estimated to be 5.4 g TEQ, of which 4.1 g TEQ or 75% were emissions to the air. The two main sources of emissions were Medical Waste Incineration and Uncontrolled Domestic Waste Burning. Other sources such as Road Vehicles were less important. The main release route identified for these emissions was the Air and other secondary routes were *Residue* (for uncontrolled combustion processes) and *Products* (for compost). *Water* and *land* have not been identified as major release routes.

2.3.4.2 INTRODUCTION

The Stockholm Convention on Persistent Organic Pollutants or POPs was adopted in 2001 with a view to eliminate an initial list of 12 POPs which pose major and increasing threats to human health and the environment. Dioxins, Furans and PCBs are three toxic chemicals, which have been classified among the 12 POPs. Whereas Dioxins and Furans are mainly produced *unintentionally* in incomplete combustion, PCB has been used as dielectric oil in transformers and capacitors. Seychelles signed the Stockholm Convention in March 2002, and thus has the obligation to meet the requirements of the convention. This study forms part of a project called "Enabling Activities under the Stockholm Convention on Persistent Organic Pollutants for Seychelles – UNIDO Proposal". The main objectives of the study are to do an inventory of the emissions of dioxins and furans, and to assess the presence and stocks of PCB in Seychelles.

2.3.4.3 REGULATORY FRAMEWORK IN RELATION TO EMISSIONS AND PCB

At the moment there are no specific regulations yet in place on emissions of dioxins and furans and on PCB. The administrative structure for monitoring and controlling of these emissions and for will have yet to be assessed and decided if deemed necessary. Capacity building, including acquisition of equipment and training, is a key factor in the field.

2.3.4.4 ASSESSMENT OF EMISSIONS OF DIOXINS AND FURANS

The process of the inventory of emissions of dioxins and furans involves 6 steps.

Step 1: Screening of the Main Source Categories of PCDD/PCDF present in Seychelles

Step 1 consists only of identifying the main categories of sources of Dioxins and Furans which exist in the country. There are ten main categories as listed in Table table 2.3.4.1 below, of which three are not relevant to Seychelles, namely:

- Production of Ferrous and Non-Ferrous Metal
- Production of Mineral Products
- Production and Use of Chemicals and Consumer Goods

Table 2.3.4.1: Screening Matrix – Main Source Categories

No.	Main Source Categories	Release Route					Relevance to Seychelles
		Air	Water	Land	Product	Residue	
1	Waste Incineration	X				X	Relevant
2	Ferrous and Non-Ferrous Metal Production	X				X	Not Relevant
3	Power Generation and Heating	X		X		X	Relevant (Power Generation only)
4	Production of Mineral Products	X				X	Not Relevant
5	Transport	X					Relevant
6	Uncontrolled Combustion Processes	X	X	X		X	Relevant
7	Production and Use of Chemicals and Consumer Goods	X	X		X	X	Not Relevant
8	Miscellaneous	X	X	X	X	X	Relevant
9	Disposal	X	X	X		X	Relevant
10	Identification of Potential Hot-Spots (Probably registration only to be followed by site-specific evaluation)						

Step 2: Identification of sub-categories of main sources of PCDD/PCDF

Step 2 looks at each individual main category and breaks it down into sub-categories for further identification of PCDD/PCDF sources and their potential release routes into the environment. At this stage, there are only 7 main categories left, which are of concern to Seychelles, namely:

- Waste Incineration (table 2.3.4.2)
- Power Generation and Heating (table 2.3.4.3)
- Transport (table 2.3.4.4)
- Uncontrolled Combustion Processes (table 2.3.4.5)
- Miscellaneous (table 2.3.4.6)
- Disposal (table 2.3.4.7)
- Identification of Potential Hot-Spots (table 2.3.4.8)

Table 2.3.4.2: Waste Incineration

	Sub – Categories of 1. Waste Incineration	Potential Release Route					Relevance to Seychelles
		Air	Water	Land	Product	Residue	
a	Municipal solid waste incineration	X	(x)			x	Not Relevant
b	Hazardous waste incineration	X	(x)			x	Relevant (waste oil from PUC)
c	Medical waste incineration	X	(x)			x	Relevant (Victoria Hospital Incinerator)
d	Light-fraction shredder waste incineration	X				x	Not Relevant
e	Sewage sludge incineration	X	(x)			x	Not Relevant
f	Waste wood and waste biomass incineration	X				x	Relevant
g	Destruction of animal carcasses	X				x	Not Relevant

X: Major Release Route

x: Minor Release Route

In Waste Incineration, only 3 sources are applicable for Seychelles and should be investigated:

- Hazardous waste incineration (waste oil from the Power Stations)
- Medical waste incineration (at the Victoria Hospital)
- Waste wood and waste biomass incineration

Table 2.3.4.3: Power Generation and Heating/Cooking

	Sub – Categories of 3. Power Generation and Heating / Cooking	Potential Release Route					Relevance to Seychelles
		Air	Water	Land	Product	Residue	
a	Fossil fuel power plants	x				x	Relevant (Heavy Fuel Oil and Light Fuel Oil)
b	Biomass power plants	x				x	Not Relevant
c	Landfill, biogas combustion	x				x	Not Relevant (no extraction of landfill gas for the moment)
d	Household heating and cooking (biomass)	x		(x)		X	Relevant (Cooking with LPG)
e	Domestic heating (fossil fuels)	x		(x)		X	Not Relevant

In Power Generation and Heating/Cooking, there are only two sources applicable to Seychelles, namely:

- Fossil Fuel Power Plants (PUC is using diesel oil and fuel oil in its Power Stations)
- Household Cooking (Households are using LPG and other fuel for cooking)

Table 2.3.4.4: Transportation

	Sub – Categories of 5. Transport	Potential Release Route					Relevance to Seychelles
		Air	Water	Land	Product	Residue	
a	4-Stroke engines	X					Relevant (most of road vehicles)
b	2-Stroke engines	X					Relevant (mainly motorcycles)
c	Diesel engines	X				(x)	Relevant (most of trucks)
d	Heavy fuel oil fired engines	X				(x)	Not Relevant (large ships)

Under the Transportation category, there are three sources applicable to Seychelles, namely:

- 4-Stroke engines (most of the road transport vehicles)
- 2-Stroke engines (boats, motorcycles, grass mowers, etc.)
- Diesel engines (most of the trucks)

Table 2.3.4.5: Uncontrolled Combustion Processes

	Sub – Categories of 6. Uncontrolled Combustion Processes	Potential Release Route					Relevance to Seychelles
		Air	Water	Land	Product	Residue	
a	Biomass burning	X	(x)	X		(x)	Relevant
b	Waste burning and accidental fires	X	(x)	X		(X)	Relevant

Table 2.3.4.6: Miscellaneous

	Sub – Categories of 8. Miscellaneous	Potential Release Route					Relevance to Seychelles
		Air	Water	Land	Product	Residue	
a	Drying of biomass	x			x		Relevant (wood/timber)
b	Crematoria	x				X	Relevant (not important)
c	Smoke houses	x			x	X	Relevant (smoking of fish)
d	Dry cleaning		x		x	x	Relevant (not important)
e	Tobacco smoking	x					Relevant

All of the sources stated in this category are relevant but not so important because of the limited activities with them.

Table 2.3.4.7: Disposal

	Sub – Categories of 8. Disposal	Potential Release Route					Relevance to Seychelles
		Air	Water	Land	Product	Residue	
a	Landfills and waste dumps		x				Relevant (STAR)
b	Sewage/ sewage treatment	(x)	x	x	x	x	Relevant (PUC)
c	Open water dumping		x				Not Relevant
d	Composting			x	x		Relevant (STAR)
e	Waste oil treatment (non-thermal)	x	x	x	x	x	Not Relevant

The following sources are applicable to Seychelles:

- Landfills and waste dumps
- Sewage/ sewage treatment
- Composting

Open water dumping might exist but there are regulations forbidding such practice.

Table 2.3.4.8: Potential Hot Spots

	Sub – Categories of 10. Identification of Potential Hot-Spots	Potential Release Route					Relevance to Seychelles
		Air	Water	Land	Product	Residue	
a	Production sites of chlorinated organics			X			Not Relevant
b	Production sites of chlorine			X			Not Relevant
c	Formulation sites of chlorinated phenols			X			Not Relevant
d	Application sites of chlorinated phenols	x	X	x	x		Not Relevant
e	Timber manufacture and treatment sites		X	X	x	x	Relevant (ex-Seytim)
f	PCB-filled transformers and capacitors				x	x	Relevant (but only for a few old transformers and capacitors of PUC)
g	Dumps of wastes/residues from categories 1-9	x	X	X		x	Relevant (Landfill)
h	Sites of relevant accidents		X	x		x	Not Relevant
i	Dredging of sediments					x	Not Relevant
j	Kaolinitic or ball clay sites			x			Not Relevant

There are two potential sites:

- The landfill site at Providence which is being operated by STAR
- The PUC site at Newport for dumping used transformers

However, a study has been carried out on contaminated sites earlier in 2004 and has already addressed the matter.

Step 3: Information Gathering/ Data collection

A survey was carried out to the various organizations and sites concerned with the sources identified in Step 2. Almost all the data have been obtained except a few.

Step 4: Process Classification and Source Quantification

CATEGORY 1: WASTE INCINERATION

Municipal waste incineration

It should be noted that in Seychelles Municipal Solid Wastes (MSW) are not incinerated but dumped in the landfill. However, there are small-size incinerators in a few places to incinerate hazardous wastes such as waste oil and medical wastes.

Incineration of waste oil and sludge

PUC has an incinerator which was commissioned with the new Power Station C in 2000. Waste lubricating oil from the diesel engine-generators, sludge from the treatment plant of Heavy Fuel Oil, and waste oil from transformers are incinerated in this incinerator.

Incineration of Medical Wastes at the Victoria Hospital

All the medical wastes from all the clinics and hospitals on Mahe, Praslin and La Digue are incinerated in one site at the Victoria hospital. There are two incinerators in the hospital. One was installed in 1982, but has been broken down already for several years. The second, which had been installed in 1988, also broke down in 1998, but has been still used_ not however in the normal operating conditions. The controls were out of order, the fan blower out of order, and the incinerator door left open. Kerosene was poured on the waste before fire was lighted. Black smoke came slowly out of the chimney. This way of burning lasts for 8 to 9 hours a day except during the weekend. The residue usually contains ash and large amounts of small bottles and needles. SWAC collects the residue and disposes it in the landfill at the Providence Industrial Estate.

Incineration of medical wastes in this site started as early as 1982 but statistics began only in 2002. In 2003, 86.2 tonnes were incinerated, excluding gloves, which were dumped in the landfill. The incinerator has a capacity of 1-2 cubic metres. In normal conditions, the combustion temperature would be 600C. At the present, in the existing conditions,

the combustion temperature is very much below, and therefore likely to generate significant amount of dioxins and furans.

Annual releases from source category No 1 are listed in table 2.3.4.9.

Table 2.3.4.9: Annual Releases from Waste Incineration

Source Categories			Potential Release Route (µg TEQ/t)					Production t/a	Annual Release						
1. Waste Incineration			Air	Water	Land	Products	Residues		g TEQ/a	g TEQ/a	g TEQ/a	g TEQ/a	g TEQ/a	g TEQ/a	
Subcat.	Class						Fly Ash	Bottom Ash	Air	Water	Land	Products	Fly ash	Bottom Ash	
b		Hazardous waste incineration							576	0.202	0	0	0	0.518	0.000
	1	Low technol. combustion, no APC system	35,000		NA	NA	9,000			0.000				0.000	0.000
	2	Controlled comb., minimal APC	350		NA	NA	900		576	0.202				0.518	0.000
	3	Controlled comb., good APC	10		NA	NA	450			0.000				0.000	0.000
	4	High tech. combustion, sophisticated APCS	0.75		NA	NA	30			0.0000				0.000	0.000
c		Medical/hospital waste incineration							86	3.448	0	0	0	0.000	0.017
	1	Uncontrolled batch combustion, no APCS	40,000		NA	NA		200	86	3.448				0.000	0.017
	2	Controlled, batch, no or minimal APCS	3,000		NA	NA		20		0.000				0.000	0.000
	3	Controlled, batch comb., good APC	525		NA	NA	920	ND		0.000				0.000	
	4	High tech, continuous, sophisticated APCS	1		NA	NA	150			0.000				0.000	0.000
f		Waste wood and waste biomass incineration							0	0.000	0	0	0	0.000	0.000
	1	Old furnaces, batch, no/little APCS	100		NA	NA	1,000			0.000				0.000	0.000
	2	Updated, continuously, some APCS	10		NA	NA	10			0.000				0.000	0.000
	3	State-of-the-art, full APCS	1		NA	NA	0.2			0.000				0.000	0.000
Waste Incineration										3.650	0	0	0	0.518	0.017

CATEGORY 2: FERROUS AND NON-FERROUS METAL PRODUCTION

As already identified above, this category is not relevant for Seychelles.

CATEGORY 3: POWER GENERATION AND HEATING/COOKING

Power Generation

The Public Utilities Corporation (PUC) is using Heavy Fuel Oil (HFO) and Light Fuel Oil (LFO) for electricity generation. The consumption of HFO and LFO for 2003 was 1,587.65 TJ and 455.44 TJ respectively.

Domestic Heating/ Cooking

There is no heating of building in Seychelles as average ambient temperature is well above 20 C throughout the year. For cooking, the fuel used is mainly LPG (Liquefied Petroleum Product), which is retailed in different cylinder sizes ranging from 5 kg to 45 kg. The total quantity of LPG consumed locally in the country in 2003 was 3,095 t. This corresponds to the consumption of the Domestic sector and that of hotels, hospital, and industry. The emission factor for LPG is assumed to be the same as for natural gas, i.e. 1.5 µg TEQ/TJ, as indicated in the Toolkit. This assumption is adequate as LPG's Calorific Value being higher than natural gas' thus allowing a higher temperature of combustion, and subsequently relatively lower emissions of PCDD/PCDF.

Annual releases from source category No 3 are listed in table 2.3.4.10.

Table 2.3.4.10: Annual Releases from Power Generation and Heating/Cooking

Class	Source Categories	Potential Release Route (µg TEQ/TJ)					Production TJ/a	Annual release						
		Air	Water	Land	Products	Residues		g TEQ/a Air	g TEQ/a Water	g TEQ/a Land	g TEQ/a Products	g TEQ/a Residues		
	Power Generation and Heating/Cooking													
	Fossil fuel power plants						2,043	0.004	0	0	0	0	0.0	
1	Fossil fuel/waste co-fired power boilers	35	ND	NA	NA	ND		0.000						
2	Coal fired power boilers	10	ND	NA	NA	14		0.000					0.0	
3	Heavy fuel fired power boilers	2.5	ND	NA	NA	ND	1,588	0.004						
4	Light fuel oil/natural	0.5	ND	NA	NA	ND	455	0.000						

Class	Source Categories	Potential Release Route (µg)					Production TJ/a	Annual release				
		Air	Water	Land	Products	Residues		g TEQ/a	g TEQ/a	g TEQ/a	g TEQ/a	g TEQ/a
	Power Generation and Heating/Cooking							Air	Water	Land	Products	Residues
	gas fired power boilers											
	Household heating and cooking - Biomass						0	0.000	0	0	0	0.0
1	Contaminated wood/biomass fired stoves	1,500	ND	NA	NA	2,000		0.000				0.0
2	Virgin wood/biomass fired stoves	100	ND	NA	NA	20		0.000				0.0
	Domestic heating - Fossil fuels					ng TEQ/kg Ash	141	0.000	0	0	0	0.0
1	Coal fired stoves	70	ND	NA	NA	5,000		0.000				0.0
2	Oil fired stoves	10	ND	NA	NA	ND		0.000				
3	Natural gas fired stoves	1.5	ND	NA	NA	ND	141	0.000				
	Power Generation and Heating/Cooking							0.004	0	0	0	0.0

CATEGORY 4: PRODUCTION OF MINERAL PRODUCTS

As already identified above, this category is not relevant for Seychelles.

CATEGORY 5: TRANSPORT

The total number of road vehicles in 2003 was 10,382 according to the Ministry of Tourism and Transport. A breakdown by category is given in Table 2.3.4.11 below.

The national consumption for Leaded gasoline, Unleaded gasoline, and Diesel in 2003 was 10,165,105 litres, 4,970,000 litres, and 12,827,335 litres respectively. These figures correspond to the quantities sold in all the Service Stations on Mahe, Praslin and La Digue

It should be noted that all passenger-vehicles imported to Seychelles are new except a few. All new vehicles are fitted with a catalytic converter, a device that reduces the exhaust pollutants produced by an automobile engine.

Table 2.3.4.11: Road Vehicles and Boats in 2003

Vehicle category	Number
4-stroke engine	
Passenger-vehicles	7,042
Light Trucks of Capacity below or equal to 3 tonnes	2,319
Heavy Trucks of Capacity above 3 tonnes	662
Buses	171
<i>Sub-total</i>	<i>10,288</i>
2-stroke engine	
Motorcycles (Gasoline + Oil)	94
Boats with outboard engines	na
Total	10,382

Source: Vehicle Testing Station, Ministry of Tourism and Transport

Annual releases from source category No 5 are listed in table 2.3.4.12.

Table 2.3.4.12: Annual Releases from Transport sector in 2003

Class	Source Categories	Potential Release Route ($\mu\text{g TEQ/t}$)					Consumption t/a *	Annual release				
		Air	Water	Land	Products	Residues		g TEQ/a Air	g TEQ/a Water	g TEQ/a Land	g TEQ/a Products	g TEQ/a Residues
	Transport											
	4-Stroke engines						11,200	0.017	0	0	0	0
1	Leaded fuel	2.2	NA	NA	NA	ND	7,522	0.017				
2	Unleaded fuel without catalyst	0.1	NA	NA	NA	ND	3,678	0.000				
3	Unleaded fuel with catalyst	0.00	NA	NA	NA	NA		0.000				
	2-Stroke engines						0	0.000	0	0	0	0
1	Leaded fuel	3.5	NA	NA	NA	ND		0.000				
2	Unleaded fuel without catalyst	2.5	NA	NA	NA	ND		0.000				
	Diesel engines						10,903	0.001	0	0	0	0
1	Diesel engines	0.1	NA	NA	NA	ND	10,903	0.001				
	Heavy oil fired engines						0	0.000	0	0	0	0
1	All types	4	NA	NA	NA	ND		0.000				
	Transport							0.018	0	0	0	0

CATEGORY 6: UNCONTROLLED COMBUSTION PROCESSES

Fires/Burnings of Biomass

Forest Fires

The Forestry Division has recorded between 2000 and 2004 an average of 10 forest fires per year. The annual burnt area was on average 16 hectares (see Table 2.3.4.13). Based on a mass of burnt biomass of 8 - 23 tonnes per hectare, the total annual mass of biomass burnt would be estimated roughly at:

$$15 \text{ t/ha} \times 16 \text{ ha} = 240 \text{ t/yr.}$$

Grassland and Moor Fires

The Fire Brigade has recorded 46 bush fires in 2003 (see Table 2.3.4.14 below). These cases can be categorized as grassland and moor fires. The total burnt area for all the 46 bush fires would not exceed 1 hectare. Based on a mass of biomass of 10 tonnes per hectare, the total mass of biomass burnt would be:

$$1 \text{ ha} \times 10\text{t/ha} = 10 \text{ t/yr.}$$

Table 2.3.4.13: Forest Fires between 2000 and 2004 (4 years)

Region	Number of fires	Approximate total area of land burnt	Species Burnt
MAHE Northern and Southern Regions	14	25 ha	Exotic (pomme de prune) Endemic (palms, commercial timber)
PRASLIN	25	40 ha	Endemic species included Coco-de-mer
Total	39	65 ha	

Source: Forestry Division, Ministry of Environment and Natural Resources, October 2004

Agricultural residue

In 2003, the Timber Control Unit of the Ministry of Environment has issued 155 Burning Licenses. The applicants for the license were mainly farmers. The biomass to be burnt included agricultural residue and grass or weeds. Assuming that each applicant was burning on average 1 tonne of biomass, the total agricultural residue burnt during the year would be estimated at 155 tonnes. As the combustion always takes place in the field, it is considered to be in poor combustion conditions, hence the choice of class 4 in Table A15 below.

Fires, Waste Burning, Landfill Fires, Industrial Fires, Accidental Fires

Accidental fires in houses, factories (per event)

In 2003, the Fire Brigade has recorded 26 cases of building fire. Assuming roughly that 2 tonnes of materials were burnt on average in each building, the total amount of burnt materials in this sub-category would be around 52 tonnes.

26 cases x 2 tonnes/ case = 52 tonnes

Uncontrolled Domestic Waste Burning

Only some households in certain districts are concerned with this type of burning as it is not common to burn wastes in new residential areas such as Roche Caiman, Cascade, etc. Domestic wastes often include household rubbish and leaves, grass and branches from gardening. Assuming that 20% of households burn 25 kg of wastes per month, the annual amount of domestic wastes, based on a total number of 20,000 households in the country, would be estimated at:

$20\% \times 20,000 \text{ households} \times 25 \text{ kg/month} \times 12 \text{ months} / 1000 = 1,200 \text{ t/yr}$

Accidental fires in vehicles (per vehicle)

In 2003, the Fire Brigade has recorded 27 cases of vehicle fires, out of which 20 road transports and 7 ships/ boats (see Table 2.3.4.14). Assuming that an average of 1 tonne of materials was burnt per vehicle/boat, the total amount of burnt materials would be estimated at:

$27 \text{ cases} \times 1 \text{ t} = 27 \text{ t/yr}$

Table 2.3.4.14: Statistics on Fires in 2003

Type of fire	Number	Total Estimated Cost (Million Rupee)
Building Fire	23	4.65
Vehicle Fire	20	0.89
Ship and Boat Fire	7	0.7
Bush Fire	46	0.004
Electrical Installation	10	0.035
Others	64	0.33
TOTAL	170	6.61

Source: Seychelles Fire Brigade, Annual Emergency Report for 2003

Annual releases from source category No 6 are listed in table 2.3.4.15.

Table 2.3.4.15: Summary for Category 6 on Releases from Uncontrolled Combustion Processes

Class	Source Categories	Potential Release Route (µg TEQ/t)					Production t/a	Annual release				
		Air	Water	Land	Products	Residues		g TEQ/a	g TEQ/a	g TEQ/a	g TEQ/a	g TEQ/a
	Uncontrolled Combustion Processes							Air	Water	Land	Products	Residues
	Fires/burnings biomass	-					395	0.006	0	0.003	0	0
1	Forest fires	5	ND	4	NA	ND	240	0.001		0.001		

Class	Source Categories	Potential Release Route ($\mu\text{g TEQ/t}$)					Production t/a	Annual release				
		Air	Water	Land	Products	Residues		g TEQ/a	g TEQ/a	g TEQ/a	g TEQ/a	g TEQ/a
	Uncontrolled Combustion Processes							Air	Water	Land	Products	Residues
2	Grassland and moor fires	5	ND	4	NA	ND	10	0.000		0.000		
3	Agricultural residue burning (in field), not impacted	0.5	ND	10	NA	ND		0.000		0.000		
4	Agricultural residue burning (in field), impacted, poor combustion conditions	30	ND	10	NA	ND	155	0.005		0.002		
	Fires, waste burning, landfill fires, industrial fires, accidental fires						1,252	0.383	0	0.000	0	0.741
1	Landfill fires	1,000	ND	NA	NA	ND		0.000				
2	Accidental fires in houses, factories (per event)	400	ND	See residues	NA	400	52	0.021				0.021
3	Uncontrolled domestic waste burning	300	ND	See residues	NA	600	1,200	0.360				0.720
4	Accidental fires in vehicles (per vehicle)	94	ND	See residues	NA	18	27	0.003				0.000
5	Open burning of wood (construction/demolition)	60	ND	ND	NA	10		0.000				0.000
	Uncontrolled Combustion Processes							0.389	0	0.003	0	0.741

CATEGORY 7: PRODUCTION OF CHEMICALS, CONSUMER GOODS

This category is not relevant as there is no production of chemicals in Seychelles.

CATEGORY 8: MISCELLANEOUS

Drying of Biomass

The drying of wood is usually done in the ambient air by stacking under a shed. The drying of coprah is done in a dryer 'Calorifer' heated by the burning of biomass. As there have been only a few coprah dryers operating recently, the annual production of coprah going to minimum, this drying is not considered as a significant source of PCDD/PCDF.

Crematoria

There is only one crematorium in Seychelles. It is located at the Providence Industrial Estate. Data have not been obtained but given its limited use, its emissions of PCDD/PCDF would be negligible.

Smoke Houses

Oceana Fisheries is an industry that processes and exports fish. Fish smoking is one of its activities. Given the small quantity of smoke fish produced, the emissions from this activity are not considered important.

Dry Cleaning Residues

There are one or two dry-cleaning enterprises in the country. This activity is not considered as an important source of PCDD/PCDF.

Tobacco Smoking *

Data on national consumption of cigarettes in 2003 is not available. However, it can be assumed as equal to the national production of cigarettes in 2002, which was 36,000,000 cigarettes, as published in Statistical Abstract 2002. It should be noted Seychelles does not export cigarettes.

Annual releases from source category No 8 are listed in table 2.3.4.16.

Table 2.3.4.16: Summary of Annual Releases from Miscellaneous (Drying of biomass, Crematorium, Smoke Houses, Dry Cleaning, Tobacco Smoking)

Source Categories	Potential Release Route (µg TEQ/l)					Production t/a	Annual release				
	Air	Water	Land	Products	Residues		g TEQ/a	g TEQ/a	g TEQ/a	g TEQ/a	g TEQ/a
							Air	Water	Land	Products	Residues
Miscellaneous											
Drying of biomass						0	0.000	0	0	0.000	0
Clean wood	0.01	NA	ND	0.1	ND		0.000			0.000	
Green fodder	0.1	NA	ND	0.1	ND		0.000			0.000	
PCP- or otherwise treated biomass	10	NA	ND	0.5	ND		0.000			0.000	
Crematoria						0	0.000	0	0		0.000
No control	90	NA	NA	NA	ND		0.000				
Medium control	10	NA	NA	NA	2.5		0.000				0.000
Optimal control	0.4	NA	NA	NA	2.5		0.000				0.000
Smoke houses						0	0.000	0	0	0	0
Treated wood, waste fuels used as fuel	50	NA	ND	ND	see wood		0.000				
Clean fuel, no afterburner	6	NA	ND	ND	com-		0.000				
Clean fuel, afterburner	0.6	NA	ND	ND	bustion		0.000				
Dry cleaning residues						0	0	0	0	0	0.000
Heavy textiles, PCP-	NA	NA	NA	NA	3,000						0.000

Source Categories	Potential Release Route ($\mu\text{g TEQ/t}$)					Production	Annual release				
treated, etc.											
Normal textiles	NA	NA	NA	NA	50						0.000
Tobacco smoking *						0	0.0000	0	0	0	0
Cigar (per item)	0.3	NA	NA	NA	NA		0.0000				
Cigarette (per item)	0.1	Na	NA	NA	NA		0.000004				
Miscellaneous						0	0.000	0	0	0.000	0.000

CATEGORY 9: DISPOSAL/LANDFILL

The total amount of wastes, excluding metal waste, collected in 2003 and dumped in the landfill was 47,747 (see Table 2.3.4.17). These are classified as non-hazardous wastes. The release route was mainly **water**.

Table 2.3.4.17: Wastes collected in 2003 in Metric Tonne

Type	Weight
MSW-collected by SWAC	16,254
MSW-collected by STAR	7,955
VEGETATION	1,512
LIQUID WASTE	3,249
OTHERS (from individuals)	16,506
METAL WASTE	731
PUTRESCENT WASTE	2,271
TOTAL	48,478

Source: SWAC, October 2004

Sewage Treatment

A new sewage treatment plant was built just a few years ago at the Providence Industrial Estate. Data on the operation of the plant have been requested to the division of Water and Sewage of the Public Utilities Corporation (PUC). Data will be included as soon as they are available.

Composting

The company STAR collects wastes, manages a landfill and produces compost from green wastes. Its production of compost in 2003 was 700 tonnes.

Annual releases from source category No 9 are listed in table 2.3.4.18.

Table 2.3.4.18: Summary of Annual Releases from Disposal/Landfill

Subcat.	Class	Source Categories	Potential Release Route ($\mu\text{g TEQ/t}$)					Production t/a	Annual release				
			Air	Water	Land	Products	Residues		g TEQ/a Air	g TEQ/a Water	g TEQ/a Land	g TEQ/a Products	g TEQ/a Residues
		Disposal/Landfill											
a		Landfill leach ate					47,747	0	0.001	0	0	0	

Subcat.	Class	Source Categories	Potential Release Route (µg TEQ/t)					Production t/a	Annual release				
			Air	Water	Land	Products	Residues		g TEQ/a	g TEQ/a	g TEQ/a	g TEQ/a	g TEQ/a
	1	Hazardous waste *	NA	200	NA	NA			0.000			0	
	2	Non-hazardous waste *	NA	30	NA	NA	47,747		0.001		0	0	
b		Sewage/sewage treatment					0	0	0.000	0	0	0.000	
	1	Industrial, mixed domestic with chlorine relevance					<i>0</i>	<i>0</i>	<i>0.000</i>	<i>0</i>	<i>0</i>	<i>0.000</i>	
		No sludge removal		5	NA	NA	1,000	<i>0</i>	<i>0.000</i>			<i>0.000</i>	
		With sludge removal		0.5	NA	NA	1,000	<i>0</i>	<i>0.000</i>			<i>0.000</i>	
	2	Urban environments					<i>0</i>	<i>0</i>	<i>0.000</i>	<i>0</i>	<i>0</i>	<i>0.000</i>	
		No sludge removal		2	NA	NA	100	<i>0</i>	<i>0.000</i>			<i>0.000</i>	
		With sludge removal		0.5	NA	NA	100	<i>0</i>	<i>0.000</i>			<i>0.000</i>	
	3	Remote and residential or modern treatment plant	0.1	NA	NA	10		<i>0</i>	<i>0.000</i>			<i>0.000</i>	
c		Open water dumping					0	0	0.000	0	0	0	
	1	Mixed domestic and industrial inputs	NA	5	NA	NA			0.000				
	2	Urban environments	NA	0.5	NA	NA			0.000				
	3	Remote environments or input control	NA	0.1	NA	NA			0.000				
d		Composting					700	0	0	0	0.070	0	
	1	All organic fraction	NA	ND	NA	100	700				0.070		
	2	Garden, kitchen wastes	NA	ND	NA	15					0.000		
	3	Green materials, not impacted environments	NA	ND	NA	5					0.000		
e		Waste oil disposal					0	0	0	0	0	0	
	1	All fractions	ND	ND	ND	ND							
		Disposal/Landfill					48,447	0.000	0.001	0	0.070	0	

CATEGORY 10:

IDENTIFICATION OF HOT SPOTS

Annual releases from source category No 10 are listed in table 2.3.4.19.

Table 2.3.4.19: Identification of Hot Spots

Subcat.	Class	Product (µg TEQ/t)	Occurrence (t)	g TEQ identified				
				Air	Water	Land	Product	Residue
		Identification of Hot Spots		x indicates need for site-specific evaluation				
d		Application sites of dioxin-contaminated pesticides				x		
e		Timber manufacture						
	1	Using pentachlorophenol, other dioxin-containing preservatives			x	x		
	2	No use of PCP, not open to the environment			x	x		
f		PCB containing equipment	0				0	
		Low chlorinated, e.g., Clophen A30, Aroclor 1242	15,000				0	
		Medium chlorinated, e.g., Clophen A40, Aroclor 1248	70,000				0	
		Medium chlorinated, e.g., Clophen A50, Aroclor 1254	300,000				0	
		High chlorinated, e.g., Clophen A60, Aroclor 1260	1,500,000				0	
	1	Leaching			x	x		
	2	Not leaching			x	x		
g		Dumps of waste/residues from categories 1-9			x	x		
h		Sites of relevant accidents			x	x		
g		Dredging of sediments			x	x		

Step 5: Compilation of the Inventory

The total annual PCDD/Fs releases are listed in table 2.3.4.20.

Table 2.3.4.20: Total Releases of Dioxins and Furans in Seychelles for 2003

Ca t.	Source Categories	Annual Releases (g TEQ/a)					
		Air	Water	Land	Produc ts	Residue	Total
1	Waste Incineration	3.650	0.000	0.000	0.000	0.5	4.150
2	Ferrous and Non-Ferrous Metal Production	0.000	0.000	0.000	0.000	0.0	0.000
3	Power Generation and Heating/ Cooking	0.004	0.000	0.000	0.000	0.0	0.004
4	Production of Mineral Products	0.000	0.000	0.000	0.000	0.0	0.000
5	Transportation	0.018	0.000	0.000	0.000	0.0	0.018
6	Uncontrolled Combustion Processes	0.387	0.000	0.003	0.000	0.7	1.090
7	Production of Chemicals and Consumer Goods	0.000	0.000	0.000	0.000	0.0	0.000
8	Miscellaneous	0.000	0.000	0.000	0.000	0.0	0.000
9	Disposal/ Land-filling	0.000	0.001	0.000	0.070	0.0	0.071
10	Identification of Potential Hot-Spots	NE	NE	NE	NE	NE	NE
1-9	Sub-total by release route	4.1	0.0	0.0	0.1	1.2	5.4

2.3.4.5 MONITORING SYSTEMS, MECHANISMS AND CONTROL TOOLS FOR EMISSIONS OF DIOXINS AND FURANS

The institutional framework for monitoring and controlling emissions of dioxins and furans in the country has yet to be organized. All the stakeholders including the Ministry of Environment and Natural Resources, the Seychelles Bureau of Standards, the Police & the Ministry of Transport (for road vehicles), the Port Authority (for ships), the department of Industry (for factories) will have to cooperate in coordinating actions for controlling emissions of dioxins and furans. An inspection team can be formed and a laboratory for performing tests needs to be identified. The inspection team will inspect combustion/ incineration sites and industrial boilers and chimneys. Capacity building for the measurement and monitoring of concentration of dioxins and furans in air, foodstuff, water, product and land will be necessary through:

- Acquisition of laboratory facilities/ equipment for sampling air, water, soil or materials likely to contain dioxins and furans
- Training of personnel working in local laboratories on the techniques and safety measures

Other actions such as the following can be also considered:

- The provision of tax incentives on the purchase of Air Pollution Control devices for industry and transports
- Fines for the burning of excessive domestic wastes without a burning license

2.3.4.6 CONCLUSIONS ON THE EMISSIONS OF DIOXINS AND FURANS

The total annual release of dioxins and furans in Seychelles for the year 2003 is estimated to be **5.4 gTEQ**, of which 4.1 g TEQ or 75% are emissions to the air. By comparing the results PCDD/PCDF inventories in other countries with the UNEP toolkit, values of total release range from a minimum of 1.4 (Brunei) to a maximum of 2111 (Argentina). Many countries including our neighboring island Mauritius range between 20 and 100 gTEQ [7].

Seychelles' per capita emissions to air for the same year is **51 µg TEQ/inhabitant**, which would be above the average as usual values for many countries range between 0 and 20 µgTEQ/ inhabitant [7].

Table 2.3.4.21 shows the largest single sources (i.e. individual sources with highest emissions) of dioxins and furans, which have been identified in the inventory. Therefore, policies and actions for reducing emissions should focus on these areas.

Table 2.3.4.21: Largest Single Sources of Dioxins and Furans

	g TEQ/a	
Medical/Hospital Waste Incineration	3.45	85.6%
Uncontrolled Domestic waste burning	0.36	9%
Hazardous waste incineration (waste oil and fuel oil sludge at PUC)	0.2	5%
Transport (Road vehicles)	0.02	0.5%

The two main sources of emissions of dioxins and furans are:

- Medical/Hospital Waste Incineration
- Uncontrolled Domestic waste burning

Other sources such as road vehicles and other transports are relatively less important. The main release route for dioxins and furans is **Air** and the other secondary release routes are *Residue* (of uncontrolled combustion processes) and *Products* (compost). *Water* and *land* have not been identified as major release routes.

2.3.4.7 RECOMMENDATIONS ON THE EMISSIONS OF DIOXINS AND FURANS

Although there is no imminent threat at the present on the level of emissions of dioxins and furans, there are some actions that need to be done made such as:

(a) Reduction of emissions from medical waste incineration, by repairing the existing incinerator at the Victoria hospital (low cost solution) or replacing it (more costly solution).

(b) Reduction of emissions from domestic waste burning, by discouraging such practice especially the burning of plastic wastes.

(c) Improvement of air quality in urban areas, by enforcing existing regulations/ standards on vehicles exhaust emissions. The police can play an important role in patrolling the roads and checking vehicles emissions at regular intervals.

2.3.4.8 HCB and PCB releases into the environment

Due to lack of financial resources and technical guidelines, the inventories for HCB and PCB releases were not developed in this inventory exercise. Once the guidelines and financial resources are available the inventories would be amended.

2.3.5 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

A contaminated site is defined as a site at which substances occur at concentrations: (1) above background levels and pose or are likely to pose an immediate or long-term hazard to human health or the environment, or (2) exceeding levels specified in policies and regulations.

2.3.5.1 Summary

The present report gives details of the findings of the group on contaminated sites. The group looked at the problem of sites which may in the future present problems through their harbouring of POPs which have been intentionally introduced, and to a lesser degree, Dioxins and Furans, which have been unintentionally produced or deposited. It covers all potential sites within the territory of Seychelles. Not all sites were actually visited however, as some are located outside Mahé, or are unavailable for investigation (e.g. closed landfills).

The general conclusions which arise from the exercise are that the most likely contaminated sites in Seychelles are few in number and that these

can be enumerated without great difficulty. Most potentially contaminated sites, for example the La Retraite Dump site, can be easily demarcated and given GIS coordinates. However, the paucity of information on the scale of use, deposition, accidental production, or transfer of POPs chemicals in the country and at these sites, limits the conclusions we can draw on the actual level of contamination. The lack of detailed information on the magnitude of POPs presence further limits our conclusions by hindering the extent to which we can extrapolate POPs presence on one site with presence in adjoining media e.g. movement to marine areas through contamination by landfill leachate. It thus limits the degree to which we can generalise contamination of the general environment or apply scales of contamination (low, medium, high).

We thus need to qualify our conclusions about potentially contaminated sites by saying that although we can identify most of the potentially affected ones, this does not mean that we have established the level of environmental contamination *per se*, since the level of contamination at all sites have not been quantified. We, therefore, propose that for the purpose of inventory and elimination of POPs in the country, only “truly” contaminated sites, with identifiable residues, or validated contamination data, should be targeted as a priority. Other sites should be considered under the heading of needing further investigations, and should enter the priority group only after detailed field investigations.

2.3.5.2 Introduction

The report is a contribution towards the implementation of the Stockholm Convention on Persistent Organic Pollutant in the Seychelles. The lead agency for the Convention, the Ministry of Environment and Natural Resources, in collaboration with the United Nation Industrial Development Organisation, UNIDO, agreed in 2003 to a work plan for early implementation of the convention. The initial part of this work plan involves the forming of working groups from different ministries and organizations to carry out inventories in order to assess the presence of POPs in Seychelles, including POPs pesticides. This inventory work includes a historical appreciation of the use and generation of POPs, the present location of stocks, quantities which remain and any effects that the POPs chemicals might have had on the environment compartments that they are in.

Contamination, a group definition

Our group considered contamination as the presence of POPs chemicals in media such as soil and water, including the likelihood of movement to other compartments, geographical locations or biological materials. We consider contamination of a site to result from the introduction (intentional or accidental), storage, or use of POPs on a site. Given the chemical characteristics of POPs chemicals, their concentration can only be mitigated by dilution/dispersal, time or removal/decontamination. Historical pointers, such as deposition of waste in the past would indicate the possible presence of POPs at a site but as said above, “truly”

contaminated sites have to be established through validation of all parameters relating to the presence of these chemicals.

POPs as Pollutants in Seychelles

As in other parts of the world pesticides and other forms of POPS chemicals (e.g. PCBs) have been used in the Seychelles. Due to poor record keeping and/or mismanagement of records, quantitative information on POPs pesticides in the Seychelles is scarce. Except for a brief study on DDT, the environmental concentration, and ecological effects of POPs, and other hazardous materials for that matter, have not been the subject to detailed analysis. This may have been partially due to financial and manpower constraints.

However, the main issue is a lack of a programmed approach to monitoring of these environmental parameters. There are to date, no formal program for the monitoring of POPs chemicals in Seychelles. A direct corollary of this deficiency in test results is a slow building up of testing capacity and the slow development of legal and technical requirements for testing and reporting (the absence of a PRTR system, and public reporting obligations). Most of the parameters which are now regularly tested and reported are related to water pollution by biological matter, or oils. Nonetheless, four things can be said about the future of reporting on POPS in Seychelles.

1. There is a strengthening of the control measures on chemicals and this encompasses controls of all chemicals including POPs. Administrative controls of chemicals are being introduced through the continuing work of the Seychelles Bureau of Standards (guidelines) and the licensing and environmental controls of projects. We therefore expect that there shall be more information generated regarding the life cycling of all chemicals in the country with this approach. However, a critical component of this would be regular public reporting. Public dissemination of information is being implemented at a slower pace than the actual development of control measures.
2. There is also emphasis on control of pesticides, and testing of residues in foodstuffs. We expect that this shall reveal more information on the presence of certain priority pollutants in the environment, and enable better conclusions to be drawn regarding the environmental and health significance of these pollutants. .
3. Development of the solid waste master plan also incorporates detailed monitoring at landfill sites and a strengthening of the procedures for hazardous waste transfer across the country. This shall surely produce much needed data on the occurrence of all chemical wastes in the country.
4. It also goes without saying that implementation of the Stockholm convention shall produce data on generation and use of POPs in the country. We foresee that the strengthening of institutional capacity under the convention shall provide a real boost to the control of pops, and moreover to the enumeration of contaminated sites.

2.3.5.3 Institutional and Regulatory Framework

The existing national institutional legislative, regulatory and institutional framework on the management of POPs pesticides has already been discussed in detail and assessed for its effectiveness in **Part 2.2** of the NIP.

The Ministries responsible for the environment and public health play the leading role in management of hazardous substances. The Seychelles Bureau of Standards is responsible for the development of standards guidelines and codes of practice. These documents are developed by technical working groups consisting of senior technicians from relevant sectors. Since its creation the Bureau has produced two codes of practice that are directly related to the management of hazardous substances.

Pesticides are regulated by the Pesticide Control Act, and the importation of POPs pesticides into the country is presently banned. There is no specific regulation at present on industrial chemicals, though the Environmental Protection Act, 1994 provides for control of hazardous substances. Emission standards for stationary combustion sources are presently being drafted under the same Act. POPs which are unintentionally produced through combustion source may be regulated through these standards. Presently the management of hazardous substances in the Seychelles is guided by the following legislation and guidelines: **Environment Protection Act 1994 (EPA 94); Pesticide Control Act 1996 (PCA 96); Code of Practice for Handling, Storage and Disposal of Hazardous Chemicals Other Than Agricultural Pesticides; Trade Tax Regulations.**

The management of hazardous waste in Seychelles has been subcontracted to a private company. The company is expected to provide a high temperature incinerator which will be used to destroy some hazardous waste. Substances which cannot be handled by this incinerator will be exported for final disposal. Temporary storage facility and collection services need to be established as part of the revised solid waste master plan.

It must be noted that the existing regulatory measures do not address limits for contamination in soils or the procedures which may be applicable under the law. There is therefore a need to further elaborate on these parameters under the broad allowances which exist under the Environment Protection Act, Section 6, and other successive clauses which concern standards for soil and contamination.

Long term contingencies for contaminated sites also do not arise in the regulatory measures. Given the absence of chemical industries, it is unlikely that the country would need to go into every aspects of this, (e.g. superfund provisions). However, it must be noted that in cases of long term contamination there may be problems in bringing a legal claim within the time limit allowed for prosecution. Under **Criminal Procedure Code,**

1955⁹⁸ the time limit to start legal action is within five years. This could mean that there is no additional recourse for regulators or potential victims in such cases.

2.3.5.4 Sites Contaminated with POPs

The group analysed the presence of contaminated sites in the country and attempted to come up with a list of places which would require further investigations and action as part of the NIP. As mentioned above in our definition of contamination, any of the factors mentioned would warrant consideration of a place as contaminated. The mitigating factors which would declassify the sites as contaminated however, are not included. It is through further testing on these sites that the non-contaminated status could be validated. Potentially contaminated sites in the country can be classified in the following manner:

Pesticide stockpiles and stores: This would include places where any of the POPs pesticides have been used in the past, especially places where DDT is mentioned as having been used.

Electricity generation and distribution: These include power stations, maintenance depots, stockpiles, switches, capacitors and transformers, substations on the network.

Landfill sites: All non engineered landfill sites where there has been mixed deposition of waste

Foundations of buildings: houses and other buildings where waste oils has been used as a soil conditioner and for termite treatment.

Dioxins and furans fallout zones: areas downwind of large fires, especially those downwind of landfill fires.

The status of contamination of these sites is diverse. This can be visualized using the grid below (figure 2.3.5.1).

Figure 2.3.5.1: Idealized classification of potentially contaminated sites

	Point	Diffuse
High	<ul style="list-style-type: none"> • Soil with PCB oils • POP pesticide handling points 	<ul style="list-style-type: none"> • Ground/ surface water movement from point sources • Electrical oils incinerator fallout
Low	<ul style="list-style-type: none"> • In the field releases from transformers 	<ul style="list-style-type: none"> • Pesticide application zones • Biomass smoke fallout zones

⁹⁸ As amended in 1991

Sites

The various locations chosen for our investigation were as indicated below. The information submitted was gathered from unstructured interviews with people who operate the sites and from direct site observations.

1. Island Development Corporation
 - Silhouette
 - Platte
 - Desroches
 - Remire
 - Farquhar
 - Assumption
 - Poivre
 - Marie-Louise
 - Alphonse
 - Providence
2. Indian Ocean Tuna
3. Public Utilities Corporation, Electricity Division
4. Ministry of Agriculture and natural Resources
 - Union Vale
 - Le Rocher
 - Grand Anse Mahe store
 - Port Glaud Housing estate
 - Val Den D'Or experimental farm
 - Amitie
5. Customs

2.3.5.4.1 Pesticide Stockpiles and stores

Although quantitative information regarding past usage of POPs in Seychelles are hard to find, documents from the Ministry of Agriculture indicate that the following POPs have been used in Seychelles:

Aldrin: Records show that aldrin was used in the 1950s to control *Melittomma*, a coconut tree disease. This indicates that aldrin must have been applied in most of our islands, since most of the habitable islands of the Seychelles contained coconut plantations. Aldrin was also used extensively in the 1960s-1970s to control *Anoplolepes longipis*.

Toxaphene: This pesticide has been used since the 1950s to control the buffalo flies.

Dieldrin, Endrin: Both pesticide were used to control *Melittomma*. They were also used for termite control. Large volumes of the pesticide were dowsed in the foundation of the houses before construction.

Potentially contaminated Agricultural sites

This report is a compilation of sites suspected of harbouring obsolete and unwanted pesticides since the 1970s, most of which are classified as Hazardous (UN).

These sites (mostly stores) contained some POPS, mainly for agricultural use (Aldrin, Chlordane) though DDT was used by the Health Services. A clean-up program in 1997 got rid of the quasi-totality of obsolete stocks. Further legislation banned the importation of the famous 12 POPS (aldrin, endrin, dieldrin, chlordane, hexachlorobenzene, DDT, morphane, toxaphene, PCB, into Seychelles.

Botanical Gardens: Ex storage site around 1976/78. The MoA then moved away to settle in Grand Anse Mahé (West Mahé). Today we have no reliable information as to the location of the pesticide store that was utilised.

Grand Anse Research Station: Up to the cleaning out operation of June/July 1997, this storage site was also the main hub of activity for handling, packaging and distributing of hazardous chemicals in Seychelles. These were then dispatched towards the various retail outlets and Extensions controlled by Ministry of Agriculture. Today in one small abandoned store we can note crumbling shelves that once used to contain pesticides, insecticides and fungicides. The roofing and door have disintegrated, leaving the room open to the elements and prowlers. A strong "chemical" smell still emanates from the location. A label on one of the remaining shelves reads *Aldrin*. One can notice spillage on the floor but no visual signs or traces of contamination could be determined outside the building.

A short distance behind the actual main store lies another decrepit building that also used to harbour pesticides, insecticide and fungicide. The location is overgrown with a broken door. Access to the site is not so difficult. Behind the building numerous empty bottles have been left lying near a concrete drain. Markings and labelling on the two stacks of empty glass containers have been eroded. We still note a very strong lingering "chemical" odour on site. In the immediate surroundings of the discarded bottles, the smell is still stronger and there are bare patches of soil where vegetation is absent.

Visually one can suspect contamination but this could be positively identified with specific tests. Records (Annex III) show that this site used to handle a certain amount of **DDT**. The store in use today is situated in a hangar. Access is controlled, the site secure and air conditioned. On investigating the limited contents of the pesticide store there was no evidence of POPS. A few bottles containing unidentified liquids were on a shelf.

In and around the site no visual evidence of contamination by POPS could be noticed.

Union Vale: A requisite store that reportedly formerly handled the *Aldrin* mixtures and *Chlordane* mix to eradicate the "crazy ant" threat. Today the store retails pesticides to farmers. A check of the contents revealed small

volumes of pesticide of toxic nature and a minimal quantity of obsolete insecticide. We can observe that the store has no burglar bars and that the electrical ventilation is not functioning.

However the general area is fenced off and there was no visual signs of contamination in the immediate vicinity.

Port Glaud: From the crossroads up 200m near a big mango tree, a house has been built on the same location that used to house a retail outlet for pesticides. We met with an ex employee who used to handle these substances. We mentioned a few POPS which he seemed to recognise adding that a variety of 25 different hazardous pesticides were widely utilised at the time. The store closed and was pulled down in 1989. We have no apparent trace of contamination on this site.

Anse Boileau Experimental Farm: Two stores co-exist on this state owned facility. The main one is controlled by staff from G-Anse. The small store is handled by the farm staff who reports that 15 years back **DDT** and **ALDRIN** could be obtained from his store. The unwanted stocks were transferred to G/Anse for subsequent disposal. Access to the small store is not quite secure. The proximity of the store to the actual plots where the crops grow may cause contamination in case of excessive rainfall and flooding. No visual signs of contamination could be observed.

Victoria Hospital: Facing the dental clinic and the main pharmaceutical store we locate a small building having reportedly contained 2500 Kg of **DDT** powder form. At the time the store belonged to MoH but it seems it contained certain pesticides belonging to MoH. Today the premises appear well kept and access to this store is strictly controlled. The facility is renovated and shelters products necessary to the local pharmaceutical activity. No exterior signs of contamination could be observed.

Agricultural Store Le Rocher: This store is situated in a by-road at Le Rocher leading past Laxmanbhai carpentry workshop. The place is closed, fenced off and seems abandoned. It was not possible to carry out an inspection up close for evident reasons of accessibility. Standing outside the premises no effects of contamination could be observed. The information reported, observed, recorded gives us only an approximate picture of the possibilities of contamination.

The June/July 1997 clean out ensured the collection, storage, decontamination and subsequent disposal (re export) of obsolete and unwanted pesticides, generally in line with the Basel Convention. A consignment of 12 tons of material was shipped to the U.K via transit in Singapore. From recorded evidence we can approximate a figure of **2%** as being the quantity of **POPs** mainly **DDT** handled during the 1997 mopping up exercise.

This review of the sites shows that the small quantities of POPS that might have caused minor contamination are not a threat. Negligible amounts of POPS cannot be overlooked, however infinitesimally small their impact on a global environment.

2.3.5.4.2 Electricity generation, and Broadcasting

These two class of activities have the most risk of harboring POPs chemicals especially PCB given the extensive use of insulating fluids in transformer, capacitors etc. The Public Utilities Corporation (PUC) and the British Broadcasting Corporation (BBC) were contacted for specific technical information regarding the use of polychlorinated Biphenyls (PCBs) in existing electrical components potential was assessed. The PUC and the BBC Transformer Servicing facilities were inspected as part of the inventory. Mr W. Monnaie (PUC) and Mr Bati (BBC) were very instrumental in providing the required technical information. There are 14 capacitors in the possession of PUC of which 6 are out of use. The location of PUC installed capacitors are as per table 2.3.5.1.

Table 2.3.5.1: PUC capacitors

Location	No. of capacitors
Near Sheraton Hotel	1
Sodepak	1
Cascade Police Station	1
Anse Francois – Anse Dejeuner	1
Reef Hotel	1
Bradley Hotel	1
Takamaka junction - Intendance	1
Plantation Club	1

BBC Indian Ocean relay station

BBC has 14 capacitors Fluid type M/DBT (33KV) which are Faradol impregnated. They are PCB free. They are within the Grand Anse BBC Broadcasting Station.

Electrical Transformers

PUC: There are 590 electrical transformers installed all around Mahé, 59 on Praslin and 8 on La Digue. It is estimated that 60% of all PUC transformers are old and 40% new transformers.

It is estimated that 200 transformers have a manufacturing date between 1965 and 1976 and 390 transformers after 1976. Used transformer oil is burnt using an incinerator. It is revealed that the used transformer oil have been used by some workers as a rubbing or massage oil in the past. The old transformers were oil (imported by SEYPEC) in conformity with the British Standards - BS 148: 1972 whereas the new imported transformer complies with BS148: 1998.

BBC STATION: There are 6 transformers at the station. They are classified in the following- 2 x 11 – 33 kV, 2 x 11 kV and 2 x 11- 415 kV. They have all been manufactured around 1987 and thus are expected to be PCB free.

PUC Electrical thermal switches: There are 63 such switches around Victoria (Le Rocher in the East and as far as St Louis in the north). They are being filled with the same type of oil as that of the transformer. The new port area has 22 switches. The oil is being changed every two years. Anse Boileau has 8 such switches but the oil is changed more frequently.

FEBA site: It is well known that the Far East Broadcasting Association (FEBA) has had electrical transformers and capacitors within their station or other facilities. It has not been possible during the time the exercise was carried out until now to identify the person who was responsible at the FEBA side or the present local authority so that information of their electrical equipment could be collected and assessed.

Only recently have we gained access to part of the ex FEBA site. Two transformers, both British but with uncertain dates of manufacture and cooling oils are present on site. One is located in the offshore switch house. It remains for us to backtrack from the manufacturer and serial number to ascertain the exact status of these two transformers, and also to access the other part of the building (especially the transmission room) to check for the presence of other PCB equipments.

IDC

IDC is responsible for the most of the outlying islands and has generators on each of them. These are given in table 2.3.5.2 below.

Table 2.3.5.2: IDC generators

Island	No. of generators	Oil used = Lubricating Oil	Age
Silhouette	1	SAE 40	5 Years
Assomption	1	SAE 40	5 Years
Providence	1	SAE 40	5 Years
Deroches	1	SAE 40	5 Years
Poivre	1	SAE 40	5 Years
Remir	1	SAE 40	5 Years
Marie-Louise	1	SAE 40	5 Years
Platte	1	SAE 40	5 Years
Farquar	1	SAE 40	5 Years
Alphonse	1	SAE 40	5 Years

Disposal of generators

The old generators are shipped to Mahé where they are scrapped to remove usable parts. The rest is disposed of at the Providence landfill. The main type of oil being used in IDC generators is the type SAE 40 Lubricating oil.

2.3.5.4.3 Landfill sites

In the past Almost 100% of the waste in Seychelles ended up in land disposal sites and landfills. We presume therefore that the landfill sites in Seychelles are potentially contaminated with PCB containing materials and other waste chemicals materials since we do not have any record of products being re-exported or disposed off in an environmentally sound manner. There are seven important landfill sites which could be chosen as potential candidates for further investigations: Some of these are shown in the attached maps.

Providence one: Site on reclaimed land and which is at present the official dump site for Mahé and where mixed waste in raised mounds on deep sandy soils.

Ex La Retraite: this is a coastal site which has been rehabilitated and is now used for recreational activities.

Ex Roche Caiman: Site on reclaimed land, which has been partly rehabilitated and which now hosts the sports complex. There are still some exposed parts towards the bird sanctuary, with pioneer growth.

Ex Barbarons site: Site at the foot of a hill, on sand and clay soil mix. No closed and rehabilitated. Close to a housing development.

Amitie Praslin: Site which is still open and now managed by STAR. Large deposits of mixed waste on plateau and waterlogged areas.

Ex Anse Severe La Digue: Closed site of mostly household waste, graded and contained with a wall.

New La Digue Landfill: Engineered landfill in use

Amongst these sites, the La Retraite site should be top priority because of the length of time that it was used and the types of waste (including USAF tracking station) which it received. It must be noted that for La Digue and Praslin, we expect more contamination with POPs pesticides compared to PCB, simply because most of the transformer maintenance, and subsequently disposal of the oils are carried out on Mahé. The same must be said for the generator site at Baie St Anne. It must also be noted that the Anse Severe and new La Digue landfill were subject to stricter controls and thus they may not qualify as candidates for site contamination.

2.3.5.4.4 Foundations of buildings

The Seychelles Building Regulations under the Town and Country Planning Act stipulates that prior to the laying of foundations; appropriate treatment against termites should be applied. At present this is done by Pest Control operators using approved pesticides. Treatment is done either before construction or by injection in untreated foundations which are showing signs of infestation. As mentioned above, in the past this treatment also involved the use of some POPs pesticides. It has also been

the practice in the past to use waste oil for the purpose of termite treatment and also for enhancing the compaction of soils. The sources of these oils are not known, but we cannot discount the use of waste oil from the electricity company, since until recently they had a large surplus of waste oil with no identified outlets.

However, because of a lack of records concerning the method of application, materials used and locations where they were used, we cannot tell whether there is a real possibility of PCB containing oils having been used for that purpose. We nonetheless gather from the claims (e.g. of using these oils as rubbing lotions) that people had a notion of the existence of different types of oil, which would be put to different uses, including pest control. Contamination of the foundations of houses could pose serious problems for inhabitants. Thus despite the paucity of data concerning use, it is imperative that trial tests are done in certain suspect areas to eliminate this possibility.

2.3.5.4.5 Dioxins and Furans Fallout zones.

Dioxins and Furans are also of concern in the country, and as we know these are generated by burning of organic materials. Certain materials in particular, such as PCB and chlorinated plastics are prone to produce these compounds. Until recently landfill fires were quite common in Seychelles. La Retraite Landfill site for example had continuous fires and smoke. Landfill fires have been drastically reduced with the new management approaches to landfilling. We nonetheless expect that the areas downwind of these fires, (La Retraite dumping site, Providence, and Roche Caiman etc.) to be contaminated with fallout of dust and smoke. This however can only be validated through testing of materials and soils in these locations.

With regards to site contamination, the reduction in landfill fires may have been negated by the introduction of an incinerator for waste oil at the new PUC Roche Caiman power station. Application of testing to the oils which are being burnt (which we suspect contain PCB) and the tool kits for estimation of PCDD generation would establish the exact risk which arises from this process. We should note that the field of contamination from this incinerator may be accentuated by the high chimney and high escape velocity of the exhaust.

2.3.5.5 Preliminary Identification of Priority Sites

With regards to the potentially contaminated sites mentioned above, the following can be said:

- Most of the sites given above fall into the non-contaminated category, and only a few (the landfills) are potentially contaminated. The site at Grand Anse and PUC new port are definite candidates for high contamination. It is recommended that only the PUC site be considered for immediate and in depth remediation. The Grand Anse site may need further study to ascertain the exact status.

- With regards to the future, we can safely conclude that there will be less and less potentially contaminated sites in the country as time goes on, simply as a result of increased technical competence amongst people in industries and more attention to regulatory measures. This could happen from two angles: we expect lower presence of contaminating materials (e.g. see above for BBC relay station), and also a greater level of contingencies and planning for pollution prevention.
- Environmental factors in the country, especially vigorous vegetation growth and high precipitation mitigates against easy identification of contaminated sites. It also complicates the issue of transfer across environmental compartments.
- There is a total lack of information on the operations at these sites which prohibits any in depth study into their significance. The old PUC conservancy section, which managed landfill sites in could not assist us with any additional information on the sites, and even opening and closing dates were not available. We find that this lack of information is even more generalized when we consider other areas of possible contamination such as stores.

2.3.5.6 Current Capacity and Experience

With regards to the country's capacity and experience for **contaminated sites, there are knowledgeable** personnel for site assessments, using relevant international guidelines. Some capacity exists for sample collection of soils and biological matter. Assessment of contaminated materials is restricted to metals; some organics etc. but does not include POPs.

Part 2.2 details the current capacity and experience regarding pesticides as well as laboratories involved in the analysis of samples, equipment used for identification.

2.3.5.7 Assignment of Responsibility and Liability

The EPA imposes a duty on an owner or user of any land to immediately notify the Authority of any incidents of pollution of the soil or sub-soil owned or used by such owner or user.⁹⁹ Furthermore, any person who fails to notify the Authority of the occurrence of any incident or other unforeseen act is guilty of an offence under the Act.¹⁰⁰

The PCA Act 1996 also states that any person who mixes or pours any pesticide shall take precautions to prevent spillage of the pesticide on the soil or floor and shall report any spillage to the Registrar within 24 hours of such spillage.¹⁰¹

⁹⁹ S 7(5) EPA 1994

¹⁰⁰ S 31(e) EPA 1994

¹⁰¹ S 16

There is no legal framework for liability in relation to the containment and disposal of POPs pesticides waste. However, under the EPA civil liability provisions exist where the Court may, in addition to imposing a penalty for an offence arising under the provisions of the Act, order the person convicted to compensate for any loss or damage to the environment and to take such steps and within such time as may be specified in the order, to pay damages and to prevent, control, abate or mitigate any harm to the environment caused by the commission of the offence or to prevent the continuance or recurrence of the offence.¹⁰²

Figure 2.3.5.2: Priority contaminated site: PUC Oil Stockpile Area, New Port



The PUC stockpile area is one of the most contaminated sites encountered Figure 2.3.5.2. PUC claims that all of the oil is from generator sumps, but the quality of the oil still has to be verified. There is evidence of extensive penetration of oil into the subsoil. Given the water table depth in the area, we expect contamination to be in excess of 1 metre deep. Losses to the ground from corroded drums may have been quite large. Given the length of time that this stockpile has been in existence, we therefore suspect that a substantial 'slug' of oil may have been introduced into the in the soil around that area, and that the area of impact is much larger than the actual surface markings.

The declining frequency of landfill fires

With changes in the management of landfills, the frequency of landfill fires have been drastically reduced. Between 1993 and 2003, the Fire Brigade recorded a total of twenty landfill fires across the entire country. According to STAR Seychelles there had been no landfill fires at the Providence landfill since they took over in 1998. It is expected that with improved management, those fires, which are important sources of Dioxins and Furans, would be reduced to even lower figures. Only in the long term would we have to consider the counterbalancing figures which would surely arise with the introduction of incinerators.

Location of potentially contaminated sites

¹⁰² S 32 EPA

Location of potentially contaminated sites are mapped in figures 2.3.5.3-

Figure 2.3.5.3: Grand Anse site and ex landfill at Barbarons, West coast Mahe

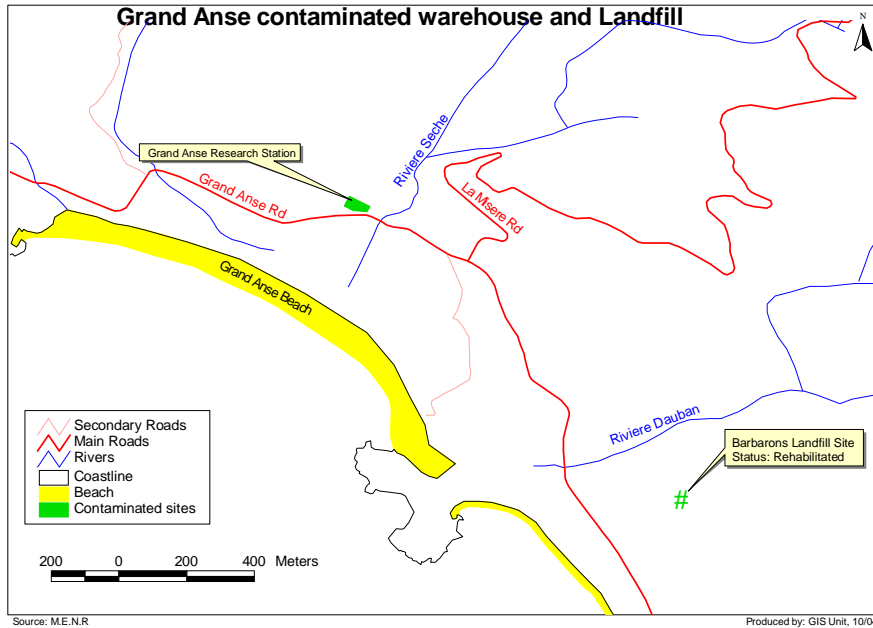


Figure 2.3.5.4: PUC electricity sites at closed power station Victoria and existing oil stockpile New Port

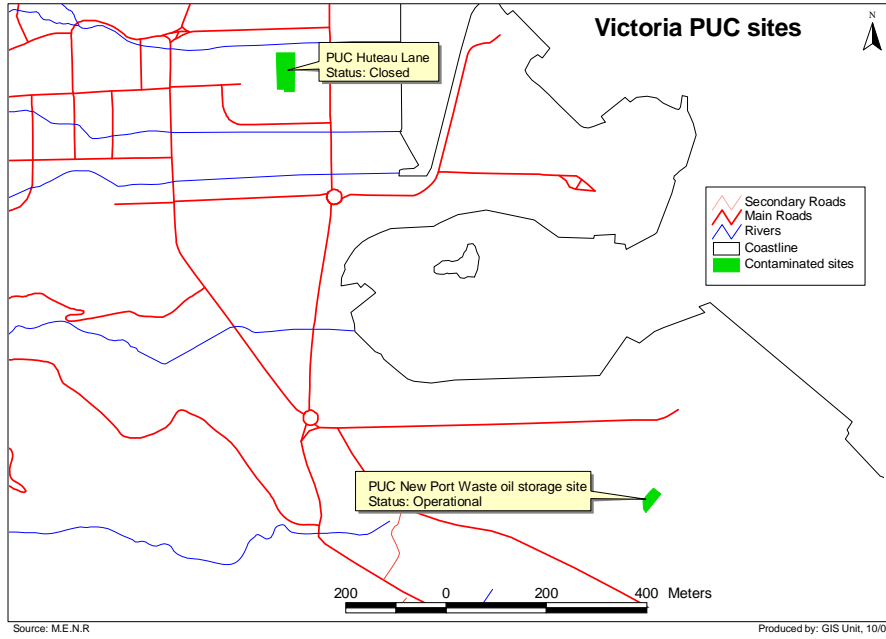


Figure 2.3.5.5: Roche Caiman landfill

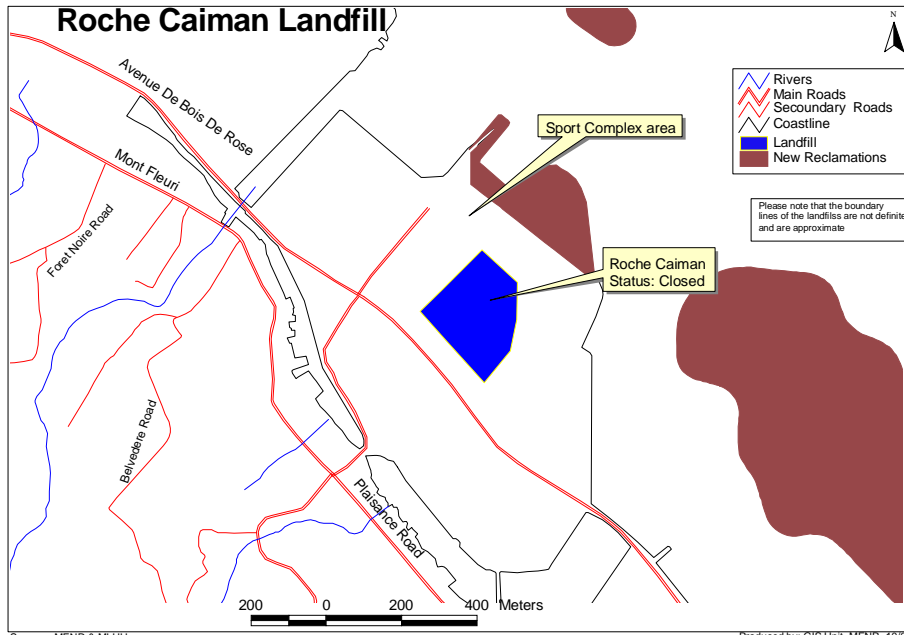
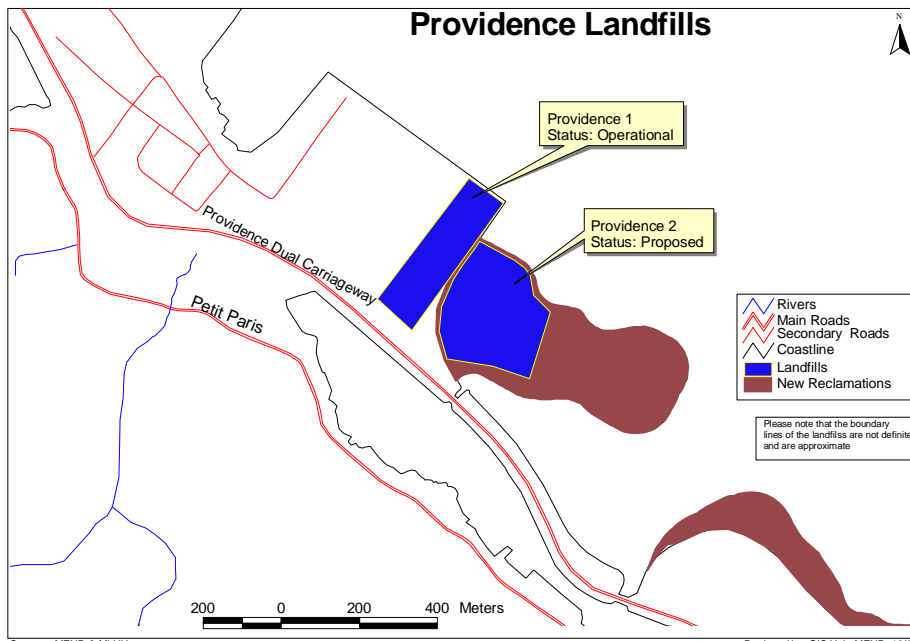


Figure 2.3.5.6: Existing and proposed landfill sites at Providence, East coast Mahe.



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

This part of the report covers the obligations under article 15 of the Convention. A limited number of estimations of future production are given for this part of the report, since many of the chemicals in question are no longer being used in the country. There is also the question of a lack of information or insufficient estimations for substances such as PCB in open use which prevents correct estimation. These estimates shall form the basis of future inventories and release estimates following to corrections. There is currently no requirement for exemption under the Convention on any of the listed chemicals (c.f. DDT below)

Article 15 paragraph 2 requests each Party to provide to the Secretariat: "(a) Statistical data on its total quantities of production, import and export of each of the chemicals listed in Annex A and Annex B or a reasonable estimate of such data; and (b) To the extent practicable, a list of the States from which it has imported each such substance and the States to which it has exported each such substance." The report attempts as much as possible to a reasonable estimate of future production of POPs substances. Within Annex A the estimate for pesticides is not found necessary as the amount which was present in the country was shipped for final disposal. Annex A part II, (PCBs) are covered by the report whilst Annex B chemicals (DDT) are not considered since it is also not used in the country and according to the records, there may only have been small insignificant amounts in stores in 2003. A complete estimate of Annex C POPs is given, base on the information provided by the inventory on PCDD/PCDF above.

There is presently no trade in POPs chemicals between Seychelles and other countries. The only export of Annex A chemicals was with the consignment of obsolete pesticides mentioned in 2.3.1 and 2.3.3 above. In total 6000 kilograms of DDT and other pesticides were exported.

As mentioned, this part of the report was derived directly from existing sources of information in the inventories and additional information made available during the NIP development process. Assumptions on future production for the selected chemicals for which projections are made available are based on growth figures provided made in the respective sectors. For the waste sector new 2005 revisions are available. For power generation and transport older but reliable figures can be obtained from several strategic documents. For uncontrolled combustion estimates figures may be more imprecise since this is an activity that has only been recorded through the burning permit system but not analysed in detail. There is little information on tendencies and trends which thus makes figures given in long term projections questionable.

The only foreseeable circumstance for requesting exemptions under the convention would be in the case where we need to use DDT against disease vectors. Health authorities may nonetheless request, for the purposes of safeguarding public health in the country, the use of DDT for

vector control. It may in the future Other POPs are not in use in the country and the industries which may rely on them do not exist in Seychelles at present.

The Seychelles does not at present have malaria but it has a potential vector, and control measures are also in place to prevent the country status from changing. Despite optimistic views from health on the risk of malaria entering the country, recent experience with Dengue and recently Chikungunya has taught us that we should always remain ready for such diseases. Thus as agreed by the health authorities, we should always leave the DDT option [albeit the very last], open as part of a scaled response system. As was agreed in a previous workshop, the best option would be no declaration to the secretariat until the need actually arises. In the eventuality of it occurring, then a cost benefit/efficiency evaluation of DDT and its alternatives (especially taking into account the experience of countries like Kenya) would be done by the authorities responsible for health and environment, following which an application for exemption could be filed.

The issue of Aldrin coming up as candidate chemicals requiring exemptions from the Convention has also been discussed extensively with all stakeholders. It has been used up to 1996 for the control of the crazy ant. According to sources in agriculture, it remains as one of the most effective controls for that species. The common position on the use of Lindane is to exhaust other alternative control measures first. Since the vector which it seeks too control does not cause human health impacts, there is little possibility for consideration for reintroduction of this substance.

Pesticides production in Seychelles is listed in table 2.3.6.1.

Table 2.3.6.1: Pesticides production in Seychelles

Year	2002/03 Baseline year	2005	2010	2020	2030
POPs Pesticides					
Production	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes
Aldrin	N/A				
Chlordane	N/A				
Dieldrin	N/A				
Endrin	N/A				
Heptachlor	N/A				
Hexachlorobenzene	N/A				
Mirex	N/A				
Toxaphene	N/A				

The table above represents the production of pesticide pops for the coming twenty years, The country has never manufactured such substances and there is no intention of introducing said production in the future. The production and use of PCBs and DDT are listed in table 2.3.6.2.

Table 2.3.6.2: Production and use of DDT and PCBs in Seychelles

Year	2002/03 Baseline year	2005	2010	2020	2030
DDT	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes
Production	N/A	0	0	0	0
Use	0				
PCB	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes
Production	0	0	0	0	0
Use					
Closed and semi closed applications	4.8				
Other applications	Unknown				

DDT is another substance that has never been produced in the country but has however been used in the past. Despite the fact that we do not expect any amount to be used in pest control, there may still be small isolated stockpiles not even quantifiable in tonnes. As for PCB, quantities in closed applications have been elaborated above, but that for other applications are still not known. We expect there to be PCB in old equipments, and these are covered in the action plans for that substance. Following to it implementation, we expect more accurate figures for the base years 2003 and 2005. Releases of Dioxins and Furans are taken directly from the inventory above (table 2.3.6.3).

Table 2.3.6.3: Releases from unintentional releases in Seychelles

Year	2003 Baseline year	2008	2013	2018	2023
Releases form Unintentional Production	(g I - TEQ) 5.4 (Cumulative value)	(g I - TEQ)	(g I - TEQ)	(g I - TEQ)	(g I - TEQ)
Dioxins and Furans (PCDDs/PCDFs)					
Waste Incineration	4.150	Not decided	Not decided	Not decided	Not decided
Ferrous and non Ferrous metal production	0	Not decided	Not decided	Not decided	Not decided
Power generation and heating	0.004	Not decided	Not decided	Not decided	Not decided

Year	2003 Baseline year	2008	2013	2018	2023
Production of mineral products	0	Not decided	Not decided	Not decided	Not decided
Transport	0.018	Not decided	Not decided	Not decided	Not decided
Uncontrolled combustion processes	1.09	Not decided	Not decided	Not decided	Not decided
Chemicals and consumer goods	0	Not decided	Not decided	Not decided	Not decided
Miscellaneous	0	Not decided	Not decided	Not decided	Not decided
Disposal and landfilling	0.071	Not decided	Not decided	Not decided	Not decided
Identification of potential hotspots	Not detected	Not decided	Not decided	Not decided	Not decided

Except for unintentionally produced POPs, there has not been any production of these substances in the country. The status would not change during the coming years.

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

2.3.7.1 Summary

Seychelles does not manufacture any kind of synthetic chemicals containing Persistent Organic Pollutants. However, the unintentional production of POPs, such as Dioxin and Furans needs to be studied further, as there might be a few industries or process which release these chemicals into the environment. Research shows that six of the Persistent Organic Pollutants pesticides have been imported and used in the country from the early 1950s to 1996 for the control of insect pest of medical and agricultural importance (refer to 2.3.1 above). It is believed that PCB containing products were also used in the production of electricity in the early 60's as most of the transformers / generators manufactured then, and imported by the third world countries contained PCBs. One of the previous employees (engineer) of the PUC observed that most workers complained of skin rashes, itchiness and eye irritation following the handling of used / waste oil, which is normally the acute symptoms / conditions experienced by person exposed to PCBs. However the country shifted to the use of mineral oil following the construction of the new electrical power plants and replacement of generators over the years mainly due to increase in electrical demands and the accessibility and availability of research findings.

The accumulative amount of Persistent Organic Pollutant Chemicals (POPs) imported over the years, could not be assessed due to the unavailability of data, but the last known figures of POPS pesticides in the country were highlighted in the Food Agricultural Organisation Report of 1997.

In Seychelles the total number of deaths reported due to acute poisoning of pesticides from 1985 to 2003 was 41 cases, and 83% of the total was among males. In both sexes death was more common between the age groups of 20 -39 years (63.4%). Cases of attempted suicides reported by intentional self poisoning by and exposure to pesticides during the same period 1985 – 2003 was 187 in total, 68% was within the males population and 32% females. The chronic diseases or death due to pesticides on the other hand is unknown and, as in other countries within the region, this needs to be studied.

It must be noted that it is difficult to associate chronic health outcomes with (pesticides) chemicals for several reasons. Chronic diseases arise as a result of continuous exposure to lower levels than do acute illnesses. There is an interval depending on the physiological structure and health status of the individuals between the exposure and the disease development, and in most cases it is beyond the bounds of possibility to make a firm linkage.

2.3.7.2 Regulatory Background for Monitoring of POPS

The regulatory background of POPs monitoring has been detailed in Part 2.2.4 above.

2.3.7.3 Current Monitoring standards and capacity for monitoring of POPs presence in the environment

The current monitoring standards and capacity for the presence of POPs presence in the environment have been detailed in Part **2.2**.

2.3.7.4 Assessment of Current Monitoring Practices with Results

History of environmental monitoring in the Seychelles dated approximately just two decades ago. Previously except for survey conducted on the effect of DDT sprayed on beaches to control sand flies and the documentation of various chemicals and pesticides used in agriculture no other monitoring activities were conducted to assess the use and effects of chemicals, including POPS in the country. The barriers to include POPs in the current monitoring practices have been identified in the Capacity Assessment undertaken in Part 2.2 above and are further detailed below.

2.3.7.4.1 AIR MONITORING

Mobile Combustion Sources

The only documented air pollution monitoring programme conducted in the country was from 1998 to 2003 whereby SBS had set up an air-monitoring station in Victoria city, (this is where most activities are taking

place, i.e. trade and commercial, domestic and industrial) so as to collect data on air pollution. The object of the exercise was to collect, analyze and disseminate data / information on the level of air pollutants such as particulate matter, particulate lead and nitrogen dioxide. The survey results were reported as follows:

(a) Total Suspended Particulate (TSP)

The 24-hour average of Total Suspended Particulate measured for the period was 47ug/m³ (microgram per meter cube), but for Saturday the busiest day of the week, the average level was 48.8ug/m³.

(b) Particulate of Lead

There was the downward trend in the measured level of particulates of lead from 1998 to 2003; this seems to correlate with the introduction of unleaded gasoline in Seychelles in 1998. The highest level of lead particulate recorded were 0.5ug/m³ in January 1998, but this systematically decreased to 0.1 ug/m³ by September 2003 giving weight to the government investment, in improving public health.

(c) Nitrogen Dioxide

The level of nitrogen dioxide measured for the period was 75 ug/m³. Overall it was observed that all the parameters measured fall well below the recommended World Health Organization (WHO) guideline.

Although SBS is the principal monitoring institution in the country, they had never been engaged into any POPs monitoring activities. To date they are yet to seek technical assistance to build capacity to broaden the scope of the monitoring programme so as to obtain a better data base for air quality in the country. Various ministries and organisations are mandated to monitor and control air pollution in the country. The Occupational Health and Safety Decree, 1978 makes provisions for the employer to maintain clean air in the working environment. Officers from the Ministry of Employment and the Occupational Health Unit within the Ministry of Health are authorised under the regulation but it is the former Ministry who has the responsibility to administer the decree.

The Occupational Health Unit within the Ministry of Health once had a gas detector which, was used for monitoring principal gases in the working environment but unfortunately the equipment is broken and is yet to be replaced. The only air monitoring device available is a digital dust level meter, which gives only quantitative measurement of dust in a particular environment, but it does not specify the type of dust. Except for the yearly mandated blood test (cholinesterase test) to measure pesticide residue among pesticide handlers, (Refer to Table 2.3.7.1 below), the Ministry of Health has not conducted any surveys to evaluate the effect of air pollution in the population.

Table 2.3.7.1: Number of Cholinesterase tests Conducted by Year.

YEAR	No. OF SAMPLES	No. OF ABNORMAL RESULTS	% OF SAMPLES ABNORMAL
1996	159	22	13.8 %
1997	150	16	10.6 %
1998	240	32	13.3 %
1999	41	2	4.8 %

2000	149	No Reagent Available	
2001	32	No Reagent Available	

Source: D. Poiret, 2004. Data Provided by Public Health Laboratory, Ministry of Health.

The Environmental Protection Act (EPA) of 1994 provides for the protection, preservation and improvement of the environment, for the control of hazards to human being, other living creature; for ensuring proper coordination, implementation and enforcement of national policies on environmental management. It also contains a framework for the administrator to designate an emission free zone and control burning activities through the issuance or non issuance of permits.

Other air pollution monitoring is being done by the Land Transport Division in the Ministry of Tourism at the official Vehicle Testing Station for opacity, carbon monoxide (CO), nitrogen dioxide (NO₂) and carbon dioxide (CO₂). All the monitoring is being conducted while the vehicle is at rest to ensure compliance to the Land Transport Regulations 1996.

Stationary Combustion Source

The Electricity Division of the Public Utility Corporation (PUC), being the electricity Authority in Seychelles, is mandated to provide electricity to the Seychellois population and is continuously improving consumer services of the country. To date there are over 20,000-metered consumers and a survey growth for electricity demand on the principal island of Mahé for the last five years was about 7% annually. PUC had projected future demand to grow by 10% per annum. Due to increasing demand, there was the need for a new and bigger power station which was commissioned in the year 2000 so as to provide its consumers with all the electricity that is required at all time. The other two main islands i.e. Praslin and La Digue also benefited from the above project and that was by the transfer of existing smaller generator sets from Mahé to help boost capacity.

The area of the new power station compound is 37,500m² and has space to house 12 generator sets giving an ultimate capacity of 75 Mw. The diesel engines installed in the station are type 18V32 manufactured by Wartsila NSD, Finland, with single unit capacity of 6.5Mw. The normal output of each generator set is 6.25 Mw at 50Hz and 11kV with an average daily production of 480,000 kWh.

To maximize the economic benefits, this facility is designed to burn heavy fuel oil. The station have a 3.6 millions litres storage facility in the station compound and average daily consumption is 115,000 litres and the exhaust heat boilers are used to generate steam for fuel treatment and the waste heat recovery is approximately 2 Mw.

Electricity is produced in the station at 11,000 volts. From the station some of the electricity is supplied directly into the distribution network. The remainder passes through transformers to increase the voltage to 33,000 volt and flow through transmission lines for bulk transfer to distance locations.

Even though the history of electricity in Seychelles dates back to the year 1926, the country is still without an Emission Standard for stationary

combustion sources. Furthermore, there had not been any monitoring activities to measure dioxins and furans production in the modern power station. However, in recognizing its responsibility to conduct its business with minimal impact on the environment the company in partnership with Wartisila NSD had initiated certain measures to minimize impact on the environment by implementing a number of features for ensuring a high level of environmental performance for the station:

- High exhaust stacks to disperse flue gases high into the atmosphere;
- Acoustic panelling to suppress high noise level;
- Oily water interceptors to remove oil from the water before it is release into the atmosphere;
- High temperature incinerator to burn fuel oil sludge and waste oil generated at the station and;
- They are not importing electrical equipment and oil that contains PCBs.

Waste oil from other outer island house generators is transferred to Mahé for further treatment and disposal.

2.3.7.4.2 WATER MONITORING

Treatment of water in Seychelles started during the late 40's following the construction of Rochon and Le Niol treatment works and such development was then linked to the improvement of health and general hygiene. Greater emphasis on the provision of water was experienced in the early 70's so as to cater for the increasing tourism industry, the general increase of the population and also the commercial sector.

Presently about 95% of the population is receiving piped treated water supplies. The provision of potable water to the population is ensured by the Water and Sewerage Division within the Public Utilities Corporation (PUC Water). PUC Water operates sixteen (16) comprehensive (effecting sedimentation, filtration, chlorination and pH correction) treatment plants. There are also other simpler treatment works effecting sedimentation and chlorination or simple chlorination before supplying water to the water distribution system. Most of the water entering these treatment works are run-offs originated from river sources with the exception of other smaller islands where some water are obtained from borehole tapping from the coastal aquifer. It must also be noted that the quality of raw water is relatively high with low level of faecal coliform and the present of heavy metal is virtually absent, therefore the minimum treatment process suffices to render it portable. The main problem usually encountered is high turbidity which occurs during period of heavy rainfall transporting organic materials (rotten leaves, etc) and soil in suspension.

The remainder of the population, those who can not be supplied with treated water, uses untreated water which is available in adequate quantity, if not quality. The River Board under the direct control of PUC Water also grants people licenses to directly abstract water from streams, in cases where they do not have access to treated water supply. The license is subject to certain technical and legal conditions with a minimal fee charged for it.

Water sampling and analysis were carried out long before the setting up of the Public Health Laboratory; it was then tested for microbiology during food poisoning outbreaks by the Clinical Laboratory. Over the years through the development of the Environmental Health Services in the country there was the formation of the Public Health Engineering Unit. The main objectives of the unit are to monitor and control:

- All drinking water supplies (including bottled water) in the country;
- All public swimming pools water;
- Wastewater treatment and disposal and;
- Environmental pollution.

Drinking Water Monitoring

Water sampling is done on a routine basis and samples are collected at water treatment works, institutions such as schools and hospitals, individual households, hotels (mainly in kitchen) and bottle water treatment plants for laboratory analysis. (The Public Health Engineering Unit is also involved with the formulation of general guidelines and standards concerning drinking water quality as well as monitoring. Corrective action is taken where quality of drinking water falls below the required standard. The current standards for the quality of drinking water are found in Schedule 1 to the Public Health (Water Examination) Regulations, 1994 made under the Public Health Act, 196, which is found in Annex 4 to the NIP. The Regulations deal with both the microbiological and chemical standards of water to prevent illness to consumers.

For the above it must be noted that no provision is made to monitor POPs therein, but with new development and the introduction of water desalination plants, officers mandated under the above mentioned regulations find that the parameters regulated are very limited so they have in most cases referred to the International Standard i.e. WHO guidelines for drinking water, *Codex Alimentarius* or the European Standard for action. The officers from Public Health Engineering Unit, Public Health Laboratory and Seychelles Bureau of Standard are in the process of revising the above-mentioned regulations

Bathing Water Monitoring.

The standard for the quality of water in swimming pools is also covered under the Public Health (Water Examination) Regulations 1994. Schedule 2 to the Regulations specifies the standards for swimming pool water as well as the requirements of swimming pools. All public swimming pools are inspected and water are collected once monthly by Environmental Health Officers to ensure compliance to the regulation. There again no provision is made with regards to monitoring of persistence organic pollutants.

Even though we are surrounded by ocean we do not have standards for bathing sea water but it is however, monitored yearly for microbiology in areas where sea outfall is used as point of discharge for wastewater treatment plants. Sea water is also monitored microbiologically in specific areas where school children is using sea water for their swimming activities and the EU Standard is used as referral for these purposes.

Wastewater Monitoring

The Environment Protection (Standards) Regulations, 1995¹⁰³ on effluent standards enacted under the Environment Protection Act specifies the prescribed standard for the discharge of effluents to a recipient system from any industry, operation or process. The Ministry of Environment is the Administrator of the Standard. Under Section 7(5) of the EPA 1994, an authorisation may be given to discharge effluent. Authorised officers are responsible for effluent monitoring and this is normally done once a year for discharge permits purposes. Monitoring is also conducted whenever there are complaints. Owners or operators of wastewater treatment plants are required to self monitor their treatment work quarterly and the results have to be forwarded to the Administrator. A copy of the standards is found in Annex 5 to the NIP. Even though the standards are stringent, there are still some parameters that are missing and have to be revised to cater for the actual prevailing situation.

2.3.7.4.3 SEDIMENT MONITORING

Although most of our wastewater treatment plant effluent discharges into the sea, rivers or marshes, very little sediment monitoring has been carried out in the country. This situation is likely to continue for some years to come. Monitoring has concentrated on parameters such as metals that can be analysed by the SBS, since other residues such as organic substances cannot be tested locally.

As most small island states, Seychelles has a waste disposal problem due to its limited land area. The solid waste management system is not a modern one and is not integrated. No separation of waste at source is done. The open dump system is still in use and this is worsened by the fact that the site is situated adjacent to the sea. Although the site being used is being referred to as controlled tipping site, this is because waste entering the dump is weighed and vehicle is controlled on entry but it does not contained the real elements of engineered landfill which includes the collection of leachate and gases produced. All the leachate generated is seeping into the adjacent marine environment with no proper sediment monitoring to evaluate the immediate and long-term environment and health effects caused by improper waste management.

All waste oil is exported to the Reunion Island (France) for treatment and disposal with the understanding that if the PCB/PCT level is above the France (EU) acceptable limit, it will be re-exported to the Seychelles. To date this had never been the case. All waste oil monitoring is done in Reunion to ascertain that it meets their standards.

2.3.7.4.4 Food and Feed

Fisheries Sector

The Fisheries Sector in the Seychelles is the first most important economic activity in the county. The Fish Inspection Services was established during the early 70's and at the time it formed part of the Fisheries Department, an organisation formed mainly to conduct post harvest research on commercial species of fish caught in Seychelles waters. The services mainly involved inspection and certification of

¹⁰³ SI 83 of 1995

consignments of fresh and frozen fish, demersal species to the region only. With the continuous growth and expansion of the fisheries sector, and fish export rapidly becoming an important economic sector, it was found necessary to reorganise the service and to manage it under the jurisdiction of a more professional organisation assuming greater roles and responsibilities in the control of fishery products for export. This unit became under the control of the Veterinary Services in the early 80's and fell directly under the responsibility of the Director of Veterinary Services. Over the years, it underwent continuous stages of development in almost every aspect from staff training, laboratory facilities, equipment, office facilities, and enactment of legislation. This process was slow at the beginning due to limited resources provided until the EEC legislation started to have serious effects on the industries and on the control authorities in the third world countries.

The main objectives of the main objectives of the Fish Inspection Quality Control Unit (FIQCU) are to:

- Ensure that fisheries products for export purposes are of the highest qualities and completely safe and wholesome to the consumers.
- Ensure establishments where the products are processed are maintained under strict hygienic conditions and that the management takes all appropriate measures to rectify any deficiency without delay.
- Ensure all personnel involved in the handling and processing of fish maintain a high level of personal hygiene and are fit to handle food.
- Ensure fisheries export industries meet the requirements of EU Directive, (Directive 91/493/EEC) on the quality and safety of fisheries products for export to the European market.
- Ensure Seychelles continues to maintain its good reputation as an exporter of high quality fisheries products and avoid the risk of complaints originating from products exported.

One of the functions of the Unit is the sampling of fisheries products. All chemical and microbiological analysis on fisheries products are conducted at the Seychelles Bureau of Standard, which had been designated as the Reference Laboratory for fisheries products following the EEC evaluation mission in August 1998. Samples are collected as per sampling program by the staff of the unit and submitted to the SBS.

The FIQCU conducts organoleptic and other physical assessment on canned tuna, fresh and frozen fish and frozen prawns. This consists of detecting contamination. In fresh fish it is verified if there has been contamination by chemicals, foreign matters and the level of freshness is assessed, etc.. Canned products are inspected for seam defects, foreign matters, low vacuum, overcooking, bones, dark flesh, etc.

The European Union Commission Decision 94/356/EC, 1994¹⁰⁴ requires that fisheries establishments in third world countries to have an effective system of approval of Hazard Analysis Critical Control Points (HACCP).

¹⁰⁴ Commission Decision laying down detailed rules for the application of Council Directive 91/493/EEC regarding health checks on fishery products. It details the rules of application for the HACCP system.

This allows the industries to conduct their own checks based on what is considered as critical control points (CCP) in the process. These systems have to be reviewed and if satisfactory, officially approved by the Competent Authority.

Out of the four approved fresh and frozen processing establishments, Indian Ocean Tuna and SMB Prawn Project have an in house quality control lab and conduct their own check according to the HACCP Plan and quality assurance procedures. Verification by the Competent Authority is done by sampling and analysis as per program and also by examination of records during factory audits. The two other establishments contract SBS to analyze their samples but sample collection and delivery to the lab is done by the Competent Authority. This allows the FIQCU at the same time to verify the establishment's own check.

Any application to operate a fish processing plant or factory vessel has to be approved by the Director of Veterinary Services before a license can be issued under the Export of Fisheries Product Act 1996¹⁰⁵.

Surveys have been conducted on different aspects of fish quality assurance such as mercury content¹⁰⁶ in commercial species, histamine levels in tuna and other pelagic fish, changes in micro-biological quality of fresh/chilled commercial species of fish and the presence of ciguatera toxins in fish species in Seychelles waters.

Council Directive 91/493/ EEC, 1991¹⁰⁷ requires a surveillance plan for fish which includes the monitoring of biological species; water etc and the relevant organisation has to submit its sampling plan results to the EU every year. This is partly being implemented in the Seychelles. Under Council Directive 96/23/EC, 1996¹⁰⁸, only aquaculture products (prawns) are being monitored for both Organochloride and Organophosphate Pesticide for exportation purposes. Since the country is not equipped to conduct such analysis, it is being done overseas by Testing Services (Food & Research Association), Wells Division, TDL Leatherhead, UK. The Directive requires one (1) sample per 100 tons export to be tested quantitatively for POPS and to date no abnormalities had been recorded.

The FIQCU plans to establish a data bank of relevant information that could be shared both at national and regional level. An environmental monitoring program is yet to be established and implemented and EU assistance is being sought on this issue.

Food Monitoring

Food sampling in the country started in 1986 and the activities intensified in 1987 so as to be in line with the introduction of the Food Act, 1987 which was promulgated that same year. Provisions were also made for

¹⁰⁵ Sections 3-8 Export of Fisheries Product Act, 1996

¹⁰⁶ Shamlaye CF. et al 1995. The Seychelles Child Development study on Neurodevelopmental Outcomes in Children following in Utero Exposure to Methyl mercury from a Maternal fish Diet: Background and demographics.)

¹⁰⁷ This lays down the health conditions for the production and placing on the market of fishery products and the hygiene regulations for fish and fishery products.

¹⁰⁸ Directive on measures to monitor certain substances and residues in live animals and animal products.

the establishment of a Food Laboratory to strengthen food control to ensure the consumption of safe and wholesome foods. Seychelles had limited agriculture land space and few food producing plants and therefore has to import a large amount of raw, processed and semi processed food products from all over the world. Sampling is conducted by the staff of the Food Control Unit and District Environmental Health Officers within the Environmental Health Services designated under the Food Act, 1987. Samples are collected routinely for bacteriological analysis by food analysts and technologists in the Public health Laboratory.

The Public Health Laboratory once started a programme to monitor pesticide residues in food and this activity could not be sustained for the following reasons:

- the qualified toxicologist for the chemistry section left prematurely;
- staff conducting the analysis were not adequately trained in the subject;
- the type of equipment available was old and broke down frequently;
- the analytical process was too laborious and unsafe for personnel conducting the analysis;
- there was a shortage of proper reagent to conduct the analysis; and
- shortage of spare parts to repair the machine which was often breaking down.

The forms used for food microbiological analysis and the one, which was used, in the pesticide monitoring programme are found in Annexes 7 and 8 respectively.

2.3.7.5 Evidence of presence of POPs in the environment, food, feed and humans

It has been reported that chemicals contaminants, which are found in the Indian Ocean Region have long – range transport potential¹⁰⁹. This includes POP chemicals, which have been produced in large quantities, and used in the region and are stable for long periods in the environment. It must also be noted that many neighbouring countries are infected / affected with the malaria vector and they are still using DDT as an affordable means of control. Taking into consideration the proximity of the Seychelles Island and the transmission pathways of chemicals it is obvious that we are prone to be affected although the importation of the POP chemicals and other dangerous chemicals has been banned.

Literature search revealed paucity of information (data) on health exposure effects, environmental levels, food importation levels and sedimentation levels (soil/water). Thus there is an urgent need to address the following so as to redress the situation and improve public health, whilst at the same time abiding to the requirements of the Stockholm Convention:

- Capacity building and manpower development to develop strategies and regulatory mechanism (management system) for chemicals.

¹⁰⁹ United Nation Environment Programme Chemicals. Global Environment Facility. Indian Ocean Regional Report December 2002

(Should focus on technical and infrastructure, legal, administrative, health and environmental monitoring).

- Conduct health studies to assess the impact of chemicals on health.
- Facilities for the measurement and the continuous monitoring of chemical levels in the country.

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

2.3.8.1 Summary

As proof of its obligations, the Government of Seychelles has signed various environment related conventions including the Stockholm Convention, which took place in May 2003, and has since then put in place various mechanisms that facilitates the protection and preservation of our environment. There is, however, a lack of focused effort to tackle the issue of POPs particularly relating to information, awareness and education, compared to other environmental areas. Awareness programmes were very few and sporadic except in some institutions such as Farmers Training Centre.

The following gaps were identified from the survey undertaken on POPs.

- There was also a lack of well coordinated information dissemination channel.
- Information going out where more environmentally related and lack POPs centred programmes.
- The vulnerable groups of the population were not being included in any forms of POPs related programme.
- Emphasis on a more consistent role of the media was also noted.

As a result, very few people are aware of POPs related issues and of the environmental and health impacts. Several members of the public were not getting access to sufficient information. Furthermore, the media is not providing enough information to the public in a manner that is understood by all. There is, therefore, an urgent need for capacity building in the area of dissemination of information dissemination of POPs chemicals. Even though several ministries have in place public relations officers or Information Communication and Education Sections, there is not much public involvement in the decision making process. The Convention also makes emphasis on non-confidentially of health and safety related information on POPs and alternative, again there is no defined policies to provide the public with this information.

Recommendations

The following recommendations have been made to address the gaps and weaknesses identified:

- Establish a body for coordinating public awareness/education programs on POPs.
- Train trainers for dissemination of information to different target groups.
- Incorporate POPs as a subject in the school curriculum.
- Establish mechanisms for effective collaboration between all stakeholders, i.e. government, non-governmental organisations, civil society organisations and the private sector.

- Acquire resource documents and set up a centralised documentation centre on POPs for public access.

2.3.8.2 Introduction

The Stockholm Convention on Persistent Organic Pollutants (POPs) makes provision under Article 10, for information dissemination and promoting public awareness on POPs.

This inventory aims to establish the country baseline awareness level on POPs. It will provide an overview of policies practices and programs that Seychelles has in place with regard to public information related to environmental issues, especially to POPs. It will give a solid foundation on which new POPs related awareness activities can be incorporated into the NIP. It will identify the barriers in the current public awareness related legislation and practices, which impede upon the successful implementation of the Convention. It will also briefly describe the information exchange mechanisms with other parties to the Convention.

This paper evaluates:

- The policies, practices and programs in relation to public awareness;
- Sensitisation and reporting of priority pollutant uses, releases and transport;
- Media relationship with governmental organisations promoting awareness among the public; and,
- Existing tools for public information and awareness and their impact.

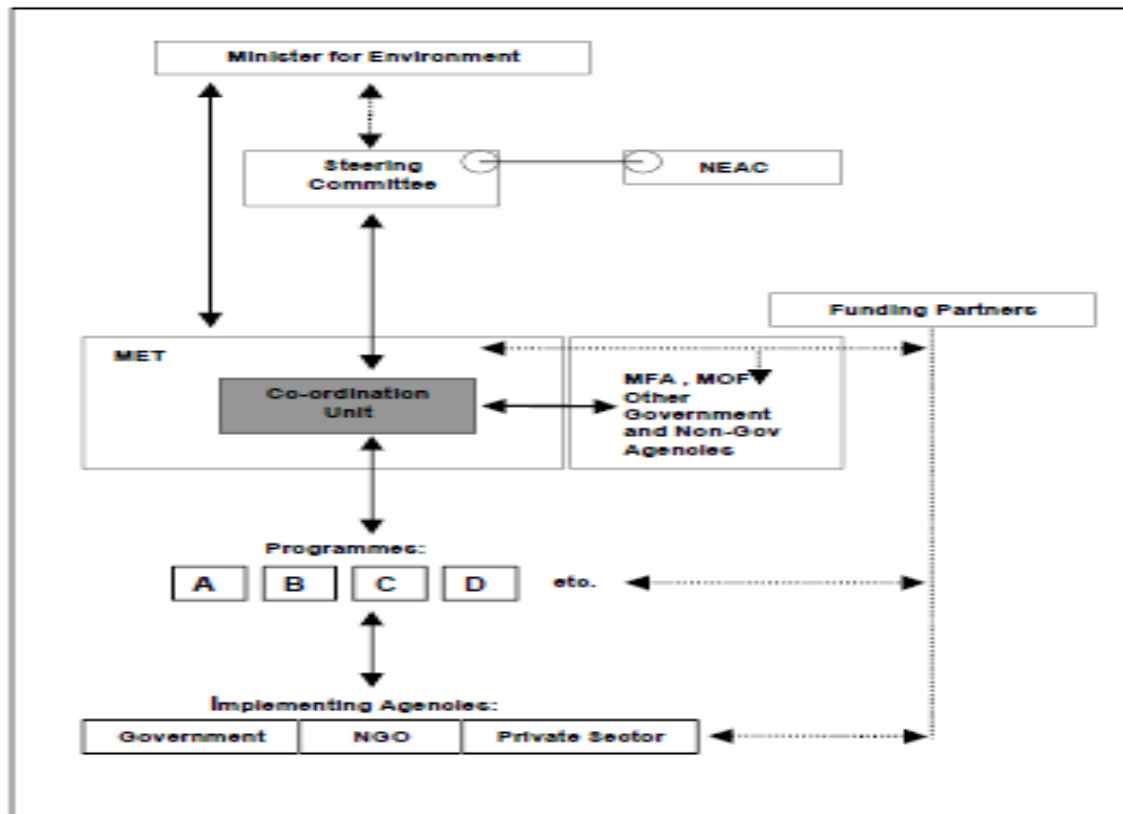
2.3.8.3 Overview of public information policy and practice related to environment

Although Article 10 of the Stockholm Convention spells out State Party's obligations in respect of information awareness raising and education on POPS, there are no clear cut policies in place to address this nationally. Existing policies which require public awareness and information are detailed below:

Environmental Policy: The EMPS 2000-2010.

The national strategy for implementing sustainable development principles in environmental protection is the Environment Management Plan (EMPS) 2000-2010. Education, awareness and advocacy as well as Partnerships, public consultation and civil society participation have been identified as cross-cutting themes of the EMPS 2000- 2010. The need for greater public participation and communication has been identified under the EMPS. The EMPS decision making process is detailed in Figure 2.3.8.1 below.

Figure 2.3.8.1: EMPS decision making process



Strategic Health Framework 2005-2009, Second Draft, Guiding Principles

The Seychellois people have the inalienable right and duty to participate individually and collectively in the planning and implementation of their health care. This will require considerable public education to create greater awareness especially in health promotion and disease prevention

Several programmes are in place within the education sector to raise awareness and education on environmental issues. The Curriculum Development Section within the Ministry of Education in close collaboration with the National Institute of Education (NIE) is responsible for preparing the curriculum, which integrates environmental issues into the national curriculum. A number of topics such as waste, pollution, water, agriculture and ecosystems feature in the primary, secondary and post secondary curriculum. However, there is still a lack of relevant information, such as learning support materials, concerning POPs.

The Ministry of Education and Youth has established an Environment Education Coordinating Committee (EECC) that remains active in reviewing environment activities undertaken by the various sectors. However, the Committee focuses on environment issues in general and not specifically on POPs related issues. There are also various informal educational programs with POPs components but these are yet to be implemented.

The Environmental Education Unit in the Ministry of Education and Youth (MOEY) supports schools in implementing the environmental education program. The unit also liaises with other governmental and non-

governmental organisations to organise other environmental education programs or activities.

Wildlife Clubs have been set up in different schools to help create awareness of the environment.

The Local Government Department, the initiator of the Neighbourhood Recreational Activities (NRA) has also taken on board environmental related aspects within their community-based programmes. Since the year 2003 the component of POPS has been incorporated as part of their activities but this is yet to be implemented.

Through its module on environment education, the National Institute of Education (NIE), national teacher training institution, has incorporated a number of environment components. Trainee teachers learn about waste and pollution in their science, Personal and Social Education (PSE) or environmental education classes. Environmental education modules are compulsory for all trainee teachers at this post secondary educational institution. This provides the future teachers with the opportunity to familiarise themselves with a number of environmental issues, which they can later use in their classes. However, POPs are not included

At the Farmers Training Centre, a post secondary institution, students and private farmers get an in-depth understanding of regarding pesticides and fertilizers as these topics are integrated in the Plant Protection module. In this module information on chemicals such as Dieldrin, DDT, Aldrin, hexachlorobeneze etc, and their effects on plants they are used on and on the whole eco-system, are given. The module includes topics such as:

- Precautions prior, during and after pesticide handling;
- Health effects of pesticide;
- Environmental and domestic effects and disposal of pesticides;
- Care of the equipment;
- Personal protection gears; and,
- The Pesticide Control Act, 1996.

2.3.8.4 Present public information tools and mechanisms

This chapter covers the specific tools, techniques and mechanisms which are used for disseminating environment related information to the public. The mechanisms in place include the following:

The Environment Impact Assessment (EIA) procedure was developed in 1970s, with the aim of predicting and mitigating adverse environmental impact that may incur due to development. EIA in principle is a formal process to predict the environmental consequences of human development activities and to plan appropriate measures to eliminate or reduce adverse effects and to augment positive effects. It has three main functions, namely: to predict environmental problems; to find ways to avoid them; and to enhance positive effects. The Pollution Control Section within the Division of Pollution Control & Environment Impacts Division of MENR deals with such matters. In line with the above-mentioned, the MENR – EIA section states as its mission statement that it commits itself: 'To facilitate sustainable development in Seychelles through the implementation of the Environment Protection Act (Impact

Assessment) Regulations, 1996¹¹⁰ and Environment Management Plan for Seychelles 2000 – 2010 according to the Government's environmental vision statement of maintaining the Seychelles as a world leader in environmental sustainable development'.

The EIA Regulations 1996 specifies that an EIA shall be open for public inspection at such place and within such period as may be specified in a notice published by the Authority. The notice shall state the summary description of the project or activity to be undertaken; the location where the project or activity is to be carried out; the place where the EIA may be inspected and the period within which the EIA is open for inspection. The notice shall be published in two issues of the local newspaper with an interval of not less than seven days between the first and the second publication. Any member of the public being a citizen or resident of Seychelles may make in writing comments on the EIA or the project or activity within the period specified in the notice or record the comments in the register kept at the place of inspection specified in the notice.¹¹¹

The mechanisms put in place for management of pesticides is the Pesticide Board established under the Pesticides Act, 1996. It is to be noted that the functions of the Pesticide Board do not include public awareness. One of the functions of the Director General of Health under the Act is the promotion of public awareness and training related to the use, storage and disposal of pesticides, the dangers involved in such matters and the safeguards required.¹¹²

Several tools are being utilised for raising awareness and to educate on environmental issues, particularly on pesticides. The Ministry of Health has published a booklet on the legal aspects of pesticides entitled, 'Pestisid – Ki Lalwa I dir ou' in 1996 and deals with occupational health issues and is being used in the training of pesticide handlers and farmers. The booklet has been written in Creole so as to facilitate its users (mainly farmers) to better understand its contents. Furthermore, it contains diagrams that depict the message to be communicated. However, the legal aspects of POPs and its management have not been included therein.

A few other leaflets were also developed but are now outdated and need to be reviewed as they address the issue of pesticides in a general sense, thus not looking at POPs as a core component. It is to be noted that all the above-mentioned materials need to be revisited, and amended or updated as deemed necessary so as to keep the pesticides users abreast with current development in this field, especially with POPs.

The Ministry of Education and Youth, Ministry of Environment and Natural Resources as well as other non-governmental organisations such as Nature Seychelles and Wildlife Clubs of Seychelles have produced materials to raise children's awareness on pollution issues such as waste. One of the most recent comprehensive learning resources is "Learning for a Sustainable Living in Seychelles", a methodology guide for teachers

¹¹⁰ SI 39 of 1996 as amended by SI 36 of 2000

¹¹¹ Reg. 8 EIA Regs.

¹¹² S 19 PCA 1996

which is a production of Nature Seychelles and Ministry of Education and Youth. The publication is a cross-curricular book, which provides schools with support materials and activities to integrate the concept of sustainable living. Some of the themes used in the book, which can help to promote a basic understanding of dangerous pollutants are: Population and Health; Water; Sanitation and Waste; Agriculture; Land Transport; Industry and Commerce; Energy; and Climate Change.

The Ministry Education and Youth works with other organisations to initiate a series of extra-curricular activities, which provide students at all levels, the opportunity to further understand a variety of environmental issues. One of these organisations involved is SWAC which participates in educational programs such as talks or lectures on the issue of waste for school children. This also includes visits to dumping sites, recycling exhibitions and clean ups of polluted places. The Water and Sewage Division with the Public Utilities Corporation also organises presentations on water and water pollution including visits to water treatment stations, water catchments areas as well as the cleaning up of polluted rivers. School children also often have the opportunity to visit the electricity power stations. Through regular visits with the Ministry of Environment, and Natural Resources, students get the chance to explore wetlands and learn about pollution. The Ozone Unit and Meteorological Office within MENR regularly give talks to schools based on climate change. There again they learn about the different factors causing air pollution and the effect on the environment.

The Science and Technology Fair is another educational extra-curricular activity which is organised every two years. Students, at all levels, investigate the effect of life-threatening issues such as waste or chemical pollution on the environment. They often have to find environmentally friendly alternatives, which local people can practice, in their everyday life.

The MoEY also encourages teachers and children to exchange their experiences and ideas through articles, poems, stories and games in the Enviro News, an environmental education newsletter published by the Ministry of Education and Youth every two months. The newsletter also covers special projects such as Small Islands Voices and APERGE. All activities and competitions organised to commemorate the different environmental theme days are also published in the newsletter. Other schools and clubs also have their environmental newsletters.

In 1994 the annual Eco-School competition was launched in order to promote the improvement of the school environment to make it more environmentally friendly. Prizes are given to best primary and secondary school as well as the best crèche every year. Since 1999 a star prize, a trip to the Aldabra, a world heritage site, has been introduced to reward the best primary and secondary schools. In November 2003, assisted by SADC, a workshop was organised for all school directors to teach them about the importance of adopting an Eco-School concept.

The APERGE (Appui Régional a la Promotion d'une Education pour la Gestion de l'environnement) Project, which is coordinated and supported by COI (the Indian Ocean Commission), was launched in 2003. This also

involves Mauritius, Madagascar and Comoros and it aims at the development of environmental Education in schools. Seychelles also participates in the UNESCO international forum Small Island Voices, where schools from small islands in the Pacific, Atlantic and Indian oceans share information on a variety of development issues through the internet.

In May 2004 Seychelles also joined another UNESCO international project for schools called Sandwatch which was initiated and first carried out by the Caribbean islands. It aims is to train children to better manage their coast. Seychellois children are encouraged to network with other children around the world to share experiences. They are also encouraged to participate in as many international competitions and projects organised by international organisations, such as UNEP.

In summary, the younger generation of Seychelles is very much aware of the negative impacts on the environment. However, the danger associated with POPs per se on the environment, needs to be addressed so that they understand the reasoning behind the ban on imports on the twelve POPs and how such substances could damage the environment.

The local media is the nucleus and the focal point in this campaign to educate and sensitise the public on environmental issues. This is done through programs, which vary from visual and audio programs to publications such as daily, weekly and monthly magazines, newsletters, leaflets, brochures and even the internet, a more recently adopted medium.

MENR has a good relationship and understanding with the local media. Their activities are some of the most frequently mentioned topics in local media. There is a maximum of two journalists from each of the national media institutions, (SBC TV and Radio and the Seychelles Nation, the daily newspaper) who specialise in reporting on the environmental issues, though they have not been necessarily trained in this particular field.

Over, the last few years MENR has rewarded local journalists on a national level for their contribution towards sensitisation and awareness activities.

MENR has also established an Education Information and Communication (EIC) section within the Ministry. The section is responsible for all promotional and educational activities, awareness raising programs and events to further sensitise the public.

The Seychelles Broadcasting Corporation produces and airs a monthly TV environment program, the aim of which is to create environmental awareness. A thirty minutes radio program, 'Nature Watch', is dedicated to raise the public's awareness on the protection and preservation of our natural resources.

The private sector is also involved in creating environmental awareness through the sponsoring of environmental programmes and prizes for environmental quizzes Agricultural programmes are also aired both on

SBC Radio and TV. Topics covered include food production, use of pesticides, soil fertilization, pest control management, etc.

'Check-In' is a fortnightly production aimed at the tourism industry. Because of the cross-cutting nature of the tourism industry, this programme provides the opportunity to raise the awareness of the public on the issue of preserving our natural resources.

The daily news on both TV and radio treat environmental issues as and when they arise.

The Seychelles Nation has an Environment page on Mondays which addresses various environmental issues. Articles are mainly from MENR. Two other newspapers make contributions. The weekly published 'THE PEOPLE' reports on environmental and agricultural. Earlier this year, it featured a series of articles on POPs written by a local environmentalist. The articles were published on a period of 12 weeks, with each article giving a precise account of the twelve POPs. However, the nature of the articles suggests that the articles might have been too complex for the ordinary reader to understand. The weekly REGAR newspaper also has an environmental column and reports on environmental issues.

MENR publishes its newsletter, the aim of which is to convey environmental and agricultural news from within this Ministry and targeting other Ministries and the public in general. A few leaflets and brochures are in production within MENR and these will be distributed to other Ministries and the general public to convey information of which POPs would be inclusive.

MENR has developed its own website. An e-network has been established between the MENR, MoH and the Customs Division. Information on dangerous chemicals including POPs would feature therein.

Environmental projects are implemented by MENR, other relevant government organisations, NGOs and private companies. However, the public in general gets very little opportunity to contribute to those programs especially given the technical aspects of POPs. Furthermore, it is also worth noting that the efforts to involve the public in contributing to the national efforts in relation to POPs is minimal, even with the assistance of the Pesticide Board or the Pollution Control Section of the Ministry of Environment.

Though MENR is undertaking sensitisation and awareness programmes, there is still further work to be done. Information on POPs is found in documentation centres in various ministries and non-governmental organisations and is therefore not readily accessible to the majority of the public. It is unclear whether the public is aware of the possible legal consequences of breaching the laws on pesticides. It is important that the efforts made by the various key stakeholders are more thorough and focused with regular updates. The language used must also be considered taking into account the level of understanding of readers.

Training provided so far have been remarkable at post secondary institutions, but there is also a need for students at earlier age to

understand at least what are POPs, and their effects on human and the environment.

2.3.8.5 Assessment of environment as public priority

This chapter assess the tools, which were described in the previous section based on their effectiveness and usability for disseminating POPs related information. These tools can later be used to raise POPs awareness among specific groups cost effectively.

In order to assess the effectiveness of the implementation of the Stockholm Convention the population was screened for assessing the baseline knowledge on POPs. To this end the task team developed questionnaires and screened a representative part of the population (women-men, educated-non educated, young-old, etc.).

A survey was conducted to have a more realistic view of the public's knowledge on POPs and their awareness of the impact of pops and of the existing mediums through which they would wish to get such information. A random sample of 46 respondents (19 males and 27 females) ranging from 8 to 54 years old, were selected to answer a questionnaire consisting of five questions (3 closed and 2 opened ended).

Out of the 19 male respondents, 10 (53%) aged above 30 years old and 4 (21%) aged between 21 – 30 years old indicated that they have not heard about POPs. 10 (37%) female respondents out of the 27 also indicated likewise. Please refer to Table 2.3.8.1 below for additional information.

Table 2.3.8.1: Public awareness baseline on POPs (part I)

Have you ever heard about POPs?								
	Male				Female			
	# of respondents		% of total		# of respondents		% of total	
	Yes	No	Yes	No	Yes	No	Yes	No
< 10 yrs old	0	0	0	0	1	0	4	0
10 - 14 yrs old	0	0	0	0	0	1	0	4
15-20 yrs old	2	1	11	5	2	2	7	7
21-30 yrs old	0	4	0	21	2	4	7	15
> 30 yrs old	2	10	11	53	5	10	19	37
<i>Sub-Totals</i>	<i>4</i>	<i>15</i>	<i>21</i>	<i>79</i>	<i>10</i>	<i>17</i>	<i>37</i>	<i>63</i>
<i>Totals</i>	<i>19</i>		<i>100</i>		<i>27</i>		<i>100</i>	

There were 2 (11%) out of the 19 male respondents (15-20 years old and above 30 years old) respectively, who indicated that they have heard about POPs. All 4 (100%) received this information from the media. Whereas 10 female respondents who indicated that they have heard about POPs, 5 (50%) also received this information from the media and 4 (40%) of them, received this information at work. Please refer to Table 2.3.8.2 below for more information.

Table 2.3.8.2: Public awareness baseline on POPs (part II)

Table Two: If Yes, in what context or circumstance you have heard it?				
	Male		Female	
	# of respondents	% of total	# of respondents	% of total
Media (TV, Radio, publications, etc..)	0	0	5	50
At work	4	100	4	40
At school	0	0	1	10
Totals	4	100	10	100

Out of the 12 (80%) of the 15 male respondents and 13 (76%) of the female respondents that indicated that they have not heard about POPs, do not know what POPs is all about. (Please refer to 2.3.8.3 below for additional information).

Table 2.3.8.3: Public awareness baseline on POPs (part III)

Table Three: If No, what do you think is the meaning of the term POPs?				
	Male		Female	
	# of respondents	% of total	# of respondents	% of total
I do not know	12	80	13	76
Related to pollution	0	0	2	12
Environment related	0	0	2	12
Organic substances	2	13	0	0
Not applicable	1	7	0	0
Totals	15	100	17	100

Out of the 19 male respondents, 5 (33%) aged between 21 – 30 years old and 9 (60%) aged above 30 years old indicated that they do not know what the impact POPs could have on the environment or health. Out of the 27 female respondents, 7 (26%) aged between 21 – 30 years old and 9 (33%) aged above 30 years old also indicated likewise. (Please refer to 2.3.8.4 below for more information).

Table 2.3.8.4: Public awareness baseline on POPs (part IV)

Table Four: Do you know the possible impact that POPs could have on the environment or health?								
	Male				Female			
	# of respondents		% of total		# of respondents		% of total	
	Yes	No	Yes	No	Yes	No	Yes	No
< 10 yrs old	0	0	0	0	0	1	0	4
10 - 14 yrs old	0	0	0	0	0	0	0	0
15-20 yrs old	0	2	0	13	0	3	0	11
21-30 yrs old	0	5	0	33	5	7	19	26
> 30 yrs old	3	9	20	60	2	9	7	33
Sub-Totals	3	16	20	107	7	20	26	74
Totals	19		100		27		100	

14 (47%) out of the 30 responses from the male respondents indicated that they would prefer to be educated via radio programs. 8 (27%) out of 30 male responses; and 19 (34%) responses from the female

respondents indicated a preference for television. (Please refer to Table 2.3.8.5 below).

Table 2.3.8.5: Public awareness baseline on POPs (part V)

Table Five: If you were to be educated on POPs, which of the following medium would you prefer?				
	Male		Female	
	<i># of responses</i>	<i>% of total</i>	<i># of responses</i>	<i>% of total</i>
Radio	14	47	10	18
Television	8	27	19	34
Publication	3	10	10	18
Journal	3	10	9	16
Meeting	2	7	7	13
None of the above	0	0	1	2
Totals	30	100	56	100

Recommendations

POPS is not a generally known topic amongst the population. There is the need for the establishment of a national body which deals with the issue of POPs, exclusively. This will take onboard all matters pertaining to public awareness in all the relevant sectors of the society and for all age groups. The body should comprise of all key stakeholders from the Government, non-governmental organisations and the private sector.

To this effect, it would also be crucial that the public active participation is sought and secured so as to empower them. Information needs to be systematic and communicated in a manner that is understood by the least educated and by using their most preferred medium.

At school level, it is also crucial that POPs be integrated in the curriculum as a component and the extra-curricular activities should also address the topic. Teachers' awareness on the topic also needs to be raised.

2.3.8.6 Chemical contaminant and pollutant release public information

Dissemination of information on chemicals related aspects is done occasionally through newspapers and publications of the National Consumers' Forum (NATCOF).

Current occupational training activities are undertaken by the Ministry of Employment with a certain number of organisations every year. These programmes are tailor made for specific types of workplaces. A draft national health and safety programme has been prepared to implement health and safety issues for the year 2006 onwards.

According to the Occupational Health and Safety Decree, 1978 organisations employing 50 employees or more have to nominate a safety officer. Organisations with less than 50 employees have to nominate. The Ministry of Employment screens the safety officer to see if he is qualified. Training for such officers is undertaken covering most aspects under law. Terms of reference for such officers exist. No Pollution Release and Transfer Registers (PRTRs) exist in the country.

2.3.8.7 Mechanism for information exchange

This part addresses the obligations of Article 9 of the Convention on the mechanisms for information exchange relating to the POPs. Such information relates to the reduction or elimination of the production, use and release of POPS and alternatives to POPs, including information relating to the risks as well as their economic and social costs.

The Convention requires the designation of a national Focal Point for the exchange of such information. The MENR has already been designated as the Focal Point for the Convention. Article 9 further requires State Parties to exchange such information with other Parties to the Convention, either directly or through the Secretariat of the Convention. Seychelles will have to establish bilateral information exchange policies to enable such exchanges.

Article 9 also states for the purposes of the Convention, information on health and safety of humans and the environment shall not be regarded as confidential. Parties that exchange other information pursuant to the Convention shall protect any confidential information as mutually agreed. At the national level, the issue of confidentiality for government officials is found within the State Secrets Act, 1977. Officers have to sign an Official Secrets Declaration upon taking up office not to reveal any confidential information acquired during their terms of office.¹¹³

The Public Service Order (PSO) 307 also makes provision for annual archiving of every official publication produced by ministries. This does not cover data which has not been become official. Therefore such information can be destroyed or kept confidential.

Under the EPA, 1994 any officer of the Authority or any person appointed on a committee or any person discharging any function or duty under the Act who discloses, otherwise than in the performance of his duties, any information obtained under this Act relating to any trade secret used in carrying out a particular project or activity, is guilty of an offence.¹¹⁴

¹¹³ Section 5 State Secrets Act, 1977

¹¹⁴ S 38 EPA 1994

Appendix 5: References, stakeholders and the questionnaire

References.

1. Environment Protection Act, 1996
2. Environment Management Plan Seychelles 2000 – 2010
3. Stockholm Convention on Persistent Organic Pollutants
4. Pesticides Control Act, 1996, (Act No. 4 of 1996)
5. Pestisid – Ki Lalwa I dir ou’
6. Bread Fruits and other Trees Protection Act, Chapter 18,

Stakeholders.

Government Institutions

Ministry of Health

Ministry of Education

Ministry of Environment and Natural Resources

Ministry of Finance – Division of Trade and Commerce

Ministry of Social Affairs

Ministry of Administration and Manpower Development

Parastatal Organisations

Seychelles Licensing Authority

Seychelles Bureau of Standards

Seychelles Public Utilities Corporation

Non – Government Institutions

Seychelles Federation of Employers

National Consumers Forum

Val D’Endor Farmers’ Association

Nature Seychelles

Farmers’ Association of Seychelles

Seychelles Chamber of Commerce and Industry

Other Institutions

National Institute of Education

National Institute of Health and Social Studies

Farmers’ Training Centre

Pesticide Board of Seychelles

Other Licensed Pesticide Operators

Media Association

Environment Education Coordinating Committee

Information and Communication Section - MENR

Questionnaire used for public awareness on POPs

KESTYONER POU EVALYE KONESANS MANM PIBLIK LO (POPS)

Laz Seks

Eski ou deza tann enn ant sa bann term swivan?

Persistan organik politan

POPs

Polyan organik e persistan

Si wi, dan ki konteks ou sirkonstans un tann nonm zot?

Si non, ki ou kwar sa term I vadir?

Eski ou konnen ki bann problem lo lasante I men ou lo lanvironman , sa sibstans I kapab koze?

Eski ou ti a kontan ganny edike lo la, e dan ki fason?

- a) lo radyo b) atraver televizyon c) dan en pti piblikasyon
d) atraver zournal e) bann rankont spesyal (Miting)

English translation of survey questions.

Have you ever heard of the following terms?

Persistent Organic Pollutants

POPs

Pollutants Organic Persistent

If yes, in what context or circumstance?

If no, what do you think the terms means?

Do you know what effect these substances can have on human health and the environment?

Would you like to be educated on POPs and by which means?

- a) through the radio b) through the television
c) through publications d) newspapers or e) meetings)

2.3.9 Relevant activities of non-governmental stakeholders

2.3.9.1 Introduction

Article 7, paragraph 2 of the Convention facilitates parties to consult their national stakeholders, including women's groups and groups involved in the health of children, in order to facilitate the development, implementation and updating of their implementation plans.

Article 10, paragraph 1/d says that each party shall promote "public participation in addressing persistent organic pollutants and their health and environmental effects and in developing adequate responses, including opportunities for providing input at the national level regarding implementation of this Convention".

In order to meet these requirements of the Convention the NIP should contain a brief inventory on the current activities and expertise of NGOs in the field of POPs.

Several NGOs have been identified, which do not deal specifically with POPs but are indirectly involved in the POPs issue.

2.3.9.2 Relevant NGO stakeholders:

Name of NGO: Nature Seychelles.

Contact details: PO Box 1310 Education and Environment Centre, Roche Caiman, Mahé, Seychelles. Tel: (248) 601100. Email: nature@seychelles.net.

Major Field of expertise: Conservation of biodiversity focussing primarily on Birds. Nature Seychelles is affiliated to RSPB and Birdlife International.

Additional expertise/Relevant activities: Improve conservation of biodiversity through education, awareness and training programmes. These include articles to increase awareness on POPs as found in Appendix 1 to this Part.

Name of NGO: National Consumers Forum

Contact details: Tel: 248 225941. Fax: 248 226093. Email: natcof@seychelles.net

Major Field of expertise: Public information and awareness campaigns for consumers.

Additional expertise/Relevant activities: Have produced leaflets to inform the public on Genetically Modified Organisms (GMOs) under the National Biosafety Framework project.

Name of NGO: Cancer Concern

Contact details: Tel: 224242. Fax: 224296. Email: angdio@seychelles.net

Major Field of expertise: To raise awareness on the issue of cancer and to provide support for patients and their families.

Additional expertise/Relevant activities: Public awareness on causes of cancer.

Indication of possible involvement in the NIP implementation or update:

There needs to be close collaboration between the implementation team and the NGOs throughout the NIP implementation process. This will be facilitated due to the fact that the NGOs are part of the EMPS Steering Committee. They will remain part of the annual review team, as detailed in the Action Plan on reporting in Part 3.

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

2.3.10.1 Introduction

This assessment provides an overview of the infrastructure currently in place in the country for POPs assessment, measurement and analysis. The first part elaborates on the waste management facilities available. Part two of the assessment elaborates on the capabilities available for contaminated site remediation. Part four looks at environmental monitoring capability and health monitoring. The assessment is based on information gathered by the task teams undertaking the relevant assessments above.

2.3.10.2 Waste management facilities

Except for waste oil incineration, the Seychelles currently does not have any specialised waste facilities dedicated to hazardous waste.

In the past hazardous waste has been deposited together with municipal waste in three non engineered landfills. Engineered landfills have been constructed on the islands of Mahe and La Digue but these lack specialised treatment facilities for hazardous waste and also specialised treatment for contaminated landfill leachate. Dedicated hazardous waste storage facilities are non existent. A small facility constructed for storage of items such as lead acid batteries at the Providence Landfill (Mahé) can no longer be used as waste from the landfill has encroached upon it. Current practice is to encourage waste generators to store their hazardous waste on site until disposal can be carried out. The same applies for the Public Utilities Corporation and its stock of waste oil from transformers. Where this is not possible STAR Seychelles, the solid waste contractor collects and stores all hazardous waste in shipping containers.

Hazardous waste storage facilities are being considered under the revised Solid Waste Master Plan 2003-2010 (Scott Wilson. 2004¹¹⁵).

¹¹⁵ Strategic Objective 10.2

2.3.10.3 Contaminated site remediation capability

The country presently neither has the capability for contaminated site remediation nor has there been any attempt to apply such technology to site remediation. There are nonetheless person in the private sector and government agencies who have had university level training in subjects related to site remediation (for example agriculture and soils, chemistry, bio-engineering) who can be further trained in remediation of POPs contaminated sites.

2.3.10.4 Environmental monitoring capacity

Environmental monitoring capacity has been covered in part 2.2 and 2.3.7 above.

2.3.10.5 Health monitoring capability

No research has been carried out in the country to detect and assess origins of specific disorder that may result from POPs in the environment. As mentioned in 2.3.7 there is an urgent need for conducting research in this area.

As the Seychelles study on the significance of mercury in developmental processes (Shamlaye CF. et al 1995) has shown, there is the potential for undertaking such research in the country.

2.3.10.6 Technical support and release mitigation services

There is a limited pool of private consultants capable of undertaking environmental audits and site assessments. In this it must be stressed that the Seychelles has traditionally used external expertise to conduct such audit services. This is due to the fact that the market is too small to support operations dedicated solely to environmental auditing.

Some personnel of the Seychelles Bureau of Standards are trained in ISO auditing and in addition there are some graduates who have followed courses in certain aspects of environmental auditing.

2.3.10.7 Research and development assets

The country does not have much technical capacity for research and development in the field of POPs. Laboratory capacity is elaborated in part 2.2.

2.3.10.8 Information management capacity

There was recently an attempt to establish a Chemical Information Exchange Network (CIEN) in the Seychelles for the exchange of chemical information between relevant stakeholders. However, as the mandate,

goals and functions of the network were not properly set out all activities relating to the network ceased.¹¹⁶

The country has all the requisite elements for environmental information management. However this is not integrated into a coherent system where information is managed centrally, processed, and disseminated.

The issue of information management were addressed in detail during the preparation of the African Environment Information Network (AEIN) project, the aim of which was to assess the national capacity for environmental information management in the Seychelles. The two main outputs of the project were the 'National Capacity Assessment for Environmental Information Management¹¹⁷' report and the "Preparation of the Country Implementation Plan¹¹⁸" for an information management system/network for the Seychelles.

The project found that within the Seychelles, some basic physical and human capacity exists for information management. There is a need strengthen this existing capacity, fund more capacity building activities (to improve human skills), harness existing expertise and harmonise processes or create synergies between them for more efficient information management.

The project highlighted that past initiatives for information management and networking have either been partly successful or failed mainly due to the following reasons: no proper follow-ups; lack of momentum and driving force; no specific and clear goals of the initiative; lack of human skills, and unwillingness to share data and make data (freely) available to users. These factors should be taken into consideration in future initiatives to manage information so that the same is not repeated.

The issue of the most suitable framework for information management within the Seychelles was considered. Other issues highlighted in the project which should be taken into account when choosing the appropriate framework for information management is the unwillingness to share data which seems to be a strong factor impeding on efficient information flow in the Seychelles as well as that of data security. The project recommended that the setting up of an information network/system for the Seychelles would have to take into consideration other initiatives within the country such as the Seychelles National Clearing House Mechanism as well as the exist system currently in place.

The main findings and recommendations of the National Capacity Assessment undertaken are found in Appendix 6. The capacity assessment of the Pollution Control and Environmental Impacts Division within MENR is found in Appendix 7.

¹¹⁶ Henriette E. (2005) Preparation of the Country Implementation Plan for an Environmental Information Management Systems/ Network for the Seychelles (AEIN)

¹¹⁷ Henriette E (2005) National Capacity Assessment for Environmental Information Management in the Seychelles (AEIN)

¹¹⁸ Henriette E. (2005) Preparation of the Country Implementation Plan for an Environmental Information Management Systems/ Network for the Seychelles (AEIN)

Appendix 6.: Conclusions and Recommendations from the National Capacity Assessment undertaken for Environmental Information Management in the Seychelles.¹¹⁹

Conclusion and Recommendations

Conclusion

The National Capacity Assessment and other studies carried out in assessing information management in the Seychelles such as the 'Seychelles Biodiversity information Management survey, 2004' revealed that all organisations surveyed possess some form of experience for information management and that each of them manages their own data and information. Though, very few organisations are mandated to manage information, most of them do so as the nature of their work requires some form of information management.

Thus, the capacity and expertise for information management already exist in the country. The key will be to find ways to harness this expertise and bring them together to achieve a common goal.

There are various pilot projects and initiative currently being tested and implemented in the Seychelles for information management. There is thus a need to draw upon the various synergies between the different pilot projects and initiatives so that information management can be addressed as a whole rather than as separate entities. The various initiatives could be brought together as part of a network for information management to facilitate information exchange and cooperation.

Furthermore, as each institution manages its own data and information, there is clearly a need for better integration between organisations for information exchange and sharing. It would be vital for any biodiversity information network and information system to take into account the expertise that already exists in the country. In establishing such a network it would be important to explore ways to harness this expertise to achieve national goals and to identify proper protocols for the sharing and exchange of information. The overall goal of the national biodiversity information network and information systems will have to be clear, take into account the needs of stakeholders within the country and provide clear benefits to all stakeholders involved in the network.

¹¹⁹ Henriette E (2005) National Capacity Assessment for Environmental Information Management in the Seychelles (AEIN)

Recommendations

- Harness expertise in information management that already exists in the Seychelles in order to achieve a common goal for environmental information management.
- Assess ways in which the environmental information management process in the Seychelles could be improved.
- Assess or support an initiative to assess ways in which information is used in the country (implementation, reporting and decision/policy-making)
- Enhance the ability of organisations to assess their own information/data needs;
- Enhance the ability of organisations to develop their own information system frameworks;
- Enhance the ability of organisations to build their own information systems.
- Facilitate the establishment of information networks with specific goals in the Seychelles.
- Establish synergies and common grounds between the various pilot projects being implemented so that information management can be addressed in a holistic manner.
- Strengthen and establish new collaboration between organisations involved in the environmental management and sustainable development.
- Facilitate the establishment of a 'National Directory of Institution and Information Sources for environmental management' (a metadata system) and establish a mechanism to keep the Directory up to date;
- Support and facilitate initiatives to digitise information (convert information that are available in non-electronic format into electronic forms);
- Strengthen national mechanisms for access to and dissemination of information;
- Develop linkages with leading international organisations and networks in information management;
- Provide information management tools, guidelines and standards for data/information management;
- Facilitate capacity building through internships and other collaboration which allows for proper exchange/sharing of expertise.

Appendix 7: National Capacity Assessment undertaken for Environmental Information Management in the Seychelles.¹²⁰

Pollution Control and Environmental Impacts (PC&EI) Division (Ministry of Environment and Natural Resources)

Overall Mission/Mandate

Pollution prevention and abatement. Implementation of the indicated modalities of facilitating the achievement of sustainable development according to the environment protection act and its regulations with the wide framework of the EMPS.

Mandates related to Information management

No specific mandate for information management.

Information Management

Major Data and Information Resources

Description of data holding:

Objectives of data holding: To meet mandate.

Name of data manager:

Job title:

Flavien Joubert

Director Pollution Control

Contact e-mail of data manager:

f.joubert@env.gov.sc

Form of data holding:

Hard copy formats	Audio-visual formats	Electronic formats
Books/reports Maps	Photographs Video/film	Word processor files Spreadsheet (Microsoft Excel) Database (Microsoft Access) GIS coverage

Operational language: English

Metadata point of contact:

Flavien Joubert (Director Pollution Control)

Botanical Gardens, Mahe, Seychelles.

Tel: +248 224 644, Fax. +248 224 500

E-mail: f.joubert@env.gov.sc Website: <http://www.env.gov.sc>

Date that metadata was recorded:

April 2004

Metadata is provided in table 2.3.10.1.

¹²⁰ Henriette E (2005) National Capacity Assessment for Environmental Information Management in the Seychelles (AEIN)

Table 2.3.10.1: Description of data holding:

Name of data holding/Type of data	Theme/Information coverage	Geographical coverage	Temporal coverage	Keywords	Last update	Frequency of update	Limitation of data	Information access	Cost of access	Distribution format	Access procedure
Surface water	Environmental	National		water	2004	Monthly & Annually	Scale Completeness Quality/Accuracy	Restricted to some	Free to most. Charged at cost of recovery for others.	Hard copy Floppy disk CD-ROMS, E-mail	A letter justifying the need and intended use of the information.
Aerial photographs	Environmental	National		Pollution, water, land use	1998		Scale Completeness Quality/Accuracy	Restricted to some	Free to most and charged at cost of recovery for others.	Hard copy Floppy disk CD-ROMS, E-mail	A letter justifying the need and intended use of the information
Land use	Environmental	National		Pollution, water, land use			Scale Completeness Quality/Accuracy	Restricted to some	Free to most and charged at cost of recovery for others.	Hard copy Floppy disk CD-ROMS, E-mail	A letter justifying the need and intended use of the information
Roads	Environmental	National			2003		Scale Completeness Quality/Accuracy	Restricted to some	Free to most and charged at cost of recovery for others.	Hard copy Floppy disk CD-ROMS, E-mail	A letter justifying the need and intended use of the information
Major settlements	Environmental	National			2003		Scale Completeness Quality/Accuracy	Restricted to some	Free to most and charged at cost of recovery for others.	Hard copy Floppy disk CD-ROMS, E-mail	A letter justifying the need and intended use of the information
Urban areas	Environmental	National		Pollution, water, land use	2003		Scale Completeness Quality/Accuracy	Restricted to some	Free to most and charged at cost of recovery for others.	Hard copy Floppy disk CD-ROMS, E-mail	A letter justifying the need and intended use of the information

Human Resources on Information Management

The table 2.3.10.2 below outlines the human resources available within the Pollution Control and Environmental Impact Division. It also indicate areas where no expertise exists (2nd column) and where more expertise is needed (3rd column).

Table 2.3.10.2: Human resources available at the Pollution Control and Environmental Impact Division

Expertise	Areas of available expertise	Areas with no expertise	Areas where more expertise required
Data collection/monitoring	X		
Data entry/quality-assurance	X		
Data analysis	X		X
Technical writing	X		X
Graphic design/publishing		X	
Communications		X	
Management information systems		X	
Geographic information systems	X		
Remote sensing		X	
Database development	X		
Systems management		X	
Internet access/web-site		X	
Other technical assistance		X	
Others:			
Database management			X
Information management			
Website development			

Facilities for information management

Main facilities accessible by the organisation to enhance information management

The table 2.3.10.3 below lists all the facilities accessible by Pollution Control and Environmental Impact Division to enhance information management. When applicable the amount of these facilities and the number of users using these resources has been denoted.

Table 2.3.10.3: facilities accessible by Pollution Control and Environmental Impact Division

Main facilities	Amount (if applicable)
Computers	6
Laptops	2
Local Area Network	7 users
Telecommunications & Networking	
<i>Telephone</i>	
<i>Fax</i>	
<i>Individual e-mail accounts</i>	
<i>Internet access points</i>	
Internet access & bandwidth	
<i>Microwave/Radio link</i>	
Data input/output	
<i>Scanners</i>	1
<i>Colour printers</i>	3
Applications software	
<i>Office productivity</i>	
<i>Graphics/presentation</i>	
Database management systems	
Access	1 user
Geo-data processing	
<i>GIS</i>	3 users
<i>Mapping</i>	3 users
<i>Global Position System services</i>	3 users
Photocopier	1
In-house printing	

Facilities needed to strengthen information management

The following facilities are needed in the Pollution Control and Environmental Impact Division for strengthening information management: database management systems, applications software and communication/groupware facilities.

Information Policy

- i. Use of an information strategy and data policy or mechanism
The Pollution Control and Environmental Impact Division does not have an information strategy and data policy or mechanism for information management.
- ii. Conditions for access to environmental information
Most of the information is accessible free of charge but conditions for access is provided on an adhoc/informal/selective basis and an individual request has to be made for accessing the information.

When an access is granted, the information is distributed or accessible in the following formats: Hard copy, Floppy disk, CD-ROM and E-mail.

Networking Partnership

i. Involvement with national networks, steering groups and or committees.

- EMPS Steering Committee
- Chemical information exchange network (CIEN) (local)
- ISO Committee

ii. Collaboration with data suppliers (table 2.3.10.4).

Table 2.3.10.4: Collaboration with data suppliers

Organisation	Data/information provided	Formal agreement/MoU
SBS		No
PUC		No
Ministry of Health		No
Consultants		Yes

iii. Collaboration with data users (table 2.3.10.5).

Table 2.3.10.5: Collaboration with data users

Organisation	Data/information received	Formal agreement/MoU
Planning Authority	Environmental assessment	No
Seychelles Licensing Authority	Environmental assessment status	No
Ministry of Health	Reports	No
Pesticides Board	Reports and site assessments	Yes
UNEP	Reports	Yes

iv. Collaboration with organisations for non-data linkages (expertise, use of facilities) (table 2.3.10.6).

Table 2.3.10.6: Collaboration with organizations for non-data linkages

Organisation	Nature of cooperation	Formal agreement/MoU
Private organisations	Preliminary assessments	No
Pesticides Board	Lectures	Yes
National Institute for Education (NIE)	Lectures	Yes
Marine Park Authorities	Lab facilities	No

v. Future and potential collaboration (partnerships) (table 2.3.10.7).

Table 2.3.10.7: Future and potential cooperation

Organisation	Potential/Proposed cooperation
Medical University for Seychelles	Lead Assessment
SADC PCB Survey	Capacity building
Nairobi Convention	Capacity building, consulting

Major Constraints on Information management

i. Data/information constraints:

The main constraints for information management with respect to data/information are: scale, completeness and quality/accuracy.

ii. Human Resource constraints:

Capacity of the human resource is limited by a lack of expertise in data management, data analysis and technical writing.

iii. Physical Resources (facilities) constraints:

Information management is limited by a lack of database management systems, applications software and communication/groupware facilities.

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

2.3.11.1 Introduction

There are currently no impacted population in the country. The report summarises the current occupational and safety measures. The action plan explicitly addresses this gap and facilitates the initial assessment of impacted populations.

2.3.11.2 Declaration and reporting of priority pollutant releases.

There are no current PRTR practices in the country and the system of operation of regulatory agencies does not at present facilitate the implementation of a proper PRTR type system. Setbacks come from several quarters, and include those listed below. The resolution of these setbacks should be seen as prerequisite for the implementation of any form of system where information is recorded, processed and released to the public on an unrestricted basis.

- Lack of public disclosure by regulators, which mostly stems from lack of definition of legal and administrative obligations for agencies and persons within those agencies to make known to the public, certain important information;
- Lack of practice of open door approaches and free dissemination of information as part of normal operation of regulatory agencies;
- Non existent challenges from the public or interest groups for disclosure on ground of public interest;
- High "cost" of public interest litigation which essentially bars most from attempting to institute legal measures¹²¹.
- Lack of knowledge amongst the lay public on the obligations to report on matters of public interest and on details of the matters that should in fact be disclosed.
- Low participation by the public in open consultations, or submission of comments on official issues

2.3.11.3 Background on potential sources of POPS impact.

No assessments have been done to determine impact of POPs on local populations. As mentioned above, the action plans once implemented would enable the determination of the extent of such impacts and affected environments.

2.3.11.4 Current occupational safety measures.

Legislation exists in relation to occupational health and safety measures. The Occupational Safety and Health Decree, 1978 puts a duty on every employer to ensure the health and safety of his employees. These duties include arrangements for ensuring the safety and the absence of risks to health in connection with the use, handling, storage and transport of articles and substances as well as the provision of such information, instruction, training and supervision as is necessary to ensure health and safety at work for his employees.¹²² The Ministry of Employment is responsible to enforce this legislation. Current occupational training activities are undertaken by the Ministry of Employment with a certain number of organisations every year. These programmes are tailor made for specific types of workplaces. A draft national health and safety

¹²¹ Bernard George Barrister, presentation given on public interest litigation

¹²² S 4 Occupational Safety and Health Decree, 1978

programme has been prepared to implement health and safety issues for the year 2006 onwards. According to the b organisations employing 50 employees or more have to nominate a safety officer. Organisations with less than 50 employees have to nominate. The Ministry of Employment screens the safety officer to see if he is qualified. Training for such officers is undertaken covering most aspects under law. Terms of reference for such officers exist.

2.3.11.5 Potential risk groups.

It is virtually impossible to quantify the potential risk groups, given that no research has been undertaken in that area. Furthermore procedures requiring testing of workers handling such chemicals were non existent. No data (medical and occupational) has been kept on persons involved in use handling. Nonetheless broad groups who were potentially at risk can be identified based on the occupations which involved use and handling of POPs chemicals:

POPs pesticides¹²³:

- Persons employed with the department of agriculture up to the mid eighties: sprayers (4 persons at any one time), requisite store workers involved in mixing and sales (12 at any one time). No protective gear was worn and regular testing was non existent.
- Persons who were at school up to the seventies and who were exposed to DDT based head lice treatment, including parents who applied the DDT power mixed with oil. Given the prevalence of head lice, we can assume that most children were exposed at some point.
- Persons employed by major importers (four major importers), who imported such chemicals in bulk, (liquid or powder form in drums) and who were involved in packaging and distribution.

PCBs

- Utilities workers employed by the Public Utilities Corporation Electricity Division (previously Public Works Division (PWD)) especially those involved in transformer maintenance.

Dioxins and Furans

- General population exposed to the burning of domestic waste, particularly populations next to landfills where fires were common, e.g La Retraite
- Persons involved in charcoal and copra production especially those living and working next to kilns "*calorifer*,
- Populations in the neighbourhood of Victoria Hospital, and also workers involved in waste incineration at the hospital.

2.3.12 Details of any relevant system for the assessment and listing of new chemicals Procedure under PCA

¹²³ Based on interviews with past health and agriculture workers

2.3.12.1 Introduction

Article 3 paragraph 3 of the Convention describes that:

“Each Party that has one or more regulatory and assessment schemes for new pesticides or new industrial chemicals shall take measures to regulate with the aim of preventing the production and use of new pesticides or new industrial chemicals which, taking into consideration the criteria in paragraph 1 of Annex D, exhibit the characteristics of persistent organic pollutants.”

2.3.12.2 Existing regulatory schemes and processes for assessing new chemicals.

There are no regulatory schemes and processes for assessing new chemicals in the country. However, the EPA 1994 empowers the Authority to commission research and sponsor studies on problems relating to environmental pollution as well as to examine such manufacturing processes, materials and substances that are likely to cause environmental pollution.¹²⁴ Furthermore, chemicals industries are considered as projects or activities requiring an environmental authorisation under the EP (EIA) Regulations¹²⁵. Consequently, the manufacture, handling, storage and transportation of hazardous chemical and substances shall require a Class 1 EIA to be carried out prior to such activities. However, the system is not fully comprehensive given that novel substances entering the country in foodstuff, or through general retail activities may not be captured by the system.

2.3.12.3 Regulatory schemes and processes for assessing new pesticides.

The current system for assessing new pesticides is found under the Pesticides Control Act, 1996. Under the Act, one of the functions of the Pesticides Board is to register any pesticide upon an application made. An application for registration of a pesticide under the Act shall contain the following particulars¹²⁶:

- (a) A description of the pesticide giving its trade name, the common name, the active ingredient, other ingredients, its chemical name and concentration;
- (b) The name and address of the manufacturer, packager and supplier
- (c) The purpose for which the registration is sought;
- (d) Toxicological data, including material data sheets, efficacy trials and environmental or health reports and the safe periods after application of the pesticide;
- (e) A statement as to whether the pesticide is banned or severely restricted in the country of origin or of packaging due to health or environment reasons;

¹²⁴ S 4(5)(iv) & (v) EPA 1994

¹²⁵ SI 39 of 1996

¹²⁶ S 9 PCA 1996

- (f) The proposed draft label for the storage, sale or supply of the pesticide;
- (g) Proposed method of storage of the pesticide; and
- (h) Intended method of disposal of the pesticide and its container if so required due to surplus or expiry date for use.

Furthermore, the Board may require an applicant to furnish such other information it may require for the purposes such an application.

2.3.12.4 Need for amending these schemes to meet the requirements of the Convention.

New schemes for the assessment of new chemicals, particularly POPS chemicals, will have to be developed to meet the requirement of the Convention under Article 3(3) as no such schemes exist in the country.

Schemes for the assessment of new pesticides under the PCA 1996 will have to be reviewed and amended accordingly to meet the requirements of the Convention, particularly the information requirements and screening criteria under Annex D, paragraph 1 as these fail to be addressed under the existing system. Currently the only information required under Annex D paragraph 1 that is being requested under the existing system is the description of the pesticide giving its trade name, the common name, the active ingredient, other ingredients, its chemical name and concentration.

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

2.3.13.1 Introduction

Article 3 paragraph 4 of the Convention describes that:

“Each Party that has one or more regulatory and assessment schemes for pesticides or industrial chemicals shall, where appropriate, take into consideration within these schemes the criteria in paragraph 1 of Annex D when conducting assessments of pesticides or industrial chemicals currently in use.”

2.3.13.2 Existing regulatory schemes and processes for assessing chemicals already in the market

There are no regulatory schemes and processes for assessing existing chemicals that are currently in use in the country. However, the EPA 1994 empowers the Authority to commission research and sponsor studies on problems relating to environmental pollution as well as to examine such manufacturing processes, materials and substances that are likely to cause environmental pollution.¹²⁷ Furthermore, chemicals

¹²⁷ S 4(5)(iv) & (v) EPA 1994

industries are considered as projects or activities requiring an environmental authorisation under the EP (EIA) Regulations¹²⁸. Consequently, the manufacture, handling, storage and transportation of hazardous chemical and substances shall require a Class 1 EIA to be carried out prior to such activities.

2.3.13.3 Regulatory schemes and processes for assessing pesticides already on the market.

There are no regulatory schemes or processes for assessing pesticides that are currently in use in the country.

2.3.13.4 Need for amending these schemes to meet the obligations of the Convention.

New schemes for the assessment of chemicals that are currently on the market, particularly POPS chemicals, will have to be developed to meet the requirement of the Convention under Article 3(4) as no such schemes exist in the country.

Schemes for the assessment of new pesticides under the PCA 1996 will have to be reviewed and amended accordingly to meet the requirements of the Convention, particularly the information requirements and screening criteria under Annex D, paragraph 1 as these fail to be addressed under the existing system. Currently the only the scheme only relates to new pesticides.

¹²⁸ SI 39 of 1996

3 Strategy and action plan elements of the national implementation plan

3.1 Policy statement

Aware of the toxic properties of POPs and their impacts on human health and the environment, and recognizing that persistent organic pollutants accumulate in the environment and can be transported and deposited far from their place of release,

Taking into account the sensitivity of our ecosystem and natural resources, particularly the marine ecosystem to the impacts of POPs

Recalling provisions of relevant International conventions to which Seychelles is party and recalling the provisions of the Rio Declaration on Environment and Development and Agenda 21,

Recognising the precautionary and polluter pays principles embedded in the convention;

Recognising the central role of the national environmental policies and sustainable development policies to the country's development, and the need to integrate the POPs issues and implementation in the NIP within this national policy

Recognising that the Seychelles National Implementation Plan is the outcome of close consultation between relevant government ministries and departments, and those in relevant non-governmental organisations and the private sector.

Recognising that the successful implementation of the Convention and the NIP will depend on assistance from international as well as local government, non governmental and private partners,

The Government of Seychelles commits itself to ratification of the Stockholm Convention and abide as far as practicable to the obligations of the Convention.

The Government of Seychelles endorses the National Implementation Plan (NIP), and commits itself to its implementation subject to adequate assistance

Commits itself to place the POPs issue and the NIP within the overall national policy and legislative framework relating to environmental protection, sustainable development, public health and agriculture.

The Government commits itself to the key principles embodied in the NIP, particularly on public awareness, public involvement/participation and endeavours to include the interests of vulnerable groups and eco-systems

throughout the implementation process. Implementation of the National Implementation Plan will start in 2007.

The Government nominates the Ministry of Environmental and Natural Resources (MENR) as the national focal point for Stockholm Convention in the Republic of Seychelles. The Ministry shall have the of long term responsibility for the implementation of the NIP within Government.

The relevant stakeholders acknowledge their involvement in the preparation of the Seychelles National Implementation Plan, recognises their important roles in its implementation, and endorses the contents of the NIP. (Endorsement letters are annexed to the document)

3.2 Implementation strategy

3.2.1 Overview

Having signed the Stockholm Convention in 2002, Seychelles is currently in the process of its ratification. Ratification is important for the Seychelles to fully commit itself to the convention which it signed in 2002, and also to launch the NIP implementation. Despite the need to action certain areas identified as priorities, there is no major POPs issue in the country which will require urgent intervention.

The NIP concept fits well within the program areas which identified in the EMPS, i.e. Society, Population and Health (including Gender); Energy and Transport; Water, Sanitation and Waste. Similar to other long term programs (e.g. phase-out of ozone depleting substances under the Montreal Protocol) its implementation will merge within the national environmental management system.

3.2.2 NIP Policy Basis and Implementation Objective

Implementation of chemical related programs falls within the mandate of the Department of Environment together with its partners. Designation of the agency as Stockholm Convention Focal point has reaffirmed the country commitment to a clear and straightforward setup. As mentioned in the opening paragraphs, Seychelles Government has given its full commitment to the NIP.

The main objective of the NIP is to satisfy requirements of the Convention within the stipulated deadlines. Each action plan details the relevant convention requirements. Secondary to that, the NIP will also be a vehicle for further develop chemical management within the country.

Generic outcomes

- Awareness on the effects of POPs on human health and the environment;

- Effective control of PCB and unintentionally produced POPs;
- Enhanced institutional, organisational and legal capacity to the level required for effective management of POPs;
- Appropriate technology and technical facilities available for control, storage, treatment and disposal of POPs
- Stakeholder involvement in the management of POPs in the country

The implementation of the NIP will begin in 2006/2007 period. Once the final document has been approved and funds are released the formal implementation process will begin. Certain activities such as legislative review can start before funding is secured for implementing the operational measures of the NIP. Most implementation activities are anticipated to end within 5 years of the commencement date, however certain activities e.g. PCB phase-out will continue to the deadline laid out in the convention.

At the present time there are no international obligations which might interfere with the implementation process. Should Seychelles decide to rejoin the Southern African Development Community (SADC), its PCB program to which the country was also previously affiliated will complement the NIP implementation process. At the national level, there is an intention to integrate the measures of the Stockholm Convention into the EMPS at its next revision. The same applies for the Solid Waste Master Plan, once it is expanded beyond 2010.

3.2.3 Implementation Principles

The following principles were considered during the development of the NIP and will be adhered to during the implementation process:

- Public and stakeholder participation
- Transparency in information sharing and exchange particularly related to monitoring and reporting on implementation activities
- Adherence to the polluter – pays and precautionary principles
- Integration within the overall environmental management and sustainable development policies, particularly the EMPS 2000-2010
- Adherence and use of technologies and applications of international standards
- Commitment to public awareness and education

3.2.4 Priorities and Conditionality

Priorities identified in the previous workshop in 2005 are detailed in table 3.2.4.1. Development of the objectives of the NIP and priority for different response measure shall reflect these priorities. In addition to the existing commitment by Government, conditions that will enable the smooth implementation of the NIP process will be commitment of funding and support from international partners, especially due to the fact that local resources will be sufficient, and the Seychelles does not possess adequate technical know-how in chemicals, particularly POPs.

Table 3.2.4.1 :Priorities of Seychelles for POPs management

Priorities	Rank
Awareness and training programmes should be developed and undertaken on a regular basis	1
Objectives: <ol style="list-style-type: none"> 1. to have general public awareness on POPs 2. to develop effective tools for training and information dissemination on POPs 3. to have regular trainings on POPs for individuals and agencies identified in Article 10 of the Convention 	
Development of strategies and regulatory mechanisms for chemicals management	2
Objectives: <ol style="list-style-type: none"> 1. to have a National Chemical Profile by 2006/2007. 2. to have comprehensive legal framework for chemicals management within five years of commencement 3. to have a hazardous waste management strategy including PCBs as a part of the Solid Waste Master Plan 	
Capacity building at the administrative, health and environmental monitoring institutions	2
Objective: <ol style="list-style-type: none"> 1. to have sustainable capacity for POPs analysis and monitoring by 2008 	
Improve information exchange between stakeholders involved in POPs/chemicals management	2
Objective: <ol style="list-style-type: none"> 1. to have in place an information exchange system between the ministries, authorities, NGOs for POPs and chemicals related matters 	
Reduction of Annex C POPs releases from existing sources	3
Objectives: <ol style="list-style-type: none"> 1. to have regular assessment of the sources and releases of the unintentionally produced POPs 2. to achieve release reduction of Annex C POPs emissions from the identified main sources 	
Ensure the proper management of PCBs and PCB-containing equipment	3
Objectives: <ol style="list-style-type: none"> 1. to have a detailed inventory of the PCB presence in the country 2. to have established mechanism for sound management and elimination of PCBs by 2012 3. to have agreements between MENR and PCB users for PCB management and elimination by 2006 	

Priorities	Rank
Conduct health studies to assess the impact of POPs on health	4
Objectives: <ul style="list-style-type: none"> 1. Target groups of POPs exposure identified 2. Establish current level of exposure and public health significance of POPs in the country 	
Strengthening the Pesticides Control Board to work on chemicals as well	4
Objective: <ul style="list-style-type: none"> 1. Creation of a strong multi-sectoral entity, which would control pesticides and other related matters (including POPs) 	
Enforcement of the current legislations should be improved	5
Objectives: <ul style="list-style-type: none"> 1. Strong adherence to the current legislations addressing POPs 2. Complete operational manual for proper enforcement of pesticide regulations in the country 3. Electronic reporting introduced for tracking and for inventory purposes 4. To have an efficient system for trapping and discouraging illegal import 	
Ensuring the proper management of contaminated sites	6
Objectives: <ul style="list-style-type: none"> 1. POPs contaminations at the suspected sites are assessed by 2009 2. Contaminated sites are managed in an environmentally sound manner by 2012 	
Analysis of introduction of legal measures for liability and duty of care	7
Objective: <ul style="list-style-type: none"> 1. to have in place proper legal measures for liability and duty of care 	
Establishment of centralized, well-equipped documentation centres accessible to public	8
Objectives: <ul style="list-style-type: none"> 1. to have a decision on establishing a new information centre or upgrading the currently available centres to accommodate POPs related information 2. Established centre(s) for POPs related information 	
Alternatives to POPs be found and used	9
Objectives: <ul style="list-style-type: none"> 1. POPs alternatives are identified, evaluated and promoted for use in the country 	

Priorities	Rank
2. National policy on the use of DDT in case of introduction of the malaria vector	

Priorities of various types of response to the problem of POPs.

Note that for the Seychelles, the need for urgent physical response measures to deal with stockpiles of POPs is not necessary given that pesticides were dealt with under a previous FAO project and PCBs were found to exist only in limited quantities, under the control of a single user. The typology of interventions is as follows:

- Interventions which would build up capacity and technical knowledge on POPs which would serve to fill in the existing knowledge gaps amongst decision makers and the public.
- Enhancing coordination and controls at the institutional and regulatory level to ensure that POPs which are found in the country are managed in a coherent and programmed manner
- Ensure that management and regulatory measures are such that POPs chemicals which remain in the country are dealt with using BAT/BEP such to avoid past mistakes

Preferences in the selection of technologies for control and elimination of POPs

In selecting the classes of technology for control and elimination of POPs the county will utilise best available technology, and/or best available practises BAT/BEP. As has been done the past, international guidelines, especially those from countries advanced in the environment field, (e.g. OECD, UNECE) will be used as guidance. Taking into consideration the country's specificity, it will be necessary to accommodate the issue of cost, in other words, the approach of BATNEEC (Best available techniques not entailing excessive cost) would have feature in the selection criteria for the appropriate technology.

3.2.5 Major Milestones

- Ratification of the Convention before submission of the Seychelles NIP in 2006
- Submission of the NIP by the end of 2006
- Integration of regulatory measures under the review of the Environment Protection Act, 1994 by the end of 2007

Compliance target dates related to the Stockholm Convention include two types of reporting. The first one relates to the implementation of agreed programmes and the second is the Financial Report. Refer to Table 1 in Activity 3.3.15 for the timing of reporting obligations under the Stockholm Convention on Persistent Organic Pollutant.

The revision of the NIP shall be undertaken every three years.

3.2.6 Institutional/Organisational Arrangements and Assignment of Responsibility

The Executing Agency for preparing the NIP, i.e. MENR, will remain the main supervisory body during the implementation of the NIP. A desk officer for the implementation of the Nip and the Convention will be designated. The role of the Agency will be focused on putting in place the appropriate regulatory measures, coordinating the NIP implementation activities, monitoring progress and acting as an international interface through the Secretariat of the Convention.

Direct responsibility for implementation of some specific action plans and strategies may be delegated to other government agencies or to external stakeholders including those in the private sector who may assume major obligations in the implementation of action plans. The relevant action plans and strategies would give more details as to which agency shall be responsible for implementation of specific parts. It has been agreed that agreements for implementation shall be laid down in formal contracts between the agency and relevant partners, and these contracts shall reflect the implementation principles defined in 3.2.3 above, the reporting obligations under 3.2.8.

Throughout the implementation of the NIP, a national NIP Steering Committee will be established. This committee shall include stakeholder organisations, public sector, private sector and NGOs. The final composition of the committee will be established at the initiation of implementation. All TORs and job descriptions will be developed at the initiation.

3.2.7 Implementation Approach and Work Plan Summary

The proposed work plan is elaborated in table 3.2.7.1.

Table 3.2.7.1 Proposed work plan and budget

Activity	Task	Timeframe	Unit cost	Total cost
Establishing coordinating mechanism for implementation of the action plan	Setting up task teams,	Year 1	5,000	5,000
	Drafting work and programmes,			
Infrastructure for the Coordinating agency	Computer sets (9)	Year 1	1500	14,300
	Camera	Year 1	800	
Running cost	Consumables	Annually	2000	10,000

Activity	Task	Timeframe	Unit cost	Total cost
	Transportation	(year 1- 5)	2,400	12,000
Personnel	Project coordinator	Annually year 1- 5	30,000	150,000
	Project Officer (University Grad)	"	15,000	75,000
			10,000	50,000
	Financial administrator	"	15,000	75,000
Coordinating meetings	Room and accessories	Quarterly (year 1- 5)	600	12,000
	Sundries	"	200	4,000
Miscellaneous	5% of total budget to cover miscellaneous expenses	annually	4000	20,000
Annual running costs			79,200	
Investment costs			19,300	
Total				415,300
Component already financed by Government of Seychelles				372,000
<i>Incremental costs over 5 year period</i>				<i>43,300</i>

Action plans have been prepared according to list agreed by the all parties and the consultants. This is given below in table 3.2.7.2. Action plans that are not, or only partially relevant to Seychelles have been left out or the relevant parts have been incorporated in the relevant activities and strategies with specific reference to each item.

Table 3.2.7.2: List of action plans in the NIP

Action Plan	Status
<i>3.3.1 Activity: institutional and regulatory strengthening measures</i>	<i>Prepared</i>
<i>3.3.2 Activity: measures to reduce or eliminate releases from intentional production and use</i>	<i>Incorporated into 3.3.7 below</i>
<i>3.3.3 Activity: production, import and export, use, stockpiles and wastes of Annex A POPs pesticides (Annex A, part 1 chemicals)</i>	<i>Prepared</i>
<i>3.3.4 Activity: production, import and export, use, identification, labelling, removal, storage and disposal of PCBs and equipment containing</i>	<i>Prepared</i>

Action Plan	Status
<i>PCBs (Annex A, part II chemicals)</i>	
<i>3.3.5 Activity: production, import and export, use, stockpiles and wastes of DDT (Annex B chemicals) if used in the country</i>	<i>Handled together with 3.3.3</i>
<i>3.3.6 Activity: register for specific exemptions and the continuing need for exemptions (article 4)</i>	<i>No exemptions filed. Will be developed if the need arises for an exemption</i>
<i>3.3.7 Action plan: measures to reduce releases from unintentional production (article 5)</i>	<i>Prepared</i>
<i>3.3.8 Activity: measures to reduce releases from stockpiles and wastes (article 6)</i>	<i>Components included in 3.3.3, 3.3.4, and 3.3.7</i>
<i>3.3.9 Strategy: identification of stockpiles, articles in use and wastes (Article 6)</i>	<i>Operational measures are covered in 3.3.4, and 3.3.7. Other measures included in 3.3.10</i>
<i>3.3.10 Activity: manage stockpiles and appropriate measures for handling and disposal of articles in use.</i>	<i>Prepared</i>
<i>3.3.11 Strategy: identification of contaminated sites (Annex A, B and C Chemicals) and remediation in an environmentally sound manner</i>	<i>Prepared</i>
<i>3.3.12 Activity: facilitating or undertaking information exchange and stakeholder involvement</i>	<i>Prepared</i>
<i>3.3.13 Activity: public awareness, information and education (article 10)</i>	<i>Prepared</i>
<i>3.3.14 Activity: effectiveness evaluation (article 16)</i>	<i>Will be prepared at a later date</i>
<i>3.3.15 Activity: reporting</i>	<i>Prepared</i>
<i>3.3.16 Activity: research, development and monitoring (article 11)</i>	<i>Prepared</i>
<i>3.3.17 Activity: Technical and financial assistance (articles 12 and 13)</i>	<i>Prepared</i>

Each activity shall have its own work plan. During the preparation of the NIP, attention has been given to a coordinated approach in developing the action plans so as to avoid any overlap.

3.2.8 Implementation Strategy Review Mechanisms

The EMPS as elaborated above, shall remain as an oversight organisation, which can question implementation, request further information, and request periodic submissions on the project. Contractual arrangements between the executive agency and implementing body would stipulate

periodic reporting and allow auditing of implementation (including financial aspects)

Reporting obligations under the Convention see table 1 under activity 3.3.15. Preparation of national reports to the Secretariat of the Stockholm Convention shall follow the same shall followed the same format as utilised for the preparation of Seychelles national communication under the United Nations Framework Convention for Climate Change UNFCCC. Under this framework, the executive presents its findings and compilation of reports on implementation to relevant stakeholder in order to seek their endorsement.

The report is formulated from the outcome of these discussions. Review of NIP is programmed for every three years to take into account changes in circumstances and information. Depending on the requirement for review, (whole or part), the relevant parties would be brought together to undertake the review.

Performance monitoring indicators can be used to assess the effectiveness of implementation activities. These would be done firstly through evaluation of reports from implementing bodies, for example evaluation of the extent to which that body has been able to deliver/complete particular elements of the activity. Secondly, it is envisaged that the executive agency performs independent reviews of the different activities to ascertain whether the objectives have been achieved. Such reviews shall take into account the principles defined in the implementation strategy.

3.3 Activities, Strategies and Action Plans

3.3.1 Institutional and Regulatory Strengthening Measures

3.3.1.1 Present National Institutional, Policy and Regulatory Framework

Institutions which are relevant to the implementation of regulations and which shall benefit from strengthening measures outlined below are listed in part 2.2.2. above.

Enforcement practices

Enforcement of environmental laws normally follows a straightforward series of steps:

Application through authorised officers who enforce directly through intervention at problem sites, application of enforcement notices for redressing environmental malpractices as well as authorisations to carry out certain activities. As opposed to practices within the health sector, warning letters are no longer issued for environmental offences

Compilation of evidence against offenders follows police investigation procedures (as taught by the police academy). Further to these all cases are processed through the attorney general's office.

The reference legislation is the Environmental Protection Act 1994. The provisions of this law have been applied extensively by the authorities concerned. However, it has not been tested through the courts due to last minute compliance and out of court settlements. Furthermore, certain provisions of the Act have not been applied entirely, e.g. EIAs, powers of officers etc.

Present legislative and regulatory framework for this action plan particularly with respect to key areas related to waste, chemical and targeted pollutant management is given in the table 3.3.1.1 below:

Table 3.3.1.1: Present legislative and regulatory framework

Legislative/ Regulatory Framework	Implementation Agency	Area
Environment Protection Act,	MENR: Department of Environment (DOE)	Pollution prevention, control and

Legislative/ Regulatory Framework	Implementation Agency	Area
1994		abatement
Environment Protection Designation of Solid Waste and Cleaning Agency (SWAC) Regulations, 1995	SWAC	Solid and chemical waste management
Environment Protection (Standards) Regulations, 1995	DOE: Pollution Control Unit	Setting of limits for effluent discharge
Pesticides Control Act, 1996	MENR: Department of Natural Resources	Safe use of pesticides
Occupational Safety and Health Decree, 1978	Ministry of Employment	Occupational Health and Safety issues regarding chemicals, hazardous materials etc.
Public Health Act, 1960	Ministry of Health	Public Health and Safety issues
Trades Tax Act/Customs Regulations	Customs Authorities	Control of imports and exports of POPS related chemicals
SBS 1994 SS 36 94 Code of Practice for Handling, Storage and Disposal of Hazardous Chemicals & other Agricultural Pesticides	SBS	Handling, Storage and Disposal of Hazardous Chemicals & other Agricultural Pesticides

3.3.1.2 Action Plan Implementation Strategy and Process

- Incorporated within the same structure as the proposed implementation strategy for the project.
- Developments to follow the principles set forth for implementation, especially those which has to do with public input and public scrutiny of the proposed regulatory measures

- This action plan shall be based almost completely on local capacity. Outsourcing of most of the required actions to local consultants, in both technical and legal fields.
- Early Implementation of parts of the action plan during the EPA review in 2006-2007.
- Implementation of the capacity building parts in tandem with other aspects of the project, especially the research parts under activity 3.3.11.

3.3.1.3 Institutional Capacity Strengthening Measures

The main institutional capacity strengthening initiatives required to give effect to the obligations of the Convention have been detailed in the relevant action plans below. These include: information exchange (Activity 3.3.12 & 13) and research, development and monitoring (Activity 3.3.16).

3.3.1.4 Regulatory Development Initiatives

3.3.1.4.1 Regulatory Bans on Annex A POPS Pesticides

Article 3 of the Convention effectively requires immediate ban on the production, use, re-use, import and export of the eight POPs pesticides listed in Annex A except as provided for through registered exemptions approved by the parties or as qualified in Annex A.

The Seychelles will impose an immediate ban on the **production, use, re-use, import and export** of the POPs pesticides listed in Annex A.

Exceptions will include importation quantities of a chemical to be used for laboratory-scale research or as a reference standard¹²⁹ and exportation for the purpose of environmentally sound disposal as per Art.6 Para 1(d) and in the event of the following: additional waste materials; stocks of intercepted items and residues from cleanup of contaminated sites. The PIC instrument in use is the notification procedures under the Basel Convention.

Recommendations for Annex A POPS Pesticides

Pesticides Control Act 1996:

- Amend the PCA to include a ban on production, use, re-use, import and export of Annex A POPs.

One of the following options shall be considered:

- An unqualified prohibition; or
- A prohibition inclusive of target dates when an outright prohibition would apply.
- A negative list is to be included under the Schedule to the Act listing prohibited pesticides;

¹²⁹ Para 5

The legislation must allow flexibility to expand the list of substances so prohibited as the need and the circumstances require. It may also include, on the prohibition list, substances, which Seychelles wants to eliminate proactively;

- The Act shall make exceptions for importation only for research purposes;
- The Pesticides Act needs to be amended (Sections 10, 18, 20) to cover research and to accommodate all research agencies, provided that they are licensed, authorised by SBS or within the national structure for controlling research;
- Export shall be limited only for purposes of disposing as per Para 2(b) i and ii. in the event of the following: additional waste materials; stocks of intercepted items and residues from cleanup of contaminated sites. There shall be no export to non parties;
- The Act shall make provisions for reporting requirements (see Activity 3.3.15);
- The Act shall address other international obligations relating to POPs pesticides e.g. the POPs Protocol to the 1979 UNECE Convention on Long-Range Transboundary Air Pollution as well as actions on the disposal of all expiring or unwanted pesticides;
- The legislation shall prohibit the recovery , recycling, reclamation, direct reuse or alternative use of listed chemicals;
- The Act shall ensure that transportation across international borders shall not be undertaken without taking into account relevant international rules, standards and guidelines;

Trades Tax Act

Provisions shall be made to include the list of Annex A POPs as restricted or prohibited goods under the Trades Tax Regulations as published in the Seychelles Nation on December 29th 2004.

Environmental Protection Act

- Formalisation of regulatory ban on Annex A pesticides in EPA or negative list under PCA
- Amendment of the EPA hazardous waste section (Section 12) to cover environmentally safe disposal as precondition for export of waste and apply limits on recovery of certain types of wastes
- Creation of an expandable annex (through gazetting) of banned products under the EPA to cover all existing POPs and new additions
- Amend the Act to provide for waste handling and disposal issues, which will include the following:
 - Disposal of Annex A POPs as per the Convention Art 6 (1)(d);
 - Address other international obligations relating to POPs pesticides e.g. the POPs Protocol to the 1979 UNECE Convention on Long-Range Transboundary Air Pollution as well as actions on the disposal of all expiring or unwanted pesticides;
 - Measures associated with analysis, storage, handling and disposal taking into account compliance with international/regional rules, standards and guidelines,

particularly regarding emissions taking into account the exemptions.

- Identification, monitoring and management of stockpiles, products, articles in use, wastes and contaminated sites.

3.3.1.4.2 Regulatory Bans and Restrictions of Annex A POPs (PCBs)

This part puts into effect the provisions of Art. 3 paragraph 1 (a), and 2 (b) of the Convention relating to Annex A POPs (PCBs). Seychelles will impose a ban on the **production and import** of POPs (PCBs) with target dates. A phase out period will be agreed with the Public Utilities Corporation (PUC). This shall not apply to quantities of a chemical to be used for laboratory-scale research or as a reference standard.

Annex A- Part II specifies the measures to phase out the use of PCB in equipment by 2025. This will be promoted through regulatory measures, e.g. MOUs.

Recommendations on Annex A POPs (PCBs)¹³⁰

- Draft new regulations, under either the EPA 1994 or PCA 1996, for the management of PCBs with provisions for bans on production, import, testing and labelling requirements, and adherence to guidelines which accompany the regulations. Amend to include a ban on annex A and B POPs. The legislation shall include the following:
 - Ban on the **production and importation** of POPs (PCBs) except as reference standards or for laboratory-scale research;
 - Ban on the import of PCB containing equipment;
 - **Export** of PCBs limited only for purposes of disposing: Equipment containing PCBs shall not be **exported or imported** except for the purpose of environmentally sound waste management. There shall be no export to non-parties to the Convention;
 - Identify, label and record PCB containing or contaminated equipment and remove them from use by 2025;
 - Ban on the use of PCBs, PCB oils and PCB containing equipment with phase out on use of such chemicals;
 - Not allow recovery for the purpose of reuse on other equipment of liquids with a certain PCB content, except for maintenance and servicing operations through a phase out plan;
 - Not allow for recycling, reclamation, direct re-use or alternative uses of PCBs;
 - Identify stockpiles, products and articles in use and wastes containing PCBs and contaminated sites;
 - Not transport these materials across international boundaries taking into account international rules(e.g. Basel Convention)

Regulatory measures

¹³⁰ Razanajatovo, Mamy (2005) “Inventory of Emissions of Dioxins, Furans and Assessment of Stocks of PCBs in Seychelles”; Group 3 Report

The following shall be dealt through regulatory measures:

- Measures to reduce exposures and risk to control the use of PCBs;
- Immediate measures to prevent cross-contamination of equipment and oil with special focus on maintenance and repair of transformers through an MOU with PUC;
- Provisions on the removal, storage and disposal of PCBs and equipment containing PCBs/Mandatory secure and licensed storage for PCBs and contaminated equipment not in use;
- Measures to handle, collect, transport and store PCBs wastes in an environmentally sound manner and disposed of as per the Convention with a phase out plan;
- Measures associated with analysis, storage, handling and disposal taking into account compliance with international/regional rules, standards and guidelines, particularly with regard to emissions;

3.3.1.4.3 Regulatory Bans and Restrictions Applicable to Annex B POPs (DDT)

Art. 3 requests Parties to restrict the production and use of chemicals listed in Annex B in accordance with the provisions of that Annex.

Seychelles does not produce DDT and intends to ban this under its legislation. Part I of Annex B states that an acceptable purpose is disease vector control in accordance with Part II of the Annex. Seychelles is not listed on the DDT Register and if the need arises, it will need to apply for immediate exemption for use in accordance with Part II (3) of the Annex.

Recommendations

Legislation shall be enacted under the EPA 1994, PCA 1996 or PHA to provide for the following:

- Ban on the production of DDT with a negative list (under the PCA) together with Annex A Part 1;
- Eliminate use except for the following:
 - To restrict the use of DDT except for disease vector control only;
 - To be used only by Ministry of Health and legally empowered/delegated organisations;
 - Disposal as per Art 6 (1) (d);
- Provisions relating to Stockpiles¹³¹, articles in use, wastes¹³² (identification, collection and disposal) and Contaminated Sites;
- Ensure other international obligations are addressed, e.g. the POPs Protocol to the 1979 UNECE Convention on Long-Range Transboundary Air Pollution.

Regulatory Measures

The following shall be done through regulatory measures:

- Measures for future DDT Storage, handling, reduction and disposal;

¹³¹ As per Art. 6 (1) (a) and (b)

¹³² *ibid*

- Measures for assessment, registration, labelling and approval for use procedures;
- Measures for inspection, instruction, maintenance to avoid and prevent accidents, abnormal operation conditions, leakages and spillage;
- Measures to clean, repair and decommission any DDT containment,

3.3.1.4.4 New Pesticide and Industrial Chemicals Regulation and Assessment

There are no regulatory schemes and processes for assessing new chemicals in the country. The current system for assessing new pesticides is found under the Pesticides Control Act, 1996. New schemes for the assessment of new chemicals, particularly POPS chemicals, will have to be developed to meet the requirement of the Convention under Article 3(3) as no such schemes exist in the country.

Schemes for the assessment of new pesticides under the PCA 1996 will have to be reviewed and amended accordingly to meet the requirements of the Convention

3.3.1.4.5 Regulation Directed to Reduction and elimination of unintentional releases of Annex C POPs

Art. 5 of the Convention requests Parties to the Convention to take measures to reduce the total releases derived from anthropogenic sources of each of the chemicals listed in Annex C, with the goal of their continuing minimisation and, where feasible, the ultimate elimination of such chemicals.

Recommendations

- Enact strategy for reduction of dioxin/furans releases by a given timeline;
- Include further measures under EPA regulations for emissions to air and stipulate conditions which shall be met upstream of combustion process;
- Stipulate in EPA EIA regulations the need for all new and existing developments to use BAT/BEP in order to reduce emissions of dioxins and furans;
- Measures for reduction and elimination of PCDDs/PCDFs, HCB and PCBs formation and unintentional releases of these substances, including measures on imports, production or uses of specific materials or substances;
- Measures to achieve realistic and meaningful levels of release reduction and source elimination (from Annex C Part II source categories) by such a date/ measures laying down limit values for releases;
- Measures to address source specific bans and controls for allowable substances in municipal solid waste by such a date;

- Measures to promote, or require, reduced use of materials and substances with a high risk of dioxin formation when burned by such a date/ promote or require the development and use of substitutes;
- Measures requiring the use of substitute or modified materials, products and processes to prevent the formation and release of the chemicals listed in Annex C;
- Measures to promote (or require) the use of BAT and BET for new and existing sources in order to reduce or eliminate formation and release of Annex C POPs;
- Measures to address the disposal of Annex C chemicals;
- Measures addressing stockpiles, articles in use and wastes.

This can be achieved through the following:

- Setting standards for POPS release into the environment by:
- reducing emissions from medical waste incineration;
- reducing emissions from domestic waste burning;
- Enforcing laws and policies relating to fire and open waste burning policies through fining people in instances where domestic waste are burnt without permission;
- Set standards on exhaust emissions from vehicles;
- Amend existing Sewerage Effluent Regulations under the EPA to include POPs.

The following is proposed to give effect to these provisions:

- Enact Regulations under the Environmental Protection Act (EPA) 1994 to deal with the issue of reduction and elimination of unintentional releases of Annex C POPs; and
- Enact Regulations under the Trades Tax Act to deal with all relevant issues, e.g. import, export etc.

3.3.1.4.6 Strengthening Hazardous Waste Regulations to Reduce or Eliminate POPS Releases from Stockpiles and Wastes

Article 6 of the Convention specifies a range of obligations regarding to Annex A, B and C POPs. Regulatory requirements requiring the registration of POPs stockpiles and wastes, and products and articles in use that consist of, contain or are contaminated with POPs wastes (potentially part of an overall requirement for waste generator registration) shall be dealt with under 3.3.1.4.1 in the amendment of the hazardous waste section under Section 12 of the EPA 1994.

Regulatory requirements that cover the identification, registration, assessment, and remediation of sites contaminated with POPs, including clean up standards that ensure prevention of POPs releases can be dealt with similar to provisions for restoration of water quality under S 7 EPA 1994.

3.3.1.4.7 Introduction/Upgrading of a Pollutant Release and Transfer Register

There are no current PRTR practices in the country and the system of operation of regulatory agencies does not at present facilitate the implementation of a proper PRTR system. However, a system based on a PRTR procedure may be trialled under this project and would promote the recording, processing and release of information on an unrestricted basis. The system shall be based on the following principles:

- public disclosure by regulators;
- practice of open door approaches and free dissemination of information as part of normal operation of regulatory agencies;
- generation of knowledge amongst the public on the obligations to report on matters of public interest and on details of the matters that should in fact be disclosed; and
- participation by the public in open consultations, or submission of comments on official issues.

Public interest litigation is linked to other issues within the judicial system that cannot be resolved through this project.

3.3.1.4.8 Legal and Regulatory Basis for the Prior Informed Consent, Public Access to Information and Information Exchange

The legal basis and regulatory basis for PIC will be considered under the implementation of the Rotterdam Convention, which Seychelles intends to ratify. However, PIC procedures will apply for all substances falling within the scope of the Stockholm Convention as all stakeholders are aware of such procedures. Actions to be implemented will ensure that those relevant stakeholders have the requisite knowledge to handle such cases.

Public access to Information and Information Exchange will be considered under the PRTR type system discussed above.

3.3.1.4.9 Action Plan Implementation Performance Monitoring and Periodic Review Mechanisms

This will follow the implementation mechanisms as detailed in Part 3.2 above.

3.3.1.4.10 Costs and Financing of Action Plan Implementation

Proposed action	Timeline	Cost
Institutional strengthening measures		
Increased number and qualification personnel at lab testing facilities <i>Graduates in biochemistry or analytical chemistry (2)</i>	3 year training starting in year 2	\$50,000/year

Proposed action	Timeline	Cost
<i>Graduates in Biomedical science(2)</i>	3 year training starting year 2/3	\$25,000/ year
<i>Soil Analyst (1)</i>	3 year training starting in year 2	\$25,000/ year
<i>Short term training for lab technicians in food analysis for POPs, other contaminants and microbiological techniques(4)</i>	Up to 2 months starting year 1	\$40,000
<i>Internships for laboratory personnel in POP testing facilities overseas for 4 weeks</i>	Year 2	\$20,000
<i>Basic equipment for site work and information management</i>	Year 1	\$500/ unit
<i>GPS for sampling and mapping of contaminated sites</i>	Year 1	\$12,000
<i>Computers and accessories for networking and other purposes</i>		See 3.3.4
<i>L2000 PCB testing equipment (refer to PCB action plan)</i>	Year 1	\$4,000
<i>PDA for customs (4 units)</i>	annually	\$2,000
<i>Personal Protective Equipment</i>		
<i>Train regulatory agency staff on basic knowledge of POPs, risks, formation conditions and applicable rules (BAT/BEP) for control</i>	Start year 1	\$4,800
<i>Customs (already covered)</i>		
<i>Department of Health</i>	Year 1-3 annually	\$ 10,000
<i>Department of Natural Resources</i>	Year 1-3	\$10,000
<i>Educate/update pesticide users through direct intervention and multi media presentation on banned pesticides [cross ref 3.3.13] (Expansion of the pesticides handlers training program)</i>	Annually from year 1 to year 3	\$8000
<i>Strengthen knowledge of residues and trace substances amongst environmental monitoring personnel</i>	Year 3	\$500
<i>Provide knowledge and guidance documents for customs officers in order to improve detection of POPs products</i>	Year 2-3	\$2000

Proposed action	Timeline	Cost
Regulatory development Initiatives		
Formalisation of regulatory ban on annex A pesticides in EPA or negative list under PCA	2006/07	\$500
Amendment of the EPA hazardous waste section to cover environmentally safe disposal as precondition for export of waste and apply limits on recovery of certain types of wastes	2006/07	\$500
Creation of an expandable annex (through gazetting) of banned products under the law to cover all existing POPs and new additions	2006/07	\$500
Draft new regulations for control of PCB with provisions for bans on import, testing and labelling requirements, and adherence to guidelines which accompany regulations (<i>cross ref guidelines with 3.3.9 articles in use</i>)	2007 +	\$500
Amend Pesticide Control Act to include a ban on annex A and B POPs (<i>also include under EPA</i>)	2007 +	\$500
Enact strategy for reduction of dioxin/furans releases by a given timeline (<i>cross ref policies and strategies under 3.3.7</i>)	2007 +	\$2000
Include further measures under EPA regulations for emissions to air and stipulate conditions which shall be met upstream of combustion process	2007 +	\$1000
Stipulate in EPA EIA regulations the need for all new and existing developments to use BAT/BEP in order to reduce emissions of dioxins and Furans	2006/07	\$500
Analysis of liability issues concerning contaminated locations	Year 3-4	\$1000
Draft new regulations for identification, maintenance of information on, and management of contaminated sites and include in list of contaminants annex A,B,C substances. [<i>cross ref 3.3.11</i>]	2007 +	\$500
Program coordination	Annually	15,000
Annual costs		130,000
Capital costs		101,300
Total allocation		433,900
Component already financed by Government of Seychelles		83,800
<i>Incremental costs over 5 year period</i>		350,100

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

This action plan was not prepared and its relevant activities are incorporated under 3.3.7 below.

3.3.3 Activity: Production, import and export, use, stockpiles and wastes of Annex A Part I chemicals.

as mentioned in the inventory report, Annex A Part 1 chemicals have never been produced in Seychelles. Currently, there is no foreseen import and export of these chemicals. Furthermore, import and export of these chemicals will be banned as part of regulatory measures under Activity 3.3.1. As a result of this, the objectives of the action plan addresses only annex A part 1 chemicals of Article 6 (*Measures to reduce or eliminate releases from stockpiles and wastes*).

3.3.3.1 Objectives and priorities of the action plan

- (a) To develop a strategy for identifying remaining unidentified stockpiles and contaminated sites containing POPs pesticides
- (b) Provide facilities for collection, storage and environmentally safe management of POP pesticides
- (c) Develop guidelines and procedures for the handling, collection, transport, storage and final disposal of POPs pesticides
- (d) Facilitate the identification of alternative to POP chemicals

3.3.3.2 Summary of annex A POPs pesticides production, uses, stockpiles, wastes and contaminated sites

Main findings of POPs Pesticides Inventory

There is a lack the knowledge, expertise and capacity within Customs, and also lack of information exchange between Customs and other agencies. This is having the effect of allowing illegal entries of pesticides and other chemicals. With regards to seized products and obsolete pesticides there is a lack of adequate storage facilities in the country. Knowledge of POPs pesticides and their effects is restricted to professionals in the field.

Methods of disposal of end of life pesticides are inadequate. Should the country decide to incinerate locally, it will take into consideration the Directive 2000/76/EC on the incineration of waste.

Main findings of contaminated sites Inventory

Most of the sites identified fall into the non-contaminated category, except landfills. The site at Grand Anse and PUC new port are definite candidates for high contamination. It is recommended that only the PUC site be considered for immediate and in depth remediation. Further study on the Grand Anse site will be needed to ascertain the exact status. Environmental factors in the country, especially vigorous vegetation growth and high precipitation prohibits easy identification of contaminated sites. Due to the lack of information on operations at these sites, the findings are based on assumptions which can only be verified by tests.

International obligations

Seychelles has adopted the EU guidelines for air emissions from incinerators. Seychelles is also under the obligations of the Basel Convention to control the movement of hazardous waste. The Rotterdam Convention, which Seychelles intends to ratify, requires parties to obtain

the consent of the country to which they are exporting their waste for disposal or recovery.

Health and Environment Impact Analysis

There is a lack of information on health exposure effects, environmental effects, residue levels in food sedimentation levels (soil/water) of the POP chemicals in Seychelles. No studies were carried out to determine the link between POPs presence and common health ailments nor the increased number of cancer cases. Further epidemiological studies are needed in this area.

Socio-Economic impacts

Seychelles' fragile economy right now may not allow for dramatic changes in POP management, for example PCB phase-out. Therefore international assistance will have to be sought for implementing a large part of the action plan. The main areas of economic concern for Seychelles to comply with Convention requirements are:

- (a) Conversion/upgrades on incineration facilities
- (b) Training- long term and short term
- (c) Clean up of contaminated sites (ex landfills, old stores, burial sites)

3.3.3.3 Proposed operational measures for Annex A part 1 chemicals

The country does not have stocks of POPs pesticides requiring immediate intervention. Actions for the management of future pesticides and sites potentially contaminated with Annex A Part 1 chemicals are elaborated in the action plans below.

3.3.3.4 Strategy for identification of stockpiles, articles in use and wastes

Given that there are no stocks of POPs pesticides in the country there is presently no need for elaboration of strategy for identification of sites. Investigation of potentially contaminated sites (including site contaminated with Annex A part 1 chemicals) will be taken care of in Part 3.3.11.

3.3.3.5 Implementation of the action plan

Overview

Since annex A POPs does not constitute a major problem for the country, the action plan shall concentrate on finalization of phase out of the remaining POPs pesticides, and ensuring that measures are in place to prevent re-introduction of these chemicals.

Strategy

Most of the activities under the action plan would be done by the agencies involved in the management of pesticides (Environment, SWAC and

Pesticide Control Board). It is envisaged that preparation of training materials for customs and delivery of training would be given out to other partners such as NGOs or Educators. Review of the implementation of the action plan shall follow the same process as outlined in part 3.2 above.

Depending on how things evolve regarding annex A POPs or amendment of the list under that annex, the action plan will have to be amended by the implementing agency, with the agreement of all stakeholders.

3.3.3.6 Key Investment Requirements

The key investment requirements for Annex A Part 1 chemicals will be collection, storage and disposal through a specialized facility overseas.

3.3.3.7 Costs and financing of Action Plan implementation

Activities	Measures	Time	Funding / organization
To quantify remaining obsolete pesticides [stabilise storage conditions] as per <i>Article 6</i> of Convention	<ul style="list-style-type: none"> - site visits to all agricultural stores to collect unlabelled and obsolete pesticides (including DDT) - purchase UN approved containers for stocking of obsolete pesticides (200) - re-pack store all obsolete pesticides in existing locations until facility is built Protective clothing (team of 5 persons) 	2009-2010	\$1500 \$20,000 \$2000
Train customs and environment officers involved in port and airport control. <i>Article 3</i> MENR, Customs	Train customs officers (trainers) on the various laws governing POPs and also to identify illegal imports <ul style="list-style-type: none"> - Regular training of custom staff - mechanism to track down illegal import 	2010	For one week training \$15000
Liaise with international companies for assistance to dispose of obsolete pesticides <i>Article 6</i>	Identify country with the best technology for disposal of POP pesticides Inform convention of quantity and quality of pesticides for disposal Request for financial assistance where necessary for shipment	2 years	1,000

Activities	Measures	Time	Funding / organization
Review annually the import and export records for cases of trade in Annex A POPs <i>Article 5</i> [note: under institutional capacity PDA for customs)	Production of annual report on any import and export of POP pesticide Annual report by Customs on all pesticides imported including importer Annual or quarterly meeting with all chemical focal persons to review implementation (see 3.2 above)	Annually	100 200
Monitor the use of Annex A part I chemicals	Annex A part 1 chemicals have been banned. Regular field visits to assess farm practices and storage facilities together with Dept of Agriculture	Start in year 1 of implementation	Compilation of report: \$200/year
Identify alternatives to POP pesticides	[cross reference with institutional capacity building] identify most viable option in view of economic situation	2009	\$5000
Annex A and B Hazardous waste storage facility			
Construct facility for the storage of obsolete stocks of Annex A part 1 chemicals (cross reference with 3.3.4 below)	Build HZW storage facility by 2010	2011 onwards	\$100,000
Program coordination	1 person	Annually	15,000
Annual costs			15,500
Capital costs			144,500
Total for the 5 year program			222,000
Component already financed by Government of Seychelles			77, 500
Incremental costs			144,500

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).

3.3.4.1 Objectives and priorities of the action plan

- (a) Ensure PCB in use is identified and properly managed by relevant companies.
- (b) Phase out the use of equipment containing PCBs and eliminate recovered PCBs according to the Convention deadline (2028).
- (c) Provide adequate storage facilities for oils and equipments containing PCB.
- (d) Put in place measures to prevent any further mismanagement of PCBs.

3.3.4.2 Summary of PCB inventory

PCB containing products were used in the production of electricity in the early 60's but there are no records of the final disposal of these equipments from Seychelles. A total of 518 pole-mounted and fixed transformers were inventoried and a fraction of these were tested. The results show that a majority of the oils contain less than 50ppm of PCB. Several sites which may be heavily contaminated with PCB transformer oil, while other sites are suspected to be contaminated to a minor extent. Used wastes PCBs oils collected from transformers are temporarily stored in drums and later disposed by sludge incineration at the PUC site. Annually PUC consumes a total volume of 6,000 litres of transformer oil to refill equipment and all of these are PCB free mineral oil.

Consequently it is foreseen that the requirements under Annex a part II will be met without much difficulty.

3.3.4.3 Proposed operational measures for PCB

Actions to be undertaken shall be threefold:

- (a) Actions aimed at ensuring proper management of existing PCB stock, including agreement with PUC on management practices; introduction of procedures and work practices and ensuring that adequate storage facilities are in place.
- (b) Actions aimed at ensuring compliance to phase out deadline: testing, labeling, gradual replacement of existing equipment through decommissioning, storage and final disposal.
- (c) Actions aimed at upgrading the existing inventory.

3.3.4.4 Strategy for identification of stockpiles, articles in use and wastes

Following discussion with stakeholders, it has been agreed that PCB is addressed in the following manner. The first part of action plan 3.3.4 shall cover the management of existing PCB in use in closed applications. It is expected that these shall be mostly transformers and other equipments owned or under the responsibility of the Public Utilities Corporation. In this regard, most of the activities shall be handled by PUC itself.

The second part shall cover the management of PCB in semi closed and open applications. Such applications were not fully covered in the inventory report and will therefore require a new inventory followed by a strategy. The strategy will have to take into account result of investigations undertaken under part 1 above as well as the inventory for semi closed and open applications of PCB.

All activities relating to final disposal of PCB containing oil and equipments will be covered under Activity 3.3.10.

3.3.4.5 Implementation of the action plan

Part one of the Action Plan will be implemented through an MOU with PUC in collaboration with the executing agency. Review of the implementation of the action plan shall follow the same process as outlined in Part 3.2 above with regards to reporting and monitoring of implementation progress. Given the fact that the action plan will span over numerous years (up to 2028), it is imperative that the legislative measures in Activity 3.3.1 relating to PCBs are put in place to ensure compliance to the requirements of the Convention.

Part two of the Action Plan shall be phased in after the first few years of implementation of part one. It should be noted that open applications are not considered a priority.

3.3.4.6 Key Investments Requirements

The key investments required for the management of PCB will involve the following:

- Replacement of PCB containing transformers (60% of total cost of action plan).
- Upgrade analytical facilities at the Seychelles Bureau of Standards.
- Construction of a storage facility for PCB oils.
- Upgrade technical knowledge in relevant field and laboratory techniques.

3.3.4.7 Costs and financing of action plan implementation

It is foreseen that the majority of the costs for capital investments will come from GEF funding.

Targets	Actions	Timeline	Cost
Part One: PCB in closed applications			
- Ban the use of PCB equipments (phase out program) by 2025 and ensure that recovered PCBs must be treated and eliminated by 2028	PCB specific awareness program after release of legislation. Produce SBS guidelines on management of PCB containing equipments (from cradle to grave).	5 years following start-up	\$1000 \$ 3000
Prevention of uncontrolled incineration of PCB containing oil	Analyse and propose control measures (including testing) for movement, storage and incineration of waste oil and PCB containing oil Testing of samples in waste oil stream (10 annually)	Year 1 2007-2025	\$1000 150
Develop and conduct training/awareness programs on PCB	Prepare educational materials Trainers trained Training sessions Evaluate effectiveness of education campaign	Year 6	\$5000
Test all of the remaining equipments (647 transformers, 14 capacitors) for presence of PCB above 50 ppm by 2011	One day training session on sampling of transformer oil at the start of annual sampling program Purchase of L2000 5 year MENR/PUC/SBS sampling program	Year 1 2007-2012	\$1000 \$6000 \$10,000
Identify, label, remove and replace or dispose all PCB containing equipment above 50ppm. (Disposal will be covered in activity 2 of Action Plan 3.3.10)	- Label all PCB containing equipments - Build HZW storage facility by 2010 - Remove from use all "in-place equipment" such as electrical transformers and capacitors containing PCBs above 50ppm [Other costs (crane, transportation etc)]	Year 1-5 Year 5 Year 2-2025	\$3500 for labels (cross reference with 3.3.3) 60,000 600,000

Targets	Actions	Timeline	Cost
	Replacement cost (10% of existing stock, <i>to be refined</i>)		
Part Two: PCB in semi closed and open applications			
Development of strategy for identification and quantification of PCB containing semi- closed and open applications	Develop guidelines and strategy for the identification of PCBs in semi- closed systems (hydraulic fluids)	Year 5-6	\$5,000
	Develop guidelines and strategy for the identification of PCBs in open applications (paints, ballast)	Year 5-6	\$5,000
Identification & quantification and phase out PCB in semi-closed and open applications	Carry out 2 year program for identification and quantification	2013-2014	\$20,000
	Draw up phase out program		\$5,000
	Implement phase out program	2014	\$100,000
	Storage and disposal of equipments [addressed as part of 3.3.10]	2014-2019	
Monitoring and management of PCB: Applies to both parts above			
	Preparation of guidance document for customs control of PCB.	2008	1000
	Cost of training for field inspections, identification research and testing of presence of PCBs.	2007-2012	10,000
	Compliance monitoring	2007-2012 Annually	1000 500
	Provide progress report on PCBs elimination every 5 years.	Every 5 years (4 reports)	
Program coordination	1 person for 5 years	annually	15,000
Annual costs			16,150
Capital costs			838,000
Total cost for action plan			918,750
Component already financed by Government of Seychelles			75,000
Incremental costs			843,750

3.3.5 Activity: production, import and export, use, stockpiles and wastes of DDT (Annex B chemicals) if used in the country

This action plan was not prepared; the relevant parts are handled together with Activity 3.3.3 above.

3.3.6 Activity: register for specific exemptions and the continuing need for exemptions (article 4)

To date there has been no need to file for exemptions for the use of DDT or any other POPs chemicals. This part will therefore be developed once the need arises.

3.3.7 Measures To Reduce Releases From Unintentional Production (Article 5)

3.3.7.1 OBJECTIVES AND PRIORITIES OF THE ACTION PLAN

Evaluation of Current and Projected Releases

Evaluation of current releases

The evaluation is based on the latest update of the inventory as presented in Annex 3. The inventory has identified 3 main categories of sources, namely:

Category 1: Waste Incineration

Category 6: Uncontrolled Combustion Processes

Category 9: Disposal/ Land-filling

Evaluation of the Efficacy of the Laws and Policies in Seychelles Relating to the Management of Unintentional Releases

There are no specific laws and regulations yet in Seychelles which address the issues of Annex-C POP's such as dioxins and furans, HCB and PCB. However, there are several laws, regulations, policies and programmes in place to address the general issues of pollution. This is dealt with under chapter 2.2 'Institutional policy and regulatory framework'. The following relevant standards and codes of practice exist within the country:

SP29:2000 Draft Standard for Stack Emission Limits from Stationary Combustion Sources

This standard specifies the emission limit from furnaces, kilns and power generators, and not from incinerators and crematoria.

SS22:1997 Standard Specification for Automotive Vehicle Emissions

The standard specifies the emission limits for carbon monoxide (CO), hydrocarbons (HC) and opacity from the engine exhaust as measured by means of specified instruments according to specified test procedures.

SS39:1996 Standard Specification for Toilet Paper

This standard does not contain specification of chemicals used for bleaching. It states only that all materials including dyes used in the manufacture of toilet paper should not cause irritation of the skin.

SS36: 1994 Code of Practice for Handling, storage and disposal of hazardous chemicals other than agricultural pesticides

SS45: 1995 Code of Practice for Handling and Disposal of Hazardous and Radioactive Wastes

SS49: 2001 Standard Specification for Compost

This standard applies to compost from different sources used as organic soil conditioners, sold or distributed in bags or in bulk.

SS19:1994 Rev.1:2004 Standard Specification for Laundry Soap

The chemical characteristics of laundry soap require a Chloride content, as sodium chloride (max): 1.0% for pure soap and 2.0% m/m for built soap.

SS14:1999 Rev.1:2005 Standard Specification for Laundry Detergent Powder

The standard covers laundry detergents in powder form for use in washing machines and in hand laundering.

Strategies for Developing an Action Plan (paragraph (a) of Article 5) taking into account the evaluations in 2.1, 2.2 and 2.3

The Working Group set up to develop this Action Plan for reducing or eliminating releases from unintentional production has done the evaluation of Current and Projected Releases in paragraph 2.2 and the evaluation of the efficacy of the laws and policies in paragraph 2.3. The work of the group is based on the inventory of dioxins and furans for the base year 2003. A National Committee on POPs led by the Pollution Control and Environmental Impacts Division of the MENR shall continuously monitor the identified priority source categories in paragraph 2.2 'Current and Projected Releases', and act as a watchdog for industrial activities and intervene in case any of the source categories stated in Annex-C of the Convention. In order to be able to efficiently discharge its role, the committee will need to use regulations and legislation. Such regulations and legislation will be required only with respect to the priority source categories.

Steps to promote education and training with regard to, and awareness of, those strategies

A working group has made an assessment of public information and awareness in management of POPs in Seychelles and found that only limited information from the Education, Information and Communication (EIC) from MENR aimed at public awareness on POPs has reached the public and that the Environment Education Committee in the ministry of Education is yet to incorporate POPs as a component in its program. The general public needs to be made aware through the media (radio/television/newspaper) of the problems posed by POPs. The education/awareness program should ensure that adequate information regarding POPs and other pollutants reach the general public. Special attention will also be given to school children (primary/secondary), since they can directly influence parents in changing current practices such as garbage and other waste burning. The information should be such that it is simple and understandable at all levels within the population. Training

of personnel should be reserved for organizations (public/private sector) that are directly involved in the management of POPs. The training program should take into account the specifics of the different types of POPs. Staff and employees of the Solid Waste Agency (SWAC) may need specific training on the monitoring of contamination by dioxins and furans.

Review every five years of strategies

The strategies that have been developed and are being implemented will be reviewed and assessed every five years. These reviews and assessments will indicate whether the targets set in reducing POPs are being met. Adjustments to the strategies will be necessary in certain areas where the targets are not being met.

3.3.7.2 CURRENT AND PROJECTED RELEASES OF PCDDs/PCDFs

Findings of the Release Inventory is stipulated in table 3.3.7.1.

Table 3.3.7.1.: Releases of Dioxins & Furans for 2003

Source Categories		Annual Releases (g TEQ/a)					Total
Ca t.		Air	Water	Land	Products	Residue	
1	Waste Incineration	3.650	0.000	0.000	0.000	0.5	4.150
2	Ferrous and Non-Ferrous Metal Production	0.000	0.000	0.000	0.000	0.0	0.000
3	Power Generation and Heating/ Cooking	0.004	0.000	0.000	0.000	0.0	0.004
4	Production of Mineral Products	0.000	0.000	0.000	0.000	0.0	0.000
5	Transportation	0.018	0.000	0.000	0.000	0.0	0.018
6	Uncontrolled Combustion Processes	0.387	0.000	0.003	0.000	0.7	1.090
7	Production of Chemicals and Consumer Goods	0.000	0.000	0.000	0.000	0.0	0.000
8	Miscellaneous	0.000	0.000	0.000	0.000	0.0	0.000
9	Disposal/ Land-filling	0.000	0.001	0.000	0.070	0.0	0.071
10	Identification of Potential Hot-Spots	NE	NE	NE	NE	NE	NE
1-9	Sub-total by release route	4.1	0.0	0.0	0.1	1.2	5.4

Revision: July 2006

Required Actions

The objective is to reduce the risk to human and the environment posed by POPs releases from the main release routes in the country. Reducing emissions from these sources will require the implementation of suitable and alternative measures to manage and dispose of these wastes instead of burning. Measures will have to be implemented in the following areas;

- (a) Reduce emissions from medical waste incineration, by repairing/upgrading the existing incinerator at the Victoria hospital or replacing the incineration system by a new one
- (b) Upgrade/retrofit the sludge incinerator at the PUC power plant to include air pollution control systems.
- (c) Reduce emissions from domestic waste burning, by discouraging such practice and implementing laws to fine people in instances where domestic waste are burnt without permission. Facilitate alternative means of waste disposal to reduce burning.
- (d) Improve the air quality in urban areas, by enforcing existing regulations/ standards on vehicles exhaust emissions. Stringent monitoring and testing of vehicles should be implemented

Other Obligations

Since Seychelles is not a signatory of the 1979 UNECE Convention on Long-Range Transboundary Air Pollution. It might consider signing the agreement and eventually, in the context of the POPs management program benefit from assistance to reduce POPs that originate from neighbouring countries and may be transported to Seychelles.

3.3.7.3 MEASURES FOR REDUCING UNINTENTIONAL RELEASES OF PCDDs/PCDFs

Given the relatively low level of releases for PCDD/PCDF identified in the inventory and the not so high projected releases in the future, measures will rather concentrate on preventive actions. There are 3 types of measures that can be considered to reduce unintentional release of Annex-C POPs namely,

- Development of Regulations and a legislation on Annex-C POPs
- Public awareness and sensitization on the issues of unintentional production of Annex-C POPs, including BAT and BEP
- Training on BAT and BEP for certain institutions/ organizations and decision makers

The following specific measures are recommended for the different sources:

Category 1:Waste Incineration (table 3.3.7.2)

Table 3.3.7.2: Measures for Reducing Releases in Waste Incineration

Sub-Categories of Waste Incineration	Measures for Reducing Releases
a) Incineration of Municipal Solid Waste	Regulations, Public awareness and information on BAT & BEP, Training
b) Incineration of Hazardous Waste	Regulations, Public awareness and information on BAT & BEP, Training
c) Incineration of Medical/ Hospital Waste	Replacement of the incinerator in the hospital with a new one
d) Light Fraction Shredder Waste Incineration	None
e) Incineration of Sewage Sludge	None
f) Incineration of Waste Wood and Waste Biomass	Regulations, Public awareness and information on BAT & BEP, Training
g) Burning of Animal Carcasses	None

Category 2 Ferrous and Non-Ferrous Metal Production: No specific measure is proposed until such industrial activities are introduced in the country.

Category 3 Power Generation and Heating/ Cooking: No specific measure is proposed as these are not major sources of unintentional release.

Category 4 Production of Mineral Products: No specific measure is proposed until such industrial activities are introduced in the country.

Category 5 Transportation: No specific measure is proposed as this is not a major source of unintentional release.

Category 6 Uncontrolled Combustion Processes: Some measures are proposed to reduce releases from Uncontrolled Domestic Waste Burning and Accidental Fires. Regulations need to be enforced for prevent the burning of mixed domestic wastes including plastics. Fire fighting equipments need to be made more easily available and affordable to the general public. Public Sensitisation on high fire risks periods/ seasons of the year and on measures to prevent fires in houses, forests, bushes, vehicles. A fire risk warning system needs to be put in place for dry periods of the year.

Category 7 Production of Chemicals and Consumer Goods: No specific measure is proposed until such industrial activities are introduced in the country.

Category 8 Miscellaneous: No specific measure is proposed as these are not major sources of unintentional releases.

Category 9 Disposal/ Land-filling (table 3.3.7.3)

Table 3.3.7.3: Sub-Categories of Disposal/ Land-filling

	Measures for reducing releases
a) Landfill Leachate	BAT, BEP, Training
b) Sewage/ Sewage Treatment	BAT, BEP, Training
c) Open Water Dumping	BAT, BEP, Public awareness and sensitisation, Training
d) Composting	None
e) Waste Oil Disposal	BAT, BEP, Public awareness and sensitisation, Training

The following activities should also be considered:

- A continuous monitoring of releases of dioxins & furans through an inventory to be carried out annually with the UNEP Standardised Toolkit,
- A sporadic sampling in hot spots and suspected sites/ areas, testing and reporting
- Setting up task teams, drafting work plans and programmes, securing funds/ budget,
- Securing support from all the Stakeholders including Government, etc.

3.3.7.3.1 Legislation/Regulations Directed to Reduce and Eliminate Unintentional Production and Release of Annex-C POPs

It may not be necessary to have immediately drafted specific laws and regulations on abatement of dioxins and furans, except for the import of articles contaminated by these pollutants. The two largest sources in the future will be Municipal Waste Incineration and the Sewage Treatment Plant.

Institutional/Regulatory

1. Set standards for POPs releases into the environment
2. Replace existing hospital incineration facilities
3. Enforce the fire and open waste burning policies
4. Set up sewerage effluent regulations

Disposal of Stockpiles

1. Ministries and other agencies will need to actively participate in the monitoring and management of POPs.

Training

1. It will be necessary to train personnel involved in the POPs management programme from these various agencies. The extent of these training will vary in relation to already available expertise. Proper coordination and communication between these agencies and ministries will be essential for successful implementation of the POPs management plan

3.3.7.3.2 Taxes and Levies on Imports, Production and Use of Specific Materials or Substances

Additional taxes and levies can be introduced on materials that may be suspected to contain or can eventually lead to high releases of dioxin & furan. This will in turn discourage such activities, consequently modified and substitute materials will be sourced. Individuals or companies that are caught breaching the new regulations should be fined and penalized also with the aim of discouraging practices that contribute to the release of Annex-C POPs.

3.3.7.3.3 Voluntary Agreements with Companies/industries to change technology/processes

Companies and industries that are contributing to releases should be encouraged to carry out a study to determine the economic viability of changing the existing technologies and processes to alternative ones that are free of releases. These companies should then be persuaded to accept the new technologies due to the long term environmental benefits. Certain code of practice should be established between companies and industries whereby measures are taken to reduce releases from their activities. The company that will operate the MSW incinerators as from 2010 onwards and PUC-Sewerage division responsible for public sewage treatment are concerned.

3.3.7.3.4 Programmes for Development, Dissemination of Information and Implementation of BAT and BEP in order to reduce the formation and release of the substances

Alternative technologies in the form of BAT and BEP should be employed to reduce releases from the main sources of emissions. The Best Available Techniques considered will concentrate mainly on the technique of **Flue Gas Cleaning** for waste incinerators. These should be applied in the following areas;

- New incineration system at the hospital for burning medical waste
- Upgrading the used oil/fuel sludge incinerator at the Public Utilities Corporation power plant to include air pollution control systems,
- Alternative means of disposing domestic and agricultural waste such as composting to burning to be introduced.
- New incinerators at the Marine Port and at the Airport,
- MSW incinerators in 2010 and onwards.

3.3.7.4 STRATEGY FOR IDENTIFICATION OF STOCKPILES, ARTICLES IN USE AND WASTES

Labelling of imported consumer goods will have to meet international standards and all imports will need to be accompanied by the relevant certificates. Customs officials will need to be trained in all these areas to ensure that all imported goods are dioxin free.

Areas suspected of contamination will need to be demarcated and the extent of the contamination assessed. Samples will be tested and the results from these analyses will indicate the course of actions to be taken. New regulations and guidelines will need to be set up to monitor and manage these sites.

Remedial and cleanup measures will also be necessary. Organizations that are responsible for sites deemed contaminated or have stocks of POPs chemicals which are not suitable stocked will be notified so that preventive measures can be taken to prevent release to the environment. Some sites have been identified as potential contaminated sites, these include;

- the metal scrap area at the PUC facilities, where out of service transformers and switchgears are stocked
- old rehabilitated land fills
- agricultural areas where spraying of POPs pesticides may have taken place
- decommissioned timber factory

These are guidelines for the identification/ detection of presence of dioxins and furans (and also HCB and PCB) in wastes and certain articles used by consumers. The guidelines can be used on a voluntary basis in a first stage, and later on they can be enforced by regulations to become mandatory when required.

3.3.7.5 PUBLIC INFORMATION AND AWARENESS

The Action Plan on Public Information and Awareness includes actions to promote education and training such as to

- Promote Public Awareness of the strategies for reducing unintentional releases of Annex-C POPs
- Promote Education and Training of targeted groups on critical subjects/ topics for reducing unintentional releases of Annex-C POPs

Public information and awareness is also covered under section 3.3.13 of the NIP.

3.3.7.6 INVESTMENT PROJECTS

Installation of a New Incinerator at the Victoria Hospital in 2006

This project entails the installation in 2006 of a new incinerator of type SAICO250L to be provided by S.A. Incinerator Co. (Pty) Ltd, South Africa. It has capacity of 670 kg/day, temperature of main furnace is 850° C and

the second chamber 900-1000° C. The incinerator will not have a particular air pollution control, but natural draft will be used, the flux of exit gas at 600° C will be 8.72 m³/s. With these conditions corresponding to class 2 in the Standardised Toolkit, the emission factor will go down to 3,000 µg TEQ/t. Source: *Ministry of Health/ Director of Technical Services*.

3.3.7.7 Implementation of Action Plan

This Action Plan will be implemented through two programmes: one on measures addressing the burning of waste for the general public and the other on technical aspects for users of incinerators and industries in general. The initial part of both programmes under this action plan will be implemented by the Agency with relevant partners. Specific duties will be contracted out to individuals or organisations such as SBS. It must be noted that the measures which address issues of waste and burning of waste have close links with the Solid Waste Master Plan. One of the initial exercises to be undertaken will be to reconcile the proposed actions with the measures under the Master Plan.

3.3.7.8 Costs and Financing of Action Plan

Measures	Activities	Time line	Approx. Cost (\$)
Part 1: Measures to address burning of waste by the public			
Commissioning of a mass-media programme for public awareness and sensitization <i>[cross reference with 3.3.13]</i>	Introduction to Annex C (unintentionally produced) POPs Prepare and present educational programs on measures to reduce releases of Annex C POP's in Category 6 sources (Uncontrolled Combustion Processes)	Year 2	\$5000/ annually
Review the system for control of burning, and propose and implement measures to minimise unintentional release of annex C POPs	Carry out evaluation of existing administrative and legal framework for control of burning, propose measures for reinforcing the system	Year 1	\$2000
	Implement new measures to prevent or minimise unintentional release	Year 2	\$64,000 annually
Part 2: Annex C POPs technical program			
Introduction to Annex C POPs, BAT and BEP techniques	Introduction to BAT and BEP for incinerators	Year 2-3	\$20,000 (International expert)
	Conduct one day workshop on BAT and BEP every two years	Year 2	\$5000 per year

Measures	Activities	Time line	Approx. Cost (\$)
Establish a monitoring system to collect data on a regular basis (once a year until 2010, twice a year afterwards)	Identify laboratories/ institutions capable of analyzing Dioxins & Furans, HCB, and PCB's, [cross ref 3.3.16	Year 1	\$500
	Establish with one laboratory a MOU for analyzing samples of flue gas & fly ash, and bottom ash from incinerators, samples of sewage sludge and water, landfill leachate, waste water at estuaries,	Year 1	\$1000
	Overseas training on sampling, preparation and analysis of Annex-C POP's	Year 1 & Year 3	\$12,000 (2 participants)
	Procurement of suitable recipients/ equipment for sampling,	Year 1 to 3 and thereafter every 2 years	\$4000/ annually
	Collection of samples for laboratory analysis abroad	"	\$500 annually
	Sample analysis at the identified laboratory	"	\$15,000/ annually
	Update the inventory, and publish results	"	\$2000/ annually
Retrofitting MSW incineration plants with Air Pollution Control system (2 plants on Mahe and 1 plant on Praslin).	Review data on releases from the 3 largest MSW incineration plants	Year 6	\$1000,000 (to be refined)
	Assess the reduction of releases through retrofitting with flue gas cleaning	Over 20 years starting in 2010	
	Source the suitable equipments		
	Install the flue gas cleaning systems		
Annual costs			95,500
Capital Costs			1,035,500
Total Costs (over 20years)			2,945,500

3.3.8 3.3.8 Activity: measures to reduce releases from stockpiles and wastes (article 6)

Components included in 3.3.3, 3.3.4, and 3.3.7

3.3.9 Strategy: identification of stockpiles, articles in use and wastes (Article 6)

Operational measures are covered in 3.3.4 and 3.3.7. Other measures included in 3.3.10.

3.3.10 Activity: manage stockpiles and appropriate measures for handling and disposal of articles in use (Article 6, paragraphs 1 (c & d))

3.3.10.1 Action Plan objectives and priorities

- Ensure that waste products and articles which may contain POPs chemicals (are properly managed (collected, transported) and disposed in an environmentally sound manner.
- Ensure the irreversible disposal of identified wastes and stockpiles at specialised facilities.
- Export of waste containing or contaminated with POPs according to international requirements. (including the Stockholm and Basel Conventions)

3.3.10.2 Summary of current measures and practices

The legislative and organisational frameworks for the handling collection, storage and disposal of hazardous waste exist in the country. However the inventory identified several weaknesses in the system, including knowledge (SWAC and waste disposal company), infrastructure for movement and storage, and specialised disposal facilities. Presently, there is no guarantee that POPs contaminated equipments and/or articles which may be present in the waste stream will be detected, and disposed of in an environmentally sound manner. In general, Seychelles lacks the required expertise in management, handling and disposal of POPs contaminated equipment and articles.

Control of hazardous waste export is adequate however there is insufficient diversion (including detection and storage) of hazardous wastes to specialised facilities abroad.

3.3.10.3 Actions for managing stockpiles, handling and disposal of POPs containing articles

Activities to detect and dispose of remainder stocks of Annex A part 1 chemicals (pesticides)

Disposal of Annex A part 2 chemicals (PCB) that arise from testing and screening of equipment in closed applications such as transformers, and other materials from semi closed and open applications detected in part 2 of the program on PCB.

Annex B chemicals (DDT). No action is being proposed for DDT, however should the need arise, testing and disposal would be carried under the program.

Measures to detect and dispose of materials and equipments contaminated or containing Annex C chemicals

3.3.10.4 Implementation of the Action Plan

Disposal will be coordinated between the coordinating agency and appropriate partners performing specific duties detailed in the table below. It is envisaged that a major part of this action plan especially management of the hazardous waste storage site, preparation for export and the actual export to specialised facilities are taken over by waste disposal companies.

Timing of each activity below should be closely synchronised with implementation of the other action plans which has as outputs waste materials in need of disposal. Close attention should be paid to the implementation schedule for action plans 3.3.3 (POPs pesticides), 3.3.4 (PCBs), and 3.3.7 (unintentionally produced POPs).

3.3.10.5 Requirements in capital investments

Major investments under this action plan will for export of POPs waste for destruction at specialised facilities. Note that the proposal below does not include disposal of materials contaminated with annex C POPs. This cannot be finalised at present as it would require input from further investigations. It imperative therefore that contingency is made for future costs in the action plan.

3.3.10.6 Cost assessment for Action Plan implementation

Target	Activities	Time Line	Budget
Detect and dispose of remaining stocks of Annex A part 1 chemicals (pesticides)	- Training workshop/Seminar in safe handling & disposal of annex A part 1 POPs (BAT/BEP) and articles	Year 3 Year 3	\$2000

Target	Activities	Time Line	Budget
	- Export of POPs pesticides detected and stored as Activity 1 under 3.3.3 above	onwards	\$10,000 Disposal fee
Disposal of Annex A part 2 chemicals (PCB) that arise from testing and screening	1. Evaluate and identify regional capacity in disposal of POPs & cost analysis	Year 5	\$500
	2.		\$20,000
	3. Equipment for compacting POP's contaminated containers and materials	Year 5	\$180,000
	4.		
	5. Shipment of PCB contaminated transformer and transformer oil to the established PCB destruction facility		
	6.		
Detection and disposal of Annex B chemicals (DDT).	7. Testing and disposal of DDT which may be detected as part of 3.3.3 above	Year 3	\$5,000
Detect and dispose of materials and equipments contaminated or containing Annex C chemicals	8. Based on test results from 3.3.7, dispose materials found to be contaminated by Annex C chemicals	Year 3 onwards	<i>Costs to be determined once update of inventory is completed</i>
Capacity building for waste handlers and disposers	9. Capacity assessment for waste handling and disposal	Year 2	\$2,000
	10. Conduct training for waste handlers and disposers	Year 3	\$5,000
Coordination of action plan activities	11. 3 persons for 3 years	Annually	45,000
Annual costs	12.		45,000
Capital costs	13.		224,500
Total costs for the period 2007 to 2011			353,500
Component already financed by Government of Seychelles			245,000
Incremental costs			108,500

3.3.11 Strategy: identification of contaminated sites (Annex A, B and C Chemicals) and remediation in an environmentally sound manner (ARTICLE 6(1) (e))

3.3.11.1 Objectives for identification of contaminated sites

The implementation of the strategy will be based on the following objectives:

- Assess, prioritise and develop site specific containment measures and remediation plans for POPs contaminated sites by 2011.
- Upgrade technical know-how on management of contaminated sites and remediation techniques.
- A register of POPs contaminated sites published by 2011
- Strengthen the legal framework to guarantee occupier/owner responsibility for potential sites and compulsory application of environmentally sound remediation practices in the contaminated sites.
- Remediation and environmentally sound management of priority contaminated sites by 2018.

3.3.11.2 POPs Contaminated Sites Identification Inventory

There are 11 sites on Mahé, 2 sites on Praslin, 1 site on La Digue and 8 sites managed by IDC on other outer islands that the inventory revealed warrant further investigations for the presence of POPs contamination. The inventory has also identified 24 sites where transformer oil may have leaked, thus giving rise to potential contamination by PCB. The inventory revealed that the PUC site at New Port has high penetration of oil from the electricity plant, which lead us to consider it as a high priority site.

There are currently no facilities to test for the presence of POPs nor adequate disposal facilities for POPs waste or contaminated soil. In terms of human resources, there are however sufficiently trained personnel in the country whose technical knowledge can be upgraded to satisfy the requirements for testing and site management.

3.3.11.3 Prioritisation of Identified POPs Contaminated Sites for Action

Two sites have been identified as areas of potentially high contamination requiring immediate evaluation and remediation if necessary. These are:

- PUC New Port waste oil storage yard. As mentioned in the inventory, there is intense penetration of oil in to the ground with mixed oil from the electricity plant.
- The site at Grand Anse Mahe, where there was storage, mixing and packing of POPs pesticides and pesticide waste including chemicals such as DDT

No risk evaluation has been carried out for these sites and would need to be carried out as part of the action plan. The status of other sites as well as required actions will be determined under this action plan.

3.3.11.4 Proposed Legal and Regulatory Strengthening, Standards for Clean-up and Releases

Legal Principles on liability

Provisions relating to corporate liability¹³³ currently exist under the Environment Protection Act 1994. Recent policy documents (EMPS, National Bio-safety Framework) indicates that the precautionary principle is part of the local environmental policy. The polluter pays principle is mentioned in the law (preamble to EPA 1994) but it needs to be reinforced under the provisions of the Act.

When it comes to POPs contaminated sites, the law (specifically the Environment Protection Act) has to provide the mechanisms to compel owners and occupiers to ensure sites are free from contamination and reinstate the sites where necessary. It also has to define the obligation that remains for past occupiers, once contamination requiring remediation is detected at a particular site.

National legal, regulatory and institutional framework to address POPs contaminated sites.

There is an existing framework under the S 22 of the Environment Protection Act (EPA) 1994 for intervening in the case of suspected pollution at any particular site where it constitutes an offence under the Act. These provisions should be broadened to provide for other types of investigations to be carried out to establish environmental quality. At present it is an obligation under the S 7(4)© EPA for property owners or users to report pollution incidents of the soil or sub-soil owned or used by such persons. Furthermore, authorised officers have the power to take samples air, water soil or other substances for the purposes of analysis¹³⁴.

Measures are proposed for the identification, management and remediation of contaminated sites which shall include a system for identifying and registering contaminated sites in Seychelles.

3.3.11.5 Proposed Operational Measures related to Assessment, Containment, Remediation and Monitoring

Assessment Phase

Identification

The Seychelles Bureau of Standards (SBS) shall as a first step, develop standards/criteria for defining contaminated sites. In addition to that,

¹³³ S 33 EPA 1994

¹³⁴ S 25 EPA 1994

guidelines shall be developed for environmental impact assessment of the sites which are deemed to have been contaminated. It will include an evaluation of potential human health impacts, assessment of media such as ground and surface water, soil, flora and fauna, the area's geological characteristics influencing pathways of movement, and potential risks to the environment. This will help to estimate the nature, probability and magnitude of risk to public health or the environment from the contaminated site.

A major component of such an assessment shall be identification of best remediation options and cost evaluation (including cost sharing for privately owned sites, and cost recovery). The remediation option will be chosen to *effectively restore the contaminated site to safe conditions*. Remedial activities may include treatment, containment, removal and ultimately, disposal of all materials. At the outset, a monitoring program must be established, (with end point clearly defined) which shall be implemented as soon as remediation activities begin.

The assessment of proposed remediation measures shall be undertaken by the agency (or contracted out). Such an assessment shall incorporate the following criteria:

- Feasibility
- Remediation cost
- Proposed techniques (compliance with Environmentally sound management principles, most effective cleanup remedy for the type of contamination, available technologies)
- Local human and technical capacity
- Disposal facility and cost of disposal

The criteria for defining contaminated sites shall be established under proposed legislation on contaminated sites under the Environment Protection Act.

Prioritisation

It is proposed that a guidance document is developed setting out the basic requirements for prioritisation of identified contaminated sites. These should include the following minimum requirements:

- Magnitude of contamination
- Risk to human health
- Risk to the environment
- Risk of further contamination

Establishment & Management of Register

The results of the above assessments shall be publicised in the proposed register for contaminated sites and shall form the basis of future action regarding contaminated sites in the country.

The legislation shall provide for the establishment and management of the register of contaminated sites. The legal obligation for the authority to publicise information in the register will only apply to contaminated sites and not to the priority list.

Remediation Phase

Remediation of contaminated sites

It must be noted that funding for remediation of contaminated sites is not included under this action plan due to the fact that site assessments and remediation options have not yet been identified. This will be determined once the assessments in the first phase have been completed.

The remediation shall be implemented by the agency and comprises the following steps:

- Secure funding: needs assessment, compilation and submission of request for funding to GEF.
- Tender for remediation activities to specialised agencies
- Implementation of remediation activities
- Monitoring: to be carried out by the Agency with the assistance of relevant partners

Monitoring

In order to ensure that contaminated sites are effectively restored to safe conditions, all monitoring of remediation activities, whether on private or public land, shall be carried out by the Agency. Monitoring activities including costs will be determined upon the assessment carried out in the first phase. These costs will be submitted together with the request for funding for remediation activities.

Institutional Strengthening

Contaminated sites assessment and site remediation has never been attempted in the country. As a result, there is a lack of expertise and technology for assessing contaminated sites and selection of remediation options. Laboratories do not have adequate technical and professional capacity to carry out assessments and investigations related to contamination by POPs.

In order to assess and select appropriate measures, there would need to be a build up of technical and human capacity in the country. This will be done through training of local staff with the assistance of international expertise. Laboratory capacity will need to be upgraded to allow local testing of all samples and preparation for overseas testing where necessary. In addition, specific technical capacity such as equipment for monitoring/sample recovery will be required.

3.3.11.6 Investment Projects

Upgrading of lab facilities

For PCB testing it is expected that the same equipment as that provided under Activity 3.3.1 (L2000) will be used for testing at sites that have been contaminated by PCB. Costs for other equipments necessary to upgrade lab facilities to test for pesticides POPs are included under Activity 3.3.16.

Site monitoring

Human and technical capacity will have to be upgraded to allow proper assessment of contaminated sites for publication in the register and also

monitoring of remediation activities. Human capacity can be budgeted for under this activity (training for field and laboratory technicians), but technical requirement for site management will depend on assessments carried out in the first phase.

Physical cleanup activities

The budget must include cost for protective gear, containers and other costs associated with clean up activities.

3.3.11.7 Implementation of the Strategy: Performance Monitoring and Review Mechanisms

Implementation of this strategy will be led by the agency, with the assistance of outside partners. It is proposed that a specialist/technical adviser is made available throughout the implementation of the strategy to respond to queries and assist in decision making by the local agencies. SBS will be required to produce guidelines and standards for contaminated sites as well as carry out tests on samples collected by field staff.

Site assessment and remediation will be carried out by specialised agencies under the supervision of the Agency. Final disposal of recovered materials will go through the normal channel for waste and hazardous waste.

Mechanisms for review and reporting of progress under the action plan shall follow the procedure elaborated in 3.2 above.

3.3.11.8 Costs and Financing of the Implementation of the Strategy

Target	Activities	Time Line	Budget
Development of guidelines for identification & classification of contaminated sites	- Development of criteria for the classification of contaminated sites	2008	\$1000
	- Develop guidance document for prioritisation of contaminated sites	2008	\$1000
	- Develop guidelines for Impact assessment of contaminated sites	2008	\$1000
Develop legislation for identification, management and remediation of contaminated sites. [crossref 3.3.1]	- Prepare legislation with enabling provision to classify sites according to levels of contamination	2008	1000
	- Prepare legislation to make it compulsory to maintain a	2008	1000

Target	Activities	Time Line	Budget
	public register for contaminated sites.	2008	\$2000
	- Enact broader provisions to provide for various types of investigations to establish environmental quality	2008-09	\$3000
	- Carry out analysis on long term liability of polluters and explore options for integration into legislation		
Identification & Assessment of the sites contaminated with POPs	- Carry out assessment of all potentially contaminated sites according to prepared guidelines	2009 - 2012 annually	\$5000/
	- Testing (if necessary)	2009-2012 annually	\$5000
	- Prioritization of contaminated areas for their remediation	2011	\$200
Develop public register of POPs contaminated sites published by 2011	- Prepare and publish public register of contaminated sites	2011	\$4000
	- Setting up of a database (GIS) [cross ref 3.3.13]		
Planning for remediation and/or cleanup)	- Prepare management plan for contaminated sites	2012	\$200
	- Prepare and submit GEF/Stockholm Convention Secretariat funding proposal for remediation of contaminated sites	2012	\$1000
	- Purchase materials and equipment for site remediation and monitoring		Corer \$2000
Contaminated sites are managed in an environmentally sound manner (by 2018)	- Carry out recommended remediation measures for contaminated sites to effectively restore contaminated site to safe conditions.	2013	
	- Carry out monitoring	2013 onwards	Costs and timeline would depend

Target	Activities	Time Line	Budget
	activities to confirm effectiveness of remediation. - Disposal of all materials originating from contaminated sites	2013 onwards	on outcome of above activity
Institutional strengthening measures	- Training of local personnel on monitoring and remediation techniques (international expert assistance) - Training of laboratory personnel on investigation of selected contaminants and use of equipment (international expert assistance)	2008 2009	\$7000 \$10,000
Project coordination		Annually	15,000
Annual costs			25,000
Capital costs			34,400
Total costs for 6 year program			109,400
Component already financed by Government of Seychelles			94,000
Incremental costs			15,400

3.3.12 Activity: Facilitating or Undertaking Information Exchange and Stakeholder Involvement (Article 9).

3.3.12.1 Objectives and Priorities of the Action Plan

This Action Plan reflects the obligations of the country under article 9 of the Convention, (Information Exchange) as well as the priorities identified under the National Implementation plan, and which are laid down in section 3.2.4 above. To ensure that the country's obligations under Article 9 are met, both nationally and internationally, the following objectives have to be fulfilled:

- Undertake exchange of information relevant to reduction or elimination of the production, use and release of POPs .
- Ensure the involvement of stakeholders in the implementation of the national plan

- Provide information on best available technologies and best environmental practices.
- Provide information on alternatives to POPs including information relating to their risks as well as to their economic and social costs.
- Ensure access by decision makers and the public to health and safety related information.

3.3.12.2 Current Information Exchange Policies and Principles

Under Article 28 of the Constitution the public has the right to information held by any government authority subject to certain limitations. For example government officials under the State Secrets Act, 1977, have to sign an Official Secrets Declaration not to reveal any confidential information acquired during their terms of office. The country also subscribes to international principles on rights of access to information (e.g. UN Declaration of Human Rights). Other national policy documents such as the Seychelles Patients Charter currently being developed, also take into account the right of the public for access to information on health and safety related issues. In practice however, the public rarely exercises its right to access information held by government departments.

Article 9 requires the designation of a focal point for the exchange of information. The Department of Environment acts as the focal point for the Stockholm Convention and also provides the mechanism for information exchange. Information exchange at international level is done according to the country's reporting obligations under the Stockholm Convention (See activity 3.3.15 on reporting). In 2003 a Chemical Information Network was initiated, however it failed for the following reasons, namely lack of momentum, clear cut goals, lack of human skills and lack of willingness to share information. Despite past failures, this model, with its weaknesses addressed, can still be utilised to build such a network for exchange of chemical information including POPs.

Weaknesses of current information exchange system

- Past information held by departments has not been updated or has been destroyed due to negligence.
- Lack of information collection by external organisations and lack of exchange with government departments.
- No systematic collection, data handling, analysis and compilation of chemical information.
- No mechanism to ensure that information generated by departments and other parties are effectively exchanged between them and the public.
- No mechanism in place for the public to communicate its needs on new technologies to government.
- Financial and technical limitations of agencies involved in collection of chemical information.
- The issue of confidentiality on health and safety related issues must be addressed under this action plan.

3.3.12.3 Information Exchange Actions to be implemented

The first series of measures proposed are aimed at facilitating the exchange information at the international level through direct participation by representatives of the focal point and through information releases of adequate quality for distribution to international technical committees.

The exchange of information can be done through leaflets, newsletters, quarterly reviews, policy briefs. Forums of experts can also be conducted. The establishment of a local database or a website on POPs could also contribute towards information exchange.

The Convention makes provision for the access to information relevant to POPs at the international level, through bilateral and multi-lateral partnership. The establishment of a regional network which takes into account the needs of Small Island States (SIDS), such as Seychelles can be initiated.

The following activity is proposed: develop a national communication strategy nationally and establish an information exchange link between relevant stakeholders.

3.3.12.4 Implementation, Costs and Financing of the Action Plan

OBJECTIVE	ACTIVITIES	TIME LINE	BUDGET
Facilitate the exchange of information at the international level	– Support to Focal Point for preparation of periodic communications (cross ref 3.3.15 & 3.3.17)	2007	\$500 annually
	– Designate representative and provide support for participation and contribution to the technical committees (e.g. POPRC)	2007	\$10,000 annually
Facilitate information exchange at national level.	– Develop and trial a mechanism for public input and public scrutiny in implementing actions under the NIP (PRTR) (cross ref 3.3.11, 3.3.13 & 3.3.15)	2007	\$5,000
	– Develop a network for open exchange of information incorporating (1) PIC procedure for	2008	\$10,000

OBJECTIVE	ACTIVITIES	TIME LINE	BUDGET
	chemicals (2) Information exchange particularly between customs and other agencies – Train stakeholders about chemical information management and exchange	2008 (concurrently with previous action)	\$2,000
Strengthen institutional capacity for implementation of Article 9	– Carry out an assessment of financial and technical capacity of agencies to exchange information	2007	\$2,000
	– Implement recommendations of capacity assessment	2008	\$5,000
	– Evaluation of information exchange measures by external assessor	2010	\$5000
Coordination of action plan	– Coordination by two persons	Annually	30,000
Annual costs			40,500
Capital costs			29,000
Total for the period 2007 to 2010 (3 years)			135,500
Component already financed by Government of Seychelles			97,000
Incremental costs			38,500

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

3.3.13.1 Objectives and Priorities of the Action Plan

In order to meet the objectives of Article 10 of the Stockholm Convention and also satisfy public education priorities identified in 3.1 above, the objectives of the action plan are formulated as follows:

- Promote and facilitate awareness amongst policy and decision makers with regards to POPs.
- Develop and implement educational and awareness programs for target groups.
- Increase awareness of POPs amongst the public to match knowledge of other environmental issues in the country within 5 years of beginning of implementation of the project.
- Develop mechanisms for public participation in developing and implementing measures to address POPs.
- Establish information centre for POPs related information

3.3.13.2 Current Public Awareness Policies and Principles

Although the Stockholm Convention spells out countries obligation in respect to information awareness raising and education, there are no clear cut policies in place to address this nationally. However, the following policies address the issue of public awareness to a certain extent:

The Health Strategic Framework 2005-2009, Second Draft, Guiding Principles(3):

The Seychellois people have the inalienable right and duty to participate individually and collectively in the planning and implementation of their health care. This will require considerable public education to create greater awareness especially in health promotion and disease prevention

The education policy guidelines which states: 'Seychelles' contribution to the realization of two of mankind's most cherished aspirations, namely, the twin achievements of world peace and sustainable development will be enhanced through an education which promotes our tradition as society sensitive to environmental issues and committed to policies emphasizing the social /human aspects of development'.

Some of the overall goals of the **Environment Management Plan (EMPS) 2000- 2010** relate to the right to information, education and awareness-raising.

Even though several ministries have in place public relations officers or Information Communication and Education Sections, there is not much public involvement in the decision making process. The Convention emphasises non-confidentiality of health and safety related information on POPs, which have been taken into account in developing this action plan.

Public Information, Awareness and Education Programmes to be implemented.

A series of programmes have been proposed to address information awareness amongst decision makers and the public.

This part looks at the short term and long term goals which needs to be met in the areas of raising the public awareness on POPs related issues as well as the dangers associated with POPs. This includes the incorporation of POPs issues in school activities and other educational programmes, as well as capacity building of stakeholders involved in POPs.

Major Activity 1: Promote and facilitate awareness amongst policy and decision makers on POPs .

As the inventory found insufficient knowledge amongst decision makers, this action plan aims to educate decision makers to have the tools to

make the right decisions and to have the ability to communicate the issue of POPS to the public. The action plan also aims to provide decision makers with up to date and regular information on POPS to keep them engaged in the NIP process and to maintain interaction between themselves and the focal point.

Major Activity 2: Develop and implement education and awareness programs for target groups.

Training in POPs related issues is fundamental for representatives of various groups of professionals so that they in turn can provide for continuity in training within their respective organizations, be it government or non-governmental. Institutions such as National Institute of Education (NIE) and National Institute of Health and Social Studies (NIHSS), could be ideal for such training programmes. Wildlife Club leaders are another core target group that can be identified to provide for continuous training to other sectors of the population.

Formal educational approaches where POPs related programmes and activities can be incorporated and developed through school activities as well as training of personnel involved with POPs will be undertaken under this activity.

Major Activity 3: Increase awareness of POPs amongst the public.

The inventory found a low level of public awareness on POPS. This activity aims to increase this awareness through dissemination of information on POPS through the media targeting different groups of the population. The activity will conduct regular evaluation of the level of public awareness on POPS in order to determine the effectiveness of the programme.

Major Activity 4: Establish information centre for POPs.

This activity aims to establish an information centre to provide information on POPS, its effects on human health and the environment. This centre will also act as a mechanism to coordinate activities undertaken in action plan 3.3.12 on information exchange relating to the following:

- Public register on contaminated sites
- PRTR type system
- Network for open exchange
- Disseminate reports collected under action plan 3.3.15 (Reporting).

Major Activity 5: Public Involvement participation

This activity aims to consolidate mechanisms for public participation established in action plan 3.3.12. by establishing links with NGOS and other interest groups. This activity also aims to provide support to these organisations for initiating activities on POPs.

3.3.13.3 Implementation of Action Plan

It is envisaged that most of the activities will be carried out by specialists recruited by the Agency. International expertise will be required for training of trainers. It is being proposed that UNIDO provides this expert

in order to limit costs. Most of the educational activities will be carried out through workshops and training sessions. A very important part of this action plan will be evaluation on public knowledge on POPs which should provide us with a measure of effectiveness of the programme.

3.3.13.4 Costs and Financing of Implementation

OBJECTIVE	ACTIVITIES	TIME LINE	BUDGET	
Promote and facilitate awareness amongst policy and decision makers on POPs	– Identify a group of potential candidates for capacity building / training	2007	100	
	– Training workshop for decision makers (MOHSS, MENR, Finance and Customs, PUC, Solid waste professionals, EIA consultants)	2008	3,000	
	– Establish mechanism (mailing list) for regular updates on new information on POPs including national regulatory developments and implementation of the project	2008 onwards	\$200 annually	
Develop and implement education and awareness programs for target groups	– Conduct assessment of potential groups requiring education on POPs.	2007	\$500	
	– And develop within a national Plan effective tools and activities for training and information dissemination on POPs for designated target groups.	2007	\$500	
	– Training of trainers for specific groups:	2008	\$15,000	
	(1) Provide support for trainers to conduct training sessions (international consultant)			\$2500 for each group (2)
	(2) Develop training manuals for future use by the Trainers			\$10,000
(3) Organize training workshop for each group	\$2000 per group			
(4) Refresher Course for already qualified Trainers	2009	\$2000 per group		
(5) Printing of training manuals				
– Carry out training sessions with target groups (including farmers, school children etc.)				
Increase awareness of	– Prepare and distribute information materials on POPs			

OBJECTIVE	ACTIVITIES	TIME LINE	BUDGET
POPs amongst the public	(1) Design posters on national POPs project	2007 and annually	\$500
	(2) Prepare leaflets, booklets, stickers and brochures for different target groups	2007 and annually	\$1000
	(3) Printing of information materials	Annually	\$10,000
	(4) Distribution of information materials	Annually	\$500
	(5) POP/Chemical safety theme day at educational establishments and during MOHSS safety week	Annually	\$1000
	– Prepare and broadcast media programmes	2007	\$10,000 annually
	(1) Recruit local producer for the preparation of radio and TV programmes for POPs awareness	2007 and annually	\$5000 annually
	(2) Prepare TV programs and spots on POPs issues quarterly		100
	(3) Prepare radio programmes	annually	\$4,000
	(4) Publish newspaper articles on POPs and progress of project implementation	every two years	
– Regular surveys to evaluate knowledge on level of awareness on POPs to coincide with submission of national reports (3.3.15)			
Establish information centre for POPs	– Identify location and set up information centre on POPS, including human and technical infrastructure	2008	\$20,000
	– Day to day operation of documentation centre, including:	2009	\$20,000 annually
	(1) Recurrent cost for office running and personnel costs		
	(2) Publication of newsletter		
(3) Collection and update of relevant data on POPs and relevant POPs issues. (cross ref: information exchange/focal point)		\$5,000 annually	
– Design and publish a website/upgrade existing MENR	2008	\$5000 + \$3,000 annual maintena	

OBJECTIVE	ACTIVITIES	TIME LINE	BUDGET
	website to include information on POPs and the NIP		nce
Consolidate mechanisms for public participation developed in 3.3.12	– Establish links with Non-Governmental Organizations and Public interest groups, and provide support for their POPs activities	2007	\$10,000 annually
Project coordination			15,000
Annual costs		annually	81,300
Capital costs			60,100
Total for the period 2007 to 2011 (4 years)			385,300
Component already financed by Government of Seychelles			64,700
Incremental costs			320,600

3.3.14 Activity: Effectiveness Evaluation (Article 16)

As the Guidelines on effectiveness evaluation have not been developed and approved by the Convention, this Action Plan will be prepared at a later date during the revision of the NIP. Note must be taken of the draft plan for regional field testing of arrangements for providing comparable data for use in the effectiveness evaluation of the Stockholm Convention presented at COP2.

3.3.15 Activity: Reporting (Article 15)

3.3.15.1 Objectives and Priorities of the Action Plan

In this section an overview of the obligations under the Stockholm Convention requiring regular Party reporting is provided. Figure 1 below contains a list of the reporting obligations under the Convention and whenever requested by the Conference of Parties, as well as a description of the requirement and the periodicity for the particular obligation. The action plan objectives shall be aimed at addressing these obligations.

Figure 3.3.15.1: Timing of reporting obligations under the Stockholm Convention on Persistent Organic Pollutant.

	0	1	2	3	4	5	6	7	8	9	10	11
	2	2	2	2		2		2		2		2
	0	0	0	0		0		0		0		0
	0	0	0	0		0		1		1		1
	4	5	6	7		9		1		3		5
	COP1		COP2		COP3		COP4		COP5		COP6	
MILESTONE	ENTRY INTO FORCE OF THE CONVENTION ¹		IMPLEMENTATION PLANS ²		REPORT ON DDT ³ *1 ST NATIONAL REPORT*		1 ST EFFECTIVENESS EVALUATION ⁵		REPORT ON PROGRESS IN ELIMINATION OF PCBs ⁶		REPORT ON DDT ³	
							REPORT ON DDT ³		*2 ND NATIONAL REPORT ⁷ REVIEW OF STRATEGIES TO ADDRESS RELEASE OF CHEMICALS LISTED IN ANNEX C ⁸		REPORT ON PROGRESS IN ELIMINATION OF PCBs ⁶	
											3 RD NATIONAL REPORT	

¹³⁵Table 3.3.15.1, found below in the Annex, provides a list of the reporting obligation under the Convention, a description of the

¹Persuant to Article 16, the Convention entered into force on 17 May 2004, the 90th day after the date of deposit of the 50th instrument of ratification, acceptance, approval or accession.

²Earliest submission of National Implementation plans to be transmitted to the Conference of the Parties pursuant to Article 7 of the Convention.

³ Report on DDT, to be submitted pursuant to Annex B, Part II, paragraph 4 of the Convention.

⁴Tentative date for the submission of the first National Report to the Conference of the Parties pursuant to Article 15 of the Convention.

⁵Persuant to Article 16 of the Convention: Effectiveness evaluation to commence.

⁶Report on progress in eliminating PCBs, to be submitted pursuant to Annex A, Part II, sub-paragraph (g) of the Convention.

requirement and the periodicity for the particular obligation. The country will have to report to the secretariat in the format provided in document UNEP/POPS/COP.1/20. All organisations/ministries involved in implementing specific parts of the NIP will be required to submit reports to the national focal point on an annual basis in the format specified by the agency.

Table 3.3.15.1: Reporting obligations under the convention

Convention Obligation	Requirement	Responsible Organisation/Agency	Periodicity
Article 5, subparagraph (a) Measures to reduce or eliminate releases from unintentional production	Requires each Party to develop an action plan, or, where appropriate, a regional or sub-regional action plan, and subsequently to implement it as part of its national implementation plan specified in article 7, designed to identify, characterize and address the release of the chemicals (Polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/PCDF) Hexachlorobenzene (HCB) (CAS No: 118-74-1) Polychlorinated biphenyls (PCB) listed in Annex C of the Convention.	-Department of Environment (DoE)	Within two years of the date in which the Convention enters into force for that Party (2004-2006).
Article 5, subparagraph (a) (v): Measures to reduce or eliminate releases from unintentional production	Review strategies pursuant to the development of the action plan to identify, characterize and address the release of unintentionally produced persistent organic pollutants	-Department of Environment -Seychelles Bureau of Standard	Every five years (From the date the Action Plan is implemented).

⁷Tentative date for submission of National Report to be submitted pursuant to Article 15 of the Convention.

⁸Review of strategies to characterise and address chemicals listed in Annex C of the Convention pursuant to Article 15, subparagraph (a) (v). Such reviews shall be included in the reports submitted pursuant to Article 15.

Convention Obligation	Requirement	Responsible Organisation/Agency	Periodicity
	listed in Annex C, and of their success to meet the obligations of paragraph (V) of Article 5.		
Article 7: Implementation plans	Requires each Party to develop and endeavour to implement an implementation plan and transmit it to the Conference of the Parties, and requires each Party to review and update its plan on a periodic basis and in a manner to be specified in a decision of the Conference of the Parties.	-Department of Environment -National Focal Point	Transmission of the implementation plan to the Conference of the Parties in 2007, or within 2 years after ratification.
Article 15: Reporting	Requires each Party to report to the Conference of the Parties on the measures taken to implement the provisions of the Convention and on the effectiveness of such measures in meeting the objectives of the Convention. (a) Statistical data on its total quantities of production, import and export of each of the chemicals listed in Annex A (Aldrin, Chlordane, Dieldrin, Endrin, Heptachlor, Hexachlorobenzene, Mirex, Toxaphene, Polychlorinated Biphenyls (PCB) and Annex B (DDT (1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane) or a reasonable estimate of such data; (b) To the extent practicable, a list of	-Department of Environment/National Focal Point (NFP) -Department of Health (DoH) -Customs	Every four years i.e. 2008.

Convention Obligation	Requirement	Responsible Organisation/Agency	Periodicity
	the States from which it has imported each such substance and the States to which it has exported each such substance.		
Article 16: Effectiveness evaluation	Call for reports and information, including the reports and monitoring information as called in paragraph 2 of article 16 (results of monitoring activities on a regional and global basis), the national reports submitted pursuant to article 15 and non-compliance information provided pursuant to the procedures to be established under article 17.	-DoE coordinator -Seychelles Bureau Standard (SBS)	Commencing four years after the entry into force of the Convention i.e. 2008.
Annex A, part II subparagraph (g) PCB	Each Party to provide a report every five years on progress in eliminating polychlorinated biphenyls and submit it to the Conference of the Parties pursuant to article 15.	-Department of Environment, -Public Utilities Cooperation (PUC) - Seychelles Bureau Standard (Every 5 years starting from 2009.
Annex B, part II paragraph 4	Each Party that uses DDT is required to provide to the Secretariat information on the amount used, the conditions of such use and its relevance to that Party's disease management strategy in a format to be decided by the Conference of the Parties in consultation with the World Health Organization.	Department of Environment Department of Health	Reporting not required as the country is not using DDT.
Convention Obligation	Requirement	Responsible Organisation/Agency	Periodicity
Article 5,	Requires each Party	-Department of	Within two

Convention Obligation	Requirement	Responsible Organisation/Agency	Periodicity
subparagraph (a) Measures to reduce or eliminate releases from unintentional production	to develop an action plan, or, where appropriate, a regional or sub-regional action plan, and subsequently to implement it as part of its national implementation plan specified in article 7, designed to identify, characterize and address the release of the chemicals (Polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/PCDF) Hexachlorobenzene (HCB) (CAS No: 118-74-1) Polychlorinated biphenyls (PCB) listed in Annex C of the Convention.	Environment (DoE)	years of the date in which the Convention enters into force for that Party (2004-2006).
Article 5, subparagraph (a) (v): Measures to reduce or eliminate releases from unintentional production	Review strategies pursuant to the development of the action plan to identify, characterize and address the release of unintentionally produced persistent organic pollutants listed in Annex C, and of their success to meet the obligations of paragraph (V) of Article 5.	-Department of Environment -Seychelles Bureau of Standard	Every five years (From the date the Action Plan is implemented).
Article 7: Implementation plans	Requires each Party to develop and endeavour to implement an implementation plan and transmit it to the Conference of the Parties, and requires each Party to review and update its plan on a periodic basis and in a manner to be specified in a decision of the Conference of the Parties.	-Department of Environment -National Focal Point	Transmission of the implementation plan to the Conference of the Parties in 2007, or within 2 years after ratification.

Convention Obligation	Requirement	Responsible Organisation/Agency	Periodicity
Article 15: Reporting	<p>Requires each Party to report to the Conference of the Parties on the measures taken to implement the provisions of the Convention and on the effectiveness of such measures in meeting the objectives of the Convention.</p> <p>(a) Statistical data on its total quantities of production, import and export of each of the chemicals listed in Annex A (Aldrin, Chlordane, Dieldrin, Endrin, Heptachlor, Hexachlorobenzene, Mirex, Toxaphene, Polychlorinated Biphenyls (PCB) and Annex B (DDT (1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane) or a reasonable estimate of such data;</p> <p>(b) To the extent practicable, a list of the States from which it has imported each such substance and the States to which it has exported each such substance.</p>	<ul style="list-style-type: none"> -Department of Environment/National Focal Point (NFP) -Department of Health (DoH) -Customs 	Every four years i.e. 2008.
Article 16: Effectiveness evaluation	<p>Call for reports and information, including the reports and monitoring information as called in paragraph 2 of article 16 (results of monitoring activities on a regional and global basis), the national reports submitted pursuant to article 15 and non-compliance</p>	<ul style="list-style-type: none"> -DoE coordinator -Seychelles Bureau Standard (SBS) 	Commencing four years after the entry into force of the Convention i.e. 2008.

Convention Obligation	Requirement	Responsible Organisation/Agency	Periodicity
	information provided pursuant to the procedures to be established under article 17.		
Annex A, part II subparagraph (g) PCB	Each Party to provide a report every five years on progress in eliminating polychlorinated biphenyls and submit it to the Conference of the Parties pursuant to article 15.	-Department of Environment, -Public Utilities Cooperation (PUC) - Seychelles Bureau Standard (Every 5 years starting from 2009.
Annex B, part II paragraph 4	Each Party that uses DDT is required to provide to the Secretariat information on the amount used, the conditions of such use and its relevance to that Party's disease management strategy in a format to be decided by the Conference of the Parties in consultation with the World Health Organization.	Department of Environment Department of Health	Reporting not required as the country is not using DDT.

3.3.15.2 Current Reporting Requirements and Principles.

In Seychelles all national statistical information is captured and stored within the Statistic Division. This division is linked up via an electronic network and is able to capture information from the Import Section of the Ministry of Finance. Seychelles imports various chemicals and pesticides for various uses including industrial, agricultural and home uses. The inventory carried out in 2004 has shown that there are no specific reporting mechanisms in place for the various ministries, departments and organisation that are involved in the importation, use and handling of chemicals as being requested by the Convention. However, the Customs Division is linked up by an electronic system called DGSU which connects government ministries electronically. This systems allows the Customs Division to capture information on products being imported and exported into and out of the country, which are later cleared through customs at the ports of entry through bills of entry which are lodged at the Import Section.

In this part, the current reporting obligation of import, export, production, use of chemicals, and reporting obligations of pollutants releases, which

might be used for providing the country-specific Persistent Organic Pollutants-(POPs) related data for reporting are summarized. The identification of possible weaknesses and processes are identified and an assessment made of whether they can be extended to include POPs related data collection. Also, the institutions responsible for developing the National Implementing Plan (NIP) and the action plan on Annex C has been identified and simultaneously the capacity building needs for undertaking the reporting obligations are assessed.

Table 3.3.15.2, found below in the annexe, describes the organisations for which regular reporting would bring benefits to the control and elimination of POPs and other chemicals of concern, the legal and administrative measure already in place and gaps which could be filled as part of the action plan.

Table 3.3.15.2. Existing reporting principles and gaps

Existing Legal/Administrative bodies.	Institutions involve in reporting	Gaps identified
Public sector organisation, including all laboratories, agencies importing and using chemicals in the field, such as agriculture department.	<p>GLP implementation by SBS should ensure that all laboratories abide to minimum standards for maintaining materials and reporting on stocks</p> <p>Annual reporting is an administrative measure which is required in the productive sectors such as agriculture and fisheries but some ministries also compiled such reports.</p>	<p>No clear obligation for periodical reporting on issues which concern them. PSO (Public Service Order) 307 makes provision for annual archiving of every official publication produced by ministries. This does not cover data which has not been officialised, which means that most of the important data, which has not been compiled, can be destroyed or kept confidential.</p> <p>Reporting is done in all ministries through the compilation of either one or all of the following reports; Monthly, Quarterly, and Annual Reports (According to the PSO such reports compilation could be done at the discretion of the head of the organisation).</p> <p>For laboratories, the SBS from time to time conducts an evaluation of laboratory capacity, which also includes reporting on inventory of materials. This however is not linked to regulation by SBS.</p>
Parastatals/utility	Annual reporting is	Parastatals are governed by

Existing Legal/Administrative bodies.	Institutions involve in reporting	Gaps identified
companies which import, and use POPs and related chemicals (PUC, Island Developing Company (IDC).	done but the obligation and issues which are mandatory in the reports are not indicated in existing administrative rules.	the Parastatal Order 1998 which is similar to the PSO. The provisions for annual reporting are similar, and the same article 307 of the PSO applies.
Private companies that import, distribute and use POPs and related chemicals. On this list we can include: Importers and distributors, retailers, Pest control operators, broadcasting companies, farmers,		<p>Customs Division collects data on all imports and compiles data for use by government departments involved in finance and statistics. Data relating to imports of chemicals are not detailed, and organisations wishing to compile these have to do the data analysis themselves.</p> <p>There are no legal obligations for importers and distributors to compile regular reports on the amount of chemicals which they distribute. It is unclear whether volumes of chemicals can be captured in reporting which they undertake as part of the existing financial, auditing and taxation legislations.</p> <p>Pest control operators are required to have a license and register with the Pesticide Control Board. There are no reporting requirements in place for pest control operators. Section 25(2)(e) makes provision for the chairman of the Pesticide Control Board to make further regulation, which would also include reporting of stored chemicals and stockpiles.</p> <p><i>Under the Agricultural and Fisheries Act (Incentives) 2005</i>, all registered farmers and agricultural lessees holding a certificate of registration and a valid lease agreement are required to submit the following:</p> <ul style="list-style-type: none"> - Annual Performance Statement to the Trade

Existing Legal/Administrative bodies.	Institutions involve in reporting	Gaps identified
		<p>and Commerce Division-Department of Finance not later than 90 days from the end of the preceding year</p> <ul style="list-style-type: none"> - Production data in the prescribed format as provided by the Department of Natural Resources. - Shall keep an inventory book of equipment granted concessions and make available for inspection to any officer of the Department of Natural Resources and the Department of Finance. <p>Only registered farmers who have pesticides handling licenses are allowed to import and handle pesticides.</p> <p>There is presently no legal obligation for British Broadcasting Cooperation (BBC), Seychelles Broadcasting Cooperation (SBC) and other broadcasting companies to compile records and report to the authority on their use of different chemicals. However, companies such as BBC have internal control systems which are in place and which effectively log all transactions, use, waste etc.</p>
<p>In addition we have to look at legal obligations for organisations which monitor emissions, incidents etc to produce annual statistical data.</p>	<p>Information regarding POPs and related chemicals should be regularly released to the public. Specific types of information to be identified, manner of analysis defined, manner of public release defined.</p>	<p>There is a serious need for organisations which monitor emissions, incidents, health effects to compile their data and present to the public on a regular basis. There is presently no obligation for this in the public sector, and this is further hindered by the confidentiality rules of the Official Secrets Act.</p>

Legislative background

The following existing legislation applies to reporting in general. However, several gaps exist.

- Health and Safety Regulations: Data collection and reporting is being done as part of administrative or policy operations but this is not enshrined in law.
- Environment Protection (SWAC) Regulations: Reporting on the activities of the Agency is being done administratively without the proper legal framework. Such a requirement could be included as part of contractual obligations.
- Environment Protection Act: There is no legal obligation to compile periodical reports on environmental aspects. This could be addressed in the review of the EPA particularly in redefining the roles of the organisation
- Customs Regulations/ Pesticides Control Act 1996: They do not make provisions to provide reporting on the use, storage of the chemicals and pesticides.

Legal instruments will have to be enacted to support and require reporting on POPs substances and for assigning clear responsibilities among institutions involved in the reporting process. It may also propose the development for the format of the national reports. (Refer to Action Plan 3.3.1).

Country specific data collection on chemicals, and/or pesticides

The sectors of the country where specific data collection on chemicals and/or pesticides is available is listed below. It should be noted that data are still in raw form as there has been no obligation to compile the data for reporting.

Customs Division: This Division hold controls the entry and exit points in the country. The data is non specific and there are no local and international initiatives to ensure that data collected is analysed and compiled for reporting purposes.

Department of Natural Resources (DNR): The Department of Natural Resources is responsible for the portfolio of agriculture in the country. The department is a national importer of chemicals, fertilisers and pesticides used in the field of agriculture which are distributed to registered farmers. Data on pesticides and chemicals which have been imported in the country is available and dates back for the past ten years. The chemicals, fertilisers and pesticides are distributed to the four agricultural stores called requisite stores. The amount of chemicals and pesticides sold to individual farmers are kept in a record book. It is difficult though to trace the amount used on the farm as the farmers do not maintain and keep a record on the use of chemicals and pesticides use. The Department of Natural Resources is requested by the United Nation of the Food and Agriculture Organisation (FAO) to fill in a report on the quantity, type and use of fertiliser, pesticides and chemicals used in agriculture annually.

Department of Environment (DoE): The Department reports to Basel Convention Secretariat on hazardous wastes and chemicals movement.

Seychelles Bureau of Standard (SBS): The Bureau is responsible for the identification and quantification of POPs.

PRTR registers

Pollutant Release and Transfer Registers have never been applied in the past in the country.

Statistical data

Data is available especially from customs and other departments/agencies but are not analysed. The Statistic Division of the Department of Trade Tax of the Ministry of Finance captures and stores data. Data on Imports from the Import Section within the Ministry of Finance are retrieved through the ESCG network.

Institutions involved in the current reporting

The institutions involved in the current reporting and the NIP preparation is found in Table 3.3.15.3 below. The identified capacity building needs are being handled in the respective action plans.

Table 3.3.15.3: agencies/institutions involved in current reporting and NIP preparation and capacity building needs.

Agencies/Institution that are involved in the current reporting and NIP preparation.	Capacity building needs of the agencies/institutions
Seychelles Bureau of Standard (SBS) and Department of Environment (DoE) should jointly compile and analyse data on releases of Annex C POPs;	-Upgrading of knowledge of local staff in the use and application of the toolkit. -Upgrading knowledge of local staff in the coordinating mechanism and computing of data.
Reporting on PCB, we propose two options (i) Public Utilities Cooperation (PUC) reporting directly to the national Focal Point, on an annual basis (ii)SBS coordinating reporting for PUC, acting as an external auditor	-Upgrading of the competence of staff in the effective internal record keeping. -Upgrade workers on reporting system. -Increase the knowledge through education of PUC decision makers on the issue of PCB. - Develop a Memorandum of Understanding (MOU) between PUC and the Agency Responsible for the Stockholm Convention.
Division of Customs: regularly updating the NFP on imports of all restricted chemicals including POPs	-Upgrade the knowledge of staff on identification of chemicals of concern especially of POPS. -Develop guidance manual to assist in identification of chemicals concern including that of POPs. -Upgrade the knowledge of staff through training on collection and processing of data using specific computer program.
DoE: acting as central repository for information and reporting to the	-Upgrade the knowledge of relevant staff on annual reporting mechanism and using the specified format.

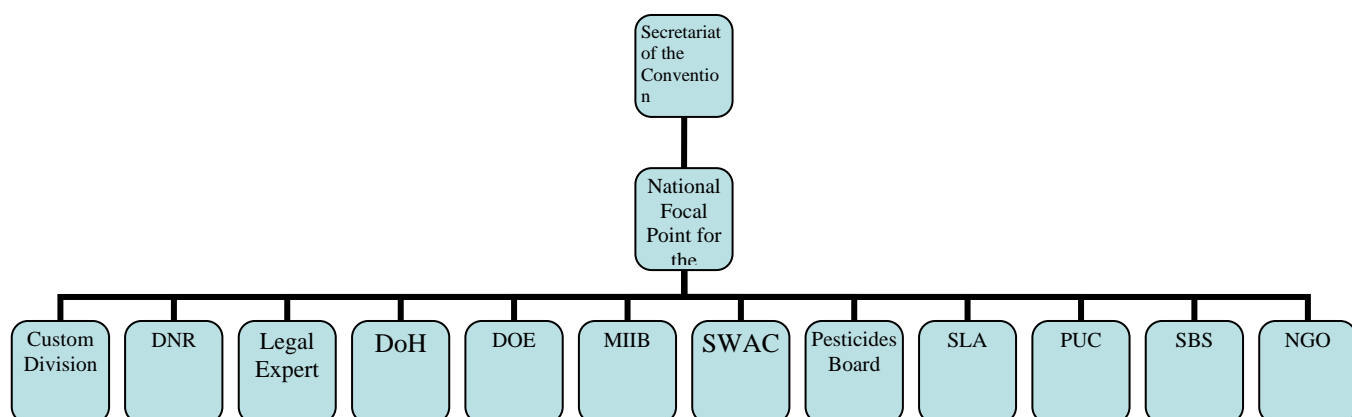
Agencies/Institution that are involved in the current reporting and NIP preparation.	Capacity building needs of the agencies/institutions
secretariat on efforts and statistics	<ul style="list-style-type: none"> - Upgrade the knowledge and skills of staff on data evaluation - Develop data management, quality control and reporting abilities - Develop online or electronic reporting system for chemicals.
DNR: regularly reporting on usage, research within the agricultural sector, and incidents involving agricultural chemicals including POPs.	<ul style="list-style-type: none"> -Develop programme to sensitise the farmers on banned and/or restricted chemicals. -upgrade the knowledge of farmers and requisite store staff on stock management and record keeping. - Develop programme to sensitise extension officers on chemical issues and risks -Upgrade the knowledge of staff through training on collection and processing of data using specific computer program. -Carry out research to determine the regular use of chemicals on the farm.
Pesticide Control Board: Regular updating of the National Focal Point (NFP) on approvals, trade and use of agro chemicals	<ul style="list-style-type: none"> -Upgrade the knowledge of members of the Pesticide Control Board on specific pesticides and POPs and impart related knowledge. -Create an annual reporting framework for the Pesticide Control Board.
Department of Health: Compile data and update all parties on regular basis on chemicals in use and its related health impacts. Regularly update all on vector control measures, needs and research needs and activities in the country. Provide update and regular reports on information on vector control measures, the use and non use of DDT . Prescribe the necessary research activity to be carried out in the country in relation to new emerging vector borne diseases.	<ul style="list-style-type: none"> -Upgrade staff knowledge in formulating and developing programme to carry out epidemiological research activity. - Upgrade staff through training to develop programme related to health research. -Upgrade staff knowledge by carrying out training on reporting. - Upgrade staff knowledge in determining the methodology to carry out research to determine/establish the base line data in relation to health related disease caused by chemicals.
Seychelles Cleaning Waste Agency (SWAC)	<ul style="list-style-type: none"> -Upgrade present staff knowledge in the identification, handling and monitoring of POPS. -Upgrade staff knowledge in the safe disposal and safe management of POPs pesticides.

3.3.15.3 Proposed Measures for Reporting

- Prepare regulations providing legislative basis for reporting.

- Prepare a Memorandum of Understanding (MOU) between the Public Utilities Cooperation (PUC) which will cover the requirements of the Stockholm Convention in relation to the storage, disposal and eventual elimination of PCB, as stipulated in Article 6, and Part II of Annex B. The requirement for reporting in the MOU will be made compulsory.
- Design organisational structure and assign clear responsibilities in the reporting programme.

Figure 3.3.15.2: Organization structure for the reporting programme



Responsibilities of each organisations/institutions in the reporting programme

All institutions identified will each submit a report to the National Focal Point on an annual basis. The National Focal Point will compile these reports and will submit the National Report to the Secretariat according to the requirements of the Convention

The Custom Division: Will be responsible to report to the national focal point on an annual basis on the total amount of import and export of all chemicals and pesticides including POPs. The Division will also be responsible to process the raw and provide statistical data on the quantities of import, export of each chemical listed in Annex A and Annex B as well as other chemicals and pesticides that are being imported and exported. Where practicable, the Division should provide a list of all the States from which each substance has been imported and the States to which each substance has been exported.

Department of Natural Resources: The Department will be responsible to make available information to the national focal point of the Stockholm Convention on an annual basis on the quantity (SI unit) of pesticides, chemicals imported in the country by the department to be used in agriculture and also provide information on the existing stock.

Legal Expert: It will provide to the office of the focal point an evaluation of the efficacy of the laws and policies in relation to the management of

releases as stipulated in Article 5 (measures to reduce or eliminate releases from unintentional production).

Department of Health: The Department will be responsible to update the national focal point on Annex B, Part 1 and Part II on an annual basis. It will, jointly with SBS and DoE, provide reports on research and development on impacts of POPs on human health. **Department of Environment (DoE) and the Solid Wastes Cleaning Agency (SWAC):**

The department will be responsible to provide information to the National Focal Point annually in relation the following parameters:

- Measures taken to manage stockpiles as stipulated in part c of Article 6.
- Report on the activities requested as per clause 1 d (i), (ii), (iii) and (iv) of Article 6.
- Report on the monitoring and control of any form of pollutants including POPs.
- Jointly with SBS, provide report on the measures to reduce or eliminate releases from unintentional production as listed for each chemical in Annex C.

Reporting activities specific to SWAC: This agency will have to report to the National Focal Point annually on the quantity, types and wastes disposed off (all chemical and pesticides types including POPs including the physical state), report on the method of disposal (incinerator, dumping, buried, landfill). Report on location that the chemicals, pesticides wastes were disposed off (Reporting should take into account all the points in section d of Article 6.

Pesticides Board: The actions and activities to be reported on are as follows:

- A list of all chemicals, pesticides applied for registration over the year in review.
- The number of competence certificate issued to the pesticides handlers and full personal details on pesticide handlers who have been issued with a certificate of competence.
- The numbers of applications lodged in the office of registrar for importation of all pesticides and chemicals. The number of application approved for importation, number declined and the reason for its decline.
- Steps made to promote education and training with regard to awareness of the use, handling and storage of chemicals.
- A list of the types of specific exemptions reproduced from Annex A and Annex B (if there is).

Ministry of Industries and International Business (MIIB): This ministry will be responsible to report to the national focal point on the actions and activities done in relation to Sections 1 paragraph (g) –In developing and implementing education and training programmes at the national and international levels within the business communities. Also to inform the NFP on the number of projects that have been approved for

implementation in the country which will either involve the use, production, storage, handling and emission of any types of chemicals.

Seychelles Licensing Authority (SLA): To report to the national focal point on an annual basis on the number, type of licenses and the purposes that the license were granted. To also provide a list of number of licenses revoked, cancelled or put on hold. To provide full personal details on the licensee.

Public Utilities Cooperation: To report to the national focal point on an annual basis on the step and progress made to comply with Part I and Part II of Annex A in relation to the elimination of PCB.

Seychelles Bureau of Standard (SBS): To report to the national focal point on annual basis on the progress made on research, development and monitoring as stipulated in Article 11.

Jointly with DoE, provide report on the measures to reduce or eliminate releases from unintentional production as listed for each chemical in Annex C.

Jointly with PUC report to the national focal point on an annual basis on the step and progress made to comply with Part I and Part II of Annex A in relation to the elimination of PCB.

Non Governmental Organisation (NGO): To assure that NGOs are involved in the implementation of this action plan, these NGOs will need to report to the national focal point on annual basis on their activities relevant to Article 10 of the Convention.

Reporting activities specific to SWAC, SBS, DoE, DoH, DNR, SBS, Pesticide Board:

- To report on part a (i) of Article 5 on the evaluation of current projected releases including the development and maintenance of source inventories and releases estimates, taking into considerations the source categories.
- To report on Article 11 and on those issues relevant to the agency/institution concerned.

3.3.15.4 Action Plan Implementation Process/ Costs and Financing of the Action Plan

Objectives	Activities	Timeline	Budget
Reporting obligations under Article 15 of the Convention is met	Compilation of Annual report to the Focal point	9 reports annually	\$900
	Compilation of reports to be submitted to the Secretariat of the Convention (Refer to table 1)	10 reports (2007, 2009,2010, 2011,2013,2014, 2015, 2017, 2019 and 2015)	US \$ 2000 (US \$ 200 per report).
	Implement online or electronic reporting system for chemicals (workshop and	2010	\$5000

Objectives	Activities	Timeline	Budget
	website) (Cross ref 3.3.12 and 3.3.13)		
	Develop an annual reporting framework for the Pesticide Control Board and other relevant agencies.	2007	\$500
Capacity building for effective data management for POPs	Capacity building for data processing and management	2007	5,000
	Purchasing of PC including software and hardware for each agencies responsible for providing report. (Cross ref 3.3.13)		(see budget under 3.2)
Annual costs			900
Capital costs			12,500
Total costs for the period 2007 to 2015			19,700
Component already financed by Government of Seychelles			16,000
Incremental costs			3,700

3.3.16 Activity: research, development and monitoring (article 11)

The action plan is aimed at encouraging monitoring and research of POPs in the country. It will include the revision and strengthening of relevant legislation, improving the capacity to detect, monitor and manage POPs and applies both for any existing stockpile or contaminated site as well as chemicals imported into the country. It is recommended that the country opts for simple, low cost monitoring activities such as the application of on-site test kits, bio indicators or biomarkers which have been found very effective in other parts of the world to assess levels and effects of specific POPs in both environment and human. It is also recommended that research is also linked with existing or upcoming global assessments of these chemicals.

3.3.16.1 Objectives and Priorities of the Action Plan

The results of the inventories (2.3.7, 2.3.10, 2.3.11) point to a general lack of detailed information on the magnitude of POPs presence in Seychelles as well as specificity on exact location of "hot spots". In addition the monitoring of populations specifically for POPs or substances with chronic impacts is limited. The situation is such that the presence and effect on the environment and human health are not very well known. In this regard, the following objectives have been formulated:

1. Create or update existing legal and institutional framework to facilitate research, development and monitoring of the presence and impacts of POPs.
2. Improve local human and laboratory capacity for monitoring of POPs in the Environment.
3. Design and deploy monitoring programs to detect the presence and quantify the level of POPs in the Environment.
4. Design and deploy monitoring program for the detection and quantification of POPs in human samples.

3.3.16.2 Summary of Research, Development and Monitoring Activities

Very little research has ever been conducted which directly or indirectly relates to the management of POPs in Seychelles. The only few national reports have been written to assess the status of POPs here, were carried out by different institutions that had been more or less national reports required for participation in overseas missions. This lack of research work is perhaps pertaining to lack of national capacity on the subject and also lack of specialized infrastructure for testing of organic chemicals.

Several data gaps in information which could aid the management of these chemicals in the country were identified as part of the inventories in part 2 above. These include:

- A general lack of detailed information on the magnitude of POPs presence in Seychelles;
- Few records showing locations where PCB oil was used including building foundations.
- No studies on ecosystems impacts of released chemicals;
- Records which would allow identification of pesticide "hot spots" have been destroyed.

These important areas for research in the country can be broken down into three main areas: human health, potentially contaminated environments, and the marine environment.

Human health impacts have not been recorded, specifically because there has not been any retrospective study on exposure versus impacts. There is now a need to monitor the status of the local population to ascertain contamination, and also compare background levels with other similar populations. The inventory results also point to the need for exploratory epidemiologic evaluations within the Seychelles population.

With regards to contaminated sites, there are indications of some sites where the levels of contamination have not been explored fully. Given that there is a lot of uncertainty on the polluted status of different sites, the approach to contaminated sites shall be to carry out general screening to monitor and establish levels (for example through the use of bio-markers), before moving on to in depth evaluation of selected priority sites.

The marine environment (inshore and offshore), an important sink of local and global significance, has never been tested for the presence of these chemicals. As there are important linkages between contamination in the marine environment, dietary intake and human health, it is therefore important that such research is carried out.

Current Analytical Capacities Assessed

a. Administrative and Legal

There are at present certain structures in place to ensure the implementation of the NIP and recommendations of the Stockholm Convention. There is however considerable need to strengthen those institutions involved with POPs and high emphasis must be placed on building expertise and acquisition of equipment so as to ensure the effective identification, storing and reporting of POPs.

Legislative authority for issues associated with POPs, or undertaking research are assigned to different agencies such as the Health Department or SBS. The scope and limitations of these regulations for managing POPs have been covered in previous parts of the NIP (3.3.1), but there is the additional need to analyse how other rules which exist and also administrative barriers hinder research work, especially those which control research on human subjects.

b. Analytical Capacities

Currently, there are two main laboratories on the island who are responsible one way or another in the analysis for pesticides. These are:

The Seychelles Bureau of Standard (SBS) a parastatal organization, which under the Pesticides Control Act is the certified laboratory responsible to undertake the necessary laboratory test on pesticides.

The Seychelles Public Health Laboratory (SPHL) falling under the responsibility of the MOHSS (Ministry of Health and Social Services); under the Food Act, the SPHL is the official laboratory for analysis of pesticides in foods.

A. SBS LABORATORY

At this point in time, the only institution in the country that has some capability to identify and quantify organochloride pesticides (inc. most of the POPs under the Stockholm Convention) is the Seychelles Bureau of Standards (SBS) Environmental Laboratory. In view of technical constraints being encountered by SPHL, SBS is currently the only laboratory in the country with functioning facilities for measuring POPs.

The SBS laboratory has to a certain extent trained personnel to identify and quantify namely all the POPs under the Convention except that of Furan, Dioxin, PCBs, Toxaphene and Mirex.

It is worth to note that the identification and quantification of the above chlorinated compounds were mainly in marine environmental samples (biota and sediment) under the Quality Assurance Program of the

International Atomic Energy Agency – Marine Environmental Laboratory-Monaco.

However, the SBS laboratory has also its own constraints. One of them (which had also affected SPHL in the past) concerns the unavailability locally of GC gases (e.g. very high purity N₂ gas). These had in the past affected the running of the service to some extent. The acquisition in the recent years, of a high purity Nitrogen generator has helped in overcoming such problem. However, in the unforeseen event that the N₂ generator fails, the unavailability of local high purity gases, poses a problem. Acquiring of gas cylinder bottles from S.Africa takes a long time especially with the foreign exchange problem that the country is currently facing and the fact that the gas cannot be transported via the airline route.

The SBS GC equipments are also very old. The main analytical equipment at the disposal of the laboratory at present is a Varian Gas chromatograph (Model 3400, Serial Number 5511, Year of Manufacture - 1989) coupled with an Electron Capture Detector (ECD) which is about 14 years old

B. THE SPHL LABORATORY

The SPHL Chemistry Laboratory had suffered various constraints in the past in relation to undertaking analysis for pesticides. These have been particularly financial, i.e. delays in acquiring funds for servicing and maintenance of equipments, but also technical and administrative setbacks which had aggravated in critically affecting the running of that particular unit of the laboratory.

The SPHL has two gas chromatography equipments which are both currently not being used. Both were purchased through overseas assistance projects from the Shimadzu firm (Japan). One is the Model GC-9A (a 1985-86 model) and the other is a GC-14B (a newer model and acquired in 1998). The GC-9A model has been discontinued in 1990, and parts supply terminated in 2000. The GC-14B, is still operational but is currently not being used because of delays in replacing the Hydrogen generator, and delays in acquiring trained technical staff to perform the analysis.

Under the Food Act of Seychelles, the SPHL has the mandate to test foods locally produce and imported, in order to safeguard the health of the population, including from cancer producing POPS. Plans are there to revive the Food Chemistry unit of the SPHL, but because of financial constraint and lack of competently trained manpower, the process is unfortunately slow.

The acquisition of toxic and inflammable organic solvents for pesticides extraction poses a constraint for developing countries. This had been experienced by both laboratories during the past years since in some cases an import permit was required which apart from extra documentation procedures, delayed the acquiring of the chemicals for the respective analysis. Safer technologies for example use of SPE (Solid

Phase Extraction) system which uses considerably less amount of toxic solvents is being considered as a solution to these problems.

3.3.16.3 Measures for Promoting Research and Development Activities

New /updated legal instruments to support R & D

In line with the new initiatives being taken by the government to encourage new business activities, research should be encourage to monitor these developments. Legal and institutional mechanisms should be put in place to facilitate this.

Measure POPs in humans and the environment

A concerted and integrated effort between the different parties concerned (especially Department of Environment & MOHSS) is crucial for the implementation of the research. Ethical issues on taking human samples e.g. breast milk from nursing mothers will have to be carefully considered. The need for close communication and harmonizing of both sample collection and laboratory analytical activities is of paramount importance. Monitoring must be complemented by effective information exchange under action plan 3.3.12.

3.3.16.4 Measures for Monitoring of POPs Levels

Improving the available national capacities and resources for monitoring POPS

In order to improve capacity at the national level the following actions are being proposed:

- Strengthen the current capacity and practical experiences in the management of chemicals in the country focusing particularly on POPs as well as on other harmful and toxic chemicals.
- Establish a programmed and coordinated approach by respective stakeholders to monitor these environmental/health parameters.
- Build up testing capacity.
- Develop legal and technical requirements for testing and reporting
- Set up a reliable monitoring mechanism whereby relevant data will be acquired on presence and levels of POPs pesticides in both environmentally related matrixes e.g imported substances, soil and water as well as on food materials locally cultivated as well as on particular imported food products.
- Adapt methods and techniques suitable for investigations and monitoring that are more affordable, safer and more effective such as utilising cost effective yet specific chemical or biological techniques for the screening and assessment of POPs pollutant in the environment or other matrixes concerned.
- Integration with regional and global pops monitoring programmes to enable effective use of resources and access to existing funding sources.

3.3.16.5 Implementation of the Action Plan

The overall strategy and organisation for implementation of the action plan shall be synchronised with the other action plans having a bearing on monitoring especially those for PCB, capacity building, and information dissemination (3.3.3; 3.3.1; 3.3.12). As mentioned above, there should be a general assessment of hindrances to research and monitoring, which could be addressed as a separate new item under this action plan or as an add-on to 3.3.1 under legislative measures. The actual monitoring (phase 2) shall commence with a feasibility assessment, and once this is completed, a three step (modified) program shall be implemented.

Step 1: Screening Methods to Identify Positive Sites for Further Investigations

- Use of in vitro cell-based bioassays or "dip stick", and easy to measure and cost effective general biomarkers for screening a wide range of chemicals from a large number of sites.
- Use of the ELISA technique for screening for dioxins fall out
- Testing of materials and soils at "La Retraite dumping site, Providence, and Roche Caiman" respectively for source of dioxins.

Step 2: Use of more involved/advanced biomarkers

Depending on findings in Phase 1, more specific and perhaps more involved biomarkers would be used to further investigate sites of interest identified in the previous tier. Rapid Assessment of Marine Pollution (RAMP) is one approach that is advocated as a hierarchical method for the monitoring of vulnerable ecosystems and of contaminant discharge (ref. STAP-GEF Japan Workshop Dec.03).

Step 3: Environmental samples in priority identified areas should be tested e.g. frogs or cost-line/estuary fishes etc.).

Phase 3 will be implemented as follows: Bio-indicator samples inc. human blood or milk samples will be tested either locally (if reliable quality system are in place locally or samples will be sent overseas to a reference laboratory).

The design of bio monitoring programmes has therefore to be carefully examined. Therefore, it is imperative, that an initial feasibility assessment be undertaken by expert from overseas in regard to the different phases of activities (i.e. Phases 1, 2 & 3 respectively).

Priority sites for monitoring include the following:

- PUC Oil Stockpile Area, New Port.
- La Retraite Landfill Sites
- Dioxins and Furans Fallout zones

The choice of samples for testing includes:

- Passive samplers for water samples.
- Biomarkers (bio indicators consumed by humans –recommended).
- Human milk, blood samples etc.
- Soil or dust for Dioxins

Work-Plan with Target Milestones

Target Milestones are given in the table below. However, some, especially phases 2 and 3, will be determined once the mission by the overseas consultant has been completed.

3.3.16.6 Key Investment Requirements (and estimate costing)

Objective	Activities	Timeline	Costs
Phase 1: Create enabling environment for research/development and monitoring			
Upgrade existing legal and institutional framework to facilitate research, development and monitoring of the presence and impacts of POPs.	– Create a framework to enable effective data collection and recording, facilitate inventory of impacts of POPs on human health and the environment, including equipment (refer to appendix 1 below)	2007-08	2,000
	– Analyse barriers to research and monitoring, and propose improvements to legal and administrative structures (Technical Assistance)		5,000
Capacity building for national labs and Research facilities, & Sampling and Testing [cross ref: 3.3.16]	– Technical training for staff to undertake testing of POPs using different techniques	2007-08	(to be budgeted)
	– Technical training for pesticides analysis (food chemistry)	2007-08	13,000
	– Hydrogen generator for SPHL	2007-08	10,000
	– Nitrogen Generator for SPHL	2007-08	9,000
	– Purchase of safe pesticides extraction Kits e.g. Solid Phase	2007-08	12,000

Objective	Activities	Timeline	Costs
2. Apply advanced biomarkers for further investigation .	<ul style="list-style-type: none"> - Assessment of application of advanced bio markers (technical assistance 2nd mission) - Purchase of materials - Training 		5,000
3. Testing of environmental samples	<ul style="list-style-type: none"> - Sample collection and testing - Data evaluation and report - Development of protocol - Purchase of materials - Training - Sample collection and testing - Data evaluation and report 		
Phase 3: Monitoring of POPs in humans			
Design and deploy monitoring program for the detection and quantification of POPs in human samples	<ul style="list-style-type: none"> - Assess the use of Bio-indicator samples inc. human blood or milk samples (technical assistance 3rd mission) - Develop parameters for sample collection, protocol, ethical standards, required trainings etc. - Purchase of materials - Training - Sample collection and testing (local or abroad) - Data evaluation and report 	2008-10	5,000 All costs to be finalised by 3 rd mission

Objective	Activities	Timeline	Costs
Project Coordination costs	– One person for initial 3 year program 2007-2010	Annually	15,000
Annual costs			15,000
Capital costs			153,800
Total costs for initial 3 year program			198,800
Component already financed by Government of Seychelles			45,000
Incremental costs			153,800

Appendix 8: List of materials required by SBS

<u>Equipment Number</u>	<u>Equipment Name</u>	<u>Part Number</u>	<u>Cost [US\$]</u>
<u>1</u>	<u>Varian 3800 Model , Basic with FID</u>	<u>03-925001-02</u>	<u>9,900.00</u>
<u>2</u>	<u>Injector Model 1177</u>	<u>03-925630-02</u>	<u>3,300.00</u>
<u>3</u>	<u>Detector ECD</u>	<u>03-925601-02</u>	<u>5,550.00</u>
<u>4</u>	<u>Detector PFPD</u>	<u>03-925604-12</u>	<u>11,900.00</u>
<u>5</u>	<u>Computer System and Software</u>	<u>03-907899-81</u>	<u>6,300.00</u>
<u>6</u>	<u>Monitor</u>	<u>03-926082-01</u>	<u>200.00</u>
<u>7</u>	<u>Printer</u>	<u>01-900204-00</u>	<u>200.00</u>
<u>8</u>	<u>Auto-Sampler</u>	<u>CP 739651</u>	<u>6,500.00</u>
<u>9</u>	<u>Auto Drive Accessory</u>	<u>925697-01</u>	<u>3,000.00</u>
<u>10</u>	<u>Model 8200 Accessory Unit</u>		<u>370.00</u>
<u>11</u>	<u>SGE Micro Syringes- 5µl x 10 10µl x 10</u>	<u>374/1100/05 374/1100/10 (_____ BDH Catalogue)</u>	<u>534.00 364.00</u>
<u>12</u>	<u>GC Installation , Commissioning & Training (estimate)</u>		<u>10,000.00</u>
<u>13</u>	<u>Sample Extraction, Clean-up, Separation and Concentration Equipment (estimate)</u>		<u>10,000.00</u>
<u>14</u>	<u>Extraction Solvents (estimated)</u>		<u>2,000.00</u>
<u>15</u>	<u>Ultra High Purity Nitrogen (>99.9995%) Generator</u>	<u>375/0305/08 (_____ BDH Catalogue)</u>	<u>10,682.00</u>
<u>16</u>	<u>POPs Standards</u>	<u>=</u>	<u>1000.00</u>
<u>17</u>	<u>GC Spare Parts (Contingencies)</u>		<u>10,000.00</u>
Total			<u>91,800.00</u>

Appendix9: Use of bio indicators and biomarkers

Biomarkers

Biomarker is mentioned as a new cost effective approach for testing of the presence of POPs (re.STAP-GEF Workshop Japan Dec.2003). It was reported in the STAP-GEF document, that "evaluation of contaminant profiles in mussels can provide advantages over traditional chemical measurements in water and sediment samples. The Mussel watch programme relies upon the ability of the shellfish to accumulate contaminants in their tissues far above the concentrations found in the surrounding environment". "Perhaps the most important potential function of biomarkers is to provide an early warning to impending environmental problems. When challenged by an environmental stressor or a toxic insult, organisms may respond, resulting in observable structural and/or functional changes. Changes at the genetic/molecular level tend to occur first, followed by responses at cellular, tissue, organ and whole-body levels. Thus, by monitoring molecular, biochemical changes, and physiological parameters, the potential harm of an agent can be assessed before more severe disturbances/consequences occur. When employed correctly they can quickly and cost effectively screen a large area and identify sites of concern. The sites of concern or hotspots may then be further investigated and contaminants that are affecting the environment identified and risk assessments made, such that resources are used wisely and cost effectively" (extracted from STAP-GEF Reports).

Bioanalytical methods

Another recent development are in vitro cell-based bioassays, also called bioanalytical methods. Cell bioassays determine contamination by pollutants through specific modes of action. They offer rapid, sensitive and relatively inexpensive screening method to identify positive samples that need further investigation using instrumental analysis. The analyses can be run by relatively unskilled personnel in the field and provide obvious advantages for developing countries. Immunoassays may complement biomarkers in monitoring programmes and have been used in combination with biomarkers to rapidly assess marine pollution.

Biological approaches offer advantages over stand-alone chemical techniques because they are integrative and not limited to known substances". From a developing country perspective, the applicability of the biomarker, bioindicator and bioanalytical methods approach were recognized in the workshop.

Chemical analysis

Chemical analyses are generally sensitive and specific. If the sole purpose of an assessment is to measure the exact concentrations of one of the 12 POPs in certain environmental (biotic or abiotic) matrices, chemical analytical techniques are the only methods that currently meet the criteria of providing quantitatively exact and comparable data.

Analysis in step 3 shall use of Gas Chromatography equipments(GCs) with specific detectors like Electron Capture(ECD) for specific POPS, particularly those which have been used in the past. These include Toxaphene, Aldrex and Dieldex(Para dichlorobenzene, Aldrex, Agrocide and Gammatin (benzene hexachloride products), Aldrin & Chlordane. Toxaphene (according to the STAP-GEF report) would need GC-MS for analysis.

The limitation of chemical analysis is that it does not take into consideration the synergistic and antagonistic effects of pollutants in environmental matrices. Nor does chemical analysis provide information about the actual bioavailability of the pollutants (which may differ with the form in which the chemical is present), and thereby about the impact on ecosystems. The effect on ecosystems cannot be correlated with concentrations of POPs in the environment. We may be able to measure concentrations of POPs with chemical analysis, but the environmental quality may be deteriorating without the knowledge of environmental managers. Neither is chemical analysis a cost-effective tool to detect "hot spots" of pollution.

However, the fact that Seychelles laboratories (both SPHL and SBS) have no or very limited experience in these bio-technologies would entail expert from overseas undertaking a feasibility study on our situation including what would be the best approach including what type of biomarkers to use, in the event that the latter is considered as feasible. "..... In the context of developing countries, the basic infrastructure needs assembly first, before more advanced techniques can be employed" (STAP-GEF report).

The rationale for using bioanalytical methodologies in the Seychelles context is that when biomarkers are employed correctly they can quickly and cost effectively screen a large area and identify sites of concern. The sites of concern or hotspots may then be further investigated and contaminants that are affecting the environment identified and risk assessments made, such that resources are used wisely and cost effectively.

Toxaphene, a POP utilized in Seychelles in the 1950s, cannot be tested by ordinary GC system, unlike other OCPs (organochloride pesticides) it must be analyzed by GC-MS(Gas Chromatography connected to a Mass Spectrophotometer equipment). Currently the Seychelles laboratories do not have such a system. The other 11 POPs can be tested by using ordinary GC with ECD (Electron Capture Detectors) detectors. Both laboratories need strengthening in regard to their analytical capabilities for analysis of POPS by Gas Chromatographical (GC) instrumentations-(depending on POPs to be tested).

Dioxins and Furans Fallout zones: Until recently landfill fires were quite common in Seychelles. It is expected that the areas downwind of these fires, (La Retraite dumping site, Providence, and Roche Caiman etc.) are contaminated with fallout of dust and smoke. However, this can only be validated through testing of materials and soils in these locations.

ELISAs are particularly well suited to laboratories in developing countries which may have access to spectrophotometric equipment but not to GC instrumentation. The in vitro bioassays for dioxin-like compounds would be well suited for screening of samples in developing countries provided that suitable laboratory facilities are available.

According to the STAP-GEF Report, the limitation of the ELISA test is that it is very specific for PCCD/F and dioxin like PCBs. It is important to note however, that bio monitoring cannot always "stand alone", thus should complement chemical analysis (refer phase 3 above).

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

Seychelles is a small island developing state. The country does not have any chemical industry for the manufacture and use of POPs except in agriculture (POPs pesticides) and production of electricity (PCBs). Consequently, the country does not have any infrastructure in place to deal with POPs or specialised personnel and technical facilities such as labs etc.

3.3.17.1 Eligibility

Seychelles is a developing country. Seychelles signed the Stockholm Convention in 2002. The country is in the process of ratifying the Convention, which should be completed by the time the NIP has been approved and is ready for implementation.

3.3.17.2 Identified areas for technical assistance needs and priorities

The following areas have been identified in order of priority.

Technical assistance (experts, equipment, specialised agencies) to carry out works on in collaboration with implementation organisations.

1. The identification and remediation of sites contaminated with persistent organic pollutants.
2. Tendering and selection of works and disposal facilities

Technical assistance required (experts from abroad to assist Agency in the country implementing the NIP (DOE)).

1. Training for decision-makers, managers and personnel responsible for issues related to the Convention
2. The review of available infrastructure, capacity and institutions at the national and local levels and the potential to strengthen them in the light of the Convention;

3. The development and strengthening of research capacity at the national, sub regional and regional levels;
4. The development and establishment of laboratory capacity, including the promotion of standard sampling and analysis procedures for the validation of inventories;
5. The identification and promotion of best available techniques and best environmental practices (BAT/BEP);
6. The development and implementation of incentives for the sound management of persistent organic pollutants.
7. Assessment of reduction of releases through retrofitting / modification of MSW incinerators
8. Specialist to advise as and when necessary on measures being taken for dealing with contaminated sites
9. Assistance to undertake monitoring using bio-markers under action plan 3.3.16

Technical assistance to carry out evaluation of activities being carried out to implement the NIP:

1. The promotion of awareness-raising and information-dissemination programmes, including awareness-raising among the general public of issues related to the Convention;
2. The identification of obstacles and barriers to the transfer of technology and identification of the means to overcome them.
3. The identification and disposal of persistent organic pollutant wastes, including technology transfer for the destruction of such wastes;
4. The development, updating and implementation of the national implementation plans called for in Article 7 of the Convention.
5. Advise on alternatives to POPs and other approved chemicals, especially pesticides

3.3.17.3 Sources of funding and technical assistance

- The Secretariat: GEF funding/ Counterpart funding from the GOS
- Intergovernmental organisations
- Bilateral development agencies: To seek additional funding and assistance through bilateral relations such as EU Countries, other developing and developed countries such as India and China, Japan (JICA)
- NGOs and civil society

3.3.17.4 Assessment of requested technical and financial assistance

Objective	Activity	Timeline	Costs
Have in place a unit for technical and financial assistance	Establish unit accessing technical and financial assistance for the NIP	2007	

Objective	Activity	Timeline	Costs
	implementation Office setup (computer, and accessories) Recruit two officers (cross reference with 3.2 above)		10,000
Capacity for accessing financial and technical assistance	Training of officers for developing project proposals and communicating with donor agencies	2007	10,000
Technical and financial assistance	Proposal development, regular reporting and communications and office running cost	2008- 2011	30,000
Annual costs			30,000
Capital costs			20,000
Total costs for the 4 year program			140,000
Component already financed by Government of Seychelles			120,000
Incremental costs			20,000

3.4 Development and capacity building proposals and priorities.

The development and capacity building proposals included in this document are aligned with the convention, but are elaborated in country specific manner in this plan. Specific development and capacity building proposals are included in the respective action plans and have not been separated into separate programs.

Generic outcomes envisaged under 3.2 reflect the three main axes for capacity building which are: Capacity to disseminate information to the public and users on the issue and the technological or practical approaches that can be taken; Capacity of organisations, especially regulatory agencies to effectively deal with POPs sources; and technical capacity for investigation, control and management. These three main areas are also reflected in the prioritisation exercise included under that same section. The capacity building groupings represent priorities that have to be implemented if we are to see immediate and significant changes in the manner that POPs is addressed locally, but it must be stressed that they represent different facets of the convention and therefore must be considered with almost equal priority rather than sequentially.

Priority: Information exchange public information

Action plans 3.3.12 (information exchange) and 3.3.13 (public awareness) embraces the priority areas related to public information, awareness and stakeholder involvement. It is foreseen that these two components of the project will run for around four years from start-up with incremental costs of around 360,000 USD. These two components are aimed at filling the gap in information generation and dissemination in the country. Major components include training of trainers for target groups, the setting up of information centre(s) for POPs and chemicals in general as well as the creation of promotional materials and media programs.

Priority: Capacity for organisations and regulatory agencies to deal with POPs

Action plan 3.3.1 (institutional and regulatory measures) details the actions that will have to be carried out to improve the control of POPs chemicals in the country. It has a strong emphasis on training of persons from agencies that are directly involved, and also laws and regulations. The main source of expertise would be local. Technical assistance under 3.3.17 on the other hand concerns expert advise that would have to be brought to local organisations if they are to improve on capacity and implement the NIP using best international guidance. In total, elevation of the capacity of organisations to deal with POPs is expected to call for around 350,000 USD in incremental cost and most of the activities are expected to be carried out early on in the program..

Priority: Technical capacity for investigation, control and management

A long list of activities, covering most of the POPs of importance to Seychelles are proposed under 3.3 above. It must be noted however, (and as indicated in 3.2), PCBs and unintentionally produced POPs are of higher importance as they are actually present and have the potential to show increased releases in the long should there be no control. Under these two areas of POPS action, capacity building proposals concern the provision of skilled persons who can undertake evaluation and implement removal schemes (e.g. PCB). In order to implement these two areas however, there need to be very important investment in infrastructure, specifically in PCB free equipment and incinerator upgrades. These two action plans (3.3.4 & 3.3.7) therefore represent the most expensive combination at 3.8 million USD (incremental cost).

In addition to implementing these two action plans there would be a need to have support in terms of research and monitoring. Action plan 3.3.16 details these actions. A relatively small part of the plan will involve training of persons who will be involved in monitoring.



3.53.5 Timetable for plan implementation and measures of success.

The implementation of the NIP will begin in 2006/2007 period. Once the final document has been approved and funds are released the formal implementation process will begin. However certain activities such as legislative review can start at any time. Most implementation activities are anticipated to end within 5 years of the commencement date; however certain activities e.g. PCB phase-out will continue to the deadline laid out in the convention.

The major milestones identified to enable start up of implementation of the NIP are:

- Ratification of the Convention before submission of the Seychelles NIP in 2006
- Submission of the NIP by 2006
- Integration of regulatory measures under the review of the Environment Protection Act, 1994 by the end of 2007
- Recruitment of desk officer for implementation of the NIP and selection of administrative assistants once funding is approved.

For implementation of the Stockholm Convention, the mechanisms for the office of the focal point must be put into place. The agency for executing the NIP, i.e. MENR, will remain the main supervisory body during the implementation of the NIP. A desk officer for the implementation of the NIP and the Convention will be designated. The role of the Agency will be focused on putting in place the appropriate regulatory measures, coordinating the NIP implementation activities, monitoring progress and acting as an international interface through the Secretariat of the Convention. Direct responsibility for implementation of some specific action plans and strategies may be delegated to other government agencies or to external stakeholders including those in the private sector who may assume major obligations in the implementation of action plans. The relevant action plans and strategies give more details as to which agency shall be responsible for implementation of specific parts. It has been agreed that agreements for implementation shall be laid down in formal contracts between the agency and relevant partners, and these contracts shall reflect the implementation principles defined in 3.2.3 above, the reporting obligations under 3.2.8.

The revision of the NIP shall be undertaken every three years taking into account changes in circumstances and information. At the national level, the EMPS review (mid term and full) might require a readjustment of the implementation process. The same applies for the Solid Waste Master Plan, once it is expanded beyond 2010. Depending on the requirement for review, (whole or part), the relevant parties would be brought together to undertake the review.

Below is a summary of the action plans with their major milestones and time line (Table 3.5.1). It is imperative that activities under 3.3.1 are implemented as soon as possible in order facilitate the implementation of

subsequent action plans of the NIP, particularly the institutional strengthening measures and the regulatory development initiatives. Other activities which trigger other activities in the NIP have been highlighted in the table below by cross referencing them with the relevant action plans.

Table 3.5.1.: Work plan of implementation

Action	Measures	Time line
Action Plan 3.3.1: Institutional and regulatory strengthening measures		
Institutional strengthening measures	Increased number and qualification personnel at lab testing facilities	Starting Year 1 for lab technicians in food analysis & others Year 2 onwards
	Basic equipment for site work and information management	Year 1 and year 2
	Train regulatory agency staff on basic knowledge of POPs, risks, formation conditions and applicable rules (BAT/BEP) for control	Years 1-3
	Enhance laboratory testing capacity for testing of PCB in oil	Year 1
	Educate/update pesticide users through direct intervention and multi media presentation on banned pesticides [<i>cross ref 3.3.13</i>]	From Year 1 (annually)
	Strengthen knowledge of residues and trace substances amongst environmental monitoring personnel	Year 3
	Provide knowledge and guidance documents for customs officers in order to improve detection of POPs products	Years 2 -3
Regulatory development Initiatives	Regulatory ban on annex A pesticides	2006/2007
	Cover environmentally safe disposal as precondition for export of waste and apply limits on recovery of certain types of wastes	2006/7
	Control of PCB with provisions for bans on import, testing and labelling requirements, and adherence to guidelines which accompany regulations (<i>cross ref guidelines with 3.3.9 articles in use</i>)	2007+
	Ban on annex A and B POPs	
	Reduction of dioxin/furans releases by a given timeline (<i>cross ref 3.3.7</i>)	2007+
	Measures for emissions to air and stipulate conditions which shall be met	2007+

Action	Measures	Time line
	upstream of combustion process	2007+
	Stipulate in EPA EIA regulations the need for all new and existing developments to use BAT/BEP in order to reduce emissions of dioxins and Furans	2006/7
	Analysis of liability issues concerning contaminated locations	2009/10
	Regulations for identification, maintenance of information on, and management of contaminated sites and include in list of contaminants annex A,B,C substances. [cross ref 3.3.11]	2007+
Activity 3.3.3: Production, import and export, use, stockpiles and wastes of Annex A Part I chemicals.		
	To quantify remaining obsolete pesticides [stabilise storage conditions	Years 2-3
	Train officers and handlers	Year 3 of implementation/2008
	Liaise with international companies for assistance to dispose of obsolete pesticides	Year 2
	Annual review of import and export records for cases of trade in Annexe A POPs (including mechanism to track down illegal import (cross ref with 3.3.1)	Annually 2008
	Identify alternatives to POP pesticides	2 years from start up
	Construct facility for the storage of obsolete stocks of Annex A part 1 chemicals (crossref with 3.3.4 below)	From year 5 (to be completed by 2010)
Activity 3.3.4: Production, import and export, use, identification, labelling, removal, storage and disposal of PCBs and equipment containing PCBs (Annex A Part II chemicals).		
PCB in closed applications	Ban the use of PCB equipments (phase out program) by 2025 and ensure that recovered PCBs must are treated and eliminated by 2028	5 years from start up
	Prevention of uncontrolled incineration of PCB containing oil	

Action	Measures	Time line
	<p>Test all of the remaining equipments (647 transformers, 14 capacitors) for presence of PCB above 50 ppm by 2011</p> <p>Identify, label, remove and replace or dispose all PCB containing equipment above 50ppm. (Disposal will be covered in activity 2 of Action Plan 3.3.10) (including building of HZW storage facility by 2010) (Disposal will be covered in activity 2 of Action Plan 3.3.10)</p>	<p>Year 1 onwards</p> <p>Year 1 to year 5</p> <p>Years 1-5</p> <p>Year 5</p> <p>Except replacement of existing stock from Year 2-2025)</p>
PCB in semi closed and open applications	<p>Development of strategy for identification and quantification of PCB containing semi- closed and open applications</p> <p>Identification & quantification and phase out PCB in semi- closed and open applications</p> <p>Storage and disposal of equipments [addressed as part of 3.3.10]</p>	<p>Year 5 to 6</p> <p>Year 6-7 and 5 years from year 7 to implement phase out program</p>
Applies to both parts above	Monitoring and management of PCB	Year 0 to year 5 except reporting on PCB elimination every 5 years
Activity 3.3.7: Measures to reduce releases from unintentional production (article 5)		
Measures to address burning of waste by the public	<p>Public and awareness programme (cross cutting with 3.3.13)</p> <p>Review the system for control of burning, and propose and implement measures to minimise unintentional release of annex C POPs</p>	<p>Year 2</p> <p>Year 1 and 2</p>
Annex C POPs technical program for users of incinerators and industries in general	<p>Field assessment and regular update of Annex C POPs inventory</p> <p>Introduction to Annex C POPs, BAT and BEP techniques</p>	<p>Year 2</p> <p>Year 2-3</p>

Action	Measures	Time line
	<p>Establish a monitoring system to collect data on a regular basis (once a year until 2010, twice a year afterwards)</p> <p>Retrofitting MSW incineration plants with Air Pollution Control system (2 plants on Mahé and 1 plant on Praslin).</p>	<p>Year 1 & 3 and every 2 years for sample collection and analysis</p> <p>Year 6</p>
Activity 3.3.10: Manage stockpiles and appropriate measures for handling and disposal of articles in use (Article 6, paragraphs 1 (c&d))		
	<p>Detect and dispose of remainder stocks of Annex A part 1 chemicals (pesticides) (Export of POPs pesticides detected and stored as Activity 1 under 3.3.3 above</p> <p>Disposal of Annex A part 2 chemicals (PCB) that arise from testing and screening</p> <p>Detection and disposal of Annex B chemicals (DDT).(Testing and disposal of DDT which may be detected as part of 3.3.3 above</p> <p>Detect and dispose of materials and equipments contaminated or containing Annex C chemicals (Based on test results from 3.3.7, dispose materials found to be contaminated by Annex C chemicals</p> <p>Capacity building for waste handlers and disposers</p>	<p>Year 3 onwards</p> <p>Year 5</p> <p>Year 3</p> <p>Year 3 onwards</p> <p>Year 2 & 3</p>
Activity 3.3.11: Identification of contaminated sites (annex a, b and c chemicals) and remediation in an environmentally sound manner (article 6(1) (e)		
	<p>Development of guidelines for identification & classification of contaminated sites</p> <p>Develop legislation for identification, management and remediation of contaminated sites. (<i>cross ref 3.3.1</i>)</p> <p>Identification & Assessment of the sites contaminated with POPs</p> <p>Develop public register of POPs contaminated sites published by 2011</p>	<p>2008</p> <p>2008/9</p> <p>2009-2011</p> <p>2011</p>

Action	Measures	Time line
	<p>Planning for remediation and/or cleanup</p> <p>Contaminated sites are managed in an environmentally sound manner (by 2018)</p> <p>Institutional strengthening measures</p>	<p>2011</p> <p>2012 & onwards</p> <p>2008/9</p>
3.3.12 Activity: Facilitating or Undertaking Information Exchange and Stakeholder Involvement (Article 9).		
	<p>Facilitate the exchange of information at the international level (Including support to Focal Point for preparation of periodic communications (cross ref 3.3.15 & 3.3.17)</p> <p>Facilitate information exchange at national level (Including develop and trial a mechanism for public input and public scrutiny in implementing actions under the NIP (PRTR) (cross ref 3.3.11, 3.3.13 & 3.3.15)</p> <p>Strengthen institutional capacity for implementation of Article 9</p>	<p>2007</p> <p>2007/8</p> <p>2008/10</p>
3.3.13 Activity: Public awareness, information and education (Article 10)		
	<p>Promote and facilitate awareness amongst policy and decision makers on POPs</p> <p>Develop and implement education and awareness programs for target groups</p> <p>Increase awareness of POPs amongst the public (including Regular surveys to evaluate knowledge on level of awareness on POPs to coincide with submission of national reports (3.3.15)</p> <p>Establish information centre for POPs</p> <p>Consolidate mechanisms for public participation developed in 3.3.12</p>	<p>2007/8</p> <p>2007/9</p> <p>2006; 2007 onwards</p> <p>2008/9</p> <p>2007</p>
3.3.15 Activity: Reporting (Article 15)		
	<p>Compilation of Annual report to the Focal point</p>	<p>Annually</p>

Action	Measures	Time line
	<p>Compilation of reports to be submitted to the Secretariat of the Convention</p> <p>Implement online or electronic reporting system for chemicals (workshop and website) (Cross ref 3.3.13)</p> <p>Revision of the Action Plan (Cross ref 3.3.17)</p> <p>Develop an annual reporting framework for the Pesticide Control Board and other relevant agencies.</p> <p>Capacity building for data processing and management</p> <p>Purchasing of PC including software and hardware for each agencies responsible for providing report. (Cross ref 3.3.13)</p>	<p>2007-2015 (10 reports)</p> <p>2010</p> <p>Every 5 years till 2028</p> <p>2007</p> <p>2007+</p>
3.3.16 Activity: Research, development and monitoring (Article 11)		
Create enabling environment for research/development and monitoring	<p>Upgrade existing legal and institutional framework to facilitate research, development and monitoring of the presence and impacts of POPs.</p> <p>Capacity building for national labs and Research facilities, & Sampling and Testing [<i>cross ref: 3.3.16</i>]</p> <p>Feasibility study of appropriate research and monitoring programs</p>	
Monitoring of POPs in the environment	Design and deploy monitoring programs to detect the presence and quantify the level of POPs in the Environment.	
Monitoring of POPs in humans	Design and deploy monitoring program for the detection and quantification of POPs in human samples	

3.6 Resource requirements.

Table 3.6.1 lists the compilation of costs for implementation of the plan, with details on each proposed item. Detailed breakdown of costs are provided in the respective part of the plan.

Table 3.6.1.: Costs of implementation

Item	Time period	Annual cost	Capital cost	Total cost	Government contribution	Incremental costs
3.2 Implementation strategy	2007-2012	79,200	19,300	415,300	372,000	43,300
3.3.1 Institutional and regulatory strengthening	2007-2011	130,000	101,300	433,900	83,800	350,100
3.3.3 Measures for Annex A part 1 chemicals	2007-2011	15,500	144,500	222,000	77,500	144,500
3.3.4 Measures for Annex A part II chemicals	2007-2025	16,150	838,000	918,750	75,000	843,750
3.3.7 Measures for unintentionally produced POPs	2007-2028	95,500	1,035,500	2,945,500	0	2,945,500
3.3.10 Management of stockpiles	2007-2011	45,000	224,500	353,500	245,000	108,500
3.3.11 Contaminated sites	2008-2012	25,000	34,400	109,400	94,000	15,400
3.3.12 Facilitate information exchange	2007-2010	40,500	29,000	135,500	97,000	38,500
3.3.13 Public awareness	2007-2011	81,300	60,100	385,300	64,700	320,600
3.3.15 Reporting	2007-2015	900	12,500	19,700	16,000	3,700
3.3.16 Research development and monitoring	2007-2010	15,000	153,800	198,800	45,000	153,800
3.3.17 Technical and financial assistance	2007-2011	30,000	20,000	140,000	120,000	20,000
Total		574,050	2,672,900	6,277,650	1,290,000	4,987,650