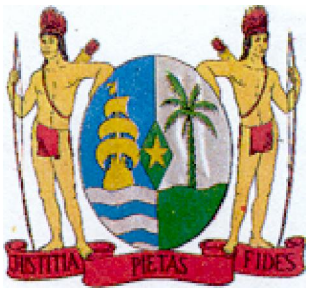

MINISTERIE VAN ARBEID
TECHNOLOGISCHE ONTWIKKELING
EN MILIEU

UNDP

Suriname's

National Implementation Plan

to the Stockholm Convention

July, 2011

The National Implementation Plan for the Stockholm Convention was prepared under the UNDP and the Government of Suriname Project entitled "Initial Assistance to Enable Suriname to fulfill its obligations under the Stockholm Convention on Persistent Organic Pollutants (POPs)", funded by the Global Environment Facility (GEF).

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Preface

Suriname has started the process to ratify the Stockholm Convention on Persistent Organic Pollutants on February 2011 in the parliament. In its process towards ratification, the Government of Suriname has received funding from the Global Environment Facility (GEF) and assistance from the United Nations Development Program (UNDP) to enable Suriname to fulfill its obligations under this convention. In this thought, the Ministry of Labour, Technological Development and Environment is executing the project *"PIMS 2790, Initial Assistance to Enable Suriname to fulfill its obligations under the Stockholm Convention on Persistent Organic Pollutants (POPs)"*. This project aims to identify means to support Suriname's own sustained capacity to fulfill its obligations in the context of the Stockholm Convention, including the preparation of a National Implementation Plan (NIP) focused on Persistent Organic Pollutants (POPs).

The NIP describes the background of the POPs issues in Suriname and the current situation of the POPs substances, which is the baseline inventory. Furthermore, the NIP details all the strategies and actions which need to be undertaken in order to meet all the obligations of the Convention.
It is my hope as the minister with the portfolio of Labour, Technological Development and Environment that this implementation plan will be a valuable reference material to further finance the implementation of the strategies and actions necessary be taken in Suriname to minimize the risks associated with the use of POPs. At the same time we hope that the knowledge and awareness on POPs is being increased in Suriname.

At last I would like to thank the GEF/UNDP for their financial support in implementing the project in Suriname, in which production of various awareness materials e.a. documentary, tv spots, radio spots, brochures and posters were made possible.
The Ministry of ATM wishes to express her sincere gratitude and appreciation to all whom contributed; without their dedication, finalization of this document would not have been reached.

The Minister of Labour, Technological Development and Environment,

H.E. Ginmardo B. Kromosoeto BSc.

Summary

This document is the National Implementation Plan (NIP) for the management and phase out of Persistent Organic Pollutants (POPs) in Suriname, compiled in accordance with article 7 of the Stockholm Convention on Persistent Organic Pollutants (SC).
The SC became enforceable on May 17, 2004. Suriname signed the SC in May 2002. The SC imposes a worldwide ban on the production and trade in eight pesticides (aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, mirex and toxaphene), two industrial chemicals (hexachlorobenzene and PCBs) and two by-products of incineration processes (dioxins and furans) from 2004 onwards. In 2009, the Conference of the Parties (COP), by decisions SC-4/10 to SC-4/18, adopted amendments to annexes A (elimination), B (restriction) and C (unintentional production) of the SC to list nine additional chemicals as persistent organic pollutants which are**,** namely**,** the following pesticides: chlordecone, alpha hexachlorocyclohexane, beta hexachlorocyclohexane, lindane, pentachlorobenzene; industrial chemicals: hexabromobiphenyl, hexabromodiphenyl ether and heptabromodiphenyl ether, pentachlorobenzene, perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride, tetrabromodiphenyl ether and pentabromodiphenyl ether; and byproducts: alpha hexachlorocyclohexane, beta hexachlorocyclohexane and pentachlorobenzene. These substances are designated as POPs and are toxic, persistent and can be transported over great distances through the air or water. POPs can cause adverse effects on the environment and health because they accumulate in organisms. This can result in cancer, sterility and disruption of the immune system. The SC imposes the obligation on the parties to develop, within two years of the ratification of the Convention, a NIP describing the national situation in respect of the substances covered by the SC**,** and the strategies that have been developed to implement their obligations under the SC. The SC also requires all parties to develop an Action Plan. In this National Action Plan (NAP) the parties to the SC must specify what strategies they will be developing to meet the obligations of the SC.

With funds made available by the Global Environment Facility (GEF) and with the assistance of the United Nations Development Program, the Ministerie van Arbeid, Technologische Ontwikkeling en Milieu (Ministry of Labour, Technological Development and Environment (ATM)) prepared the first NIP for Suriname as part of the project “Initial Assistance to Enable Suriname to fulfil its obligations under the Stockholm Convention on Persistent Organic Pollutants (POPs)”. The initial preparations started mid-2007 and the Project Coordination Unit of the Ministry of ATM in close collaboration with the project coordinator and the National Coordination Committee coordinated all the activities.

The NIP describes the background of the POPs issues in Suriname and the current situation of the POPs substances which is the baseline inventory. Furthermore, the NIP details all the strategies and actions which need to be undertaken in order to meet all the obligations of the Convention.

First inventories for all POPs groups (pesticides, PCB and PCDD/PCDF) have been successfully compiled during the NIP preparation process. The inventories were robust enough for assessment of the dimension of the presence of different POPs categories in Suriname as well as for priority setting considerations for the action plan. All inventories will, however, need to be improved within the NIP implementation process.

Persistent Organic Pollutants (POPs) pesticides
Suriname does not have facilities to produce pesticides. The imports of pesticides have increased and the use of pesticides has doubled between 2005 and 2009. Yet, there are not enough systems in place to sufficiently guide the safe use of pesticides. In general, there is insufficient dissemination of risk-related information to transportation companies, salespersons and users. Also, suppliers and users are not familiar with processes of risk management. The mixing of pesticides is generally practiced without knowledge of the specific risks and impacts to human health. Pesticides are stored with the wholesalers and users. The majority of the identified obsolete pesticides and POPs pesticides are stored inadequate. The Ministry of ATM initiated the participation of Suriname to the Pesticide Stock Management System (PSMS) of the Food and Agricultural Organization (FAO).

An inventory of obsolete pesticides was conducted. A storage site was identified to store the obsolete pesticides of the country; however, a preliminary assessment showed that it could not be excluded that the storage may cause odour nuisance. If a storage site is selected and assessed, the storage facility will be upgraded to an Intermediate Collection Centre (ICC) to international standards for the repacked pesticides waiting for export to a destruction facility outside the country.
There is limited information about the potential impacts of the environmental, safety, health risks, and impacts involved with import, storage, transport, distribution, use, handling, and disposal of chemicals at different levels within the society. For the past 10 years, the Ministerie van Landbouw, Veeteelt en Visserij (Ministry of Agriculture, Animal Husbandry and Fisheries (LVV)) has executed awareness programs for farmers on the correct use of pesticides.

Polychlorinated biphenyls (PCB)
PCB-containing materials, such as insulating oils for electrical devices, hydraulic oils, paints, etc., have always been imported into Suriname. Most PCB-containing or contaminated equipment, such as transformers and capacitors, can be found in the electricity generation sector, which is owned by both public and private companies. Transformers currently being used do not contain PCB and their maintenance is done using PCB-free equipment. . The cut-off year for importation of PCB- free equipment of N.V. Energie Bedrijven Suriname (N.V.EBS) is suspected to be around the late 80s and early 90s. Currently, the import of PCB containing materials is not forbidden, but requires a license.

Due to the lack of facilities for environmentally sound disposal of PCBs and the fact that Suriname was not yet party to the Basel Convention**, at** that time an MOU was signed in 2006 between the **m**inistry of environment in the Netherlands (VROM) and the Ministry of ATM for the transport of PCB-filled transformers and capacitors to the Netherlands. Most recently, on February 15, 2011, the Stockholm Convention on Persistant Organic Pollutants and the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, have been approved in De Nationale Assemblee (The National Assembly (DNA)). The Ministry of ATM is continuing the ratification process.
Due to the economic development of the last 15 years in Suriname, where, for example, mobile telephone systems have been deployed by three competitive companies/providers, as well as a growth in gold mining companies, it is assumed that many transformers are new and free of PCBs.

Suriname is not a producer of PCB or PCB-containing equipment; there are neither obselete stocks nor reserves. Nevertheless, as previously mentioned, transformers and capacitors are the major source of PCB in Suriname. The majority of the transformers and capacitors is still not sampled and tested. Because a comprehensive inventory has not been completed as yet, it is expected that PCB-contaminated materials as well as contaminated soil or other material with PCB still exist.

Since a comprehensive survey, in particular of PCB- contaminated sites, has not been conducted, the impacts that can occur nationally cannot be determined at this moment. Nevertheless, PCBs, when exposed in the environment, can pose a serious threat to human health.

Unintentionally-produced POPs (UPOPS)
Regarding the unintentional POPs, a dioxin inventory has been compiled for 2010 using the methodology of the Standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases. Total contemporary release from all source categories were estimated to 21.33 g toxicity equivalents (TEQ) of polychlorinated dibenzo-para-doxins (PCDDs) / polychlorinated dibenzofurans (PCDFs) per year. The major release stems from uncontrolled combustion (largely open waste burning) with an emission of 20.2 g TEQ/a (94.6% of total release); another relevant contributing source is hospital waste incineration 0.92 g TEQ (4.3% of total release) A preliminary inventory of historic PCDD/PCDF releases for PCP application to rice fields have been compiled and estimated to 5565 g TEQ for the years 1964 to the early 1970s. While this is not a current PCDD/PCDF release, this historic legacy can — due to the high persistence of PCDD/PCDF — have current impact on biota, and via accumulation in the food chain, it can pose a contemporary threat to human health. There is a need for further assessment.

Concerning the newly listed POPs, no inventories have been established to date. Therefore, no assessment of the extent of the presence of new POPs in articles, wastes and contaminated sites could be performed. The inventories for the newly listed POPs should be established as soon as possible. When it comes to PFOS, a potentially contaminated site has been discovered

Based on the POPs inventories and an intensive stakeholder-consultation process, the action plans for the POPs categories have been developed. Furthermore, priorities for the implementation of the NIP have been established together with the stakeholders.
The basic strategy is to harmonize and link the Stockholm Convention implementation activities where possible and appropriate with national priorities, and support the sustainable development of a Green Suriname. Furthermore, the SC implementation process possesses synergies with other conventions' activities, in particular, the recently ratified Basel Convention, the Rotterdam Convention, and the Montreal protocol. These synergies will be assessed and considered.

Several of the priority areas need the support and cooperation of different ministries and stakeholders. Therefore, the strengthening of cooperation between the different ministries, institutions, and other stakeholders, is an important factor for an effective implementation of the Stockholm Convention, and will be stressed in the first phase of the implementation. For the preparatory phase of the NIP, the National Chemical Coordination Committee has served as the entity with key responsibilities for cooperation and will be further strengthened in the implementation process.

Also awareness on different stakeholder levels for all POPs groups (Pesticides, UPOPs, PCB and new POPs) is needed and will be an important element of the implementation plan. In particular, there is no knowledge of the POPs newly-listed in the Convention. Since some of the new POPs are present in goods of daily life (electronics, car shredder residues, synthetic carpets, flame retarded or surface treated textiles, furniture, mattresses, etc.), the establishment of awareness-raising materials and awareness-communication should include also these chemicals and link the awareness of chemical management and waste management.

In the inventory process, it has been discovered that for all POPs groups (pesticides, PCB, UPOPs and newly listed POPs) a range of contaminated and possibly contaminated sites have been generated over the last three decades in Suriname. Currently there are no or only very limited assessments done for these sites. Therefore, it is of high priority to initiate the assessment and mapping of POPs-contaminated sites and establish a risk assessment for the sites. These activities could be linked with the establishment of a contaminated site database for Suriname.

The improvement of waste management is a priority with respect to controlling open waste burning as a measure to reduce a major source of PCDD/PCDF release. Additionally, new POPs (in particular PBDEs and PFOS) can be present in several waste streams (electronic waste, car shredder residues, synthetic carpets, flame retarded or surface treated textiles, furniture, mattresses, etc.). These wastes are currently all deposited in Suriname. Since Suriname does not have any waste destruction capacity, POPs-containing wastes need to be exported at high cost as discovered now with PCB and pesticide stockpiles.

The improvement of waste management will consider the waste hierarchy, including the 3 R approach (reduce, reuse and recycling). These activities will contribute to the prevention of more POPs-contaminated sites in the future.

The assessment of PCDD/PCDF releasing facilities within the Dioxin inventory process revealed that for the Environmental Impact Assessment (EIA) required in Suriname the technologies are/were not sufficiently described and assessed, and in this respect, improvements are needed in the permit- process. The few Annex C facilities relevant for PCDD/PCDF release (hospital waste incinerator, iron smelter) do not comply with the Best Available Technology and Best Environmental Practice (BAT/BEP), and improvements for BEP and possibly in respect to BAT will be considered.

In the BAT/BEP assessment process, it was also discovered that no emission standards (air, water and wastes) for industrial facilities are in place in Suriname (besides for PCDD/PCDF also for basic parameters like particles or heavy metals). This will also be addressed during the NIP implementation.

The improvement of POPs monitoring is another important area which will be addressed during the NIP implementation. Currently, there are hardly any monitoring data on POPs in the country. In particular no data exists on POPs levels in the population of Suriname and on POPs in air, both of which are the selected matrices for the effectiveness evaluation of the SC. For the implementation of the Convention, baseline data of human-POPs levels - which will further support priority setting and enhance the evaluation tool regarding effective implementation - will be generated by participating in the United Nations Environment Programme (UNEP) / World Health Organisation (WHO) human monitoring activities. It is planned to combine these activities by conducting POPs research at Anton de Kom Universiteit van Suriname (Anton de Kom University of Suriname (ADEKUvS)) with possible collaboration with experienced POPs research institutions.

Summary Action Plan

Nr	Action	Estimated Budget in US $
POPs Pesticides		
1.	Maintain and improve technical capacity for better management of obsolete and POPs pesticides	511,750
2.	Maintain and improve technical capacity for better management of pesticides	287,000
3.	Legal Measures	22,500
4.	Develop cooperation between institutions	54,000
5.	Increasing Awareness and Information Dissemination	151,000
	SUB TOTAL	**1,026,250**
PCBs		
1.	Conduct comprehensive inventory on PCBs	200,000
2.	Legal Instruments and Technical Guidelines for Managing PCBs	50,000
3.	Develop Cooperation between institutions	122,500
4.	Improving Technical Capacity for better Management of PCBs	58,500
5.	Increasing Awareness and Information Dissemination	96,000
	SUB TOTAL	**527,000**
UPOPS		
1.	Improvement of PCDD/PCDF inventory: Coordination of Stakeholders	30,000
2.	Improvement of Waste Management (WM) (harmonization with other WM activities)	190,000
3.	Implementation of Best Available Techniques and Best Environmental Practices	80,000
4.	Monitoring of status of POPs pollution in Suriname	198,500
5.	Awareness raising and Information Dissemination	190,000
6.	Addressing newly listed POPs in the convention	470,000
	SUB TOTAL	**1,158,500**
	TOTAL ESTIMATED COSTS	**2,711,750**

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

Abbreviation	Dutch name	English Name
ADEKUVS	Anton de Kom Universiteit van Suriname	Anton de Kom University of Suriname
ADRON	Anne van Dijk Rijst Onderzoekscentrum Nickerie	Anne van Dijk Rice Research Centre Nickerie
ANW	Jaarwerkplan	Annual Work Plan
AMT		Aligned Monitoring Tool
APR		Annual Project Report
AST		Above-ground storage tank
ATM	Ministerie van Arbeid, Technologische Ontwikkeling en Milieu	Ministry of Labour, Technological Development and Environment
BAT	Beste beschikbare technieken	Best available techniques
BET	Beste praktijken op milieugebied	Best environmental practices
BOG	Bureau voor Openbare Gezondheid	Bureau for Public Health
CARICOM	Caribische Gemeenschap	Caribbean Community
CASAS		Civil Aviation Safety Authority Suriname
CEPC		Centre for Environmental Protection and Consultancy
COP	Conferentie van de Partijen	Conference of the Parties
CSM		Conceptual Site Model
CSS		Composite Soil Sample
DCs	Districtscommissarisen	District Commissioners
DDT		1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane
DEF	Ministerie van Defensie	Ministry of Defence
DNA	De Nationale Assemblee	The National Assembly
EIA	Milieu Effect Rapportage	Environmental Impact Assessment
ERP		Expenditure Reports
EU	Europese Unie	European Union
E-waste	Electronisch afval	Electronic waste
EOI		Expression of Interest
EOX		Extractable Organic halogen Components
FAO	Voedsel-en Landbouw Organisatie van de Verenigde Naties	Food and Agricultural Organization of the United Nations
FIBC		Flexible Intermediate Bulk Container
FIN	Ministerie van Financiën	Ministry of Finance
FP		Focal Point
GDP	Bruto Binnenlands Product	Gross Domestic Product
GEF		Global Environment Facility
GIS	Geografische Informatie Systemen	Geographic Information Systems
GPS	Geografische Positionering Systeem	Geographic Positioning System
HCB		Hexachlorobenzene

HPPMG		Harmonized Programme and Project Management Guidelines (UN)
HS	Geharmoniseerd Systeem	Harmonized system
HBB		Hexabromobiphenyl
HCH		Hexachlorocyclohexane
HeptaBDE		Heptabromodiphenyl ethers
HexaBDE		Hexabromodiphenyl ethers
HI	Ministerie van Handel en Industrie	Ministry of Trade and Industry
H&SP	Gezondheids-en veiligheidsplan	Health and Safety Plan
IBC		Intermediate Bulk Container
ICC		Intermediate Collection Centre
IHPA	Internationaal HCH & Pesticide Associatie	International HCH & Pesticides Association
IPM	Geïntegreerde Pest Beheer	Integrated Pest Management
IRS	Bespuiting van insecticiden binnenshuis	Indoor residual spraying
IVM	Geïntegreerde vector beheer	Integrated Vector Management
JP	Ministerie van Justitie en Politie	Ministry of Justice and Police
LLIN	Duurzame, met insecticide behandelde muskietennetten	Long-lasting insecticide-treated mosquito nets
LVV	Ministerie van Landbouw, Veeteelt en Visserij	Ministry of Agriculture, Animal Husbandry and Fisheries
MINOV	Ministerie van Onderwijs en Volksontwikkeling	Ministry of Education
M&E	Monitoring en Evaluatie	Monitoring and Evaluation
MOP	Meerjaren Ontwikkelingsplan	Multi Annual Development Programme
MOU		Memorandum of Understanding
NAP	Nationaal Actieplan	National Action Plan
NCC	Nationale Cöordinatie Commissie voor Chemicaliënbeheer	National Coordinating Committee for Chemicals Management
NCCR	Nationale Cöordinatie Commissie Rampenbeheersing	National Coordination Commission for Disaster Management
NCPS	Nationaal Chemicaliën Profiel Suriname	National Chemical Profile Suriname
NIMOS	Nationaal Instituut voor Milieu en Ontwikkeling in Suriname	National Institute for Environment and Development in Suriname
NGO	Niet Gouvernementele Organisatie	Non-Governmental Organization
NH	Ministerie van Natuurlijke Hulpbronnen	Ministry of Natural Resources
NIP	Nationaal Implementatie Plan	National Implementation Plan
NPC	Nationaal Project Coördinator	National Project Coordinator
NVEBS	Naamloze Vennootschap Energie Bedrijven Suriname	Limited Liability Company Energy Company of Suriname, Co.Ltd
c-OctaBDE		c-octabromodiphenyl ether
OPs		Obsolete Pesticides
OW	Ministerie van Openbare Werken	Ministry of Public Works

PBDEs		Polybrominateddiphenyl ethers
PCBs		Polychlorinated biphenyls
PCDDs		Polychlorinated dibenzo-para-dioxins
PCDFs		Polychlorinated dibenzofurans
PCP		Pentachlorophenol
PCPNa		Pentachlorophenol Sodium
PCU	Project Coördinatie Unit	Project Coordination Unit
PE		Polyethylene
PeCB		Pentachlorobenzene
PentaBDE		Pentabromodiphenyl ethers
c-PentaBDE		c-pentabromodiphenyl ethers
PFOS		Perfluorooctane sulfuric acid
PIC	Voorafgaande geïnformeerde toestemming	Prior Informed Consent
PIR	Project Implementatie Recensie	Project Implementation Review
POPs	Persistente organische verontreinigende stoffen	Persistent Organic Pollutants
PPE	Persoonlijke Beschermingsmiddelen	Personal Protective Equipment
PPMG	Program-en projectbeheer richtlijnen	Programme and Project Management Guidelines
PSMS	Pesticide Voorraad Beheersysteem	Pesticide Stock Management System
PM	Project Manager	Project Manager
PMU	Project Beheer Unit	Project Management Unit
PRTR	Registratie van verontreinigde vrijlatingen	Pollution Release Transfer Register
RFP	Verzoek van voorstel	Request for Proposal
RACI	Verantwoordelijkheid, verantwoordingsplicht, consultancy en informaticadiensten	Responsibility, Accountability, Consulting and Information
RGB	Ministerie van Ruimtelijke ordening, Grond- en Bosbeheer	Ministry of Physical Planning, Land- and Forest Management
RO	Ministerie van Regionale Ontwikkeling	Ministry of Regional Development
SC	Stockholm Verdrag	Stockholm Convention
TEQ		Toxicity Equivalents
TCT	Ministerie van Transport, Communicatie en Toerisme	Ministry of Transport, Communication and Tourism
UNEP	Verenigde Naties Milieu Programma	United Nations Environment Programme
UPOPs	Onopzettelijke Productie POPs	Unintentional production POPs
UST		Underground storage tank
VG	Ministerie van Volksgezondheid	Ministry of Public Health
WHO	Wereldgezondheidsorganisatie	World Health Organization

1 Introduction

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

1.1 *Stockholm Convention*

The SC on POPs was ratified on 17th May, 2004. The SC imposes a worldwide ban on the production and trade in eight pesticides (aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, mirex, and toxaphene), two industrial chemicals (hexachlorobenzene and polychlorinated biphenyls (PCBs)) and two by-products of incineration processes (dioxins and furans) from 2004 onwards. In 2009, the Conference of the Parties (COP), by decisions SC-4/10 to SC-4/18, adopted amendments to annexes A (elimination), B (restriction), and C (unintentional production) of the SC to list nine additional chemicals as persistent organic pollutants. The latter are namely the following pesticides: chlordecone, alpha hexachlorocyclohexane, beta hexachlorocyclohexane, lindane, pentachlorobenzene; industrial chemicals: hexabromobiphenyl, hexabromodiphenyl ether and heptabromodiphenyl ether, pentachlorobenzene, perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride, tetrabromodiphenyl ether and pentabromodiphenyl ether; and byproducts: alpha hexachlorocyclohexane, beta hexachlorocyclohexane and pentachlorobenzene. Table 1.1 presents an overview of the POPs listed in Annex A, B and C of the SC.

Table 1.1 List of POPs in Annex A, B and C of the SC

Annex A (Elimination)	Annex B (Restriction)	Annex C (Unintentional Production)
Parties must take measures to eliminate the production and use of the chemicals listed under Annex A. Specific exemptions for use or production are listed in the Annex and apply only to Parties that register for them.	Parties must take measures to restrict the production and use of the chemicals listed under Annex B in light of any applicable acceptable purposes and/or specific exemptions listed in the Annex.	Parties must take measures to reduce the unintentional releases of chemicals listed under Annex C with the goal of continuing minimization and, where feasible, ultimate elimination.
Aldrin Chlordane Chlordecone Dieldrin Endrin Heptachlor Hexabromobiphenyl Hexabromodiphenyl ether and heptabromodiphenyl ether Hexachlorobenzene (HCB) Alpha hexachlorocyclohexane Beta hexachlorocyclohexane Lindane Mirex Pentachlorobenzene Polychlorinated biphenyls (PCB) Tetrabromodiphenyl ether and pentabromodiphenyl ether Toxaphene	DDT Perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride	Polychlorinated dibenzo-p-dioxins (PCDD) Polychlorinated dibenzofurans (PCDF) Hexachlorobenzene (HCB) Pentachlorobenzene Polychlorinated biphenyls (PCB)

These substances are designated as POPs and are toxic, persistent and can be transported over great distances through the air or water. POPs can cause adverse effects on the environment and health because they accumulate in organisms. This can result in cancer, sterility and disruption of the immune system. The SC imposes the obligation on the parties to develop, within two years of the ratification of the Convention, a NIP describing the national situation in respect of the substances covered by the SC and the strategies that have been developed to implement their obligations under the SC. The SC also requires all parties to develop an Action Plan. In this National Action Plan (NAP) the parties must specify what strategies they will be developing to meet the obligations of the SC.

Suriname signed the SC in May 2002. Organochlorine pesticides subject to this convention are not in use at present in Suriname, and since 1990, the Ministry of LVV stopped the issuance of import permits for several pesticides which were identified as dangerous for human health and the environment. In the same year, the Ministerie van Handel en Industrie (Ministry of Trade and Industry (HI)) prohibited the import of chemicals on the Prior Informed Consent (PIC) list of the Rotterdam Convention, that includes the following: 2,4,5-T, aldrin, binapacryl, captafol, chlordane, chlordimeform, chlorobenzilate, *DDT, dieldrin*, dinoseb, dinoseb salts, DNOC and its salts, EDB, ethylene dichloride, ethylene oxide, fluoroacetamide, HCH, *heptachlor*, *hexachlorobenzene*, lindane, mercury compounds, *mirex,* monocrotophos, pentachlorophenol, t*oxaphene*, methamidophos, methyl-parathion, parathion, phosphamidon, dust/ powder formulations of benomyl (at or above 7%), carbofuran (at or above 10 %) and thiram (at or above 15 %), asbestos, polybrominated biphenyls (PBB), *polychlorinated biphenyls*, polychlorinated terphenyls tetraethyl lead, tetramethyl lead, tris(2,3 dibromopropyl) phosphate (substances in Italics are currently controlled by the SC). In May 2000, the Government also ratified the Rotterdam Convention on the PIC Procedure for certain Hazardous Chemicals and Pesticides in International Trade. The status on the production and use of POPs in Suriname is presented in Table 1.2.

Table 1.2 Uses of POPs in Suriname

POP Chemical	Characteristic	Status in the Republic of S
Aldrin	Pesticide	Prohibited
Chlordane	Pesticide	Prohibited
Dieldrin	Pesticide	Prohibited
Heptachlor	Pesticide	Prohibited
Hexachlorobenzene	Pesticide	Prohibited
Mirex	Pesticide	Prohibited
Toxaphene	Pesticide	Prohibited
Polychlorinated biphenyls	Chemical	Import license required
DDT	Pesticide	Prohibited
Lindane	Pesticide	Prohibited

With the start of preliminary studies, the identification of the existence of stocks or reserves of organochlorine pesticides is taking place. In light of the preparation of this NIP, an initial inventory of PCBs was done. Suriname is fully aware of the locations where PCB may exist locally. Up to now “pure” PCB transformer was not found. The same holds for capacitors. It is expected that the quantity of PCB contaminated material in Suriname could increase to a few hundred tons in total. Studies about contaminated soil or other material with PCB still need to be conducted.

The Global Environment Facility (GEF) approved financial support for the implementation of the project "Initial Assistance to Enable Suriname to fulfil its obligations under the Stockholm Convention on Persistent Organic Pollutants". The implementation partners are the Ministry of ATM and the United Nations Development Programme (UNDP).
The project aims to identify means to support Suriname's own sustained capacity to fulfil its obligations under the SC, including the preparation of a NIP focused on POPs, that covers more widely aspects important to the safe and environmentally sound management of chemicals and waste.

The project is being executed by the Project Coordinating Unit (PCU) within the Ministry of ATM. The 'Nationale Coördinatie Commissie voor Chemicalienbeheer' (National Coordinating Committee for Chemicals Management (NCC) was established in May 2007 by the Ministry of ATM, and it is responsible for coordinating national activities directed towards the preparation of the NIP.

1.2 *Goals and Provision of the Stockholm Convention*

Article 7 of the SC requires that each Party must develop, and endeavor to put into practice, a plan setting out how it will implement its obligations under the SC. The plan must be transmitted to the Conference of the Parties within two years of the date on which the Convention was ratified by that Party.
The goals of the NIP are:

I. To set out the actions that Suriname has undertaken regarding the reduction of the presence of POPs;
II. To propose actions that Suriname will undertake in order to manage and eliminate POPs from entering the environment considering the Convention;
III. To inform the Conference of the Parties and Surinamese community about national initiatives and projects designed to meet the requirements of the SC.

The NIP describes how Suriname will fulfill its obligations under the SC to eliminate or reduce POPs-releases to the environment and carry out environmentally-sound management of stockpiles of POPs-contaminated wastes and contaminated sites that pose high risks for human health and the environment, with a regional perspective[1].

The outcomes from the implementation of the NIP will include:

I. The protection of public health from the effects of POPs;
II. A structured POPs management;
III. Capacity building to maintain and monitor the quality of the environment; and
IV. Meeting the obligations under the SC.

The NIP will be updated as necessary to reflect decisions made by the Government and by the COP - such as amendments to the SC or its annexes, including the addition of chemicals to annexes A, B or C, or adoption of guidance or guidelines.

[1] United Nations Development Program PIMS 2790, Initial Assistance to Enable Suriname to fulfill its obligations under the SC on POPs.

1.3 *NIP Development Methodology*

The Ministry of ATM is the Focal Point (FP) of the SC and coordinates all activities regarding the implementation of the SC, inclusive of the NIP. The NCC was installed with the purpose of formulating and developing the National Implementation Plan (NIP). The NCC will further provide overall policy guidance for the process. Other tasks of the NCC are:

- Supervising and monitoring the POPs project;
- Developing a National Action Plan on mercury contamination;
- The development of a National Strategy for hazardous chemicals and waste; and
- Identifying synergies between the conventions relating to chemicals such as the Rotterdam Convention, the Basel Convention, the Stockholm Convention and the Montreal Protocol

The NCC consists of members of: the Ministry of ATM, 'Nationaal Instituut voor Milieu en Ontwikkeling in Suriname' (National Institute of Environment and Development in Suriname (NIMOS), Ministerie van Openbare Werken (Ministry of Public Works (OW), Ministry of HI, Ministry of LVV, Ministerie van Volksgezondheid (Ministry of Public Health (VG), Bureau voor Openbare Gezondheidszorg (Bureau for Public Health (BOG), ADEKUS, and Vereniging van Surinaamse Bedrijven (Association of Surinamese Businesses (VSB).

Activities that have been conducted so far are:

1. Establishing and strengthening coordinating mechanism through the FP and the NCC to guide the process leading to the formulation and approval of the NIP. In light of the project 'PIMS 2790 Initial Assistance to Enable Suriname to fulfil its obligations under the SC', a PCU was established within the Ministry of ATM responsible for the project execution, and an NPC, along with the core project team, was appointed;
2. Public awareness and participation workshops have been executed to assure wide support for the implementation of the SC. The public awareness campaign focused on the characteristics of products and unintentional by-products that are considered to be persistent organic pollutants, and the risks involved. There was also a focus on the difference that exists between the hazards and the risks of chemicals, and hazardous waste, as well as on the different aspects of integral management to assure safety, the protection of human health and the environment. Awareness materials, including brochures and a documentary about the situation in Suriname, were also developed;
3. Elaboration of a National Profile on Chemical Management (NPS) to support the implementation of the SC;
4. *Training*. Suriname participated in different workshops and activities at regional level that were aimed at raising awareness on the obligations deriving from the SC and help build or strengthen human capacity to implement the Convention at national level. National training workshops have been conducted concerning the different areas covered by the SC such as management, control and effects of unintentional releases of dioxins and furans, PCB, pesticides, legislation related to controlled substances, contaminated sites, etc. International expertise is engaged to conduct training to improve the local staff's capacity;
5. *Monitoring and risk assessment capacity*. A review of the capacity needs and means to monitor POPs and other chemical pollution to the environment, and assess human and ecosystem exposure, as well as training on the methodologies to assess human health and eco-toxicological risks has been conducted;

6. *Infrastructure capacity*. Environmentally-sound options for the integrated management of hazardous wastes and an inventory of existent infrastructure and capacities (installations, technologies, trained manpower and other relevant aspects) has been established;
7. *Best Available Techniques (BAT) and Best Environmental Practices (BEP)*. The results of the preliminary inventory of sources and loads of POPs in Suriname have been analyzed in order to establish priorities, objectives, and goals to be considered in the NIP as well as to identify the capacity building needs to reduce or eliminate POPs emissions. Local staff got acquainted with the UNEP toolkit to elaborate inventories of unintentional POPs sources and loads; and
8. Elaboration of Inventories of unintentional POP's sources and loads as well as of existing stocks of POPs pesticides and PCBs. Field surveys have been executed to establish an inventory and propose strategies to improve containment and storage conditions of existing POPs stocks.

The NIP is consistent with the GEF initial guidelines for enabling activities for the SC on POPs, and the interim guidance for developing a NIP (UNEP and The World Bank Group), including strategies required under articles 5 and 6 of the Convention. The process of developing the NIP was supported financially by the GEF with the UNDP as implementing agency.

1.4 *NIP structure*

The NIP comprises of the following three chapters:

- Chapter 1, gives an introduction about the SC and its goals and provisions. It describes the development and the structure of the NIP. Overall, chapter 1 provides an overview of the aims and goals of the NIP, as well as the process for the development of the NIP;
- Chapter 2, outlines Suriname's demographic, political and economic status. It elaborates on the environmental situation and the current status of the institutional, policy and regulatory framework. This chapter also presents the results of the assessment of POPs, focusing on the import and export, production, current and future use, registration, release, storage, disposal, and the potential impact. The POPs mentioned in this chapter are: POPs pesticides, PCBs, DDT, new POPs, unintentional production POPs. The existing monitoring programmes, and the information exchange and awareness are also described in this chapter. Overall, it gives basic information on Suriname's status regarding the management of POPs;
- Chapter 3, presents an overview of recommended activities, strategies, and action plans. In addition, there is a budget related to the activities of the action plan; and
- The appendices which follow detail information on legislation relevant to NIP.

2 Country Baseline

Section 2 provides basic background information relevant to the NIP. It describes the current situation and state of knowledge in the country about POPs and the status of institutional and other capacity to address the problem.

2.1 *Country Profile*

A brief country profile is given in order to place the NIP strategies and action plans in a country-specific context. It summarizes information on geography and population, membership in regional and sub-regional organizations, the country's political and economic profile, profiles of potentially important economic sectors in the context of the POPs issue, and overall environmental conditions and priorities in the country.

2.1.1 Geography and Population

The Republic of Suriname has a land mass of 163,820 km^2 and is located on the northern part of South America between 2-6 ^{0} N and 54-58 ^{0} W[2]. Suriname borders the Atlantic Ocean in the north Brazil in the south, Guyana in the west and the French Department of *La Guyane* (also named French Guiana) in the east. The land area can be divided into a swampy coastal plain, a central plateau region containing broad savannahs and swamp forest, and to the south a mountainous region densely forested with tropical vegetation.

The country has a typical tropical climate with two rainy and two dry seasons, an average daily temperature of 27 ^{0} C and an annual average rainfall varying from 1,900 mm along the coast and 2,700 mm in the middle of the country.[3] Suriname is divided into ten districts: Paramaribo, Brokopondo, Commewijne, Coronie, Marowijne, Nickerie, Para, Saramacca, Sipaliwini, and Wanica. These districts are headed by a District Commissioner (DC).

Suriname has a small, yet culturally diverse population of 492,829 people. Approximately 90% of the population lives along the coast of Suriname. The population is characterized by an ethnic diversity of the following: Hindustani, 27.4%;Creoles, 17.7%; Maroons, 14.7%; Javanese, 14.6%; Mixed, 12.5%; Others (Chinese, Indigenous peoples, Lebanese, European, etc) 6.5%; Not reported, 6.6%.[4]

Population Density (people per square km) in the urban and rural areas, as well as the interior of Suriname, is divided in the following:

- Population density in the urban areas: Paramaribo: 1,327.6; Wanica: 194.1
- Population density in the rural areas: Nickerie: 6.8; Coronie: 0.7; Saramacca: 4.4; Commewijne: 10.5; Para: 3.5
- Population density in the interior: Marowijne: 3.6; Brokopondo: 1.9; Sipaliwini: 0.3

2 Ministry of ATM; Suriname 3rd National Report to the Convention on Biological Diversity; September 2009
3 Algemeen Bureau voor de Statistiek (ABS), 2010
4 ABS, 2005

The birth rate per 1,000 in 2003 is 20.2[5] and the life expectancy in 2002 is 71.1 years at birth[6]. Suriname has a literacy rate of 89.6%[7]. The medium age of the population is 26.5 years while 292,089 people are in the age group of 15-59 (2004)[8].

The official language is Dutch, but more than 16 other languages are spoken, including Sranan Tongo (the national lingua franca), and languages specific to the various ethnic groups.

Figure 1 Map of Suriname

2.1.2 **Political Profile**

In 1975, Suriname became independent from the Netherlands. The Republic of Suriname is a constitutional democracy based on the 1987 constitution. The legislative branch of government consists of a 51 member national assembly, elected for a 5-year term. The last election was held May 2010. The executive branch is headed by the President, who is elected by a two-thirds majority of the National Assembly or, failing that, by a majority of the 'People's Assembly' for a 5-year term. The People's

5 ABS Data of 2003
6 PAHO Health Data
7 www.indexmundi.com/g/g.aspx?c=ns&v=39
8 Suriname Census 2004 Vol. 2, General Bureau of Statistics

Assembly is formed from all National Assembly delegates, and regional and municipal representatives who are elected by popular vote in the most recent national election. A simple majority of the National Assembly or People's Assembly is required to elect a Vice President. He or she is usually elected at the same time as the President, for a 5-year term.
As Head of Government, the President appoints a cabinet of ministers. A 15 member State Council chaired by the President advises the president.
The judiciary branch is comprised of the Court of Justice and the Supreme Court. The Supreme Court supervises the magistrate courts. Members are appointed for life by the President in consultation with the National Assembly, the State Council, and the National Order of Private Attorneys.

2.1.3 Profiles of Economic Sector

Mining, agricultural production, manufacturing, wholesale and retail contribute to Suriname's Gross Domestic Product (GDP). However the largest contributors are mining and quarry operations, with exports of alumina, gold, and oil accounting for about 85% of export trade and 25% of government revenues. In the manufacturing sector, bauxite processing and crude oil refining are the largest contributors to GDP [9].

Table 2.1 The various contributions of the industrial sectors to the GDP[10]

Industries of origin	Contribution in 2009 (in 1000 USD)
Manufacturing	471,500
Mining and Quarrying	289,000
Whole sale and retail	238,900
Agriculture, animal husbandry and forestry	115,500
Construction	103,500
Electricity, gas and water	96,000

Economic growth reached about 6% in 2007 and 2008, owing to sizeable foreign investment in mining and oil. The economy slowed in 2009, however, as investment waned; and the country earned less from its commodity exports when global prices for most commodities fell. In 2000, inflation was over 100%; a growing fiscal deficit led the Government to implement an austerity program and raise taxes in an attempt to control spending and dampen any inflationary trends.

2.1.4 Environmental overview

2.1.4.1 Environmental Management Framework

Several governmental bodies form the national institutional framework for environmental management in Suriname:

- The Ministry of ATM is responsible for coordinating the preparation of national environmental policy. NIMOS, which was established in March 1998 as an autonomous government foundation, functions as the technical working arm of the Ministry of ATM.
- The National Council for the Environment has the mandate to advise the government on the development and implementation of the National Environmental Policy.

9 ABS 2010
10 The currency exchange for 1 USD is 3.25

- Other sector ministries such as the Ministerie van Ruimtelijke Ordening, Grond- en Bosbeheer (Ministry of Physical Planning, Land- and Forest Management (RGB)), Ministerie van Natuurlijke Hulpbronnen (Ministry of Natural Resources (NH)), the Ministry of HI, Ministerie van Regionale Ontwikkeling (the Ministry of Regional Development (RO)), Ministry of VG, and the Ministry of LVV all have environment-related tasks, in addition to agencies such as the Nationale Coordinatie Commissie Rampenbeheersing (National Coordination Commission Disaster Management).

2.1.4.2 Main Environmental Concerns

Suriname, with a land mass of 163,820 km^2, accounts for 0.11% of the Earth's total land mass. 90% of the country is covered by relatively pristine tropical rainforest . Its rich biodiversity includes rare, endemic plant species and several endangered species of wildlife. Compared with globally known species, Suriname has:

- 2.0 % of the world's higher plant species;
- 3.1 % of the world's fish species;
- 2.4 % of the world's amphibian species;
- 2.8 % of the world's reptile species;
- 7.9 % of the world's bird species; and
- 4.8 % of the world's mammals species[11]

Apart from its biodiversity, Suriname is particularly rich in subsoil resources: minerals, such as bauxite, and gold, are the country's main sources of income next to hydro-carbons and forest. Agriculture is primarily practiced in the coastal plain areas and river valleys. The main cash crop is paddy rice. Other commercial crops include bananas, coconuts, plantains, peanuts, and citrus fruits. In addition, small scale farm holdings produce a variety of vegetables and fruits. Shrimp and fish farming are expanding along the coast.

These days, other business activities relating to ecotourism are increasingly seen in a lucrative light. In addition, Suriname has the opportunity to benefit from the compensation of carbon credits. However, these activities are dependant on the preservation of the nation's natural wealth, its forest, water, and soil. Nevertheless, several threats face this natural wealth.

The main environmental threats, risks, and issues derived from economic exploitation of the natural resources, the industrial activities, and households are:

- Depletion of fish and shrimp resources due to over-fishing;
- Increasing oil exploration with high risks for environmental damage;
- Seawater intrusion due to man- made water reserves that prevent water flowing to the sea;
- Air pollution from vehicles and industry;
- Groundwater pollution due to the lack of proper storm water and household water drainage;
- Soil and water pollution due to poor waste management. With virtually limited waste separation or re-use of waste, both the collection and disposal of waste are of concern. Except for the car wreckages that are being collected and exported and plastic bottles that are being recycled, the collected waste is mainly disposed of at open landfills. There is also pollution of surface water due to extensive use of fertilizers;
- Mercury pollution of fertile soil and downstream waters;
- Drainage of polluted industrial waste water;

11 Ministry of ATM; Surinjame 3rd National Report to the Convention on Biological Diversity; September 2009

- Indiscriminate issuance of lumber and mining concessions in the interior are examples of the comprehensive national environmental and social problems; and
- Wastewater treatment is restricted at best to treatment by septic tanks (stabilizing sewage), followed by discharge into the surface water, which ultimately makes its way to the sea.

From the above mentioned main threats, the following three issues (waste management, industrial emissions, and contaminated sites) are closely linked with the POPs topics and potential NIP activities. A more detailed description follows:

Threats

a) Waste Management in Suriname

The Waste Management of Suriname is in a developmental stage, and currently, existing systems can hardly cope with the waste generated. The waste from greater Paramaribo and the district of Wanica is deposited on a partly managed landfill with no bottom liner or leachate treatment. Other landfill areas in Suriname, assigned by the Districts Commissioners (DCs), are open dump sites.

The National Chemical Profile Suriname (NCPS) details the situation for chemicals waste*:"Generally, multinational and large scale companies as well as some medium scale companies do have data on chemical waste including the type and quantity of waste. In many cases when chemical waste cannot be destroyed, companies collect and store their chemical waste. It is unknown in which stage these chemicals are, and if their storage complies with proper storage guidelines. Most companies hire a waste disposal service company to collect and destroy or dump (chemical) waste. These waste collecting/destruction companies usually receive a permit from the Ministry of OW to collect and dump (chemical) waste at the public landfill which is owned and managed by the Government.*

The NPS further highlights that *"Until now, there is no national chemical waste management plan. There is only one private company specialized in chemical waste collection and destruction. It is not known how much household waste collection and destruction companies are present in Suriname. With respect to the waste landfill, there is one public landfill which is a government entity. The public landfill, Ornamibo, located in district Wanica, is circa 20 hectares with a lifetime of 20 – 25 years. Since 2002, the public landfill has been in the state of rehabilitation, to be transformed into a controlled landfill, to include the collection and disposal of chemical waste. The public landfill collects mostly waste from greater Paramaribo and the district of Wanica. With respect to the other districts, the DCs assign a public landfill for their respective district; in reality, it is not regularly supervised. The amount of waste disposed in the public landfill are given in table 2.2 The figures of the amounts of waste show that, in general, the amount of disposed waste has decreased. However, the amounts of hazardous waste materials have increased".*

The NCPS concludes with that *"Since the municipal garbage landfill can be considered an open dump, it creates great risks for the soil, groundwater and neighbouring surface water contamination, as well as air pollution (methane emissions and odour), all leading to serious health risks for the local people."*

Table 2.2 Amount of waste disposed off in m3, 2007-2009 at Ornamibo

Waste type	2007	2008	2009
Household waste	151,536	142,596	145,236
Agricultural waste	8,328	6,036	5,160
Enterprise waste[12]	31,332	30,432	29,460
Dangerous waste materials	3,888	4,116	4,200
Asbestos & glass	228	252	132
Total	**197,319**	**185,440**	**186,197**

Source: ABS Environmental Statistics 2010; Ministry of Public Works

Currently in Suriname, there are 3 functioning incinerators in Suriname that handle all medical waste. These incinerators are from governmental hospitals, namely the Academisch Ziekenhuis Paramaribo, the Streekziekenhuis Nickerie, and the 'Stichting Wasserij Particuliere Ziekenhuizen' (Waspar). Recently, the Ministry of VG signed a public, private, partnership contract with a waste management company. This partnership is part of the government's policy to outsource some of its activities regarding waste collection and disposal.

In this respect, it needs to be highlighted that the new POPs recently added to the SC list of POPs are present in everyday goods (electronics, car shredder residues, synthetic carpets, flame retarded or surface treated textiles, furniture, mattresses etc.) and therefore in household waste that finally ends up in landfills and open dumps. In this way, persistent and semi volatile POPs migrate and leach into the wider environment with the potential to contaminate soil and groundwater, and ultimately, be a threat to human health.

There is therefore an urgent need to improve waste management in order to prevent long-term contamination. Experiences in industrial countries have revealed the high cost of securing and remediating landfills containing hazardous chemicals and wastes. According to the 'polluter pays principle' companies who have deposited their wastes on such landfills have to bear (part of) the high securing and remediation costs. Considering these findings from the NCPS and the UPOPs inventory, the improvement of waste management is of urgency from several perspectives, and it should have a high priority in the overall action plan of the NIP.

b) Industrial Emissions

Another threat to environmental integrity is industrial emissions. The emission from industrial facilities depend on the type of facility, the technologies installed for emission control, and the emission standards, Currently in Suriname, no air emission standards are set. With respect to water emissions, the NCPS notes that *"It must also be noted that some companies adjacent to a river or channel are accustomed to discharge (chemical) waste into the latter. Multinational companies consider international water quality standards for discharging waste water into water streams."* Furthermore it has been discovered during the Dioxin/ UPOPs inventory for the NIP that for the Environmental Impact Assessment (EIA) the technologies used for large-scale facilities seem not to be sufficiently described (e.g. there is no prescribed guidance on water or off gas cleaning technologies) and assessed. With this respect, improvements need to be made in the licensing process. This has been derived from the assessment of the metal smelter's construction in District Para, which still has no appropriate off-gas suction system and no off gas cleaning system for the melting furnace despite the fact that an EIA has been conducted for this facility.

12 The Ministry of OW did not specify enterprise waste.

It can be concluded that poor construction, uncontrolled emissions from industries and other facilities lead to environmental contamination of water, air, and soil with the risk of generating contaminated sites over time.

c) Contaminated sites

Contaminated sites are a result of inadequate waste management, mismanagement or of the deposition of hazardous chemicals to soil (e.g. use of persistent pesticides or POPs in other material released to the environment like PFOS use in specific fire fighting foams). Furthermore, the uncontrolled releases of persistent and toxic substances from industries and other facilities to air, water, and soil can lead to contaminated sites.

Industrial development and associated releases have contaminated sites which are a large burden to industrialized economies. Industrial and commercial activities, as well as the treatment and disposal of waste, are reported to be the most important sources. Although considerable efforts have been made already, it will take decades to clean up the legacy of contamination. The costs for these activities are likely to be enormous (100 billion euro scale) and include remediation of not only soil, but also groundwater and sediments. These enormous costs and associated assessments[13] demonstrate that only prevention of contaminated sites in the first place represents a sustainable solution and a means to arrest the continued development of contaminated site challenge. It has been highlighted that with the continuing shift of industrial activities to developing countries and countries in transition with a lack of regulation, additional challenges in relation to contaminated sites are expected to emerge globally[14].

For Suriname, within the SC inventory process of POPs, it has been discovered that for all POPs groups (pesticides, PCB, UPOPs and newly listed POPs) a range of contaminated and possibly contaminated sites are present. Regarding the pesticide-stockpiles the extent of contamination of soils and groundwater is increasing by washout, considerably increasing future remediation costs. More illegal dumps and landfills are emerging with the increased imports and consumption of goods. Considering POPs chemicals, such deposits have the potential to become contaminated sites in future.

2.2 *Institutional, Policy and Regulatory Framework*

This section describes the present overall institutional, policy, and regulatory framework within which the NIP will be implemented. It also covers more detailed baseline information about the POPs issue such as the status of action and implementation activities under related Conventions or regional and sub-regional agreements.

2.2.1 **Introduction**

Several ministries and institutes within the Government have tasks and responsibilities related to environmental management. The Ministry of ATM is assigned the task to coordinate environmental policy for the country. As the FP to most of the environmental conventions, the Ministry of ATM is therefore responsible for implementing the country's obligations under these conventions. Most recently, on February 15, 2011, the SC on POPs and the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, have been approved in De Nationale Assamblee (The National Assembly (DNA)). The Ministry of ATM is continuing the ratification process.

13 see e.g. Montague P (2006): The modern approach to problems: Prevention. Rachel's Democracy & Health News #845, http://www.precaution.org/lib/06/why_pp_now.060309.htm

14 Weber R, Gaus C, Tysklind M, Johnston P, Forter M, et al. Dioxin- and POP-contaminated sites - contemporary and future relevance and challenges. Env Sci Pollut Res 15, 363-393 (2008). http://www.springerlink.com/content/0q10km8582605r1x/fulltext.pdf

One of the main priorities of the environmental policy of the government is to enhance public participation in environmental management and the establishment of a legal framework for environmental management, inclusive of standards and guidelines.. The strategy to achieve these priorities is to enhance the institutional structure and develop adequate legislation. Chemicals management is one of the thematic areas that has received special attention from the government. An important step thereto has been made by having the SC approved by DNA on February 15, 2011. After signing the SC in 2002, Suriname received assistance from the SC in the form of an enabling activity project to create sustainable capacity and ownership in Suriname to meet the country's obligations under the SC. This includes the preparation of the NIP.

2.2.2 **Legal Framework Roles and Responsibilities**

Presently, Suriname has no legislation that is specifically aimed at addressing POPs, except for the Pesticides Act. However, there are several laws and regulations that can be applied in the absence of specific POPs legislation.
The legislative framework for environmental management is based on the Constitution of the Republic of Suriname, which entrusts the State with the responsibility to create and promote conditions, necessary to protect nature and preserve ecological balance. In addition, the State must supervise the production, availability, and trade in chemical, biological, medical (pharmaceutics) and other products, intended for consumption, medical use, and diagnoses. The State also supervises all medical professions, pharmacists and other medical practices. The monitoring of above mentioned products and professions is subject to enforcement by law.

The import and export of chemicals, including certain POPs are regulated through the State Order Negative List which regulates the import and export of goods. This list is being amended regularly to comply with international conventions ratified by Suriname. Amendments to this State Order have been made based on the Montreal Protocol for Ozone Depleting Substances, Food and Agriculture Organization (FAO) Negative list, and the Convention on Chemical Weapons. Currently, PCB-containing materials is on this list as being goods for which a license is required. This regulatory instrument is flexible in comparison with Acts approved by the DNA. However, Government approval is required to make any adjustments to the aforementioned list. With the ratification of SC and Basel Convention, it is foreseeable that the import and export of POPs and hazardous waste will also be regulated through the aforementioned State Order Negative list.

The Ministry of LVV has prepared comprehensive legislation covering the management of pesticides. The Pesticides Act, which was last amended in 2005 incorporates the international techniques for the management of pesticides. The FAO Code of Conduct on the Distribution and Use of Pesticides provides the inspiration and guidance for the Pesticides Act and Pesticides State Order. The Pesticides Act also incorporates the Prior Informed Consent (PIC) procedure. The Pesticides Act further gives authority to the ministers of LVV and VG to regulate the ban of certain pesticides. In accordance with the Pesticides Act, it is prohibited to transport, import, store, sell or use for agricultural purposes pesticides that are listed on the FAO 'Negative List'. This list is automatically adjusted whenever the Rotterdam Convention prohibits a pesticide. The Ministry of LVV publishes a list of pesticides that are prohibited in Suriname. Appendix 2 provides a copy of the aforementioned published list. This list also includes the following POPs: aldrin, chlorodane, DDT, dieldrin, heptachlor, heptachlorobenzene, and toxaphene, including a POP from the new list, namely lindane. Currently, a new State Order has been prepared to extend the list of banned pesticides. This list includes endrin and impregnate salts (known as Wolman salts), which for years have not been traded in Suriname. The methamidophos, carbofuran, dimethoaat, and endosulfan—which are

currently on the list of the Ministry of LVV - will also be included, since the State Order is the required legal basis to ban the import or export ban of pesticides. With the ratification of the SC, the list of banned pesticides will be extended to include the rest of POPs — both the initial and new list.
By ministerial order, labelling of pesticides is regulated. More details about the Pesticides Act and labelling regulation are provided in Appendix 1. Other laws and regulations relevant to chemicals management in general are provided in Appendix 1.

The Ministry of ATM has prepared an environmental framework law. Currently, this draft is under review to streamline it with the policy of the newly established Government. When it is passed by DNA, general aspects of environmental management will have a sound legal basis. This draft Act specifically deals with pollution control. It is advisable to review the prepared draft laws (draft environmental law and draft waste management act) to see to which extent they could contribute to the implementation of the Stockholm Convention and the Basel Convention.
It is noteworthy to mention that while awaiting the enactment of the Environmental Act, NIMOS uses a system to handle environmental complaints and keeps a database of all complaints and their responses. In addition, NIMOS provides environmental advice on environmental matters to permitting agencies such as the Ministry of HI and the DCs. NIMOS has even developed guidelines for storage of chemicals and petroleum products, but currently these can only be enforced if incorporated in the permits of the aforementioned permitting agencies. It is noteworthy to mention that since these advices currently lack the support of the law, the permitting agencies are not obliged to act on the advice.

2.2.3 **Relevant International Commitment Obligations**

Environmental degradation has always been a concern of the Government of Suriname. In order to improve our efforts to protect nature the Government has ratified several international environmental agreements in order to improve our efforts to protect nature. However, efforts to bring social and economic development for the country, and environmental management at the same time, have been very challenging. The following list of international agreements (Table 2.3) establishes the positive efforts that have been made over the last several decades.

Table 2.3 International agreements signed by Suriname

No	Title	Year of ratification/signing
1	International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, 1969	1976
2	The Treaty on the Non-Proliferation of Nuclear Weapons, The Non-Proliferation Treaty; NPT	1976
3	The International Plant Protection Convention, IPPC	1977
4	The Treaty of Tlatelolco for the Prohibition of Nuclear Weapons in Latin America and the Caribbean	1977
5	The London Convention on Prevention of Pollution by Dumping of Wastes and Other Matter 1972	1980
6	Convention on International Trade in Endangered Species of Wild Fauna and Flora	1981
7	The Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat	1985

No	Title	Year of ratification/signing
8	International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto	1989
9	Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and under Water, Partial Test-Ban Treaty	1993
10	The Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction; Biological and Toxic Weapons Convention	1993
11	UN Convention on Biological Diversity	1996
12	The Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on Their Destruction, Chemical Weapons Convention	1997
13	The Vienna Convention for the Protection of the Ozone Layer	1997
14	Montreal Protocol on Substances that Deplete the Ozone Layer	1997
15	United Nations (UN) Framework Convention on Climate Change	1997
16	UN Convention on the Law of the Sea	1998
17	UN Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, particularly in Africa	2000
18	Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade	2000
19	The Comprehensive Test-Ban Treaty	Signed 2006. The convention will come into effect when the required 44 countries mentioned in the annex have ratified it
20	Kyoto Protocol	2006
21	The 1996 Protocol to the London Convention on Prevention of Pollution by Dumping of Wastes and Other Matter 1972	2006
22	The SC on Persistent Organic Pollutants	In process of Ratification. Approved by DNA on February 15, 2011
23	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	In process of Ratification. Approved by DNA on February 15, 2011.

2.2.4 **Institutional Framework**

The principal ministries with legal responsibilities for management of chemicals (including POPs) in the country are:

1. ATM, responsible for coordinating environmental policy and legislation;
2. VG, responsible for public health;
3. LVV, responsible for pesticides control;
4. TCT, responsible for the ports in Suriname;
5. OW, responsible for waste collection and processing in Paramaribo;

6. HI, responsible for issuance of permits for the industries in both the import as well as export sectors;
7. RO, responsible for waste collection in the districts outside Paramaribo;
8. Def, responsible for disaster management;
9. JP, responsible for enforcement in general; and
10. NH, responsible for regulating the mining industries.

Several agencies and organizations functioning under the above mentioned ministries have responsibilities related to chemicals management. An overview of all ministries and agencies involved in chemicals management is provided in Appendix 3.
The management of POPs, through the stages of their lifecycles is also a shared responsibility of several ministries. A general overview of the responsibilities of the different ministries, agencies and other institutions for the different stages of the chemical life cycle is presented in Appendix 1 and summarized in Table 2.4. Under the terms of the SC, legislation will be enacted and institutions will be entrusted with certain tasks related to POPs management. Table 2.5 presents an overview of ministries and agencies with their proposed and foreseen contributions to POPs management.

Table 2.4 Stages of Life-Cycle

Concerned Ministry/ Agency	Import	Production	Storage	Transport	Distribution/ Marketing	Use/Handling	Disposal
VG[15]	X	X	X		X	X	X
LVV [16]	X		X		X	X	X
NH[17]		X	X	X			X
ATM[18]	X	X	X	X		X	X
HI	X[19]	X[20]			X[21]		
Fin [22]	X						
OW			X				X
RO [23]		X	X	X	X	X	X
JP [24]	X	X	X	X	X	X	X[25]
Def[26]	X		X	X		X	X

15. Department Bureau of Public Health: Department of Environmental Inspection (storage, production, use/handling and disposal) and Sanitation (importation, production, storage distribution/marketing, waste disposal)
16. Pesticide Department Subdivision of Agricultural Research, Marketing and Processing
17. Mining of minerals
18. Includes the Labor Inspection and NIMOS (since NIMOS lacks a legal basis, its plays an advisory role instead of enforcement)
19. Department Import, Export and Foreign Exchange Control, 'Dienst IUD'
20. Department for Operating Licenses (Afdelingbedrijfsvergunning)
21. Department Operating Licenses (AfdelingBedrijfsvergunning)
22. Customs Department
23. District Commissioners
24. Narcotics: Police (import, disposal); Fire Department,Law Enforcement (Police)
25. Procurator-general formally approves destruction or it is delegated to relevant departments
26. Explosives (import, storage, transport, use/handling, disposal); National Centre for Disaster Control (NCCR)

Concerned Ministry/ Agency	Import	Production	Storage	Transport	Distribution/ Marketing	Use/Handling	Disposal
BUZA [27]							
TCT[28]	X		X[29]	X			
Others	X[30]	X	X	X	X	X	X[31] X

Table 2.5 Overview of ministries and agencies with their proposed/foreseen contribution to POPs management.

Proposed/Foreseen Contribution	Functions-Primary Responsibilities	Ministries/Agencies
Promulgation of legislation (including bans/restriction of the production and use of POPs, as well as emissions limit from unintentional sources) Permitting	Coordination Permitting Enforcement Standards Awareness	ATM LVV VG HI Bureau of Standards
Focal point Coordination of all POPs activities of all the ministries and departments Implementation of NIP	Policy and Coordination	ATM
Statistical data on POPs	Monitoring, data management, and publicity Data collection	ABS LVV Fin HI VG
Contribution in providing funds to implement SC	Financing Networking and lobby	Fin ATM
Certified lab testing	Standards for Laboratories Identifications of laboratories	VG Assigned Laboratories; Bureau of Standards

27. International agreements (Basel Convention, Rotterdam Convention, SC etc.)
28. Transportation by water, air and road and facilities for water and air transportation
29. Port Authority
30 By Presidential Order, stipulators regarding transport, import, export, transit, production and sale of gunpowder, and other highly flammable explosives
31. Maritime Authority of Suriname

2.2.5 **POPs-Management and Monitoring Requirements**

As mentioned earlier, apart from the Pesticides Act, Suriname has no legislation that is specifically aimed at addressing POPs. However, there are several laws and regulations that can be applied in the absence of specific POPs legislation. The current legislation is fragmented over several ministries and agencies, and part of it is out-dated. In addition, different ministries have responsibilities with regards to POPs management. Their mandates are based on the State Order "Task Description of Ministries".

- The first government entity that directly comes into contact with POPs when they are imported is the Customs Department of Ministerie van Financiën (the Ministry of Finance (FIN)). This Ministry is responsible for levy and indirect tax collection. The Customs Department is responsible for checking whether goods are imported legally (with the required permit). Customs also collect the related taxes, and is physically present at the port when the goods are cleared. Currently, the Customs and the workers at the different ports lack the capacity to detect and handle chemicals in general. However, it is noteworthy to mention that the Custom Department has been specifically trained by NIMOS through the Project "*Monitoring the Activities in the Refrigerant Management Plan (RMP*), "To identify equipment containing ozone-depleting substances when they enter the country.

- The Ministry of HI is responsible for the issuance of licences for the import and export of goods. Based on the State Order "Negative List," certain chemicals (all kind of waste, pesticides and chemicals on the FAO negative List, chemicals and radioactive waste and chemical weapons) are banned, while a license is required for others. For example, licenses are required for pesticides that are not included on the FAO negative list and PCB-containing materials. In practice, when a license is being requested to import these pesticides, the Ministry of HI requests advice of the Ministry of LVV. With the ratification of the SC, it is expected that POPS chemicals will be included in the State Order "Negative List".

- With regards to POPs-pesticides, the Ministry of LVV is responsible for the enforcement of Pesticides legislation. The Minister of LVV is authorized, in consultation with the Minister of VG, to prescribe by regulation which pesticides are banned. The Minister of LVV decides whether a pesticide can be imported. In 2006, as part of its policy, the Minister also banned the import of dimethoaat, endosulfan, and methamidophos. However, this should still be legalized through a State Order. It should be stated that endosulfan is proposed to be listed in the SC Annex A, at the COP 5 to be held in Geneva (April 25-29, 2011). The Pesticide Department of the Ministry of LVV is involved in the enforcement of the rules and regulations for pesticides, regulating imports, correct labelling, distribution and disposal. The Extension Officers of the Ministry of LVV are responsible for training in the safe handling and use of pesticides.

- The Ministry of VG is responsible for public healthcare. In particular, the Ministry is responsible for food safety and sanitation, and guidance in the destruction of pharmaceuticals, clinical and industrial waste. The Environmental Inspection of BOG is responsible for inspection of water, soil, and air pollution. They are involved in different stages of the chemical cycle: import, production, storage, use/handling, and disposal. Pharmaceutical inspection operates on behalf of the permanent secretary of the Ministry of VG. The Pharmaceutical Inspection is responsible for the supervision of the import, production, sale, and destruction of pharmaceuticals in Suriname. The new building of central laboratory of the Ministry of VG was opened in September 2010. This lab

will be used as a reference laboratory for the different ministries like the Ministries of JP, HI, LVV, and VG. The most common analyses on food safety and infectious diseases will be carried out in Suriname and the laboratory will also provide services to other countries in the region.

- The upgrading of other laboratories also took place. These include the chemical laboratory of the ADEKUS, the Fish Inspection Institute (Viskeuringsinstituut-VKI), and the Agricultural Health and Food Safety Unit (AHFSU) of the Ministry of LVV. AHFSU is responsible for the coordination, monitoring, administration and reporting of agriculture health activities for the Ministry of LVV. VKI is established to execute the Fish Inspection Act of 2000, and thereby conducts activities such as determining of quality standards for all fisheries products and executes all necessary inspections and control for quality assurance of fisheries products. One of the achievements of VKI is the establishment and implementation of an annual Residue Monitoring Plan for aquaculture products in compliance with European Union regulations. The program monitors the following possible residues in aquaculture products at farm level: chloramphenicol, nitrofurans, tetracyclines, oxolinic acid, enrofloxacin, emamectine, sum DDT, malachite green, leucomalachite green, and crystal violet). As mentioned in the NCPS, an update of the survey of laboratories needs to be done because the last survey was executed in 2001.

- The DCs under the Ministry of RO are responsible for granting permits based on the Hindrance Act. These permits are required for setting up establishments, which may cause hindrance to others: e.g. set up of shops, service stations, or paint spraying boots for cars. Since the DC is not obliged to ask advice from the Ministry of LVV or any other relevant governmental institutions, instances can be found where often these “Hindrance Act” permits are issued without environmental, health or safety requirements. For example, it often occurs that permits are granted to retail shops where also pesticides are in their possession without consulting the Ministry of LVV. Due to this shortcoming in the Law, the Ministry of LVV does not have adequate data on the pesticides that are for sale and no adequate provisions are put into the permit. However, it must be noted that the Ministry of LVV is collaborating with the Ministry of HI - which is responsible for issuance of operating licenses for enterprises - to monitor these retail shops.

- The Ministry of Defense is amongst others responsible for providing assistance in case of disasters. The ‘Nationaal Coördinatie Centrum Rampen Beheersing’ (National Coordination Commission Disaster Management (NCCR) is responsible for monitoring and assessing social development to identify potential disasters and crises. NCCR has a coordination structure (collaboration with several Ministries and organizations) in place in case of a disaster with chemicals.

- The Ministry of ATM is pre-eminently responsible for monitoring the compliance of labour laws and with regard to the environment, the coordination of the preparation of the national environmental policy. The Labour Inspection Department is responsible for the enforcement of the regulations on safety and occupational health in Suriname. They also provide advice and guidance to employers as well as employees. The Environmental Department of the Ministry of ATM is responsible for the preparation of the environmental policy. Special attention is given to the issue of chemicals. In June 2007, the Minister of ATM established the National Coordination Commission responsible for:

a. Guiding and monitoring the POP’s project;
b. Developing a National Action Plan on mercury contamination/pollution;
c. Developing a National Strategy for hazardous chemicals and hazardous waste ; and

d. Identifying the synergies between chemical conventions e.g. Rotterdam Convention, Basel Convention, Stockholm Convention, and Montreal Protocol.
Members of the commission are representatives from the Ministries of ATM, NIMOS, OW, HI, VG, LVV, ADEKUS, and business community. NIMOS, the technical arm of the Ministry provides amongst others environmental technical advice on the storage and handling of chemicals to:
DC (Hindrance Act permit), Ministry of HI (permit for establishment of enterprises) and Customs Department (import of chemicals).On an ad hoc basis, NIMOS has guided transportation for chemicals of private companies from the port to the company's facility. The draft Environmental Framework Law does consider measures and has provisions to handle adequately the issues of pollution and pollution management.This draft contains a specific chapter on pollution control regulating aspects like environmental norms and standards, notification of spills or releases of contaminants, national register for sources of pollution, environmental permits, and historical pollution. In anticipation of the Environmental law, NIMOS has also prepared a number of guidelines which are relevant for chemicals management in general. These are:
    - Guidelines for conducting Environmental and Social Impact Assessments;
    - Guidelines for setting up depots for chemicals;
    - Guidelines for setting up and use of incinerators for medical waste;
    - Guidelines for Petroleum Products; and
    - Guidelines for Spraying Boots.

2.3 *Assessment of POPs*

Assessment of current POPs management in the Suriname is based on preliminary inventories of: pesticides, polychlorinated biphenyls (PCBs), and unintentional production of POPs (UPOPs: polychlorinated dibenzo-para-dioxins (PCDD) / polychlorinated dibenzofurans (PCDF), hexachlorobenzene (HCB) and PCB) are described in this section. This section also presents information on current POPs stockpiles, contaminated areas and waste, data on remediation of contaminated areas, POPs levels in different environmental media, prediction of future POPs production, use and release, POPs monitoring in the Suriname, as well as current information level, knowledge and education levels of each target group, and the mechanism for information exchange with other parties of the SC.

2.3.1 **POPs Pesticides**

2.3.1.1 General

In many parts of the world, poorly stored obsolete POPs-pesticides stocks and other hazardous pesticides in dump sites, landfills, and warehouses await clean-up and final disposal. There are approximately 50,000 tonnes of POPs pesticides in Africa with an estimated cost for management and destruction of 250 to 300 million US$. At the present rate of disposal, it would take more than 100 years to destroy all these stocks (World Bank 2002)[32].
A comprehensive overview on pesticide stockpiles of South American countries is not available yet.
The chemicals in this category of POPs include: aldrin, chlordane, dieldrin, endrin, heptachlor, hexachlorobenzene (HCB), mirex, and toxaphane. They are listed in Annex A of the SC along with the other POPs which are chemicals to be eliminated. However, the convention has noted special exemptions, such as: (i) the use of aldrin as ectoparasiticides and insecticides; (ii) chlordane for registered parties production and use as local ectoparasiticide, insecticide, termiticide and additive in

32 World Bank (2002) AFRICA: Africa Stockpiles Program (ASP): Funding the prevention and disposal of obsolete pesticides from African countries Work Program Inclusion – Resubmission – (FAO – World Bank Co-Submission) Project Brief 11th September 2002.

plywood adhesives, dieldrin in agriculture; (iii) heptachlor a termiticide, wood treatment, and protection of underground cable boxes; and (iv) HCB production for registered parties as allowed and for use as an intermediate solvent for pesticide and closed-system site-intermediate, mirex for use as a termiticide, and production for registered parties.

The main characteristics of the chemicals in this category of POPs are:

- **Aldrin** is an organochlorine insecticide that was widely used until the 1970s when it was banned in most countries. It is a colorless solid. Before the ban, it was heavily used as a pesticide to treat seed and soil. Aldrin and related "cyclodiene" pesticides became notorious as POPs. Aldrin is highly lipophilic.
- **Chlordane**, or chlordan, is an organochlorine pesticide. Chlordane was a manufactured chemical, commonly used between 1948-1988. This white solid was sold in the U.S. until 1983 as an insecticide for crops like corn and citrus and on lawns and domestic gardens as well as a method of termite control. Pathways of exposure to chlordane include ingestion of crops grown in chlordane-contaminated soil, ingestion of high fat foods such as meat, fish, and dairy — as chlordane builds up in fatty tissue -- as well as through inhalation of air near chlordane treated homes and landfills. Chlordane is excreted slowly through feces and urine elimination, as well as through breast milk in nursing mothers, and it is able to cross placenta and become absorbed by developing fetus' in pregnant women.
- **Dieldrin** is a chlorinated hydrocarbon originally produced as an insecticide. Dieldrin is closely related to aldrin, which reacts further to form dieldrin. Aldrin is not toxic to insects; it is oxidized in the insect to form dieldrin which is the active compound. Originally developed in the 1940s as an alternative to DDT, dieldrin proved to be a highly effective insecticide and was very widely used during the 1950s to early 1970s. However, it is an extremely persistent organic pollutant; it does not easily break down. Furthermore, it tends to biomagnify as it is passed along the food chain. Long-term exposure has proven toxic to a very wide range of animals including humans -- far greater than to the original insect targets. It has been linked to health problems such as Parkinson's, breast cancer, and immune, reproductive, and nervous system damage. It can also adversely affect testicular descent in the foetus if a pregnant woman is exposed to dieldrin.
- **Endrin** is an organochloride that was primarily used as an insecticide. It is a colorless odorless solid, although commercial samples are often off-white. It is also a rodenticide. This compound became infamous as POPs. Like related organochlorine pesticides, it is lipophilic. Thus, it tends to accumulate in fatty tissues of organisms living in water. Some estimates indicate its half-life in soil is over 10 years. In comparison with dieldrin, endrin is less persistent in the environment.
- **Heptachlor** is an organochlorine compound that was used as an insecticide. Usually sold as a white or tan powder, heptachlor is one of the cyclodiene insecticides. In 1962, Rachel Carson's *Silent Spring* questioned the safety of heptachlor and other chlorinated insecticides. Due to its highly stable structure, heptachlor can persist in the environment for decades. One study described its half life to be 2 years and claimed that its residues could be found in soil 14 years after its initial application. Like other POPs, heptachlor is lipophilic and poorly soluble in water; thus, it tends to accumulate in the body fat of humans and animals. Heptachlor epoxide is more likely to be found in the environment than its parent compound. The epoxide also dissolves more easily in water than its parent compound and is more persistent. Heptachlor and its epoxide absorb soil particles and evaporate.
- **Hexachlorobenzene (HCB),** is a chlorocarbon. It is a fungicide formerly used as a seed treatment, especially on wheat to control the fungal disease bunt. HCB is an animal carcinogen and is considered to be a probable human carcinogen. After its introduction as a fungicide in 1945, for crop seeds, this toxic chemical was found in all food types. Chronic oral exposure in humans has been shown to give rise to a liver disease, skin lesions with discoloration, ulceration, photosensitivity,

thyroid defects, bone defects and loss of hair. Neurological changes have been reported in rodents exposed to HCB. HCB may cause embryolethality and teratogenic effects. Human and animal studies have demonstrated that HCB crosses the placenta to accumulate in foetal tissues, and it is transferred in breast milk. HCB is very toxic to aquatic organisms. It may cause long-term adverse effects in the aquatic environment. Therefore, release into waterways should be avoided. It is persistent in the environment. Ecological investigations have found that biomagnification up the food chain does occur. HCB has a half life in the soil of between 3 and 6 years. Risk of bioaccumulation in an aquatic species is high.

- **Mirex** is a chlorinated hydrocarbon that was commercialized as an insecticide. This white crystalline odorless solid is a derivative of cyclopentadiene. It was popularized to control fire ants, but by virtue of its chemical robustness and lipophilicity, it was recognized as a bioaccumulative pollutant. Mirex is only moderately toxic in single-dose animal studies. It can enter the body via inhalation, ingestion, and via the skin. The most sensitive effects of repeated exposure in animals are principally associated with the liver, and these effects have been observed with low doses. At higher dose levels, it is fetotoxic and teratogenic. Mirex was not generally active in short-term tests for genetic activity. There is sufficient evidence of its carcinogenicity in mice and rats. Delayed onset of toxic effects and mortality is typical of mirex poisoning. Mirex is toxic for a range of aquatic organisms, with crustacea being particularly sensitive. Mirex induces pervasive chronic physiological and biochemical disorders in various vertebrates. It can be said that it has carcinogenic risk to humans. Data on human health effects do not exist.
- **Toxaphene** is a mixture of approximately 200 organic compounds. Toxaphene is usually seen as a yellow to amber waxy solid. It is volatile enough to be transported for long distances through the atmosphere. When inhaled or ingested, sufficient quantities of toxaphene can damage the lungs, nervous system, and kidneys, and may cause death. It is classified as carcinogen.

2.3.1.2 Import

Suriname mainly imports pesticides for controlling pest and diseases in the agricultural industry. These pesticides are imported by private companies that are specifically focused on the agricultural sector. Household insecticides are also imported — although to a smaller extend than the agricultural pesticides. The official import data is maintained by the Ministry of HI as the main entry point of pesticides. Also, the Ministry of LVV maintains a detailed record on types and quantities of pesticides imported (Table 2.6). However, there are discrepancies between the data of these two ministries because importers, amongst others, codify pesticides in the wrong category when obtaining their license from the Ministry of HI.
The Ministry of LVV grants permits for the import of pesticides and the Ministry of HI executes the physical aspects of import. Pesticides enter the country through three major port sites in the country: the harbour in Paramaribo, the harbour in Nickerie (approximately 250 km from the capital city of Paramaribo), and the international Johan Adolf Pengel airport, approximately 40 km from Paramaribo. When pesticides enter via the harbours they are subjected to custom control. Both harbours have a permanent office of Customs that practice a well-established procedure where importers need to have a license before physically moving goods from the boat into the country. However, importers are often not following the procedures because they request permits when pesticides have already arrived at the harbour. Although pesticides should not be transported by air, customs at the airport do random surveillance by picking out travellers and checking their luggage. This results in limited control on the import of pesticides.

Prior to 1990, all types of pesticides were allowed to be imported based on permission needed by the Minister of LVV. However, material such as DDT and endrin were not approved for import. After 1990, the government has made a serious effort to ban pesticides which were identified as dangerous for humans

and the environment. As such, in 1999, the import of chemicals banned under the Rotterdam Convention, including aldrin, chlordane, DDT, dieldrin, mirex, toxaphene, heptachlor, hexachlorobenzene, and PCB, were prohibited, representing nine pesticides out of the twelve POPs listed under the SC. In 2005, the government prohibited the import of the Ozone Depleting Substance (ODS) and methyl bromide by adding this to the negative list of goods which require license and/or special treatment. Since 2006, the Ministry of LVV has prohibited further import of dimethoate, endosulfan, methamidiphos, and endrin -- allowing the use of existing stocks in the country. These pesticides are currently being proposed for lawful banning.

2.3.1.3 Production

Suriname does not have facilities to produce pesticides. Unofficially, the Ministry of LVV is aware that several companies are blending chemicals; however these are not the companies that import pesticides.

Table 2.6 Import of pesticides in Suriname from 2005-2009 [33]

Type of chemical	2005	2006	2007	2008	2009
Industrial insecticides	**(l/kg)**				
	186,000	200,000	140,000	140,000	250,000
Household insecticides	**(pieces)**				
Mat	220,000	401,000	250,000	256,000	270,000
Coil	11,500,000	9,000,000	8,100,000	na	8,200,000
Chalk	12,400,000	10,000,000	26,000,000	na	16,000,000
Various remaining	8,400	3,000	23,000.00	21,000,000	36,000
Type of chemical	**2005**	**2006**	**2007**	**2008**	**2009**
Rodenticides	**(l/kg)**				
	13,000	7,100.00	265,000	12,000	16,000
Fungicides	**(l/kg)**				
	36,000	122,000	105,000	95,000	338,000
Herbicides	**(l/kg)**				
	530,000	430,000	513,000	655,000	730,000
Molluscides	**(l/kg)**				
	30,000	25,500	30,020.00	25,000	24,000
Surfactants	**(l/kg)**				
	627.00	304.00	3,100	3,000	27,000

Source: Ministry of LVV

33 All figures are rounded up

Table 2.7 Pesticides that are prohibited in Suriname since 1999

2,4,5-Tricholorphenoxyacetic acid (herbicide)	Mirex (insecticide)	Aldrin (insecticide)	Thiram (at or above 15 %), (fungicide)
Carbofuran (insecticide)[34] (at or above 10 %)	Monocrotophos (insecticide)	Dieldrin (insecticide)	Fluoroacetamide (rodenticide)
Captafol (fungicide)	Pentachlorophenol (herbicide, insecticide, fungicide, algaecide)	Dinoseb (Binapacryl), Dinoseb salts	Hexachlorocyclohexane (HCH) (Insecticide)
Chlordimeform (acaricide)	Toxaphene (insecticide)	DNOC and its salts including Binapacryl (acaricide, herbicides, insecticide, fungicide)	Heptachlor (insecticide)
Chlorobenzilate (acaracide)	**Methamidophos (insecticide)**	Ethylene dibromide (EDB) (soil fumigant)	Hexachlorobenzene (fungicide)
Chlordane (insecticide)	Methyl-parathion (insecticide)		Lindane (insecticide, lice)
DDT (insecticide)	Parathion (insecticide, acaricide)	Dustable powder formulations of Benomyl (at or above 7%) (fungicide)	Phosphamidon (insecticide)
Dimethioate (insecticide)	Ethylene dichloride (EDC) (solvent)	Endosulfate (insecticide and acaracide)	Ethylene oxide (disinfectant)
Mercury compounds	Trybutyltin compounds[35]		

Source: Ministry of HI and LVV

2.3.1.4 Export

The Ministry of HI grants permits for the export of pesticides. Suriname exports pesticides according to the data of the Customs Department of the Ministry of FIN. The export amounts are given in Table 2.8. However, the data is insufficient to give a specification based on type of pesticide.
Although Suriname is not a producer of pesticides, almost 10 % of the imported pesticides are exported.

Table 2.8 Export and Import of Pesticides in Suriname Between the Years 2005-2009 [36]

Pesticides	2005	2006	2007	2008	2009
Export amount	**(kg)** 116,000	111,000	180,000	203,000	150,000
Import amount	**(kg)** 1,800,000	1,900,00	2,000,000	42,000,000[37]	3,900,000

Source: NPS 2011; Ministry of LVV and Customs Department

34 The pesticides in bold text are in the process of being legally banned, and are currently halted for import. (Source: Ministry of HI and LVV)
35 Trybutyltin compounds are used in industrial paint for painting for example ships. An assessment needs to be done in order to know if companies are aware that it is prohibited to import trybutyltin compounds.
36 All figures are rounded up
37 Considering the numbers of the pesticides import over the year 2008, it is presumed that a human error in recording the import number took place.

2.3.1.5 Registration

When a license for import has been granted by the Ministry of LVV, pesticides are required to be registered with the Ministry of HI upon entry into the country. The registration system is based on the Caribbean Community (CARICOM) External Tariffs list. The Custom Department registration system categorizes trade of goods and does not specify the type of pesticides and its future use. Distributors and sellers are not obliged to register buyers or what quantity of pesticides are sold.

2.3.1.6 Release

After the import has officially been completed, pesticides can only be released with a label in the national language of Dutch clearly stating the trade name, active substance, type of pesticide, toxicity, hazardous symbol, and instructions for use and disposal. The Ministry of LVV is working with the Ministry of HI to collaboratively monitor importers to place a label on the pesticide container as required by law. Release from the point of entry may include special instructions for transportation. In the case of chemicals, including pesticides that need special care and handling, the Ministry of HI also requests assistance from NIMOS, as this institution has developed guidelines for the storage of chemicals.

2.3.1.7 Use

Since 2005, the use of pesticides has almost doubled. However, there are not enough systems in place to sufficiently guide the safe use. In general, there is insufficient dissemination of risk-related information to transportation companies, salespersons, and users. Also, suppliers and users are not familiar with the procedures of risk management. The mixing of pesticides is generally practiced without knowing the specific risks and impacts to human health.
However, since the 1990s, there has been a trend towards using environmentally-safer pesticides. Nevertheless, the costs for farmers are relatively high.
Pesticides are predominantly used in the large-scale rice and banana cultivation in the districts of Saramacca and Nickerie, and the smaller-scale vegetables and fruit production operations in the districts of Saramacca, Wanica, and Commewijne. There is inadequate data collection or enforcement on the life cycle and residual effects of pesticides. The 2005 Pesticide Act provides a framework for safe handling and use of pesticides. However, the support to implement the act is dependent on government infrastructure which is insufficient. Therefore, the focus of the Ministry of LVV is on raising awareness at the farmer's level. Research about risks associated with the use of pesticides and the dissemination of research-results to the suppliers and users are limited. The same holds true for the information on the testing of new pesticides before use.

A program on Integrated Pest Management (IPM), implemented by the Caribbean Institute and financed by the GEF-SGP and the ALCOA foundation, has been initiated by the Ministry of LVV. This Project "Promotion of Organic Agriculture: the Answer to Land Degradation and POPS for the Farmers in the District of Saramacca", introduces organic cultivation and biological pest-control so that fertilizers and synthetic pesticides are no longer used.
Farmers have been trained over the past four (4) years to make a shift to organic farming. Since January 2010, vegetables are being supplied to a select group of customers. In addition, the Caribbean Institute, in collaboration with the "Agriculture Cooperation Safe Food," publishes an Agriculture paper called "Wroko Nanga Koni" which means "Work Smart". The Ministry of LVV is involved in the implementation of the project. It is recommended that for the implementation of the NIP the NGO community will be targeted

in order to increase the awareness of POPs chemicals; no doubt lessons can be learned from the project being executed by organisations such as the Caribbean Institute.
Since 2006, an integrated approach of crop management has been introduced to farmers in order to use alternatives for pesticides and fertilizers like crop rotation, pest control with biological means and organic farming in district Saramacca. The IPM program focuses on prevention, observation, and intervention. It is an ecological approach with its main goal of significantly reducing or eliminating the use of pesticides while at the same time managing pest populations at an acceptable level. As a result of this Ministry of LVV initiative, a number of farmers are implementing it on different levels.

2.3.1.8 Future use of pesticides

The IPM program and other plans of the Ministry of LVV with regards to pesticides, have as their main goal reducing dependence on pesticides and artificial fertilizers in the production of agricultural products. If alternatives are cheaper and environmentally friendly, the use of pesticides will decrease.
Staatsolie Company (State Oil Company) is planning to convert circa 12.000 ha of a former agricultural cultivation area of Wageningen into a sugarcane-based bio fuel operation. A soil, sediment and groundwater survey is currently being carried out in the scope of the environmental baseline site assessment. To a certain extent, large-scale agricultural production needs pesticides and fertilizers. It is a challenge for the producers and competent authorities to work together in minimizing the use of pesticides and fertilizers in this future large scale sugar cane production.
Also other multinational companies show interest in the production of bio-fuels. This leads to the increasing interest in importing pesticides to supply this potentially new demand.

2.3.1.9 Storage

Pesticides are stored by the wholesalers and users. The majority of the identified obsolete pesticides and POPs pesticides are stored inadequate. The Pesticide Act of 2005 outlines the requirements for storage, with specific focus on the labelling and handling of containers and specifications for the storage area. The wholesaler and user are responsible for ensuring safe storage with no potential harm to human health and the environment.

2.3.1.10 Management

The Ministry of ATM initiated the participation of Suriname n the Pesticide Stock Management System (PSMS) of the Food and Agricultural Organization (FAO). In collaboration with the Ministry of LVV, information about the obsolete stocks and POPs pesticides, import, export and use of pesticides, are integrated into an international FAO database, PSMS.

A monitoring system for residue measurement in plants and animals is currently being established within the Ministry of LVV. Laboratory personnel are trained while the laboratory facilities for residue measurement need rehabilitation. The Ministry of VG analyzes residues in products that can be dangerous to consumer health through its central laboratory.

2.3.1.11 Disposal

There is uncontrolled release and disposal (including sediment run-off) of different types of pesticides by formal and informal enterprises. The Ministry of LVV made an inventory of all known obsolete pesticides and POPs (see Table 2.9 for the number of stores where obsolete pesticides are found). After the

initiation of the NCC's pesticides team in 2009, some additional sites were found. An overview of the inventory is provided in Appendix 3.

Table 2.9 Inventory Country Data of Total POPs Pesticides

		Pesticides (kg)			Vet. prod. (kg)			Contaminated (kg)				
District	Number of stores	Usable	Obsolete	Requires Testing	Usable	Obsolete	Requires Testing	Material (kg)	Building	Equipment	Empty containers	Soil
Coronie	1	0	0	38	0	0	0	0	0	0	0	0
Wanica	1	0	2.500	0	0	0	0	0	0	0	0	0
Saramacca	3	3.800	6.402	151	0	0	0	800	0	0	0	0
Paramaribo	3	0	632	0	0	0	0	0	0	0	0	0
Nickerie	3	0	20.161	4	0	0	0	0	0	0	0	0
Commewijne	1	0	10	0	0	0	0	0	0	0	0	0
Total	**12**	**3.800**	**29.704**	**193**	**0**	**0**	**0**	**800**	**0**	**0**	**0**	**0**

The inventory data were filled in on field forms of the FAO Pesticide Stock Management System (PSMS) and later uploaded on the FAO PSMS website. In total 22 sites were assessed. From the 22 identified sites, the highest amount of POPs pesticides was found at Mariënburg. At 10 sites, no obsolete pesticides were found. With the PSMS, a risk assessment for these sites with pesticides was made. The 22 sites can be categorized in the following 4 categories:

1. No critical sites;
2. One site problematic for the environment;
3. One site problematic for the quantity of pesticides;
4. The remaining sites are non-priority sites.

Based on the information an additional preliminary assessment was made. These results are presented in Appendix 3. The results differ from the FAO risk assessment because of the condition of the contaminated soil that has been taken into consideration.

For the majority of the storage sites (with and without pesticides), unacceptable risks cannot be excluded in case of residential use in the immediate surroundings. At storage sites with topsoil contaminated by pesticides (hotspots), unacceptable environmental risks are present. These risks are related mainly to the land use in the immediate surroundings of these storage sites. Risks for direct contact with contaminated topsoil cannot be excluded.

The intention was to use a former experimental station in the district of Saramacca as a temporarily storage facility. However, this is on hold, awaiting the results of an environmental site assessment. Based on a preliminary environmental risk assessment, it was advised that the location was not suitable for storage due to the fact that the storage facility will be located near a residential living community. If a storage site is selected and assessed, the storage facility will be upgraded to an Intermediate Collection Centre (ICC) built to international standards for the repacked pesticides waiting exportation to a destruction facility outside the country.

The Pesticide Act specifies that disposal may not harm the environment and that specific regulations may be given for disposal. However, there is a challenge in collaboration between relevant Ministries (LVV, HI, and ATM) and governmental institutions for the temporary storage, awaiting destruction of waste pesticides abroad. The Ministry of LVV started with desk and field studies on the disposal of pesticides

containers. The results of the inventory showed high direct risks to the environment and human health; this caused the Ministry of LVV and NCCR to repack around 1,600 – 1,800 litres of obsolete pesticide in 9 polyethylene barrels at the Tijgerkreek site in district Saramacca. This site is located in the district of Saramacca and it is owned by the government. The Ministry of LVV started desk research and field studies on the disposal of pesticides containers. The focus is on 'Triple Rinse' where pesticides containers are rinsed three times before returning them to the empty container collection centers which are currently being established in the various districts.

2.3.1.12 Potential Impacts

There is limited information about the potential impacts on the environment, and safety and health risks. Also the impacts involved with import, storage, transport, distribution, use, handling and disposal of chemicals at different levels within the society is limited. For over 10 years, the Ministry of LVV has executed awareness programs for farmers regarding the correct use of pesticides.
The fact that in the agro-districts of Nickerie and Saramacca pesticides are easy to access and the impact of specific circumstances such as social-economic conditions in the local communities have led to the highest suicide rate with pesticides in the country in the past period. An epidemiological study in District Nickerie catchment area revealed high rates of suicide (48 per 100,000) and attempted suicide (207 per 100,000) on average in the years 2000–2004. Particularly remarkable is the high number of attempted suicides among males (49%), and the use of pesticides in both fatal (55%) and nonfatal suicidal behavior (44%).The most urgent measure that was identified was to stow away pesticides in locked cabinets with the key held by the proprietor[38.] The Ministry of LVV started an awareness project with NGOs and relevant institutions such as the Anne van Dijk Rijst Onderzoekscentrum Nickerie (Anne van Dijk Research Centre Nickerie (ADRON)). A helpline has been set up where counseling takes place for people who need help in collaboration with the Foundation 'Welzijns Instituut Nickerie'. The focus is on introducing the 'storage' project where pesticides are put into locked storage compartments.

2.3.2 **DDT**

2.3.2.1 General

Dichloro**d**iphenyl**t**richloroethane (DDT) is one of the well-known synthetic pesticides and was first time synthesized in 1874. The chemical structure of DDT is $(ClC_6H_4)_2CH(CCl_3)$. DDT readily binds with fatty tissue in any living organism, and due to its stability, bio-concentrates and bio-magnifies with increasing trophic level in food chains. The half-life of DDT in humans is more than 4 years; the half-life for DDE is probably longer. DDT is highly toxic to insects, shrimps and fish, and adversely affects the reproduction of wild birds through thinning of egg shells. The global production of DDT for vector control is estimated at 4550 tonnes in 2003 and 4740 tonnes in 2005. In 2007, production increased, with 6300 tonnes produced in India alone. Data on DDT-use from several countries are not available or need verification. With the possible exception of the Dominican Republic, there is no reported use of DDT for disease vector control from the Americas. Use in Ecuador, Mexico, and Venezuela was phased out in the year 2000.
Over the years, WHO reports have stated that DDT is the most cost effective and time-tested tool for preventing transmission of human malaria.

38 T. Graafsma, e.a. Research Trends, High rates of suicides and attempted suicide using pesticides in Nickerie, Suriname, South America, 2006.

2.3.2.2 Import

The government has made a serious effort to ban pesticides which were identified as dangerous for humans and the environment. DDT has not been imported since the beginning of the 80s, and therefore the government decided in 1981, to bury the then-existing stock. As such, in 1999, the import of DDT chemicals was prohibited under the Rotterdam Convention. DDT is prohibited based on the 1999 regulation of the Ministry of HI, and the 2005 ban on pesticides by the Ministry of LVV.

2.3.2.3 Export

Since the use was prohibited, no export, registration, and control of DDT has been recorded.

2.3.2.4 Use

Between 1958 and 1982, Suriname intensely used DDT for malaria control in the Interior of the country. In the second part of the 1980s and early 1990s the use of synthetic pyrethroids was gradually introduced, and by the end of the 90s, these insecticides were the only ones imported and used in the malaria vector-control strategies. The main insecticides used were deltamethrin, permethrin, and Lambda cyhalothrin.

Suriname reported no spraying has been done — although it was one of the most highly malaria-ridden countries of the Americas (PAHO 1994). In order to control malaria, the Ministry of VG implemented the WHO Global Malaria Programme which resulted in reducing the number of reported malaria deaths that fell from 24 in 2000, to one death in 2009; this can be seen as great success. These achievements are strongly associated with the scaling-up of anti-malaria interventions. The programme has delivered a total of 22,490 long-lasting insecticide-treated mosquito nets (LLINs) during 2007–2009, enough to protect 79% of the population at high risk. No data were reported on the indoor residual-spraying implementation in recent years. Although the programme did not report delivery of Artemisinin-based Combination Therapy (ACT) in 2009, supply has probably been adequate to treat all *P. falciparum* cases. [39]

However, because of the high costs of the pyretroids alternatives, these can only become available through donor projects, which provide funds to purchase these alternatives. It is noteworthy to mention that these alternatives need more frequent spraying, as they are less persistent than DDT. Resistance among mosquitoes against DDT was found.

In February 2011, the Government signed a bilateral agreement with French Guiana to fight against the dengue mosquito, an insect well-known in tropical and sub-tropical climates worldwide. The dengue mosquito carries the virus that causes the much feared dengue fever in humans. This dengue project is supported by the Agence Française de Développement with the help of the Conseil Général of French-Guiana, together with Surinamese counterparts, namely the Ministry of VG. *Bacillus thuringiensis israelensis* (BTI) will be used for the destruction of the mosquito larvicide. BTI is a proven, environmentally-safe mosquito larvicide that is non-toxic for people. The product destroys the insect in its larval state, and is of course also effective against adult insects. The objective of this project is to improve health and education services, and infrastructure for the populations of the Marowini River.

39 World Malaria Report; WHO Global Malaria Programme 2010

'Kwasibita' (*Quassia amara L.*) is a bitter wood which has been used for decades by the local communities for the prevention and treatment of malaria and fevers. The plant grows in low-lying areas and contains many of the same antimalarial phytochemicals contained in quinine. By boiling pieces of Quassia wood in water, one obtains a spray effective against many insects. Such popular remedies are used not only in Suriname and Guyana, but also, in Brazil. It is also used as a repellent against mosquitoes.[40]

2.3.2.5 Release, contaminated sites and storage

According to the information from the Pesticides Department of the Ministry of LVV, a quantity of DDT and dibrom has been buried in the last quarter of 1981 on a location at the site of the central laboratory of the Ministry of VG. It was buried together with some old air conditioners at a 2.5 m depth in an area where the groundwater level is circa 2 meters. Circa 550 kg DDT (75 % active substance) and an unknown quantity of dibrom that was stored in leaking drums was buried. It is recommended as part of the NIP that the abovementioned buried DDT and accompanying goods should be recovered, the area cleaned up, as well as the DDT destroyed.

2.3.2.6 Potential impacts

Some studies on the impacts from the use of DDT on malaria was done in the 80s[41]. There is no information on research that has been done on the environmental and health impact of DDT in Suriname. To date, no environmental and biological samples of DDT were determined. Therefore, impact studies in vulnerable areas with the presence of DDT are needed. Areas of studies are the food chain, impacts on human health and (ground) water resources. In relation to the abovementioned buried pesticides it is important to realize that the groundwater is used by the milk company located nearby. It is known that the water quality is monitored on a regular basis; however it is not known whether pesticides-related parameters are being analyzed.

2.3.3 Polychlorinated Biphenyls (PCB)

2.3.3.1 General

Poly**c**hlorinated **B**iphenyls (PCBs) are a class of chlorinated aromatic compounds with 1 to 10 chlorine atoms substituted to biphenyl (a molecule composed of two benzene rings). The chemical formula for PCB is C12H10-xClx. PCB's are man-made chemicals; they are not flammable, have high electrical resistance, and possess good insulating properties.

PCBs were widely used for many applications, especially as dielectric fluids—in transformers, capacitors, and coolants—but also in open applications like sealants, paints, plastic additives, or non carbon copy paper. Concerns about the toxicity of PCBs are largely based on the dioxin-like activity of some PCB congeners. However, toxic effects such as endocrine disruption and neurotoxicity are also associated with other PCB congeners. Approximately 1.3 to 2 million tonnes of PCBs were manufactured over the period from 1930 to 1993, half of which were produced by Monsanto in the US. In preparation for the fourth Meeting of the Conference of the Parties, the Stockholm Convention Secretariat reviewed the PCB data in the National Implementation Plans from the 88 Parties who had submitted them by December

40 http://www.quasix.eu/pdf/4-2/Data_Quassia_1.pdf
41 For examples: reserach studies of J.E. Hudson; Ministry of VG.

2008. The inventories of these 88 Parties indicated more than 6,431,886 tonnes of PCB-contaminated oil together with 472,853 tonnes of contaminated equipment. Another analysis by the Stockholm Convention Secretariat indicated that about 3 million tonnes of PCBs and contaminated equipment still exist globally[42].With current total treatment costs of USD 5,000 per tonne (including packing, transport, and destruction), this would amount to an estimated USD 15 billion to manage the stored transformer, capacitor and contaminated oil associated with PCBs. Comparison with the USD 550 million allocated GEF funding for the SC from 2003 to 2010 demonstrates the magnitude of the financial challenge to implement the PCB obligations of the Stockholm Convention by the target date of 2028. The original PCB producers are currently not stakeholders in the financing of PCB waste management.

2.3.3.2 Import

PCB-containing materials, such as insulating oils for electrical devices, hydraulic oils, paints, etc., have always been imported into Suriname. Most PCB containing or contaminated equipment can be found in the electricity generation sector, which is possessed by both public and private companies. Transformers currently being used do not contain PCB, and their maintenance is done using PCB-free equipment. . The cut-off year for importation of PCB- free equipment of N.V.EBS is suspected to be around the late 80s and the beginning of the 90s. Currently, the import of PCB-containing materials is not forbidden.
The Ministry of HI issues all permits for imported/exported goods, but it is the Custom Department that registers the actual imports/exports by making use of the Harmonized System (HS) Codes. The use of these HS Codes was introduced in 1999 after the approval of the *Law for Import Tariffs 1996*, also known as the 'Customs Law'. Nevertheless, the import of mixtures and preparations containing PCBs is facilitated by the HS Codes under 3824.82.00, as specified in the CARICOM External Tariffs 2007.

2.3.3.3 Export

Regarding PCB destruction, the Government signed in 2005 a bilateral agreement for a period of two years with the Ministry of Environment from the Netherlands to facilitate shipments of PCB-waste to the Netherlands. The waste was collected from the Suriname Aluminium Company (Suralco), a subsidiary bauxite mining company from ALCOA, and, a small part, from the BHP Billiton. The total PCB waste and scrap PCB transformers exported, amounted to 1 – 20 feet and 8- 40 feet containers, respectively.

2.3.3.4 Use

Due to the economic development over the last 15 years in Suriname, for example, the introduction of mobile telephone systems by three companies/providers, as well as the gold mining companies, it is believed that many transformers are new and free of PCBs. As mentioned above, PCB containing equipment is mostly used for electricity generation and can be found in electrical devices such as transformers and capacitors. According to a list provided by the company, the public-owned electricity generation company, N.V.EBS, alone has 10,784 registered transformers, nation-wide. There are also private companies that possess transformers and capacitors. Some of these companies have the capacity to identify and handle PCB-containing or contaminated equipment. The use of 'pure' PCB transformers and capacitors has not been found until present. Although data has not been presented, it is

42 Stockholm Convention (2010) PCB Elimination Network Magazine, Issue 1, pp. 12 (12/2010).

assumed that PCBs in 'open applications', such as paints, caulking, hydraulic systems, have been used in the past.

2.3.3.5 Registration and Control

A permit of the Ministry of HI is required for the import of PCB-containing equipment. However, there is no legal instrument that requires mandatory registration and control of PCB-containing materials/equipment that are already in the country. Nevertheless, registration of transformers and capacitors is taking place based on the policies of a few companies. For example N.V.EBS has a data base of all their transformers, and the company also established that untested transformers will not leave N.V.EBS premises; the EHS policy of SURALCO governs proper management of PCBs (PCB concentration above 50 ppm need to be reduced below that level). SURALCO's PCB-contaminated transformers are all below 50 ppm; and the gold mining company IAMGOLD has labelled their equipment PCB-free and they want to keep the company that way.

2.3.3.6 Release, Contaminated Sites and Storage

Suriname is not a producer of PCB or PCB-containing equipment. There are neither obsolete stocks nor reserves. Nevertheless as previously mentioned, transformers and capacitors are the major source of PCB in Suriname. The majority of the transformers and capacitors has still not sampled and tested. Because a comprehensive inventory has not been completed yet, it is expected that PCB contaminated materials as well as contaminated soil or other material with PCB still exist.
An area that needs consideration for release of PCB in the environment is the newly-established recycling industry in Suriname, where scrap metal dealers have the possibility to sell, among others, PCB-contaminated oil transformers.
Although SURALCO has disposed all PCB-contaminated waste and scrap-equipment, there still may be very few tiny ballast capacitors that contain PCB. There are also transformers in service with PCB-contaminated oil between 2 and 50 ppm. Additionally, there still exists potential contaminated soil that was underneath the former PCB-containing or contaminated transformers.

Currently, there is no interim storage for any PCB-containing equipment in Suriname that meets international standards. As such, interim storage will be required, since it is expected that PCB-contaminated equipment will be exported to licensed facilities abroad. This will be necessary, because it is expected that the volume of PCB-contaminated equipment or materials is low, and therefore a national disposal facility for PCB is not necessary.
The N.V.EBS has a transformer storage facility at their Livorno establishment, where all phased-out transformers from the N.V.EBS premises are gathered. The old transformers used by N.V.EBS in the past may contain PCB.

Another issue that requires much attention is cross-contamination with PCB during maintenance-activities of transformers. With many of the transformers believed to be new, it is therefore important that those who own or perform maintenance activities be made aware of this potential problem. In this context, it should be mentioned that for example the N.V. EBS has developed an internal program that informs and raises awareness of its personnel. The aim of the program is to provide information on how to protect the environment and humans while carrying out relevant duties, as well as how to manage transformers, especially those manufactured and installed between 1960 and 1985. The program details information on what PCBs are and their effects on the environment, visual inspection according to a checklist, labelling of transformers with yellow (PCB-containing) stickers and blue (PCB-Free) stickers. See Figure 2 for an example of the stickers. For the management of transformers, the N.V. EBS has created areas for

transformers that are out-of-order or broke down: still can be operated or in operation; and those which require repairs; plus an area for PCB-waste.

Figure 2 Stickers Used for PCB-Containing Equipment

Source: N.V.EBS

2.3.3.7 Potential Impacts

Since a comprehensive survey in particular of PCB-contaminated sites has not been conducted yet, the impacts that can occur nationally cannot be determined at this moment. Nevertheless, PCBs when exposed in the environment can pose a serious threat to human health. The analysis of a limited amount of oil-samples from transformers of both N.V.EBS and SURALCO indicates that both companies have to take precautionary measures to ensure that impacts on both humans and the environment are preferably eliminated. In this regard, assistance will be required from government agencies such as the Ministry of ATM.

2.3.4 POPs Recently Listed in the Stockholm Convention ("new POPs")[43]

In 2009, the SC COP, by decisions SC-4/10 to SC-4/18, adopted amendments to Annexes A (elimination), B (restriction), and C (unintentional production) of the SC to list nine additional chemicals as persistent organic pollutants. These are the following pesticides: chlordecone, alpha hexachlorocyclohexane, beta hexachlorocyclohexane, lindane, pentachlorobenzene; industrial chemicals: hexabromobiphenyl, hexabromodiphenyl ether and heptabromodiphenyl ether, pentachlorobenzene, perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride, tetrabromodiphenyl ether and pentabromodiphenyl ether; and byproducts: alpha hexachlorocyclohexane, beta hexachlorocyclohexane, and pentachlorobenzene.

In compliance with the Convention, Parties who have ratified the new POPs must therefore implement measures to reduce or eliminate production, uses, and releases of the new POPs according to the Convention requirements (Articles 3, 5, 6), and report these efforts to the Secretariat.

In Suriname, no inventory activities with respect to the nine new POPs have been performed as yet. Of the nine new POPs, only some information is available on lindane. Lindane has been used in Suriname in agriculture and in wood treatment. It has been listed by the Ministry of LVV as a pesticide that is prohibited in Suriname. However, lindane is still used in the medical sector against hair- and grass lice. An assessment needs to be done in order to understand the handling of lindane in the medical sector.

43 The newly listed POPs contain POPs listed in Annex A, Annex B and Annex C. They are, however, dealt with in dedicated chapters since no inventory has been established yet for this POPs-group and specific consideratons are needed to address the different compound groups in this NIP.

A lindane stockpile has been discovered in pesticide storage in Mariënburg (see documentation Figure 4)
New POPs which can be assumed to be present in Suriname are:

- PBDEs (c-PentaBDE and c-OctaBDE) and HBB can be present in used electronics, electronic wastes, cars, car shredder wastes, treated furniture (polyurethane foam), treated textiles, and other flame retarded materials. Furthermore, over the last 30 years such PBDE containing wastes have been deposited and can be considered as the largest PBDE stock present in the country.
- Perfluorooctane sulfonic acid (PFOS) and related compounds can be present in Aqueous Film Forming Foams (AFFF) for fire extinguishing, specific surface treated materials (synthetic carpets, paper, textiles, furniture), hydraulic oils in air planes, and in industrial processes (e.g. certain oil production operation, chromium plating*)
- Polyethylbenzene (PeBz) are emitted as unintentionally and are addressed by the established PCDD/PCDF inventory (see below). Specific PeCB sources, like chlorinated solvent-use or application of specific pesticides (e.g. pentachloronitrobenzene and related formation during degradation), need further assessment in the inventory process of new POPs.
- Chlordecone might formally have been used (in particular on banana plantation). Since global production was stopped in 1991, only possible stocks might be present, but have not been discovered in the list of stored pesticides.
- Lindane (Gamma-HCH), alpha-HCH and beta-HCH have been discovered during the first POPs inventory process as stocks in Mariënburg (see Figure 4) and needs further assessment and management.

GEF has allocated specific funds for Parties to the Convention to establish inventories for the newly listed POPs. Inventories and reporting, in respect to new POPs, should be done by August 2012.

2.3.5 PCDD/PCDF and Unintentional Production POPs (UPOPs)

2.3.5.1 General

Polychlorinated dibenz*o*-*p*-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs), together with polychlorinated biphenyls (PCBs), hexachlorobenzene (HCB), and pentachlorobenzene (PeCB), are listed in Annex C of the SC as unintentionally-produced POPs (UPOPs) often also called “by-products”. PCBs, HCB and PeCB have also been industrially-produced and used in several applications. PCDDs/PCDFs were not produced commercially,[44,] and they have no known use.
PCDDs/PCDFs and the other UPOP formation and/or releases arise mainly from four types of sources. Three releases are process-related:

- Chemical production processes – for example, the production of chlorine, chlorinated phenols and other chlorinated aromatic compounds; the production of chlorinated solvents and the oxychlorination of mixed feeds to make certain chlorinated solvents; the use of chlorine in industrial process like the production of magnesium or titanium oxide using elemental chlorine, pulp, and paper using elemental chlorine for chemical bleaching;
- Thermal and combustion processes: destruction of POPs and other organochlorine containing waste, general incineration of wastes, the thermal processing of metals—in particular metal production from metal scraps;

44 With the exception of analytical standards.

- Biogenic processes or photolytic processes, which can form PCDD/PCDF from precursors mostly of anthropogenic origin such as pentachlorophenol and other chlorinated phenols. Also the degradation of certain organochlorines can form unintentionally-produced POPs; e.g., pentachloronitrobenzene (Quintozene) partly degrades to UPOPs PeCB and is considered one of the largest sources of PeCB.[45]

Meanwhile, the fourth, and probably by far the largest source, is related to historic formation and releases of PCDD/PCDF and other UPOPs[46]:

- Reservoir sources, such as historic landfills and dumps of PCDD/PCDF and other UPOPs-containing wastes, stem largely from chlorine and organochlorine production. Historic inventories reveal that they have exceeded by far the documented releases from contemporary sources (Figure 2)[47]. This can, for example, be illustrated by the historic PCDD/PCDF inventory compiled for Japan[48] and a historic PCDD/PCDF inventory of dioxin from wood-treatment in Sweden. PCDD/PCDF contamination from pesticide-use between 1950 and 1998 in Japan alone has been estimated at 460 kg TEQ (see Figure 2). Wood treatment for Sweden resulted in historical releases of between 205 and 250 kg TEQ[49] By comparison, contemporary releases of PCDD/Fs from a total of 55 countries - combined from where inventories existed - have been estimated at approximately 20 kg TEQ/year[50]. Similarly, this estimated contemporary inventories-releases can be compared to other historic PCDD/PCDF releases, such as the release of 378 kg TEQ from a single factory producing hexachlorocyclohexane (HCH) and 2,4,5-Trichlorophenoxyacetic acid (2,4,5-T) in Hamburg or the estimated dioxin release of more than 366 kg TEQ from spraying of defoliants in the Vietnam War[51].
- Also, in respect to HCB and PeCB inventories, the contaminated-sites, stockpiles, and wastes exceed current releases by orders of magnitudes. HCB/PECB wastes are deposited in the order of 10,000 tonnes at single factories producing chlorinated solvents (tetrachloroethene, trichloroethene, tetrachloromethane, EDC etc.)[50,52]
- In addition to deposits and contaminated-materials, also soils and sediments - which have accumulated PCDDs/PCDFs and other UPOPs over the last 100 years of releases from chlorine and organochlorine production and application of organochlorines containing UPOPs (or industrial produces HCB, PeCB or PCB) - are secondary sources of these. In the countries where PCDD/PCDF monitoring (human milk or food survey) has been performed for two or three decades, a significant decline of PCDD/PCDF levels have been observed which can be explained mainly by the cessation of production of certain chlorinated organics like Pentachlorophenol (PCP), 2,4,5-T and PCB, the improvement and control of PCDD/PCDF in pesticide and biocide products (see Figure 2). Another minor reduction came from BAT/BEP measures in, e.g., incinerators or metal industries. The PCDD/PCDF-contaminated sites, soils, and sediments from the past PCDD/PCDF release are still relevant for food contamination (e.g. fishes, grazing cattle, and milk and dairy products)

45 Stockholm Convention document from the 6th POP Reviewing Committee meeting (UNEP/POPS/POPRC.6/INF/21)
46 For an overview see Weber R, Gaus C, Tysklind M et al (2008) Dioxin- and POP-contaminated sites—contemporary and future relevance and challenges. Env Sci Pollut Res 15, 363-393. http://www.springerlink.com/content/0q10km8582605r1x/fulltext.pdf
47 For an overview see Weber R, Gaus C, Tysklind M et al (2008) Dioxin- and POP-contaminated sites—contemporary and future relevance and challenges. Env Sci Pollut Res 15, 363-393. http://www.springerlink.com/content/0q10km8582605r1x/fulltext.pdf
48 The historic PCDD/F inventory of Japan does not yet include the large PCDD/PCDF deposits from organochlorine production and chlorine production.
49 Swedish Environmental Protection Agency (2005): Survey of sources of unintentionally produced substances. Report for the Swedish Government.
50 Fiedler H (2007): National PCDD/PCDF release inventories under the Stockholm Convention on Persistent Organic Pollutants. Chemosphere 67, 96-108.
51 Stellmann MJ, Stellmann SD, Christian R, Weber T, Tomasallo C (2003): The extent and patterns of usage of Agent Orange and other herbicides in Vietnam. Nature 422, 681-687.
52 Stockholm Convention (2010) SC document from the 6th POP Reviewing Committee meeting (UNEP/POPS/POPRC.6/INF/21).

2.3.5.2 Stockholm Convention Obligation in Respect to Dioxins/UPOPs (Article 5)

The framework for the action plan for dioxins and other Annex C chemicals is given by the obligations of Article 5 of the Convention.

Article 5 of the SC, covering the measures to reduce and eliminate releases from unintentional production, states that each Party shall, at a minimum, take the following 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 minimization, and, where feasible, ultimate elimination (paraphrased and summarized):

Article 5 (a): Develop an action plan with the elements 5a (i-v) to facilitate its implementation (subparagraph (b) to (e)

Article 5 (a) (i): Evaluate current and projected releases, including the development and maintenance of source inventories and release estimates, taking into consideration the source categories identified in Annex C.

Article 5 (a) (ii): Evaluate the efficacy of laws and policies to manage releases.

Article 5 (a) (iii): Identify strategies to meet dioxin reduction obligations, taking into account the evaluations in (i) and (ii).

Article 5 (a) (iv): Take steps to promote education and training, and raise awareness of the strategies.

Article 5 (a) (v): Review, evaluate, and report on strategies every five years in meeting release-reduction obligations.

Article 5 (a) (vi): Develop a schedule for implementation of the action plan, including the strategies and the measures identified in them.

Article 5 (b): Promote the application of available, feasible, and practical measures that can readily achieve a realistic and meaningful level of release reduction or source elimination.

Article 5 (c): Promote the development and use of substitute or modified materials, products, and processes to prevent the release of Annex C chemicals.

Article 5 (d): Promote and, as soon as practicable, require BAT/BEP for new installations (sources) listed in Annex C Part II.

Article 5 (e): Promote BAT/BEP for existing installations (sources) listed in Annex C Parts II and III and for new sources listed in Annex C Part II.

2.3.5.3 Inventory of PCDD/PCDF and Other Unintentionally-Produced POPs

In most processes, PCDD/PCDF and the other listed unintentional-POPs (PCB, HCB and PeCB) are formed together. Therefore, the inventory of PCDD/PCDF can be seen as representative for the other UPOP for most processes. Reduction of PCDD/PCDF from these sources also lead to the reduction of the other unintentionally-formed POPs. Thus, most processes and priority setting on UPOPs can be addressed by developing a PCDD/PCDF inventory and addressing the highest release sources. The sources where specific UPOPs are formed, and are not covered by the PCDD/PCDF inventory (e.g. production of specific pigments or degradation of specific pesticides), are specifically mentioned and addressed.

The standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases (UN Environment Program Chemicals (UNEP), 2nd edition February 2005) was used in making the inventory for PCDD/PCDF.

This is the first PCDD and PCDF inventory report of Suriname, and it presents estimates of current release of PCDDs/PCDFs in Suriname by determining the main emission sources of PCDDs/PCDFs.

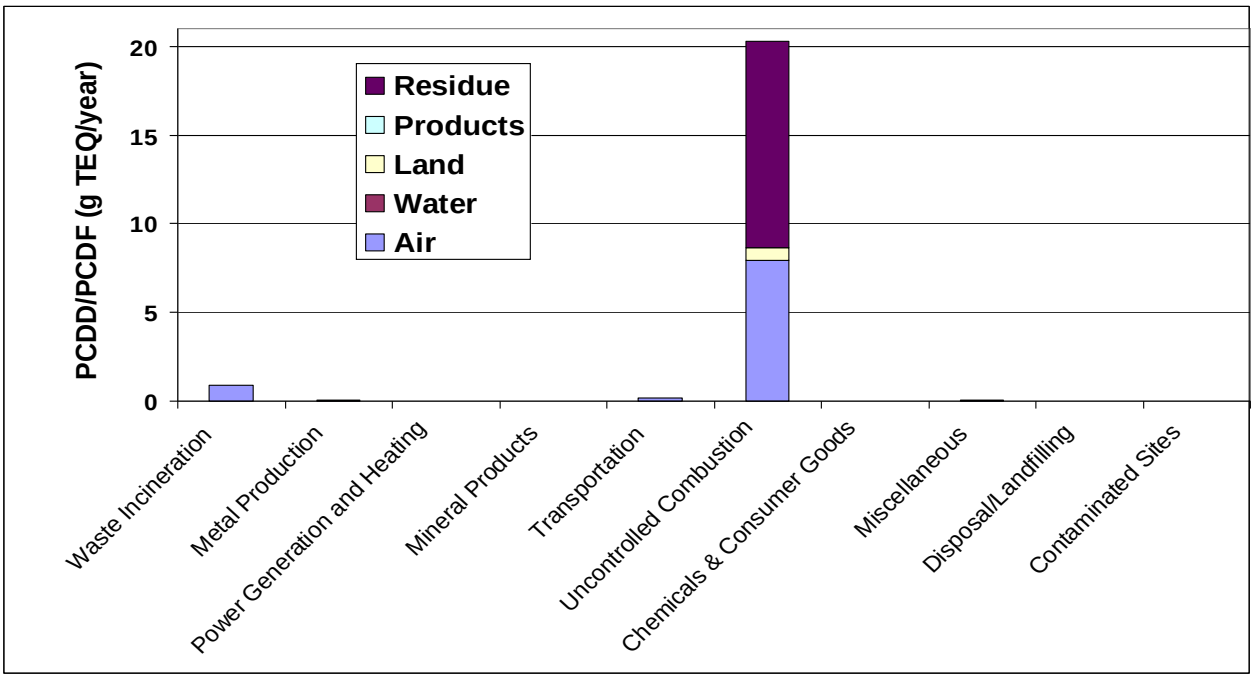
For this purpose, the dioxin task team screened all emission sources listed in the UNEP toolkit (including all source categories identified in Annex C of the SC) for PCDD/PCDF release, and evaluated their relevance for the country.

The PCDD/PCDF inventory conducted for the 10 main source categories and their respective subcategories yielded a total annual figure of 21.33 g TEQ released to all environmental compartments.

The PCDD/PCDF inventory from former air-spray application of PCP on rice fields (confirmed for air spray operations from 1964 to the 1970s) has been estimated at 1431 g I-TEQ for the rice plantation area of Wageningen. The total release from PCP-use for all former rice fields in Suriname between 1964 and early 1970s is estimated to be approximately 5565 g I-TEQ53. While this is not a current PCDD/PCDF release, this historic legacy can be due to the high persistence of PCDD/PCDF. Its current impact on biota and subsequent accumulation in the food chain can pose a current threat to human health. As such, it is necessary to consider and assess the same within the NIP implementation.

For current releases, uncontrolled combustion processes ranked first with an emission of 20.18 g TEQ/year (94.6% of total emission). The main contributor came from uncontrolled domestic waste-burning with an estimated emission of 17.39 g (81.5% of total emission), followed by agriculture residues burning (2.65 g; 12.4% of total releases), and accidental fires in houses and factories (0.14 g; 0.66%). Other sources contributing to the total emission in percentage range from category 1 waste-incineration (0.916 g; 4.3%) and from category 4 transportation (0.171 g; 0.8%). The quantities of dioxin and furan releases from all categories are summarized in Table 2.10 and 2.11. An estimated 21.33 g TEQ of PCDD/PCDF was released into the environments of Suriname in 2009.

Figure 3 Current PCDD/PCDF Release Inventory of Suriname for 2009 [54]



53 This is rather an underestimation of total release from historic PCP-use in Suriname since PCP has most probably been applied already before 1964. As basis of the calculation, available data on PCDD/PCDF content in PCP formulation from the 1960s and the early 1970s have been used for this estimate from Masunaga S, Takasuga T, Nakanishi (2001) J Chemosphere 44, 873-885.

54 The inventory was compiled in 2010. Activity rates for the source categories were taken from the years where statistical data were available (largely 2007 to 2010).

Table 2.10 Summary Table of Dioxin Releases to Air from Source-Categories (g I-TEQ/year) [54]

Dioxine releases	g I-TEQ/year
Uncontrolled domestic waste burning	5.80
Agriculture residues burning	1.98
Medical waste incineration	0.914
2-strokes engines	0.15
Accidental fires in houses etc	0.07
Crematoria	0.05
Iron and steel production plants	0.017
4-stroke engines	0.016
Lime production	0.007
Electrical power HFO	0.006
Diesel engines	0.005
Ceramics production	0.005
Household heating and cooking with biomass	0.004
Smoke houses	0.003
Accidental fires in vehicles	0.002
Destruction of animal carcasses	0.002

Table 2.11 Summary Table of Dioxin Releases to Residues from Source Categories (g I-TEQ/year)

Dioxin releases to air from source categories	g I-TEQ/year
Uncontrolled domestic waste burning	11.6
Accidental fires in houses etc	0.071
Iron and steel production plants	0.026
Smoke houses	0.0075
Medical waste incineration	0.0061
Crematoria	0.0006
Household heating and cooking with biomass	0.0004
Accidental fires in vehicles	0.0004

The current releases to the 5 categories (air, water, land, residues, and products)– were assessed. According to the toolkit approach, the main emission vectors were to residue (11.7 g; 54.9 % of total releases) and air (8.97 g, 42.1 % of total releases), with minor releases to land (0.661 g; 3.1 % of total releases), product (0.0048 g; 0.023 % of total releases), and water (0.0 g; 0.0% of total releases). "However, the releases to residues for open burning can also be viewed as a direct contamination of soil since the residues of uncontrolled waste burning are just scattered all over the land, mixed with soil, and further distributed by the wind. Also the ashes from hospital waste-incineration and the slag thereof are applied partly to land.

The historic releases of PCDD/PCDF to land/soil from the PCP-application to rice fields in Suriname between 1964 and the early 1970s is estimated to be approximately 5565 g I-TEQ55. While this is not a current PCDD/PCDF release, this historic legacy, due to the high persistence of PCDD/PCDF in soils, can have current impact on biota, and via accumulation in the food-chain, be a current threat to human health.

2.3.5.4 Sources not Quantified in the Current Inventory with Potential Relevant Releases

Some sources have not been or have only been partially included in this first inventory due to the lack of available information. These potential sources need to be assessed in the update of the inventory during the NIP implementation:

a) The production of chlorine
Depending on the production process, the chloroalkali process can have high releases of PCDD/PCDF and other UPOPs. In Suriname, one chlorine production-site is in operation. Detailed information on the facility could not be gathered during the inventory process. Therefore, an assessment of potential releases could not be done in this inventory.

b) Smouldering of wires and electronic waste
Open burning of wires occasionally takes place from artisanal activities to recover copper. Such practices form and release significant amounts of PCDD/PCDF. In this first inventory, the activity rate of such practice could not be estimated. Also, it has not been clarified if cables are systematically recovered or mainly end up in landfills. Also smouldering and open burning of electronic waste takes place in Suriname (e.g. this was discovered during the site visit around the landfill of Paramaribo). Such activities can form and release high concentration of PCDD/PCDF and other UPOPs as well as brominated and brominated-chlorinated PXDD/PXDF.

c) The importation of pesticides
PCDD/PCDF and other releases of UPOPs from certain pesticides (e.g. PCP, PCP-Na, 2,4,5-T. 2,4-D, Pentachloronitrobenzene/Quintocene) were the major source of UPOPs releases in history[56]. Recently it was discovered that also currently used pesticides contain PCDD/PCDF[57]. Furthermore, the degradation of certain pesticides can generate unintentionally POPs, including PCDD/PCDF. The degradation of pentachloronitrobenzene is a major source for PeCB from a global perspective[58]

d) PCDD/PCDF and other UPOPs contaminated sites
Several potential PCDD/PCDF and other UPOPs-contaminated sites have been discovered during the preliminary inventory process (for details see 2.3.6.7 below where the site types are listed). However, up to now, no assessment and measurements have been performed which need to be considered as a future NIP activity.

55 This is rather an underestimation of the total release from historic PCP-use in Suriname since PCP had most probably been applied prior to 1964. The calculation of this estimate has been based on available data on PCDD/PCDF-content in PCP formulation from the 1960s and the early 1970s from Masunaga S, Takasuga T, Nakanishi (2001) J Chemosphere 44, 873-885.
56 Weber R, Gaus C, Tysklind M et al (2008) Dioxin- and POP-contaminated sites—contemporary and future relevance and challenges. Env Sci Pollut Res 15, 363-393. http://www.springerlink.com/content/0q10km8582605r1x/fulltext.pdf

57 Holt E, Weber R, Stevenson G, Gaus C. Polychlorinated Dibenzo-*p*-Dioxins and Dibenzofurans (PCDD/Fs) Impurities in Pesticides: A Neglected Source of Contemporary Relevance, Environ. Sci. Technol 44, 5409–5415 (2010).

58 Stockholm Convention document from the 6th POP Reviewing Committee meeting, Geneva, 11-15 October, 2010 (UNEP/POPS/POPRC.6/INF/21).

2.3.6 **POPs Site Assessment**

2.3.6.1 POPs pesticides

Information on contaminated soil and groundwater present at storage sites (old and currently in used) is not available. Based on the POPs-site inventory made by the NCC dioxins and furans task team, it is assumed that at a certain number of the storage sites listed in Appendix 3, the soil, and the groundwater are possibly contaminated. The situation at these sites concerning the environmental quality of the possible soil and groundwater contamination can be classified in:

- Contaminated hotspots
  - The locations where spills and leakage took place and pure pesticides have entered the soil - and most likely the groundwater at places where the groundwater table is shallow (within 2 meter below the surface level. The levels of organic compounds are high, and the contaminated soil in the hotspots must be treated as POPs;
  - Most of these hotspots are located at:
    - On and off-loading platforms
    - Mixing / preparation basins
    - Filling station at airstrips
    - Not well-maintained storage buildings
- The contaminated soil and groundwater around the hotspots
  - If the soil is contaminated at levels below the 50 mg per kg of dry matter, the soil should be treated as contaminated soil. To establish the degree and extent of contamination in the vertical and horizontal directions, a soil survey is needed. The processes responsible for the dispersion in the horizontal direction of the contaminants are surface runoff of rainwater, wind, and ground works. Percolation of rainwater accelerates the spreading of the contaminants in the subsoil and groundwater.
  - If the groundwater is contaminated, it should be treated as such. To establish the degree and extent in the vertical and horizontal directions, a groundwater survey is needed. The processes responsible for the dispersion in the horizontal direction of the contaminants are groundwater streaming, drainage, and pumping of groundwater. The natural infiltration of rain and groundwater, and the pumping of groundwater are responsible for the migration of the contaminants into deeper aquifers.

Soil and groundwater surveys and assessments of the sites need to be carried out in order to know the usage of the site and its surrounding, as well as the potential impact of the contaminated sites. The possible potential impacts are:

- Direct risks related to the hotspot, the contaminated buildings, and the contaminated groundwater
- Potential risks related to the contaminated soil and groundwater
- Latent risks related to the contaminated soil and groundwater

The first inventory on obsolete and POPs pesticides was done by the Ministry of LVV under the guidance of the FAO in 1999. The total quantity recorded at five (5) different locations in the country was around 31 tonnes. The locations with significant amounts of obsolete and POPs-pesticides were Mariënburg and the Stichting Machinale Landbouw Suriname (Foundation for Mechanized Agriculture Suriname (SML)) airstrip in Wageningen. Ten tonnes of HCH were found at Mariënburg. Another inventory was carried out again by the Ministry of LVV with the assistance of Crop Life in 2005. The results of this inventory were different because it showed that people have used pesticides from the obsolete stocks.

The Mariënburg site was visited again on January 2008. The situation at this obsolete and POPs pesticide storage site had worsened. The roof was almost completely gone, and people were starting to use the surroundings of the storage facility. The situation at this site and at other sites will worsen, and if no immediate actions are taken, the direct risks for the people living at and nearby these sites will increase. The ultimate result will be that all the pesticides cannot be reclaimed anymore, ending up in the environment.

Considering this situation one has to realize that the current inventory data within half a year will not be valid anymore. The infinite assessment cycle, which is illustrated in figure 5, should be broken by final removal. Site assessments and completion of inventories should only be carried out if the follow-up (site cleanup) is guaranteed to save costs on future site assessments.

2.3.6.2 PCB

A range of potential PCB-contaminated sites have been identified during inventory. PCB-contaminated sites are related to PCB-storage sites and where PCB transformers have been operating.
No assessment data of PCB-contamination in soils at the potentially contaminated areas have been found during the inventory process. Such assessments should be performed within the NIP implementation. Some of the sites are close to rivers. It is known that PCB-contaminated sites can adversely impact adjacent rivers and their fish resources with exposure risk to humans[59] Therefore, fishes in the rivers close to potential PCB-contaminated sites should also be screened.
The pictures of the storage facility at Mariënburg taken in 1999, 2006, and 2008 (Figure 4) clearly illustrate the need for immediate action.[60]

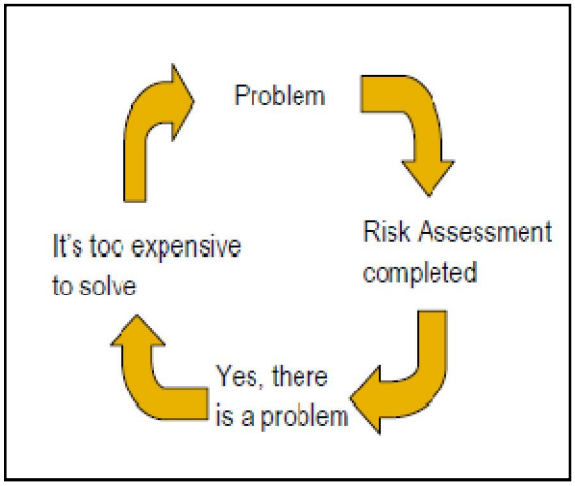
59 Zennegg M, Schmid P, Tremp J (2010) PCB FISH CONTAMINATION IN SWISS RIVERS – TRACING OF POINT SOURCES. Organohalogen Compounds 72, 362-365. http://www.unido.org/index.php?id=1001169

60 Information from: Rapport over voorraden ongewenste en vervallen bestrijdingsmiddelen in Suriname. Onderdirectoraat Landbouwkundig Onderzoek, Afzet en Verwerking, Afdeling Bestrijdingsmiddelen by Alies van Sauers-Muller UPDATE JANUARI 2008 Distr: Min/Dir/ODLOAV/Dhr. Kalka/afd. Bestrijdingsmiddelen/T149

Figure 4 Situation Mariënburg

(Photo by the Ministry of LVV and John Vijgen, 2008)

Figure 5 Infinite assessment cycle by Joop Harmsen



2.3.6.3 PCDD/PCDF and UPOPs Contaminated Sites and Hotspots.

As mentioned above, today the largest amounts of PCDD/PCDF present are from historic releases of the chlorine and organochlorine industry, from the application of organochlorine pesticides, and presently at contaminated sites - including landfills and deposits, but also in soils and sediments[61]
In the first inventory work in Suriname, only an initial screening for possible PCDD/PCDF and UPOPs-contaminated sites have been conducted, and a range of possibly PCDD/PCDF-contaminated sites have been discovered.

I) Formulation sites, storage sites and application sites of chlorinated phenols

Suriname has a long history of agriculture and wood treatment where PCP and other dioxin-containing pesticides have been used. PCP has been used from the 1950s to the 1970s in rice fields for snail control. It was also used in swamps against snails. From 1964 through the 1970s, the PCP has been applied to a large extent via aircraft spray operations. The PCDD/PCDF inventory from former aircraft spray-application of PCP to rice fields (confirmed for air spray operations from 1964 to the 1970s) has been estimated to be 5565 g I-TEQ62.

In the first assessment at Mariënburg, three potential hotspots have been found:

1. The mixing and loading area;
2. The area near the air strip where the air planes and tanks were emptied and cleaned; and
3. The area where, for decades, pesticide residues, including PCP, have been burned in the open.

Sodium PCP and PCP was also used to treat wood in the sixties and up to the eighties, sometimes in combination with lindane. Furthermore, PCP was used until the beginning of the 80s to impregnate wooden window frames and also as a component of anti-mildew paint. 2, 4, 5-T was used at interior locations in Suriname at several wood treatment sites, and possibly other applications, until the 80s. 2, 4-D is still being used in Suriname. Sodium PCP was not officially used anymore since the 90s after being placed on the black list.
The various wood treatment sites can be considered to be contaminated with PCDD/PCDF.

II) Kaolin sites

At several locations in the world, PCDD-contaminated kaolin has been discovered. In Suriname, Moengo, a private company has operated a kaolin processing industry since 2002. The country has large kaolin resources, and the kaolin will be processed to meta kaolin, with which high quality building materials will be fabricated as end- products. There are currently no PCDD measurements of kaolin in Suriname.

III) Chlorine production sites

In Suriname, a detergent-bleach factory started operating in 1982. The company has been producing chlorine and bleaching powder. During the inventory process within this company, it has been noticed that the company use technologies involving graphite electrodes. Accurate data gathering was very difficult and information of this company was based on verbal communication. No official information about the consumption of electrodes and closing of cells were available; the same was the case with possible deposits and storage or dumping of generated waste.

61 Weber R, Gaus C, Tysklind M et al (2008) Dioxin- and POP-contaminated sites—contemporary and future relevance and challenges. Env Sci Pollut Res 15, 363-393. http://www.springerlink.com/content/0q10km8582605r1x/fulltext.pdf

62 This is rather an underestimation of total release from historic PCP use in Suriname since PCP has most probably been applied already before 1964. As basis of the calculation available data on PCDD/PCDF content in PCP formulation from the 1960s and the early 1970s have been use for this estimate from Masunaga S, Takasuga T, Nakanishi (2001) J Chemosphere 44, 873-885.

IV) PCB-contaminated sites

The potentially PCB-contaminated sites can also be considered as potentially PCDF-contaminated. An assessment should consider this contaminant.

V) Dredging of sediments in the Suriname River

Experimental sediment dredging took place a few years ago. The aquatic pathway in the Suriname River has been deepened and shipment was maintained. There is no data available about what was done with the sediment dredged. It is suggested that the sediment was deposited somewhere else near the estuary of the river. Research activity on sediment disposal is proposed in the NIP. This research should establish whether or not the dredging sludge depots are possible sources of contamination.

VI) Deposits of wastes/residues

Some historic and current industrial processes might have generated PCDD/PCDF and other UPOPs-contaminated residues which have been deposited. These processes include former production of aluminum and current production of iron from scrap metal. Also, ashes are generated from hospital waste incineration and are dumped near the incinerators or at landfills.

Furthermore, landfills and dumpsites in Suriname could be a reservoir of PCDD/PCDF and other UPOPs-containing products or residues.

VII) Newly listed POPs

In respect to the newly listed POPs, no assessment on possible contaminated sites has been carried out so far. However, considering the experience from other countries on newly-listed POPs-contaminated sites, it is most probable that Suriname has a range of sites contaminated with new POPs:

2.3.6.4 Future production, use and releases of POPs requirements for exemptions

Among the 9 new POPs, three chemicals in Annex A (lindane, tetrabromodiphenyl ether and pentabromodiphenyl ether, heptabromodiphenyl ether and hexabromodiphenyl ether) are allowed for continued use for a specified period, provided that the Party has notified the Secretariat for registry of the specific exemption.[63]

The types of usage allowed for these chemicals are as follows:

- Use of lindane: Human health pharmaceutical for control of head lice and scabies as second line treatment, in accordance with Article 4, for a period of five years from the date of ratification of the amendment, unless otherwise decided by the COP; and
- Use of PBDEs in articles: Recycling of articles that contain or may contain these chemicals, and the use and final disposal of articles manufactured from recycled materials that contain or may contain these chemicals, in accordance with Part IV of Annex A, until 2030, unless otherwise decided by the COP.

Among the new POPs, PFOS, its salts, and PFOS-F are listed in Annex B with a range of acceptable purposes and specific exemptions for its production and use provided that a Party has notified the Secretariat for registry of the acceptable purposes or the specific exemption. (For details, see the Start-up Guidance for the 9 new POPs mentioned in the footnote).Currently, the status of the necessity of the use of listed exemptions for new POPs is not known for Suriname, and therefore, no conclusion on possible exemptions can be given at this stage of assessment. Such an evaluation will be part of the action of this NIP.

63 Stockholm Convention (2010) STARTUP GUIDANCE for the 9 new POPs (general information, implications of listing, information sources and alternatives) 10/2010.

2.3.7 Existing Monitoring Programmes

A monitoring programme of soil, water, and air contamination - resulting from the use on POPs - is weak due to the absence of accurate legislation, the lack of technical capacity such as laboratory facilities and equipment, as well as human resources.

2.3.8 Current Level of Information, Information Exchange, Awareness and Education

2.3.8.1 General

Although there has been more awareness-raising on general environmental issues such as biodiversity and climate change in the country, specific awareness and knowledge about chemicals management – inclusive of POPs - can still be improved within the government as well as the general public.
The local companies, (formal and informal), mainly small and medium size, do not have proper information on POPs due to a lack of awareness. These companies' financial limitations, poor legislative framework, poor environmental management, and weak government control result in inadequate chemicals' management. While the large-scale companies, usually multi-national companies, have sufficient funding to keep up with the international standards. In this regard, government institutions are well behind these companies and depend on the information that is provided by them.

2.3.8.2 Information and Awareness

In general, awareness on the use of pesticides is gradually increasing within the group of stakeholders that participate in the newly set up empty container and the IPM program. The Ministry of LVV, in cooperation with NGOs, and other organizations are constantly working on raising awareness, but due to the limited funds available, not all aspects are shared and not all farmers are reached on a regular basis.

The availability of information on chemicals in general - especially the POPs and their impacts on the human beings and the environment - is limited to: those that deal with them on a daily basis, mainly persons in several government agencies, and the private sectors. General public or nation-wide information dissemination and awareness have not been conducted structurally or on a regular basis. The development of training modules for persons making use of the pesticides is also required, and this can be done through the collaboration of government agencies and the private sector.

2.3.8.3 Information exchange between Parties

Information exchange on POPs-related issues with other Parties to the Convention had not been done in the past. Within the frame of other Conventions, (for example the Basel Convention), contacts have been established.

2.3.9 Relevant Activities of Non-Governmental Stakeholders

There are a number of NGOs in Suriname actively involved in the field of conservation and environment. Their activities are focused on the management of conservation areas, the protection of the environment and ecological functions, capacity building of relevant stakeholders, and public awareness. In general, the NGO community has no priority in focusing on POPs-chemicals, except for one NGO, "the Caribbean Institute" which promotes organic agriculture.

Another foundation that focuses on sustainable agriculture is the Foundation for Ecological Products Suriname (STEPS). It is a local organization that aims at the social, economic, and cultural exploitation of the Interior. STEPS promotes sustainable production by local communities and builds capacity regarding the technical aspects (design of sound processing units). An example of a project activity, with support of the Interchurch Organization (ICCO), is the participation of the community in Moengo in the Marowijne district in the implementation of sustainable environmental development in order to acquire a good income through the harvesting, processing, and sale of products derived from 'Podosiri' fruit, also known as acai. Since 1996, ICCO has a financing relationship with STEPS.

2.3.10 Current Level of Information, Information Exchange, Awareness and Education

For the monitoring of POPs, air, water, soil and human health monitoring should rely on qualitative standardized processes of data collection and analysis. In Suriname, only a few operating laboratories perform tasks in the area of chemical monitoring. The majority of the laboratories are historically established for fundamental support of the primary production sector and has served predominantly for quality control purposes. Most of these laboratories are operated by governmental institutions, and therefore, have made a late shift towards including environmental factors in their test repertoire.
The most advanced laboratories for testing chemical contaminants are the Chemical and Environmental laboratories of the ADEKUS and of the Central laboratory of the Ministry of VG. Both laboratories have sufficient trace-analytical equipment and trained personnel to analyse trace amounts of contaminants in soil, water, and human tissue and food. The private sector companies also rely on the services of these laboratories for testing of contaminants, usually on an ad-hoc basis.

Private sector laboratories maintain equipment attuned to the specific needs of the area of work. As such, laboratories of the larger companies, e.g. SURALCO, N.V., Consolidated Industries Corporation, Suriname Alcoholic Beverages N.V., and Staatsolie Company execute their own routine analysis on their main compounds. Analysis on potential pollutants that may be released into the environment is hereby limited. Testing of surface water quality is conducted by the Ministry of OW. Their hydrology laboratory routinely tests the chemical and biological quality of surface water from channels, creeks, and rivers. The Ministry also has a laboratory to measure the atmosphere, specifically the atmospheric greenhouse gases and ozone levels. Regular air testing may occur on an ad-hoc basis by multinational and private companies.

2.3.11 Identification of Impacted Populations or Environments

Suriname has no overview of contaminated land (soil and groundwater). Private companies do carry out occasional soil and groundwater surveys focussed on contaminants. There is no data infrastructure set up by the government to collect and safeguard the data on contaminated soil and groundwater. No data on human POPs-levels have been identified in the preparation of this NIP.

In the past several spills and accidents took place possibly causing soil and groundwater contamination at industrial sites, sites of medium and small enterprises, and privately-owned areas. Although the contaminated sites are not registered, a summary of possible contaminated sites is made based on oral information collected during the workshops, site visits, and interviews.
The most common suspect sites of soil and groundwater contamination are:

- The 22 already identified pesticide storage sites are suspect sites for soil and groundwater contamination with organic chlorinated hydrocarbons and possibly other chemical compounds;
- Industrial sites with underground and aboveground storage tanks (UST and AST) are suspect sites for soil and groundwater contamination of the chemicals stored in the tanks;
- Industrial sites, petrol stations, small car and motorcycle service stations, fitting companies, storing and car tectyl companies - selling and handling all kinds of mineral products - are suspect sites of soil and groundwater contamination with TPH, poly cyclic aromatic hydrocarbons, and volatile organic hydrocarbons;
- Small and larger scale paint spraying companies are suspect sites of soil and groundwater contamination with TPH and volatile organic hydrocarbons;
- Sites where dry cleaning took place are suspect sites of soil and groundwater contamination with chlorinated organic hydrocarbons;
- The places where fire drills with firefighting foam are held on a regular basis, such as at the international airports. These sites are suspect for soil and groundwater contamination from compounds of firefighting foam;
- The places where waste is dumped (legal and illegal) are suspect sites for soil and groundwater contamination with all kinds of contaminants; and
- While implementing the NIP, assessment in human milk or blood should be considered.

As mentioned before, the easy access to pesticides, among others, is one reason for the high suicide rates in the Saramacca and Nickerie districts. To deal with this issue, the Ministry of LVV, together with other organizations, including ADRON, started an awareness project to raise awareness and inform the local community on the proper and adequate use and storage of pesticides.
Also, open air burning of rice husks for many years have resulted in local air pollution and health effects. Many rice companies were issued permits for rice production activities in populated areas. There were no alternatives for the destruction of rice husks, so companies burn rice husks in the open-air or dispose of it in the river.

As a consequence of the limited awareness of the risks involved when exposed to toxic substance, in particular to POPs, not all people exposed to POPs in the workplace are using adequate Personal Protective Equipment (PPE). Examples can be observed when people apply pesticides, perform open waste burning, work at small and large scale industries, and handle all kind of wastes.

2.3.12 Details of any Relevant System for the Assessment and Regulation of Chemicals in the Market

There are legal means to ban and prohibit POPs. However, no such capabilities or systems have been put in place to date to determine chemicals as POPs.

3 Strategy and Elements of the NIP Action Plan

Section 3 addresses the two following elements: the formal policy statement and the implementation strategy for the NIP. The implementation strategy sets out specific action plans or strategies to achieve Convention obligations and other additional objectives set by the country.

3.1 *Strategy and policy statement*

The United Nations Conference on Environment and Development in 1992 in Rio de Janeiro, Brazil, as well as the World Summit on Sustainable Development in 2002 in Johannesburg, South Africa, both emphasized the enormous pressure put on our environment. In Suriname there are environmental problems, among others, concerning diseases and plagues, oil spills and drainage of various waste streams in the open sea, hazardous waste stocks, decline of biodiversity and land degradation. These have led to the awareness of the need to embrace Agenda 21, and to implement a sound and sustainable environmental policy for Suriname which is embedded in the Meerjaren Ontwikkelingsplan (Multi Annual development Plan (MOP)).The Government's national development strategy is set up in the 2006-2011 MOP taking into consideration the experiences, results and lessons learned in the previous MOP (2001-2005). The 2006-2011 MOP was developed using the Millennium Development Goals (MDGs) as guidance to determine, develop, and evaluate its development strategies and programs. The 2006-2011 MOP consists of four main components for which each strategic objectives and strategies were developed. These components are: governance, including democracy; constitutional state and security; social and human development; economic development and fair distribution. The MOP 2006-2011 also gives the highest priority to the crosscutting issues of environment, gender, and youth.

The Ministry of ATM is responsible for the development of an overall environmental policy and the coordination and monitoring of all activities regarding environmental policy. This is done in collaboration with governmental and non-governmental bodies and institutions. At present, Suriname does not have a national policy to address the environmentally sound management of persistent toxic substances and wastes; regulations, standards, and guidelines are to be developed. However, the draft Environmental Framework Law provides a legal framework for the establishment of standards and procedures for solid waste and hazardous waste management. A Governmental Decree, proceeding from this Framework Law will be needed to incorporate more practical solutions and regulations regarding management of POPs and its waste .This will enable Suriname to develop a strategic approach to POPs-management and a national policy for management of POPs.

3.1.1 Considerations with respect to synergies of implementation

In recent years, the importance for coordination of the implementation of chemical Conventions has been emphasized. At the international level, the Conferences of the Parties to the three conventions called for greater cooperation and coordination among the three conventions, and measures to be taken for a more harmonized implementation.
This harmonized implementation should also be considered at the national level. Suriname has ratified and is a signatory to a range of international conventions and agreements, and is also aware that at national level efforts need to be made to synchronize the implementation of these 3 conventions.

Hazardous waste management is an important requirement for the adequate implementation of the chemical conventions. Furthermore, also the international efforts on protecting the ozone layer have certain waste management aspects - including the management of fluorinated hydrocarbons present in air conditioning houses, offices or cars.
Suriname has limited waste destruction capacity, and therefore, is currently depositing most of the materials imported to the country at the end of their useful life. Only a minor fraction of the materials are recycled or exported. In the case of the challenge of POPs, however, the government became highly aware that critical chemicals, which cannot be deposited in the country, need to be managed and exported at high costs. The expensive and time-consuming waste management and export efforts for PCBs, POPs pesticides, but also Ozone Depleting Substances (ODS), have alarmed the government and the private sector to seek a more sustainable management of chemicals and articles containing critical chemicals. It becomes obvious that another policy for imports of chemicals and articles containing hazardous chemicals is needed. This becomes even more obvious considering new POPs containing waste fractions like electronic waste, car shredder waste or synthetic carpets. Such bulk wastes containing critical chemicals have entered Suriname in thousands of tonnes over the last two decades and are currently largely disposed of. While it has been already discovered that the deposition of waste in Suriname threatens the precious ground water resources and contaminates the soils, the listing of new POPs - present even in a range of waste fractions coming from households (e.g. the mentioned electronic (E)-waste, car shredder residues, furniture, mattresses, synthetic carpets, impregnated textiles, impregnated paper) - highlights the fact that another waste management and import policy is needed to cope with the materials and articles containing critical chemicals of modern consumer society.

The effects of leaching of POPs and other chemicals from landfills and dumps into the water resources and related natural resources as well as biota, emphasize the need for an integrated management of the import, consumption and treatment of these chemicals. A development strategy for a green economy aimed at incorporating the environment into all the national plans and programmes, such as green economy, can facilitate this approach.

The waste management efforts are directly link to sustainable production, and in the case of Suriname, to “Sustainable Import of Products”. Considering the challenges of managing POPs and new POPs, such a policy need to be developed within the framework of the implementation of the SC and the Basel Convention. Such efforts can be linked to sustainable consumption of the Surinamese population. POPs and new POPs can be used here as an awareness raising tool for all stakeholder groups.

3.2 *Activities, Strategies and Action Plan*

3.2.1 Activity: Institutional and Regulatory Strengthening Measures

I. Develop Legal and Technical Instruments for Managing Pesticides

The existing legal instruments have limited focus on the monitoring of pesticide use. The Ministry of LVV has legal tools to administer pesticides as a follow-up after its preliminary registration at the point of entry until their usage and/or disposal. The registration system should be based on location and amount of pesticide use. The latter is linked to the area of the crop under production, the data for which can be acquired from the statistics division of the Ministry of LVV.

For instance, a farmer can only acquire a certain amount of pesticide from the supplier based on the area under production. Such a system can be easily set up with Geographic Information Systems (GIS) which will enable geospatial analysis and comparison of data. This GIS system will serve as the main system for pesticide registration and management.

To adequately assess the risk associated with pesticides, the Ministry of LVV should have a protocol to engage in pre-testing of new pesticides before being release for wider use. Pre-testing should be approached as a routine activity that is the legal responsibility of the importer under the supervision of the Ministry of LVV. In that way, the Ministry can assess the effects of pesticides on secondary crops and existing biodiversity. A second aspect of risk assessment is residue analysis. Residue-analysis can be used as a way of enforcement based on new legal regulations. Finally, emergency measures and new regulations should be developed to address the liability and redress in case there is a calamity with pesticides that are harmful for human health and/or the environment. Because the Government possesses limited resources, the liability and redress - in terms of non-compliance with regulations on risk-assessment, storage, transportation, handling and use of pesticides - should be the responsibility of the user and supplier. Given the onus of liability on the user/supplier as stated in the 2005 Pesticide Act, further regulations should support a clear system in liability and redress, and include enforcement clauses. Furthermore, clear guidelines should be developed for the storage, disposal, and transportation of pesticides.

II. Legal Instruments and Technical Guidelines for Managing PCBs

As is the case with all other POPs, the import of equipment and materials containing PCB must be prohibited. For this matter, the Decree Negative List of 1999 stipulates which goods are

a. prohibited,
b. need a permit, or
c. a certificate when imported to and exported from Suriname.

Acknowledging that the responsibility for the implementation of the SC is with the Ministry of ATM and this Ministry will have to propose the amendment to the Ministry of HI.

In the case of the prohibition of PCB imports, the Ministry of ATM will need to consult other stakeholders, such as the Ministry of LVV, Customs Department, and the private sector, that uses equipment and materials containing PCBs. Among the stakeholders are N.V.EBS and SURALCO.

The Alcoa PCB Team at SURALCO provided a comprehensive set of requirements for the management of PCBs based on the best available scientific data and the practical experience of Alcoa and other companies. They were first approved and issued in 1993. In 1995, a review of the standards was conducted with input from Alcoa locations and Corporate Environmental, Health and Safety to identify improvements based on two years of experience in applying the standards.

III. Legal Instruments and Technical Guidelines for Managing DDT

To date, no production on DDT has taken place in Suriname. Also the import of DDT chemicals was prohibited under the Rotterdam Convention. DDT is prohibited based on the 1999 regulation of the Ministry of HI and the 2005 ban on pesticides.

IV. Legal framework, categorization and inventory of wastes

Suriname has drafted legislation concerning regulations for the safe disposal of waste (Afvalstoffenwet)". This Act categorizes the different waste streams, namely, household, farming and gardening, company and industrial waste, hazardous waste, effluent, dredging, and car wrecks. It needs to be assessed whether this draft should be updated.

The key base for the establishment of an efficient and effective waste management in Suriname is to develop a system which defines in detail the different waste categories present in the country (including all industrial waste, household waste, and others), establish a database of the waste, and clarify appropriate management of the wastes. Therefore, it is recommended to establish a methodology to comprehensively categorize hazardous wastes and other wastes.

The NPS highlights that data of the production of chemical waste are not available except for waste pesticides. No inventories of (chemical) waste production and handling by companies have been done to date.
Data on the import and export of chemicals are available at Customs and other (governmental) institutions such as NIMOS, the Ministry of LVV, and the Ministry of VG - which have specific tasks such as to collect import and export data, to comply with international regulations or commitments. These institutions started to collaborate with Customs in order to develop a unified data base.
These activities have to be considered or might be a first starting point to develop a comprehensive waste catalogue and database of wastes.
In addition, the development of inventories, material flow analysis, and substance flow analysis could be performed.

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

3.2.3 Activity: Production, Import and Export, Use, Stockpiles, and Wastes of Annex A POPs pesticides (Annex A, part 1 chemicals)

The overall objective of the NIP Strategy and Action Plan is to ensure a safe use of pesticides for environmental and human health in Suriname. The strategy that is currently being executed is based on:

1. Use of environmental safe pesticides
2. Safe use of potential hazardous pesticides
3. Banning the use of extremely hazardous chemicals and
4. Disposal of hazardous pesticides.

For successful implementation of the strategy, the gaps in the current system should be addressed. The first gap to be addressed is that pesticides need to be registered in a comparable format based on its location and use. The second gap is that information about the risks of pesticides to the environment and human health should be analysed to ensure the safety of farmers, consumers, and pesticide handlers. The third gap is the lack of a system of liability and enforcement to ensure the proper handling, storage, and disposal of pesticides. To adequately address these gaps, the action plan will focus on the activities that need to be undertaken in the areas of legal measures, technical measures, institutional setting, and dissemination of information and awareness.

3.2.3.1 Develop cooperation between Institutions

The NCC should bring together the expertise necessary to analyze the potential risks and decide what actions should be proposed to mitigate the risk. They should also develop an emergency response plan for proposed actions when pesticides are released into the environment. The NCC can invite outside experts, as needed, to aid in the risk assessment and management process from the import to the use and disposal of pesticides. Another task of the expert group would be to assess the sensitivity of information and decide on what information to keep confidential for reasons of national security. The working group can act as the focal point of pesticide management in each ministry. The proposed working group can be an extension of the NCC that was set up for conducting preparatory work for the formulation of the NIP.

3.2.3.2 Improving technical capacity for improved management of pesticides

Apart from the Ministries of ATM and LVV, the technical capacity for understanding the risks of the use and handling of pesticides is limited. From interviews conducted, it became apparent that suppliers have limited knowledge about the risks to human health associated with the storage of pesticides. Suriname should design a training program that is specifically focused on translating the message from the guidelines and legislation to the different stakeholders, e.g. customs, suppliers, distributors, transporters, farmers. It is important to train trainers so that they can conduct refresher courses on a frequent basis. In addition, it should be required by the Government that sales persons should be trained in order to obtain a permit.

Second, the current laboratory infrastructure needs to adhere to international standards. Laboratories should have standard laboratory equipment, an institutionalized system with full-time and trained personnel, and suitable physical infrastructure. Not only training of personnel is important, but also the instalment of a system of validation of data with reference to other similar laboratories.

3.2.3.3 Increasing awareness and information dissemination

The general awareness on the nature and use of pesticides can be improved in Suriname. Information about pesticides should be translated into different messages that target the consumers. By making use of film, pamphlets, radio and other suitable awareness materials, the stakeholders can be informed about the risks associated to human health due to uncontrolled use of pesticides in food. Another focus of this campaign should be on the use of personal protective equipment when using pesticides in the household and while farming. The campaign should be conducted for the duration of at least two years after which sensitization can occur twice yearly, at a minimum.

In case more technical information is required, for instance by suppliers, an information website[64] should be established. This website will provide general information on all the pesticides used in Suriname, their use and risks to human and environmental health. Also, the obligations of suppliers, transporters, and farmers can be made public along with pressing regulatory issues.

64 The website of the Ministry of ATM can be used which is http://www.atm.gov.sr/depmilieu/index.php?option=com_content&view=category&id=3&Itemid=76

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

The overall objective of the strategy and action plan is to have PCBs-free equipment and materials being used in Suriname. Acknowledging that currently PCBs are found in electrical devices and that alternatives to these devices are being used in Suriname, the strategy and action plan for eliminating the use of PCB-containing and contaminated equipment should focus on the proper management and phasing-out of this equipment. Furthermore, to adequately implement such a strategy and action plan it is necessary that a comprehensive inventory takes place together with risk assessments on both electrical devices and other sources of PCB, such as 'open applications'. As part of the strategy and action plan, this inventory should occur concurrently with the implementation of the following proposed actions.
The strategy and action plan will focus on provisions and measures in four areas, namely, legislation, institutional setting, technical capacity, as well as information dissemination and awareness.

3.2.4.1 Develop Cooperation between Institutions

With the completion of a nation-wide comprehensive survey on the magnitude and location of PCB-containing and contaminated materials, it should be clear which other stakeholders will be relevant for the management and phase-out of PCBs. Initially, the Ministry of ATM can establish a forum for both government agencies and private sector stakeholders, such as EBS and SURALCO, to discuss and share experiences or information on matters concerning the proper management and phasing-out of PCBs in their respective sectors. The proposed forum can be an expansion of the PCB Task Team that was set up for conducting preparatory work for the formulation of the NIP. One of the outcomes of this forum should be an integrated database for POPs that includes PCB-containing and contaminated equipment and materials. With respect to PCB-containing and contaminated equipment and materials, this database should provide, for example, information on the names of owners, the management scheme - such as maintenance activities - the location and status of the equipment and materials, et cetera. Cooperation between government institutions and the private sector (the owners of PCB-containing and contaminated equipment and materials) is necessary for the maintenance of this database. Another outcome of the proposed forum would be to coordinate the development of an Emergency Response Plan in case PCBs are released into the environment. For this matter, the involvement and participation of the NCCR should be considered.

3.2.4.2 Improving Technical Capacity for Better Management of PCBs

Technical capacity encompasses technical infrastructure and human resources to survey, analyze, determine, and manage PCB-containing and contaminated equipment and materials. Although personnel at the ADEKUS have been trained and provided with an analyzer to determine PCB concentrations, two to three additional analyzers should enable the laboratory to increase its services and output with the implementation of the proposed comprehensive inventory on PCB-containing and contaminated equipment and materials.

Besides the training of government officials, the owners of PCB-containing and contaminated equipment and materials should be trained in all technical requirements related to Environmentally Sound Management (ESM) and the SC that are required for dealing with these equipment and materials. In this regard, owners of transformers and capacitors, as well as those possibly dealing with PCBs in 'open applications,' should participate. Furthermore, based on the result of the comprehensive inventory, training should also be provided to owners of recycling businesses and to both scrap metal buyers and operators.

3.2.4.3 Increasing Awareness and Information Dissemination

There is a great need to develop nation-wide general public awareness to the hazards caused by PCBs. The impacts of PCB-contamination on human beings and the environment is known to those that deal or are confronted with the issue; knowledge of such impacts is limited to, for example, certain government officials, private companies, and some members of the scientific community. In this case, public awareness materials on POPs and also PCBs can be produced, in general. Written and visual materials should also be tailored to reach and speak to the common person. These should include folders, teaching packages, television and radio advertisements. Furthermore, a webpage linked to the internet-site of the Ministry of ATM, or even a separate website, can be dedicated to Suriname's progress in implementing the SC. Information on the POPs, including PCB, can be posted on the website or webpage of the Ministry of ATM. Workshops can be organized to provide information on the POPs, including PCB, to relevant stakeholders.

3.2.5 Activity: Production, Import and Export, Use, Stockpiles and Wastes of DDT (Annex B Chemicals) If Used in the Country

Currently, Suriname does not use DDT.

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

Although DDT is currently not being used for the control of the vectors of Malaria, Suriname considers it necessary to be able to use it in case of emergency, or if the foreign aid to support the costs of the use of more expensive alternatives is not available.

Currently, the status of the necessity of the use of listed exemptions for new POPs is not known for Suriname, and therefore, no conclusion on possible exemptions can be given at this stage of assessment. Such an evaluation need to be part of the action plan of the NIP or a specific activity on addressing new POPs as currently foreseen in the frame to updating NIPs.

3.2.7 **Activity: Measures to Reduce Releases from Unintentional Production (Article 5)**

The following activities are proposed for the action plan to reduce the release from unintentionally produced POPs (PCDD/PCDF and UPOPs PCB and HCB).
In the action plan the priorities have been set by considering the listing of the sources in Annex C of the SC, the total amount of contemporary releases as a outcome of the inventory process and also by considering point sources with potential risk to humans.

3.2.7.1 Improvement of waste management to reduce open burning

By far the largest source of contemporary Dioxin/UPOPs releases is the open burning of waste. Therefore, addressing open burning and improvement of waste management will have the largest effect on the reduction of dioxin/UPOPs formation and release. As described in the chapter 2.1.4 and 2.3.6, one large threat to environmental integrity is the challenging situation of waste management in the country. Therefore improved waste management is of crucial importance to avoid threats posed to the nation's water resources and soil integrity. Sustainable industrial development is only possible in the long run if there is proper developed waste management and related recycling activities.

3.2.7.2 Requirements on a waste management system

A waste management system needs a comprehensive framework including

- Legal framework for waste management (Hazardous waste and non-hazardous waste)
- Classification of waste, using a well defined waste list
- Database of waste generated in the country
- Collection, transport, and storage of waste
- Permission, monitoring, and controlling systems for wastes (in particular hazardous wastes)
- Infrastructure of waste treatment including destruction capacity, or a detailed policy for the export of waste which should not be deposited
- Waste management plans
- Awareness-raising of all stakeholders

3.2.7.3 Waste management hierarchy and implementation of the 3 R approach

The 3 R[65] approach emphasize that the principles of Reduce, Reuse, and Recycle are the preferable options in the waste management hierarchy; they should take precedence over other waste management options like thermal destruction or deposition.

a) Recycling, reuse and reduction
The UPOPs-inventory has revealed that some critical wastes with UPOPs-formation potential are not appropriately recycled (wires, electronic waste, metals, cars). Some of these wastes possibly even contain new POPs (c-PentaBDE, c-OctaBDE and HBB), and primitive recycling activities could therefore result additionally in new POPs releases and contamination.

65 UNEP Strategic Elements in Implementing the 3R Platform http://www.unep.or.jp/ietc/spc/3R_Strategic_Elements.pdf

In the NIP, a systematic assessment of recycling options and limitations for different wastes generated in Suriname could be initiated as part of SC implementation-activities, particularly if this is not already addressed by other projects. In such a study an overall assessment of materials recycled in Suriname and other materials which could also be recycled, could be established and promoted.

A key for the implementation of the 3R approach is the reduction of waste - in particular, reduction of waste which cannot be recycled or which poses a challenge for treatment (in Suriname). In addition to specific legislation and the infrastructure framework, this need can best be achieved by

- Reduction of the overall consumption (sustainable consumption element)
- Education and awareness of the general public (separation at the source; sustainable consumption)
- Use of products which can be recycled (sustainable production)

This topic goes beyond the scope of SC implementation and would be best handled by a national program on Sustainable Consumption and Production[66]. The same may then be linked with the implementation of the SC, and the awareness-raising component of the SC can support it.
On the other hand, the POPs-challenge is an excellent topic to highlight the need of sustainable production and consumption; hence, it is stated here.

b) Thermal destruction
With the exception of the two medical waste incinerators and limited capacity to destroy waste oils, at present, there is no thermal destruction capacity and facility in Suriname. It should be noted that the medical waste incinerators do not meet BAT criteria.
Therefore, other hazardous wastes should either be exported or be deposed in controlled landfills.

c) Landfills
Currently, the cheapest way for managing waste is deposition. The deposition of chemicals and hazardous chemical-containing materials especially impact and endanger groundwater in Suriname. Therefore, the landfill policy needs to be revised.

3.2.7.4 Extended Producer and Importer Responsibility

Since Suriname does not have any destruction capacity for hazardous wastes, all wastes which cannot be recycled or reused or safely deposited need to be exported. Examples are equipment containing PCBs, electronic waste, ODS from air conditioners, end of life cars (a least the shredded waste), batteries, et cetera.
The options - to what extent and for which products the responsibility for the waste management of a product could and should stay with the producer and/or importer - should be assessed, and where necessary and feasible, be implemented by legislation.
The most prominent examples of product groups for which the producers have been made responsible for in the management of electronic waste. Under directive 2002/96/EC on waste electrical and electronic equipment (WEEE)[67], electronic waste is returned to Europe.
In this context it should be also assessed what is the responsibility of the consumer in Suriname, and how the burden of appropriate waste management could be shared through appropriate waste fees.

66 http://www.un.org/esa/dsd/dsd_aofw_scpp/scpp_index.shtml; http://www.scp-centre.org/
67 EU directive 2002/96/EC on waste electrical and electronic equipment
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:037:0024:0038:en:PDF

3.2.7.5 Medical waste

Alternatives for medical waste incineration are available. A recent Medical Waste project from UNDP/GEF addressed the reduction of UPOPs as well as the reduction of mercury in hospitals and hospital waste.[68]
One additional option to reduce the formation and release of PCDD/PCDF from hospital waste is the reduction and substitution of PVC which finally end up in the incinerator. The approach is also in accordance with the substitution principle highlighted in Article 5C of the Convention. The reduction of PVC additionally brings the benefit of reduced phthalate and other softener use and exposure to patients.[69]

3.2.7.6 Requirement and implementation of Best Available Technology and Best Environmental Practice (BAT/BEP)

BAT/BEP, in respect to PCDD/PCDF control and reduction, is described in the "Guidelines on BAT and provisional guidance on BEP" developed within the SC [70]. The Guidelines consist of two major parts. The first part, Sections I to III, contains general information that should be taken into account when applying the guidelines for a specific source. The second part of the Guidelines, Section IV to VI, contains the guidelines listed by source in the order that they appear in Annex C of the Convention. The concept of BAT is, however, not aimed at the prescription of any specific technique or technology, but at taking into account the technical characteristics of the installation concerned, its geographical location, and the local environmental conditions.
For the description of the respective technologies, their use in the development of an appropriate environmental impact assessment (EIA), and for certification of facilities, the SC BAT/BEP guidelines can be a good support. However, the guidance is not detailed enough for an EIA since it mainly addresses the release reduction of PCDD/PCDF/UPOPs. Comprehensive BAT Reference documents (BREFs) for large-scale industries have been developed by the European Commission (EU) within and as a base to the Integrated Pollution Prevention and Control process of the EU. There is free access[71] to BAT documents, and they can be used in other countries.

In Suriname, only a few facilities, listed in Annex C of the SC, have been discovered as potential PCDD/PCDF point-sources and quantified for their dioxin release in the inventory process:

- Medical waste incinerators;
- Crematoria;
- Iron-smelter (induction furnace) operations using metal scrap; and
- Furthermore, since chlorine-production started in the early 1980s, the technology used in the production facility could not be assessed within the first PCDD/PCDF inventory process.

3.2.7.7 Medical waste incinerator

The medical-waste incinerators operating in Suriname are small-scale batch incinerators without specific flue gas cleaning. As a result, the incinerators have been categorized in the second highest group for PCDD/PCDF releases and are estimated to emit 0.31 g PCDD/PCDF TEQ per year.
Currently, there is a plan to make a company responsible for the medical waste management of Suriname.

68 http://www.gefmedwaste.org/
69 http://www.env-health.org/IMG/pdf/PVC_in_hospitals.pdf;
http://www.noharm.org/europe/issues/toxins/pvc_phthalates/alternatives.php
70 Stockholm Convention (2009) "Guidelines on best available techniques and provisional guidance on best environmental practices"
http://chm.pops.int/Programmes/BAT/BEP/Guidelines/tabid/187/language/en-US/Default.aspx
71 BAT Reference (BREF) download page: http://eippcb.jrc.es/reference/

It has been reported that the construction of smaller-scale medical-waste incinerators in Suriname is planned within this process. While the coordination of the medical waste management is a step forward, the continuation and even expansion of medical waste management using small-scale incinerators should be thoroughly assessed within the implementation of the SC.
An assessment should be made within the action plan if the company could establish a centralized treatment facility with higher BAT/BEP environmental standards. Within these considerations, non-combustion technologies should also be assessed.

3.2.7.8 Crematoria

According to the Dioxin/UPOPs inventory the crematoria[72] are operated with no emission control, or rather, with limited emission technology used for cremation. Therefore, the improvement of crematoria should be addressed within the NIP.

3.2.7.9 Iron smelter

The furnace for melting secondary iron (near Paramaribo) is an induction furnace which is currently not described in the UNEP toolkit for estimating PCDD/PCDF releases. The smelter is a furnace with an opening on top where scrap is fed into an induction furnace. The facility has very limited air pollution control measures. It therefore has been categorized in the highest emission category. Although the total PCDD/PCDF emission of the facility is rather limited (0.017 g TEQ to air and 0.025 g TEQ to residues), there is a specific threat to the workers operating on top of the furnace; they are directly exposed to the fumes.

The management of the smelter operations is aware of the heath risk for the workers. Initial BEP attempts were made to improve the suction system; however, this has failed. The management of the facility is planning another attempt to improve the off-gas suction system for better protection of the workers. Furthermore, the plant management intends to improve the waste management of the residues.
These activities should be supported within the implementation of the action plan.

EIAs are required in Suriname and have been performed also for the iron smelter. The permit approval process for the construction of the iron smelter in the current setting revealed that the requirement for BAT/BEP for large-scale facilities is weak in Suriname. Shortcomings within the EIA guidelines suggests that BAT/BEP for the different industries is not defined. Furthermore, there are no specific emission limits (e.g. for particles), and no workplace concentrations have been set for the facility. This reveals potential areas of improvement of the EIA in Suriname. Support documents like the SC BAT/BEP Guidelines and, possibly, EU BREF documents could be considered in further EIA procedures.

Since the technology of the induction-furnace is currently not described in the UNEP PCDD/PCDF toolkit, a report to UNEP Toolkit-group could be prepared describing this technology so that it can possibly be considered in the continuous updating process of the Toolkit-document.

72 This is only focusing on closed crematoriums with furnaces where a corpse can be burned and reduced to ashes.

3.2.7.10 Chloroalkali Productions and Planned Production of Chlorine

The technology of the chloroalkali production has not been assessed in the inventory project. This, including the documentation of the technologies used since the start-up production, should be a part of the NIP implementation. Furthermore a second chloroalkali production is in the planning stage. For this planned-production, BAT/BEP considerations should be included in the EIA.

3.2.7.11 Monitoring of PCDD/PCDF and UPOPs

There is a complete lack of monitoring data on UPOPs in Suriname.
The following areas could be considered for monitoring PCDD/PCDF and other UPOPs within the implementation activity.

I. Monitoring of human milk or blood

The SC has selected human milk as the matrix to assess the status and the effectiveness of POPs-pollution and pollution reduction in several countries. Alternatively, human blood can also be used.
A human milk survey can be done within the framework of WHO/UNEP global milk survey[73].

II. Monitoring of food and feed

More than 90% of PCDD/PCDF exposure of humans stem from food intake. Dioxin food crises in the last 20 years have revealed various pathways for PCDD/PCDF to food and feed.
One screening tool is bio-assays developed and used globally for the monitoring of PCDD/PCDF in food and feed, and other matrices. One leading company having developed such a tool is located in the Netherlands[74.] It has already established monitoring schemes in South American countries (e.g. Chile). Within the implementation of the Convention, a screening of matrices and samples of interest could be performed.

III. Monitoring of potentially contaminated sites

According to a first assessment, a range of potentially PCDD/PCDF-contaminated sites are present in Suriname. For confirmation and assessment of these sites, monitoring needs to be conducted.

3.2.7.12 Assessment of PCDD/PCDF and UPOPs Contaminated Sites

The largest amounts of PCDD/PCDF present today are from historic releases and often within contaminated sites, including landfills, soils, or sediments. Recently, a systematic overview on PCDD/PCDF and UPOPs-contaminated sites have been published with open access[75]. In the first inventory work in Suriname, only an initial screening for possible PCDD/PCDF and UPOPs- contaminated sites has been performed, and a range of possibly PCDD/PCDF-contaminated sites have been discovered (see above). These sites will need further assessment on their contamination level and on possible impact of the environment and risk of human exposure.

73 http://www.who.int/foodsafety/chem/pops/en/
74 Bio detection systems; http://www.bds.nl/
75 Weber R, Gaus C, Tysklind M et al (2008) Dioxin- and POP-contaminated sites—contemporary and future relevance and challenges. Env Sci Pollut Res 15, 363-393. http://www.springerlink.com/content/0q10km8582605r1x/fulltext.pdf

The future assessment of PCDD/PCDF and other UPOPs-contaminated sites should be included in the larger frame of contaminated-site assessment. Such activities should also be linked to a larger frame of monitoring of POPs in Suriname.

3.2.7.13 Updating and Refining the PCDD/PCDF/UPOPs Inventory and Linking with Inventories

In the further implementation of the SC, the UPOP-inventory will be updated. In this process, the sources currently not addressed by the inventory, but potentially relevant (such as, contaminated sites and hot spots, chlorine production, cable smouldering, E-waste smouldering), would need to be addressed.

Suriname is establishing inventories for different pollutants (POPs, Greenhouse Gases, mercury in future). It should be assessed if such efforts could be better harmonized, and if they could be addressed within a common database or approach, such as e.g. Pollution Release Transfer Register.[76]

3.2.8 Activity: Measures to Reduce Releases from Stockpiles/Wastes (Article 6)

3.2.8.1 POPs Pesticides

The goal of the activities described in the NIP action plan for the obsolete and POPs stockpiles are to:

- Eliminate or contain the direct risks caused by the obsolete and POPs stockpiles
- Eliminate or reduce the release of contaminants in the environment.

These overall objectives can be reached when specific site-cleanup programmes are designed in such a way that the mitigation, remediation, and containment measures are:

- Sustainable
- Realistic
- Cost-effective
- Appropriate

The overall goal is to develop and implement a programme to reduce releases from stockpiles and waste in accordance with internationally-accepted guidelines and practises for handling, storage, transportation, and disposal thereof, within a time-frame of one year after the approval of the NIP by the DNA.

3.2.8.2 Problem Statement

The inventory on obsolete and POPs-pesticides stockpiles, which had been already carried out, illustrates that there is sufficient inventory-capacity to complete, and if necessary, to update the stockpiles-inventories before future plans for site cleanup can be made.

The inventory studies identified a limited but adequate in-country capacity for the handling and transportation of hazardous waste. The NCCR, under the Ministry of Defence, is the coordinating body whenever a disaster occurs and spilled chemicals need to be reclaimed, transported, and stored. The NCCR mainly contracts one private specialized company to assist whenever hazardous waste has to be removed.

The storage capacity for chemical and hazardous waste that cannot be disposed of in an environmentally-sound way is very limited in Suriname.

Extra storage capacity for these for chemicals and hazardous waste has to be provided.

76 (PRTR; http://www.unitar.org/cwm/prtr/).

A temporary storage facility - an Intermediate Collection Centre (ICC) - for the assessed quantity of 30–60 tonnes of repacked obsolete and POPs-pesticides should be identified. The ICC should be available before any repackaging starts, and until export of the repacked obsolete and POPs-pesticides is realized. The ICC should be in conformity with the international ICC standards as presented by the FAO.

Certain disposal practices identified during the inventory process, such as open burning of assorted waste, burying waste, and inadequate storage of obsolete and POPs pesticides are responsible for the generation and release of UPOPs, and soil and groundwater-contamination. The inventory process also revealed that appropriate strategies for identification of contaminated sites and their management have not been integrated in the activities of the institutions responsible for POPs. It is important that appropriate infrastructure and capacity is developed and established for soil and groundwater assessment as well as the remediation of contaminated sites.

3.2.8.3 Objectives

The objectives are:

1. To complete and update the site inventory on obsolete and POPs-pesticides;
2. To develop and implement appropriate strategies for identifying and assessing contaminated sites; and
3. To develop and implement strategies for the management and remediation of contaminated sites in a safe, efficient, and environmentally-sound manner.

3.2.9 Strategy: Identification of Stockpiles, Articles in Use and Wastes

To date, there is no intergovernmental policy instrument that addresses the identification and remediation of contaminated sites. Countries that have ratified the Stockholm Convention (Parties) must however endeavour to develop strategies for identifying sites contaminated with POPs (Article 6 SC). While not explicitly requiring remediation of contaminated sites, the Stockholm Convention stipulates that any remediation attempts must be carried out in an environmentally sound manner (Article 6 SC).

3.2.9.1 POPs-pesticides stockpiles

An almost countrywide inventory for obsolete and POPs-pesticides stockpiles and waste has been carried out recently. It is recognized that a few storage sites are still missing in the inventory and that the inventory of buried stockpiles and waste is also not complete. The majority of the inventory data is uploaded in the FAO PSMS, and therefore recorded for future use - such as the designing of specific site cleanup programs.

The inventory of remaining stockpiles has to be carried out and the data should also be uploaded in the PSMS before a complete, country-wide cleanup campaign can be designed.

3.2.9.2 POPs pesticides of articles in use and waste

No inventory has been established on POPs-pesticides in articles in use and wastes. However, articles in use and wastes with POPs pesticides are most probably present in Suriname. For example, PCP is applied in the glue to prevent woodworms from affecting the plywood.
POPs-pesticides-related material such as empty packaging and articles in use containing POPs-pesticides are being disposed of and end-up on landfills of Suriname. Figure 6 shows a picture of pesticide related waste on the domestic waste landfill in Wageningen.

Figure 6 Empty pesticide containers on the domestic waste landfill

(Photo by B.Fokke, 2011)

The inventory of POP-pesticides will have to be completed in line with the inventory executed using the PSMS.

The need for developing a strategy for the assessment of POPs-pesticides, articles in use, and waste should be assessed. The recent implementation of the empty-container program has to prevent more of Suriname's future legacy in terms of soil and groundwater-contamination.

3.2.9.3 New POPs in articles and wastes

No inventory has been conducted on stockpiles, articles in use, and wastes categorized under the new POPs. However, considering the use of new POPs listed, a range of stockpiles, articles in use, and wastes are most probably present in Suriname. For the individual new POPs and new POPs classes, following potential POPs stockpiles, articles in use, and wastes need to be considered and assessed.

I. Articles in use and wastes containing PBDEs (TetraBDE, PentaBDE, HexaBDE, HeptaBDE) and HBB

The newly-listed brominated flame retardants PBDE and HBB are present in a range of materials and articles including electronics, upholstery in cars and buses, insulation materials, mattresses, and textiles.
The use of the POPs' PBDEs stopped around 2004 (for some regions in the world even earlier) and other flame retardants are and have been in use.
Therefore, a strategy for the assessment of such materials needs to be developed, and wastes should be appropriately treated. E- waste contains a range of other hazardous substances and is a priority within the BC. Thus, these activities should be combined with the BC activities in Suriname.

II. Articles in use and wastes containing PFOS and related substances

PFOS and related substances are present in materials. These include synthetic carpets, impregnated textiles, and impregnated furniture. It is recommended to develop a strategy for the assessment of such materials and to manage wastes appropriately.

III. Stockpiles, articles in use and wastes containing lindane, alpha-HCH and beta-HCH

HCH has been used in agriculture, and stockpiles and wastes might be present in storage areas of pesticide stockpiles.
HCH was partly used in Suriname for wood treatment. Therefore HCH-treated wood could be present as stockpiles in houses and wooden constructions. HCH is also used in preparing medical substances as, for example, hair lice and grass aphid.

IV. Chlordecone

If chlordecone has been used in the past, then it might be present in pesticide stockpiles.

V. Pentachlorobenzenes

Pentachlorobenzene might be present in chlorinated solvents and pigments known to contain hexachlorobenzene. Furthermore, PeCB can be present in wastes from factories generating and releasing UPOPs (ashes from open burning, hospital waste incinerators, and metal smelters).

3.2.10 Activity: Manage Stockpiles and Appropriate Measures for Handling and Disposal of Used Articles

3.2.10.1 POPs Pesticides

There are no stockpiles for POPs-pesticides planned to be used in the future. This also applies to DDT which is currently not in stock and not used in the country.

For new POPs, currently, no inventory and overview of new-POPs-containing articles have been established. Considering their possible presence in a wide range of articles and wastes, parameters on the waste management of these waste categories (electronic wastes, car shredder residues, synthetic carpets, surface treated furniture, textiles, etc.) need to be established so that these wastes do not end up in landfills and dump sites.

3.2.10.2 Capacity building handling hazardous waste and POPs pesticides

The NCCR has a small Hazmat team. More capacity is required for disaster control. Thus, the NCCR currently makes use of contractors. In the event of major disasters, the main task of NCCR is the coordination and control of the disaster. In 2009, NCCR received in 2009 a HAZMAT training. It utilizes the hazardous material (HAZMAT) classification system for handling hazardous waste. The classes are:

- HAZMAT C: Personnel with regular safety training and experiences on the handling of non-hazardous materials.
- HAZMAT B: Personnel with regular safety training and experiences on the handling of non-hazardous materials. This group can read and use MSDS and other safety sheets. They are also allowed to work with hazardous waste and have the capacity to manage a cleanup campaign.
- HAZMAT A: Personnel with regular safety training and experiences on the handling of non-hazardous materials. This group can read and use MSDS and other safety sheets. They are also allowed to work with hazardous waste and have the capacity to manage cleanup campaigns. They closely cooperate with the fire brigade and police, and they are also trained paramedics.
- A HAZMAT engineer has the qualifications of HAZMAT A. Whereas an engineer has a solid chemical background, a HAZMAT engineer is able to design action plans for cleanup campaigns for hazardous chemicals.

3.2.11 Strategy: Identification of Contaminated Sites (Annex A, B, and C Chemicals) and Remediation in an Environmentally-Sound Manner

3.2.11.1 General

The activities for the identification and assessment of POPs-contaminated sites should be harmonized with the general strategy of Suriname to assess and remediate contaminated sites and hotspots. Suriname probably has contaminated soil as mentioned in section 2.3.12, and faces a great challenge to implement a cost-effective and sustainable contaminated land management plan. The great advantage for this country is that it can make use of the lessons learned in the USA and Europe.

Initial institutional and individual capacities in land management are being developed through the Land Registration and Information System (GLIS) project from the Ministry of RGB. The GLIS project focuses on the modernization of the national land cadastre and property registry system. GLIS produces high resolution digital satellite maps of the country and build capacity for their use within the Ministry of RGB. The latter, together with Conservation International Suriname and SARVISION, produced an up-to-date vegetation map for Suriname for the year 2010. This project provided hands-on training to local governmental institutions in the use of advanced remote radar-sensing technology for land and vegetation cover-mapping, classification, and monitoring. This map can also be used as the basis for the detailed mapping of waste stockpiles, contamination sites, as well as waste streams. The Ministry of LVV make use of ARCVIEW and GPS for the production of maps.

3.2.11.2 Pesticides

Several sites with the obsolete POPs-pesticides stockpiles are suspected sites for soil and groundwater contaminated with pesticides. Within the implementation of the convention, further assessments of the obsolete POPs-pesticides-stockpiles sites should be performed including actual soil and groundwater sampling and analyses. Since there is a possible overlap with sites contaminated with other POPs, these site-assessments should be harmonized with the evaluation of POPs-contaminated sites.

Some of the following detailed considerations elaborated in the NIP can, to some extent, also be applied for other POPs-contaminated site types (see following paragraphs). It is elaborated here for POPs-pesticides since these site types probably consists of the largest share of POPs-contaminated sites in Suriname.

3.2.11.3 Soil survey strategy suspect sites

The approach for the soil survey aims at reducing risks related to direct exposure to pure product and contaminated topsoil at the site (hotspots). Direct exposure to pure product is prevented by repackaging and removal of the pure product. Direct exposure to contaminated soil that people come into contact with can be prevented by remediation.

Remediation can only be carried out safely if the contractor is aware of all aspects of the remedial work. To provide the contractor with an understanding of the soil contamination, a soil survey has to be carried out. The findings of the soil survey should be reported. The report can be used by the project commissioner as a tender document. This report should be part of the contract document and contains information essential for a safe and cost-effective remediation.
A precondition of soil remediation is that the campaign is only focused on remediation of the topsoil that forms an acute risk. Usually, the soil posing an acute risk is the topsoil (0.0-0.5 meters below surface) with a POPs-concentration of 50 mg per kg and more. The soil survey strategy depends on the type of site. A distinction should be made between a preliminary survey, a topsoil survey, a pit survey, and a tailor made soil-survey.
Four storage site categories have been distinguished and discussed during the inventory and workshop held in Paramaribo in March 2011. The proposed categories are presented in Table 3.1. For each site category, a soil-survey strategy has to be established.

Table 3.1 Categories of suspect sites

Category	Characterization
1. Site with POPs	Site with one or more storage building(s) with obsolete POPs-pesticides that can be repacked, and with contaminated hotspots in the topsoil, as well as pits with obsolete POPs-pesticides. The storage buildings vary from lockable, completely-closed dry storage, to storage buildings that are open and are unsuitable for a safe storage of obsolete POPs pesticides
2. Site with buried POPs	Site with one or more storage building(s) as mentioned under category 1. These sites also have pit(s) with buried obsolete POPs-pesticides.
3. Lost site	Site with or without one or more storage building(s) and POPs-pesticides are dispersed in the surrounding environment. The obsolete POPs-pesticides cannot be reclaimed and have polluted the topsoil. Hotspots are difficult to identify
4. Airstrip	A site with an airstrip, one of more storage buildings, and with obsolete POPs-pesticides buried in pits.

3.2.11.4 Approach to site assessment

For all sites, a preliminary site assessment is necessary to establish the category of the site and to be able to prepare the most suitable site-specific assessment. The preliminary site assessment consists of interviews with local stakeholders and site users, a site walkover, and the preparation of a photo report. This preliminary site assessment is actually part of a normal POPs inventory. It is highlighted here because the focus of this part of the inventory should be on the topsoil quality. One of the aims of the preliminary site assessment is to identify suspect locations of contaminated topsoil and other suspected locations because:

- Humans could be in direct contact with topsoil (playing children);
- Wind can blow topsoil away, especially if there is no vegetation cover; and
- Vegetation takes most water from the topsoil
- Vegetation on contaminated soil could be consumed (indirect exposure).

Suspect locations for soil contamination at storage site are:

- The soil at the entrance of the store;
- The soil around the loading platforms;
- The soil around mixing basins;
- The soil around, on top of, and inside a pit with buried pesticides; and
- The soil at places where tanks (of air spraying planes) are rinsed or washed.

The GPS coordinates of all suspect sites should be recorded. The content of pits with buried pesticides should be revealed as much as possible during the interviews. If the groundwater level is expected to be within five (5) meters below surface, and the site has suspect location(s), the future survey should also include groundwater sampling up and down-gradient at the site. These preliminary site assessment results should be presented in a report containing the following:

- Description of the site and the site category;
- Photo report of the site;
- Topsoil sampling and analyses plan for the suspect locations;
- Site survey plan; and
- Groundwater sampling and analyses plan if the groundwater is within five (5) meters depth.

3.2.11.5 Approach to topsoil survey

The first step in the topsoil survey is to check for locations suspected of contamination as identified in the preliminary site assessment. Usually, there are visible signs of soil contamination such as the absence of vegetative cover, stressed vegetation, or differences in aspect, or other obvious signs of contamination (presence of plastic, scrap metal or other waste).

It is expected that in most cases the degree of contamination is much less outside the visually affected area ('the contamination contour'). Sampling is proposed on a contour that lies a few meters beyond the outer contour of the visibly contaminated area.
The sampling interval depends on the size of the visible contamination contour. Only the topsoil (0-0.3 meters below ground level) needs to be sampled. Five to ten individual samples are mixed to make one composite soil sample (hereafter CSS) for analysis. For the contamination contour, the number of CSS depends on the size (surface area) of the visibly contaminated area.

- As a rule 2 CSSs are sufficient for contaminated areas under 25 m^2;
- For areas of 25 to 100 m^2, 3 CSSs should be taken;
- 4 CSSs should be taken for areas above 100 m^2; and
- Every CSS consists of 5-10 individual samples.

For verification of the visibly contaminated area (the hotspot), one CSS is sufficient. The results of the analysis will confirm if the visually contaminated area really is (much) more contaminated compared to the outer area which is not visually contaminated. In most cases, the results will indicate that this is the case. When the contaminated area is now delineated, the surface area can be calculated.
Samples will be analyzed preferably for EOX (total extractable organ halogen compounds); this is a parameter indicative of organochlorine pesticides (including all POPs-pesticides and a broad range of other pesticides and herbicides). The EOX indicator provides broad and reliable screening at relatively low analysis costs.

3.2.11.6 Assessment Extractable Organic Halogen Components (EOX) levels

Risk analysis has identified value limits for residential use (people living in the area, but also applicable for cattle grazing in the area) and direct contact. A value limit for the definition of a hotspot has also been defined. These value limits are presented below in Table 3.2 with the corresponding value limits for POPs-pesticides (based on the fact that the chlorine content of POPs-pesticides is roughly 50 %).

Table 3.2 Soil Proposals for Value Limits for POPs-pesticides and EOX

Compound	Residential use (mg/kg)	Direct contact (mg/kg)	Hotspot (mg/kg)
POPs-pesticides	1	5-10	> 25
EOX	0.5	2.5-5	> 50

With regard to further actions to be taken, a distinction is made between hotspot soil (likely to be visually contaminated) and non-hotspot soil.

I. Approach to pit survey

A pit survey has the same objectives as the topsoil survey. The first step of a pit survey is to check for locations suspected of buried pesticides identified in the preliminary site assessment. During the last POPs inventory, a few sites were identified as probably having buried pesticides. The information on the buried pesticides was not consistent; therefore, the proposed pit survey is an essential part of the site assessment.
Usually, there are visible signs of buried pesticides such as signs on the surface (lower or higher than surrounding surface), the absence of vegetation cover, stressed vegetation or differences in aspect, or other (obvious) signs of contamination (such as the presence of plastic, scrap metal, pesticides, or other waste). The aim of this survey is to establish the amount of buried pesticides through a limited intrusive survey or applying remote sensing techniques. An intrusive survey can be performed by soil drillings or digging small sample pits just on the borders of the buried pesticides. The remote sensing technique, such as ground radar is an increasingly used technique to trace anthropogenic relics in the subsoil. Further, it is more accurate, safer, and cheaper, and the radar apparatus is available in the country.

II. Remediation hotspot

The proposed soil remediation technique for pesticides storage sites for the heavily contaminated soil (> 50 mg/kg) is excavation of the contaminated topsoil to a maximum depth of 50 cm. The contaminated soil will be transported to a site for treatment. The excavation at the storage site will then be filled with clean soil from the direct vicinity of the site when the hotspot removal is completed. At the treatment site the contaminated topsoil will be pre-treated at specially allocated and organized plots before the soil is placed in beds for containment and/or bioremediation.

III. Buried pesticides removal

One possible means to remediate pits with buried pesticides is the removal of the pesticides. First, the pit is opened with an excavator; then the buried pesticides have to repacked and transported to the ICC. The heavily contaminated soil (bottom and sides) will also be excavated and transported to the soil treatment site.

IV. Bioremediation

However, bioremediation of organochlorine pesticides is not as easy as the bioremediation of TPH. But newer techniques are being developed. In relation to the selection of the best available, applicable, and sustainable technique, it should be clearly stated that before any bioremediation technique can be applied, pilots have to prove that the selected bioremediation is applicable.

V. Phytoremediation

Phytoremediation is an innovative technique that is gaining recognition as a cost-effective and aesthetically-pleasing method of remediating contaminated sites. Phytoremediation refers to the natural ability of certain plants to bio-accumulate, degrade, or render harmful contaminants in soil and water. Application of phytoremediation at sites contaminated with pesticides is a relatively new area of research. Some good results have been obtained; however, one major disadvantage of phytoremediation is that it requires a long-term commitment because the process is dependent on plant growth, tolerance to toxicity, and bioaccumulation capacity.
For sites with multiple pesticide contaminants, phytoremediation will have to prove its effectiveness.
Some compounds may be effectively remediated by phytoremediation whereas other compounds (e.g. herbicides) will prevent phytoremediation from being effective or even possible at all. It is therefore proposed to assess the possibilities of phytoremediation in close cooperation with companies or institutes that have experience in this field. The experimental character of applying phytoremediation can be seen as an opportunity for capacity building and knowledge exchange. If phytoremediation proves effective, it will be the most cost-effective cleanup method for the large expanses of light to moderately-contaminated soils.

VI. Benefits of plant cover

Besides possible reduction of contaminant concentrations, plant cover has the additional benefit of fixing the soil and thereby reducing wind erosion and erosion by run-off of rain water. This will greatly reduce the migration of contaminants into the environment.

VII. Application

Application of this measure will comprise of the introduction of suitable plants (planting, sowing) and the maintenance of the plant cover (irrigation, weeding). The first step will be the identification of suitable plant species (in collaboration with local institutes) with the potential to grow in the given circumstances and capable of contributing to the phytoremediation of the site. Depending on the species selected, irrigation of the area will be needed to some degree. Prevention of run-off water or excess of rainwater should be implemented to sustain the plant cover. The contaminants in the surplus rainwater from the bio-beds may not contribute to the migration of contaminants.

The activities on identification and assessment of POPs-contaminated sites should be harmonized with the general strategy of Suriname to assess and remediate contaminated sites and hotspots.

3.2.11.7 PCB contaminated sites

Currently, no assessment has been done with respect to PCB-contaminated sites. This includes, in particular, areas where PCB transformers and transformer oil have been stored. These areas should be assessed for PCB contamination which is part of the Action Plan. If such storage areas are close to rivers, lakes, or ponds where fishes are caught for human consumption, it is recommended to analyse these fishes for their PCB levels.

3.2.11.8 PCDD/PCDF and other unintentionally POPs (UPOPs PCB, HCB and PeCB) contaminated sites

Regarding PCDD/PCDF, a range of potentially contaminated sites have been discovered in the inventory process. Within the implementation of the convention further assessments of these sites should be performed including actual measurement. Since there is an overlap with sites contaminated with pesticides and with PCB, these assessments should be harmonized with the evaluation of PCB and POPs-pesticide-contaminated sites.

3.2.11.9 New POPs

No inventory and no assessment on possible contaminated sites have been conducted for new POPs. However, considering the usage-pattern of new POPs listed, a range of potentially new POPs-contaminated sites need to be considered for the individual new POPs.

3.2.11.10 PBDEs (TetraBDE, PentaBDE, HexaBDE, HeptaBDE) and HBB

The newly listed brominated flame retardants, PBDE and HBB, are present in a range of materials and articles, including e.g. electronics, upholstery in cars and buses, insulation materials, mattresses, and textiles. Depending on the waste management, the materials finally lead to POPs contamination. In Suriname, such materials including electronics, car shedder residues, or mattresses, etc. are deposited in landfills and dump sites. Therefore, such landfills and dumpsites can be considered contaminated with PBDE POPs. Furthermore, areas where E-waste or car wracks are managed or treated can possibly be contaminated.

3.2.11.11 Contaminated sites from PFOS and related substances

PFOS and related substances are present in materials, including synthetic carpets, impregnated textiles, impregnated furniture, and impregnated paper. The deposition of such PFOS-containing materials is leading to landfills and dump sites loaded with PFOS. Since PFOS is water soluble, this can lead to ground water contamination and release via leachates.

In addition, PFOS was used in specific fire fighting foams (so-called Aqueous Film Forming Foams AFFF) used by fire brigades for specific fires, including oil/hydrocarbon based fires. Such foams are used by fire brigades in oil production, refineries, and at airports; the same is true for fire brigades in general. PFOS-contaminated sites are generated by the application of the foams from the use in actual fire events, but also in fire-fighting practice areas.
PFOS and related substances are also used in oil production. Therefore, oil production activities might have resulted in PFOS contamination.

3.2.11.12 Lindane, alpha-HCH and beta-HCH

Lindane (therefore HCH) is currently prohibited in Suriname. It has been used in agriculture and might be present in stores of pesticide waste, and need to be included in the assessment of such sites.
HCH was partly used in Suriname for wood treatment. Therefore, wood treatment sites could be contaminated with HCH and should be assessed in this respect. Further it should be assessed what type of wood has been treated, and if this wood is present in houses, this would have implications for the respective houses and constructions. Currently, lindane is still being used in the medical sector, and as such, it is of high importance to start with an assessment on the awareness, import, handling, use, and disposal of medical products with lindane.

3.2.11.13 Chlordecone

Chlordecone is an insecticide and fungicide which has been used in the banana industry. It is, however, not known if it is being applied in Suriname. This needs further assessment.

3.2.12 Activity: Facilitating or Undertaking Information Exchange and Stakeholder Participation

Information exchange and stakeholder involvement are activities to be elaborated for the implementation of the NIP. A needs-assessment - all part of the development of a comprehensive strategic communication plan - will be one of the first steps to take in order to achieve successful implementation of the NIP. The communication plan must also ensure that POPs-management issues will be addressed through various media - a website and other means of communication means, in order to raise public awareness and to receive full collaboration. The efficient use of information should lead to behaviour changes. A national strategy for institutional information exchange will be developed through regular workshops to ensure full stakeholder engagement.

3.2.13 **Activity: Public Awareness, Information and Education (Article 10)**

A range of awareness activities has been addressed in the individual chapters of this NIP with regards to pesticides, PCBs, UPOPs, and new-POPs. These activities will be coordinated and addressed collectively where appropriate. The awareness activities will be linked to general awareness activities on chemical safety, awareness programmes on public health, and on green economic development, as well as awareness programs on sustainable consumption and production - all aimed at broad awareness raising strategies for sustainable development. The Ministry of ATM has also produced a documentary on POPs which has been presented to the public through media as well in various workshops. This documentary has been distributed to all relevant stakeholders.

Within Stockholm Convention activities, the UN Safe Planet Initiative and Biovision has started to utilize film and art as an awareness-raising tool; this can be used in Suriname. Some short films have been shown in stakeholder workshops in Paramaribo, and it has been acknowledged that an awareness-raising campaign through appropriate films and accompanying discussions can have excellent results and make a serious input. These possibilities should be further explored in the NIP implementation. This approach can be easily brought to schools, academia, and various organizations, as well as mass media. Some films recommended for the awareness are: "Story of Stuff"[77], "Silent Snow"[78] (on contamination of the Arctic by the use of POPs chemicals),,and "Submission"[79] (on present-day chemical pollution of human blood).

Other awareness-enhancing methodologies should be further explored and be included as part of the activities regarding information exchange and the development of a sound, meaningful, and effective communication plan.

3.2.14 **Activity: Effectiveness Evaluation (Article 16)**

According to Article 16 (paraphrased): Parties, in accordance with their technical and financial capabilities and using existing monitoring programmes and mechanisms (where possible), are to co-operate on a regional basis, when appropriate, and contribute to a global monitoring programme for the SC

As main matrices selected for assessment of the effectiveness of the implementation, human milk and air have been chosen. These activities are coordinated in the frame of the global POPs. UNEP together with WHO and the Stockholm Convention Secretariat are conducting and supporting human milk surveys in developing countries.[80] Alternatively to human milk, human blood can possibly be used as monitoring matrix.

Suriname will be participating in the human milk survey and will take further steps to contact to the responsible UN agencies to seek for guidance and funding options.

77 www.storyofstuff.org
78 http://www.silentsnow.org
79 http://www.underkastelsen.se/
80 http://www.who.int/foodsafety/chem/pops/en/index.html

3.2.15 **Activity: Reporting (Article 15)**

According to Article 15 (here paraphrased): Parties are required to report periodically on the measures taken, and on their effectiveness in meeting the objectives of the SC. Reporting will include:

- Data on the total quantities of production, import, and export of the chemicals listed in Annexes A and B
- A list of countries from which each of these substances has been imported and exported.
  The format and frequency of reporting were decided by the Conference of the Parties (COP).

3.2.16 **Activity: Research, Development and Monitoring (Article 11)**

Some studies on environmental pollution include some measurements of POPs. The data are, however, not yet compiled or included in a database. Within the frame of the NIP implementation, these data should be compiled to present an overview and to develop a database on POPs.

The participation in the WHO/UNEP human milk survey would be a key achievement in monitoring POPs in Suriname. The study could be combined with research activities. In addition to the measurement of pooled human milk samples in the WHO laboratory, local institutes in Suriname can also participate in the analysis of some of the POPs in individual samples. Depending on its outcome (levels of POPs in the human milk/blood survey), further monitoring activities of POPs should be initiated.

For POPs research and monitoring, international cooperation with experienced institutions are the most appropriate approach for progress in this topic. In this respect, the capacity building activities offered in the frame of the Stockholm Convention will be considered for possible participation. Also the activities in the regional Stockholm Convention Centres will be assessed for possible participation.

The assessment of POPs-contaminated sites outlined in this action plan will also result in valuable data which will need to be included in a database compiling POPs data generated in the country

3.2.17 **Activity: Technical and Financial Assistance (Articles 12 and 13)**

Suriname needs technical and financial assistance and will seek this assistance when implementing its NIP.

3.3 ***Development and capacity-building, proposals and priorities***

As high priority areas for the implementation of the SC the following area have been discovered during the inventory making process and the stakeholder workshops including the NIP workshop (5./6. April 2011) where priorities have been discussed with relevant stakeholders.
The SC activities should be linked and harmonized with national priorities and support sustainable development. Where possible and appropriate, the implementation of the SC should seek synergies with the implementation of other Conventions.

The order of the high priority areas listed below does not mean a prioritization between the different high priority areas.

I. Strengthening the coordination between institutions and stakeholders

Several of the listed priorities need the support and cooperation of different ministries and stakeholders. A strong coordination of activities is needed between the different stakeholders for the effectiveness of the implementation of the action plan. Therefore the strengthening of cooperation between the different ministries, institutions and other stakeholder is an important factor for an effective implementation of the Stockholm Convention.

II. Institutional and regulatory strengthening measures

Harmonization of legislation regulating chemical management is needed. Legislation should, therefore, be merged, and duplication or conflicts of the law avoided. In-keeping herewith, immediate development of legislation dealing with should be emphasised. The same should include provisions for the introduction of efficient chemicals management, with the focus on requirements for handling chemicals, restrictions in the use of chemicals, the banning of POPs-imports, and various requirements and mitigation measures.

III. Awareness raising, information and education

For all POPs groups (Pesticides, UPOPs, PCBs, and new-POPs), coordinated awareness enhancing activities are needed. Additionally, and in particular, there is no knowledge of the POPs newly listed in the Convention. Since some of the new POPs are present in everyday goods (electronics, car shredder residues, synthetic carpets, flame retarded or surface treated textiles, furniture, mattresses, etc.), the establishment of awareness raising materials and awareness communication should include also the new-POPs.

IV. Manage POPs pesticides and PCB stockpiles

Preliminary POPs-assessments have already been done by the Ministry of LVV and the task teams. The results have been presented in the chapters and the potential impacts are emphasised. Activities that need to be considered are a thorough environmental monitoring of sites and follow-up rehabilitation activities.

V. Improvement of waste management for reduction of unintentionally-formed POPs and management of new POPs potentially present in current waste streams including household waste

Open waste burning is the single most source of PCDD/PCDF release. Suriname does not have a waste destruction capacity, and therefore, wastes POPs containing need to be exported at high cost.
New POPs (in particular PBDEs and PFOS) can be present in several waste streams (electronic waste, car shredder residues, synthetic carpets, flame retarded or surface treated textiles, furniture, mattresses, etc.). These wastes are currently all deposited in Suriname. Therefore, and considering other contaminants (e.g. heavy metals) in the waste, the lack of waste management presents a serious threat to soil, ground water, and the wider environment.
The improvement of waste management is, therefore, of high priority for current and future control of unintentionally-produced POPs release and for the management of new POPs in waste streams in Suriname.

VI. Implementation of BAT/BEP for PCDD/PCDF release reduction

The few Annex C facilities relevant for PCDD/PCDF release (medical waste incinerator, crematory, iron smelter) do not comply with BAT. The assessment of the facilities revealed that for the EIA the technology itself is not sufficiently described and assessed, and in this respect, improvements are needed in the permitting process. Also it was revealed that no emission standards are in place in Suriname.
Therefore, there is a need for considering BAT within the EIA. Furthermore, there is an urgent need to establish emission limits and the related legislation.

VII. Monitoring of POPs, effectiveness evaluation and initiate research and collaborations

There are hardly any monitoring data for POPs in the country. In particular, there is no data of POPs in the population of Suriname or of POPs in the air – both of which are the selected matrices for the effectiveness evaluation of the Stockholm Convention. Also no data on POPs in biota have been found.
For the implementation of the Convention, baseline data of human POPs levels are needed for the support of refined priority setting and for an effectiveness evaluation of the implementation of the Convention.
These activities should be combined and could possibly present an impulse for establishing POPs-research activities

VIII. Contaminated site assessment and management

It has been discovered that for all POPs groups (Pesticides, PCB, UPOPs, and newly listed POPs) there is a range of possibly contaminated sites. Currently, there are no or only preliminary assessments. Therefore, it is of high priority to initiate the assessment and mapping of POPs-contaminated sites. These activities could be linked with the establishment of a database of contaminated-sites in Suriname.

A range of activities in the different action plans is linked to these high priority areas. These activities are not repeated here but can be found in the action plans described in the different areas and are listed in the action plan tables below (see chapter 3.4).

3.4 *Action Plan Tables, Suggested Schedule, and Resource Requirements*

An estimate of resource requirements of the respective activities is included in the action plan tables.
Suriname is aware that the financial resources from GEF and other UN funding do not sufficiently cover the full implementation costs; hence, co-funding has to be considered. Therefore, potential sources of funding have been identified. Details on co-funding will be elaborated on during the respective project developments.

The following action tables will be presented:

1. Action plan for POPs- pesticides;
2. Action plan for Reduction of UPOPs (PCDD, PCDF, PCB, and HCB); and
3. Action plan for PCBs.

Table 3.3 Action plan for POPs pesticides

Nr	Activities	Objective	Accountable & responsible & Other stakeholder	Duration or period in month allocated	Success Indicator(s)	Description	Estimate Costs in US$
1	**Maintain and improve technical capacity for better management of obsolete and POPs-pesticides**						
1.1	PSMS is already in use, the functionalities of PSMS and the needed, desired additional tasks should be assessed. Based on the assessment a training program has to be designed for an extensive use of PSMS (Pesticide Stockpile Management System) for other pesticide activities.	To improve the use of PSMS for the analysis of existing data on the import, trade and use and non-use of pesticides.	LVV accountable	9	Gaps on knowledge using PSMS and program to fill the gaps reported	Gap analyses design training program	to be determined
			ATM, Fin , HI responsible	12	In house training completed and PSMS is used also for identified purposes by LVV	PSMS training of one or two key users	$ 5,000.00
						Subtotal	**$ 5,000.00**
1.2	Establish pesticide disposal infrastructure. Select and renovate ICC (high priority)	To be able to temporary store max 60 tons of pesticides (200 - 300 m2)	ATM accountable & responsible LVV,OW,NCCR	2	EIA of proposed ICC including renovation plan with cost estimate is reported	Site assessment and design ICC	$ 5,000.00
			LVV responsible	3	Selected ICC and renovation cost are approved	Officially approved including approval of all stakeholders	$ 2,000.00
			NCCR	4	ICC is rehabilitated up to the international standards	ICC renovation	$ 20,000.00
						Subtotal	**$ 27,000.00**
1.3	Complete obsolete and POPs pesticides inventory and site assessment and design of cleanup plan	To obtain a complete list of sites with obsolete and POPs pesticides to be repacked, pit, hotspots and contaminated soil to be remediated. And also to obtain for each site a tailor made site cleanup plan	LVV accountable & responsible	2	Number of sites, inventories updated and completed and reported	Update inventories and inventory remaining sites, total 30 sites (2/day)	$ 15,000.00
			ATM, NCCR responsible	6	Number of site assessments completed and reported	Training and site assessment for 15 sites (1 site assessment per day)	$ 20,000.00
			VG	6	Number of samples analyzed and reported	Average 5 chemical analyses per site	$ 18,750.00
			OW,ATM,LVV and VG	6	Number of remediation plans completed and reported	Remediation design for 10 sites	$ 6,000.00

Nr	Activities	Objective	Accountable & responsible & Other stakeholder	Duration or period in month allocated	Success Indicator(s)	Description	Estimate Costs in US$
				6	Number of site cleanup plan (repackaging and remediation) designed and reported	Cleanup plan for 20 sites	$ 10,000.00
						Subtotal	**$ 69,750.00**
1.4	Establish obsolete and POPs pesticides disposal infrastructure	To ensure safe disposal of max 60 tonnes obsolete and POPs pesticides and remediation of contaminated hotspots to prevent potential harm to the environment	ATM accountable & responsible LVV,TCT,OW,NCCR	15	Tonnes obsolete and POPs pesticides repacked, transported and stored	Repackaging, transport and temporary storage	$ 60,000.00
			LVV, ATM, HI, TCT responsible	36	International transport to disposal facility and disposal 60 tonnes	60 tonnes for a estimated price of 3,000 euro per ton	$ 180,000.00
						Subtotal	**$ 240,000.00**
1.5	Remediate, contain and monitor, landfarms with contaminated soil from hotspots and phytoremediation sites with contaminated soil	To ensure a reduction of the exposure and emission of contaminants from contaminated site	ATM accountable & responsible ADEKUVS	6	Study landfarm and phytoremediation options, performing lab test and pilots	Assessment on BAT & BEP	$ 50,000.00
			LVV responsible OW,TCT,ATM	15	Number of sites where hotspot is excavated and transported to landfarm	Selection, management and construct 3 landfarm sites	$ 100,000.00
				15	Number of site planted to contain/remediate contaminated soil	Management and planting selected pants at phytoremediation 10 sites	$ 10,000.00
				Ongoing	Number hotspot contained/landfarmed and monitored	Manage landfarms cost first year	$ 5,000.00
				Ongoing	Number of sites contained/phytoremediated and monitored	Manage phytoremediation sites cost the first year	$ 5,000.00
						Subtotal	**$ 170,000.00**
						Total	**$ 511,750.00**

Nr	Activities	Objective	Accountable & responsible & Other stakeholder	Duration or period in month allocated	Success Indicator(s)	Description	Estimate Costs in US$
2	**Maintain and improve technical capacity for better management of pesticides**						
2.1	Establish strengthen field data gathering and surveillance system including already existing system GAP (Good Agricultural Practice)	To improve local extension systems to gather data and supervision on pesticide use and handling at the farm level	LVV accountable & responsible	12	Project implementation plan with budget	Expert cost	$ 10,000.00
			NGO	12	Monitoring equipment purchased	Equipment two field monitoring teams	$ 6,000.00
				12	Three vehicles purchased	Three transportation vehicles	$ 150,000.00
				12	Three GPS devices purchased	Three GPS devices	$ 1,000.00
				12	Training completed	Training of three teams	$ 10,000.00
				Ongoing	Number of collected and reported data	Three teams can improve performance extension work	To be determined
						Subtotal	**$ 177,000.00**
2.2	Support to field testing infrastructure	To improve field infrastructure for testing pesticides on their risks to the environment	LVV accountable & responsible	12	Project implementation plan with budget	Expert cost	$ 10,000.00
			ADEKUVS, CELOS, ADRON, SBBS and	12	Regular field tests executed and analyzed	Test developing	$ 5,000.00
			Private sector, NIMOS	12	Field team trained and equipped	Field preparation	$ 5,000.00
				10	Number of test carried out	Logistic costs	$ 5,000.00
						Subtotal	**$ 25,000.00**

Nr	Activities	Objective	Accountable & responsible & Other stakeholder	Duration or period in month allocated	Success Indicator(s)	Description	Estimate Costs in US$
2.3	Establish empty container program (separate collection of pesticide bottles and empty containers) the collection centers are the pesticide sales locations	To ensure safe disposal of the empty containers to prevent potential harm to the environment	LVV accountable & responsible NCCR, ATM	Ongoing	Number tonnes being collected	Continue introduction triple rinse program	To be determined
			LVV accountable and responsible, NCCR, ATM	Ongoing	Number collection centers established	Establish recycling collection centers	To be determined
			ATM accountable and responsible, NCCR, LVV	Ongoing	Number tonnes being exported for recycling	Establish/combine with private sector export od collected empty containers	To be determined
						Subtotal	To be determined
2.4	Support to laboratories for testing residues in food, humans and the environment	To improve the laboratory facilities and personnel for testing pesticide residues (LVV, BOG and UVS) for adhering to an acceptable national safety level	ADEK, ATM,VG,OW,LVV	Completed	National Chemical Profile		To be determined
			LVV accountable & responsible	Ongoing	See activity 3.2		To be determined
			BOG, ADEKUVS	Ongoing	Routine results from residue testing available	To be determined	To be determined
				12	Cross reference system with laboratories in the region	Testing /yearly To be determined	To be determined
						Subtotal	To be determined
2.5	Design training program attuned to level and discipline of stakeholders (Certificating !, implementation en training)	To provide a basic training package with all necessary information for stakeholders to adequately manage pesticide trade, movement and use	LVV accountable & responsible	12	Report on baseline assessment	Baseline assessment on needed program To be determined	To be determined
			NIMOS, ATM	14	Number of subscribers (companies, permitting authorities and trainers for trainers)	Campaign	$ 15,000.00
			Fire brigade, MINOV	18	Training packages designed for various stakeholders	Consultant and local experts	$ 35,000.00
						Subtotal	**$ 50,000.00**

Nr	Activities	Objective	Accountable & responsible & Other stakeholder	Duration or period in month allocated	Success Indicator(s)	Description	Estimate Costs in US$
2.6	Organize training for selected stakeholders and implement certification for pesticide trade and organize with permitting department that only certificated companies can obtain a permit	Improve safe pesticide management and guarantee the availability of adequate PPE at pesticides outlets. To provide relevant stakeholders – customs, farmers, suppliers, transporters, disposers - with necessary information on pesticides.	LVV accountable & responsible	24	Participants obtained certificates and are actively involved in pesticide management	Consultant training for trainers	$ 30,000.00
			NIMOS		Number of certified companies	Issuing certificates	$ 5,000.00
			HI		Number of submitted permits	Logistics training	To be determined
					Number of trained trainers for trainers		To be determined
						Subtotal	**$ 35,000.00**
						Total	**$ 287,000.00**
3	**Legal Activities**						
3.1	Develop subsidiary regulations on liability and redress (revise) to the 2005 Pesticide Act	To increase the compliance of suppliers and user of pesticides to the 2005 Pesticide Act	LVV accountable & responsible	3	Subsidiary regulations approved by stakeholders and by Council of Ministers	Not part of project	To be determined
			ATM, Min HI, Private Sector	4	Amendment Published	Not part of project	To be determined
						Subtotal	To be determined

Nr	Activities	Objective	Accountable & responsible & Other stakeholder	Duration or period in month allocated	Success Indicator(s)	Description	Estimate Costs in US$
3.2	Assess technical guidelines for the storage, transportation, handling, disposal and use of pesticides written by NIMOS. For the assessment the FAO guidelines can be used	To improve the storage, transportation, handling, disposal and use of pesticides	LVV accountable & responsible	3	Assessed and reported draft Final Guidelines	Research, cost to be determined	To be determined
			ATM, NIMOS	2	Approved by stakeholders	Workshop to discuss guidelines	$ 2,500.00
			Private Sector	Ongoing	Final guidelines approved by stakeholders and published	Distribution of information	$ 5,000.00
						Subtotal	**$ 7,500.00**
3.3	Improve and extend field testing for pesticides. Tests in line with the FAO protocol for agricultural crops are already implemented	To have a complete tool for assessing the risks associated with pesticide use for the environment before its release	LVV accountable & responsible	Implementation ongoing	Report on the sort of tests and number pesticide testing to be setup	Research cost to be determined	To be determined
			SBBS and private sector	12	Number reported pilot test	Pilot testing	$ 5,000.00
			ADEKUVS, CELOS,ADRON,	14	Approved of test layout by stakeholders	Workshop	$ 5,000.00
			VG	18	Test protocol approved by stakeholders and published	Distribution of information	$ 5,000.00
						Subtotal	**$ 15,000.00**
						Total	**$ 22,500.00**
4	**Develop cooperation between institutions**						
4.1	Re-establish or continue NCC for implementation of NIP and overall management of pesticides	To coordinate activities of the different institutions in the administration and collaboratively monitor the risks associated with different uses of pesticides and	NCC accountable & responsible	1	Memorandum of Understandings developed and implemented	The MU will elaborate on the ambitions and commitments of all relevant stakeholders	To be determined
			LVV	Ongoing	Identified and reported gaps in respect to the coordinating activity	Gap analyses of participant of NCC to improve effective operation of NCC	$ 5,000.00

Nr	Activities	Objective	Accountable & responsible & Other stakeholder	Duration or period in month allocated	Success Indicator(s)	Description	Estimate Costs in US$
		implementation of NIP	ATM	Ongoing	Identified and reported possible cooperation aspects that lead to cost effective NIP implementation	Update capability assessments for NIP implementation	To be determined
			NIMOS, HI, JP, VG	Ongoing	Number of meetings with stakeholders to report and discuss progress and hurdles in the cooperation	Administrative & logistic costs based 1 meeting per trimester (cost for 1 year)	$ 1,500.00
						Subtotal	**$ 6,500.00**
4.2	Develop bilateral agreements with institutions for collaboration in testing of pesticides	To commit institutions to regular laboratory testing (BOG/LVV/UVS) and field testing (UVS and other institutions) for support to the adequate and cost effective monitoring and management of pesticides	NCC accountable & responsible	1	Memorandum of Understandings developed and implemented	The MU will elaborate on the ambitions and commitments of all relevant stakeholders	To be determined
			Other Relevant Government agencies, Private Sector	Ongoing	Identified and reported gaps in respect to the coordinating activity	Gap analyses of participant of NCC to improve effective operation of NCC	To be determined
				Ongoing	Identified and reported possible cooperation aspects that lead to cost effective monitoring	Update capability assessments for NIP implementation	To be determined
				Ongoing	Number of meetings with stakeholders to report and discuss progress and hurdles in the cooperation	Administrative & logistic costs based 1 meeting per trimester (cost for 1 year)	$ 1,500.00
						Subtotal	**$ 1,500.00**

Nr	Activities	Objective	Accountable & responsible & Other stakeholder	Duration or period in month allocated	Success Indicator(s)	Description	Estimate Costs in US$
4.3	Support implementing (develop) an Emergency Response Plan (ERP) in case of pesticides released/spilled in the environment.	To coordinate the control of a possible release, spills of pesticides in the environment	ATM accountable & responsible	6	Report on baseline on ERP including recommendations on improvement of already implemented aspects and implementation of not yet implemented ERP aspects	Consultants/ risk mapping	$ 40,000.00
			NCCR responsible	12	Number of trained national ERP consultants that can organize information campaigns	Workshop/ Training and information campaigns on ERP	$ 5,000.00
			NIMOS, Other Relevant Government agencies, Private Sector	24	Number of reports on ERP safety audits and drills held	ERP audits cost to be determined	$ 1,000.00
						Subtotal	**$ 46,000.00**
4.4	Develop cooperation between institutions managing geodata archives (GMD, DBK, CBL etc)	To make geodata available for the different stakeholders working on site assessment	NH accountable & responsible	3	Archives are safeguarded and accessible	To be determined	To be determined
						Subtotal	to be determined
						Total	**$ 54,000.00**

Nr	Activities	Objective	Accountable & responsible & Other stakeholder	Duration or period in month allocated	Success Indicator(s)	Description	Estimate Costs in US$
5	**Increasing Awareness and Information Dissemination**						
5.1	Develop awareness materials to depict the hazards associated with Pesticides. Should be harmonized with waste!	To provide materials that can be (multi) used for awareness activities on pesticides	LVV accountable & responsible	**12**	Project implementation plan with budget	Expert cost	$ 10,000.00
			LVV		Evaluation and monitoring results of implementation are positive	Consultant Information Compilation/Gathering	$ 5,000.00
			OW			Folders, Teaching Packages, TV and Radio Ads	$ 30,000.00
			VG			Farmers instruction/ Demonstrations To be determined	To be determined
						Evaluation and monitoring To be determined	To be determined
						Subtotal	**$ 45,000.00**
5.2	Execute an awareness campaign for the general public. Should be harmonized with waste!	To sensitize general public on the impacts of Pesticide contamination on humans and the environment, hereby using folders, teaching packages, television and radio ads, etc.	ATM & LVV accountable & responsible	12	Program implemented	Design program To be determined	To be determined
						Prepare campaign To be determined	To be determined
						Exposing awareness materials through all sorts of media	$ 100,000.00
						Subtotal	**$ 100,000.00**

Nr	Activities	Objective	Accountable & responsible & Other stakeholder	Duration or period in month allocated	Success Indicator(s)	Description	Estimate Costs in US$
5.3	Develop a Website or webpage linked to existing internet site of the Ministry ATM (idem PCB's). Should be harmonized with waste!	To disseminate up to date information on Suriname's progress in implementing the SC	ATM accountable & responsible	12	Website or Webpage online	To be determined	To be determined
						Consultant Information Compilation /Gathering	$ 3,000.00
						IT Consultant &	$ 3,000.00
						Subtotal	**$ 6,000.00**
						Total	**$ 151,000.00**
	Summary						
1	**Maintain and improve technical capacity for better management of obsolete and POPs pesticides**						**$ 511,750.00**
2	**Maintain and improve technical capacity for better management of pesticides**						**$ 287,000.00**
3	**Legal Activities**						**$ 22,500.00**
4	**Develop cooperation between institutions**						**$ 54,000.00**
5	**Increasing Awareness and Information Dissemination**						**$ 151,000.00**
	Total						**$ 1,026,250.00**

Note:

- Responsible (in Dutch: verantwoordelijk): This is the organization or person that carries out the actual work. This party responds to the accountable party
- Lead/ Accountable (in Dutch: eindverantwoordelijk): This is the organization or person that has the final responsibility.
- Ongoing means that when this activity is implemented the monitoring of the containments, landfarms and phytoremediation sites are ongoing. The length of this activity is long (years)
- To be determined means: To be determined in a later phase of the NIP implementation because it is impossible to estimate the cost in this phase

Table 3.4 **Action Plan for Reduction of Unintentionally Produced POPs (PCDD, PCDF, PCB and HCB)**

Overall Activity: IMPROVEMENT OF PCDD/PCDF INVENTORY; COORDINATION BETWEEN STAKEHOLDERS					
Activities	Objective	Responsible/ Other Agencies	Estimated Duration (aimed completion date)	Success Indicator(s)	Estimate Costs in US$
Improvement and update of the current PCDD/PCDF inventory	To complete the inventory for a comprehensive overview on PCDD/PCDF & other UPOPs in Suriname including sources not addressed in the first inventory	ATM(lead) NIMOS Task team	12 month (01.12.2012)	• Releases of missing sources estimated • Final Report on completed inventory	10,000
Improvement of coordination between stakeholders related to Dioxin/UPOPs activities.	Coordination of activities between ministries and stakeholders for optimizing outcomes.	Ministries NCC Other Stakeholders	less than 12 months (01.06.2012)	• Stakeholder from different ministries and entities are included in implementation task team and are involved in tasks of respective competencies.	20,000
TOTAL					**30,000**

Improvement of Waste Management (harmonization with other WM activities)					
Activities	Objective	Responsible/ Other Agencies	Estimated Duration (aimed completion date)	Success Indicator(s)	Estimate Costs in US$
Legislation on waste management (WM) improved	To improve waste management by appropriate legal frame supporting the 3 R methodology for reduction, reuse and recycling of wastes.	ATM OW NIMOS	12 month (related to timing of the current WM activities in Suriname)	• Approval of waste legislation by Council of Ministers • Legislation Published	10,000
Regulation, enforcement and awareness raising to control the open burning of wastes	Reduction of UPOPs releases from open burning (open waste burning, landfill fires, agriculture burning, forest fires)	ATM (lead) NIMOS NGOs	18 months (01.12.2012)	• Existing guidelines enforced • Stakeholders reached • Enforcement officers trained	20,000
Development of a waste catalogue	Waste catalogue developed	ATM OW NIMOS	6 months (01.06.2012)	• Waste catalogue approved	30,000
Establish database for wastes generated in the country	To have all POPs, UPOPs and new POPs waste included in a database (this harmonized with a general waste database)	ATM (lead) OW NIMOS	18 months (01.12.2013)	• Database established	70,000
Establishment of management of Electronics and Electronic Waste as case study for management of new POPs containing wastes	To manage electronic waste according to 3R and reduce, reuse and recycle E-waste to manage new POPs PBDE containing wastes.	ATM (lead)	24 months (related to timing of the current WM activities in Suriname)	• Legal frame for E-waste management	To be determined
	Linking Stockholm Convention and Basel Convention activities	OW		• Commitment and involvement of private sector on support	

		NIMOS Related Private Sector		• Pilot project collection and management established	
Establish costing system for waste generation and management (deposition fees; export fees)	To establish appropriate fees which cover costs of waste management including aftercare of landfill, development of sanitary landfill	ATM (lead) Private Sector	24 month (related to timing of the current WM activities in Suriname)	• Fees and taxes established • Pilot study	40,000
Upgrading the informal sector working in the field of waste management and low tech recycling	To integrate people working in the informal sector into normal occupation. To have better trained work force in this recycling/waste sector.	ATM ATM NIMOS(lead) Private Sector	36 months (01.12.2014)	• Informal sector personal have been trained and upgraded and/or linked/integrated to waste/recycling business Number of people from informal sector trained	To be determined
Material and Substance Flow analysis of POPs and materials containng POPs	To have an overview on material and substance flow analysis of materials possibly containing POPs	ATM NIMOS ADEKUVS International Research Institutes	12 months (01.06.2013)	• Material flow and substance flow for selected materials and substances established	20,000
TOTAL					**190,000**

Implementation of BAT/BEP					
Activities	Objective	Responsible/ Other Agencies	Estimated duration (aimed completion date)	Success Indicator(s)	Estimate Costs in US$
Develop Policy and possibly legislative base for BAT/BEP requirements for facilities listed in Annex II and III.	To guarantee minimized releases of UPOPs and other pollutants by requirement of BAT/BEP in the permits of facilities	ATM (lead) HI NIMOS Relevant stakeholders	12 month (01.12.2012)	• Policy/Legislation draft prepared Number of staff in relevant competent authority trained	10,000
Improvement of the secondary iron smelter	To control releases of emissions from the smelter and to protect workers from exposure	ATM(lead) Private Sector	18 months (01.12.2012)	• BEP measures introduced	To be determined
Improvement of hospital waste treatment and management	To reduce releases of unintentionally POPs from hospital waste incineration	VG ATM NIMOS Private sector	24 months (01.09.2013)	• Hospital waste management of Suriname is improved and coordinated;. UPOPs releases have been reduced; solid residues are managed approriately	50000
Assessment of BAT/BEP options for the facilities not assessed in above project	To assess appropriateness and potential BEP (and BAT) improvement of Dioxin emitting facilities	ATM (lead) HI NIMOS	15 months (12.2012)	• Technologies assessed	20,000
TOTAL					**80,000**

Monitoring of status of POPs pollution in Suriname					
Activities	Objective	Responsible/ Other Agencies	Estimated Duration (aimed completion date)	Success Indicator(s)	Estimate Costs in US$
POPs monitoring activities for effectiveness evaluation	To monitor the status of POPs pollution in the matrix or matrices chosen for effectiveness evaluation (human milk/blood or others)	VG ATM (lead) ADEKUVS NGOs specifically women groups	15 months (01.12.2012)	• Human milk (or blood) sampled and sent to WHO laboratory • Data for effectiveness evaluation generated • Related research study with capacity building performed	30,000
Screening of selected food and feed for PCDD/PCDF and dl-PCB relevant for the Suriname food basket	To get an indication or overview on Dioxin/PCB contamination in food and feed	VG ATM (lead) ADEKUVS International partner	18 months (01.06.2013)	• Appropriate samples chosen, sampled and sent to laboratories • Results of the survey compiled	18,500
Monitoring and identification of potentially UPOPs contaminated sites (dioxins, PCB)	To get an overview of POPs pollution at potentially POPs polluted sites.	ATM (lead) NIMOS ADEKUVS	36 months (12.2014)	• Potentially contaminated sites selected and sampling • Collaboration partner selected • Number of sites monitored and identified	100,000
Establishment of research collaboration with international partners	To improve local POPs research capacity and have a link to global POPs research community	ATM (lead) ADEKUVS International partner	24 months (01.12.2013)	• Collaboration partner selected • Common research project established • Student(s) selected and sent	50000
TOTAL					**198,500**

Awareness RAISING and Information Dissemination					
Activities	Objective	Responsible/ Other Agencies	Duration and (aimed completion date)	Success Indicator(s)	Estimate Costs in US$
Awareness on Waste Management with emphasize of the 3 R Policy Strategies for practical implementation of reduce, reuse, recycle of waste Pilot project on waste separation at the source	To increase commitment in the population to understand material cycles and that waste is a resource and that the aim a "Zero Waste"	ATM (lead) OW MINOV ADEKUVS NGOs; Religious Communities	36 months (01.12.2014)	• Awareness raising materials selected and developed • Waste topic addressed in TV and radio • Reach out to industrial stakeholders achieved • Reach out to civil society and households	150,000
Execute an awareness campaign on POPs and chemicals for relevant stake holders (policy makers, workers/farmers, the general public)	To sensitize policy makers and general public on the impacts of POPs (humans and the environment), films, teaching packages, television and radio, etc. To link these activities with education activities on chemicals and sustainable consumtion and production.	ATM (lead) MINOV NIMOS NGOs Religious Communities	18 months (01.06.2013)	• Awareness raising material developed and selected • Reach out to relevant stake holders Activities harmonized with other POPs/chemicals awareness activities	30,000 (Exposing awareness materials through all sorts of media $30,000)
Develop a Website or webpage linked to existing internet site of the Ministry ATM for POPs and chemicals (all POPs; other chemicals)	To disseminate up to date information on Suriname's progress in implementing the Stockholm Convention. Link to basic information on POPs and chemicals at large	ATM (lead) ADEKUVS NGOs NIMOS	6 months (01.06.2012)	• Website or Webpage online • Reach out defined by clicks/month and downloads	10,000
TOTAL					**190,000**

NEW POPs

ADDRESSING POPs newly Listed in the convention					
Activities	Objective	Responsible/ Other Agencies	Duration (Aimed completion date)	Success Indicator(s)	Estimate Costs in US$
Establishment of inventories for the newly listed POPs	To have an overview on the possible presence, dimension and relevance of the different new POPs in Suriname.	ATM (lead) NIMOS Industrial sectors	12 months (01.07.2012)	Initial assessment to identify presence of new POPs done Inventory for the nine new POPs established	100,000
Assessment of the need for exemptions and acceptable purposes	To know the need for exemptions and acceptable purposes for new POPs having these options (PFOS, PBDE, Lindane) and to communicate it to the Stockholm Convention	ATM (lead), HI, Stakeholders	12 months (01.07.2012)	Requirements for exemptions determined and SC informed. Decisions on need for exemptions made	10,000
Legislation updated to restrict and manage new POPs	To update regulatory instruments that support compliance with Convention obligations in respect to new POPs	ATM (lead)	12 months (01.12.2012)	• Legislation approved	10,000
Assessment of stockpiles, articles in use and wastes	Identification of stockpiles, articles in use and wastes of new POPs containing materials.	ATM, LVV, HI OW NIMOS	18 months (01.12.2013)	• Stockpiles and articles in use are known	50,000
Establish management of stocks of materials containing new POPs	To assess and establish management options of materials	ATM OW NIMOS	18 months 01.12.2013	Overview on management options have been developed Pilot project for stocks and materials have been established and completed	To be determined

ADDRESSING POPs newly Listed in the convention					
Activities	Objective	Responsible/ Other Agencies	Duration (Aimed completion date)	Success Indicator(s)	Estimate Costs in US$
Assessment of sites possibly contaminated with new POPs	To get an overview on potentially new POPs contaminated sites and an initial risk assessment for environment and human exposure.	ATM (lead)	36 months (01.06.2015)	• Sites possibly contaminated with new POPs identified • Sites possibly contaminated assessed by measurements	200,000
Awareness raising on new POPs and awareness raising on alternatives to new POPs	Relevant stakeholders are aware on the key issues of new POPs and on the alternatives to new POPs	ATM (lead), HI MINOV NIMOS NGOs	36 months (01.12.2014)	• Information material for new POPs established • Stakeholders reached Knowledge on alternatives communicated	100,000
TOTAL					**470,000**

Note:

- Responsible (in Dutch: verantwoordelijk): This is the organization or person that carries out the actual work. This party responds to the accountable party
- Lead/ Accountable (in Dutch: eindverantwoordelijk): This is the organization or person that has the final responsibility.
- Ongoing means that when this activity is implemented the monitoring of the containments, landfarms, and phytoremediation sites are ongoing. The length of this activity is long (years)
- To be determined means: To be determined in a later phase of the NIP implementation because it is impossible to estimate the cost in this phase

Table 3.5 Action Plan for PCBs

Overall Activity: CONDUCT COMPREHENSIVE INVENTORY ON PCBs					
Activities	**Objective**	**Responsible/ Other Agencies**	Duration after Approval (in months)	Success Indicator(s)	**Estimate Costs in US$**
Conduct a comprehensive inventory together with risks assessments of PCB containing and contaminated equipment and materials	To establish through sampling and testing a complete overview of PCB containing equipment and materials including PCBs in possibly "open applications" and the remaining electrical devices	ATM(lead)/	ongoing	Interim Reports on completed inventory and risks assessments	200,000
		Private Sector			(Research Consultants $195,000 & Printing $5,000)
TOTAL					**200,000**

LEGAL INSTRUMENTS and TECHNICAL GUIDELINES for Managing PCBs					
Activities	**Objective**	**Responsible/ Other Agencies**	Duration after Approval (in months)	**Success Indicator(s)**	**Estimate Costs in US$**
Amending Decree Negative List 1999	To ban/prohibit the import of POPs including PCB containing materials	ATM(lead)/	6	Approval by Council of Ministers	To be determined
		HI, Private Sector		Amendment Published	To be determined
Develop Technical Guidelines for proper management of PCB containing and contaminated equipment and materials	To have uniformity in the management by owners of PCB containing or contaminated equipment and materials	NIMOS(lead)	6	Final Guidelines published	50,000
		ATM, Private Sector			(Research $35,000 & Printing $15,000)
TOTAL					**50,000**

DEVELOP COOPERATION BETWEEN INSTITUTIONS					
Activities	**Objective**	**Responsible/ Other Agencies**	Duration after Approval(in months)	**Success Indicator(s)**	**Estimate Costs in US$**
Establish a forum for government agencies and the private sector(owners of PCB containing and contaminated equipment and materials	To discuss and share experiences or information on matters concerning the proper management and phase-out of PCBs in their respective sector	ATM (lead) Private Sector	4	· Meetings of and reports produced by the forum	7,500 (yearly) (Administrative & logistic costs based 2 meetings per month)
Forum to produce an integrated database comprised of data, among others, on PCB containing and contaminated equipment and materials	To centralize information and data on the management of PCB containing and contaminated equipment and materials	ATM (lead) Other Relevant Government agencies, Private Sector	4	· Submission of Queries from the database to users	40,000 (Consultants development Database $30,000 & (IT) Equipment $10,000)
Forum to produce an Emergency Response Plan (ERP) in case of PCBs released in the environment	To coordinate the control of a possible release of PCB in the environment	ATM(lead) NCCR, Other Relevant Government agencies, Private Sector	8	· ERP known to all stakeholders	75, 000 (Consultants $65,000 & Printing $10,000)
TOTAL					**122,500**

IMPROVING TECHNICAL CAPACITY FOR BETTER MANAGEMENT OF PCBS					
Activities	**Objective**	**Responsible/ Other Agencies**	Duration after Approval (in months)	**Success Indicator(s)**	**Estimate Costs in US$**
Purchase 2 to 3 additional PCB Analyzers for the University laboratory	To increase services and output of the University laboratory, especially during implementation of the comprehensive inventory on PCB containing and contaminated equipment and materials	ATM (lead)	6	· The use of 2 to 3 additional PCB analyzers at the University	8500
Identify and train Stakeholders on ESM of PCB containing and contaminated equipment and materials. owners	To increase proper management of PCBs by all stakeholders including relevant government officials, owners of electrical devices, recycling businesses and the scrap metal buyers and operators	ATM (lead)	8	· Certificates of participation given to trainees	50,000 (Trainer $40,000 and Administrative & Logistic costs based 3 -4 training sessions $10,000)
TOTAL					**58,500**

INCREASING AWARENESS AND INFORMATION DISSEMINATION					
Activities	**Objective**	**Responsible/ Other Agencies**	Duration after Approval(in months)	**Success Indicator(s)**	**Estimate Costs in US$**
Develop reading and visual awareness materials to depict the hazards associated with PCBs	To sensitize general public on the impacts of PCB contamination on humans and the environment, hereby using folders, teaching packages, television and radio ads, etc.	ATM (lead)	10		65,000 (Consultant Information Compilation/Gathering $8,000 & Folders $10,000, Teaching Packages $25,000 & TV and Radio Ads $22,000)
Develop a Website or webpage linked to existing internet site of the Ministry ATM	To disseminate up to date information on Suriname's progress in implementing the Stockholm Convention	ATM (lead)	10	· Website or Webpage online	6,000 (IT Consultant $3,000 & Consultant Information Compilation /Gathering $3,000)
Organize Workshops to provide information to selected stakeholders	To provide all relevant stakeholders with necessary information on POPs including PCBs	ATM (lead)	12	· 2 – 3 workshops held	25,000 (Administrative & logistic costs for 2 - 3 workshops)
TOTAL					**96,000**

Appendix

Appendix 1. Existing Legal Instruments to Address Management of Chemicals

Legal Instrument (Type, Reference, Year	Responsible Ministries or Bodies	Chemical Use Categories Covered	Objective Legislation	Relevant Articles / Provisions
General				
Constitution S.B. 1987 no.116 last amended by S.B. 1992 no.38.	State	All types of chemicals	Provide rules for the sovereignty, principles for freedom, equity and democracy.	• Article 6g: The State is responsible to create and promote conditions, necessary to protect nature and preserve the ecological balance • Article 28: All employees have, independent of age, sex, race, nationality, religion or political opinions, the right to safe and healthy working condition; • Article 36 (2): The State shall promote the general health care by systematic improvement of living and working conditions and shall give information on the protection of health. • Article 48: the state supervises the fabric, availability and trade in chemical, biological, pharmaceutical and other products, intended for consumption, medical use and diagnoses. The state also supervises all medical professions, pharmacists and other paramedical practices. The monitoring of abovementioned products and professions will been forced by law.
Act on Standards (S.B. 2004 no. 121)	HI	All types of chemicals	Rules for promoting, developing, adopting and adjusting standards for goods and accepted operating procedures.	• Article 3: the Bureau of Standards is authorized to develop and set up or change standards • Article 6: the Minister can designate standards for the protection of *a.* the consumer or user against dangers to the public health or safety b. the environment; *c.* the national production, fair trade and social activity Article 11: Inspection of imported goods against set standards.

Legal Instrument (Type, Reference, Year	Responsible Ministries or Bodies	Chemical Use Categories Covered	Objective Legislation	Relevant Articles / Provisions
Act on the establishment of the Suriname Bureau of Standards (S.B. 2006 no.30)	Bureau of Standards	All types of chemicals	Establishment, purpose and duties of the Suriname Bureau of Standards	• Article 3: The objective is to set up an infrastructure for standards to stimulate economic activities and protecting the environment and health. • Article 3 (2): The bureau shall function as national Institute for: a. standards and technical regulations b. certification of goods and processes c. metrology accreditation of laboratories
Decree on operating licenses for enterprises (S.B. 1981 no. 145)	HI	All types of chemicals	Rules for the issuance of permits for enterprises and professions	It is prohibited for enterprises or professions in the field of trade, industry or tourism to operate without a written permit
State Order regarding the implementation of article 2 of the Decree on Operating Licences (S.B 1981 no. 147, last amended by S.B 1993 no. 51)	HI	All types of chemicals	Specific determination of enterprises or professions for which an operating license is required	Article 1 lists a number of enterprises and professions for which a license is required, for example: manufacturers of pesticides, paints etc.
Air emissions				
Hindrance Act G.B. 1930 no 64 amended by S.B. 2001 no. 63	HI (Districts Commissioner)	All types of chemical by products	Prohibits pollution of air through rules for the establishment of enterprises	Article 1: it is prohibited to establish an enterprise which can cause danger, damage or hindrance without a permit from the District Commissioner

Legal Instrument (Type, Reference, Year	Responsible Ministries or Bodies	Chemical Use Categories Covered	Objective Legislation	Relevant Articles / Provisions
Water emissions				
Police Criminal Law G.B. 1915 no 77 amended by S.B. 1990 no. 24	JusPol	Different chemicals	Regulates public order	Article 39a: penalizes the disposal of waste on public places; Article 51: polluting of a water resource or water well is fined. Article 45: the catching of fish through intoxication is prohibited.
Penal Code G.B. 1911 no1 as amended	JP	Different chemicals	Rules for public order	Articles 224, 225: contamination of water resources is penalized.
Harbors Decree 1981 S.B. 1981 no 86	MAS	Different chemicals	Provisions for harbor activities	Article 17: prohibits discharge of waste, oil, oil-contaminated water and condemned goods into public waters
Chemicals				
Act on the Movement of Goods S.B. 2003 no 58	HI	General	Rules for the liberalization of the international trade	Article 3: the movement of goods with foreign countries is free, except for: By State Order decided negative list, of which the import and export of goods are prohibited, require a license or require special treatment.
State Order Negative List SB 2003 no. 74 amended by S.B. 2006 no .100	HI	Different chemicals	Regulates goods from which the import and export is under restriction and divided into three categories 1) goods as to which the import and export is prohibited; 2) Goods that require a license;	Article 2: the goods from which the import and export are prohibited, require a license or otherwise are restricted are listed on the Negative List included as an annex to this State Order. In the list of goods from which the *import* is prohibited is included: - All apparatus or products that contain Ozone Depleting Substances (ODS) and all ODS, as mentioned in Annex A and B of the Montreal Protocol; except for those listed in annex A and B of the Montreal Protocol;

			3) goods that require special treatment.	- all kinds of waste - Pesticides (FAO Negative List) - Chemicals (FAO Negative List) - Chemicals and radioactive waste - Chemical Weapons In the list of goods for which the *import* license is required: - All ODS and apparatus or products that contain ozone depleting substances (except for those listed in annex A and B of the Montreal Protocol; - All chemicals (except for those listed on the FAO negative list), included methyl bromide and chemical - and radioactive substances. - Mercury - PCB and PCT containing apparatus The goods from which the *export* is prohibited include: - Chemical weapons
State Order on Detergents (G.B. 1952 no. 92)	VG	Consumer Chemicals	To determine requirements for detergents	Article 12: detergents and bleach that contain corrosive substances such as alkali or alkali substances should have visual warning symbols including a prescription of the harmful effects on the skin or on textiles.
State Order on Paints (G.B. 1952 no. 75)	VG	Paints	To specify the kind of paint and its components and the requirements for their composition	Article 2: indicates the names and the composition of the paint such as zinc white, unleaded, titanium dioxide, antimony oxide etc.

Legal Instrument (Type, Reference, Year	Responsible Ministries or Bodies	Chemical Use Categories Covered	Objective Legislation	Relevant Articles / Provisions
Pesticides				
Pesticides Act G.B. 1972 no 151 last amended by S.B. 2005 no. 18	LVV	Pesticides	Rules on handling and use of pesticides	• Article 2: the Minister of LVV can -in mutual agreement with the Minister of VG- prescribe by regulation which pesticides are banned. • Article 3: it is prohibited to sell, store or to use pesticides which are not allowed under this act. • Article 4: a pesticide is only allowed if: a. the content and the further composition (colour, shape, packaging specifications) comply with the criteria as specified by the Minister of Health b. with rational certainty is accepted, that the pesticide is reliable for proper use and has no side effects such as damage to the health, food, the production potential of the soil, plants or parts of plants or animals. • Article 5: the Minister of LVV grants a permit for the import of a pesticide. • Article 9: it is prohibited to transport, import, and store, sell or use pesticides for agricultural use that are listed on the "Negative List" of the Food and Agriculture Organization.
State Order on Pesticides S.B. 2005 no. 21(Implementation Regulation of the Pesticide Act)	LVV	Pesticides	Provide rules for the sale, storage, transport and the use of pesticides and the storage, removal, destruction of the packages and the residues of pesticides.	• Article 2-3: the oral and dermatologic toxicity of pesticides are classified in very poisonous, poisonous, less poisonous or dangerous for the health. The toxicity should be prescribed on the label. • Article 6- 7: the toxicity and other specific properties of pesticides should be printed on the label. Important data as danger symbols, colour of the pesticide etc. should be displayed prominently on front of the label.

				• Article 9: when using pesticides, protective clothing and equipment (gloves, coveralls, boots, goggles and respirator) should be worn, contact with skin and inhalation should be avoided, etc. • Article 10: it is prohibited to re-use empty containers of a pesticide with a skull symbol. • Article 15: pesticides should be stored in special storage place for security reasons and to protect human and the environment. • Article 16: the minister of Agriculture can prescribe by regulation how to safely dispose pesticide containers. The disposal of used containers and pesticides should be in such a manner that water collection areas or surface water is not contaminated. • Article 17: If working with pesticides, employers are obliged to have washing accommodation, protective clothing and equipment such as gloves, boots, coveralls, goggles, respirator, and hats for their workers. • Article 19: after working hours the pesticide storage building should be securely locked. The warning signs "Pesticides" and a skull symbol should be placed on the outside of the storage place.
Ministerial Order "labelling of pesticides" (Government gazette no. 4767)	LVV	Pesticides	Rules regarding the labelling of pesticides	• Article 2: on the label of the pesticides the following information should be stated: - Trade Name - Active Substances according to the International Union of Pure and Applied Chemistry (IUPC) - Percentage of active substances - Formula in which the product is offered - Type of pesticide - Netto quantity of the product in the package - Other substances - Toxicity - Danger symbols

				- Safety period - Correct dosage - Way of disposal of the package, - First aid in case of poisoning - Eventual effects on the environment - Contact information of the manufacturer, - Contact information of the importer - Batch number and date of expiration - Way of storage. • Article 3: the text on the label of the pesticide should be readable (minimal font of 10) in clear Dutch language; other languages can also be used e.g. English, Spanish, Portuguese. • Article 6: it is prohibited to give an improper impression of the use, toxicity; composition etc. is prohibited during the sale of these pesticides.
Occupational Health and Safety				
Safety Regulation 1 regarding the prevention and limitation of accidents in all enterprises G.B. 1947 no. 168	ATM	Different chemicals	Regulates the prevention and limitation of accidents	• Article 31: bottles that contain hydrochloric acid nitric acid, carbolic or caustic substances, should have visual warning symbols that indicate which kind of substance it contains. When these liquids are poured out, splashing should be prevented.
Safety Regulation 3 to provide First Aid G.B. 1948 no. 183	ATM	Different chemicals	Provide provisions for enterprises regarding first aid	Article 1: Enterprise where materials are present that are corrosive or poisonous or explosive or of a high temperature are obliged to provide effective first-aid in case of accidents.

Legal Instrument (Type, Reference, Year	Responsible Ministries or Bodies	Chemical Use Categories Covered	Objective Legislation	Relevant Articles / Provisions
Accident Regulation G.B. 1947 no. 145 amended by S.B. 2001 no. 66	ATM	Different chemicals	Provide rules for the liability of the employer in case of accidents or occupational disease of the employee and compensation	Article 25: some occupational diseases are disorders developed by the use of methyl chloride, radioactive substances, fertilizers etc.
Food Safety				
Penal Code G.B. 1911 no1 as amended by S.B 2004 no.5	JP	Different Chemicals	Regulates criminal offences in general	Articles 226 and 227: Persons who sell, deliver or handover goods that are harmful for health will be penalized
Ministerial Order on Process Water S.B. 2002 no. 11	VG	Different Chemicals	Regulates quality of process water	Article 4: The microbiology-physical-chemical research is done by the Central Laboratory of the Ministry of VG and the research in organoleptic and physical-chemical parameters is done by SWM, the environmental laboratory of the University and Central Laboratory of the Ministry of VG; Enforcement: Article 134, 135 Police Penalty code.
Disaster Management				
Law on the National Army (S.B. 1996 no.27)	DEF NCCR	Different Chemicals	Provide rules on the National Army of Suriname	Article 2: The Army is responsible for assistance for the prevention and control of disasters and accidents.
Law on the Fire Brigade (S.B. 1996 no. 96)	JP Fire Brigade	Different Chemicals	Provide rules on the institutional arrangements for the Fire Brigade	Article 5d: The Fire Brigade is responsible for supervision of storage of explosive or highly flammable substances.

Legal Instrument (Type, Reference, Year	Responsible Ministries or Bodies	Chemical Use Categories Covered	Objective Legislation	Relevant Articles / Provisions
Law on Transport, in-and export, transit, manufacturing, sale of Gunpowder and other explosives and highly flammable substances (G.B. 1938 no.76, last amended by G.B. 1949 no.72)	JP	Different Chemicals	Provide rules for the transport of gunpowder and other explosives and highly flammable substances	Article 1: For Public safety, the President can make rules for transport, in-and export, transit, manufacturing, sale of gunpowder and other explosives and highly flammable substances
Act on Safety and protection of civil aviation in Suriname (S.B. 2002 no.24)	TCT	Different chemicals	Rules on safety of civil aviation	It is prohibited to have on board an aircraft: explosives, weapons, hazardous substances, radioactive material, flammable substances, oxidized substances, corrosive substances, acid substances and other dangerous goods. The Minister of TCT can grant an exemption for these goods.

Legal Instrument (Type, Reference, Year	Responsible Ministries or Bodies	Chemical Use Categories Covered	Objective Legislation	Relevant Articles / Provisions
BILLS				
Act dated ....., concerning regulations for Sustainable Environmental Management (Environment Act)	Environmental Authority	Contaminants	Provide rules regarding the preservation, management and protection of a healthy environment	• Article 16: The Environmental Agency shall define in its regulations as environmentally polluting and shall determine what quantities respectively concentrations shall be deemed potentially dangerous for the environment; • Article 17: The Environmental Agency shall establish permissible pollution levels for dumping, releasing or discharging contaminants on land or into the soil, in the water or in the air or in the various geographical areas. • Article 18: The Environmental Agency shall grant a permit that allows the dumping, release or discharge of a contaminant on or into the soil, the water or the air in quantities or concentrations above the admissible norms, under general environmental condition.
Act dated ....., concerning regulations for the safe removal of waste (Afvalstoffen-wet)	OW	All chemicals	Rules for the safe handling of waste	The different waste streams are categorized in Household, farming and gardening, company and industrial waste, hazardous waste, effluent, dredging and car wracks. Article 25: it is prohibited to handover hazardous waste to others without a notification to NIMOS. It is also prohibited to collect hazardous waste without a permit from the Ministry of OW. Article 27: The Ministry of ATM and VG will prescribe the appropriate removal of hazardous waste by regulation.

Appendix 2. List Prohibited Pesticides Suriname 2009

In the goods transportation act (1999 and 2003) Surname has a list of chemicals banned for import. This list is adapted to the FAO list of prohibited chemicals. In accordance with de act on pesticides (S.B.no 18, feb. 2005) it is prohibited to store, possess, sell and use these chemicals. The pesticides are presented in the list below.

Name of prohibited pesticide	Name of prohibited pesticide
2,4,5-T	HCH
Aldrin	Heptachlor
Binapacryl	Hexachlorobenzene
Captafol	Lindane
Chloordaan	Mercury compounds
Chlordimeform	Monocrotophos
Chlorobenzilate	Parathion
DDT	Toxaphene
Dieldrin	Combination of benomyl <7 %;
Dinitro-ortho-cresol = DNOC	carbofuran<10 %; thiram <15 %.
Dinoseb	Methamidophos <60 %
1,2-dibromoethane = EDB	PCP
Ethylene dichloride	Phosphamidon
Ethylene oxide	Methyl-parathion
Fluoroacetamide	Tributyltin verbindingen

Source: Ministry LVV 2009

The penalties that will be used to stimulate the ban are:

- Detention
- Fine
- Forfeiture goods
- Destroy, return of banned pesticides on the cost of the offender

Based on the goods transportation act and related negative list also Methyl bromide is banned. This ban is initiated by the relevant part of the activities under the Montreal Convention (Ozon depleting substances)

The Ministry of LVV has stopped the import in 2006 of the following chemicals:

- Carbofuran
- Dimethoaat
- Endosulfan
- Methamidophos

These chemicals will be complete banned as soon as the stocks are used. Currently, a State Decree for the ban of Wholmansalts, endosulfan, endrin, dimethoaat, methamidophos and carbofuran is in process.

Appendix 3: Results of the POPs site inventory in Suriname

	Site/store affected	Commercial name	Toxicity Group (WHO)	Type of Container	Condition of Container	Number of containers	Quantity Kg	Quantity Ltr	Soil m^3	Comments/Remarks
1	Marienburg-Commewijne	HCH	II	Jute + Plastic bag - 25 kg	Bad	0	4,000	0	**50**	Originally 10,000 kg, seems much less now. Totaly wet, roof leaking
		Endrin	Ib	Metal drum - 200 Ltr	Corroded	0	0	0		Gone, leaked from drums
2	Fernandes Paramaribo	Stam-LV-1	III	Metal drum - 20 ltr	Corroded	4		80		Leaking
3	Peperpot Commewijne	Cupravit		Bags	Broken				5	Quantity of contaminated soil is unkown
		Bravo								
4	Oryza-Saramacca	Propanil	III	Metal drum - 200 Ltr	Bad and corroded	6	0	1,159		Quantity of contaminated soil is unkown
		Azodrin					0	0.4850		
5	Landbouwproefstation - Paramaribo	Lasso		Metal drum	Bad and corroded	1	10			Quantity of contaminated soil is unkown
		Daconate		Plastic drum	Good	1	4			
		Maneb	III	Bag	Bad	1	2			
		Several pesticides		Bags (4), bottles in plastic bags	Bad	4	100	?		
6	BOG-Paramaribo	DDT		Mixed with Dibrom	Bad		550		**10**	Buried
7	Bacove steiger	Peltis		Barrel	Bad	1		20		Quantity of contaminated soil is unkown
					Bad	12				
	Punwasi, Kwattaweg	Diquat		Metal drum - 200 liter	Corroded	1		175	**10**	Leaking
8	Slootwijk-Commewijne	Azodrin	Ib	Metal drum - 200 Ltr	Corroded	0	0	300		At least 20 liter present and quantity of contaminated soil is unkown
		Nuvacron	Ib	Metal drum - 200 Ltr	Corroded	0	0	300		

	Site/store affected	Commercial name	Toxicity Group (WHO)	Type of Container	Condition of Container	Number of containers	Quantity Kg	Quantity Ltr	Soil m^3	Comments/Remarks
9	Nw. Nickerie-Nickerie	Fen-ox		Bottle - 1 ltr	Affected	38		38		Bottles flattened and quantity of contaminated soil is unkown
		Mite-ox		Bottle - 0.5+1 ltr	Affected	7		5		Bottles flattened
		Karatox	II	Plastic bottle - 0.5 ltr	Affected	72		36		Bottles flattened
		Bravox	III	Plastic bottle - 0.5 ltr	Affected	27		13.5		Bottles flattened
		Actox	III	Plastic bottle - 0.5 + 1 ltr	Affected	26		13		Bottles flattened
10	Wageningen-Nickerie	Klerat	Ia	Plastic bag	Good	0	200	0	500	
		Dalapon	II	Paper bag - 20 kg	Good	0	4,000	0		Part of a trench at the back of the barn is used to dispose empty packaging.
		Etrofolan	II	Cardboard drum - 50 kg	Good	0	10,780	0	10	Trench was used to burn empty packaging for years
		Arrosolo	II	Metal drum - 200 ltr	Rusty	0	0	220		
		Frescon	III	Metal drum - 100 ltr	Rusty	0	0	331		
		Malariol	?	Metal drum - 200 ltr	Rusty	0	0	2,459		
11	Jules Chen	Sulfamethion ?						1		Quantity of contaminated soil is unkown
12	Suradel, Franchepanestr. Par'bo	Top Crop Flowable		Jerrycan	Good	31		279		
13	Bacove steiger	Benlate SP		Carton box	Good		1			Quantity of contaminated soil is unkown
		Derosal 500g/l		Plastic bottle	Good	338		1,690		
		Bravo C/M		Paper bag	Good		460			
		Calixin		Barrel	Good	1		200		
		Counter		Paper bag	Good	48	960			

	Site/store affected	Commercial name	Toxicity Group (WHO)	Type of Container	Condition of Container	Number of containers	Quantity Kg	Quantity Ltr	Soil m^3	Comments/Remarks
		Mertect 340 F		Plastic jerrycan	Good	166		1,257		
14	Nickerie	Derosal 500g/l		Plastic bottle	Good			600		Quantity of contaminated soil is unkown
		Calixin		Barrel	Good	4		800		
		Counter		Paper bag	Good		740			
		Fungaflor		Paper bag	Good		77			
15	Jarikaba	Mertect 220 SL		Plastic jerrycan	Good			100		Quantity of contaminated soil is unkown
		Diazinox		Plastic bottles	Good			16		
16	Bergwijn - Wanica	Furadan	II	Plastic bags - 25 kg	Good	70	1,750			Property of GPOV (semi-gov). Quantity of contaminated soil is unkown
17	Surland rijstbedrijf	NaPCP								
18	Apura/Blaka watra	2,4,5-T								Buried, LBB, Quantity of contaminated soil is unkown
19	Apura/Moeroekreek	Wolmanszout								
20	Victoria-Brokopondo	Gesapax 80	III	Plastic bag - 1 kg	Good	0	10	0		
		Endrin	Ib	Metal drum - 200 ltr	Good	0	0	100		
		Malathion	III	Metal drum - 200 ltr	Good	0	0	50		
		Propanil	III	Plastic bottle - 1 ltr	Good	0	0	12		
		Na Arsenite	I b	Glass bottle - 1 ltr	Good	0	0	2		

	Site/store affected	Commercial name	Toxicity Group (WHO)	Type of Container	Condition of Container	Number of containers	Quantity Kg	Quantity Ltr	Soil m^3	Comments/Remarks
21	Tijgerkreekwest-Saramacca	Chloor ipc		Metal drum	Bad	9		1,800		REPACKED
							23,644	**12,057**	**585**	

Direct risks	**Latent risks**
Risks	**Unknown**
Potential risks	**No risks assessed repacked**