# National Implementation Plan
## under the
# Stockholm Convention on POPs
## for Sri Lanka

UNEP

GEF

MINISTRY OF ENVIRONMENT SRI LANKA

**THE PERSISTENT ORGANIC POLLUTANTS (POPS) PROJECT**

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# MESSAGE FROM THE HON MINISTER OF ENVIRONMENT

In keeping with the Government's commitment to improve global environmental improvement through addressing national priorities, the preparation of the National Implementation Plan (NIP) for the Stockholm Convention on Persistent Organic Pollutants (POPs) can be considered a major milestone in our efforts towards improved environmental management in the country. Out of the twelve pollutants designated for international action under the Convention, Sri Lanka has already taken steps to ban eight of them long before the Convention came into force. Recognising the persistent nature of these chemicals and potential health hazards to human beings, Sri Lanka is committed to cooperate with the regional and international community in finding ways to control and eliminate these pollutants completely. This further confirms our commitments for the implementation of the Rio Declaration and the Johannesburg Declaration on Sustainable Development, through adoption of sustainable production and consumption patterns.

The NIP identifies the actions that Sri Lanka has to take in order to fulfil our obligations and responsibilities towards successful implementation of the Convention. The inventories of the three groups of POPs chemicals which were compiled through the NIP preparation process provide a good insight into the scope and scale of the situation in the country. The awareness creation and public education programmes conducted in the country for identifying the possible sources of these pollutants and the impacts of POPs and the steps that could be taken to control them effectively would be helpful in the implementation of the plan with adequate public participation.

I wish to thank GEF/UNEP for their financial assistance and guidance provided in the preparation of the NIP and congratulate my Ministry staff and all others who were involved, for their relentless efforts in preparing the NIP within the timeframe stipulated by the Convention. I would also like to assure the international community that our government will continue to take further measures to fully comply with our commitments under the Stockholm Convention.

Hon. Maithripala Sirisena
Minister of Environment

# MESSAGE FROM THE HON DEPUTY MINISTER OF ENVIRONMENT

It gives me great pleasure to send this message on the completion of the National Implementation Plan (NIP) for the Stockholm Convention on Persistent Organic Pollutants (POPs).

The twelve pollutants identified for global action under the convention are known to have properties highly detrimental to human and animal life and it is necessary that timely action is taken to eliminate them globally through local actions. The NIP has addressed the major issues of concern and presents the action plans and resource requirements required for its successful implementation.

It is noted that the release of unintentionally produced POPs in uncontrolled thermal processes and open burning of waste have to be reduced and restricted. A good awareness programme for stakeholders and the general public would be very useful in soliciting their cooperation in the successful implementation of the NIP. It requires national level inputs with public-private partnerships followed by regional and international cooperation especially in the area of environmentally sound transfer of technology.

Finally I would like to offer my grateful thanks to all government and non government institutions, and individuals that contributed to the preparation of the NIP.

Pandu Bandaranaike
Deputy Minister of Environment.

# PREFACE

The preparation of the National Implementation Plan (NIP) is the result of a series of activities including compilation of preliminary inventories on POPs Pesticides, Polychlorinated Biphenyls (PCBs) and the Unintentionally Produced Dioxins and Furans undertaken by this Ministry. Capacity building and Institutional Strengthening programmes, Awareness Raising and Information Dissemination together with a national data collection exercise comprised the balance components of the programme. The preliminary inventories have already been published.

The NIP details several activities to control and manage POPs in Sri Lanka. Capacity Building and Institutional Strengthening as well as Awareness raising on the detrimental effects of POPs are areas of high priority for the successful implementation of the NIP. Currently, Sri Lanka does not use any of the POPs pesticides, identified by the Stockholm Convention. The NIP has identified a few of the POPs for priority action. Polychlorinated Biphenyls (PCBs) in transformers need high resource utilization and development of expertise in management, control and elimination. In the case of restriction and control of unintentionally produced POPs such as Dioxins & Furans, PCBs and Hexachlorobenzene, the introduction of Best Available Technology & Environmental Practices (BAT/BEP), use of Cleaner Production Techniques in industry and awareness programmes would be necessary. A substantial amount of external inputs in expertise, technology transfer, use of external testing and treatment facilities are envisaged. It is also necessary to improve waste management practices locally by creating awareness on the detrimental impacts arising out of uncontrolled dumping and burning of waste.

The NIP was prepared with inputs from key stakeholders and the general public. The cooperation of other ministries, government agencies and private sector institutions would be necessary for the successful implementation of NIP. We look forward to their support and encouragement in this endeavour and hope to generate mutual strengthening of expertise and capacity of Sri Lanka in the different sectors relating to industry and environment.

The generous support and advice extended to us by GEF/UNEP in this national endeavour is greatly appreciated.

J.R.W. Dissanayake
Secretary
Ministry of Environment.

# FOREWORD

The National Implementation Plan (NIP) for the Stockholm Convention is the product of a concerted team effort with valuable contributions from many institutions, groups and individuals.

The project for the preparation of the NIP was implemented in collaboration with the United Nations Development Program (UNEP), with funding from the Global Environmental Facility (GEF).

The project activities followed a phased process set out in the GEF guidelines for actions under the Stockholm Convention viz. Determination of coordinating mechanisms and organization of process; Assessment and enhancement of national infrastructure and capacity and the establishment of POPs inventory; Setting up of priorities and determination of objectives; Formulation of a National Implementation Plan (NIP) and Specific Action Plans; and Endorsement of NIP by Stakeholders.

A Project Control Unit was established with a National Project Coordinator to coordinate the activities of the project. This unit was supported by a Technical Advisory Panel to provide technical guidance as and when necessary.

Six Task Teams were established in respect of POPs Management; POPs Monitoring; Socio Economic Aspects of POPs; POPs Pesticides; PCBs and PCB containing equipment; and Unintended by-products and industrial chemicals. Task Team members were selected from relevant stakeholder institutions. It is expected that this mechanism would in turn ensure continuation of the project activities after completion of the initial project. There were three mentors who provided guidance to the task teams in preparation of the inventories. All the Task Teams were assisted by International Consultants and the inventories and the NIP were subjected to a review by UNEP.

Stakeholder workshops were conducted during all stages of the project with high-level participation of representatives from various governmental, non governmental and private sector institutions. Many awareness programs at national, provincial and local authority level were also conducted to raise awareness on POPs and the country situation on POPs. Several media programs were also developed and telecast in this endeavour. An information system and a website were also developed during the project period to disseminate information and secure the cooperation of stakeholders and interested parties in developing the NIP and also in its implementation.

The NIP contains time bound action plans and resource requirements based on the recommendations of the task teams and on the comments of the stakeholder institutions and interested parties.

The Ministry of Environment expresses its sincere gratitude to all those who contributed at various levels to develop this document which would help Sri Lanka to implement the Stockholm Convention and facilitate the national and international community to reduce and eliminate the health and environmental impacts arising from POPs. The technical and financial assistance provided by UNEP/GEF is gratefully acknowledged.

L P Batuwitage
Project Director/Director Environment
Ministry of Environment

# ACKNOWLEDGEMENTS

The preparation of this National Implementation Plan (NIP) was a national effort involving many Ministries, Government Departments and Agencies, the Private Sector, non-governmental organizations (NGOs) and the general public. Inputs from a host of them, including individuals have been used to prepare the NIP. The NIP preparation process spanned across the tenure of three Ministers of Environment, Hon. Rukman Senanayake, Hon. A.H.M. Fowzie and our current Minister Hon. Maithripala Sirisena. It is with deep gratitude that we place on record the unstinted support provided by them in the functioning of the Project Implementation Unit and its activities leading to the successful completion of the NIP. Valuable assistance and guidance were provided by former Secretaries of the Ministry of Environment- Mr. Thosapala Hewage, Mr. D. Dissanayake, Mr. P. M. Leelaratne and our current Secretary, Mr. J. R. W. Dissanayake to whom we offer our grateful appreciation. Special thanks are also due to Mr. W. R. M. S. Wickremasinghe, Additional Secretary, who has been assisting the project team from the very inception in various ways and providing advice and guidance as well as reviewing project reports and publications. The services rendered by Mr. Anura Jayathilake of the Ministry of Environment during the project inception is also acknowledged.

The Global Environment Facility (GEF) through the United Nations Environmental Programme (UNEP) provided the bulk of the funding for this project without which the project may not have materialized. We offer our grateful thanks to them. In the provision of managerial expertise and advise on NIP preparation, particular mention should be made of the Task Managers for Enabling Activities at UNEP Ms. Fatoumata Ouane and Dr. David Piper who advised and guided the Project Director and National Project Coordinator in project implementation. Dr. Piper has been especially helpful in the review and advice on the completion of the three inventories and this NIP. The former National Project Coordinator (NPC) Dr. Rupa Wickremaratne, assisted by Mr. Lal Induruwage and Mr. Champika Somatileka, former Project Assistants and Ms. Menaka Dilrukshi former office assistant, have done a lot of work in the initial stages of the preparation of the NIP while Mr. Desmond de Silva, Financial Assistant, Ms. Dilani Sooriyarachchi, Project Assistant Mr. Lalith Perera, former Information Technology Assistant and Mrs. U.D.G.S. Uggala have been a great resource in assisting me in my duties. Ms. L.P. Batuwitage, the Project Director from the inception, has been a source of expertise and inspiration and she guided us well and offered her assistance to complete the NIP. Our thanks are due to all of them. The valuable cooperation provided by key institutions such as the Ceylon Electricity Board (CEB), Lanka Electricity Company Ltd (LECO) and Lanka Transformers Ltd (LTL), Office of the Registrar of Pesticides, Central Environmental Authority, Industrial Technology Institute (ITI), Tea Research Institute, Customs Department, Ministries of Health, Industries, Science and Technology, National Planning and the Department of Imports and Exports is acknowledged with gratitude. They provided a great deal of expertise and data and also released some of their key staff to function as Task Team Members in NIP preparation. Dr. A.M. Mubarak, Director, ITI, Dr. G. Manuweera, Registrar of Pesticides and Ms. L.P.Batuwitage functioned as Mentors for the Task Teams and offered their expert advise. Dr. Neville Goonewardena, Deputy Director General of Customs and Mr. K.D.G.Bandaratileka Deputy Director General of CEA are the other members of the Technical Advisory Panel who provided guidance and advice to the PCU as well. Mr. R. H. R. Lokubalasuriya, Deputy General Manager, Ceylon Electricity Board has been particularly helpful with technical advice. Final technical review of this NIP was done by Prof. Ajith de Alwis of the University of Moratuwa, who provided valuable comments. The National Coordinating Committee (NCC) has met regularly and reviewed progress of the project activities and outputs; we wish to thank the NCC members for their patience and valuable inputs towards the preparation of the NIP. Finally, we wish to record our appreciation for assistance provided by numerous other ministries, departments, institutions and individuals who have assisted us in various ways in ensuring that the project activities could be successfully completed.

S.A.M.Azmy
National Project Coordinator

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| | |
|---|---|
| °C | Degrees Celsius |
| 2,4,5-T | 2,4,5-Trichlorophenoxyacetic acid |
| a | Year (annum), 365 days |
| ADt | Air-dried ton (of pulp) |
| APC(S) | Air pollution control (system) |
| BAT | Best available techniques/technologies |
| BHC | Benzenehexachloride |
| BOI | Board of Investment of Sri Lanka |
| C | Chlorination bleaching stage using molecular chlorine dispersed dissolved in water (pulp and paper production) |
| CAS | Chemical Abstract Service |
| CEA | Central Environmental Authority |
| CEB | Ceylon Electricity Board |
| CFR | Case Fatality Rate |
| CMC | Colombo Municipal Council |
| CNP | 2,4,6-Trichlorophenyl-4'-nitrophenyl ether |
| COP | Control of Pesticides |
| CRI | Coconut Research Institute |
| CTC | Ceylon Tobacco Company Limited |
| CTMP | Chemo-thermo-mechanical pulp |
| D | Chlorine dioxide bleaching stage using a water solution of chlorine dioxide (ClO2) (pulp and paper production) |
| d.m. | Dry matter |
| DDD | Dichlorodiphenyldichloroethane |
| DDE | Dichlorodiphenyldichloroethylene |
| DDT | Dichlorodiphenyltrichloroethane |
| DDTs | Total DDT and its Metabolites |
| DL | Detection limit |
| E | Extraction bleaching stage using sodium hydroxide (NaOH) |
| ECF | Elemental chlorine free (bleaching) |
| ECVM | European Council of Vinyl Manufacturers |
| EDC | 1,2-Dichloroethane |
| EPA | Environmental Protection Agency |
| EPL | Environmental Protection Licence |
| EPZ | Export processing Zones |
| ESP | Electrostatic precipitator |
| EU | European Union |
| FTA | Free Trade Agreement |
| g | Grams |
| GC | Gas Chromatography |

| | |
|---|---|
| GCMS | Gas chromatography Mass spectroscopy |
| GDP | Gross Domestic Product |
| GEF | Global Environment Facility |
| Gen. Aux | Generation Auxiliary Transformers |
| GSMB | Geological Survey and Mines Bureau |
| GWh | Giga watt hours |
| h | Hour(s) |
| HCB | Hexachlorobenzene |
| HCB. | Hexa chloro benzene |
| HCE | Hexa chloro ethylene |
| HDI | Human Development Index |
| HEPZ | Horana Export Processing Zone |
| HPLC | High Performance Liquid Chromatography |
| HS Codes | Harmonized System codes |
| HW | Hazardous waste |
| IARC | International Agency for Research on Cancer |
| IDB | Industrial Development Board |
| IPHTR&DC | Institute of Post Harvest Technology Research and Development Centre |
| IPM | Integrated Pest Management |
| IPP | Independent Power Producers |
| ISO | International Standardization Organization |
| I-TEF | International Toxicity Equivalency Factor |
| I-TEQ | International Toxic Equivalent |
| ITI | Institute of Industrial Technology |
| IVM | Integrated Vector Management |
| K | (Degree) Kelvin |
| kg | Kilograms |
| kPa | Kilo Pascal (= one thousand Pascal) |
| kVA | Kilo volt Ampere |
| l | Liter |
| LECO | Lanka Electricity Company (Pvt) Ltd |
| LOI | Loss on ignition (a measure for residual carbon content) |
| LP | Liquefied petroleum |
| LTL | Lanka Transformers Limited |
| LW/TW | Ratio between the total weight and the liquid weight |
| ME&NR. | Ministry of Environment and Natural Resources |
| ME | Ministry of Environment |
| MEPZ | Mirigama Export Processing Zone |
| Mg | Magnesium |
| mg/l | Milligrams per Litre |
| MRL | Maximum Residue Limit |
| MSW | Municipal solid waste |
| MVA | Mega volt ampere |
| MW | Megawatt |

| | |
|---|---|
| NA | Not applicable (not a relevant release vector) |
| $Na_2S$ | Sodium sulfide |
| NaOH | Sodium hydroxide |
| NARA | National Aquatic Resources Research and Development Agency |
| NASTEC | National Science and Technology Commission |
| NCASI | National Council (of the Paper Industry) for Air and Steam Improvement, Inc. |
| NCC | National Coordinating Committee |
| NCS | National Conservation Strategy |
| ND | Not determined/no data /Not detected |
| NEA | National Environmental Act. |
| NEP | National Environmental Policy |
| NERDC | National Engineering Research and Development Centre |
| ng | Nanogram |
| NIP | National Implementation Plan |
| $Nm^3$ | Normalized (standard) cubic meter; the volume a gas occupies at atmospheric pressure (1,013 mbar) and 273.15 K (0 °C) |
| NTEQ | Toxic equivalent using the Nordic scheme (commonly used in the Scandinavian countries)[1] |
| NWPEA | North Western Province Environmental Authority |
| O | Oxygen bleaching stage (pulp and paper production) |
| PAH | Poly aromatic hydrocarbon |
| PARCOM | Paris-Oslo Commission |
| PBB | Polybrominated Biphenyl |
| PCB | Polychlorinated Biphenyl |
| PCDD | Polychlorinated dibenzo dioxin |
| PCDF | Polychlorinated dibenzo furan |
| PCI | Per Capita Income |
| PCP | Pentachlorophenol |
| PCP-Na | Sodium pentachlorophenate |
| PCT | Polychlorinated tetraphenyl |
| PeTAC | Pesticide Technical and Advisory Committee |
| PIC | Prior Informed Consent |
| POPs | Persistent Organic Pollutants |
| ppm | Parts per million |
| ppb | Parts per billion |
| PTS | Persistent toxic substances |
| PVC | Polyvinyl chloride |
| RDA | Road Development Authority |
| RDF | Refuse derived fuel |
| RSS | Ribbed smoked sheet |
| SAICM | Strategic Approach for International Chemical Management |
| t | Ton (metric) |

| | |
|---|---|
| TCF | Totally chlorine free (bleaching) |
| TEF | Toxicity Equivalency Factor |
| TEQ | Toxic Equivalent |
| TRI | Tea Research Institute |
| TW | Total weight |
| UN/UNO | United Nations Organization |
| UNEP | United Nations Environment Programme |
| UV | Ultra-violet |
| VCM | Vinyl chloride monomer |
| WHO | World Health Organization |

# EXECUTIVE SUMMARY

Sri Lanka became a signatory to the Stockholm Convention on Persistent Organic Pollutants (POPs) on 5th September, 2001 and ratified the Convention on 22nd December 2005.

In order to meet her obligations towards the Convention, the Government of Sri Lanka initiated activities to prepare the National Implementation Plan (NIP) for the control of Persistent Organic Pollutants (POPs) with the assistance of United Nations Environment Programme and Global Environmental Facility (UNEP/GEF). Twelve Persistent Organic Pollutants (POPs), due to their toxicity, persistence and other detrimental properties are designated for international action with a view to final elimination worldwide. Eight of these are pesticides, two are industrial chemicals and the other two are unintentionally produced chemicals. The Pesticides are; Aldrin, Chlordane, Dieldrin, Endrin, Heptachlor, Hexachlorobenzene (HCB), Mirex. Toxaphene and are no longer used in Sri Lanka. Two industrial chemicals; Polychlorinated Biphenyls (PCBs) and Hexachorobenzene (HCB) which is also a pesticide had extensive usage in Sri Lanka. The two unintentionally produced by products are Dioxins (Polychlorinated Dibenzo Dioxin - PCDD) and Furans ( Polychlorinated Dibenzo Furan (PCDF).

The project for the formulation of the National Implementation Plan (NIP) was planned so as to generate an integrated and workable NIP, with the satisfactory execution of the following activities:

1. Establishment of a coordinating mechanism
2. Formulation of POPs inventories and assessment of infrastructure and capacities
3. Priority setting and determination of objectives
4. Formulation of the National Implementation Plan (NIP)
5. Endorsement of the NIP by the stakeholders

For the formulation of the NIP and determination of the baseline situation, it was necessary to compile preliminary inventories of POPs, which would help determine the scope of the POPs issue in Sri Lanka. For this purpose, six Task Teams were set up to contribute towards the NIP preparation out of which three teams were assigned to the formulation of 3 inventories namely POPs Pesticides, Polychlorinated biphenyls (PCBs) and unintentionally produced Dioxins and Furans. The other three teams were assigned with Tasks to evaluate the legislative framework, socioeconomic issues, country baseline situation, assess and generate data on POPs in the environment, institutional capacities on POPs monitoring etc. Since one of the major aims of the project was to build capacity of stakeholder institutions, all the Task Team members were selected from relevant stakeholder institutions in order to facilitate capacity building, which is a major objective of the project so that implementation activities could be conducted without major problems.

Sri Lanka has been fortunate that the detrimental effects of POPs have been noted long before the Stockholm Convention came into force and substantial measures have been taken even decades before the convention was signed by Sri Lanka and has never manufactured any of the POPs chemicals. For instance, while there is no history of use of Hexachlorobenzene and Mirex, Dichlorodiphenyltrichloroethane (DDT) has been banned from agricultural uses in 1970 and from all other uses such as for vector control by 1976. By 1996 Chlordane, the last of the POPs pesticides was banned from all uses in Sri Lanka. Even in the case of Polychlorinated Biphenyls (PCBs), in the 1990s, in some instances safety measures have been taken by storing used PCB oils in steel drums securely for safe disposal in the future.

Sri Lanka is also a party to the Basel Convention on the Control of Transboundary Movements of Hazardous Waste and their Disposal and is obliged to find environmentally sound solutions for all POPs chemicals as wastes. Similarly, Sri Lanka has ratified The Rotterdam Convention on the Prior Informed

Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade which became international law and thus legally binding on its members today.

***POPs PESTICIDES***

The currently recommended pesticides are less toxic and less persistent than the earlier pesticides. The stocks of outdated POP pesticides are negligible and hence disposal is not a serious issue but larger stocks of out-dated non-organochloro pesticides need immediate attention. Although DDT was prohibited from use in agriculture in 1970 and from public health in 1976, traces of DDT and its derivatives have been detected in some environmental compartments and this needs further investigation. There is limited information available on the residues of these chemicals in groundwater and surface water bodies, which are found in large numbers in agriculture areas. Awareness on POP pesticide related issues, concerns and required remedial measures are alarmingly poor among most of the sectors in the society. Replacement of all POP pesticides with other chemical alternatives in agriculture, public health vector control, industrial uses such as wood preservation and termite control have been successfully implemented in Sri Lanka.

***Problems related to POPs Pesticides***

- *Possibility of illegal imports through false declarations*
- *Lack of resources for systematic screening of imports*
- *Environmental impacts and baseline levels not adequately studied*
- *Lack of sufficient resources for identification and analysis*
- *Inadequate Health impact data*
- *Stocks of outdated Non-POPs pesticides still to be disposed.*

***Management Actions Identified***

1. Improvement of pesticide regulatory system to adequately address the specific issues
2. Mechanism to minimise accumulation and safe disposal of outdated pesticides, at all levels
3. Development and implementation of proper information gathering and dissemination system
4. Develop Laboratories and analytical capacity
5. Monitoring and surveillance of environmental and human health effects

***Polychlorinated Biphenyls (PCBs)***

PCB is an industrial chemical which was used extensively all over the world. Transformers used in Sri Lanka have been imported from over twenty countries and cover many models produced for Generation, Transmission and Distribution. PCB was used extensively as a dielectric in transformers until international production ceased in 1986. Of the estimated 18,500 transformers in the electricity and industrial sector, a very few pure PCB transformers have been identified. Initially it was assumed that only transformers manufactured before 1986 had high probability of containing PCB. However, sampling across different era of manufacture using field test kits and laboratory analysis indicates that there is a very high degree of cross contamination of even non-PCB transformers during routine maintenance even among relatively new transformers. Thus, on subsequent random sampling of "Non PCB" transformers, a several PCB contaminated transformers (within the range of 50-2000 ppm PCB) have been identified. The contamination is assumed to have taken place during maintenance activities or the in adverted use of PCB contaminated oil.

For elimination of PCB several alternatives are currently available. Three test burning experiments have been conducted for PCB destruction of transformer oils at a Cement Kiln in Sri Lanka and this could be a positive development in PCB management.

***Problems related to PCBs***

- *Lack of adequate legislation to control imports*
- *Environmental impacts and baseline levels not adequately studied*
- *Lack of sufficient resources for identification and analysis*
- *Lack of acceptable treatment, disposal and storage systems for PCB contaminated oils and equipment.*
- *Contaminated sites yet to be identified.*
- *Cross Contamination of non PCB oil with PCB oil*

***Management Actions Identified***

1. Develop new legislation for management and prevention of new entry to the country
2. Establish full inventory of PCB containing equipment
3. Establish procedures for equipment maintenance
4. Establish appropriate laboratory facilities for PCB analysis.
5. Establish and implement guidelines for phase out, transportation, storage and disposal of PCB containing equipment
6. Establish progress monitoring mechanisms

7. Capacity building for control and management of PCBs
8. Disposal of existing stocks and stockpiles
9. Rehabilitation and decontamination of contaminated sites
10. Introducing control measures to prevent cross contamination.

***Unintentionally Produced POPs***

The estimates of Unintended POPs produced in Sri Lanka were made using a toolkit developed by UNEP. The main sources of releases of PCDD and PCDF (Dioxins and Furans) in Sri Lanka were identified as:

- The uncontrolled combustion of wastes, primarily in dumps and in the open;
- The processing of metals, in particular scrap copper where a significant amount of PCDD/F is likely to be associated with the residues from gas cleaning systems;
- The incineration of medical wastes which is largely carried out under very poorly controlled conditions;
- Burning of biomass in homes for cooking, industry and for disposal of agricultural residues.

Estimates of releases to air and residues were far greater than for releases to water, land or in products. This reflects both the nature of the main sources (thermal processes giving air emissions and residues from gas cleaning and combustion) and a lack of data to estimate releases to other media.

***Problems related to unintentionally produced by products***

- Lack of information to enable an estimate of releases associated with certain industries burning wastes, in particular textile off cuts and other waste.
- Lack of data on several categories of accidental fires.
- Lack of appropriate emission factors for some sectors. Of particular significance would be the lack of data on releases to water, for example associated with textile and leather industries.
- Lack of emission factors that relate to the burning of wastes and biomass is noted and further testing will greatly increase confidence in the estimated emissions.
- Significant uncertainty in relation to the amounts of waste that are ultimately burned in dumps and landfills, the fate of medical waste and the quantities of biomass that are used in the country.
- Uncertainty over the appropriate emission factors for the metal processes, biomass combustion and related to textile and leather processing in addition to the burning of wastes in dumps and in the open.

***Management Actions Identified***

1. Incorporate BAT/BEP requirement into legislation for new sources
2. Review & upgrade relevant legislation/s on solid waste management
3. Implement proper solid waste management/disposal mechanism
4. Implement proper medical wastes disposal techniques
5. Review existing technology on secondary metal recycling plants, including traditional industries, and identify necessary changes for upgrading these systems
6. Review existing crematoria designs for their acceptance and identify changes
7. Research and Development.

**Resource Availability and Requirements for management of POPs**

During the NIP preparation process a substantial amount of Capacity Building was done in terms of training of Task Teams to generate the inputs required for this NIP. Awareness raising among stakeholders was conducted through workshops, distributed printed materials and through electronic media such as Radio, TV and CDs. Institutional strengthening and further building of expertise have been included in the action plans of this NIP. While local expertise was available for identifying the scale of the POPs Pesticide issues, external expertise through foreign consultants was used for PCBs and Dioxins & Furans in the process of NIP development. In addition, managerial expertise was provided by UNEP throughout the project implementation.

There is a lacuna in expertise for NIP implementation in the area of technical expertise and Technology Transfer. While some expertise may be available in the country, access to same may be limited due to various reasons and therefore, enhancement of local expertise on POPs management is highly recommended. Human Resources Development in this area may not be difficult as adequate human resources are currently available in the country with basic engineering and technical skills. A good framework for the control of chemical import and use, especially for pesticides is in place and many of the unsafe pesticides have thus been banned or prohibited from import completely. This has been possible due to the availability of the expertise to handle the issue of certain pesticides effectively. In the need for external inputs for capacity building, particular mention can be made under the following:

i) Application of Cleaner Production Technology

A Cleaner Production (CP) Centre functions in Sri Lanka under the Ministry of Industrial Development as the host institution. A National Policy and Strategy for CP was also formulated in 2005 by the Ministry of Environment in collaboration with the CP Centre and other stakeholders. However multi disciplinary approaches and. additional expertise in Industry Specific CP techniques would be essential for the implementation of the NIP.

ii) Decontamination of Contaminated Sites

Decontamination has hardly been done in the country.

iii) Management of Stockpiles

iv) POPs treatment techniques, especially for PCBs

v) Effective control of generation of Unintended POPs.

vi) Fate and Effects Modelling

vii) Application of Best Available Technologies and Environmental Practices (BAT/BEP)

viii) Sampling and Analysis of POPs

The expertise available in the above fields in Sri Lanka has been confined to certain institutions such as the Universities, National Engineering Research Centre (NERD), Industrial Technology Institute (ITI), Office of the Registrar of Pesticides (RoP) etc. However such expertise may not be specific to POPs, hence there is a need for external expertise, on specific POPs issues.

Based on the analysis of the country baseline situation and the provisions of the Stockholm Convention along with other relevant international treaties, action plans were developed under six (6) broad categories viz; Action Plan 1: Institutional and Regulatory Strengthening Measure, Action Plan 2 : Management of POPs Pesticides, Action Plan 3 : Management of PCB and Equipment Containing PCBs, Action Plan 4 : Management of Unintentionally Produced POPs by-products, Action Plan 5 : Monitoring, Action Plan 6 : Public Awareness Information Dissemination and Training.

Management options/activities were identified under each of these categories under which detailed activities were developed.

The action plans in this NIP stipulates specialised needs for specific activities under each prioritised issue. Costing for same has been indicated considering requirements of Local and Foreign expertise, Equipment, disposal and treatment facilities. Human, Capital and Operational Costs have been quantified and mentioned separately in this NIP. The Costs in US Dollars for the different activities over a three, six and over six year periods are as follows:

**TABLE OF COST ESTIMATES FOR IMPLEMENTATION OF ACTION PLANS**

| **Period** | **Estimated Costs in US $** | | | | |
|---|---|---|---|---|---|
| | Pesticides | PCBs | Unintended Releases | Monitoring | Management |
| **Short Term (Three Years) 2007-2009** | **1,583,320** | **1,591,150** | **1,402,100** | **917,400** | **1,407,400** |
| **Medium Term (Six Years) (Continuation of short term activities also included Upto year 2012)** | **2,407,100** | **1,979,800** | **7,005,300** | **805,600** | **7,194,500** |
| **Long Term (Continuation of Medium Term Activities also included up to 2016)** | **291,100** | **845,200** | **177,604** | **511,200** | **211,204** |
| **Total Estimated up to 2016** | **4,281,520** | **4,416,150** | **8,585,004** | **2,234,200** | **8,813,104** |

**TABLE OF TOTAL COSTS FOR SHORT, MEDIUM AND LONG TERM ACTIVITIES**

| Period | Estimated Costs in US $ |
|---|---|
| **Short Term (Three Years) 2007-2009** | **6,901,370** |
| **Medium Term (Six Years) Continuation of short term activities included up to year 2012** | **19,392,300** |
| **Long Term – Continuation of Medium Term Activities included up to 2016** | **2,036,307** |
| **Total Estimated up to 2016** | **28,329,977** |

Hence for the three year period from 2007 to 2009 approximately US $ 7.0 Million is required for short term activities, while a six year term from 2007 to 2012 would require an additional US $ 19.4 million including continuation of short term activities, and a further continuation and additional activities up to the year 2016 would require a further US $ 2,036,307. Thus a total of US $ 28.329 million is estimated to be needed up to the year 2016 for all activities related to management and control of POPs in Sri Lanka scheduled to commence in 2007.

While a high input of local funds may be available, through the annual budgets of the Ministry of Environment and other Ministries and government agencies, the major funding has to be secured from external sources. It is estimated that approximately 30 % of the funding estimates would be in-kind contributions of State resources such as the services of permanent staff, office space, equipment and services. The Government, as a party to the Stockholm Convention, has already allocated US$ 130,000 to the Ministry of Environment directly for POPs implementation activities in 2007. This is in addition to the currently available resources of the Ministry such as infra structure, staff and equipment and excludes salaries of permanent staff and other resources at the Ministry of Environment, as well as at other Ministries and government agencies.. ..

Chapter

1

## 1.0 INTRODUCTION

Persistent Organic Pollutants (POPs) are organic compounds that resist photolytic, chemical and biological degradation. They are characterized by low water solubility and high lipid solubility, resulting in bioaccumulation in fatty issues. They are semi volatile which enables movement over long distances in the atmosphere before deposition occurs. These properties of unusual persistence and semi volatility coupled with other characteristics cited above have resulted in the presence of these compounds all over the world and even in regions where they have never been used. Humans can be exposed to POPs through diet, occupational accidents and the environment (including indoors). Exposure to POPs either to acute or chronic can be associated with wide range of adverse health effects including life threatening genetic dysfunctions. POPs includes 12 chemicals, referred to as the "dirty dozen" have been identified by for control and management with a view to final elimination under the Stockholm Convention.

Sri Lanka became a signatory to the Stockholm Convention on Persistent Organic Pollutants (POPs) on 5th September, 2001 and the Ministry of Environment was designated as the focal point for the Convention. In order to meet the obligations towards the Convention, the Ministry of Environment secured funding through the Global Environmental Facility (GEF) for the preparation of a national implementation plan (NIP) for the control of POPs. A National Project Director and a Coordinator were appointed and a Project Coordinating Unit (PCU) under the Ministry of Environment was established to coordinate and prepare the NIP. The project was executed in collaboration with relevant stakeholders. With the establishment of the PCU, a National Coordinating Committee (NCC) was constituted under the chairmanship of the Secretary, Ministry of Environment. The NCC comprised of representatives of regulatory, implementing and monitoring agencies including line ministries . Subsequently a Technical Advisory Panel (TAP) was also set up to facilitate the input of expertise in the development with a mandate to review and advise on technical issues. Sri Lanka is also a party to the Basel Convention on the Control of Transboundary Movements of Hazardous Waste and their Disposal and is obliged to find environmentally sound solutions for all POPs chemicals as wastes. Hence this project is also instrumental in implementing provisions under the Basel Convention as well. Sri Lanka became a party to the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, in January 2006. POPs too are included as hazardous chemicals and pesticides under this Convention. Hence, the Basel Convention and Rotterdam Convention implementation activities will be highly conducive and complement many activities in NIP implementation. The twelve chemicals designated for international action by the Stockholm Convention are grouped into 3 categories viz;

- Pesticides

  Aldrin

  Chlordane

  DDT

  Dieldrin

  Endrin

  Heptachlor

  Mirex

Toxaphene

- Industrial Chemicals

  Hexachlorobenzene (HCB) which is also used as a pesticide

  Polychlorinated Biphenyls (PCBs)

- Unintended by-products

  Dioxins (Polychlorinated Dibenzodioxin-PCDD)

  Furans (Polychlorinated Dibenzofuran-PCDF)

HCB and PCBs were used as pesticides in the past and they may be also be produced as unintended by-products of certain anthropogenic activities.

The main objective of the Stockholm Convention is the Precautionary Principle: Protecting human health and environment from Persistent Organic Pollutants.

Article 3 of the Convention states that: Parties shall: [Article 3, para. 1]

(a) "prohibit and/or take the legal and administrative measures necessary to

eliminate":

(i) production and use of chemicals in Annex A (Aldrin, Chlordane,

Dieldrin, Endrin, Heptachlor, Hexachlorobenzene, Mirex, Toxaphene,

Polychlorinated biphenyls (PCBs))

and

(ii) import and export of chemicals in Annex A

i.e., trade is restricted

(b) "restrict its production & use" of chemicals in Annex B (DDT)

For Annex C Chemicals (PCDD/PCDF, Hexachlorobenzene, PCBs)

Parties shall, at a minimum, take measures to address the following:

- Develop an action plan
- release reduction or source elimination
- substitute materials, products, processes
- For new and existing sources use best available techniques (BAT) and best environmental practices (BEP)

Under the provisions of the Stockholm Convention, Sri Lanka is required to completely phase out the use of PCB's by 2025 and dispose of any stocks of PCB in an environmentally safe manner by 2028.

Thus, the first priority was the development of the NIP and hence the project to develop the NIP was established.

The project was planned so as to generate an integrated and workable NIP, with the satisfactory execution of the following activities:

1. Establishment of a coordinating mechanism
2. Formulation of POPs inventories and assessment of infrastructure and capacities
3. Priority setting and determination of objectives
4. Formulation of the National Implementation Plan (NIP)
5. Endorsement of the NIP by the stakeholders

For the formulation of the NIP, it was necessary to compile preliminary inventories of POPs, which would help determine the scope of the POPs issue in Sri Lanka. For this purpose, six Task Teams were set up to contribute towards the NIP formulation out of which 3 teams were assigned the formulation of 3 inventories –on pesticides, Polychlorinated biphenyls (PCBs) and on Dioxins and Furans. Since one of major aims of the project was to build capacity of stakeholder institutions, all the Task Team members were selected from relevant stakeholder institutions, in order to facilitate capacity building, which is a major objective of the project.

**Task Teams and Subjects Assigned**

Task Team 1 – POPs Management

Task Team 2 – POPs Monitoring

Task Team 3 – Socio-Economic Aspects of POPs

Task Team 4 – POPs Pesticides & Industrial Chemicals

Task Team 5 – PCBs

Task Team 6– Unintended POPs

The National Coordinating Committee (NCC) with representation from major stakeholders and a Technical Advisory Panel (TAP) comprising of local experts were established to assist the Task Teams as well as the PCU in developing the NIP. The outputs generated by these task teams helped to develop the NIP.

## 1.1 THE PRELIMINARY ASSESSMENT OF THE SITUATION IN SRI LANKA WITH RESPECT TO THE STOCKHOLM CONVENTION

### 1.1.1 POPs PESTICIDES, INCLUDING DDT FOR HEALTH CONTROL

At the present time all of the POPs pesticides including DDT, Aldrin, Dieldrin, Mirex, Hexachlorobenzene, Heptachlor, Endrin, Toxaphene are not registered for use in Sri Lanka. The prohibition of the use of POPs pesticides was initiated in the early seventies and the last of the POPs pesticides, Chlordane was banned from its last allowed use for termite control in building construction sites in 1996.

On the basis of the above mentioned regulatory action under the Control of Pesticides Act no 33 of 1980 it could be safely assumed that no legal importation of POPs pesticides are taking place into Sri Lanka. This does not necessarily mean however, that illegal importation is not taking place. It is still possible for an importer to import these banned POPs pesticides under a different HS code as chemicals and not classified as a pesticide. This issue will have to be looked into, in order to ensure that no more stocks of these pesticides are imported into the country for any purpose.

The other major issue regarding POPs pesticides, is the possibility of certain food items being imported which may contain residues of POPs chemicals, particularly if they are being imported from countries where POPs pesticides are still being used and sometimes even manufactured. Routine analysis of food items for pesticide residues is not being carried out in Sri Lanka at present

### 1.1.2 POLYCHLORINATED BI PHENYLS (PCB) USED IN TRANSFORMERS

The preliminary inventory in Sri Lanka shows that there are 17,528 transformers owned by the CEB and 2700 owned by LECO. In addition there are around 74 transformers owned by independent Power Producers. Out of the 681 transformers manufactured on or before 1986, 176 units were subjected to the Field Test. It was revealed that 60% of the samples were positive for PCB's. However GC results indicated that only 48% of the transformers which indicated positive results from the Test Field Kits could be confirmed as positive through Gas Chromatography It is clear that a more comprehensive survey has to be carried out in order to determine the exact number of transformers and capacitors which contain PCB. In addition to this other priority sectors such as electronic manufacturing plants, railroad systems, transformer repair facilities, heavy industry and residential and commercial buildings should be surveyed in order to complete the survey and make a complete inventory of the PCB stocks in Sri Lanka.

Although Sri Lanka has signed the Stockholm Convention and is therefore bound by the conditions in the convention, there is no domestic legislation which can prevent anyone from importing PCB or PCB containing equipment if they so wish. The highest priority therefore is to classify all of the POPs chemicals as banned substances for importation by including these items under regulation under the Imports and Exports Control Act as was done for Blue Asbestos. The Harmonised System (HS) codes have been developed to control PCBs and PCB containing equipment to facilitate development of regulations.

Under the provisions of the Stockholm Convention, Sri Lanka is required to completely phase out the use of PCB's and dispose of any stocks of PCB in an environmentally safe manner by 2028. In order to do this it is vital that more precise information is available regarding PCB containing equipment including transformers and capacitors. Once a comprehensive survey is carried out regarding the available stocks of PCB a management plan would be required to be drawn up on the gradual phase out and environmentally safe disposal of these chemicals.

### 1.1.3 UNINTENTIONAL RELEASES OF POPs CHEMICALS

With respect to the unintentional releases of POPs chemicals from the preliminary inventory of sources of Dioxins and Furans, it appears that open burning of household garbage is one of the biggest sources. It would be very difficult if not impossible to put a complete stop to the burning of household waste as it is such a widespread practice in the absence of a proper waste management system. What would be more feasible and cost effective would be to carry out public awareness programmes on the possible emissions of Dioxins and Furans arising from the burning of household waste and the possible adverse health impacts of this practice. In addition to this, the provision of facilities such as sanitary landfill sites for the disposal of municipal solid waste is a priority in order to reduce the amount of open burning of household waste.

As for the emissions arising from hospital waste incinerators, it is still possible for the Ministry of Environment through the Central Environment Authority (CEA) to intervene in this matter and ensure that if hospital waste incinerators are considered to be an absolute necessity, to install one or two centrally located

incinerators rather than install incinerators in all hospital premises individually. It would also be possible to advise the health Authorities to go in for technology such as Autoclaving rather than the installation of incinerators which are considered as a major source of Dioxins and Furans.

With respect to the other major source of Dioxins and Furans which is the metal recycling industry, it is strongly recommended that the Ministry of Environment through CEA intervene in this matter, and take it up with the Board of Investment in order not to attract investors of such metal recycling industries to Sri Lanka in future. In fact , a decision has already been taken by the Board of Investment not to allow any new metal recycling industries into the country.

Chapter

2

# 2.0 COUNTRY BASELINE

## 2.1 COUNTRY PROFILE

### 2.1.1 GEOGRAPHY AND POPULATION

#### 2.1.1.1 Geography

The Democratic Socialist Republic of Sri Lanka is a tropical island lying close to the south-eastern part of the Indian subcontinent. Its location is between 50 54' and 90 52' North latitude and 790 39' and 810 83' East longitude. It has a land area (i.e. excluding inland waters) of 62,705 $km^2$.

Topographically, three-quarters of the island consists of a broad low-land peneplain at an average elevation of 75m above mean sea level. South-centrally, the land rises steeply to form a central massif which goes up to an elevation of 2500 m. The mean annual temperature of the lowlands ranges from 27 °C in the wet lowlands to 30 °C in the dry northern and eastern regions, and there is little variation in the mean monthly temperature during the year. In the hill country, situated in the south-central part of the island, the temperature is appreciably lower than in the lowlands, with a drop of around one degree Celsius for every 150 m rise in elevation. The high altitude region (2000 m and over) occasionally experiences ground frost at night, but its area is very small compared to the rest of the country.

Geologically, much the greater part of the island (90 per cent) is made up of Precambrian crystalline rock. Miocene limestone is found in the Jaffna peninsula and offshore islands and extending down the northwest coast as far as Puttalam and down the eastern coast as far as Mullaitivu. A few square kilometers of Jurassic Sandstone deposits are found in Tabbowa on the western coast and at Andigama near Puttalam. Notably, the island lacks fossil fuel deposits, and even in its offshore territorial waters, no deposits have been discovered to date. The main mineral deposits found in the country are graphite, gemstones, apatite phosphate, limestone, clays and mineral sands.

Water is one of the country's most important natural resources. On an average the island as a whole receives an annual rainfall of 2000 mm. There is considerable variation, however, in the spatial and temporal distribution of the rainfall. In two-thirds of the country, covering the northern and eastern parts of the island, the average rainfall is around 1500 mm, but what is significant here is the seasonal nature of the rainfall, much of the precipitation occurring during four months of the year (October to January). Because of the occurrence of a prolonged dry spell during a good part of the year this area is referred to as the dry zone. The southwest of the country, including much of the hill country, receives an annual rainfall of 2500 mm and more. Although two peak periods of heavy rainfall can be recognized here, there are no regularly occurring dry months. This area is referred to as the wet zone.

The harnessing of the water resources of the country for agricultural development in the dry zone is an epic saga in the ancient history of Sri Lanka. Beginning around 500 BC and spanning a period of several centuries, Sri Lanka's rulers developed what is now referred to as a "hydraulic civilization" where water resources were harnessed for the sustenance and well-being of the people. Over a long period of time,

thousands of reservoirs and associated water distribution systems were built throughout the dry zone. After the 12th century, the irrigation systems went into decline. Many of the reservoirs have been restored in recent times to serve their original purpose.

With emphasis being placed, since the 1940s, on restoring the original reservoirs and building new ones, the development of domestic agriculture received a fresh impetus. The soils of the country are of different types. The most widespread is the type described as Reddish Brown Earths, the most common soil in the dry zone. They are moderately deep and well-drained. The agricultural potential of this type of soil is very high, and a wide range of tropical cereals, oil seeds and subsidiary food crops could be grown on them under rain-fed or irrigated conditions. With the use of nitrogen and phosphate, efficient weed control and correct tillage and management practices, sustained levels of high production could be obtained in areas with this type of soil. In undulating land, in the middle and lower aspects, Yellowish Brown Earths and Low Humic Gley Soils respectively occur. These soils, with their imperfect to poor drainage, are ideally suited for growing rice which is the staple food of the Sri Lankan people. With the expansion of rice cultivation throughout the island and the use of high yielding varieties there has been a sharp increase in the use of fertilizers, insecticides and weed killers.

The soils of wet zone in the southwest of the country are mostly lateritic in nature. These soils are acidic in reaction, and the organic matter content and nitrogen status are moderate, increasing with elevation. Phosphorus and potassium status is generally low.

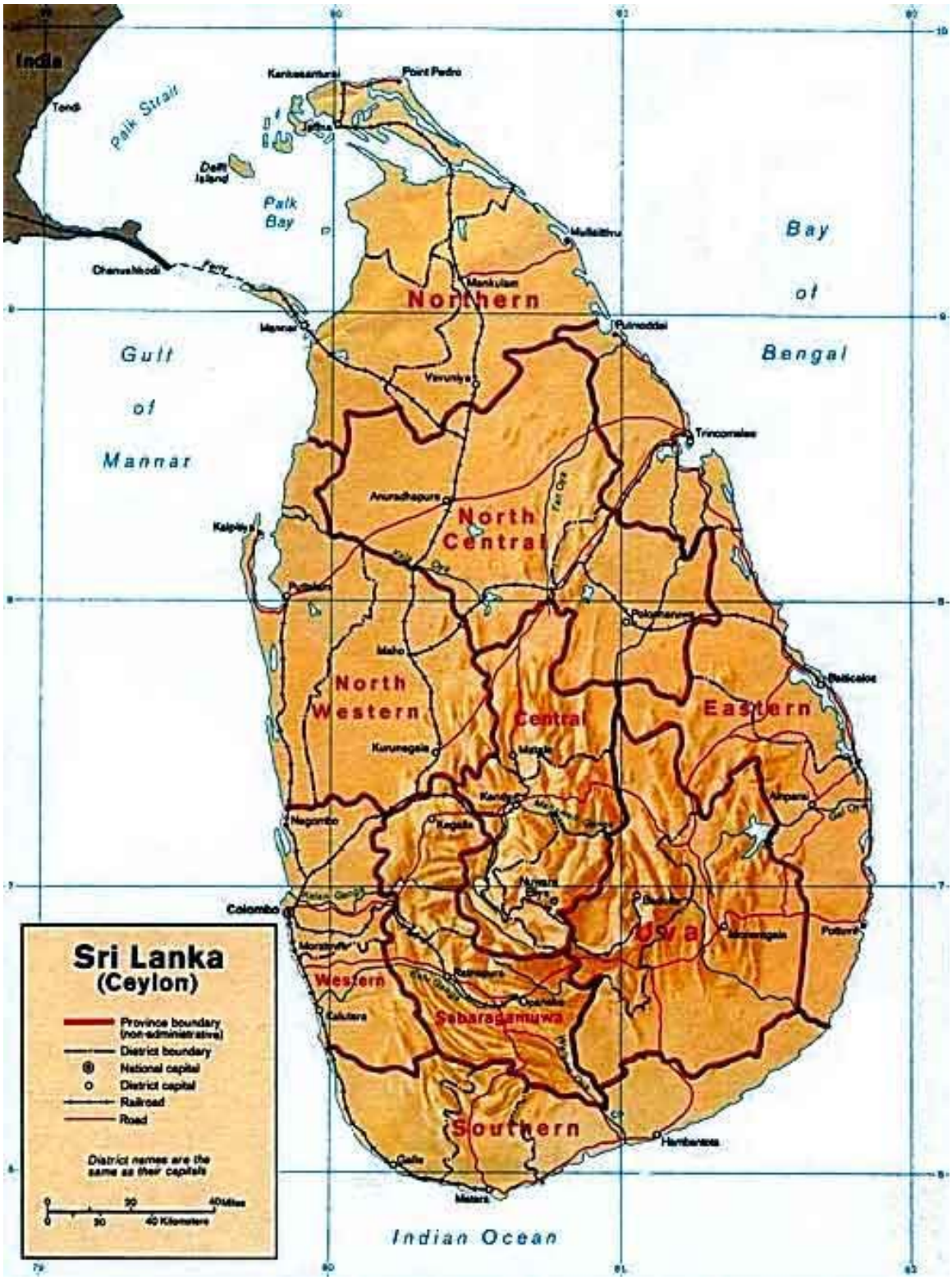


***Figure 1: Map of Sri Lanka***

***Source: www.gov.lk***

However, the soils have a good cat-ion exchange capacity and there is good retention of chemical fertilizers even under the high rainfall conditions in this region of the country. The depth, texture and drainage are generally good, and a high proportion of the soils are used for raising crop plantations (tea, rubber, and coconut), vegetables, spice crops, orchard crops, etc.

Natural forest was at one time the dominant vegetation over the island, accounting for around 70 per cent of the land area a century ago. With continued deforestation of the land to accommodate a variety of other uses, the forest cover has now reduced to 22 per cent.

Sri Lanka has a coastline of 1600 km. The Exclusive Economic Zone, extending to 200 nautical miles beyond the coast (except where the ocean is shared with India), covers an area of over six times the island's land area. The offshore and deep sea resources, including ocean bed minerals have yet to be assessed. The main coastal resources are fisheries and industrial sands (ilmenite, rutile, zircon and monazite).

### 2.1.1.2 Population

Sri Lanka's population now stands at 19.5 million, registering more than an eight-fold increase since the first scientific census carried out in 1871. During the early part of this period population growth was slow due to the high death rates, including maternal mortality. There was acceleration in population growth since the mid 1940s, reaching a peak of 2.8 per cent in the early 1960s. This was due to a dramatic decline in mortality without a corresponding drop in fertility. After 1963 the rate of growth declined as a result of a gradual decline in fertility and immigration. In 2004 the population growth was estimated to have declined to 1.1 per cent.

The distribution of population, the land area, and the population density by provinces is given below.

**Table 1 : The distribution of population, the land area, and the population density by provinces**

| *Province* | *Population* (provisional) | *Land area* | *Density of Population* |
|---|---|---|---|
| Western | 5.526 million | 3593 $km^2$ | 1583 |
| Central | 2.506 " | 5575 " | 450 |
| Southern | 2.346 " | 5383 " | 436 |
| Sabaragamuwa | 1.840 " | 4921 " | 374 |
| North-Western | 2.214 " | 7506 " | 295 |
| Eastern | 1.540 " | 9361 " | 165 |
| Uva | 1.223 " | 8335 " | 147 |
| Northern | 1.122 " | 8290 " | 135 |
| North-Central | 1.145 " | 9741 " | 118 |
| Total | 19.462 " | 62,705 " | 310 |

*Source: Department of Census & Statistics 2004*

Within the country there are sharp differences in the population density as shown by the above statistics. The highest population densities are seen in the southwest coastal areas and the Central Province, with the administrative districts of Colombo, Gampaha, Kalutara, Galle, Matara and Kandy recording a density of over 500 persons per square kilometer.

The population comprises a mix of ethnic groups, of which the main ones are Sinhalese which form the majority (82 per cent of the population) and Tamils (9.4 per cent). These figures are based on the 2001 census, as more recent estimates are not available. The main religion is Buddhism (76.7 per cent of the population), with Hindus, Muslims and Christians comprising the balance.

The distribution of the population is also classified according to three sectors: Rural, Urban, and Estate. By far the highest proportion is rural (72.2 per cent). The urban and estate sectors account for 21.5 per cent and 6.3 per cent respectively.

Overall, urban migration has been slow to moderate. The process of urbanization being contained at this level can be attributed to the efforts made to develop the rural economy through the provision of schools, health centres, roads, electricity, etc. Although the urban-rural drift has on the whole been modest, in recent years there has been a considerable increase in the population in the south-western part of the country, in the areas surrounding the metropolis where there is a concentration of industries and where economic and social infrastructure is much better developed than in the rest of the country. In the Western province, which includes the metropolitan area, the proportion living in urban areas is nearly 47 per cent.

Since Sri Lanka gained independence in 1948 successive governments have placed considerable emphasis on education and health for the people. Systems of free education and free health services were introduced and continue to this day. As a result of these measures Sri Lanka has achieved a high literacy rate (for aged 5 years and above) of 92.5 per cent and a life expectancy at birth of 71.7 years for males and 76.4 years for females. As regards health, however, some indicators fall well short of desirable levels, and many of them are environment-related. The most notable among these is the incidence of communicable diseases – vector borne diseases, mainly malaria, filaria, Japanese encephalitis, dengue and dengue haemorrhagic fever and a range of bowel diseases.

## 2.1.2 POLITICAL AND ECONOMIC PROFILE

### 2.1.2.1 Economic growth

The economy of Sri Lanka is mainly agriculture based. It has two sectors namely, domestic and plantation sector. In management of pests, the plantation sector approach in a more organized manner whereas, in the domestic sector it is more complicated due to large number of farmers, crops and the pests involved. Agriculture is the biggest user of pesticides in Sri Lanka. The extents under different agricultural crops are Rice (6,85,625 ha), Fruit crops (99,727 ha), Other agricultural crops (1,31,220 ha), and Plantation crops (6,94,674 ha) (AgStat, 2004).

The year 1977 marked a watershed in the economic development of the country. In November of that year the government in power introduced sweeping economic reforms which included the liberalization of trade and relaxation of exchange controls and the adoption of an economic strategy dependent on private investment and market forces. The accompanying fiscal policy reforms relied on large scale support from international agencies, notably the IMF and the World Bank, and a host of donor countries. Prior to 1977, there were high levels of state ownership and state control in many sectors, and their performance was well below desirable levels.

The average annual rate of growth of the GDP from 1970 to 1977 had been 2.8 per cent, and this shot up to 8.2 per cent in 1978. This sharp increase was an immediate response to the new economic measures that were introduced and the growth was not expected to persist at that level. Between 1978 and 1984, the economy grew at an average annual rate of 5.9 per cent per annum. After 1984, one of the key factors that had a continuing adverse effect on the growth of the economy was the civil unrest in the north and east of the country demanding the establishment for a separate state. The growth rate of the economy fell to around 2.5 per cent in 1988-1989. In the following period there was a significant improvement in the growth rate and it fluctuated between 3.8 per cent and 6.9 per cent from 1990 to 1998.

In 2001 the Sri Lankan economy underwent a serious downturn, and the GDP recorded a negative growth rate of 1.4 per cent. This was brought about by several factors, both external and internal. Externally, there was the continuing decline in the world economy and the 11 September attack on key targets in the USA. In the local scene, a prolonged drought which had serious adverse effects on agriculture and power generation and the terrorist attack on the country's international airport with the accompanying loss of several aircrafts were the chief contributory factors.

With the cessation of hostilities in the armed conflict, the growth rate of the economy picked up in the first years of the new millennium. The growth of the GDP in 2004 was 5.4 per cent & in 2005 it was 6.0. Two important factors would no doubt have had an impact on the growth of the GDP in 2005; one was the tsunami disaster that struck the country on 26 December 2004 and caused extensive damage along more

than two-thirds of the island's coastline, and the other was the increase in oil prices which began in 2004 and reached historically high levels in 2005.

The investment/GDP ratio, which was 25 per cent in 2004 increased to 26.5 per cent in 2005. The domestic savings/GDP ratio was 15.9 per cent in 2004 increased to 17.2 in 2005. National savings, which include net factor income and net private current transfers from abroad, also from 21.6 per cent in 2004 to 23.3 per cent in 2005 of the GDP (Central Bank Report 2005). According to Central Bank, these levels of savings and investment are not adequate to raise growth and the living standards substantially, and a concerted effort must be made to raise savings and investment to at least 30 per cent of the GDP.

Sri Lanka's Human Development Index stood at 0.740, ranking 96th among 177 countries in 2002. The annual average inflation rate based on the Colombo Consumers' Price Index rose from 7.6 per cent in 2004 to 11.6 per cent in 2005. The Sri Lanka Consumers Price Index registered a 10.6 per cent increase in 2005.

## 2.1.3 PROFILES OF ECONOMIC SECTORS

### 2.1.3.1 Economic Sectors

The sectoral composition of the GDP in 2005 at constant (1996) prices is as follows.

**Table 2: The sectoral composition of the GDP in 2005 at constant (1996) prices**

| | | |
|---|---|---|
| ***Agriculture sector*** | **17.2** | **per cent** |
| Agriculture | 14.2 | per cent |
| Forestry | 1.7 | per cent |
| Fishing | 1.3 | per cent |
| ***Industry sector*** | **27.0** | **per cent** |
| Manufacturing | 16.3 | per cent |
| Construction | 7.2 | per cent |
| Mining & quarrying | 1.9 | per cent |
| Electricity and water | 1.7 | per cent |
| ***Services*** | **55.8** | **per cent** |

*Source: Central Bank Report 2005*

#### 2.1.3.1.1 Agriculture

Though no longer the dominant sector of the economy in terms of GDP, agriculture is of signal importance from the socio-economic point of view. Agriculture absorbs 34 per cent of the labour force, well ahead of industry. The agriculture sector (including forestry and fisheries), recovered from the setback in 2004 and registered a growth of 1.5 percent in value added terms in 2005. The record paddy harvest in both Maha and Yala seasons and a record production of tea were major contributors to this growth. Improved performance in other field crops and vegetables, rubber and other export agricultural crops also contributed to the recovery.

In terms of land use, the area sown in paddy amounted to 930,000 ha in 2005. Tea lands accounted for 222,000 ha, rubber 116.000 ha, and coconut around 395,000 ha. There are a number of other crops serving the domestic and/or export markets, such as cinnamon, coffee, cloves, pepper, cocoa, cardamom, maize,

chilli, onions and potatoes. The agricultural labour force is on average the more impoverished among the population.

#### 2.1.3.1.2 Industry

With successive governments in recent years placing emphasis on industry as the "engine of growth" and the recognition of the private sector in driving the process, this sector has played an increasingly important role in promoting GDP growth. In 2005 the provisional growth rate of this sector was estimated at 8.3 per cent. The sector covers mining and quarrying, manufacturing, construction, electricity and water. The manufacturing sub-sector is dominated by factory industries which accounted for 59 per cent of the overall growth of the sector as a whole. The major contribution to the growth in factory industries in 2005 (over 90 per cent) arose from four of the nine major industrial categories, namely, textile, apparel and leather products; food, beverages and tobacco products; chemical, petroleum, rubber and plastic products; and non-metallic mineral products (mainly ceramics, processed diamonds, cement and roofing sheets).

#### 2.1.3.1.3 Energy

The supply of energy in Sri Lanka is mainly based on three primary sources, namely, hydropower, biomass and petroleum. The relative proportions of these three forms of energy in the year 2005 were 8, 47 and 45 per cent respectively. Biomass fuel is used mainly for household cooking. Although the number of households using biomass fuel for cooking has been progressively decreasing, in 2004 it was estimated that as much as 82.8 per cent of households still used biomass fuel. It must be noted that, besides the three sources of energy mentioned above, other sources have traditionally been used to a considerable extent, but do not generally enter into reckoning when considering the energy balance of the country. These include the direct use of solar energy for drying agricultural and other products and the use of muscle power when draught animals are used for hauling goods.

Right up to the late 1980s, the generation of electricity was predominantly through the use of hydropower, with thermal generation mainly serving as a standby source. Since then, with much of the remaining potential sources of hydropower generation being used up and the demand for electricity increasing sharply, thermal generation had to be resorted to on an increasing scale. Between 2000 and 2005, the annual hydroelectricity generated in the island fluctuated around 3000 GWh, depending on the rainfall. Thermal generation went up from 3647 GWh in 2000 . Total Electricity generated in 2005 for supplying the national grid was 8769 GWh. 39.4% of this was generated from Hydro while 56.6% was from thermal sources. The installed capacities are 1291 MW of Hydro and 1115 MW of Thermal (Statistical Digest, CEB. 2005)

Successive governments, while recognizing the need to increase electricity supplies to sustain economic growth, have so far not been able to implement what would have been a major project for Sri Lanka intended to increase substantially the electricity supply through the use of coal. The plant was to have been set up in Norochcholai, near Puttalam, and was to use imported coal. Technical as well as social issues have been raised by the public objecting to the location of the plant at the proposed site, and up to now no firm decision seems to have been made whether or not to go ahead with the project. .

Rural electrification by the expansion of the national grid into villages has received special attention by successive governments. On this scheme, even after the supply line is extended to reach a village many households remain unconnected as they cannot afford the cost involved in obtaining the connection and paying the monthly bills.

#### 2.1.3.1.4 Transport

This sector has shown rapid growth in recent years. The registration of new vehicles grew from 82,401 in 1995 to 229,665 in 2005. In the individual categories, motor cycles, three wheelers and private cars showed the highest rates of increase. The other categories listed are buses, dual purpose vehicles, goods transport vehicles, land vehicles, and others. The growth trend is expected to continue. As regards fuel consumption by the transport sector, petrol has shown increases but diesel has shown decreases.. Petrol consumption

increased sharply from 224,000 tonnes in 2000 to 463,000 tonnes in 2005, thus doubling in five years. Diesel consumption decreased from 1,762,000 tonnes to 1,690,000 during the same period.

### 2.1.3.1.5 Health and Housing

Although Sri Lanka enjoys a remarkably high life expectancy for a developing country, it has a problem with regard to the control on vector borne diseases. This is basically an environment related problem. Urban expansion seen in recent decades was not pursued through a planned framework. The problems that emerged were urban sprawl and "ribbon development" along major roads, unplanned fragmentation of land, and use of low-lying areas and environmentally sensitive wetlands for industrial, commercial and residential purposes. Overcrowding and unhygienic living conditions are common in many towns. About half of Colombo's resident population lives in shanties and slums. As one of the strategies for controlling the spread of vector borne diseases the authorities are compelled to use insecticides on a regular basis.

Another matter of importance in the context of environmental pollution is the proper management of hazardous clinical waste, a matter that should receive the attention of the health authorities in collaboration with other concerned institutions.

### 2.1.3.1.6 Poverty and Unemployment

The per capita income which was 584 US $ a decade ago has been increasing at a modest rate over the last 10 years and has just nudged the 1000 dollar mark, reaching 1188 $ in 2005. There are wide disparities, however, in the distribution of wealth. A high proportion of the population lives in poverty. In 2005, a total of 2.0 million families, accounting to 42 per cent of the population, benefited directly from the income supplementary programme of the Samurdhi.. The population with an income of less than US $ 1 per day was estimated at 6.6 per cent of the population and with less than US $ 2 per day at 45.4 per cent (1995 data). Poverty in Sri Lanka is primarily a rural phenomenon; about 85 per cent of the poor households live in rural areas. The incidence of poverty is highest among casual labourers, small farmers, estate workers and rural women. The average income per household is lowest in the Uva Province.

Sri Lanka has a long tradition of providing income support and economic advancement assistance to the poor. Many different government agencies/programmes operate transfer schemes. Among them are the Department of Social Services, the Samurdhi programme, government-sponsored micro-credit programmes, regional economic advancement programmes, World Bank funded community driven development programmes, agricultural programmes providing subsidies and low-cost credit to landless poor and to resource poor farmers, and organizations providing relief and rehabilitation assistance to those displaced by the ethnic conflict in the north and northeast. The tsunami disaster of December 2004 rendered many hundreds of thousands of people homeless and deprived them of their sources of income. Rehabilitation of these people is a major task of the government, for which generous foreign assistance has been pledged.

There was a general decline in the rate of unemployment between 1990 and 2000, from 15.9 per cent to 7.6 per cent. From then on, however, there has been an increase in the percentage of unemployed, However the unemployment rate estimated by the Special Labour Force Survey declined to 7.7 per cent in August 2005 from 8.3 per cent in 2004. In absolute terms, the number unemployed increased from 517,000 to 684,000 between 2000 and 2004.

## 2.1.4 ENVIRONMENTAL OVERVIEW

Sri Lanka's first National Environmental Action Plan was prepared in 1990 and came into effect in 1991, coinciding with the United Nations Conference on Environment and Development which was held in 1992. Since then, and up to 2001, there have been two more plans at three to four intervals, signifying the need to constantly update the needed action towards exercising environmental care in pursuing economic development. The current plan entitled: Caring for the Environment – Path to Sustainable Development (CFE) covers the period 2003-2007. It emphasizes that environmental care is the responsibility of every

development sector and institution and that the large majority of activities for safeguarding the environment have to be incorporated into, and form part of, any development project. Committees on Environmental Policy and Management, with membership of governmental and non governmental organizations in the appropriate sectors, review the progress of activities set out in CFE.

The Ministry of Environment in charge of the environment and the Central Environment Authority (Regulatory authority functioning under the Ministry of Environment) will no doubt play key roles in reviewing and catalyzing progress, giving the necessary guidance, and providing leadership in carrying out key functions that are cross sectoral in nature, while at the same time providing the necessary legislation and regulations and adopting control measures where needed.

Waste substances and articles containing or contaminated with PCB and/or PCTs and/or PBB are included as a waste stream (Waste Stream 23), in Schedule I of the regulation No. 1 of 1990, of the National Environmental Act, as amended by Gazette Extraordinary No. 595/16 of 1990. Under this regulation, no person shall collect, transport, store, recover, recycle or dispose waste containing or contaminated with PCBs or establish any site or facility for their disposal, except under the authority of a license issued by the CEA.

A Cleaner Production (CP) Centre functions in Sri Lanka under the Ministry of Industrial Development as the host institution. A National Policy and Strategy for CP was also formulated in 2005 by the Ministry of Environment in collaboration with the CP Centre and other stakeholders.

Under the National Environmental Act, standards have been proposed for inland water bodies. Proposed maximum acceptable levels of organic micro-pollutants in 'Inland surface waters where fisheries and aquatic life are to be protected' give a limit of 1 nanograms per litre of PCB (total) as the maximum acceptable level. However, the 'Proposed quality standards for different use classes of coastal water in Sri Lanka' proposes different values for different uses. (Table 3)

**Table 3: Proposed quality standards on PCB for different use classes of coastal water in Sri Lanka**

| Parameter | Unit | Value for different use classes | | | |
|---|---|---|---|---|---|
| | | Nature conservation | Fishery of shell fish | Fishery of fin fish | Non consumption use |
| PCB (total) | µg/l | Natural condition | Smaller than 0.03 | Smaller than 0.03 | Smaller than 0.06 |

*Source: CEA, 2001*

The Act No. 33 of 1980 on Control of Pesticides does not have provisions to control PCBs since this chemical is not used as a pesticide.

## 2.1.5 CHEMICAL PROFILE

The National Chemical Profile has been prepared in the framework of the UNITAR/CEA project in 2002 (the original National Chemical Profile was prepared in 1997). It is addressing the issues on chemicals in general concerning chemical life cycle-importation manufacturing, storage, transportation, use and disposal of chemicals. Adequate attention has been focused on pesticides and chemicals in general. Sri Lanka became a party to the Rotterdam Convention in January 2006.

Following main areas have been discussed in general with regard to industrial chemical, Pesticides and Consumer/ Domestic chemicals.

- Chemical production, import, export and use.
- Priority concern related to chemical production, import, export and use.

- Legal instruments and non-regulatory mechanisms for monitoring chemicals.
- Ministries, agencies and other institutions managing chemicals.
- Relevant activities of industry, public interest groups and the research sector.
- Inter-ministerial commissions and coordinating mechanisms.
- Data access and use.
- Technical infrastructure.
- International linkages.
- Awareness/Understanding of workers and public.
- Resources available & needed for chemicals management.

## 2.2 INSTITUTIONAL, POLICY AND REGULATORY FRAMEWORK

### 2.2.1 INTRODUCTION

The Constitution of Sri Lanka makes it "The duty of every person in Sri Lanka to protect Nature and Conserve it's riches". The National Environmental Policy (2003) (NEP) acknowledges this duty and seeks to provide the direction according to which steps will be taken to conserve and manage Sri Lanka's environment in all it's aspects. Further, the NEP renews the commitment of the government, in partnership with the people, effectively to manage the environment for the benefit of present and future generations and has listed the outcomes expected and strategies to adopt for the key economic sectors in the policy document.

The National Environmental Policy recognises the importance of application of Cleaner Production and Life Cycle thinking in achieving sustainable development. Accordingly a Cleaner Production Policy has been developed and published in 2005 aiming at improving the productivity and economic sustainability of development activities while achieving environmental quality by taking preventive measures.

There is hardly any chemical manufacture taking place in Sri Lanka. As such almost all chemicals whether they be pesticides, pharmaceuticals or industrial chemicals are being imported into the country. In view of this situation, any scheme to control the import and use of chemicals would be most effectively implemented at the point of entry. Chemicals imported and used in Sri Lanka could be classified into several groups such as pesticides, fertilizers, pharmaceuticals and industrial chemicals. Out of these, the import and use of pesticides, pharmaceuticals and fertilizers are being controlled through separate legislative enactments.

### 2.2.2. ENVIRONMENTAL/SUSTAINABLE DEVELOPMENT POLICY AND GENERAL LEGISLATION

The Constitution of Sri Lanka (1978) recognizes both the responsibility of the State as well as the individual in Environmental Management and Protection by the following statements; "The state shall protect, preserve and improve the environment for the benefit of the community" and "It is the duty of every person in Sri Lanka to protect nature and conserve its riches". The pledge given in the 1978 constitution to safeguard the environment was formally institutionalised with the enactment of the National Environmental Act No. 47 of 1980. In 1990 a separate line Ministry was established by the government giving priority to the subject of environment.

Sri Lanka was also among the first few countries to recognize the objectives of the World Conservation Strategy (WCS) of 1980. An important recommendation of the WCS was that each country should prepare its own National Conservation Strategy (NCS) to guide the management and rational utilization of its natural resources in achieving the development objectives of the country. Work on the preparation of a NCS for Sri Lanka was initiated in 1982 and was completed in 1988. It identified priority areas and a strategy to deal with the problems of environmental degradation in Sri Lanka.

Strategic planning for environment commenced in the 1980s with the formulation of National Conservation Strategy (NCS). The original NCS has been regularly updated in the form of a National Environmental Action Plan (NEAP). The NEAP first published in 1991 covered the period 1992 – 1996 and the first update published in 1993 covered the period 1995 – 1998. The third update of the NEAP covered the period 1998 – 2001. A National Environmental Policy (2003) has been developed by the Ministry of Environment and many sectoral policies have been developed to integrate environmental concerns and to facilitate implementation of environmental policies in the journey of sustainable development. The recently developed Cleaner Production(CP) Policy and strategy make the approach of CP practices throughout the life cycle of products, production processes and services. Implementing this policy will facilitate meeting the objectives of the Stockholm Convention.

The first legislative Acts relating to the environment were passed by the British colonial government to assert authority and control over natural resources. The Crown Lands Encroachment Ordinance (1840) declared “all forests, waste, unoccupied and uncultivated lands shall be presumed to be the property of the Crown until the contrary thereof be provided”. Subsequently a number of conservation and protection oriented Acts were passed to mitigate the environmental damage this Act encouraged such as the Forestry Ordinance (1907), Fauna and Flora Protection Ordinance (1937) and the Soil Conservation Act (1951).

Several other legislative Acts were introduced in the 1980s. The Coast Conservation Act was passed 1981 and amended in 1988. The National Heritage Wildness Area Act No. 3 of 1988 is cited as the national heritage Act. The National Environmental Act No. 47 of 1980 is the most comprehensive Act relating to environmental management and protection. This Act has been amended in 1988 and in 2000. From the late 1980s to the mid 1990s, several environments related Acts were revised to focus on a more participatory approach to environmental management. The revisions in 1995 to the Fisheries Act envisaged setting up of fishery management committees, the 1988 revision to the Irrigation Ordinance mandated farmer organizations, and the Forest Ordinance revision of 1988 contained provisions for participatory forestry.

### 2.2.3 ROLES AND RESPONSIBILITIES

The roles and responsibilities of the main institutions involved in POPs life cycle is given below.

#### 2.2.3.1 Ministry of Environment

The Ministry of Environment, being the focal point for the Stockholm Convention is responsible for preparation of the NIP and solicits other relevant Government and non governmental institutions for the implementation. The National Coordinating Committee established by the ministry will coordinate and monitor as well as be responsible to update the NIP periodically based on the progress to fulfil the objectives of the Convention. The under mentioned institutions will have major roles in NIP implementation.

#### 2.2.3.2 The Office of the Registrar of Pesticides

The Registrar of Pesticides is the Authority vested with the responsibility of controlling the importation, use and disposal of pesticides. The Registrar functions under the provisions contained in the Control of Pesticides Act No 30 of 1980, Control of Pesticides (Amendment) Act No. 6 of 1994. Under this Act, all pesticides are required to be registered with the Registrar of Pesticides prior to being sold in the market.

Prior to the registration of a pesticide a statement of the claim made by the manufacturer or producer of such pesticides as to its use, potency, stability in storage and the period of usage.

The Registrar of Pesticides as the licensing authority is entrusted with the responsibility of assuring the safety to the environment. The Registrar is advised on all matters relating to technical and policy aspects of the enforcement of the Act by a Technical Advisory Committee (PeTAC) appointed by the Minister of Agriculture under the provisions of the Act.

### 2.2.3.3 Customs Department

In Sri Lanka almost all chemicals used in the country are being imported. There is no manufacture of chemicals in the country, although some chemicals (mostly pesticides) are formulated using technical grade material. The Department of Customs plays an important role in the importation of chemicals into the country. At present, the first priority of Customs Department is to verify the authenticity of the chemicals being imported into the country with the main objective of collecting the required taxes. This is usually carried out based on the documents which accompany the cargo. The purpose for which each chemical is imported is not recorded under the current procedural requirements. Qualitative examination of chemicals is carried out only if there is reason to suspect irregularities.

### 2.2.3.4 Central Environmental Authority

The Central Environmental Authority is the National Level Government Agency vested with the responsibility of Environmental Management and Protection & functions under the provisions contained in the National Environmental Act no 47 of 1980 and its Amendment Acts no 56 of 1988. It is primarily a regulatory agency and the major regulatory functions of the agency are the implementation of the Environmental Impact Assessment (EIA) process for new, large scale development projects and the issuing of Environmental Protection Licences (EPL) for the control of waste discharges from industry.

The CEA does not directly control the import and use of chemicals by industry through regulatory measures. However, it does have a mandate to control waste discharges from industry which may contain chemicals. The CEA has already gazetted wastewater quality standards which are required to be met by industry when discharging their wastewater into the environment. These standards are concentration based standards which specify the maximum levels of polluting chemicals which may be discharged into the environment.

CEA has initiated activities to implement load based licensing system to promote industries to take preventive measures rather than concentrating on end of pipe treatment. Even though the CEA has no direct role at present to control the import or use of chemicals, it has presently identified a preliminary list of chemicals which are deemed to be hazardous to human health and / or the environment and require to be brought under some form of control through licensing. PCB's have also been included in this preliminary list of chemicals which are being proposed to be restricted and / or banned.

### 2.2.3.5 Imports and Exports Control Department

The Imports and Exports Control Department functions under the provisions in the Import and Export Control Act No.1 of 1969 (last amended in 1987). The Act has introduced a "Special Import License Scheme (SIL) under which chemicals that come under the scheme cannot be imported without a license issued by the Controller of Imports and Exports. The license is issued on recommendations / certification given by the relevant regulatory Authority. (e.g. The Registrar of Pesticides in the case of chemicals classified as pesticides). On arrival of these chemicals to the country, clearance from the Imports and Export Control Department must be obtained before the Customs officials can release the goods to the importer. The Imports and Exports Control Act has provisions for further additions to the dangerous chemicals list by publishing regulations under the act on policy decisions made by the government.

### 2.2.3.6 Board of Investment

The Board of Investment established under the provisions of the Board of Investment (BOI) Act No. 4 of 1978 as amended in 1992, is vested with the responsibility of bringing in foreign investment into the country. A BOI enterprise could import chemicals and equipment which are required for the operation of the particular industry. The list of such chemicals and equipment is required to be submitted to the appraisal Department of the BOI to obtain approval. This list is usually referred to the environment Department which in turn recommends to the Investor Services Department of the BOI clearance of the chemicals / equipment.

Under section 17 (1) of the BOI Act of 1978, The BOI has the power to grant exemptions from any law referred to in schedule B of the BOI Act or to modify or vary the application of any such law to enterprises in accordance with such regulations as may be made by the Minister. However, the Imports and Exports Control Act No. 1 of 1969 has not been included in schedule B of the BOI Act.

## 2.2.4 RELEVANT INTERNATIONAL COMMITMENTS AND OBLIGATIONS

The National Environmental Policy (NEP) (2003) states " International Commitments will be honoured as part of our responsibility to the national and global communities. The national policies of Sri Lanka are in line with the objectives of the Basel Convention for the Control of Transboundary Movements of Hazardous Wastes and their Disposal, and Sri Lanka become a party to the Basel Convention, in August 1992. The Ministry of Environment is the Focal point and the Central Environmental Authority is the Competent Authority for the implementation of this Convention.

The Ministry of Environment has established a National Co-coordinating Committee (NCC) to co-ordinate the implementation of the Basel Convention. The Secretary of the Ministry of Environment chairs NCC which includes representatives from various key institutions. Policy issues related to the implementation of various provisions of the Basel Convention and issues related to the hazardous waste management are considered at NCC meetings.

Although regulations for internal management of hazardous waste are in place to a considerable extent, implementation of these regulations is being delayed due to non availability of infrastructure facilities and support services for the disposal of these wastes. Sri Lanka also lacks sufficient facilities required to control transboundary movements of hazardous wastes. The country needs to strengthen its capacity for the identification and control of hazardous wastes coming into the country. Technical and financial assistance to build the capacity of the country in hazardous waste management are essential pre requisites for the effective implementation of the hazardous waste management plan.

Sri Lanka has taken steps to formulate legislation for the control of transboundary movements of hazardous waste under Import and Export Act. These will be gazetted shortly.

## 2.2.5 PRINCIPLES OF EXISTING LEGISLATION AND REGULATIONS ADDRESSING POPS

With regard to the legislation presently available in the country for the control of POP's chemicals, as far as the POP's pesticides are concerned there is adequate legislation in the form of the Control of Pesticides Act no 33 of 1980, for the control of the import, use and disposal of POP's chemicals classified as pesticides. At the present time, regulatory action under the provisions in the Pesticides Act no 33 of 1980 has resulted in the banning of all of the POP's Chemicals imported and used in Sri Lanka could be classified into several groups such as pesticides, fertilizers, pharmaceuticals and industrial chemicals. Out of these, the import and use of pesticides, pharmaceuticals and fertilizers are being controlled through separate legislative enactments.

With respect to the legislation required for the management of PCB and PCB containing equipment, new regulations are required in order to compel anyone having in their possession, PCB or PCB containing equipment to report the exact quantities they hold and how they plan to phase out the use of these chemicals by 2025 as required by the Stockholm Convention. Although draft legislation has already been developed under this project, there is still a need to discuss these regulations with the stakeholders

concerned, particularly with the Ceylon Electricity Board and Lanka Transformers Ltd (LTL) who own the majority of the PCB stocks as well PCB containing chemicals.

As far as the control of unintentionally produced POPs such as dioxins and furans are concerned, at the present time there is no legal requirements to control such emissions. It is only fairly recently that standards for the control of common air pollutants such as Sulphur Dioxide, Oxides of Nitrogen and particulate matter have been drafted. Even these standards are still in their draft form and have not been gazetted as air emission standards which are required to be met by industrialists. These standards are however being imposed on new industries which are being established and such industries are required to install the necessary equipment for pollution control. However Stack Emission Standards are due to be gazetted.. In the case of vehicle emissions, standards have been in force since 2003 by Gazette Notification for Diesel and Petrol vehicles and the standards are to be revised soon. Carbon monoxide, sulphur dioxide, particulate density hydrocarbon emissions etc. have been controlled under this act.

In view of the above situation it is difficult to imagine a situation whereby industries and/or other sources of unintentionally produced POPs would be required to meet stipulated standards. A more practical suggestion would be to recommend the adoption of Best Available Technology (BAT) and Best Environmental Practices (BEP) by such sources and control emission by effective temperature control in the processes.

There is hardly any chemical manufacturing taking place in Sri Lanka. As such almost all chemicals whether they be pesticides, pharmaceuticals or industrial chemicals are being imported into the country. In view of this situation, any scheme to control the import and use of chemicals would be most effectively implemented at the point of entry. As such, the Imports and Exports control Department and Customs Department would play a crucial role in chemicals management in view of the fact that these departments would play a crucial role in determining the types and quantities of chemicals which would enter the country. In addition to these two Departments the other government agencies which play a crucial role in chemical management are the Office of the Registrar of Pesticides, The Central Environmental Authority. The Registrar of Pesticides is the Authority vested with the responsibility of controlling the importation, use and disposal of pesticides. The Registrar functions under the provisions contained in the Control of Pesticides Act no 30 of 1980, and its amendment Act no 6 of 1994. similarly, The CEA has no direct role at present to control the import or use of chemicals, it has presently identified a preliminary list of chemicals which are deemed to be hazardous to human health and/or the environment and require to be brought under some form of control. PCBs have also been included in this preliminary list of chemicals which are being proposed to be restricted and/or banned.

### 2.2.6 ADEQUACY OF PRESENT LEGISLATIVE ACTS RELATING TO CHEMICALS MANAGEMENT WITH PARTICULAR REFERENCE TO POPS

There are several legislative enactments which specifically regulate the import, use and disposal of certain categories of chemicals in Sri Lanka.

#### 2.2.6.1 The Control of Pesticides Act No 33 of 1980, and its Amendment Act No. 6 of 1994

The control of Pesticides Act No 33 of 1980, and its Amendment Act No 6 of 1994, aims at controlling the import, use, transport, storage and disposal of pesticides in the country. This Act contains adequate provisions in it for the control of the import and use of any pesticide. Under this Act, all pesticides which are being imported or used in the country are required to be registered, including its physical and chemical properties, toxicological data, amount of isomer impurities and other by- products, methods of analysis etc has to be submitted to the Registrar of Pesticides prior to registration.

Under this Act almost all of the POP pesticides have already been banned in Sri Lanka. Stockholm Convention Article 3; No. 1, 3 & 4 could be dealt under Control of Pesticides Act.

### 2.2.6.2 Malathion Control Act No.22 of 1985

An Act to prohibit the possession, transport, sale and use of malathion in Sri Lanka by unauthorized personnel; Any hazardous pesticide can be dealt under this Act.

### 2.2.6.3 Customs Ordinance

The Customs Ordinance which was last amended in 1988, is being implemented by the Customs Department. Under this Act, there is a gazetted list of restrictions, bans, enactments, laws and regulations already enacted, or to be enacted in the future by any agency/authority pertaining to imports and exports which are to be enforced, monitored or regulated by the Director General of Customs.

Since many of the POPs pesticides are already banned /not registered for use in Sri Lanka, it would be possible to take necessary actions against any violations in this regard. However, the situation regarding non pesticide POPs is different, as presently there are no restrictions in place.

### 2.2.6.4 Import and Export Control Act

The Imports and Exports Control Act, which was last amended in 1987, is an act to provide the control on importation of goods, for the regulation of standards of exportable goods and for matters connected therewith or incidental thereto. It is being implemented by the Department of Imports and Exports Control. Under this Act, a special import licence scheme has been introduced for selected chemicals. Chemicals which fall under this scheme such as fertilizer and pesticides cannot be imported into the country without a licence issued by the Controller of Imports and Exports. The licence is issued by the Controller of Imports and Exports based on the recommendations/ certification/ registration given by the relevant statutory authority for the respective chemicals.

Many restrictions can be introduced in the Management of POPs through Customs Law and Import & Export Law using the framework of it's existing provisions.

### 2.2.6.5 The National Environmental Act No 47 of 1980 and its Amendment Act No 54 of 1988 *(See* chapter 2.2. 3)

The use and disposal of chemicals as well as the control of emissions arising from industrial processes is within the mandate of the CEA. As such, it is possible for the CEA to control the emissions of unintended POPs such as Dioxins and Furans through appropriate regulations, as and when required.

### 2.2.6.6 National Environmental Act No. 53 of 2000

An Act to make provision for the Protection, Management and Enhancement of the Environment. Article 3 .2 of the Stockholm Convention on import of chemicals in Annex A and B, can be dealt under the Hazardous.

Waste Regulations 924/13 gazetted under the powers of the NEA.

The details of the exact provisions within each of the above mentioned Legislative Acts is described in the background report .

When a gap study is done considering the POPs separately, the pesticides in common can be dealt within the Pesticides Act and the Industrial chemicals should be controlled by Customs Law and Import and Export Law. Hazardous Waste Regulations under the NEA also can be made useful in chemical management process.

## 2.2.7 PRIORITY PROBLEMS AND OBJECTIVES FOR INSTITUTIONAL AND REGULATORY STRENGTHENING

### 2.2.7.1 Objective

Develop and put in place legal and institutional tools for POPs management to achieve targets stipulated in the Stockholm Convention

### 2.2.7.2 Priority problems

#### *Importation*

- Continued importation of POPs other than pesticides (PCB &HCB);
- Importation of active ingredients of pesticides as chemicals;
- Lack of monitoring facilities at the point of import for pesticides contaminated with POPs.
- Lack of analytical facilities with regulate authorities to monitor/validate submitted claims

#### *Regulatory Issues*

- Absence of legislation for the control of chemicals and PCBs (Importation);
- Absence of legislation for management of PCBs /POPs within the country.
- Absence of legislation to control Dioxin and Furans emission

#### *Disposal and treatment*

- No facility for treatment and disposal of POPs waste;
- Absence of a comprehensive plan with adequate funding for phasing out PCB and PCB contaminated material.
- No technological capacity to introduce BAT/BEP in processes.

## 2.3 ASSESSMENT OF THE POPs ISSUE IN SRI LANKA

## 2.3.1 POPs PESTICIDES (INCLUDING DDT FOR DISEASE VECTOR CONTROL)

### 2.3.1.1 Introduction

The first synthetic pesticide to be used in Sri Lanka on a large scale was DDT, which was just after the World War II in the late 1940's. It was followed by benzenehexachloride (BHC) to control the malaria vector. Subsequently, with the successes achieved in vector control, these pesticides were used in agriculture for control of pests to meet the increasing demand for food after the War. By the next decade more toxic chemicals such as aldrin, dieldrin, endrin and others were also included in the arsenal of pesticides which were used indiscriminately for control of pests in the fields of agriculture, veterinary, public health, and the industry. All these chemicals were persistent, lasting in the environment for a very long time before breaking down and they are now categorized as Persistent Organic Pollutants (POPs) under the Stockholm Convention.

### 2.3.1.1.1 Relevant Stockholm Convention Requirements with regard to pesticides

**Parties shall:** [Article 3, para. 1]

(a) "prohibit and/or take the legal and administrative measures necessary to eliminate":

(i) production and use of chemicals in Annex A[1] and

(ii) import and export of chemicals in Annex A

- *i.e.,* trade is restricted [see paragraph (2)]

(b) "restrict its production & use" of chemicals in Annex B[2]

- "acceptable purposes" specified for these chemicals

**Parties shall: [**Article 6]

- develop and implement strategies to identify stockpiles [para. 1 (a)(i) and 1 (b)]
- manage stockpiles in a safe, efficient and environmentally sound manner (ESM) until they are deemed to be wastes [paragraph 1 (c)]
  - *i.e.,* no remaining uses by Party
    - no *specific exemption* or *acceptable purpose*
  - 
  - does not apply to stockpiles that may be exported
    - per Article 3, para. 2
- develop strategies to identify [para. 1 (a)(ii)]
  - products and articles in use, and
  - wastes

  that consist of, contain or are contaminated with a POP in Annex A, B or C
- endeavor to develop strategies for identifying sites contaminated by POPs in Annex A, B or C[3] [para. 1 (e)], and
- if remediation is attempted, do it in an environmentally sound manner

**Relevant Stockholm Convention Requirements with regard to DDT**

**Parties shall:** [Article 3, para. 1]

(b) "restrict its production & use" of chemicals in Annex B

- "acceptable purposes" specified for these chemicals

[1] Aldrin, Chlordane, Dieldrin, Endrin, Heptachlor, Hexachlorobenzene, Mirex, Toxaphene, Polychlorinated biphenyls (PCBs)
[2] DDT
[3] PCDD/PCDF, hexachlorobenzene, PCBs

**All Parties shall eliminate DDT production and use <u>except</u>** Parties that notify the Secretariat of their intention to produce and/or use DDT in disease vector control programs (an "acceptable purpose" in Annex B):

These Parties will be included in a special publicly available DDT Register maintained by the Secretariat.

A Party may withdraw from the DDT Register at any time.

Production and/or use must be in accordance with WHO recommendations and guidelines on use of DDT, and only when locally safe, effective and affordable alternatives are not available to the Party.

### 2.3.1.2 Situation in Sri Lanka

POPs pesticides were never manufactured in Sri Lanka but were imported as ready-to-use products or technical materials for local formulation. Only limited data is available on POPs as they were either banned, not used for the last fifteen years (e.g. endrin, heptachlor, toxaphene) or no history of their use at all in Sri Lanka (HCB and mirex). Recent detection of their residues in seabed (Colombo Harbour, ITI study) may be due to their persistence and excessive use in the distant past or due to long distance transport by water currents from the sites of their use. It may also have been due to sweepings of the ships and containers arriving at the harbour points. At the same time, though almost all these chemicals have been banned for use in domestic agriculture over a very long time, some of the chemicals had been allowed in to Sri Lanka in restricted quantities for use by trained personnel only in industry for control of termites in building sites and in plantation agriculture, which have also now been completely banned.

Pest management in Sri Lanka is mostly pesticide dependent and the annual imports of pesticides cost around 0.1% of Gross Domestic Production in 2002. Sri Lanka has successfully phased out number of hazardous pesticides including all the WHO hazard Class 1 pesticides and POP pesticides from usage. The currently recommended pesticides are less toxic and least persistent than the earlier pesticides. Safer alternatives are available for the spectrum of pests controlled by POP pesticides. The stocks of outdated POP pesticides are negligible and hence disposal is not a serious issue but larger stocks of out-dated non-organochroline pesticides, need immediate attention. Although DDT was prohibited from use in agriculture in 1971 and from public health in 1976, traces of DDT and its derivatives have been detected in some environmental compartments and this needs further investigation. There is limited information available on the residues of these chemicals in groundwater and surface water bodies, which are found in large numbers in agriculture areas. Awareness on POP pesticide related issues, concerns and required remedial measures are alarmingly poor among most of the sectors in the society.

As the regulatory authority responsible for proper management of pesticides in the country, Registrar of Pesticides has to depend on certification of product quality by the foreign manufacturer, but he is not adequately equipped to verify the claims. Cooperation received from the Customs Department in controlling illegal imports and pesticide industry in safe handling of pesticides, are very encouraging. However, certain improvements are needed in custom classification procedure to ensure prevention of possible imports through improper declarations. Incidences of pesticide related accidents are very high in Sri Lanka. On the other hand environmental damage due to pesticides has not been adequately studied.

Replacement of all POP pesticides with other chemical alternatives in agriculture, public health vector control, industrial uses such as wood preservation and termite control have been successfully implemented in Sri Lanka. For POP pesticides, the availability of safer alternatives has made them redundant in chemical pest control. In replacing the POP pesticides, the alternatives were recommended on the basis of pests, not on the basis of the chemical, and hence in certain cases there were more than one pesticide available to cover the spectrum of pests. Sri Lanka strongly advocates adoption of IPM technology to control pests, thereby, reducing the over dependence on pesticides. This in the long run helps to minimize pesticide-related hazards, in addition to ecological benefits.

Due to effective management of pesticides in Sri Lanka by the authorities through the implementation of International Guidelines, no serious problems are anticipated from storage of currently available pesticides. However, it is imperative that vigilance be maintained on possible "hot spots" in the environment, adverse health effects arising from exposure to contamination and to avoid any possible importation of candidate POP pesticides and illegal materials.

**Table-4: Foreign exchange spent for import of Pesticides-2003**

| Item | Volume in Metric Tonnes | Value in US $ (x1000) |
|---|---|---|
| Insecticides | 1684.4 | 7825.95 |
| Weedicides | 2925.1 | 8918.55 |
| Fungicides | 792.18 | 2775.76 |
| Others (acaricides, rodenticides, fumigants, molluscicides, insect repellents, etc.) | 19.55 | 74.79 |
| ***Total*** | ***5120.73*** | ***19595.05*** |

*Source: Pesticide Statistics for the Year 2003, Office of the Registrar of Pesticides*

**Table 5**: **Status of prohibition and import of POP pesticides in Sri Lanka.**

| NAME OF PESTICIDE | Year of administrative declaration of prohibition/restriction of imports | Last imports | |
|---|---|---|---|
| | | Amount (kg)/year | Year |
| Aldrin | 1986 | 7,040 | 1986 |
| Chlordane | 1996 | 4600 | 1994 |
| DDT | 1976 | 316,522 | 1976 |
| Dieldrin | 1992 | 1,100 | 1991 |
| Endrin | 1970 | NA | - |
| Heptachlor | 1986* | NA | - |
| Hexachlorobenzene | HCB has never been used as a pesticide in Sri Lanka. | None | - |
| Mirex | Mirex has never been used as a pesticide in Sri Lanka. | None | - |
| Toxaphene | 1970+ | NA | - |

*Source: Pesticide Statistics for the Year 2003, Office of the Registrar of Pesticides*

NA- Not Available * Year of restriction for termite control $^{+}$ Year maximum expected in use

### 2.3.1.3 Priority problems and objectives for POPs management

Although some data are available concerning the concentration of limited number of pesticides in surface waters, river waters, etc. in Sri Lanka (BGS, 1992; Silva, et al., 1991) little or no information is available concerning the biological significance. Isolated incidences of pesticide related deaths of fish populations,

snakes, etc. have been reported in surface waters following heavy application of mostly organophosphate and carbamate type of pesticides in agricultural fields without possible long-term environmental damages. Also, scattered incidences are reported to the Office of the Registrar of Pesticides on deaths of peacocks and other birds due to the consumption of rice grains treated with insecticides.

The acute pesticide poisoning effects often resulted in mortality are easily noticeable from sub-lethal effects which require exposure to pesticides for a longer period of time. Though it is likely to be prevalent, long-term effects are either not diagnosed properly in some cases or difficult to establish the actual causative agent under the conditions prevailing in Sri Lanka. Since all POP pesticides are banned for more than a decade, any observable effects due to POP pesticides should have been associated with long-term sub lethal exposure from contaminated environmental compartments and food chains. Such effects are most often not studied to identify or associate with the cause though it is widely believed that cases of chronic health problems such as carcinogenicity and reproductive effects are rapidly increasing. Thus the real effects of POP pesticides are often underestimated.

Poisonings in occupationally exposed persons are usually associated with contract spray operator groups or farmers carrying out prolonged spray operations under hot humid conditions without adequate personal protection. Recent poisoning data reveal >80% of poisonings caused by pesticides to be due to wilful ingestion of pesticides for self-harm.

#### 2.3.1.3.1 Stocks of outdated pesticides

Though there had been no import of POP pesticides to Sri Lanka in the recent past, a certain amount of outdated pesticides from the earlier imports are stockpiled at different places due to their withdrawal from use. However, large cumulative quantities of other outdated pesticides are available in stocks which have become a national problem for disposal. A complete list of outdated pesticide stocks, with specific locations, available in Sri Lanka is given in the Annex I of the background report on pesticides. This information has been collected by Registrar of Pesticides following FAO guidelines. Except 18 liters of aldrin and 10 kg of DDT (which are tenable to the POP convention), rest of the stock is predominantly of non-organochlorine in origin.

#### 2.3.1.3.2 Contaminated sites and environmental compartments

Contaminated sites are identified as having a history of heavy previous use or locations where pesticides are transported into and deposited from those sites. Though a somewhat complete picture on available stockpiles can be drawn, the situation on contaminated sites with regard to POP pesticides is obscure. DDT and subsequently BHC had been used for malaria vector control programs as a household residual insecticide; door-to-door application in malaria-infested areas in the Dry Zone (Herath, 1984 – not in any reference section !) and in the Wet Zone including some areas of the Colombo district (Dr. R.R.M.L.R. Siyambalagoda, Director, Anti Malaria Campaign-personal communication). Agricultural uses were basically on coconut plantations, tea plantations, horticultural projects and tobacco nurseries. However, area specific potential contamination (non-point pollution sources) could be predicted for aldrin, chlordane, DDT, dieldrin and heptachlor for which there were specific agricultural uses in plantations, horticultural nurseries, non-food crops (e.g. tobacco) and in non-agricultural termite control uses.

Although DDT was totally banned as early as 1976, its precursors and derivatives could be present in the environment for a long period of time and thus could contaminate agricultural produces. In tea, DDT isomers could have been originated from heavy use of dicofol in the past which could be contaminated with DDT isomers depending on the production process adopted in manufacturing dicofol. Due to this reason, the use of dicofol in tea commenced in 1965 was prohibited in 1994. The total consumption of 42% dicofol (Kelthane) emulsifiable concentrate formulation was 2,084 liters from 1988-1992. A large number of estates in Uva, upcountry and mid country experienced heavy mite infestations during dry weather periods necessitating repeated use of miticides (Vitharana, 2003). Therefore, the detection of these pesticides in the environment may be due to agricultural run-off and excessive use or mis-use in the past.

There is no planned monitoring system or infrastructure facility available with the pesticide registration authority to trigger remedial actions to mitigate the problems. So far no proper monitoring studies have been carried out on pesticides. Further, there is no surveillance system in place in the health sector to monitor the trends of health effects with respect to exposure to pesticides from environmental contamination. The data available in environmental concentrations are primarily produced for academic interests or data generated for export of agricultural commodities as a requirement from importing countries (residue levels) rather than for environmental or long-term monitoring purposes. This leads to rather discrete data coverage (spatial and temporal) which makes it difficult to evaluate significant trends of contamination by POP pesticides in the country.

Very little information is available on the concentration of chlordane in the environmental compartments despite the fact that chlordane has been used in Sri Lanka until recently compared to other POP pesticides which have been banned long ages.

Since, some of the organochlorine concentrations are still found in some environmental compartments, coupled with the lack of knowledge on the true picture of toxicological impact of POP pesticides in the environment and human health point of view, the situation would have to be seriously dealt with to achieve environment and human health protection goals. In this context, further research, monitoring and environment protection procedures are critically needed in Sri Lanka.

A compendium of information relevant to all POP pesticides designated under the Stockholm Convention, on production, imports, exports, emissions, stocks, levels in the various environmental compartments, exposure along with relevant sources of data is presented in the Annex II of the background report on pesticides.

#### 2.3.1.3.3 Objectives

- To eliminate possibilities in import, distribution and usage
- To eliminate possible health and environmental adverse effects due to

  stocks of outdated pesticides
- To identify information gaps on the status
- To reduce pesticide-related environmental adverse effects
- To eliminate potential health hazards

#### 2.3.1.3.4 Priority problems

- Unauthorized imports and use of POPs pesticides
- Absence of proper mechanism for safe disposal of outdated stocks of pesticides
- Lack of effective information dissemination system
- Inadequate infrastructure to monitor environmental and human health effects

#### 2.3.1.3.5 Legislation:

- Banning of all POP pesticides, of which the uses are already cancelled through a Gazette Notification under the provisions of the Control of Pesticides Act No. 33 of 1980.
- All POP pesticides imported as pure chemicals for research and academic purposes should be subject to licensing : Joint responsibility should be held by Registrar of Pesticides & Department of Customs;

- Revision of existing HS codes (additional national subheading) to ensure accurate identification of chemical consignments with respect to POP pesticides.

- Necessary legal structure to be formulated to reship all unidentified and/or unclaimed chemical consignments held at entry points by the consignee or in case of absence of the consignee, by the shipping agent.

#### 2.3.1.3.6 Administrative measures:

- Disposal of existing stocks of outdated pesticides including POP pesticides.

- Development of infrastructure at Office of the Registrar of Pesticides and Customs for compliance monitoring programs with respect to contamination/adulteration of chemical products with POP pesticides.

- Surveillance on environment compartments (air, sediments, water, soil, biological) and food products for presence of POP pesticides and candidate POP pesticides, including;

    - Assessment of pesticides residues for ground and surface water bodies.

    - Further investigation on the presence of POP pesticide residues in coastal seabed.

    - Study of all pesticides recommended for agriculture on the fate and effects in the environment under the local conditions to ascertain any relevance to POP qualities.

    - Establishment of MRLs for Sri Lanka and devising methods to minimize the residue levels in agricultural commodities.

    - Establish regular pesticide residue monitoring programs on food (local and imported) by strengthening the relevant aspects under the Food Act.

- Surveillance on adverse effects of pesticides including POPs on the environment and human health under the local conditions by;

    - Establishment of a proper surveillance and reporting system (social and scientific) within the health sector on chronic health effects from exposure to pesticides.

    - Establishment of complimentary analytical programs to study the fate of such pesticides in the environmental compartments for the establishment of correlations between presence and their health effects.

- Development of a coordinating system by establishing a network among the health, agriculture, industry and environmental sector research groups through the Office of the Registrar of Pesticides as the focal point for coordination, information collection and sharing and policy decisions for prevention of POP pesticide related adverse effects.

## 2.3.2. POLYCHLORINATED BIPHENYLS (PCBs)

### 2.3.2.1 Introduction

PCB oils were initially introduced as dielectric fluids for use in electrical equipment such as transformers, capacitors, circuit breakers, voltage regulators etc. because of their excellent dielectric properties and also because of their very low flammability. PCB oil can absorb rapid changes in electrical fields with very little heating up, and hence very little loss of energy. Also, PCB has a very low flash point and no fire point, and therefore, is stable in changing temperatures. They only burn when in contact with an open flame.

When PCBs do burn, they can form Dioxins and Furans. These two gases are highly toxic and their deleterious effects on health have been well demonstrated. Apart from the danger of PCBs producing Dioxins and Furans, they themselves are dangerous substances because of their high stability and their oleophilic nature. They can be easily absorbed by fatty tissues of humans and animals. PCB bioaccumulte in bodies, especially in fat and liver.

PCBs were started to be manufactured on an industrial scale in 1929. They were intensively used between 1930 and 1980. PCBs were gradually phased out for application in electrical equipment from the early 1980s, depending on the country. United States prohibited manufacture and marketing of PCBs from 1979, while the European Union mandated that all PCBs should be destroyed by 2010. In the absence of further information, it was considered that transformers manufactured on before 1986 may contain PCBs.

Capacitors are another type of common equipment that can contain PCBs. The size of capacitors can vary. According to Basel Convention Guidelines for the Preparation of a National Environmentally Sound Management Plan, all capacitors manufactured between 1930 and 1977 contain PCBs as the dielectric fluid.

A very large number of electrical equipment exists today globally, which still contain PCBs. There are several ways in which these transformers or oils therein can reach Sri Lanka. Furthermore, there are a large number of equipment in Sri Lanka contaminated with PCBs, and the challenges are first to identify such equipment, and then to select the most appropriate steps to eliminate the PCBs that they contain.

It is necessary to take decisions in management of PCBs in accordance with the overall objectives of environmental management at national level, and specially in relation to management of chemicals and hazardous waste. Furthermore, they should strengthen environmental management practices at the level of individual owners, industries and companies.

The preliminary PCBs inventory will be the baseline for the phase out process. Environmentally sound management of PCB is necessary throughout their life cycle process. It includes preventive aspects at all stages of the life cycle as well as the maintenance and retro filling of PCB containing equipment.

#### 2.3.2.1.1 Relevant Stockholm Convention Requirements

**Annex A requires all Parties to cease production of new PCBs immediately (*i.e.,* entry into force)**

**All Parties using the (Part II) PCB specific exemption shall:**

- eliminate use of in-place equipment containing PCBs **by 2025:**
  - make determined efforts to identify, label & remove from use equipment with >10% or >0.05% and >5 liters of PCB
  - endeavor to identify & remove from use equipment with >0.005% (50ppm) and >0.05 liters of PCB
  - give higher priority to equipment with higher PCB levels
- promote measures to reduce exposures and risk:

- use PCBs only in intact and non-leaking equipment and only in areas where risk of environmental release can be minimized and quickly remedied
- forbid use in food and feed production and processing areas
- when used in populated areas (schools, hospitals, etc.)
  - take all reasonable measures to protect from electrical failure which could result in a fire
  - inspect regularly for leaks in equipment
- not export or import PCB equipment, except for the purpose of environmentally sound management (ESM) of waste
- not recover liquids with more than 0.005% PCBs for reuse in other equipment, except for maintenance and servicing
- make determined efforts to achieve ESM of wastes containing >0.005% PCBs ASAP, and **by 2028**
- endeavor to identify articles with >0.005% PCB for ESM
- report to the COP every five years on their progress in eliminating PCBs [per Article 15]

  COP will review progress toward the 2025 and 2028 targets at 5 year intervals.

### 2.3.2.2 Situation in Sri Lanka

There are many institutions dealing with management of PCBs, contaminated equipment and sites. Roles and Responsibilities of these institutions differ vastly. Following institutions have been identified as main stakeholder institutions, and the inventory have been developed in collaboration with these institutions;

Ministry of Environment, Ceylon Electricity Board, Lanka Electricity Company, Lanka Transformers Limited, Central Environmental Authority, Sri Lanka Customs, Industries, Plantations, Informal Recyclers of waste oil and disposed transformers. The Ceylon Electricity Board (CEB), Lanka Electricity Corporation (LECO) and Lanka Transformers Limited (LTL) can be considered as the three main agencies that deal directly with transformers and capacitors, which may be contaminated with PCBs. These institutions import and handle all transformers used by the state sector and by the power utilities in the country.

Two kinds of transformers are used by the CEB; Step up transformers (Generating Transformers) where voltage is increased in order to reduce the energy loss during transmission and Step down transformers (Power Transformers) where voltage is reduced to assure safety of user and equipment. Generating transformers of 12.5 kV/220kV and 12.5 kV /132kV and distribution transformers of 33kV/415V and 11kV/415kV are presently used by CEB.

CEB purchases high voltage transformers from several foreign vendors on turnkey basis. Before the establishment of LTL, the CEB used to import Distribution Transformers from various countries from over 140 different manufacturers. Presently, the Divisional Operational Centres of the CEB takes these old transformers for repairs to the LTL.

Maintenance of medium voltage transformers is done at the Maintenance Branch of the CEB at Piliyandala. Some repairs are done at Lanka Transformers Ltd, while in case of major repairs, the manufacturer's assistance is sought. Some burnt distribution transformers of CEB are taken to the LTL Yard in Homagama earlier and now to Sapugaskanda, for repairs, servicing or inspection before disposal.

PCBs have been used in transformers and other electrical equipments in Sri Lanka, but the extent of the use have not been assessed before. The Ceylon Electricity Board (CEB), the Lanka Electricity Company (LECO) and the Lanka Transformers Limited (LTL) are the main institutions handling transformers, but there is a dearth of information about the use of PCBs in transformers. Several industries also own and maintain

the transformers that they are holding. However, this is only a small percentage of Distribution transformers. The owners are in the industrial sector, plantation sector and a very few community groups. However, there are no legal provisions to obtain information from the owners regarding the status of these transformers.

Another important sector that needs to be taken in to account are the informal recyclers of transformer oil.

### 2.3.2.3 Priority problems and objectives for PCB management

Informal recyclers of transformers/oil are small scale operators that are scattered throughout the country. Recyclers are engaged in recycling of oil and scraps from transformers, specially the metal parts and porous parts.

Since PCB containing oils are still in use in transformers in detectable amounts, there is a probability of these entering in to recycling operations. Used PCB oils or contaminated transformer mineral oils can be mixed with waste mineral oil, resulting in contamination with low concentrations of PCBs. Industrial Development Board of Sri Lanka acts as an intermediate in procuring decommissioned transformers for recyclers to be scrapped. However, none of these transformers are tested for PCBs before decommissioning.

Presently all decommissioned transformers area sold by the LTL at their Homagama yard and by the LECO at their Wasgamuwa yard. The usual buyer is the Industrial Development Board of Sri Lanka. They in turn scrap the transformers to sell the copper and oil to small scale recyclers, who are engaged in manufacturing of welding transformers, battery charging, motor winding etc., throughout the country.

Industrial Development Board of Sri Lanka (IDB) initiated purchasing of transformers in July, 2003. Numbers of transformers have been purchased from LTL and LECO, from 2003 up to date are in Table 6.

**Table 6 Used Transformers purchased and sold by IDB**

| Seller | Quantity (Nos) |
|---|---|
| Lanka Transformers Ltd | 81 units |
| Lanka Electricity Company | 93 units |
| Total | 174 units |

*Source: PCB Inventory Ministry, of Environment 2006*

Price of transformers varies according to their power capacity. Transformers of capacity range 50kVA-1000kVA are purchased at around Rs. 14,500-80,500.

Composition and amounts of material sold by the IDB since initiation of the program in 2003 are given in table 7.

**Table 7. Composition and amounts of material sold by IDB**

| Material | Quantity |
|---|---|
| Copper | 26,511 kg |
| Lamination | 50,615 kg |
| Iron | 41,311 kg |
| Oil | 210 liters |

*Source: PCB Inventory, Ministry of Environment 2006*

The recyclers use a considerable quantity of used transformer oil in their daily operations. Scraps of transformers are prized mainly for copper. These may contain PCBs impregnated in to the metal.

Saw-dust is used to absorb any oil that is spilled during draining of transformers, and saw-dust soaked with transformer oil is handed over to the relevant local authority for disposal. Therefore, there is a possibility of dumping and burning of saw dust used for cleaning spilled oil, which might contain PCBs. Hence, one of the ways in which environmental contamination with PCBs can occur is through recyclers, scrapping yards and repair yards.

According to the Guidelines issued by the Basel Convention for the Preparation of a National Environmentally sound Management Plan for PCBs and PCB contaminated equipment, the average working life of a transformers is 30 years. However, many countries have determined the age of phasing out at 35 years. Considering the financial and practical position of Sri Lanka as a developing country, it was decided to consider 35 years as the useful age of a transformer.

**Table 8: Transformers over 35 years of age as Over Aged.**

| Category | NO Units | Total weight (kg) | Total Liquid Weight (kg) |
|---|---|---|---|
| Total of units over aged | 135 | 1 018 083 | 283 458 |

*Source: Preliminary Inventory of PCB, Ministry of Environment 2006*

#### 2.3.2.3.1 Objectives for PCB Management

- Prevent new entry of PCBs to the country;
- Action plan for the management of equipment;
- Prevent further cross contamination;
- Establishment of adequate testing facilities;
- Prevent PCBs getting in to the environment;
- Environmental and progress monitoring;
- Adequate capacity building for PCB control and management;
- Elimination of existing stocks in an environmentally sound manner;
- Decontamination/ Rehabilitation of contaminated sites.

#### 2.3.2.3.2 Priority problems

- Lack of legislation;
- Lack of complete inventory on PCB equipment;
- Existence of PCB containing equipments/oil/stockpiles;
- Haphazard disposal of decommissioned transformers;
- PCB contaminated sites;
- Import of PCB containing equipment and material;
- Lack of proper temporary storage facilities;
- Lack of identified methods for elimination of PCB contaminated equipment/material;
- Lack of awareness;
- Lack of sufficient testing facilities.

## 2.3.3 UNINTENTIONALLY PRODUCED POPs

### 2.3.3.1 Introduction

Dioxins and furans are considered as unintended by products from anthropogenic activities. In Sri Lanka there are several activities that could lead to these by products especially in case of open air burning. There is inadequate legislation in the country for controlling such activities.

However, with regard to imports a control mechanism is in place under the Basel Convention. Under this Convention, processing of some wastes listed in list B can lead to the emissions of dioxins and furans. Hence, if country receives any project proposal involving such waste processing activities, the proposal is closely scrutinised by a National Committee formulated for the implementation of the requirements of the Convention. This Committee studies the project in detail and if assured only that there is no risk of dioxins and furans emissions from the project activity, approval for the project is granted subject to the implementation of relevant precautionary measures.

Dioxins and furans can exert their toxicity at very low levels (microgram levels). Hence detection of dioxins and furans at such very low levels is essential and this requires use of sophisticated equipment/techniques. Sri Lanka does not have such sophisticated equipment at present..

### 2.3.3.1 .1 Relevant Stockholm Convention Requirements

**Parties shall, <u>at a minimum</u>, take measures to address the following:**

- action plan
- release reduction or source elimination
- substitute materials, products, processes
- new and existing sources
  - best available techniques (BAT)
  - best environmental practices (BEP)

- **An action plan shall:** [Article 5, para. (a)]
  - be developed within 2 years of entry into force
    - may be national, regional, or sub-regional
    - constitutes part of the overall implementation plan in Article 7
  - identify, characterize and address release of chemicals in Annex C
  - facilitate implementation of other requirements in Article 5
  - be implemented!
- **For industrial sources that Party identifies as having <u>potential for comparatively high</u> formation & release of POPs to environment (*including* those in categories in Annex C Part II), Party must:**
  - for <u>new</u> sources warranting such action:

- promote, and as provided for in an action plan, require use of best available techniques (BAT) [Article 5, para. (d)]
  - phase in any BAT requirements for new sources in categories in Annex C Part II as soon as practicable but *no later than 4 years after entry into force*
- promote use of best environmental practices (BEP) [Article 5, para. (d)]
- for existing sources, promote use of BAT & BEP [Article 5 (e)]

### 2.3.3.2 Situation in Sri Lanka

The process of developing the inventory was based on both field research (site visits, interview, and personal contacts) and statistical information and the use of the Toolkit to provide default emission factors. In the absence of comprehensive measured data there will always be uncertainty associated with the estimates made.

In general good statistical information is available on those industries that are regulated by the Central Environment Authority and operated under the Board of Investment systems. Information on other processes was harder to gather in some cases.

The main sources of releases of PCDD/F in Sri Lanka were identified as:

- The uncontrolled combustion of wastes, primarily in dumps and in the open;
- The processing of metals, in particular scrap copper where a significant amount of PCDD/F is likely to be associated with the residue from gas cleaning systems;
- The incineration of medical wastes which is largely carried out under poorly controlled conditions;
- Burning of biomass in homes for cooking, industry and for disposal of agricultural residues.

Estimates of releases to air and residues were far greater than for releases to water, land or in products. This reflects both the nature of the main sources (thermal processes giving air emissions and residues from gas cleaning and combustion) and a lack of data to estimate releases to other media.

The process of assembling the inventory has allowed a valuable and extensive database of knowledge on a wide range of processes and activities to be assembled. This knowledge should be reviewed, stored and used as a basis for updating the inventory with any necessary additions, changes and corrections. It will also be of considerable use in assessing other pollutant sources to the environment in Sri Lanka.

In Sri Lanka, testing for dioxins and furans have not been carried out so far except for the recent sampling programme initiated by Holcim Lanka (pvt) Ltd. (the only clinker manufacturer in Sri Lanka) at Puttlam in February 2004. The samples collected were sent to Singapore for dioxins and furans analysis. The results however have not been communicated to the POPs office as yet.

It was possible to make estimates of releases for all the main categories and to identify two types of potential “hot spot”. The best data were available on air emissions and the inventory of releases to air is more complete than for releases to water, land, products or residues. There is almost no information on releases to water, in products or to land. Limited information is available on releases to residues.

The largest calculated releases are to air (171 g I-TEQ per year) and in residues (79.5 g I-TEQ per year). Based on limited data releases to water were estimated at 0.079 g I-TEQ per year and in products at 6.27 g I-TEQ per year.

The largest estimated air emissions are from category 6, uncontrolled burning processes (waste and biomass), category 1, waste incineration, category 3, the generation of heat and power, category 2, metal production and processing and category 8, miscellaneous. Between them these account for over 99% of the total estimated emissions to air.

The main source categories contributing to estimated releases in residues were category 2, metal processing and category 6, uncontrolled combustion, between them accounting for over 99% of estimated releases.

For all the open burning categories it was felt that emissions factors that were based on local conditions and local wastes and biomass would help greatly to improve estimates of releases.

Category 2, the production and processing of metals is estimated to contribute significantly to overall releases of PCDD/F in Sri Lanka. In particular the processing of non-ferrous metals. The processing of scrap copper which originates in the middle east is a major industry. The processing plants are fitted with basic wet scrubbers to reduce releases of pollutants to air and the feed materials have to meet the requirements of the Basel Convention (95% metal). Emissions to air and residues have been calculated. The calculated release associated with the flue gas treatment residues is the largest estimated residue release. These residues are meant to be re-exported to the country from where the scrap originates so that with proper management there should not be a significant release to the environment in Sri Lanka. Further information is required to fully characterise this potentially significant source of releases of PCDD/F to air and residues and attention should be paid to potential releases to water arising from the use of wet scrubbers.

The processing of scrap aluminium is also becoming a significant activity. The industrial facilities benefit from scrap sorting and wet flue gas scrubbing which will reduce releases compared to the worst cases. In addition to the industrial-scale processing there is also a widespread, cottage-scale industry melting aluminium (as well as brass) for local products. There is little data that allows to estimate the magnitude of releases from this sector but it is clear that occupational exposures to pollutants are high.

The main source related to combustion in Sri Lanka is likely to be the open or poorly controlled burning of wastes and other materials. The inventory for dioxins and furans has shown that poorly controlled or uncontrolled combustion is a major activity and major source of PCDD/F.

**Table 9 : Summary Inventory of Releases for Sri Lanka, 2002**

| | Category | Releases, g I-TEQ per year | | | | |
|---|---|---|---|---|---|---|
| | | Air | Water | Land | Products | Residues |
| 1 | Waste Incineration | 20.3 | 0.055 | NA | NA | 0.133 |
| 2 | Ferrous and non-ferrous metal production and processing | 5.52 | ND | NA | NA | 49.8 |
| 3 | Power generation, heat and cooking | 19.3 | ND | ND | NA | 0.096 |
| 4 | Mineral products | 1.37 | NA | ND | ND | 0.002 |
| 5 | Transport | 0.54 | NA | NA | NA | ND |
| 6 | Uncontrolled combustion | 121 | ND | ND | NA | 29.4 |
| 7 | Chemical and consumer products production and use | ND | ND | ND | 0.446 | ND |
| 8 | Miscellaneous | 3.46 | ND | ND | ND | 0.074 |
| 9 | Disposal/landfill | ND | 0.024 | ND | 6.00 | 0.022 |
| 10 | "Hot spots" | Site of chlorine production. Residues from chlorine bleaching of pulp | | | | |
| | | | | | | |
| | Total | 171 | 0.079 | ND | 6.45 | 79.5 |

*Source: Preliminary Inventory of Dioxin and Furans,* Ministry of Environment *2006*

Preliminary estimates of possible releases of hexachlorobenzene from open waste burning can be made by combining the estimated mass of waste (domestic/industrial/commercial) being burned in landfill fires and in the open with initial estimates for emission factors derived from testing in the US.

**Table 10 : Estimated air releases of HCB from open burning**

| | | Activity statistic | Emission factor | Estimated annual release, |
|---|---|---|---|---|
| | | | Air | Air |
| **Open burning of wastes** | Landfill fires and open burning | 142,500 t | 0.035 mg/kg | 4990 g |

*Source: Preliminary Inventory of Dioxin and Furans,* Ministry of Environment *2006*

Other releases would be expected from the other principal sources of PCDD/F identified in Sri Lanka, in particular other uncontrolled combustion processes, incineration and processing of metals.

### 2.3.3.3 Priority problems and objectives for POPs management

#### 2.3.3.3.1 Objectives

- Implementation of BAT/BEP requirement for new sources in the legislation;
- Implementation of proper solid waste management and disposal mechanisms in accordance with BAT/BEP;
- Implementation of BAT/BEP in secondary metal recycling plants;
- Upgrading the incineration processes in existing crematoria.

#### 2.3.3.3.2 Priority problems

- Lack of legislation/s to cover unintentional POPs emissions regulation;
- Lack of data to determine levels in environment to determine extent of contamination.
- Uncontrolled combustion of wastes;
- Medical wastes burning in low technology incinerators or burn pits;
- Processing of scrap metals;
- Household cooking;
- Power generation using heavy fuel;
- Crematoria.

## 2.3.4 MONITORING

### 2.3.4.1 Introduction

In order to address the monitoring capacity of POPs it is necessary to address both technical and administrative aspects. Through the two aspects are inter-related it is important that they are taken individually so that the strengths and weaknesses in the regional and local levels could be easily understood. These two aspects should further be considered in qualitative and quantitative terms in respect of monitoring capacity.

#### 2.3.4.1.1 Relevant Stockholm Convention Requirements

**Parties must, within their capabilities**, address the following obligations in preparing their action plan to address research, development and monitoring measures (Article 11):

- At the national and international levels, encourage and/or undertake research, development, monitoring and cooperation on all aspects of POPs, their alternatives and candidate POPs, including on (para. 1):
    - Sources and releases into environment;
    - Presence, levels and trends in humans and the environment;

- Environmental transport, fate and transformation;
- Effects on human health and the environment;
- Socio-economic and cultural impacts;
- Release reduction and/or elimination; and
- Harmonized methods for making source inventories and analytical techniques for measuring releases.

- In undertaking the actions in paragraph 1 (para. 2)
  - Support and further develop international programmes, networks and organizations to define, conduct, assess and finance research, data collection and monitoring;

### 2.3.4.2 Situation in Sri Lanka

While there are a large number of laboratories (ITI, Registrar of Pesticides, SGS , TRI, University of Ruhuna, University of Colombo, NARA, City Analyst Lab, University of Moratuwa, Govt. Analyst Dept., IFS, CRI and NWSDB.) in Sri Lanka with chromatographic facilities, only ITI, Registrar of Pesticides, SGS (private laboratory) and TRI regularly carry out analysis of pesticides, and only ITI carries out analysis of PCB and industrial chemicals. Further ITI is the only laboratory that has international accreditation against ISO 17025 for any of the POPs. (Accreditation has been obtained for pesticides in water) There is no lab with facilities (High resolution GC & HRGCMS) to measure Dioxin & Furan in Sri Lanka.

In order to address the monitoring capacity of POPs it is necessary to address both technical and administrative aspects. Out of the two aspects the most important with respect to monitoring of unintentional by-products is the technical aspect, as there are no facilities in the region to monitor unintentional by-products. Facilities to monitor other POPs are available but there are technical and administrative problems prevailing in the country that retard the development and maintenance of the laboratory monitoring capabilities. viz;

#### 2.3.4.2.1 Priority Problems

- The laboratories that are capable of monitoring POPs have limited funds or funds are mandated for other purposes and hence do not have a budget for environmental monitoring. (e.g. ITI, ROP)
- The authorities responsible administratively for monitoring industrial or environmental aspects (e.g. CEA) do not have the facilities nor do they have necessary funds to obtain the services of the laboratories having the facilities
- Severe lack of technical backup support and supplies for the maintenance of laboratory equipment as well as purchase of analytical consumables. When an instrument requires repair, it is often necessary to bring down technicians from abroad or send the instrument to the manufacturer which is expensive.
- Lack of adequate financial support for sustainability of the facility, especially in weaker economic countries.
- Data generated from laboratories should be reliable and since the carrying out of accurate analysis, maintenance of a quality system, and professional maintenance of instruments requires expertise and funds. Priority should therefore be to provide funds for existing facilities to be maintained, developed and used for monitoring instead of seeking to build up many more facilities.

With respect to regulatory and administrative capabilities in Sri Lanka, the capacity is relatively satisfactory with persistent pesticides compared to other POPs, as these have been banned for a long time. In contrast the administrative monitoring capacity for the POPs of industrial origin, PCB and unintended by-products are relatively poor in the Indian Ocean region. At present there is no regulation to prevent PCB from entering the country, and it is also possible to bring other POPs into the country under other HS codes.

### 2.3.4.3 Priority problems and objectives for POPs monitoring

One of the main concerns associated presently with POP pesticides is the possibility of exposure through contaminated sites / environmental compartments resulting from historical uses. However there is very little information available on environmental levels which hinders seriously the arrival at a sound and reasonable prediction on potential human and environmental adverse effects arising from POP pesticides use in Sri Lanka. Existing data however indicates that the degradation products of DDT in particular are present in sediment samples which could be due to historical use or illegal entry might still be taking place into the country. Analysis of samples of imported dry fish indicated again the presence of DDT degradation products suggesting that this might be a route of entry into the country.

As a result of the preparation of the baseline and monitoring analytical reports it was possible to identify some of the key issues in the related field:

- Lack of information on environmental levels of POP pesticides in various environmental compartments and sites where they were used in the past since there is no regular monitoring programme.
- Lack of laboratory to analyse for Dioxins and Furans means that all the values reported are based on calculated values using the toolkit. However it is too prohibitively expensive to establish such a lab.
- PCBs contamination (50-2000ppm) has been reported from hundreds of transformers which complicates the issue as the contamination could be widespread.
- Lack of facilities to monitor the quality of food at the point of import allowing the import of items contaminated with POP pesticides or possible false declarations by the importer.
- Disposal of outdated stocks of POP pesticides in Sri Lanka. e.g. 10 kg of DDT and 18 kg of Aldrin have already been identified to be requiring disposal
- Lack of proper awareness on present status on POP pesticides among all the sectors including scientific community.
- Absence of a proper system to monitor serious human health and environmental adverse effects of pesticides under the local conditions and usage practices.

#### 2.3.4.3.1 Objectives

- To get sufficient resources for effective monitoring;
- To prevent importation of contaminated food

#### 2.3.4.3.2 Priority problems

- Monitoring problems (technical/financial);
- Risk of importation of contaminated food;
- Presence of POPs in the environment- PCBs and pesticides.

Chapter

3

# 3.0 STRATEGY AND ACTION PLAN ELEMENTS OF THE NATIONAL IMPLEMENTATION PLAN

The GOSL is committed to protect the environment and also to uphold international commitments made in this regard. On 5th September 2001 the GOSL became a signatory to the Stockholm convention and ratified the same on 22nd December 2005. The GOSL then followed up with a program of inventorisation of relevant issues and the formation of an action plan (NIP) to meet expected provisions under the convention through a grant from GEF. The chapter 3 describes in detail the GOSL policy, goals, strategies and action plans developed. Cost estimates for various activities are also presented.

As GOSL has also committed to the international conventions and protocols such as Montreal, Basel and Rotterdam, the activities considered under NIP also seek cross program support in realising common goals. Also it is the expectation of GOSL to plan innovatively to implement ideas with future in mind. This is in line with the GOSL thinking on sustainable development for Sri Lanka.

**POLICY STATEMENT ON POPS MANAGEMENT**

As a party to the Stockholm Convention, the Government of Sri Lanka is committed and will take necessary measures to fulfil its obligations and responsibilities. These measures will be implemented within the National Environmental Policy.

## 3.1 SUMMARY OF FINDINGS FROM INVENTORIES

The process of inventorisation and related studies revealed the following issues with regard to the three core groups – pesticides, PCB's and Unintended byproducts of concern. The analysis of problems led to the development of a set of management actions.

### 3.1.1 PROBLEMS RELATED TO POPS PESTICIDES

- *Possibility of illegal imports through false declarations*
- *Lack of resources for systematic screening of imports*
- *Environmental impacts and baseline levels not adequately studied*
- *Lack of sufficient resources for identification and analysis*
- *Inadequate Health impact data*
- *Stocks of outdated Non-POPs pesticides still to be disposed.*

### 3.1.1.1 Management Actions Identified for - Pesticides

1. Improvement of pesticide regulatory system to adequately address the specific issues
2. Mechanism to minimise accumulation and safe disposal of outdated pesticides, at all levels
3. Development and implementation of proper information gathering and dissemination system
4. Develop Laboratories and analytical Capacity
5. Monitoring and surveillance of environmental and human health effects

## 3.1.2 PROBLEMS RELATED TO PCBs

- *Lack of adequate legislation to control imports*
- *Environmental impacts and baseline levels not adequately studied*
- *Lack of sufficient resources for identification and analysis*
- *Lack of acceptable treatment, disposal and storage systems for PCB contaminated oils and equipment.*
- *Contaminated sites yet to be identified.*
- *Cross Contamination of non PCB oil with PCB oil*

### 3.1.2.1 Management Actions Identified for PCBs

1. Develop new legislation for management and prevention of new entry to the country
2. Establish full inventory of PCB containing equipment
3. Establish procedures for equipment maintenance
4. Establish appropriate laboratory facilities for PCB analysis.
5. Establish and implement guidelines for phase out, transportation, storage and disposal of PCB containing equipment
6. Establish progress monitoring mechanisms
7. Capacity building for control and management of PCBs
8. Disposal of existing stocks and stockpiles
9. Rehabilitation and decontamination of contaminated sites

10.Introduce control measures to prevent cross contamination.

## 3.1.3 PROBLEMS RELATED TO UNINTENTIONALLY PRODUCED BY PRODUCTS

- Lack of information to enable an estimate of releases associated with certain industries burning wastes, in particular textile off cuts and other waste.
- Lack of data on several categories of accidental fires.
- Lack of appropriate emission factors for some sectors. Of particular significance would be the lack of data on releases to water, for example associated with textile and leather industries.
- Lack of emission factors that relate to the burning of wastes and biomass is noted and further testing will greatly increase confidence in the estimated emissions.
- Significant uncertainty in relation to the amounts of waste that are ultimately burned in dumps and landfills, the fate of medical waste and the quantities of biomass that are used in the country.
- Uncertainty over the appropriate emission factors for the metal processes, biomass combustion and related to textile and leather processing in addition to the burning of wastes in dumps and in the open.

### 3.1.3.1 Management Actions Identified for unintentionally produced by products

1. Incorporate BAT/BEP requirement into legislation for new sources
2. Review & upgrade relevant legislation/s on solid waste management
3. Implement proper solid waste management/disposal mechanism
4. mplement proper medical wastes disposal techniques
5. Review existing technology on secondary metal recycling plants, including traditional industries, and identify necessary changes for upgrading these systems
6. Review existing crematoria designs for their acceptance and identify changes
7. Introduce Cleaner Production Technology Concepts to Industry.

This three sets of findings in turn generated several action plans necessary to fulfil monitoring, and knowledge dissemination and reporting. Separately designed action plans finally led to some streamlining of related activities such as in Policy and Regulatory framework design and implementation and in Resource and Development.

## 3.2 IMPLEMENTATION STRATEGY

The implementation strategy proposes detailed actions to be taken to meet the obligations of the Stockholm Convention, reflecting the specific situation of the country. This was done based on the analysis of the country baseline situation, the provisions of the Stockholm Convention as well as other relevant international treaties and national policies, pursuant to the national priorities and objectives for POPs. Options were identified for institutional and regulatory strengthening, POPs management, awareness raising activities and research and development.

The proposed options are subject of the particular action plans and strategies. For each option an explanatory text describes the rationale behind selecting the particular option as well as the expected capacity of the option to meet the Stockholm Convention requirements.

An implementation strategy table contains information on activities associated with the particular option, implementation timelines, responsible and supporting agencies for implementation, and indicators of success. Links to existing country programmes on chemical management, environmentally sound waste management and environmental pollution control as well as with the national activities on sustainable development are provided.

In the Resource Requirements, human, capital and operation costs of the identified activities are described, considering the established timeline. The issues related to pesticide and PCBs stockpiles, as well as to pesticides, PCBs and PCDD/PCDF wastes and contaminated sites are included in the respective action plans. Some of the overlapping issues, such as institutional and regulatory strengthening measures and awareness raising activities are mentioned in the compound specific action plans with the reference to the specific action plans, where they are elaborated in detail.

A strategy for information exchange and reporting provides the base for the reporting to the Conference of the Parties (COP) as well as for the future evaluation and updating of the NIP.

**The overall strategy, goals and the action plans are outlined in summary form below;**

## Strategy

**Achieve satisfactory POP and related Chemicals Management in Sri Lanka through Public Awareness and Participatory Action within an appropriate legal and institutional framework**

## Goals:

1. Integrate into legislation BAT/BEP requirements for new sources
2. Review & upgrade relevant legislation/s on solid waste management
3. Implement of proper hazardous waste management/disposal mechanism
4. Implement of proper medical wastes disposal techniques
5. Review existing technology on secondary metal recycling plants, including traditional industries, and identify necessary changes for upgrading these systems
6. Review existing crematories designs for their acceptance and identify changes
7. Establish environmental regulatory approval authority status to CEA for managing chemicals

## Action Plans:

Action Plan 1: Institutional and Regulatory Strengthening Measures;

Action Plan 2: POPs Pesticides;

Action Plan 3: PCBs and Equipment Containing PCBs;

Action Plan 4: Unintentionally Produced POPs By-products;

Action Plan 5: POPs Monitoring;

Action Plan 6: Information Exchange and Reporting; Public Awareness, Information Dissemination and Training;

## 3.3 STRATEGIES AND ACTION PLANS

### 3.3.1 ACTION PLAN 1`: INSTITUTIONAL AND REGULATORY STRENGTHENING MEASURES

#### 3.3.1.1 Management Activities

The following 10 activity areas were identified for institutional and regulatory strengthening: based on the analysis of the country baseline situation, provisions of the Stockholm Convention as well as other relevant international treaties and national policies, pursuant to the national priorities and objectives for POPs management.

1.Formulate regulation for management, handling and phase out of PCBs and PCBs containing material

2.Develop policies on setting up of new foreign investment projects related to POPs Chemicals

3.Establish Legislation requiring the use of BAT/BEP for new installations and upgrading the existing systems

4.Identify contaminated sites and develop de-contamination programs with required funding, appropriate technology and time targets

5.Strengthen monitoring and institutional capacities at the point of import

6.Implement Hazardous chemical management systems including POPs

7. Improve pesticide regulatory system

8. Review and upgrade relevant legislation on solid waste management

Research and Development

9. Evaluation of current/future technologies and identification of alternative technologies.

10. Evaluate PTS for candidate POPs action

*Note: Management activity 7 is covered under the Action Plan (AP) on POP pesticides and management option 8 is covered under the AP on unintentionally produced POPs by-products.*

The proposed activities for realising the objectives are described in more detail in the following text. For each activity an explanatory text describes the rationale behind selecting the particular idea as well as the expected capacity of the activity pathway to meet the Stockholm Convention requirements.

An implementation strategy table contains information on activities associated with the particular management option, implementation timelines, responsible and supporting agencies for implementation, and indicators of success. Links to existing country programmes on chemical management, environmentally sound waste management and environmental pollution control as well as with the national activities on sustainable development are provided.

In the resource requirements human, capital and operation costs of the identified activities are described, considering the established timeline.

### 3.3.1.2. Implementation strategy

Even though Sri Lanka has ratified the Basel Convention on the Control of Transboundary Movements of Hazardous wastes and their Disposal, there are certain gaps in the national legislation which require to be filled in order to effectively control the importation of POPs chemicals/wastes.

Import and use of Pesticides are being controlled through the Control of Pesticides Act by the Registrar of Pesticides. However the existing regulatory mechanism to control POPs other than pesticides is insufficient. Therefore the highest priority should be given to the prevention of fresh stocks of POPs chemicals coming into the country in the form of pure chemicals, POPs containing equipment or as waste materials.

As PCBs have been used worldwide in a wide variety of industrial and consumer applications there is a need to be aware of flow of used products/wastes coming into the country. As such, a possibility exists that PCB containing and contaminated equipment may be exported to countries such as Sri Lanka. According to the investigations made during the PCB inventory preparation, Sri Lanka does not need PCB anymore as there are sufficient alternatives. Phasing out of existing stocks of PCBs in the country would not be a problem as long as fresh stocks of PCBs are not brought in legally or illegally. Since there is no specific legislation or regulation imposing a specific ban on the import of PCBs, gazetting such a regulation banning the import of PCB and PCB containing equipments/ waste material is a priority.

Therefore, the banning of PCB immediately would be an essential and important step towards the minimization of environmental and health risk due to accumulation of PCBs. Alternate options to address the problem range from leaving existing laws in place while filling the gaps with new laws or voluntary initiatives, amendment of existing laws or introducing new comprehensive legislation.

#### 1. Formulate regulation for management, handling and phase out of PCBs and PCBs containing material

##### 1a. Prohibit imports of PCBs and PCB containing equipments under Import & Export Control Act

A complete and immediate ban on the import of PCBs (both waste and PCB containing equipments) and other POPs industrial chemicals through the Import and Export Control Act is the fastest and straightforward measure as that seems to be the best solution in this regard. Further the regime of penalties is effective and consistent. However, a new act if it is deemed necessary may be considered in the future.

**Table 11 (a): Prohibit imports of PCBs under Import & Export Control Act**

| | **Option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **1a.** | **Prohibit imports of PCBs under Import & Export Control Act.,** | | | | |
| 1a.1 | Evaluate the Existing law and gaps and propose amendments or new regulations | 2007 | **CEA**,ME,Dept of Im & Ex, Dept. of Customs & other stakeholders | Evaluation Report with Proposals | Regulations under the Basel Convention |
| 1a.2 | Drafting | 2007 | -do- | Amendments New Regulations | |
| 1a.3 | Approvals | 2007 | **Dept of Im. & Ex**. ,CEA, ME | Approvals | |
| 1a.4 | Gazette the regulation | 2007 | -do- | Regulation gazetted | |
| 1a.5 | Monitor Implementation | 2008- cont. | -do- | Zero imports | |

### 1b. Formulate regulation under the NEA for management, handling and phase out of PCBs and PCBs containing material

Legislative reform for the management (inventory, labelling, reporting), handling (maintenance, transport, disposal) and phasing out of PCBs and PCB containing material (equipment and wastes) is an urgent need. Relatively high health, safety and environment risks associated with PCBs were identified and in the absence of effective recording, labelling, reporting mechanism, there is a significant shortage of reliable data in order to arrive at decisions and formulate policies with regard to their phase out and final disposal by the year 2025 for equipment, and 2028 for wastes respectively. Therefore there is an urgent need for an integrated law to effectively manage existing PCBs stocks in order to regularly update the PCBs inventory and gradually phase out the PCBs containing equipment as well as dispose of the PCBs containing waste.

**Table 11 (b): Formulate regulation under the NEA for management, handling and phase out of PCBs and PCBs containing material**

| | **Option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **1b** | **Formulate regulation under the NEA for management, handling and phase out of PCBs and PCBs containing material** | | | | |
| 1b.1 | Draft regulations with Enabling regulation for reporting requirements and phase out date | 2007/8 | **CEA**, ME, Users | Regulations | Drafting of regulations would be provided under the Import and Export Control Act. Under the NEA also regulations |
| 1b.2 | Obtain necessary approvals | 2007 | **ME** | Legislation in place | |
| 1b.3 | Gazette the regulation | 2007/8 | **ME**, CEA | | |
| 1b.4 | Develop Guidelines & Standards for PCB life cycle management/control | 2007/8 | **CEA** | Guidelines | |

| | | | | | |
|---|---|---|---|---|---|
| 1b.5 | Develop system to monitor the fate of the existing PCB containing equipments and repairs | 2008 | **CEA**, LEB, LECO | GI &Std in place | could be drafted. If no provisions are available amendments to the Act would be required. |
| 1b.6 | Implement the regulations | 2008/9 | **CEA** | Inventory completed | |
| 1b.7 | Monitor Compliance | 2009 cont. | **CEA** | Compliance mechanism | |

A consideration of the CEA as a regulatory authority for managing chemicals overall in the country from an environmental standpoint will considerably ease management. The CEA will have the powers to designate authority under specific instances in collaboration with the Ministry of Environment. For example, the ROP can be the designated authority for pesticides. This will ensure even future developments.

## 2. Develop policies on setting up of new foreign investment projects related to POPs Chemicals

There is evidence that many of the polluting industries being rejected in developed countries are being shifted to Developing countries like Sri Lanka.

The uncontrolled usage of chemicals / Hazardous Substances, and Waste have become a serious concern from the point of view of the society, as exposure to chemical pollution and hazards have a number of adverse effects to the environment and human health.

There is evidence that in Sri Lanka certain foreign investment projects are being allowed without a proper evaluation on knowledge of their possible adverse impacts. Such projects may include those which emit large quantities of unintentionally produce POP's such as Dioxin and Furan. Therefore a clear-cut policy should be put in place not to allow such polluting industries within the country which could result in irreversible health and environmental damage. BOI should be encouraged to develop a policy to exclude industries that will compromise Sri Lanka's international environmental obligations as well as affecting national environmental conservation strategies (ie. The adoption of a negative list of industries and giving due publicity).

### Table 11 (c): Develop policies on setting up of new foreign investment projects related to POPs Chemicals

| | **Option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **2** | **Develop policies on setting up of new foreign investment projects related to POPs Chemicals** | | | | |
| | | | | | |
| 2.1 | Carryout the study regarding existing foreign investment projects . | 2007 | **BOI**, ME, My of Ind. | Evaluation report | Considerat ion of POPs issue in EIA/IEE. Raise Awareness |

| | | | | | |
|---|---|---|---|---|---|
| 2.2 | Evaluate the current policy regarding foreign investments | 2006 | **MIP**, BOI, other related. min[4]. | Evaluation Report | |
| 2.3 | Identify Projects which need to be controlled or not allowed. | 2007 | -do- | List of projects | |
| 2.4 | Amend the current policy | 2007 | -do- | Amended policy | |
| 2.5 | Implement the Policy | 2006/7 | -do- | Regulations and necessary guidelines and procedures | |
| 2.6 | Monitor and make necessary changes to the policy | 2007 cont. | -do- | Progress | |

## 3. Establish Legislation requiring the use of BAT/BEP for new installations and upgrading the existing systems

Under the Stockholm Convention on Persistent Organic Pollutants, Parties are obligated to promote in some cases and require in others the use of best available techniques (BAT), and promote the application of best environmental practices (BEP). As Sri Lanka does not have financial capability to establish Dioxin and furan monitoring/ measuring system application of BAT and BEP are the best solution to control this unintended production of unintentional POPs from industrial purposes. An existing pollution control tools specified in the regulations gazetted under the NEA such as EPL procedure could be used in this regard.

**Table 11 (d): Establish Legislation requiring the use of BAT/BEP for new installations under existing legislation on Environmental protection Licence**

| | **Option /** Activities | **Time frame** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **3.** | **Establish Legislation requiring the use of BAT/BEP for new installations under existing legislation on Environmental protection Licence** | | | | |
| 3.1 | Evaluate existing systems | 2007 | **CEA**/BOI/IDB/ NCPC/ITI | Evaluation report | Establishment of emission standards for Dioxin & Furans is impractical at the present time as the costs involved would be prohibitive for industry. The use of BAT/BEP is the most practical solution in this regard. |
| 3.2 | Propose suitable BAP/BEP technologies for existing systems | 2007 | **CEA**, ITI, NCPC, ME, BOI | List of suitable technologies | |
| 3.3 | Identify a strategy for promotion of these technologies e.g:: regulations/ market based incentives | 2008 | **CEA**, ME, My of Ind. NCPC | A strategy | |
| 3.4 | Prepare a schedule for implementation of suitable BAT/BEP technologies | 2008 | **CEA**, ME, My of Ind, NCPC | Work plan | |
| 3.5 | Supplementary Environmental Review for new installations | 2008/10 | **Industries**/ CEA | Reduce unintended by products | |
| 3.6 | Tax incentives/subsidies for adoption of BAT &BEP | 2009/10 | **My. of Finance**, MENR | Improved Techniques | |
| 3.7 | Monitoring | 2010/11 | **Monitoring committee** | Progress | |

[4] Other ministries related to industrial development

## 4 Identify contaminated sites and develop a de-contamination programme with required funding and time targets

In the absence of integrated hazardous waste management facilities in the country for disposal of hazardous waste, industries dispose industrial waste with municipal waste or separately in all haphazard way. Hence, there may be lot of contaminated sites with hazardous substances including POPs due to this uncontrolled disposal. During the initial investigation of POPs contaminated sites, it was noted that outdated transformers and capacitors were stored in open areas without any control measure which could lead to heavy contamination of surrounding areas. (PCB Inventory)

There is an urgent need to identify contaminated sites and prepare procedure to screening and apply environmentally sound control measures in order to stop further pollution and if need to apply remedial measures for such contaminated sites.

### Table 11 (e): Identify contaminated sites and develope a decontamination programme with required funding and time targets

| | **Option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| 4 | **Identify contaminated sites and develope a decontamination programme with required funding and time targets** | | | | |
| 4.1 | Identify an effective integrated methodology for possible contaminated sites | 2008 | **CEA**, ME, BOI, IDB etc | A strategy | echnology nsfer and acity Building of eholders is a c prerequisite |
| 4.2 | Identify prioritization criteria | 2008/9 | -do- | Set of Criteria | |
| 4.3 | Establish an evaluation mechanism of the extent of pollution | 2009/10 | -do- | A report | |
| 4.4 | Establish expert committee for decision making | 2009/10 | -do- | A TEC established | |
| 4.5 | Prepare decontamination & monitoring programs based on their recommendations | 2011 | -do- | A report | |
| 4.6 | Implementation | 2012 on wards | -do- | Implementation strategy | |

## 5. Strengthen monitoring and institutional capacities at the point of import.

Several laws such as Pesticides act, contain provisions for registration and licensing of certain chemicals.

Sri Lanka Ports Authority finds it difficult to implement the existing law to avoid accumulation of hazardous chemical waste due to practical limitations. The chemical names are changed on documents due to the lack of means of qualitative verification incorporated into the process of clearance of chemicals at Customs . It is also important to note that the current tax structure for chemical goods is not designed in a way to contribute to managing the type and quantity of chemicals being imported.

The Customs Tariff Guide, which is an adoption of the Harmonized System (HS) Code, used by the Customs Officials, only facilitates the identification of the chemical or the chemical group, mainly for tax purposes. It does not contain any information on the toxicity or hazards of the chemicals. The Customs Tariff Guide does not give a complete list of chemicals as some HS numbers represent a group of chemicals, which may include several chemical varieties. To expedite controls it is important to quickly establish 8-digit code with national numbers. Customs should be strengthened in terms of environmental monitoring and control. Therefore the monitoring facilities including Technical competency in terms of expertise as well as infrastructure should be improved at the point of import.

### Table 11 (f): Strengthen monitoring and institutional capacities at the point of import

| | **Option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **5.** | **Strengthen monitoring and institutional capacities at the point of import** | | | | |
| 5 1 | Identify the necessary requirements and sectors to be improved/ upgraded | 2006/7 | **Customs,** Ports Authority, Airport & Aviation Authority | Report | Prepare Network of Stakeholders |
| 5.2 | Upgrade laboratory facilities | 2007/8 | -do- | | |
| 5.3 | Train Personnel on better detection and monitoring | 2007/8 | -do- | Better detection of illegal imports | |
| 5.4 | Identify information dissemination system | 2006 | -do- | Dissemination progress | |
| 5.5 | Establish such a system | 2006/7 | -do- | System Established | |
| 5.6 | Disseminate information among stakeholders | 2007 | -do- | Feedback reports from stakeholders | |

## 6. Implement Hazardous chemical management systems including POPs

A legislative reform for the management of chemicals including POPs is an urgent need due to rapid growth in production, trade, trafficking and use of a wide variety of chemicals in the country. Health, safety and environment risks associated with hazardous chemicals are expected to rise in the absence of effective regulations and hence there is an urgent need for an integrated law to effectively regulate the import, storage, transport, handling, sale, use, recycling and disposal of Industrial Chemicals in the country. This law should comply with the principles of Strategic Approach for International Chemical Management (SAICM). Since Sri Lanka is a party to the Rotterdam Convention as well, conformity with it is also necessary.

**Table 11 (g): Implement Hazardous chemical management systems including POPs**

| | **Option /** Activities | **Time frame** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **6** | **Implement Hazardous chemical management systems including POPs** | | | | |
| 6.1 | Identify Strategy | Mid 2007 | **CEA**.,ME, ROP,ITI,BOI | Strategy | Comment: POPs waste Will have to be addressed Through implementation of Basel Conv.,& internal HWM reg. |
| 6.2 | Identify Implementing Agency | 2007 | -do- | | |
| 6.3 | Draft legislation | 2008 | -do- | Legislation in place | |
| 6.4 | Obtain necessary approvals | 2008 | -do- | | |
| 6.5 | Implementation | 2008 | -do- | Haz.Chemical Mgt.& Tracking System in place | |
| 6.6 | Evaluate the Strategy | 2008 | **CEA**,MEand Multidisciplinary Committee | | |

## 7. Improve pesticide regulatory system

The management activities and implementation strategy to improve pesticide regulatory system is detailed under the Action Plan (AP) on POP pesticides.

## 8. Review and upgrade relevant legislation on solid waste management

The management activities and implementation strategy to Review and upgrade relevant legislation on solid waste management is covered under the AP on unintentionally produced POPs by-products.

## 3.3.1.2.1 Research and development

The proposed research and development actions are described in more detail in the following text. For each proposed R&D action an explanatory text describes the rationale behind selecting the particular option as well as its expected capacity to facilitate NIP implementation.

An implementation strategy table contains information on activities associated with the particular R&D action, implementation timelines, responsible and supporting agencies for implementation, and indicators of success. Links to existing country programmes on chemical management, environmentally sound waste management and environmental pollution control as well as with the national activities on sustainable development are provided.

In the Resource requirements human, capital and operation costs of the identified activities are described, considering the established timeline.

## 9. Evaluate of current / future technologies and identification of alternative cleaner production technologies

Under the Stockholm Convention on Persistent Organic Pollutants, Parties are obligated to promote in some cases and require in others the use of best available techniques (BAT), and promote the application of best environmental practices (BEP).In Sri Lanka majority of the industries follow conventional methods evolved form the past experiences. Therefore the time has come to evaluate the situation and to identify the applicable BAT and BEP in Sri Lanka. NCPC can play a major role here under the National Cleaner Production Policy as an affiliate of the Ministry of Industries / UNIDO

**Table 11 (h): Evaluation of current / future technologies and identification of alternative cleaner technologies**

| | **Research & Development Action /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **9** | **Evaluation of current / future technologies and identification of alternative cleaner technologies** | | | | |
| 9.1 | Upgrade preliminary Inventories | 2006-2007 | **ME**, **FCCISL**, CEA /BOI/NWPA/Min of Industries | Upgraded Data base | |
| 9.2 | Evaluation of alternative technologies | 2008 | **Universities**/ ITI/ NERD/ NCPC | No of TT | |
| 9.3 | Identify implementation strategy and a policy | | **CEA**/ITI/BOI/ Min of Industries/ NCPC | Policy formulated | |
| 9.4 | Necessary steps for upgrade the existing systems including training and awareness | 2008 | **BOI**, Min of **Industries**, ITI, CEA | Report on progress of upgrades | |
| 9.5 | Monitoring the performance | | **Min of Env**, CEA, BOI | Reports | |

## 10. Evaluate PTS for candidate POPs action

According to the literature and current investigations there are PTS identified as candidate POPs that will affect human health and the environment. In this context it will be vital need to asses the behaviour of these chemicals and the uses of these substances and include those in the management system in Sri Lanka.

**Table 11 (i): Evaluate PTS for candidate POPs action**

| | **Research & Development Action /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **10** | **Evaluate PTS for candidate POPs action** | | | | |
| 10.1 | Assess current situation | 2007 | **Consultants** & relevant Labs | Status report | |
| 10.2 | Recommend potential POPs for management | 2008 | -do- | Expanded POPs list | |
| 10.3 | Include those to the management system | 2008 | **ME** | Document containing management measures | |

### 3.3.1.3 RESOURCE REQUIREMENTS

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1a** | **Prohibit imports of PCBs under Import & Exports Act.** | H | 10,100 | 5,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 0 |
| | | C | 2,400 | 5,400 | 2,400 | 1,000 | - | - | - | 4,000 | - | 0 |
| | | O | 8,100 | 3,000 | 6,400 | 6,400 | 6,400 | 6,400 | 6,400 | 6,400 | 6,400 | 0 |
| | | **T** | **20,600** | **14,200** | **13,600** | **12,200** | **11,200** | **11,200** | **11,200** | **15,200** | **11,200** | **0** |
| 1a1 | Evaluate the Existing law and gaps and proposals for amendments or new regulations | H | 7,200 | | | | | | | | | |
| | | C | 2,400 | | | | | | | | | |
| | | O | 6,400 | | | | | | | | | |
| | | **T** | **16,000** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **0** |
| 1a2 | Drafting | H | 2,400 | | | | | | | | | |
| | | C | - | | | | | | | | | |
| | | O | 1,200 | | | | | | | | | |
| | | **T** | **3,600** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **0** |
| 1a3 | Approvals | H | 500 | | | | | | | | | |
| | | C | | | | | | | | | | |
| | | O | 500 | | | | | | | | | |
| | | **T** | **1,000** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **0** |
| 1a4 | Gazette the regulation | H | | 1,000 | | | | | | | | |
| | | C | | | | | | | | | | |
| | | O | | 500 | | | | | | | | |
| | | **T** | **-** | **1,500** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **0** |
| 1a5 | Monitor Implementation | H | | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | |
| | | C | | 5,400 | 2,400 | 1,000 | | | | | | |
| | | O | | 2,500 | 6,400 | 6,400 | 6,400 | 6,400 | 6,400 | 6,400 | 6,400 | |
| | | **T** | **-** | **12,700** | **13,600** | **12,200** | **11,200** | **11,200** | **11,200** | **15,200** | **11,200** | **0** |

All costs are in US$

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1b** | **Prohibition of import of PCBs under NE Act** | H | 3,600 | 8,200 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 0 |
| | | C | 1,200 | 6,400 | 0 | 0 | 6,400 | 0 | 0 | 0 | 4 | 0 |
| | | O | 2,000 | 5,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 0 |
| | | **T** | **6,800** | **20,400** | **9,600** | **9,600** | **16,000** | **9,600** | **9,600** | **9,600** | **9,604** | **0** |
| 1b1 | Formulating of regulations | H | 2,400 | | | | | | | | | |
| | | C | 1,200 | | | | | | | | 4 | |
| | | O | 2,000 | | | | | | | | | |
| | | **T** | **5,600** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **4** | **0** |
| 1b2 | Drafting-Incorporate the regulation with the regulation on reporting requirements | H | 1,200 | | | | | | | | | |
| | | C | | | | | | | | | | |
| | | O | | | | | | | | | | |
| | | **T** | **1,200** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 1b3 | Approvals | H | | 1,000 | | | | | | | | |
| | | C | | | | | | | | | | |
| | | O | | | | | | | | | | |
| | | **T** | **0** | **1,000** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 1b4 | Gazette the regulation | H | | 2,400 | | | | | | | | |
| | | C | | | | | | | | | | |
| | | O | | 1,000 | | | | | | | | |
| | | **T** | **0** | **3,400** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 1b5 | Implementation and monitoring | H | | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | |
| | | C | | 6,400 | | | 6,400 | | | | | |
| | | O | | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | |
| | | **T** | **0** | **16,000** | **9,600** | **9,600** | **16,000** | **9,600** | **9,600** | **9,600** | **9,600** | **0** |

H-Human costs
C-Capital costs
O-Operational costs
T-Total costs

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1c** | **Prohibit imports of PCBs under new Act.** | H | 0 | 7,600 | 13,600 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | C | 0 | 2,600 | 11,000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | O | 0 | 5,000 | 7,000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | **T** | **0** | **15,200** | **31,600** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 1c1 | Determine chemicals to be brought under license control or complete ban | H | | 4,800 | | | | | | | | |
| | | C | | 1,000 | | | | | | | | |
| | | O | | 3,000 | | | | | | | | |
| | | **T** | **0** | **8,800** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 1c2 | Draft Act on Control of Industrial Chemicals including POPs | H | | 2,800 | | | | | | | | |
| | | C | | 1,600 | | | | | | | | |
| | | O | | 2,000 | | | | | | | | |
| | | **T** | **0** | **6,400** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 1c3 | Obtain Commitment of the relevant stakeholders | H | | | 6,400 | | | | | | | |
| | | C | | | 6,000 | | | | | | | |
| | | O | | | 3,000 | | | | | | | |
| | | **T** | **0** | **0** | **15,400** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 1c4 | Approval from the LD | H | | | 1,200 | | | | | | | |
| | | C | | | | | | | | | | |
| | | O | | | | | | | | | | |
| | | **T** | **0** | **0** | **1,200** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 1c5 | Cabinet approval | H | | | 1,200 | | | | | | | |
| | | C | | | | | | | | | | |
| | | O | | | | | | | | | | |
| | | **T** | **0** | **0** | **1,200** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 1c6 | Enactment of the appropriate law | H | | | 4,800 | | | | | | | |
| | | C | | | 5,000 | | | | | | | |
| | | O | | | 4,000 | | | | | | | |
| | | **T** | **0** | **0** | **13,800** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1d** | **Regulations for implementation of reporting mechanism for to regularly update the PCB inventory with a phase out plan PCB containing material under NEA.** | H | 0 | 0 | 8,600 | 38,000 | 42,800 | 12,800 | 4,800 | 4,800 | 4,800 | 0 |
| | | C | 0 | 0 | 1,500 | 23,200 | 25,600 | 3,600 | 2,400 | 2,400 | 2,400 | 0 |
| | | O | 0 | 0 | 5,000 | 16,400 | 20,400 | 6,400 | 4,000 | 4,000 | 4,000 | 0 |
| | | **T** | **0** | **0** | **15,100** | **77,600** | **88,800** | **22,800** | **11,200** | **11,200** | **11,200** | **0** |
| 1d1 | Draft regulations with Enabling regulation for reporting requirements and phase out | H | | | 4,800 | | | | | | | |
| | | C | | | 1,500 | | | | | | | |
| | | O | | | 3,500 | | | | | | | |
| | | **T** | **0** | **0** | **9,800** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 1d2 | Obtain Necessary approvals | H | | | 1,000 | | | | | | | |
| | | C | | | | | | | | | | |
| | | O | | | 500 | | | | | | | |
| | | **T** | **0** | **0** | **1,500** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 1d3 | Gazette the regulation | H | | | 1,000 | | | | | | | |
| | | C | | | | | | | | | | |
| | | O | | | 500 | | | | | | | |
| | | **T** | **0** | **0** | **1,500** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 1d4 | Prohibit Importation of PCB and PCB containing equipments | H | | | 1,800 | | | | | | | |
| | | C | | | | | | | | | | |
| | | O | | | 500 | | | | | | | |
| | | **T** | **0** | **0** | **2,300** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 1d5 | Develop Guidelines & Standards for PCB life cycle management/control | H | | | | 10,000 | 10,000 | | | | | |
| | | C | | | | 12,000 | 12,000 | | | | | |
| | | O | | | | 6,000 | 6,000 | | | | | |
| | | **T** | **0** | **0** | **0** | **28,000** | **28,000** | **0** | **0** | **0** | **0** | **0** |
| 1d6 | Develop system to monitor the fate of the existing PCB containing equipments and repairs | H | | | | 20,000 | 20,000 | | | | | |
| | | C | | | | 10,000 | 10,000 | | | | | |
| | | O | | | | 8,000 | 8,000 | | | | | |
| | | **T** | **0** | **0** | **0** | **38,000** | **38,000** | **0** | **0** | **0** | **0** | **0** |
| 1d7 | Implement the regulations | H | | | | 8,000 | 8,000 | 8,000 | | | | |
| | | C | | | | 1,200 | 1,200 | 1,200 | | | | |
| | | O | | | | 2,400 | 2,400 | 2,400 | | | | |
| | | **T** | **0** | **0** | **0** | **11,600** | **11,600** | **11,600** | **0** | **0** | **0** | **0** |
| 1d8 | Monitor compliance | H | | | | | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | |
| | | C | | | | | 2,400 | 2,400 | 2,400 | 2,400 | 2,400 | |
| | | O | | | | | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | |
| | | **T** | **0** | **0** | **0** | **0** | **11,200** | **11,200** | **11,200** | **11,200** | **11,200** | **0** |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2** | **Develop policies on setting up of new foreign investment projects related to POPs Chemicals** | H | 12,800 | 10,400 | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | C | 2,500 | 2,000 | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | O | 2,000 | 3,500 | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | **T** | **17,300** | **15,900** | **-** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 2.1 | Evaluate the current policy regarding foreign investment projects | H | 6,400 | | | | | | | | | |
| | | C | 2,000 | | | | | | | | | |
| | | O | 1,000 | | | | | | | | | |
| | | **T** | **9,400** | **-** | **-** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 2.2 | Identify Projects which need to be controlled or not allowed. | H | 6,400 | | | | | | | | | |
| | | C | 500 | | | | | | | | | |
| | | O | 1,000 | | | | | | | | | |
| | | **T** | **7,900** | **-** | **-** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 2.3 | Amend the current policy | H | | 6,400 | | | | | | | | |
| | | C | | 2,000 | | | | | | | | |
| | | O | | 1,000 | | | | | | | | |
| | | **T** | **-** | **9,400** | **-** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 2.4 | Implement the Policy | H | | 4,000 | | | | | | | | |
| | | C | | | | | | | | | | |
| | | O | | 2,500 | | | | | | | | |
| | | **T** | **-** | **6,500** | **-** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3** | **Establish Legislation requiring the Use of BAT/BEP for new installations under existing legislation on Environmental protection Licence** | H | | 14,400 | 44,500 | 16,500 | 16,500 | 16,500 | 8000 | 8000 | 0 | 0 |
| | | C | | 2,500 | 120,000 | 1,010,000 | 1,010,000 | 1,010,000 | 10000 | 10000 | 0 | 0 |
| | | O | | 5,500 | 31,000 | 37,000 | 37,000 | 37,000 | 25000 | 25000 | 0 | 0 |
| | | **T** | | **22,400** | **195,500** | **1,063,500** | **1,063,500** | **1,063,500** | **43000** | **43000** | **0** | **0** |
| 3.1 | Evaluate existing systems | H | | 2,400 | | | | | | | | |
| | | C | | 1,000 | | | | | | | | |
| | | O | | 2,500 | | | | | | | | |
| | | **T** | **-** | **5,900** | | | **-** | **-** | **0** | **0** | **0** | **0** |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3.2 | Proposal of suitable BAP/BEP technologies could be adopted in the existing systems | H | | 12,000 | | | | | | | | |
| | | C | | 1,500 | | | | | | | | |
| | | O | | 3,000 | | | | | | | | |
| | | **T** | **-** | **16,500** | **-** | **-** | **-** | **-** | **0** | **0** | **0** | **0** |
| 3.3 | Identify a strategy for promotion of these technologies | H | | | 8,000 | | | | | | | |
| | | C | | | 6,000 | | | | | | | |
| | | O | | | 5,000 | | | | | | | |
| | | **T** | | | **19,000** | **-** | **-** | **-** | **0** | **0** | **0** | **0** |
| 3.4 | Prepare a schedule for implementation of suitable BAT/BEP technologies | H | | | 20,000 | | | | | | | |
| | | C | | | 8,000 | | | | | | | |
| | | O | | | 6,000 | | | | | | | |
| | | **T** | | | **34,000** | | | **-** | **0** | **0** | **0** | **0** |
| 3.5 | EIA/IEE for new installation | H | | | 8,000 | | | | | | | |
| | | C | | | 6,000 | | | | | | | |
| | | O | | | 8,000 | | | | | | | |
| | | **T** | **-** | **-** | **22,000** | **-** | **-** | **-** | **0** | **0** | **0** | **0** |
| 3.6 | Tax incentives/subsidies for adoption of BAT &BEP | H | | | 8,500 | 8,500 | 8,500 | 8,500 | | | | |
| | | C | | | 100,000 | 1,000,000 | 1,000,000 | 1,000,000 | | | | |
| | | O | | | 12,000 | 12,000 | 12,000 | 12,000 | | | | |
| | | **T** | **0** | **-** | **120,500** | **1,020,500** | **1,020,500** | **1,020,500** | **-** | **-** | **0** | **0** |
| 3.7 | Monitoring | H | | | | 8,000 | 8,000 | 8,000 | 8,000 | 8,000 | | |
| | | C | | | | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 | | |
| | | O | | | | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 | | |
| | | **T** | **0** | **-** | **-** | **43,000** | **43,000** | **43,000** | **43,000** | **43,000** | **0** | **0** |

All costs are in US$

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **4** | **Identify contaminated sites and development of a de contamination programme with time targets** | H | 0 | 20,000 | 47,900 | 25,000 | 25,000 | 25,000 | 0 | 0 | 0 | 0 |
| | | C | 0 | 8,000 | 20,000 | 200,000 | 200,000 | 200,000 | 0 | 0 | 0 | 0 |
| | | O | 0 | 3,000 | 22,000 | 50,000 | 50,000 | 50,000 | 0 | 0 | 0 | 0 |
| | | **T** | **0** | **31,000** | **89,900** | **275,000** | **275,000** | **275,000** | **0** | **0** | **0** | **0** |
| 4.1 | Identify an effective integrated methodology for possible contaminated sites | H | | 20,000 | 20,000 | | | | | | | |
| | | C | | 8,000 | 8,000 | | | | | | | |
| | | O | | 3,000 | 3,000 | | | | | | | |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **T** | **0** | **31,000** | **31,000** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 4.2 | Identify prioritization criteria | H | | | 6,400 | | | | | | | |
| | | C | | | 4,000 | | | | | | | |
| | | O | | | 4,000 | | | | | | | |
| | | **T** | **0** | **0** | **14,400** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 4.3 | Establish an evaluation mechanism of the extent of pollution | H | | | 9,000 | | | | | | | |
| | | C | | | 3,000 | | | | | | | |
| | | O | | | 8,000 | | | | | | | |
| | | **T** | **0** | **0** | **20,000** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 4.4 | Establish expert committee for decision making | H | | | 500 | | | | | | | |
| | | C | | | | | | | | | | |
| | | O | | | 1,000 | | | | | | | |
| | | **T** | **0** | **0** | **1,500** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 4.5 | Prepare decontamination & monitoring programs based on their recommendations | H | | | 12,000 | | | | | | | |
| | | C | | | 5,000 | | | | | | | |
| | | O | | | 6,000 | | | | | | | |
| | | **T** | **0** | **0** | **23,000** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 4.6 | Implementation | H | | | | 25,000 | 25,000 | 25,000 | | | | |
| | | C | | | | 200,000 | 200,000 | 200,000 | | | | |
| | | O | | | | 50,000 | 50,000 | 50,000 | | | | |
| | | **T** | **0** | **0** | **0** | **275,000** | **275,000** | **275,000** | **0** | **0** | **0** | **0** |

All costs are in US$

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **5** | **Strengthening of monitoring and institutional capacities at the point of import** | H | 8,400 | 83,900 | 76,400 | 66,400 | 5,400 | 5,400 | 5,400 | 5,400 | 0 | 0 |
| | | C | 4,000 | 105,400 | 135,000 | 115,000 | 5,000 | 0 | 0 | 0 | 0 | 0 |
| | | O | 2,400 | 96,800 | 59,200 | 87,200 | 7,200 | 7,200 | 7,200 | 7,200 | 0 | 0 |
| | | **T** | **14,800** | **286,100** | **270,600** | **268,600** | **17,600** | **12,600** | **12,600** | **12,600** | **0** | **0** |
| 5.1 | Identify the necessary requirements and sectors to be improved/ upgraded | H | 8,400 | 8,400 | | | | | | | | |
| | | C | 4,000 | 4,000 | | | | | | | | |
| | | O | 2,400 | 2,400 | | | | | | | | |
| | | **T** | **14,800** | **14,800** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 5.2 | Upgrade laboratory facilities | H | | 36,000 | 36,000 | 36,000 | | | | | | |
| | | C | | 70,000 | 100,000 | 100,000 | | | | | | |
| | | O | | 30,000 | 30,000 | 30,000 | | | | | | |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **T** | **0** | **136,000** | **166,000** | **166,000** | **0** | **0** | **0** | **0** | **0** | **0** |
| 5.3 | Train Personnel on better detection and monitoring | H | | 25,000 | 25,000 | 25,000 | | | | | | |
| | | C | | 15,000 | 15,000 | 15,000 | | | | | | |
| | | O | | 50,000 | 10,000 | 50,000 | | | | | | |
| | | **T** | **0** | **90,000** | **50,000** | **90,000** | **0** | **0** | **0** | **0** | **0** | **0** |
| 5.4 | Identify information dissemination system | H | | 4,500 | | | | | | | | |
| | | C | | 6,400 | | | | | | | | |
| | | O | | 2,400 | | | | | | | | |
| | | **T** | **0** | **13,300** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 5.5 | Establish such a system | H | | 10,000 | 10,000 | | | | | | | |
| | | C | | 10,000 | 15,000 | | | | | | | |
| | | O | | 12,000 | 12,000 | | | | | | | |
| | | **T** | **0** | **32,000** | **37,000** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 5.6 | Disseminate information among stakeholders | H | | | 5,400 | 5,400 | 5,400 | 5,400 | 5,400 | 5,400 | | |
| | | C | | | 5,000 | | 5,000 | | | | | |
| | | O | | | 7,200 | 7,200 | 7,200 | 7,200 | 7,200 | 7,200 | | |
| | | **T** | **0** | **0** | **17,600** | **12,600** | **17,600** | **12,600** | **12,600** | **12,600** | **0** | **0** |

All costs are in US$

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **6** | **Hazardous chemical management, including POPs** | H | 0 | 16,800 | 9,400 | 9,400 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | C | 0 | 7,400 | 6,500 | 6,500 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | O | 0 | 7,800 | 8,500 | 3,500 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | **T** | **0** | **32,000** | **24,400** | **19,400** | **0** | **0** | **0** | **0** | **0** | **0** |
| 6.1 | Identify strategy | H | | 2,400 | | | | | | | | |
| | | C | | | | | | | | | | |
| | | O | | 500 | | | | | | | | |
| | | **T** | **0** | **2,900** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 6.2 | Identify implementing agency | H | | 1,000 | | | | | | | | |
| | | C | | | | | | | | | | |
| | | O | | | | | | | | | | |
| | | **T** | **0** | **1,000** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 6.3 | Draft legislation | H | | 6,500 | | | | | | | | |
| | | C | | 2,400 | | | | | | | | |
| | | O | | 1,800 | | | | | | | | |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **T** | **0** | **10,700** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 6.4 | Obtain necessary approvals | H | | 500 | | | | | | | | |
| | | C | | 1,000 | | | | | | | | |
| | | O | | 500 | | | | | | | | |
| | | **T** | **0** | **2,000** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 6.5 | Implementation | H | | 6,400 | 6,400 | 6,400 | | | | | | |
| | | C | | 4,000 | 4,000 | 4,000 | | | | | | |
| | | O | | 5,000 | 5,000 | 5,000 | | | | | | |
| | | **T** | **0** | **15,400** | **15,400** | **15,400** | **0** | **0** | **0** | **0** | **0** | **0** |
| 6.6 | Evaluate the strategy | H | | | 3,000 | 3,000 | | | | | | |
| | | C | | | 2,500 | 2,500 | | | | | | |
| | | O | | | 3,500 | 3,500 | | | | | | |
| | | **T** | **0** | **0** | **9,000** | **9,000** | **0** | **0** | **0** | **0** | **0** | **0** |

All costs are in US$

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **9** | **R&D: Evaluation of current / future technologies and identification of alternative cleaner technologies** | H | 0 | 30,000 | 66,000 | 80,800 | 48,400 | 48,400 | 0 | 0 | 0 | 0 |
| | | C | 0 | 6,000 | 40,000 | 788,400 | 756,000 | 756,000 | 0 | 0 | 0 | 0 |
| | | O | 0 | 12,000 | 32,000 | 49,800 | 37,000 | 37,000 | 0 | 0 | 0 | 0 |
| | | **T** | **0** | **48,000** | **138,000** | **919,000** | **841,400** | **841,400** | **0** | **0** | **0** | **0** |
| 9.1 | Upgrade preliminary Inventories | H | | 30,000 | 30,000 | | | | | | | |
| | | C | | 6,000 | 4,000 | | | | | | | |
| | | O | | 12,000 | 12,000 | | | | | | | |
| | | **T** | **0** | **48,000** | **46,000** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 9.2 | Evaluation of alternative technologies | H | | | 36,000 | 36,000 | | | | | | |
| | | C | | | 36,000 | 36,000 | | | | | | |
| | | O | | | 20,000 | 20,000 | | | | | | |
| | | **T** | **0** | **0** | **92,000** | **92,000** | **0** | **0** | **0** | **0** | **0** | **0** |
| 9.3 | Identify implementation strategy and a policy | H | | | | 4,800 | | | | | | |
| | | C | | | | 2,400 | | | | | | |
| | | O | | | | 4,800 | | | | | | |
| | | **T** | **0** | **0** | **0** | **12,000** | **0** | **0** | **0** | **0** | **0** | **0** |
| 9.4 | Necessary steps for upgrade the existing systems including training and awareness | H | | | | 40,000 | 40,000 | 40,000 | | | | |
| | | C | | | | 750,000 | 750,000 | 750,000 | | | | |
| | | O | | | | 25,000 | 25,000 | 25,000 | | | | |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **T** | **0** | **0** | **0** | **815,000** | **815,000** | **815,000** | **0** | **0** | **0** | **0** |
| 9.5 | Monitoring the performance | H | | | | | 8,400 | 8,400 | | | | |
| | | C | | | | | 6,000 | 6,000 | | | | |
| | | O | | | | | 12,000 | 12,000 | | | | |
| | | **T** | **0** | **0** | **0** | **0** | **26,400** | **26,400** | **0** | **0** | **0** | **0** |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **10** | **R&D : Evaluate PTS for candidate POPs action** | H | - | 25,400 | 9,000 | - | - | - | - | - | - | - |
| | | C | - | 9,400 | 5,400 | - | - | - | - | - | - | - |
| | | O | - | 18,000 | 7,200 | - | - | - | - | - | - | - |
| | | **T** | **-** | **52,800** | **21,600** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| 10.1 | Assess current situation | H | | 10,000 | | | | | | | | |
| | | C | | 3,500 | | | | | | | | |
| | | O | | 8,400 | | | | | | | | |
| | | **T** | **-** | **21,900** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| 10.2 | Recommend potential POPs for management | H | | 6,400 | | | | | | | | |
| | | C | | 500 | | | | | | | | |
| | | O | | 2,400 | | | | | | | | |
| | | **T** | **-** | **9,300** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| 10.3 | Include those to the management system | H | | 9,000 | 9,000 | | | | | | | |
| | | C | | 5,400 | 5,400 | | | | | | | |
| | | O | | 7,200 | 7,200 | | | | | | | |
| | | **T** | **-** | **21,600** | **21,600** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |

H-Human costs
C-Capital costs
O-Operational costs
T-Total costs

## 3.3.2 ACTION PLAN 2: MANAGEMENT OF POPS PESTICIDES

### 3.3.2.1 Management activities

Based on the analysis of the country baseline situation, considering the provisions of the Stockholm Convention as well as other relevant international treaties and national policies, pursuant to the national priorities and objectives for POPs management, the following activity pathways were identified:

1. Improvement of pesticide regulatory system to adequately address the specific issues
2. Mechanism to minimise accumulation and safe disposal of outdated pesticides, at all levels
3. Development and implementation of proper information gathering and dissemination system
4. Monitoring and surveillance of environmental and human health effects

Research and Development

5. Study of possible correlation of environmental levels and adverse impacts
6. Study of environmental impact indicators
7. Fate and effects modelling

The proposed activities for realising the objectives are described in more detail in the following text. For each activity an explanatory text describes the rationale behind selecting the particular option as well as the expected capacity of the option to meet the Stockholm Convention requirements.

An implementation strategy table contains information on activities associated with the particular management activity, implementation timelines, responsible and supporting agencies for implementation, and indicators of success. Links to existing country programmes on chemical management, environmentally sound waste management and environmental pollution control as well as with the national activities on sustainable development are provided.

In the Resource requirements human, capital and operation costs of the identified activities are described, considering the established timeline.

### 3.3.2.2 Implementation strategy

### 1. Improvement of pesticide regulatory system to adequately address the specific issues

The Registrar of Pesticides is the national authority for implementing the laws and regulations under the Control of Pesticides Act No. 33 of 1980 and hence conformation to international conventions in relation to pesticides such as POP, PIC, etc. which would be carried out as a routine measure. With the strengthening of infrastructure, Sri Lanka would be able to effectively implement POP negotiations whichever tenable to present as well as candidate POP pesticides. An established working mechanism exists where pesticides are concerned under the specific HS coding system. Should any pesticide be prohibited for import unless with forged declarations, there is no possibility that they would pass through the Customs who work closely with the Registrar of Pesticides in regulating pesticide imports.

**Table 12 (a): Improvement of pesticide regulatory system to adequately address the specific issues**

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **1.** | **Improvement of pesticide regulatory system to adequately address the specific issues** | | | | |
| 1.1 | Banning | 2007 | **Pesticide registration office**/Customs and Import control | Gazette notification | adequate legal coverage for import control |
| 1.2 | Revision of HS codes classifications | 2007 | **Pesticide registration office**/Customs and Import control | Revised HS code subheadings | |
| 1.3 | Legal provisions for re-export of illegal consignments | 2007 | **Env. Min**./Exp.Imp. Controller, Customs | Legal provisions established | Responsibility held by the consignee/ shipping line |
| 1.4 | Regular monitoring of imports for chemical identity and POPs impurities | 2008 | **Pesticide registration office**/Customs | Monitoring of imports | |

## 2. Mechanism to minimize accumulation and safe disposal of outdated pesticides, at all levels

The stocks of outdated POP pesticides are negligible and hence disposal is not a serious issue but large stocks of outdated non-organochlorine pesticides need immediate attention.

**Table 12(b): Mechanism to minimize accumulation and safe disposal of outdated pesticides, at all levels**

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **2.** | **Mechanism to minimize accumulation and safe disposal of outdated pesticides, at all levels** | | | | |
| 2.1 | Information gathering system establishment | 2008 | **ROP**/Pesticide Industry, Local authorities | System established | |
| 2.2 | Establishment of disposal management infrastructure | 2009 | **ROP**,Pesticide Industry, Local authorities | Infrastructure established | Relevance to Basel, risk assessment |
| 2.3 | Development of disposal facilities | 2010 | **CEA**/local authorities | Facility established | |
| 2.4 | Waste minimization program | 2008-2009 | **CEA**/ROP, Pesticide industry | Protocol established | |

| | | | | | |
|---|---|---|---|---|---|
| 2.5 | Export of out-dated pesticides approved disposal sites | Upto 2009 | **ROP**/CEA, Min Env.,Imp., Finance & Exp Control, Customs, pesticide Industry | Export of outdated pesticides | Basel, Stockholm |
| 2.6 | Identification of alternative disposal options | Continuous | **CEA**/Min. Env., Industry | Availability of alternative disposal options | Technologies and local facilities |

## 3. Development and implementation of proper information gathering and dissemination system

Although almost all POP pesticides were prohibited from use in Sri Lanka since a decade ago, environmental levels are still detectable at varied levels. Awareness on POP pesticides related issues, concerns and required remedial measures are alarmingly poor among most of the sectors of the society including scientific community.

**Table 12(c): Development and implementation of proper information gathering and dissemination system**

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting **Institution(s)** | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **3.** | **Development and implementation of proper information gathering and dissemination system** | | | | |
| 3.1 | Establishment of a network mechanism among stakeholders centered at the ROP | 2008 | **ROP**, CEA, MoH, Universities, ITI, Others | System established | |
| 3.2 | Database development | 2008 | **ROP** | Database completed | |
| 3.3 | Development of a research partnership program | 2008 | **ROP**, CEA, MoH, Universities, ITI, NARA, Others | Research programs initiated | |

## 4. Monitoring and surveillance of environmental and human health effects

There is no planned monitoring system or infrastructure facility available with the pesticide registration authority to trigger remedial actions to mitigate the problems. So far no proper monitoring studies have been carried out on pesticides. Further, there is no surveillance system in place in the health sector to monitor the trends of health effects with respect to exposure to pesticides from environmental contamination. The data available in environmental concentrations are primarily produced for academic interests or data generated for export of agricultural commodities as a requirement from importing countries (residue levels) rather than for environmental or long-term monitoring purposes. This leads to rather discrete data coverage (spatial and temporal) which makes it difficult to evaluate significant trends of contamination by POP pesticides in the country.

**Table 12(d): Monitoring and surveillance of environmental and human health effects**

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting **Institution(s)** | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **4.** | **Monitoring and surveillance of environmental and human health effects** | | | | |
| 4.1 | Improvement of analytical capacity | 2008-2011 | **ROP**, MoH, CEA | Regular monitoring env. samples | |
| 4.2 | Assessment of environmental levels | Started by 2008 | **ITI**/ROP, NARA, Univ. | Env. Levels reported | |
| 4.3 | Establishment and operation of a coordination body | 2007 | **MoH**/ ROP, ITI, Univ, CEA,MoE | Meeting Reports | |
| 4.4 | Surveillance system on potential health effects | 2008 | **MoH**/ ROP, MRI | Study reports | |
| 4.5 | Surveillance of possible environmental effects | Started by 2008 | | Study Reports | |
| 4.6 | Establishment of MRLs | 2008 | **MoH**/ ROP | Document on MRLs | |
| 4.7 | Monitoring of food for residues | 2008 | **MoH**/ ROP, ITI, Univ | Study Reports | |

### 3.3.2.2.1 Research and development on POPs pesticides

The proposed research and development actions are described in more detail in the following text. For each proposed R&D action an explanatory text describes the rationale behind selecting the particular option as well as its expected capacity to facilitate NIP implementation.
An implementation strategy table contains information on activities associated with the particular R&D action, implementation timelines, responsible and supporting agencies for implementation, and indicators of success. Links to existing country programmes on chemical management, environmentally sound waste management and environmental pollution control as well as with the national activities on sustainable development are provided.
In the Resource requirements human, capital and operation costs of the identified activities are described, considering the established timeline.

## 5. Study of possible correlation of environmental levels and adverse impacts

**Table 12(e): Study of possible correlation of environmental levels and adverse impacts**

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting **Institution(s)** | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **5.** | **Study of possible correlation of environmental levels and adverse impacts** | | | | |
| 5.1 | Mapping of environmental levels | 2008 | **ITI/ROP**, CEA, MoE, Univ | Map | |
| 5.2 | Survey of potential environmental impacts | 2009 | **MoE**/ Research Institutes, ROP | Impact Reports | |
| 5.3 | Survey of potential health impacts | 2009 | **MoH**/MoE, Res. Institutes, ROP, MRI | Impact Reports | Including epidemiological |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | studies |
| 5.4 | Establishment of possible correlations | From 2010 | **ROP**/MoE, Res. Institutes, MRI | Report | |

## 6.Study of environmental impact indicators

### Table 12(f): Study of environmental impact indicators

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **6.** | **Study of environmental impact indicators** | | | | |
| 6.1 | Literature survey for potential indicators | 2008 | **MoE**/Res. Institutions, ROP, MRI | Survey Report | |
| 6.2 | Verification under different local conditions | 2009-2011 | **MoE**/Res. Institutions, ROP, MRI | Indicators identified | |
| 6.3 | Field validation | 2010-2011 | **MoE**/Res. Institutions, ROP, CEA, MRI | Indicators verified | |

## 7. Fate and effects modelling

### Table 12(g): Fate and effects modeling

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **7.** | **Fate and effects modeling** | | | | |
| 7.1 | Literature survey for potential models | 2008 | **MoE**/Res. Institutions, ROP | Survey Report | |
| 7.2 | Verification under different local conditions | 2009-2011 | **MoE**/Res. Institutions, ROP | Models identified | |
| 7.3 | Field validation | 2010-2011 | **MoE**/Res. Institutions, ROP,CEA | Models verified | |

### 3.3.2.3 Resource requirements

All costs are in US$

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | **Improvement of pesticide regulatory system to adequately address the specific issues** | H | 3,100 | 7,200 | 4,100 | 4,100 | 4,100 | 4,100 | 4,100 | 4,100 | 4,100 | 0 |
| | | C | 5,000 | 35,000 | 20,000 | 0 | 0 | 10,000 | 0 | 0 | 0 | 0 |
| | | O | 1,960 | 21,960 | 25,000 | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 | 0 |
| | | **T** | **10,060** | **64,160** | **49,100** | **24,100** | **24,100** | **34,100** | **24,100** | **24,100** | **24,100** | **0** |
| 1.1 | Banning | H | 1,300 | 1,300 | | | | | | | | |
| | | C | 2,000 | | | | | | | | | |
| | | O | 1,360 | 1,360 | | | | | | | | |
| | | **T** | **4,660** | **2,660** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| 1.2 | Revision of HS codes classifications | H | 900 | 900 | | | | | | | | |
| | | C | 3,000 | 0 | | | | | | | | |
| | | O | 300 | 300 | | | | | | | | |
| | | **T** | **4,200** | **1,200** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| 1.3 | Legal provisions for re- export of illegal consignments | H | 900 | 900 | | | | | | | | |
| | | C | 0 | 0 | | | | | | | | |
| | | O | 300 | 300 | | | | | | | | |
| | | **T** | **1,200** | **1,200** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| 1.4 | Regular monitoring of imports for chemical identity and POPsimpurities | H | | 4,100 | 4,100 | 4,100 | 4,100 | 4,100 | 4,100 | 4,100 | 4,100 | |
| | | C | | 35,000 | 20,000 | 0 | 0 | 10,000 | 0 | 0 | 0 | |
| | | O | | 20,000 | 25,000 | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 | |
| | | **T** | **0** | **59,100** | **49,100** | **24,100** | **24,100** | **34,100** | **24,100** | **24,100** | **24,100** | |

All costs are in US$

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2** | **Mechanism to minimize accumulation and safe disposal of outdated pesticides, at all levels** | H | 0 | 25,600 | 76,000 | 57,000 | 36,000 | 21,000 | 6,000 | 6,000 | 6,000 | 0 |
| | | C | 0 | 75,500 | 405,500 | 610,000 | 250,000 | 5,000 | 35,000 | 0 | 0 | 0 |
| | | O | 0 | 9,200 | 39,200 | 29,400 | 23,600 | 28,600 | 3,600 | 3,600 | 3,600 | 0 |
| | | **T** | **0** | **110,300** | **520,700** | **696,400** | **309,600** | **54,600** | **44,600** | **9,600** | **9,600** | **0** |
| 2.1 | Information gathering system establishment | H | | 15,600 | 5,000 | 5,000 | 6,000 | 6,000 | 6,000 | 6,000 | 6,000 | |
| | | C | | 62,000 | | 20,000 | | | 35,000 | | | |
| | | O | | 2,400 | 2,400 | 2,400 | 3,600 | 3,600 | 3,600 | 3,600 | 3,600 | |
| | | **T** | **0** | **80,000** | **7,400** | **27,400** | **9,600** | **9,600** | **44,600** | **9,600** | **9,600** | **0** |
| 2.2 | Establishment of disposal management infrastructure | H | | | 24,000 | 10,000 | | | | | | |
| | | C | | | 190,000 | 35,000 | | | | | | |
| | | O | | | 10,000 | 10,000 | | | | | | |
| | | **T** | **0** | **0** | **224,000** | **55,000** | **0** | **0** | **0** | **0** | **0** | **0** |
| 2.3 | Development of disposal facilities | H | | | | 30,000 | 30,000 | 15,000 | | | | |
| | | C | | | | 550,000 | 250,000 | 5,000 | | | | |
| | | O | | | | 15,000 | 20,000 | 25,000 | | | | |
| | | **T** | **0** | **0** | **0** | **595,000** | **300,000** | **45,000** | **0** | **0** | **0** | **0** |
| 2.4 | Waste minimization program | H | | 5,000 | 12,000 | 12,000 | | | | | | |
| | | C | | 10,000 | 12,000 | 5,000 | | | | | | |
| | | O | | 2,000 | 2,000 | 2,000 | | | | | | |
| | | **T** | 0 | **17,000** | **26,000** | **19,000** | **0** | **0** | **0** | **0** | **0** | **0** |
| 2.5 | Export of out-dated pesticides approved disposal sites | H | | | 30,000 | | | | | | | |
| | | C | | | 200,000 | | | | | | | |
| | | O | | | 20,000 | | | | | | | |
| | | **T** | **0** | **0** | **250,000** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 2.6 | Identification of alternative disposal options | H | | 5,000 | 5,000 | | | | | | | |
| | | C | | 3,500 | 3,500 | | | | | | | |
| | | O | | 4,800 | 4,800 | | | | | | | |
| | | **T** | 0 | **13,300** | **13,300** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3** | **Development and implementation of proper information gathering and dissemination system** | H | 0 | 12,400 | 11,600 | 3600 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | C | 0 | 3,500 | 19,500 | 10,000 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | O | 0 | 10,800 | 10,800 | 4,800 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | **T** | **0** | 46,700 | 41,900 | 18,400 | **0** | **0** | **0** | **0** | **0** | **0** |
| 3.1 | Establishment of a network mechanism among stakeholders centred at the ROP | H | | **4,000** | **2000** | | | | | | | |
| | | C | | 5,500 | 1,500 | | | | | | | |
| | | O | | 3,600 | 3,600 | | | | | | | |
| | | **T** | **0** | 13,100 | 7,100 | - | **0** | **0** | **0** | **0** | **0** | **0** |
| 3.2 | Database development | H | | 4,800 | 6,000 | | | | | | | |
| | | C | | 8,000 | 8,000 | | | | | | | |
| | | O | | **2,400** | **2,400** | | | | | | | |
| | | **T** | **0** | 15,200 | 16,400 | - | **0** | **0** | **0** | **0** | **0** | **0** |
| 3.3 | Development of a research partnership program | H | | 3,600 | 3,600 | 3,600 | | | | | | |
| | | C | | 10,000 | 10,000 | 10,000 | | | | | | |
| | | O | | 4,800 | 4,800 | 4,800 | | | | | | |
| | | **T** | **0** | 18,400 | 18,400 | 18,400 | **0** | **0** | **0** | **0** | **0** | **0** |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | **Monitoring and surveillance of environmental and human health effects** | H | 4,800 | 62,600 | 62,600 | 59,000 | 59,000 | 24,000 | 9,600 | 4800 | 4800 | 4800 |
| | | C | 2,000 | 175,000 | 103,000 | 262,000 | 73,000 | 48,000 | 62,000 | 20000 | 12000 | 12000 |
| | | O | 1,200 | 32,800 | 35,800 | 33,400 | 33,400 | 18,400 | 10,000 | 5000 | 5000 | 5000 |
| | | **T** | **8000** | **270,400** | **201400** | **354400** | **165400** | **90400** | **81600** | **29800** | **21800** | **21800** |
| 4.1 | Improvement of analytical capacity | H | | 35,000 | 35,000 | 35,000 | 35,000 | | | | | |
| | | C | | 120,000 | 25,000 | 100,000 | 25,000 | | | | | |
| | | O | | 12,000 | 15,000 | 15,000 | 15,000 | | | | | |
| | | **T** | **0** | **167,000** | **75,000** | **150,000** | **75,000** | | | **0** | **0** | **0** |
| 4.2 | Assessment of environmental levels | H | | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | | | |
| | | C | | 12,000 | 12,000 | 50,000 | 12,000 | 12,000 | 12,000 | | | |
| | | O | | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | | | |
| | | **T** | **0** | **21,800** | **21,800** | **59,800** | **21,800** | **21,800** | **21,800** | **0** | **0** | **0** |
| 4.3 | Establishment and operation of a coordination body | H | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | | | | |
| | | C | 2,000 | 3,000 | | 2,000 | | | | | | |
| | | O | 1,200 | 1,200 | 1,200 | 1,200 | 1,200 | 1,200 | | | | |
| | | **T** | **8,000** | **9,000** | **6,000** | **8,000** | **6,000** | **6,000** | | **0** | **0** | **0** |
| 4.4 | Surveillance system on potential health effects | H | | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | | | | |
| | | C | | 12,000 | 25,000 | 30,000 | 12,000 | 12,000 | | | | |
| | | O | | 3,600 | 3,600 | 3,600 | 3,600 | 3,600 | | | | |
| | | **T** | | **20,400** | **33,400** | **38,400** | **20,400** | **20,400** | **0** | **0** | **0** | **0** |
| 4.5 | Surveillance of possible environmental effects | H | | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | | | | |
| | | C | | 12,000 | 25,000 | 30,000 | 12,000 | 12,000 | | | | |
| | | O | | 3,600 | 3,600 | 3,600 | 3,600 | 3,600 | | | | |
| | | **T** | **0** | **20,400** | **33,400** | **38,400** | **20,400** | **20,400** | **0** | **0** | **0** | **0** |
| 4.6 | Establishment of MRLs | H | | 3,600 | 3,600 | | | | | | | |
| | | C | | 4,000 | 4,000 | | | | | | | |
| | | O | | 2,400 | 2,400 | | | | | | | |
| | | **T** | **0** | **10,000** | **10,000** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 4.7 | Monitoring of food for residues | H | | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 |
| | | C | | 12,000 | 12,000 | 50,000 | 12,000 | 12,000 | 50,000 | 20,000 | 12,000 | 12,000 |
| | | O | | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 |
| | | **T** | **0** | **21,800** | **21,800** | **59,800** | **21,800** | **21,800** | **59,800** | **29,800** | **21,800** | **21,800** |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | **R&D: Study of possible correlation of environmental levels and adverse impacts** | H | 0 | 40,000 | 100,000 | 106,000 | 66,000 | 6,000 | | | | |
| | | C | 0 | 12,000 | 36,000 | 42,000 | 30,000 | 6,000 | | | | |
| | | O | 0 | 6,000 | 18,000 | 22,800 | 16,800 | 4,800 | | | | |
| | | **T** | **-** | **58,000** | **154,000** | **170,800** | **112,800** | **16,800** | | | | |
| 5.1 | Mapping of environmental levels | H | | 40,000 | 40,000 | 40,000 | | | | | | |
| | | C | | 12,000 | 12,000 | 12,000 | | | | | | |
| | | O | | 6,000 | 6,000 | 6,000 | | | | | | |
| | | **T** | **-** | **58,000** | **58,000** | **58,000** | | **-** | | | | |
| 5.2 | Survey of potential environmental impacts | H | | | 30,000 | 30,000 | 30,000 | | | | | |
| | | C | | | 12,000 | 12,000 | 12,000 | | | | | |
| | | O | | | 6,000 | 6,000 | 6,000 | | | | | |
| | | **T** | **-** | **-** | **48,000** | **48,000** | **48,000** | **-** | | | | |
| 5.3 | Survey of potential health impacts | H | | | 30,000 | 30,000 | 30,000 | | | | | |
| | | C | | | 12,000 | 12,000 | 12,000 | | | | | |
| | | O | | | 6,000 | 6,000 | 6,000 | | | | | |
| | | **T** | **-** | **-** | **48,000** | **48,000** | **48,000** | **-** | | | | |
| 5.4 | Establishment of possible | H | | | | 6,000 | 6,000 | 6,000 | | | | |
| | | C | | | | 6,000 | 6,000 | 6,000 | | | | |
| | | O | | | | 4,800 | 4,800 | 4,800 | | | | |
| | | **T** | **0** | **0** | **0** | **16,800** | **16,800** | **16,800** | **0** | | | |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | **R&D: Study of environmental impact indicators** | H | 0 | 3,000 | 18,000 | 35,000 | 40,000 | | | - | - | - |
| | | C | 0 | 1,000 | 15,000 | 20,000 | 20,000 | | | - | - | - |
| | | O | 0 | 2,000 | 3,600 | 13,600 | 13,600 | | | | - | - |
| | | **T** | **0** | **6,000** | **36,600** | **68,600** | **73,600** | **0** | **0** | **0** | **0** | **0** |
| 6.1 | Literature survey for potential indicators | H | | 3,000 | | | | | | | | |
| | | C | | 1,000 | | | | | | | | |
| | | O | | 2,000 | | | | | | | | |
| | | **T** | **0** | **6,000** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 6.2 | Verification under different local conditions | H | | | 18,000 | 20,000 | 25,000 | | | | | |
| | | C | | | 15,000 | 15,000 | 15,000 | | | | | |
| | | O | | | 3,600 | 3,600 | 3,600 | | | | | |
| | | **T** | **0** | 0 | **36,600** | **38,600** | **43,600** | **0** | **0** | **0** | **0** | **0** |
| 6.3 | Field validation | H | | | | 15,000 | 15,000 | | | | | |
| | | C | | | | 5,000 | 5,000 | | | | | |
| | | O | | | | 10,000 | 10,000 | | | | | |
| | | **T** | **0** | **0** | **0** | **30,000** | **30,000** | **0** | **0** | **0** | **0** | **0** |

T

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **7** | **R&D : Fate and effects modelling** | H | - | - | 3,000 | 20,000 | 40,000 | 40,000 | | - | - | - |
| | | C | - | - | 1,000 | 15,000 | 30,000 | 30,000 | - | - | - | - |
| | | O | - | - | 2,000 | 3,600 | 7,200 | 7,200 | - | - | - | - |
| | | **T** | **-** | **-** | **6,000** | **38,600** | **77,200** | **77,200** | **-** | **-** | **-** | **-** |
| 7.1 | Literature survey for potential models | H | | | 3,000 | | | | | | | |
| | | C | | | 1,000 | | | | | | | |
| | | O | | | 2,000 | | | | | | | |
| | | **T** | **-** | **-** | **6,000** | **-** | **-** | **-** | | **-** | **-** | **-** |
| 7.2 | Verification under different local conditions | H | | | | 20,000 | 20,000 | 20,000 | | | | |
| | | C | | | | 15,000 | 15,000 | 15,000 | | | | |
| | | O | | | | 3,600 | 3,600 | 3,600 | | | | |
| | | **T** | **-** | **-** | **-** | **38,600** | **38,600** | **38,600** | **-** | **-** | **-** | **-** |
| 7.3 | Field validation | H | | | | | 20,000 | 20,000 | | | | |
| | | C | | | | | 15,000 | 15,000 | | | | |
| | | O | | | | | 3,600 | 3,600 | | | | |
| | | **T** | **-** | **-** | **-** | **-** | **38,600** | **38,600** | **-** | **-** | **-** | **-** |

## 3.3.3 ACTION PLAN 3: MANAGEMENT OF PCBS AND EQUIPMENT CONTAINING PCBS

### 3.3.3.1 Management activities

Based on the analysis of the country baseline situation, considering the provisions of the Stockholm Convention as well as other relevant international treaties and national policies, pursuant to the national priorities and objectives for POPs management, the following management action pathways were identified:

1.Develop and put in place Legislation for PCB management

2.Establish full inventory of PCB containing equipment

3.Establish procedures for equipment maintenance

4.Establish appropriate PCBs analysis laboratory facilities

5.Establish and implement guidelines for phase out, transportation, storage and disposal of PCBs equipment

6.Establish progress monitoring mechanisms

7.Capacity building for control and management of PCBs

8.Disposal of existing stocks and stockpiles

9.Rehabilitation and decontamination of contaminated sites

Research and Development

10.R & D on treatment/elimination technologies

11.R & D on containment and decontamination of contaminated sites

12.Research for prevention of cross contamination

13.Research on health environmental effects due to exposure

The proposed actions for realising the objectives are described in more detail in the following text. For each option an explanatory text describes the rationale behind selecting the particular option as well as the expected capacity of the option to meet the Stockholm Convention requirements.

An implementation strategy table contains information on activities associated with the particular management option, implementation timelines, responsible and supporting agencies for implementation, and indicators of success. Links to existing country programmes on chemical management, environmentally sound waste management and environmental pollution control as well as with the national activities on sustainable development are provided.

In the Resource requirements human, capital and operation costs of the identified activities are described, considering the established timeline.

### 3.3.3.2 Implementation strategy

## 1. Develop and put in place legislation for PCB management

In order to prevent new entry to the country, it is necessary to have the necessary regulatory framework in place. New entry is not only through importation. We have to establish guidelines wherever cross-contaminations could occur.

Importation can be avoided by implementing annexes for certain customs tariff numbers. Every legal import of transformers will be along 2 or 3 specific tariff numbers which are used internationally. If imports with such tariff numbers arrive the customs can ask for PCB free declarations from the manufacturer or ask for samples for verification of PCB content. Customs could use PCB-free inventory labels if equipment is confirmed as PCB-free.

Key requirement for further contaminations is PCB management. It will include all aspects related to equipment that might be PCB contaminated, such as sampling, labelling, analysing, maintenance operation, movements, transportation, storing and disposal. Unless tested as PCB-free each device that may contain or may be contaminated with PCB will be regarded as PCB. Three test burning experiments have been conducted for PCB destruction of transformer oils at a Cement Kiln here and this could be a positive development in PCB management.

**Table 13(a): Develop and put in place Legislation for PCB management**

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **1.** | **Develop and put in place Legislation for PCB management** | | | | |
| 1.1 | Amendment/formulation regulations to control PCBs(waste, non-waste contaminated equipment) | 2007-2008 | **CEA** ME, | Legislation in place | Contributing activities undertaken for Basel Convention |

## 2. Establish full inventory of PCB containing equipment

To establish the full inventory on PCB contaminated equipment and to develop Action Plan based on this inventory. All PCBs containing equipment should be labelled.

**Table 13(b): Establish full inventory of PCB containing equipment**

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **2.** | **Establish full inventory of PCB containing equipment** | | | | |
| 2.1 | Data collection | 2007-2009 | **CEA**,CEB,LECO,LTL, private sector | Data collected | Existing data to be used as the baseline |
| 2.2 | Formulation of database | 2007-2009 | **CEA**,CEB,LECO,LTL, private sector | Complete database | |

## 3. Establish procedures for equipment maintenance

Establish guidelines and procedures in order to prevent cross contamination of equipment during maintenance of equipment. Any kind of maintenance where people get into direct contact with PCB liquid should be strictly followed by specific protection clothing. If not absolutely necessary any "open" handling of PCB contaminated equipment should be avoided. The requirements will be specified by an expert team under participation of LTL, CEB, MENR and an international expert.

### Table 13(c): Establish procedures for equipment maintenance

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **3.** | **Establish procedures for equipment maintenance** | | | | |
| 3.1 | Establish a labeling procedure for identification | 2007-2010 | **CEA**,CEB,LECO,LTL, private sector | All equipment labeled | Draft manual prepared by the TT6 could be used |
| 3.2 | Establish maintenance procedure | 2007-2009 | **CEA**,CEB,LECO,LTL, private sector | Manuals operational | |

## 4. Establish appropriate PCB analytical laboratory facilities

Establish PCBs testing (screening tests) facilities to cover all provinces. Upgrading and accrediting existing laboratory facilities for PCBs analysis (including customs labs for compliance monitoring). Customs lab development should be considered a priority.

Several labs in the GOSL system can be developed as referral labs for the purpose of all related conventions – CEA / customs/ SLSI/ ROP. These could be backed up by ITI and University labs. The first layer directly supports the regulatory and monitoring purpose.

### Table 13(d): Establish appropriate PCBs laboratory facilities

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **4.** | **Establish appropriate PCBs laboratory facilities** | | | | |
| 4.1 | Upgrade/accredit existing laboratories | 2008-2011 | **ITI**, CEB, CEA, Customs | Laboratories accredited | |
| 4.2 | Establish testing facilities within stakeholder organizations | 2008-2011 | **CEA**,CEB,LECO,LTL, private sector | Testing facilities available within stakeholders | |

## 5. Establish and implement guidelines for phase out, transportation, storage and disposal of PCBs equipment

To prevent haphazard disposal of decommissioned transformers guidelines will be established. The transformers and capacitors will be gradually phased out according to a Phasing out plan. This Phasing out plan will be elaborated on the base of the inventory of PCBs equipment according to the UNEP Guidelines.

**Table 13(e): Establish and implement guidelines for phase out, transportation, storage and disposal of PCBs equipment**

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **5.** | **Establish and implement guidelines for phase out, transportation, storage and disposal of PCBs equipment** | | | | |
| 5.1 | Prepare guidelines for decommissioning | 2007-2008 | **CEA**, CEB, LTL, LECO | Guidelines | |
| 5.2 | Phasing out plan | 2008- | **CEA**, CEB, LTL, LECO | Plan | |
| 5.3 | Implement the phasing out plan | 2009-2016 | **ME** , CEA, CEB, LTL, LECO | Stockholm Convention Commitment met | |

*Note: These guidelines are enforcing the regulation elaborated under item 2 of the AP on institutional and regulatory strengthening*

## 6. Establish progress monitoring mechanisms

Progress monitoring to ensure all the actions given in the PCBs equipment phasing out plan is implemented by the stakeholders.

**Table 13(f): Establish progress monitoring mechanisms**

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting **Institution(s)** | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **6.** | **Establish progress monitoring mechanisms** | | | | |
| 6.1 | Establish monitoring program | 2008 -2016 | **ME**, MPE, CEB, LECO, LT, Private Sector | Milestones in the program met | |
| 6.2 | Implementation of Monitoring System | 2008 | **CEB**, MPE, ME | Updated reports | |
| 6.3 | Action to fill Gaps | 2008 | **CEB**, MPE, ME | Reports | |

## 7. Capacity building for control and management of PCBs

Establish control and management task forces within stakeholder institutions, and upgrade their capabilities for management of PCBs. Particular emphasis should be put on safe handling of PCBs equipment, prevention of cross-contamination and procedures for identification and labelling of the PCBs equipment.

**Table 13(g): Capacity building for control and management of PCBs**

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **7.** | **Capacity building for control and management of PCBs** | | | | |
| 7.1 | Establish teams within stakeholder institutions | 2007-2011 | **ME**,CEB,LECO ,LTL, private | No of Task Teams and | |

| | | | | | |
|---|---|---|---|---|---|
| | | | sector | Coverage | |
| 7.2 | Training and capacity building program | 2008-2011- | **ME**,CEB,LECO ,LTL, private sector | Report on no. Of capacity building programs conducted and steps taken for PCB management | Stakehold er capacity building programs |

Note: this item is included also in the AP on awareness raising

## 8. Disposal of existing stocks and stockpiles

Action to be taken for disposal of existing stocks identified as PCB contaminated using best available technologies in Sri Lanka. While activities are enumerated upto 2016, a review of PCB Stock will be made in 2015 after which further actions as necessary will be in taken.

**Table 13(h): Elimination of existing stocks and stockpiles**

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **8.** | **Elimination of existing stocks and stockpiles** | | | | |
| 8.1 | Evaluation of the capability of existing facilities for disposal | 2007-2008 | **CEA,** CEB,LECO,LTL | Suitable facility identified | |
| 8.2 | Recommending improvement | 2008 | **CEA** | Recommendatio ns/guidelines developed | |
| 8.3 | Disposal of existing stocks | 2007-2016 | **ME**,CEB, LECO, LTL | Existing Stocks Disposed | |

## 9. Rehabilitation and decontamination of contaminated sites

It is necessary to identify existing polluted sites, and take steps to decontaminate and rehabilitate those using appropriate technologies.

**Table 13(i): Rehabilitation and decontamination of contaminated sites**

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **9.** | **Rehabilitation and decontamination of contaminated sites** | | | | |
| 9.1 | Inventory of contaminated sites | 2008-2009 | **Stakeholders** | Inventory | |
| 9.2 | Identify feasible decontamination/rehab methods | 2009 | **Stakeholders** | Feasibility Report | |
| 9.3 | Decontamination and rehabilitation | 2010-2015 | **Stakeholders** | % of decontaminated sites | |

## 3.3.3.2.1 Research and development

Based on the identified national priorities and objectives for POPs management, as well as the selected management options, the following research and development actions were identified to facilitate the NIP implementation under the PCB action plan.

The proposed research and development actions are described in more detail in the following text. For each proposed R&D action an explanatory text describes the rationale behind selecting the particular option as well as its expected capacity to facilitate NIP implementation.

An implementation strategy table contains information on activities associated with the particular R&D action, implementation timelines, responsible and supporting agencies for implementation, and indicators of success. Links to existing country programmes on chemical management, environmentally sound waste management and environmental pollution control as well as with the national activities on sustainable development are provided.

In the Resource requirements human, capital and operation costs of the identified activities are described, considering the established timeline.

## 10. R&D on treatment / elimination technologies

Based on BAT and BEP for Sri Lanka, it is necessary to identify suitable final disposal options for PCBs in Sri Lanka

**Table 13 (j): R&D on treatment / elimination technologies**

| | **Research & Development Action /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **10.** | **R&D on treatment / elimination technologies** | | | | |
| 10.1 | Introduce to universities as a research priority | 2008-2009 | **ME**, MPE, Universities, MST, CEB | Suitable technology suggestions | |
| 10.2 | Promote stakeholders to initiate R&D | 2008 | **ME**, Stakeholders | Same as above | |

## 11. R&D on containment and decontamination of contaminated sites

Contaminated sites should be identified and inventorized. Steps should be taken for decontamination of decontaminated sites

**Table 13 (k): R&D on containment and decontamination of contaminated sites**

| | **Research & Development Action /** Activities | **Timeframe** | **Responsible /** supporting Institution(s**)** | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **11** | **R&D on containment and decontamination of contaminated sites** | | | | |
| 11.1 | Survey on contaminated sites | 2009 | **Stakeholders**, R&D institutions, MPE | Survey completed and inventory in place | |
| 11.2 | Introduce to universities as a research priority | 2008-2009 | **MPE**, Stakeholders, R&D | Research priorities identified | |
| 11.3 | Promote stakeholders to initiate R&D | 2009 | **MPE**, Stakeholders,R &D | Mechanism for R&D implemented | |

## 12. Research for prevention of cross contamination

R&D should be carried out to investigate causes for cross contamination in different provinces and for prevention of cross contamination

### Table 13(l): Research for prevention of cross contamination

| | **Research & Development Action /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **12** | **Research for prevention of cross contamination** | | | | |
| 12.1 | Survey for identification of reasons for cross contamination | 2008-2010 | **MPE**, Universities, industries | Reasons for cross contamination identified | |
| 12.2 | Procedures developed for prevention of cross contamination | 2010 | **CEB**, LECO, LTL, Universities | Procedures developed | |

## 13. Research on health and environmental effects due to exposure

Conducting research and surveys on health and environmental effects due to exposure for PCBs in Sri Lanka

### Table 13(m): Research on health and environmental effects due to exposure

| | **Research & Development Action /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **13** | **Research on health and environmental effects due to exposure** | | | | |
| 13.1 | Formulate a program on research on above | 2008 | **MoH,** MRI, ME stakeholders | Program developed | |
| 13.2 | Implement the programme | 2008-2011 | **MoH,** MRI | 12 programs implemented per year | |

### 3.3.3.3 Resource Requirements

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | **Develop and Put in Place Legislation for PCB management** | H | 3,200 | 3,200 | - | - | - | - | 0 | 0 | 0 | 0 |
| | | C | 1,400 | 1,400 | - | - | - | - | 0 | 0 | 0 | 0 |
| | | O | 9,000 | 9,000 | - | - | - | - | 0 | 0 | 0 | 0 |
| | | **T** | **13,600** | **13,600** | **-** | **-** | **-** | **-** | **0** | **0** | **0** | **0** |
| 1.1 | Amendment/formulation of regulations to control PCBs (waste, non-waste, contaminated equipment) | H | 3,200 | 3,200 | | | | | | | | |
| | | C | 1,400 | 1,400 | | | | | | | | |
| | | O | 9,000 | 9,000 | | | | | | | | |
| | | **T** | **13,600** | **13,600** | | | | | **0** | **0** | **0** | **0** |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2** | **Establishment of a full inventory on PCBs equipment** | H | 12,200 | 15,000 | 15,000 | | | | 0 | 0 | 0 | 0 |
| | | C | 8,400 | 5,500 | 2,000 | - | - | - | 0 | 0 | 0 | 0 |
| | | O | 6,250 | 6,250 | 6,750 | - | - | - | 0 | 0 | 0 | 0 |
| | | **T** | **26,850** | **26,750** | **23,750** | **-** | **-** | **-** | **0** | **0** | **0** | **0** |
| 2.1 | Data collection | H | 9,300 | 9,300 | 9,300 | | | | | | | |
| | | C | 4,000 | 4,500 | 1,000 | | | | | | | |
| | | O | 5,250 | 5,250 | 5,250 | | | | | | | |
| | | **T** | **18,550** | **19,050** | **15,550** | **-** | **-** | **-** | **0** | **0** | **0** | **0** |
| 2.2 | Formulation of a database | H | 2,900 | **5,700** | **5,700** | | | | | | | |
| | | C | 4,400 | 1,000 | 1,000 | | | | | | | |
| | | O | 1,000 | 1,000 | 1,500 | | | | | | | |
| | | **T** | **8300** | **7700** | **8200** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3** | **Establish procedures for equipment maintenance** | H | | 12,800 | 12,800 | 12,800 | - | - | - | 0 | 0 | 0 |
| | | C | | 4,000 | 2,000 | 2,000 | - | - | - | 0 | 0 | 0 |
| | | O | | 10,000 | 10,000 | 9,000 | - | - | - | 0 | 0 | 0 |
| | | **T** | | **26,800** | **24,800** | **23,800** | **-** | **-** | **-** | **0** | **0** | **0** |
| 3.1 | Establish a labeling procedure for identification | H | | 6,400 | 6,400 | 6,400 | | | | | | |
| | | C | | 2,000 | 2,000 | 2,000 | | | | | | |
| | | O | | 5,000 | 5,000 | 4,000 | | | | | | |
| | | **T** | | **13,400** | **13,400** | **12,400** | **-** | **-** | **-** | **0** | **0** | **0** |
| 3.2 | Establish maintenance procedure | H | | 6,400 | 6,400 | 6,400 | | | | | | |
| | | C | | 2,000 | 2,000 | | | | | | | |
| | | O | | 5,000 | 5,000 | 5,000 | | | | | | |
| | | **T** | | **13400** | **13400** | **11400** | **0** | **0** | **0** | **0** | **0** | **0** |

All costs are in US$

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **4** | **Establish appropriate PCB analysis Laboratory Facilities** | H | - | 43,000 | 31,000 | 32,000 | - | - | - | - | - | - |
| | | C | - | 70,000 | 75,000 | 80,000 | - | - | - | - | - | - |
| | | O | - | 16,000 | 22,000 | 20,000 | - | - | - | - | - | |
| | | **T** | **-** | **129,000** | **128,000** | **132,000** | **-** | **-** | **-** | **-** | **-** | **-** |
| 4.1 | Upgrade and accredit existing laboratories | H | | 25,000 | 25,000 | 25,000 | | | | | | |
| | | C | | 10,000 | 15,000 | | | | | | | |
| | | O | | 10,000 | 10,000 | | | | | | | |
| | | **T** | **-** | **45,000** | **50,000** | **55,000** | **-** | **-** | **-** | **-** | **-** | **-** |
| 4.2 | Establish testing facilities within stakeholder organisations | H | | 18,000 | 6,000 | 7,000 | | | | | | |
| | | C | | 60,000 | 60,000 | 60,000 | | | | | | |
| | | O | | 6,000 | 12,000 | 10,000 | | | | | | |
| | | **T** | **-** | **84,000** | **78,000** | **77,000** | **-** | **-** | **-** | **-** | **-** | **-** |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **5** | **Establish and implement guidelines for phase out, storage transportation and disposal of PCB equipment** | H | 4,800 | 36,800 | 18,400 | 6,400 | 6,400 | 6,400 | 6,400 | 6,400 | 6,400 | 6,400 |
| | | C | 3,000 | 5,000 | 12,000 | 12,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 |
| | | O | 3,600 | 7,200 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 |
| | | **T** | **11,400** | **49,000** | **35,200** | **23,200** | **15,200** | **15,200** | **15,200** | **15,200** | **15,200** | **15,200** |
| 5.1 | Prepare guidelines for decommissioning | H | 4,800 | 16,800 | | | | | | | | |
| | | C | 3,000 | 1,000 | | | | | | | | |
| | | O | 3,600 | 3,600 | | | | | | | | |
| | | **T** | **11,400** | **21,400** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| 5.2 | Phasing out plan | H | | 20,000 | | | | | | | | |
| | | C | | 4,000 | | | | | | | | |
| | | O | | 3,600 | | | | | | | | |
| | | **T** | **-** | **27,600** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| 5.3 | Implement the phasing out plan | H | | | 18,400 | 6,400 | 6,400 | 6,400 | 6,400 | 6,400 | 6,400 | 6,400 |
| | | C | | | 12,000 | 12,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 |
| | | O | | | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 |
| | | **T** | **-** | **-** | **35,200** | **23,200** | **15,200** | **15,200** | **15,200** | **15,200** | **15,200** | **15,200** |

All costs are in US$

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **6** | **Establish progress monitoring mechanisms** | H | - | 6,400 | 6,400 | 6,400 | 6,400 | 6,400 | 6,400 | 6,400 | 6,400 | 6,400 |
| | | C | - | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 |
| | | O | - | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 |
| | | **T** | **-** | **15,200** | **15,200** | **15,200** | **15,200** | **15,200** | **15,200** | **15,200** | **15,200** | **15,200** |
| 6.1 | Establish monitoring programme | H | | 6,400 | 6,400 | 6,400 | 6,400 | 6,400 | 6,400 | 6,400 | 6,400 | 6,400 |
| | | C | | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 |
| | | O | | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 |
| | | **T** | **-** | **15,200** | **15,200** | **15,200** | **15,200** | **15,200** | **15,200** | **15,200** | **15,200** | **15,200** |

All costs are in US$

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **7** | **Capacity building for control and management of PCBs** | H | 4,800 | 16,800 | 15,000 | 5,000 | 1,000 | - | 0 | 0 | 0 | 0 |
| | | C | 6,400 | 18,400 | 15,000 | 5,000 | 1,000 | - | 0 | 0 | 0 | 0 |
| | | O | 2,400 | 8,800 | 6,400 | 6,400 | 6,400 | - | 0 | 0 | 0 | 0 |
| | | **T** | **13,600** | **44,000** | **36,400** | **16,400** | **8,400** | **-** | **0** | **0** | **0** | **0** |
| 7.1 | Establish teams within stakeholder institutions | H | 4,800 | 4,800 | | | | | | | | |
| | | C | 6,400 | 6,400 | | | | | | | | |
| | | O | 2,400 | 2,400 | | | | | | | | |
| | | **T** | **13,600** | **13,600** | **-** | **-** | **-** | **0** | **0** | **0** | **0** | **0** |
| 7.2 | Training and capacity building programme | H | | 6,400 | 6,400 | 6,400 | 6,400 | | | | | |
| | | C | | 12,000 | 15,000 | 5,000 | 1,000 | | | | | |
| | | O | | 6,400 | 6,400 | 6,400 | 6,400 | | | | | |
| | | **T** | **-** | **18,400** | **21,400** | **11,400** | **7,400** | **-** | **0** | **0** | **0** | **0** |

All costs are in US$

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **8** | **Disposal Of stocks and stockpiles** | H | | 18,600 | 12,000 | 12,000 | 6,400 | 6,400 | 6,400 | 6,400 | 6,400 | 6,400 |
| | | C | | 28,800 | 125,000 | 250,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 |
| | | O | | 103,600 | 200,000 | 400,000 | 400,000 | 200,000 | 200,000 | 100,000 | 100,000 | 250,000 |
| | | **T** | | **151,000** | **337,000** | **662,000** | **418,400** | **218,400** | **218,400** | **118,400** | **118,400** | **268,400** |
| 8.1 | Evaluation of the capability of existing facilities for disposal | H | | 3,600 | | | | | | | | |
| | | C | | 4,800 | | | | | | | | |
| | | O | | 3,600 | | | | | | | | |
| | | **T** | | **12,000** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| 8.2 | Elimination Locally | H | | 15,000 | 12,000 | 12,000 | 6,400 | 6,400 | 6,400 | 6,400 | 6,400 | 6,400 |
| | | C | | 24,000 | 125,000 | 250,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 |
| | | O | | 100,000 | 200,000 | 400,000 | 400,000 | 200,000 | 200,000 | 100,000 | 100,000 | 250,000 |
| | | **T** | **-** | **139,000** | **337,000** | **662,000** | **418,400** | **218,400** | **218,400** | **118,400** | **118,400** | **268,400** |

All costs are in US$

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **9** | **Rehabilitation and decontamination of contaminated sites** | H | - | 9,600 | 34,600 | 36,000 | 24,000 | 24,000 | - | - | 0 | 0 |
| | | C | - | 10,000 | 13,500 | 20,000 | 25,000 | 48,000 | - | - | 0 | 0 |
| | | O | - | 30,000 | 55,000 | 12,000 | 36,000 | 36,000 | - | - | 0 | 0 |
| | | **T** | **-** | **49,600** | **103,100** | **68,000** | **85,000** | **108,000** | **-** | **-** | **0** | **0** |
| 9.1 | Inventory of contaminated sites | H | | 9,600 | 9,600 | | | | | | | |
| | | C | | 10,000 | 10,000 | | | | | | | |
| | | O | | 30,000 | 30,000 | | | | | | | |
| | | **T** | **-** | **49,600** | **49,600** | **-** | **-** | **-** | **-** | **-** | **0** | **0** |
| 9.2 | Identify feasible decontamination/rehabilitation methods | H | | | 25,000 | | | | | | | |
| | | C | | | 3,500 | | | | | | | |
| | | O | | | 25,000 | | | | | | | |
| | | **T** | **-** | **-** | **53,500** | **-** | **-** | **-** | **-** | **-** | **0** | **0** |
| 9.3 | Decontamination and rehabilitation | H | | | | 36,000 | 24,000 | 24,000 | | | | |
| | | C | | | | 20,000 | 25,000 | 48,000 | | | | |
| | | O | | | | 12,000 | 36,000 | 36,000 | | | | |
| | | **T** | **-** | **-** | **-** | **68,000** | **85,000** | **108,000** | **-** | **-** | **-** | **0** |

H-Human costs
C-Capital costs
O-Operational costs
T-Total costs

All costs are in US$

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **10** | **R&D on treatment / elimination technologies** | H | - | 16,800 | 8,400 | - | - | - | - | - | 0 | 0 |
| | | C | - | 2,000 | 1,000 | - | - | - | - | - | 0 | 0 |
| | | O | - | 24,000 | 6,400 | - | - | - | - | - | 0 | 0 |
| | | **T** | **-** | **42,800** | **15,800** | **-** | **-** | **-** | **-** | **-** | **0** | **0** |
| 10.1 | Introduce to universities as research priority | H | | 8,400 | 8,400 | | | | | | | |
| | | C | | 1,000 | 1,000 | | | | | | | |
| | | O | | 12,000 | 6,400 | | | | | | | |
| | | **T** | **-** | **21,400** | **15,800** | **-** | **-** | **-** | **-** | **-** | **0** | **0** |
| 10.2 | Promote stakeholders to initiate R&D | H | | 8,400 | | | | | | | | |
| | | C | | 1,000 | | | | | | | | |
| | | O | | 12,000 | | | | | | | | |
| | | **T** | **-** | **21,400** | **-** | **-** | **-** | **-** | **-** | **-** | **0** | **0** |

All costs are in US$

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **11** | **R&D on containment and decontamination of contaminated sites** | H | 0 | 18000 | 26400 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | C | 0 | 11000 | 12000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | O | 0 | 5500 | 11500 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | **T** | **0** | **34500** | **49900** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 11.1 | Survey on contaminated sites | H | | 9,600 | 9,600 | | | | | | | |
| | | C | | 10,000 | 10,000 | | | | | | | |
| | | O | | 2,500 | 2,500 | | | | | | | |
| | | **T** | **0** | **22100** | **22100** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 11.2 | Introduce to universities as research priority | H | | 8,400 | 8,400 | | | | | | | |
| | | C | | 1,000 | 1,000 | | | | | | | |
| | | O | | 3,000 | 3,000 | | | | | | | |
| | | **T** | **0** | **12400** | **12400** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 11.3 | Promote stakeholders to initiate R&D | H | | | 8,400 | | | | | | | |
| | | C | | | 1,000 | | | | | | | |
| | | O | | | 6,000 | | | | | | | |
| | | **T** | **0** | **0** | **15400** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |

All costs are in US$

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **12** | **R&D Research for prevention of cross-contamination** | H | - | 6,400 | 6,400 | 11,200 | - | - | - | - | 0 | 0 |
| | | C | - | 12,000 | 5,000 | 16,000 | - | - | - | - | 0 | 0 |
| | | O | - | 3,600 | 3,600 | 8,400 | - | - | - | - | 0 | 0 |
| | | **T** | **-** | **22,000** | **15,000** | **35,600** | **-** | **-** | **-** | **-** | **0** | **0** |
| 12.1 | Survey for identifiction of reasons for cross-contamination | H | | 6,400 | 6,400 | 6,400 | | | | | | |
| | | C | | 12,000 | 5,000 | 12,000 | | | | | | |
| | | O | | 3,600 | 3,600 | 3,600 | | | | | | |
| | | **T** | **-** | **22,000** | **15,000** | **22,000** | **-** | **-** | **-** | **-** | **0** | **0** |
| 12.2 | Develop procedures for prevention of cross-contamination | H | | | | 4,800 | | | | | | |
| | | C | | | | 4,000 | | | | | | |
| | | O | | | | 4,800 | | | | | | |
| | | **T** | **-** | **-** | **-** | **13,600** | **-** | **-** | **-** | **-** | **0** | **0** |

All costs are in US$

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **13** | **R&D Research on health and environmental effects due to exposure** | H | 0 | 21,600 | 13,200 | 13,200 | 13,200 | 0 | 0 | 0 | 0 | 0 |
| | | C | 0 | 39,500 | 36,000 | 36,000 | 36,000 | 0 | 0 | 0 | 0 | 0 |
| | | O | 0 | 18,400 | 12,000 | 15,000 | 15,000 | 0 | 0 | 0 | 0 | 0 |
| | | **T** | **0** | **79,500** | **61,200** | **64,200** | **64,200** | **0** | **0** | **0** | **0** | **0** |
| 13.1 | Formulate a program on research on the above | H | | 8,400 | | | | | | | | |
| | | C | | 3,500 | | | | | | | | |
| | | O | | 6,400 | | | | | | | | |
| | | **T** | **0** | **18,300** | **-** | **-** | **-** | **0** | **0** | **0** | **0** | **0** |
| 13.2 | Implement the programme | H | | 13,200 | 13,200 | 13,200 | 13,200 | | | | | |
| | | C | | 36,000 | 36,000 | 36,000 | 36,000 | | | | | |
| | | O | | 12,000 | 12,000 | 15,000 | 15,000 | | | | | |
| | | **T** | **0** | **61,200** | **61,200** | **64,200** | **64,200** | **0** | **0** | **0** | **0** | **0** |

H-Human costs
C-Capital costs
O-Operational costs
T-Total costs

## 3.3.4 ACTION PLAN 4: MANAGEMENT OF UNINTENTIONALLY PRODUCED POPs BY-PRODUCTS

The main sources of releases of PCDD/F in Sri Lanka were identified as: the uncontrolled combustion of wastes, primarily in dumps and in the open, the processing of metals, in particular scrap copper where a significant amount of PCDD/F is likely to be associated with the residues from gas cleaning systems,the incineration of medical wastes which is largely carried out under very poorly controlled conditions, burning of biomass in homes for cooking, industry and for disposal of agricultural residues.

Estimates of releases to air and residues were far greater than for releases to water, land or in products. This reflects both the nature of the main sources (thermal processes giving air emissions and residues from gas cleaning and combustion) and a lack of data to estimate releases to other media.

### 3.3.4.1 Management activities

The following management activity pathways were identified based on the analysis of the country baseline situation, considering the provisions of the Stockholm Convention as well as other relevant international treaties and national policies, and pursuant to the national priorities and objectives for POPs management. Application of cleaner production concepts and practices in all these management options/activities has been recommended at all levels in line with the National Cleaner Production Policy and Strategy.

1. Incorporate into legislation BAT/BEP requirement for new sources

2. Review & upgrade relevant legislation/s on solid waste management

3. Implement proper solid waste management/disposal mechanism

4. Implement proper medical wastes management disposal mechanisms.

5. Review existing technology on secondary metal recycling plants, including traditional industries, and identify necessary changes for upgrading these systems

6. Review existing crematoria designs for their acceptance and identify changes

Research and Development

7. Development of emission factor for production of charcoal (Coconut shell) under different process conditions.

8. Investigate unintentional by products & AOX in leachate and soil in the contaminated open dump sites (eg.Bloemendhal)

9. Investigation of contamination of animal milk and human milk in the scavenging animals and people living close vicinity to the dump sites

10. Research on recycling potential for flammable material (plastics/Polymers)

11. Assessment of unintentional by products in process sludge / air emission and treatment of sludge in BOI plants & traditional secondary smelting plants

12.Assessment of unintentional by products in the soil contaminated from the wastewater and sludge releases from service stations

13. Life cycle assessment of PVC materials used

14. Risk assessment on use of biomass for cooking

### 3.3.4.2 Implementation strategy

## 1. Incorporate into legislation BAT/BEP requirement for new sources

Sri Lanka does not have legislation for controlling PCDD/PCDF emissions. Further, the need of using BAT/BEP requirements into PCDD/PCDF generating sources is not a legal requirement in the country. The only legislative requirement is the need of incorporating technical devices for controlling parameters listed in the ambient air quality standards. These parameters include only CO, $NO_2$, $SO_2$, $O_3$, Pb and SPM. The use of relevant technical devices may help in reducing PCDD/PCDF as well. However, there is a need to further reduce these levels, as the legal limits those have been stipulated for PCDD/PCDF in other countries are very low (nanogram levels). Therefore, it is essential to introduce BAT/BEP to the new sources, and to the existing sources with an extended period of compliance (e.g. within 10 years), in order to reduce PCDD/PCDF emissions.

Introduction of BAT/BEP will also not create the need of testing for PCDD/PCDF on a regular basis for which highly expensive and highly sophisticated techniques are required. Hence, the necessity of implementing BAT/BEP in PCDD/PCDF sources will not be only technically feasible but also be economically advantageous.

**Table 14(a): Incorporate into legislation BAT/BEP requirement for new sources**

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **1.** | **Incorporate into legislation BAT/BEP requirement for new sources** | | | | |
| 1.1 | Carry out a survey on existing sources (with special emphasis on medical wastes incineration and secondary metal melting plants including traditional industries ) and identify the shortcomings | 2007 | **CEA,** ME, , MLG, ITI & BOI NERD, MI (IDB) | Reports on the Situation analysis of application of BAT/BAP in major source categories. | |
| 1.2 | Identify the BAT/BEP requirements | 2007 | **CEA** ME, , ITI & BOI, NERDC, MI | Report on the need of BAT/BEP requirements | |
| 1.3 | Drafting Regulations | 2008 | -do- | Draft Regulations | |
| 1.4 | Approvals | 2008 | -do- | Approved Regulations | |
| 1.5 | Gazette the Regulations | 2008 | -do- | Gazzetted Regulations | |
| 1.6 | Monitor implementation | 2009 | -do- | Establishment of new sources with BAT/BEP requirements. | |

## 2. Review & upgrade relevant legislation/s on solid waste management

Management of solid wastes by legislation is addressed only in the Local Authority Regulations and as per the said Regulations the sole responsibility of managing solid wastes has to be borne by the relevant Local Authorities. However, with the rapid development in the past, presently there is a huge generation of wastes of heterogeneous composition specially comprising non-degradable waste such as polythene. Particularly hazardous is the common practice of uncontrolled burning of wastes. With the existing legal mechanism, the Local Authorities alone are unable to manage such wastes and therefore they need further strengthening their capacity to handle solid waste in an environmentally sound manner.. This can be achieved by reviewing and upgrading the present legislation. Prohibition of open burning of wastes at least in the urban area will be considered.

**Table 14(b): Review & upgrade relevant legislation/s on solid waste management**

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **2.** | **Review & upgrade relevant legislation/s on solid waste management** | | | | |
| 2.1 | Review existing legislation in Sri Lanka for solid wastes management | 2007 | **CEA**, ME, MLG *Legal Draftsman Dept. | Draft Report on the existing legislation for the management of solid waste. | |
| 2.2 | Compare 2.1 above with the legislative provisions of other signatory countries specially with reference to minimizing PCDD/PCDF (this may be the BAT/BEP – omission of this may be considered) | 2007 | -do- | Report on comparison with identified gaps. | |
| 2.3 | Upgrade/amend existing legislation by incorporating findings in 2.2 above | 2008 | -do- | | |
| 2.4 | Summarise outcome of 2.3 above into a common structure clearly defining the responsible Stakeholders. | | -do- | | |
| 2.5 | Draft amended Regulations | 2009 | -do- | Draft of amended Regulations | |
| 2.6 | Approvals | 2009 | -do- | | |
| 2.7 | Gazette the Regulations | 2009 | -do- | | |
| 2.8 | Monitor implementation ( Implementation of regulations should handle by the management Group) | 2009 onwards | -do- | Solid wastes reaching disposal sites will be easy to manage | |

## 3. Implement of proper solid waste management/disposal mechanisms

In addition to the above-mentioned shortcomings in the legal mechanism, Sri Lanka has no real implementation experience with proper solid wastes management/disposal mechanisms. Haphazard disposal practises have lead to severe environmental degradation not only by way of PCDD/PCDF but by other pollutants as well. These improper disposal practises have lead to depreciation of

aesthetic value too, at the vicinity of disposal sites. Further, the PCDD/PCDF inventory has revealed that fires at dump site are the biggest contributors for PCDD/PCDF emissions in Sri Lanka by way of air (57% of total air emissions). Even though the total TEQ for leakages has not been carried out due to the lack of information the highly contaminated leachate may posses high value of TEQ and these also leached out from the dumping sites.

Hence, implementation of proper solid waste management/disposal mechanisms is an urgent need of the country.

### Table 14(c):Implement of proper solid waste management/disposal mechanisms

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **3.** | **Implement of proper solid waste management/disposal mechanisms** | | | | |
| 3.1 | Identification of a co-ordination mechanism which is acceptable to all stakeholders | 2007 | **ME,**MLG, MoH, | Report on the Existing co-ordination mechanism for solid waste management Report & Action plan | FP-ME&NR |
| 3.2 | Carry out a situation analysis with regard to existing solid waste management systems | 2007 | **ME**,MLG, MOH, CEA | Report on the Situation analysis of Solid waste management System in Sri Lanka | |
| 3.3 | Prepare guidelines for waste management and disposal in accordance with BAT & BEP | 2008 | **ME,** MLG, MoH | Report & Action plan | FP-ME&NR |
| 3.4 | Identify weaknesses of implementation of 3Rs and waste prevention measures | 2008 If BAT & BEP to be decided. | **ME,**MLG, CEA, WMA, LA BoI, ITI, M/Industries and Project SMED, NCPC | Report & Action Paln | FP-ME&MR |
| 3.5 | Identification of feasible and practicable disposal options | 2007 | **ME**,MLG, CEA,SMET, WMA,LA BoI, ITI, NCPC | Report & action Plan | |
| 3.6 | Identification of necessary technical & financial resources to local authorities | 2007 | **Treasury**, ME , MLG, CEA | Report & Action plan | |
| 3.7 | Implementation of proper solid waste disposal technology/ies in selected local Authority Areas | 2007 | **ME**,CEA. MLG, Foreign funding Agency | Establishment of proper solid waste management/disposal mechanisms in selected local Authority areas | |
| 3.7 | Creation of general awareness on SWM | On going | **MLG**,CEA, WMA,LA BoI, | Reduction of quantity of waste | |

| | | | | | |
|---|---|---|---|---|---|
| | | | | per inhabitant, Changes in behavior pattern with regard to waste disposal. Increase of waste recycling facilities. | |

## 4. Implement of proper medical wastes management/disposal mechanisms

In Sri Lanka medical wastes are mainly disposed of by landfilling/uncontrolled burning – usually managed with other solid waste without any differentiation. Although segregation of wastes is practiced to a certain extent, this is not implemented at a satisfactory level due to lack of a proper management mechanism.

With regard to medical wastes incineration, there is only one such incinerator that is being operated by a private hospital. Although it is incorporated with the relevant temperature control devices, whether the necessary temperature levels are maintained in real practise is ambiguous.
There are number of small-scale burning chambers operated in several hospitals without any gas cleaning systems. Their burning practises are similar to burning of solid waste in the open air. In almost all cases, solid wastes are burnt without any segregation and this leads to emission of PCDD/PCDF.

As per the inventory, after fires at dump site, burning of medical wastes is the second biggest contributor for PCDD/PCDF emissions in Sri Lanka by way of air. Hence, implementation of proper medical wastes management/disposal mechanisms is an urgent need of the country.

### Table 14(d): Implement of proper medical wastes management/disposal mechanisms.

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **4.** | **Implement of proper medical wastes management/disposal mechanisms.** | | | | |
| 4.1 | Review of existing medical wastes management/disposal techniques | 2007 | **MOH**, ME , CEA & ITI, BOI | Report on the existing practices of management of Hospital Wastes | There are several studies carried out by the Ministry of health. By re-viewing these reports a fresh report can be prepared |
| 4.2 | Identify shortcomings and thereby relevant improvements/ technologies. Identify a mechanism for implementing these technologies | 2007 | -do- | Report /Activity plan | |
| 4.3 | Implement above. Report/ Activity plan in selected hospitals in all districts as a pilot | 2007 | -do- | Number: of Improved medical wastes | |

| | | | | | |
|---|---|---|---|---|---|
| | /demonstration project | | | managment practises | |
| 4.4 | Monitoring of Implementation of Report/ Activity plan | 2007/8 | **CEA**, BOI, Local Authorities | Number of hospitals adhere to the BAT/BEP | |

## 5. Review existing technology on secondary metal recycling plants including traditional industries and identify necessary changes for upgrading these systems

With respect to Air Pollution Control (APC), there are two main categories of secondary metal recycling plants in Sri Lanka. These are; (a) those operate without any APC devices and run on a cottage scale. (b) those operate with APC (wet scrubber devices) and run on an industrial scale.

The inventory has revealed that PCDD/PCDF contamination with respect to via residue, the residue generated from secondary metal recycling makes the biggest contribution (62% of total residue contamination).

Hence, implementation of proper technology capable of minimising contamination by residue and air emissions too, is an essential need of the country.

### 5(a) Cottage scale metal recycling plants

**Table 14(e): Review existing technology on secondary metal recycling plants including traditional industries and identify necessary changes for upgrading these systems**

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **5a.** | **Review existing technology on secondary metal recycling plants including traditional industries and identify necessary changes for upgrading these systems** | | | | |
| 5.1a | Review the existing technologies of traditional secondary smelting plants for improvements | 2007 | **ITI,**UoM,UoP,NERD, CEA,BoI,IDB, SMED | Report on the Existing technology in the Secondary metal cottage industries | |
| 5.2a | Identify the required improvements/technologies and inclusive of BAT/BEP | 2007 | **ITI**, NERD, CEA, BOI, IDB & SMED | Report on the applicability and improvement of existing technology | |
| 5.3a | Identify a mechanism for implementing above 5.2a | 2007 | **ME,** consultation with above | Action plan | |
| 5.4a | Implementation of Action plan | 2007 | **ITI**,NERD, CEA, BOI, IDB & SMED | Number of facilities improved | |
| 5.4a | Monitoring of implementation of Action plan | 2007 | **CEA**,Local Authority | Number of cottage scale industries operating according to the guidelines increase | |

**5 (b) Industrial scale metal recycling plants**

**Table 14(f): Review existing technology on secondary metal recycling plants including traditional industries and identify necessary changes for upgrading these systems**

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **5b.** | **Review existing technology on secondary metal recycling plants including traditional industries and identify necessary changes for upgrading these systems** | | | | |
| 5.1b | Control of importation of recyclable material | 2007 | **Customs**, DoIC,ME, CEA,BoI & PA | Ensure purity of metals imported, prohibit highly contaminated metals | |
| 5.2b | Computerize importation of secondary metals and monitor them along with resulting exports (mass balancing checks) | On going | **Customs** & BOI | Data on imports and resulting exports as well | |
| 5.3b | Review existing technologies of the scrap metal recycling plants and identify the possible BAT/BEP | 2007 | **ITI**,UoM,UoP,NERD, CEA,BoI,IDB | Report on the existing practice of BAT/BEP | |
| 5.4b | Implement the suitable BAT/BEP in any identified sources in 5.3b above | 2007 | **ITI**,BOI & CEA | Number of Industrial metal recycling plants with BAT/BEP | |

## 6. Review existing crematoria designs for its acceptance and identify changes

In Sri Lanka crematoria are designed without due consideration to appropriate temperature controls. Some are over a century old and were constructed during the colonial period. Cremation of deceased is quite common among Buddhists and Hindus. Approximately 65 Crematoria exist while some pyres are made of wood close to funeral homes by tradition. No air cleaning or pollution control systems are adopted in these crematoria which are with single chamber with no after burning systems incorporated.. The stack height is designed to provide enough dilution only.

As there is no proper temperature controlling mechanism, temperatures can exist in the range favourable for PCDD/PCDF formation during burning activities. Emission factor to air is estimated to be 90 ug I-TEQ per Cremation. Hence, reviewing crematoria designs with respect to temperature controls and finding out the relevant BAT/BEP is a need to minimise PCDD/PCDF emissions.

**Table 14(g): Review existing crematories designs for its acceptance and identify changes**

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **6.** | **Review existing crematories designs for its acceptance and identify changes** | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 6.1 | Review of existing crematoria designs and identify shortcomings with respect to temperature controls and thereby the required BAT/BAP | 2007 | **MLG** and ITI | Status Report | |
| 6.2 | Identify measures to improve shortcomings | 2007 | -do- | Action Plan | |
| 6.3 | Secure endorsement of stakeholders and Implement the Action Plan | 2008 | **Local Authorities**, Provincial Councils, MLG, CEA and, ME | Number of Upgraded crematoria | |
| 6.4 | Monitoring of implementation of Action plan | 2008 | **CEA**, ME, & MLG | Number of Crematoria in operation adhere to the Action Plan | |
| 6.5 | Secure technical assistance and technology transfer | 2008 | **M/Industries**, MENR | | |

### 3.3.4.2.1 Research and development

The proposed research and development actions are described in more detail in the following text. For each proposed R&D action an explanatory text describes the rationale behind selecting the particular option as well as its expected capacity to facilitate NIP implementation.

An implementation strategy table contains information on activities associated with the particular R&D action, implementation timelines, responsible and supporting agencies for implementation, and indicators of success. Links to existing country programmes on chemical management, environmentally sound waste management and environmental pollution control as well as with the national activities on sustainable development are provided.

In the Resource requirements human, capital and related operation costs of the identified activities are described, considering the established timeline.

## 7. Development of an emission factor for charcoal production (Coconut shell) under different process condition.

Coconut is one of the major plantation crops in Sri Lanka. Each and every part of the tree has a commercial value. Coconut shells are burnt in open pits in huge quantities for manufacture of charcoal. During burning of coconut shells a dense smoke is emitted and it is likely to contain a high content of volatile organic substances, particulate matter and other air pollutants. Out of these, some constituents may be contaminated with carcinogenic substances including PCDD/PCDF.

Further, as the growth of coconut flourishes in the coastal belt, its shells can contain a high chloride content. Hence, burning shells can lead to produce high levels of PCDD/PCDF.

However, the toolkit has not identified coconut shell burning as a PCDD/PCDF generating source although other types of biomass burning operations are included in it. Hence, a TEQ value for burning of charcoal is not included in the inventory. Therefore, it will be necessary to develop an emission factor for coconut shell burning as well, as it has a potential to release PCDD/PCDF due to the above-mentioned reasons. Development of an emission factor will enable other coconut growing countries too, to adopt same factor during preparation of their PCDD/PCDF inventory. A review of existing local technology being used for Charcoal Production will be useful.

**Table 14(h): Development of an emission factor for charcoal production (Coconut shell) under different process condition.**

| | **Research & Development Action /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **7.** | **Development of an emission factor for charcoal production (Coconut shell) under different process condition** | | | | |
| 7.1 | A survey of charcoal production sites and selection of representative sampling locations | 2007 | **CEA**, ISB, CRI, BOI & ITI,NWPEA, | Action plan/Activity Plan | |
| 7.2 | Carry out sampling with special reference to residue, products & air | 2007 | -do- with international expert and assistance | Analytical Report on the emission of PCDD/PCDF in charcoal production | |
| 7.3 | Organise testing of above 1.2 for PCDD/PCDF (1.2 and 1.3 may combined together) | 2007 | -do-, with overseas technical support | | |
| 7.4 | Compute the emission factor based on output of above 1.3 | 2007 | -do- | Emission factor for the charcoal production | |

## 8. Investigate unintentional by products & AOX in leachate and soil in the contaminated open dump sites

In Sri Lanka “Colombo” is the major city with a complex mixture of residential, commercial and industrial activities. Hence, the solid waste generated is of heterogeneous in composition mainly comprising flammable and biodegradable material. A recent survey has revealed approximately 650 t is generated per day.

This waste is haphazardly disposed of directly on a block of land located within Colombo city (Bloemendhal). This site does not have the basic environmental pollution control devices such as facilities for controlling fires, leachate collection & treatment etc.

Therefore, this site is being operated without basic facilities although a complex waste mixture is contained. There are frequent occurrence of fires which sometimes exist for weeks. These uncontrolled fires emit major types of pollutants into the environment. Apart form the fires, the leachate from the dump site is also considered as a major environmental issue. Hence, contamination of the site and its vicinity with PCDD/PCDF and AOX is also expected.

However, no investigations have been so far carried out with respect to these substances in leachate and soil. Hence, analysis of leachate and soil for PCDD/PCDF and AOX levels will enable to understand the extent the site has been contaminated and thereby the necessary BAT/BEP requirements to control/minimise such contamination. Further, these results can be utilised as a criteria (baseline data) in assessing the effectiveness of BAT/BEP at landfill sites. In addition, these test results also help to assess the situation in other similar dump sites located in other places in the country.

**Table 14(i): Investigate unintentional by products & AOX in leachate and soil in the contaminated open dump sites in Colombo,Kandy, Nuwareliya etc**

| | **Research & Development Action /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **8** | **Investigate unintentional by products & AOX in leachate and soil in the contaminated open dump sites in Colombo,Kandy, Nuwareliya etc** | | | | |
| 8.1 | A detailed survey of the site with regard to its topography (terrain), rainfall pattern, soil characteristics etc. | 2007 | **CEA**, ME, , CMC & ITI, BOI | Report on the situation analysis of Bluemendal dumping site | |
| 8.2 | Identification of representative sampling locations and carry out sampling accordingly | 2007 | -do- | No of Sample Collected | |
| 8.3 | Organise testing of above 2.2 for PCDD/PCDF and AOX | 2008 | -do- with overseas technical support | Contaminated levels of PCDD/PCDF | |
| 8.4 | Maintain above 2.3 as baseline data and continue periodic testing to assess effectiveness of BAT/BEP | Continue | -do- | Monitoring Plan | |

*Note: This research & development action can be coupled with management option No 3.*

## 9. Investigation of contamination of animal milk and human milk in the scavenging animals and people living close vicinity to the dump sites

As in Colombo, solid wastes generated from other urban areas including small towns are being disposed of haphazardly onto productive land. There are no proper pollution control mechanisms applied. There is also no control with respect to scavenging by humans and animals.

Most of the times, these dump sites are set on fire intentionally or unintentionally. These waste dumps contain unsegregated mixed waste including plastic and hospital waste. It is expected that the open burning of such wastes may emit highly toxic gases and substances. Several studies in other developing countries in similar type of dump sites, have revealed not only presence of PCDD/PCDF but also PITs in milk of feeding mothers who are engaged in scavenging at the dumping sites. Therefore, study on such contamination is very useful to identify the short/long term impacts on animals and human beings. This will also enable to identify the importance of designing a proper solid waste management system.

**Table 14(j): Investigation of contamination of animal milk and human milk in the scavenging animals and people living close vicinity to the dump sites**

| | **Research & Development Action /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **9.** | **Investigation of contamination of animal milk and human milk in the scavenging animals and people living close vicinity to the dump sites** | | | | |
| 9.1 | Situation analysis of environmental | 2007 | **ME**, CEA,ML & | Situation analysis | |

| | | | | | |
|---|---|---|---|---|---|
| | issues including the details of scavengers and potential exposure people in and around the dumping sites. | | ITI, MoH | Report | |
| 9.2 | Identification of representative sampling locations and carry out sampling accordingly | 2007 | **CEA**,ML & ITI, MoH | Identified locations of sample | |
| 9.3 | Organise testing of above 2.2 for PCDD/PCDF | 2008 | -do- with overseas technical support | Contaminated levels of PCDD/PCDF | |
| 9.4 | Preparation of Guidelines for solid waste dump site with respect to PCDD/PCDF | 2008 | do- with overseas technical support | Set of guidelines for solid waste dump sites | |
| 9.5 | Implementation of Solid waste Guidelines and monitoring | 2008 | **CEA**, BOI and MLG | | |

*[This need not be given high priority as integrated solid waste management practice implementation if given support and priority will take care of these issues as the data generated will be less useful]*

## 10. Research on recycling potential for flammable material

The inventory has revealed, landfill fires as the highest contributor for PCDD/PCDF emissions in Sri Lanka (57% of total air emissions). This situation is same with respect to some other countries in the region such as Cambodia, Philippines etc. Investigations have revealed that frequent landfill fires are mainly due to accumulation of combustible material within solid waste disposal sites. Hence, avoidance of such material reaching landfill sites will greatly reduce fire eruptions.
Therefore, research on recycling potential for such material is an essential need of the country.

**Table 14 (k): Research on recycling potential for flammable material**

| | **Research & Development Action /** Activities | **Timeframe** | **Responsible /** supporting **Institution(s)** | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **10** | **Research on recycling potential for flammable material** | | | | |
| 10.1 | Identify potentially combustible material reaching at dump sites | 2007 | **CEA** & MLG | Report on combustible materials in the dumping sites | |
| 10.2 | Study on source and the potential recyclings and develop a management mechanism | 2008 | **ME**, CEA, MLG & ITI | Action plan | |
| 10.3 | Implementation of Action Plan | 2009and continue | **M/Industries** and Chambers, CEA & MLG, BOI | Quantity of wastes recycled | |
| 10.4 | Monitoring of implementation of Action Plan | 2009and continue | -do- | Increase of quantity of recyclable waste | |

## 11. Assessment of unintentional by products in process sludge/air emissions and treatment of sludge in BOI plants and traditional secondary smelting plants

The residue generated from a BOI approved secondary smelting plants are of two types with respect to its origin. These are;

(a). Residue (slag) remaining within the furnace floor subsequent to smelting.

(b). Residue trapped by wet scrubbing and subsequent sedimentation to arrest air pollution.

The former has been exposed to a high temperature only, whereas the latter has been exposed to a progressive cooling process (by wet scrubbing) that is favourable for PCDD/PCDF formation. However, to ascertain this theoretical situation, it is necessary to test both types of residue separately for PCDD/PCDF. If the said situation reveals true the relevant residue handling techniques and additional precautionary measures required to prevent PCDD/PCDF release can be proposed.

Although the gas cleaning systems are incorporated in BOI secondary smelting plants, the effectiveness of these systems is not known. Therefore, it is also useful to test the PCDD/PCDF levels in the stack emissions and thereby to check the efficiency of wet scrubbers with respect to PCDD/PCDF removal.

As traditional smelting plants do not have any APC devices, testing of its fly ash (residue) directly discharged into the atmosphere will enable to make a justifiable assessment with regard to the need of such APC devices.

**Table 14 (I): Assessment of unintentional by products in process sludge/air emission and treatment of sludge in BOI plants and traditional secondary smelting plants**

| | **Research & Development Action /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **11.** | **Assessment of unintentional by products in process sludge/air emission and treatment of sludge in BOI plants and traditional secondary smelting plants** | | | | |
| 11.1 | Select representative samples of air and residue in BOI and traditional secondary smelting plants | 2007 | **CEA** & ITI | Report on methods adopted and analytical report | |
| 11.2 | Organise testing for PCDD/PCDF | 2008 | -do- with overseas technical support | Emission levels of PCDD/PCDF | |
| 11.3 | Propose relevant BAT/BEP accordingly and identify a management tool to implement above BAT/BEP with a time frame for its implementation | 2008 | -do- | Action plan | |
| 11.4 | Implementation of Action Plan | 2009 | **BOI**, CEA& ML | | |
| 11.5 | Monitoring of implementation of Action plan | 2009 and cont | **BOI**,CEA &ML | No of industries implemented the Action Plan | |

## 12. Assessment of unintentional by-products in the soil contaminated from the waste water and sludge released from service stations

Vehicle servicing is a major activity in the transport sector including railways. The waste engine oil used for the cooling and lubricant purposes are collected and sold out for recycling purposes particularly for the secondary smelting industries. Huge amount of mud and sludge from the oil separators are collected and disposed of without any treatment all over the country. Most of the time along with the Municipal waste collection system and dumped in the municipal dump yards. As the oils are subject to 100- 500 $^{0}$C it is suspected of generate PCDD/PCDF. Therefore, testing of PCDD/PCDF in the soil contaminated from the waste and sludge released from service stations will enable to assess the pollution potential of such materials.

**Table 14 (m): Assessment of unintentional by products in the soil contaminated from the waste water and sludge released from service stations**

| | **Research & Development Action / Activities** | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **12** | **Assessment of unintentional by products in the soil contaminated from the waste water and sludge released from service stations** | | | | |
| 12.1 | Study the type and quantities sludge generated and the possibility of contamination of soil | 2007 | **CEA,** MT, BOI, ITI & ML | Situation Report | |
| 12.2 | Identified suitable sample location and collection of samples | 2007 | **CEA**, BOI, ITI with the assistance of the international expert | Collection of sample | |
| 12.3 | Testing of samples | 2008 | **CEA**, BOI, ITI with the assistance of the international consultant | Results of the Test | |
| 12.4 | Preparation of guidelines to the Handling of waste water and sludge based on the results of the test, | 2008 | **CEA**, BOI, ITI with the assistance of the international consultant | Set of Guidelines | |

## 13. Life cycle assessment of PVC materials used

PVC materials are widely used due to its non-degradable property. This material has been identified as having a high potential to release PCDD/PCDF if gets exposed to high temperatures. (The toolkit says that if only PVC is burnt, 40-3,500µg of PCDD/PCDF is trapped in per tonne of soot produced – Page No: 120).

PVC materials are often noted at landfill sites. These have a high risk to fire exposures due to the reasons mentioned in 2 above and such fires could lead to PCDD/PCDF emissions.

A life cycle assessment of PVC materials will enable to identify the reasons for its disposal of at landfill sites. Accordingly, an environmentally sound management mechanism (both technical and legal) can be proposed to prevent PVC material reaching at landfill sites.

**Table 14(n): Life cycle assessment of PVC materials used**

| | **Research & Development Action /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **13** | **Life cycle assessment of PVC materials used** | | | | |
| 13.1 | Details of Importations of PVC in any form. | 2007 | **Customs**, BOI & CEA | Report on the Total Quantity of PVC imported per year | |
| 13.2 | Assessment of waste generation , existing practices of disposal | 2008 | **ME**, CEA, MLG, BOI | Situation Analysis report | |
| 13.3 | Existing practices of disposal | 2007 | -do- | Situation Report | |
| 14.4 | Evaluation of data | 2008 | -do- | Evaluation report | |
| 13.5 | Identify reasons for disposal of at landfill sites | 2008 | -do- | Evaluation report | |
| 13.6 | Preparation of Action plan on proper collection system and recycling methodology Propose a suitable mechanism to prevent them reaching at landfill sites | 2008 | -do- | Report on the collection and recycling of PVC waste | |
| 13.7 | Implementation of Action plan | From 2009 | -do- | | |
| 13.8 | Monitoring of implementation of action plan | From 2009 | -do- | Quantity of wastes recycled | |

## 14. Risk assessment on use of biomass for cooking

As per the inventory, burning of biomass has been identified as the third biggest contributor for PCDD/PCDF emissions into air. The guidelines given in the toolkit was the only criteria used for deriving the said finding. However, Sri Lanka had been engaged in biomass burning cooking practises from the time immemorial and there had been no proven evidence of toxicity so far. Hence, the reality of considering biomass burning as a considerable PCDD/PCDF source is doubtful. This will be the same for other countries as well. Hence, a risk assessment on biomass burning cooking practices will enable to resolve this issue.

### Table 14 (o): Risk assessment on use of biomass for cooking

| | **Research & Development Action /** Activities | **Timefra me** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **14.** | **Risk assessment on use of biomass for cooking** | | | | |
| 14.1 | A comparative survey on the health situation of personnel engaged in biomass burning cooking practises and other practises | 2007 | **ME**, CEA, MLG, Universities, ITI & NERD | Identification of impacts due to biomass burning cooking practises and other practises as well | |
| 14.2 | Air sampling of biomass burning emissions & testing for PCDD/PCDF | 2007 | **ME**, ITI along with overseas technical support | Number of samples tested | |
| 14.3 | Investigation of outputs derived in 7.1 & 7.2 above in terms of impacts due to burning of biomass | 2008 | **ME**, CEA, ITI & NERD | Amendments to the guidance given in the toolkit | |

### 3.3.4.3 Resource Requirements

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | **Implement into legislation BAT /BEP requirement for new sources** | | 6,400 | 10,700 | 6,400 | 6,400 | 6,400 | 6,400 | 0 | 0 | 0 | 0 |
| | | | 0 | 0 | 1,200 | 0 | 1,200 | 0 | 0 | 0 | 0 | 0 |
| | | | 3,600 | 2,200 | 2,400 | 2,400 | 2,400 | 2,400 | 0 | 0 | 0 | 0 |
| | | | **10,000** | **12,900** | **10,000** | **8,800** | **10,000** | **8,800** | **0** | **0** | **0** | **0** |
| 1.1 | Carry out a survey on existing sources and identify the deficiencies | | 6,400 | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | 3,600 | | | | | | | | | |
| | | | **10,000** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 1.2 | Identify the BAT/BEP requirement | | | 3,600 | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | 1,000 | | | | | | | | |
| | | | **0** | **4,600** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 1.3 | Drafting legislation | | | 3,600 | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | **0** | **3,600** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 1.4 | Approvals | | | 500 | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | **0** | **500** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 1.5 | Gazette the regulations | | | 3,000 | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | 1,200 | | | | | | | | |
| | | | **0** | **4,200** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 1.6 | Monitor implementation | | | | 6,400 | 6,400 | 6,400 | 6,400 | | | | |
| | | | | | 1,200 | | 1,200 | | | | | |
| | | | | | 2,400 | 2,400 | 2,400 | 2,400 | | | | |
| | | | **0** | **0** | **10,000** | **8,800** | **10,000** | **8,800** | **0** | **0** | **0** | **0** |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2** | **Review & upgrade relevant legislation/s on solid waste management** | | 3,400 | 5,200 | 2,000 | 6,500 | 6,400 | 6,400 | 0 | 0 | 0 | 0 |
| | | | 1,100 | 0 | 0 | 0 | 1,200 | 0 | 0 | 0 | 0 | 0 |
| | | | 1,500 | 0 | 0 | 2,400 | 2,400 | 2,400 | 0 | 0 | 0 | 0 |
| | | | **6,000** | **5,200** | **2,000** | **8,900** | **10,000** | **8,800** | **0** | **0** | **0** | **0** |
| 2.1 | Review existing legislation in Sri Lanka for solid wastes management | | 2,400 | | | | | | | | | |
| | | | 1,100 | | | | | | | | | |
| | | | 1,500 | | | | | | | | | |
| | | | **5,000** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 2.2 | Compare 2.1 above with the legislative provisions of other signatory countries specially with reference to minimizing PCDD/PCDF | | 1,000 | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | **1,000** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 2.3 | Upgrade/amend existing legislation by incorporating findings in 2.2 above | | | 2,000 | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | **0** | **2,000** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 2.4 | Summarise outcome of 2.3 above into a common structure clearly defining the responsible Stakeholders. | | | 2,400 | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | **0** | **2,400** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 2.5 | Draft amended regulation | | | 300 | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | **0** | **300** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 2.6 | Approvals | | | 200 | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | **0** | **200** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 2.7 | Gazette the regulation | | | 300 | | | | | | | | |
| | | | | | | | | | | | | |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | O | | | | | | | | | | |
| | | **T** | **0** | **300** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 2.8 | Monitor implementation | H | | | 2,000 | 6,500 | 6,400 | 6,400 | | | | |
| | | C | | | | | 1,200 | | | | | |
| | | O | | | | 2,400 | 2,400 | 2,400 | | | | |
| | | **T** | **0** | **0** | **2,000** | **8,900** | **10,000** | **8,800** | **0** | **0** | **0** | **0** |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3** | **Implement proper solid waste management/disposal mechanisms** | H | 1,000 | 57,600 | 5,000 | 36,000 | 24,000 | 36,000 | 10,000 | 10,000 | 6,000 | |
| | | C | - | 23,700 | 6,500 | 40,000 | 25,000 | 700,000 | 1,000 | 1,400 | 1,000 | |
| | | O | - | 13,600 | 27,600 | 24,000 | 25,000 | 24,000 | 3,000 | 73,000 | 13,604 | - |
| | | **T** | **1,000** | **94,900** | **39,100** | **100,000** | **74,000** | **760,000** | **14,000** | **84,400** | **20,604** | **-** |
| 3.1 | Identification of a co-ordination mechanism which is acceptable to all stakeholders | H | 1,000 | | | | | | | | | |
| | | C | | | | | | | | | | |
| | | O | | | | | | | | | | |
| | | **T** | **1,000** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | |
| 3.2 | Carry out a situation analysis with regard to existing solid waste management systems | H | | 10,000 | | | | | | | | |
| | | C | | 3,900 | | | | | | | | |
| | | O | | 4,800 | | | | | | | | |
| | | **T** | **-** | **18,700** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | |
| 3.3 | Prepare guidelines for waste disposal in accordance with BAT & BEP | H | | 5,000 | | | | | | | | |
| | | C | | 3,600 | | | | | | | | |
| | | O | | 2,000 | | | | | | | | |
| | | **T** | **-** | **10,600** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | |
| 3.4 | Identify weaknesses of implementation of 3Rs | H | | 3,600 | | | | | | | | |
| | | C | | 9,800 | | | | | | | | |
| | | O | | 2,000 | | | | | | | | |
| | | **T** | **-** | **15,400** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | |
| 3.5 | Identification of feasible and practicable disposal options | H | | 39,000 | | | | | | | | |
| | | C | | 6,400 | | | | | | | | |
| | | O | | 4,800 | | | | | | | | |
| | | **T** | **-** | **50,200** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3.6 | Identification of necessary technical & financial resources to local authorities | H | | | 2,000 | | | | | | | |
| | | C | | | 6,500 | | | | | | | |
| | | O | | | 3,600 | | | | | | | |
| | | **T** | **-** | **-** | **12,100** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| 3.7 | Implementation of proper solid waste disposal technology/ies in selected local Authority Areas | H | | | 3,000 | 36,000 | 24,000 | 36,000 | 10,000 | 10,000 | 6,000 | |
| | | C | | | | 40,000 | 25,000 | 700,000 | 1,000 | 1,400 | 1,000 | |
| | | O | | | 24,000 | 24,000 | 24,000 | 24,000 | 3,000 | 73,000 | 13,604 | |
| | | **T** | **-** | **-** | **27,000** | **100,000** | **73,000** | **760,000** | **14,000** | **84,400** | **20,604** | |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **4** | **Implement proper medical waste management/disposal mechanisms** | H | 2,000 | 9,600 | 9,000 | 39,000 | 39,000 | 36,000 | - | - | - | |
| | | C | 2,500 | 27,500 | 27,500 | 652,500 | 802,500 | 1,000,000 | - | - | - | |
| | | O | 1,200 | 8,100 | 6,900 | 6,900 | 6,900 | 4,500 | - | - | - | |
| | | **T** | **5,700** | **45,200** | **43,400** | **698,400** | **848,400** | **1,040,500** | **-** | **-** | **-** | |
| 4.1 | Review of existing medical wastes management/ disposal techniques | H | 1,000 | | | | | | | | | |
| | | C | 2,500 | | | | | | | | | |
| | | O | 1,200 | | | | | | | | | |
| | | **T** | **4,700** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | |
| 4.2 | Identify shortcomings and thereby relevant improvements/ technologies. Identify a mechanism for implementing these technologies | H | 1,000 | 3,600 | | | | | | | | |
| | | C | | 2,500 | | | | | | | | |
| | | O | | 3,600 | | | | | | | | |
| | | **T** | **1,000** | **9,700** | | | | | | | | |
| 4.3 | Implement above. Report/ Activity plan in selected hospitals in all districts as a pilot /demonstration project | H | - | 6,000 | 6,000 | 36,000 | 36,000 | 36,000 | | | | |
| | | C | - | 25,000 | 25,000 | 650,000 | 800,000 | 1,000,000 | | | | |
| | | O | - | 4,500 | 4,500 | 4,500 | 4,500 | 4,500 | | | | |
| | | **T** | **-** | **35,500** | **35,500** | **690,500** | **840,500** | **1,040,500** | **-** | **-** | **-** | |
| 4.4 | Monitoring of Implementation of Report/ Activity plan | H | | | 3,000 | 3,000 | 3,000 | | | | | |
| | | C | | | 2,500 | 2,500 | 2,500 | | | | | |
| | | O | | | 2,400 | 2,400 | 2,400 | | | | | |
| | | **T** | **-** | **-** | **7,900** | **7,900** | **7,900** | **-** | **-** | **-** | **-** | **-** |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **5a** | **Review existing technology on secondary metal recycling plants including traditional industries and identify necessary changes for upgrading these systems** | H | 1,000 | 8,500 | 4,400 | 26,400 | 13,900 | 3,400 | 0 | 0 | 0 | 0 |
| | | C | 0 | 4,800 | 0 | 39,800 | 44,800 | 4,800 | 0 | 0 | 0 | 0 |
| | | O | 0 | 1,000 | 2,000 | 16,800 | 16,800 | 4,800 | 0 | 0 | 0 | 0 |
| | | **T** | **1,000** | **14,300** | **6,400** | **83,000** | **75,500** | **13,000** | **0** | **0** | **0** | **0** |
| 5a1 | Review the existing technologies of traditional secondary smelting plants for improvements | H | 1,000 | | | | | | | | | |
| | | C | | | | | | | | | | |
| | | O | | | | | | | | | | |
| | | **T** | **1,000** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 5a2 | Identify the required improvements/technologies and inclusive of BAT/BEP | H | | 6,000 | | | | | | | | |
| | | C | | | | | | | | | | |
| | | O | | | | | | | | | | |
| | | **T** | **0** | **6,000** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 5a3 | Identify a mechanism for implementing above 5.2a | H | | 2,500 | | | | | | | | |
| | | C | | 4,800 | | | | | | | | |
| | | O | | 1,000 | | | | | | | | |
| | | **T** | **0** | **8,300** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 5a4 | Implementation of Action plan | H | | | 2,000 | 24,000 | 11,500 | | | | | |
| | | C | | | | 35,000 | 40,000 | | | | | |
| | | O | | | 1,000 | 12,000 | 12,000 | | | | | |
| | | **T** | **0** | **0** | **3,000** | **71,000** | **63,500** | **0** | **0** | **0** | **0** | **0** |
| 5a5 | Monitoring of implementation of Action plan | H | | | 2,400 | 2,400 | 2,400 | 3,400 | | | | |
| | | C | | | | 4,800 | 4,800 | 4,800 | | | | |
| | | O | | | 1,000 | 4,800 | 4,800 | 4,800 | | | | |
| | | **T** | **0** | **0** | **3,400** | **12,000** | **12,000** | **13,000** | **0** | **0** | **0** | **0** |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **5b** | **Review existing technology on secondary metal recycling plants including traditional industries and identify necessary changes for upgrading these systems** | H | 6,000 | 17,200 | 13,100 | 6,400 | 36,000 | 36,000 | - | - | - | 0 |
| | | C | - | 31,200 | 58,000 | 25,000 | 50,000 | 50,000 | - | - | - | 0 |
| | | O | 1,500 | 11,400 | 10,200 | 4,800 | 4,800 | 4,800 | - | - | - | 0 |
| | | **T** | **7,500** | **59,800** | **81,300** | **36,200** | **90,800** | **90,800** | **-** | **-** | **-** | **0** |
| 5b1 | Control of importation of recyclable material | H | 1,200 | 1,200 | | | | | | | | |
| | | C | | 2,400 | | | | | | | | |
| | | O | 500 | 1,200 | | | | | | | | |
| | | **T** | **1,700** | **4,800** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **0** |
| 5b2 | Computerize importation of secondary metals and monitor them along with resulting exports (mass balancing checks) | H | | 4,800 | 4,800 | | | | | | | |
| | | C | | 12,000 | 12,000 | | | | | | | |
| | | O | | 6,400 | 3,000 | | | | | | | |
| | | **T** | **-** | **19,800** | **19,800** | **-** | **-** | **-** | **-** | **-** | **-** | **0** |
| 5b3 | Review existing technologies of the scrap metal recycling plants and identify the possible BAT/BEP | H | 4,800 | 4,800 | 4,800 | | | | | | | |
| | | C | - | 4,800 | 4,800 | | | | | | | |
| | | O | 1,000 | 2,400 | 2,400 | | | | | | | |
| | | **T** | **5,800** | **12,000** | **12,000** | **-** | **-** | **-** | **-** | **-** | **-** | **0** |
| 5b4 | Implement the suitable BAT/BEP in any identified sources in 5.3b above | H | | 6,400 | 3,500 | 6,400 | 36,000 | 36,000 | | | | |
| | | C | | 12,000 | 10,000 | 25,000 | 50,000 | 50,000 | | | | |
| | | O | | 4,800 | 4,800 | 4,800 | 4,800 | 4,800 | | | | |
| | | **T** | **-** | **23,200** | **18,300** | **36,200** | **90,800** | **90,800** | **-** | **-** | **-** | **0** |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **6** | **Review existing crematories designs for its acceptance and identify changes** | H | 8,800 | 35,300 | 28,800 | 29,400 | 11,200 | - | - | 0 | 0 | 0 |
| | | C | 3,000 | 37,000 | 55,400 | 205,400 | 405,400 | - | - | 0 | 0 | 0 |
| | | O | 16,500 | 21,400 | 20,000 | 25,000 | 9,800 | - | - | 0 | 0 | 0 |
| | | **T** | **28,300** | **93,700** | **104,200** | **259,800** | **426,400** | **-** | **-** | **0** | **0** | **0** |
| 6.1 | Review of existing crematoria designs and identify shortcomings with respect to temperature controls and thereby the required BAT/BAP | H | 4,000 | 12,500 | | | | | | | | |
| | | C | 3,000 | 12,000 | | | | | | | | |
| | | O | 4,500 | 6,400 | | | | | | | | |
| | | **T** | **11,500** | **30,900** | **-** | **-** | **-** | **-** | **-** | **0** | **0** | **0** |
| 6.2 | Identify measures to improve shortcomings | H | 4,800 | 4,800 | | | | | | | | |
| | | C | - | | | | | | | | | |
| | | O | 12,000 | | | | | | | | | |
| | | **T** | **16,800** | **4,800** | **-** | **-** | **-** | **-** | **-** | **0** | **0** | **0** |
| 6.3 | Implement the Action Plan | H | | 18,000 | 24,000 | 24,000 | 6,400 | | | | | |
| | | C | | 25,000 | 50,000 | 200,000 | 400,000 | | | | | |
| | | O | | 15,000 | 15,000 | 20,000 | 4,800 | | | | | |
| | | **T** | **-** | **58,000** | **89,000** | **244,000** | **411,200** | **-** | **-** | **0** | **0** | **0** |
| 6.4 | Monitoring of implementation of Action plan | H | | | 4,800 | 5,400 | 4,800 | | | | | |
| | | C | | | 5,400 | 5,400 | 5,400 | | | | | |
| | | O | | | 5,000 | 5,000 | 5,000 | | | | | |
| | | **T** | **0** | **0** | **15200** | **15800** | **15200** | **0** | **0** | **0** | **0** | **0** |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | **R&D: Development of an emission factor for charcoal production (Coconut shell).** | H | - | 42,400 | 11,000 | 16,000 | - | - | - | - | - | 0 |
| | | C | - | 24,000 | 12,200 | 200,000 | - | - | - | - | - | 0 |
| | | O | - | 26,400 | 22,000 | 40,000 | - | - | - | - | - | 0 |
| | | **T** | **-** | **92,800** | **45,200** | **256,000** | **-** | **-** | **-** | **-** | **-** | **0** |
| 7.1 | A survey of charcoal production sites and selection of representative sampling locations | H | - | 6,400 | | | | | | | | |
| | | C | - | 12,000 | | | | | | | | |
| | | O | | 6,400 | | | | | | | | |
| | | **T** | **-** | **24,800** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **0** |
| 7.2 | Carry out sampling with special reference to residue, products & air | H | | 36,000 | | | | | | | | |
| | | C | | 12,000 | | | | | | | | |
| | | O | | 20,000 | | | | | | | | |
| | | **T** | **-** | **68,000** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **0** |
| 7.3 | Organise testing of above 1.2 for PCDD/PCDF (1.2 and 1.3 may combined together) | H | - | | 6,000 | 16,000 | | | | | | |
| | | C | | | 5,000 | 200,000 | | | | | | |
| | | O | | | 20,000 | 40,000 | | | | | | |
| | | **T** | **-** | **-** | **31,000** | **256,000** | **-** | **-** | **-** | **-** | **-** | **0** |
| 7.4 | Compute the emission factor based on output of above 1.3 | H | | | 5,000 | | | | | | | |
| | | C | | | 7,200 | | | | | | | |
| | | O | | | 2,000 | | | | | | | |
| | | **T** | **-** | **-** | **14,200** | **-** | **-** | **-** | **-** | **-** | **-** | **0** |

All costs are in US$

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | **R&D: Investigate unintentional by products & AOX in leachate and soil in the contaminated open dump site (eg:Bloemendal)** | H | 0 | 12,000 | 13,000 | 36,000 | 6,400 | 6,400 | 6400 | 0 | 0 | 0 |
| | | C | 0 | 20,000 | 6,000 | 25,000 | 25,000 | 25,000 | 26000 | 0 | 0 | 0 |
| | | O | 0 | 12,000 | 30,000 | 30,000 | 30,000 | 100,000 | 30000 | 0 | 0 | 0 |
| | | **T** | **0** | **44,000** | **49,000** | **91,000** | **61,400** | **131,400** | **62400** | **0** | **0** | **0** |
| 8.1 | A detailed survey of Bloemendal site with | H | | 12,000 | | | | | | | | |
| | | | | | | | | | | | | |
| | | C | | | | | | | | | | |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | regard to its topography (terrain), rainfall pattern, soil characteristics etc. | | | 20,000 | | | | | | | | |
| | | O | | 12,000 | | | | | | | | |
| | | **T** | **0** | **44,000** | **-** | **-** | **-** | **-** | **0** | **0** | **0** | **0** |
| 8.2 | Identification of representative sampling locations and carry out sampling accordingly | H | | | 3,000 | | | | | | | |
| | | C | | | | | | | | | | |
| | | O | | | | | | | | | | |
| | | **T** | **0** | **-** | **3,000** | **-** | **-** | **-** | **0** | **0** | **0** | **0** |
| 8.3 | Testing of above 2.2 for PCDD/PCDF and AOX | H | | | 10,000 | | | | | | | |
| | | C | | | 6,000 | | | | | | | |
| | | O | | | 30,000 | | | | | | | |
| | | **T** | **0** | **-** | **46,000** | **-** | **-** | **-** | **0** | **0** | **0** | **0** |
| 8.4 | Maintain above 2.3 as baseline data and continue periodic testing to assess effectiveness of BAT/BEP | H | | | | 36,000 | 6,400 | 6,400 | 6,400 | | | |
| | | C | | | | 25,000 | 25,000 | 25,000 | 26,000 | | | |
| | | O | | | | 30,000 | 30,000 | 100,000 | 30,000 | | | |
| | | **T** | **0** | **-** | **-** | **91,000** | **61,400** | **131,400** | **62400** | **0** | **0** | **0** |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **9** | **R&D :Investigation of contamination of animal milk and human milk in the scavenging animals and people living close vicinity to the dump sites** | H | 0 | 3,600 | 3,600 | 82,400 | 24,000 | 0 | 0 | 0 | 0 | 0 |
| | | C | 0 | 4,800 | 4,800 | 100,000 | 150,000 | 0 | 0 | 0 | 0 | 0 |
| | | O | 0 | 4,800 | 4,800 | 260,000 | 200,000 | 0 | 0 | 0 | 0 | 0 |
| | | **T** | **0** | **13,200** | **13,200** | **442,400** | **374,000** | **0** | **0** | **0** | **0** | **0** |
| 9.1 | Situation analysis of environmental issues including the details of scavengers and potential exposed population in and around the dumping sites. | H | | 3,600 | 3,600 | | | | | | | |
| | | C | | 4,800 | 4,800 | | | | | | | |
| | | O | | 4,800 | 4,800 | | | | | | | |
| | | **T** | **0** | **13,200** | **13,200** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 9.2 | Identification of representative sampling locations and carry out | H | | | | 16,000 | | | | | | |
| | | C | | | | 25,000 | | | | | | |
| | | | | | | | | | | | | |
| | | O | | | | | | | | | | |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | sampling accordingly | | | | | 30,000 | | | | | | |
| | | **T** | **0** | **0** | | **71,000** | **0** | **0** | **0** | **0** | **0** | **0** |
| 9.3 | Organise testing of above 2.2 for PCDD/PCDF | H | | | | 36,000 | | | | | | |
| | | C | | | | 25,000 | | | | | | |
| | | O | | | | 30,000 | | | | | | |
| | | **T** | **0** | **0** | | **91,000** | **0** | **0** | **0** | **0** | **0** | **0** |
| 9.4 | Preparation of Guidelines for solid waste dump site with respect to PCDD/PCDF | H | | | | 6,400 | | | | | | |
| | | C | | | | | | | | | | |
| | | O | | | | | | | | | | |
| | | **T** | **0** | **0** | **0** | **6,400** | **0** | **0** | **0** | **0** | **0** | **0** |
| 9.5 | Implementation of Solid waste Guidelines and monitoring | H | | | | 24,000 | 24,000 | | | | | |
| | | C | | | | 50,000 | 150,000 | | | | | |
| | | O | | | | 200,000 | 200,000 | | | | | |
| | | **T** | **0** | **0** | **0** | **274,000** | **374,000** | **0** | **0** | **0** | **0** | **0** |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **10** | **R&D: Research on recycling potential for flammable material** | H | 0 | 1200 | 15600 | 9600 | 9600 | 0 | 0 | 0 | 0 | 0 |
| | | C | 0 | 4800 | 24600 | 13400 | 13400 | 0 | 0 | 0 | 0 | 0 |
| | | O | 0 | 2400 | 22400 | 12000 | 12000 | 0 | 0 | 0 | 0 | 0 |
| | | **T** | **0** | **8400** | **62600** | **35000** | **35000** | **0** | **0** | **0** | **0** | **0** |
| 10.1 | Identify flammable material reaching dump sites | H | | 1200 | 1200 | | | | | | | |
| | | C | | 4800 | 4800 | | | | | | | |
| | | O | | 2400 | 2400 | | | | | | | |
| | | **T** | **0** | **8400** | **8400** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 10.2 | Study on source and the potential recyclings and develop a management mechanism and action plan | H | | | 4800 | | | | | | | |
| | | C | | | 6400 | | | | | | | |
| | | O | | | 8000 | | | | | | | |
| | | **T** | **0** | **0** | **19200** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 10.3 | Implementation of Action Plan | H | | | 8400 | 8400 | 8400 | | | | | |
| | | C | | | 12000 | 12000 | 12000 | | | | | |
| | | O | | | 9600 | 9600 | 9600 | | | | | |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **T** | **0** | **0** | **30000** | **30000** | **30000** | **0** | **0** | **0** | **0** | **0** |
| 10.4 | Monitoring of implementation of Action Plan | H | | | 1200 | 1200 | 1200 | | | | | |
| | | C | | | 1400 | 1400 | 1400 | | | | | |
| | | O | | | 2400 | 2400 | 2400 | | | | | |
| | | **T** | **0** | **0** | **5000** | **5000** | **5000** | **0** | **0** | **0** | **0** | **0** |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **11** | **R&D: Assessment of unintentional by products in the air emissions and residue generated from BOI and traditional secondary smelting plants** | H | - | - | 16,000 | 60,000 | 24,000 | 24,000 | - | - | - | - |
| | | C | - | - | 1,200 | 84,400 | 16,000 | 16,000 | - | - | - | - |
| | | O | - | - | 10,000 | 148,000 | 120,000 | 120,000 | - | - | - | - |
| | | **T** | **-** | **-** | **27,200** | **292,400** | **160,000** | **160,000** | **-** | **-** | **-** | **-** |
| 11.1 | Select representative samples of air and residue in BOI and traditional secondary smelting plants | H | | | 16,000 | | | | | | | |
| | | C | | | 1,200 | | | | | | | |
| | | O | | | 10,000 | | | | | | | |
| | | **T** | **-** | **-** | **27,200** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| 11.2 | Organise testing for PCDD/PCDF | H | | | | 24,000 | | | | | | |
| | | C | | | | 60,000 | | | | | | |
| | | O | | | | 12,000 | | | | | | |
| | | **T** | **-** | **-** | **-** | **96,000** | **-** | **-** | **-** | **-** | **-** | **-** |
| 11.3 | Propose relevant BAT/BEP accordingly and identify a management tool to implement above BAT/BEP with a time frame for its implementation | H | | | | 12,000 | | | | | | |
| | | C | | | | 8,400 | | | | | | |
| | | O | | | | 16,000 | | | | | | |
| | | **T** | **-** | **-** | **-** | **36,400** | **-** | **-** | **-** | **-** | **-** | **-** |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11.4 | Implementation and Monitoring of Action plan | H | | | | 24,000 | 24,000 | 24,000 | | | | |
| | | C | | | | 16,000 | 16,000 | 16,000 | | | | |
| | | O | | | | 120,000 | 120,000 | 120,000 | | | | |
| | | **T** | **-** | **-** | **-** | **160,000** | **160,000** | **160,000** | **-** | **-** | **-** | **-** |
| | | | | | | | | | | | | |
| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
| **12** | **R&D : Assessment of unintentional by products in the soil contaminated from the waste water and sludge released from service stations** | H | 0 | 0 | 60800 | 60800 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | C | 0 | 0 | 61000 | 63000 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | O | 0 | 0 | 38000 | 42000 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | **T** | **0** | **0** | **159800** | **165800** | **0** | **0** | **0** | **0** | **0** | **0** |
| 12.1 | Study the type and quantities sludge generated and the possibility of contamination of soil | H | | | 4800 | | | | | | | |
| | | C | | | 16000 | | | | | | | |
| | | O | | | 12000 | | | | | | | |
| | | **T** | **0** | **0** | **32800** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 12.2 | Identify suitable sample location, collection of samples/ Testing of samples | H | | | 56000 | 56000 | | | | | | |
| | | C | | | 45000 | 45000 | | | | | | |
| | | O | | | 26000 | 26000 | | | | | | |
| | | **T** | **0** | **0** | **127000** | **127000** | **0** | **0** | **0** | **0** | **0** | **0** |
| 12.3 | Preparation of guidelines for the Handling of waste water and sludge based on the results of the test, | H | | | | 4800 | | | | | | |
| | | C | | | | 18000 | | | | | | |
| | | O | | | | 16000 | | | | | | |
| | | **T** | **0** | **0** | **0** | **38800** | **0** | **0** | **0** | **0** | **0** | **0** |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **13** | **R&D: Life cycle assessment of PVC materials used** | H | 0 | 4,800 | 52,400 | 11,200 | 11,200 | 0 | 0 | 0 | 0 | 0 |
| | | C | 0 | 2,400 | 48,000 | 20,400 | 20,400 | 0 | 0 | 0 | 0 | 0 |
| | | O | 0 | 5,400 | 60,800 | 27,600 | 27,600 | 0 | 0 | 0 | 0 | 0 |
| | | **T** | **0** | **12,600** | **161,200** | **59,200** | **59,200** | **0** | **0** | **0** | **0** | **0** |
| 13.1 | Details of Importations of PVC Activity | H | | 4,800 | | | | | | | | |
| | | C | | 2,400 | | | | | | | | |
| | | O | | 5,400 | | | | | | | | |
| | | **T** | **0** | **12,600** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 13.2 | Assessment of waste generation , existing practices of disposal | H | | | 24,000 | | | | | | | |
| | | C | | | 12,000 | | | | | | | |
| | | O | | | 4,800 | | | | | | | |
| | | **T** | **0** | **0** | **40,800** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 13.3 | Existing practices of disposal | H | | | 1,200 | | | | | | | |
| | | C | | | | | | | | | | |
| | | O | | | 2,000 | | | | | | | |
| | | **T** | **0** | **0** | **3,200** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 13.4 | Evaluation of data | H | | | 4,800 | | | | | | | |
| | | C | | | 2,400 | | | | | | | |
| | | O | | | 1,200 | | | | | | | |
| | | **T** | **0** | **0** | **8,400** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 13.5 | Identify reasons for disposal of at landfill sites | H | | | 4,800 | | | | | | | |
| | | C | | | 1,200 | | | | | | | |
| | | O | | | 1,200 | | | | | | | |
| | | **T** | **0** | **0** | **7,200** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 13.6 | Preparation of Action plan on proper collection system and recycling methodology Propose a suitable mechanism to prevent them reaching at landfill sites | H | | | 6,400 | | | | | | | |
| | | C | | | 12,000 | | | | | | | |
| | | O | | | 24,000 | | | | | | | |
| | | **T** | **0** | **0** | **42,400** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 13.7 | Implementation of Action | H | | | 6,400 | 6,400 | 6,400 | | | | | |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | plan | C | | | 12,000 | 12,000 | 12,000 | | | | | |
| | | O | | | 24,000 | 24,000 | 24,000 | | | | | |
| | | **T** | **0** | **0** | **42,400** | **42,400** | **42,400** | **0** | **0** | **0** | **0** | **0** |
| 13.8 | Monitoring of implementation of action plan | H | | | 4,800 | 4,800 | 4,800 | | | | | |
| | | C | | | 8,400 | 8,400 | 8,400 | | | | | |
| | | O | | | 3,600 | 3,600 | 3,600 | | | | | |
| | | **T** | **0** | **0** | **16,800** | **16,800** | **16,800** | **0** | **0** | **0** | **0** | **0** |

All costs are in US$

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **14** | **R&D: Risk assessment on use of biomass for cooking** | H | 0 | 5000 | 0 | 8400 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | C | 0 | 24000 | 0 | 12000 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | O | 0 | 12000 | 0 | 10000 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | **T** | **0** | **41000** | **0** | **30400** | **0** | **0** | **0** | **0** | **0** | **0** |
| 14.1 | A comparative survey on the health situation of personnel engaged in biomass burning cooking practises and other practises | H | | 5000 | | | | | | | | |
| | | C | | 24000 | | | | | | | | |
| | | O | | 12000 | | | | | | | | |
| | | **T** | **0** | **41000** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 14.2 | Air sampling of biomass burning emissions & testing for PCDD/PCDF | H | | 5000 | | | | | | | | |
| | | C | | 20000 | | | | | | | | |
| | | O | | 60000 | | | | | | | | |
| | | **T** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| 14.3 | Investigation of outputs derived in 8.1 & 8.2 above in terms of impacts due to burning of biomass | H | | | | 8400 | | | | | | |
| | | C | | | | 12000 | | | | | | |
| | | O | | | | 10000 | | | | | | |
| | | **T** | **0** | **0** | **0** | **30400** | **0** | **0** | **0** | **0** | **0** | **0** |

H-Human costs
C-Capital costs
O-Operational costs
T-Total costs

## 3.3.5 ACTION PLAN 5: MONITORING

### 3.3.5.1 Management Activities

Based on the analysis of the country baseline situation, considering the provisions of the Stockholm Convention as well as other relevant international treaties and national policies, pursuant to the national priorities and objectives for POPs management, the following objectives for monitoring were identified:

1.Monitor POPs in the environment

2.Monitor POPs in imported food and other relevant materials

3.Monitor POPs in exposed populations

4.Mobilize resources for monitoring

Research and Development

5.Identify low-cost methods for monitoring

The proposed monitoring objectives are described in more detail below. An implementation strategy table contains information on activities associated with the particular monitoring objective, implementation timelines, responsible and supporting agencies for implementation, and indicators of success. Links to existing country programmes on chemical management, environmentally sound waste management and environmental pollution control as well as linkages with the national activities on sustainable development are provided. All monitoring programs will require some resource mobilisation and generation of a monitoring network mechanism.

In the Resource requirements human, capital and operation costs of the identified activities are described, considering the established timeline.

Since the entry of the POPs chemicals is restricted into the country, it is expected that POPs could be present in the Sri Lankan environment and food chain through the following:

- through imported food which are not checked for POPs at present
- through illegal entry
- Present in the environment as residues from the time they were permitted to be used in the country
- Present in the environment as by-product of activities which lead to POP formation

Implementation of a monitoring programme is required to asses the actual contamination levels in the environment.

Facilities are available in some laboratories in the country for monitoring of all the POPs except dioxin & furan. The Industrial Technology Institute was the only laboratory with international accreditation against ISO 17025 for analysis of pesticides including the POPs. However since there is no budget allocation for a regular monitoring programme in any of the laboratories, data was sparse.

Available monitoring data before 2003 was for a few samples carried out by different institutions for different purposes and indicated that PCB and organochlorine pesticides (OCls) were occasionally detected. Identifying that both food and environment were the most important components that required monitoring the monitoring carried out in 2003-2004 under the POPs project was for imported milk powder, tinned and dried fish and sediment and fish samples collected from polluted lagoons and the harbour. This data indicated POPs contamination in some of the samples. It was hoped that data could be obtained through the project for biological samples from exposed populations but this was not carried out since such exposed people could not be identified.

Lack of funds for regular monitoring programmes and maintenance of sophisticated instruments required for the monitoring

No import restrictions on food containing POPs allows the entry of contaminated food into the environment which allows not only exposure to the human population who consume this food but entry into the food chain allowing persistence in the environment
Vague import categories could allow import of POPs with out detection and possible illegal entry.

The main objectives for monitoring:

- To have a regular POPs monitoring programme in the environment (sediment & biological samples); POPs are known to accumulate in sediment and biological tissue. Studies that have been carried out have detected some POPs in samples at selected locations. Regular monitoring is required to assess the status of the problem.

- To monitor exposed populations to assess existing situation and potential risk: The PCB team has identified that there are many transformers in Sri Lanka containing PCB. It is expected that personal working with transformers have therefore been exposed to PCB. In addition people living near incinerators and crematoriums could be exposed to POPs. No assessment of exposure of people to POPs has been done at present in this country.

- To monitor POPs in imported food Preliminary analysis indicated that dried fish entering the country contains residues of POPs pesticides. It is necessary to continue to check regularly the quality of the imported food, particularly fat containing food items since POPs accumulate in fatty tissues to assess our exposure to POPs through imported food.

**Requirements/Activities to fulfil the above objectives:**

- Set aside an annual budget for a regular monitoring programme of the environment and exposed populations (including maintenance and repair cost of equipment, training of staff on analytical techniques and repair of instrument)

- Assign laboratories with the required facilities to carry out this monitoring and provide required data

### 3.3.5.2 Implementation strategy

### 1. Monitor POPs in the environment (air, water, and soil)

**Table 15(a): Monitor POPs in the environment**

| | **Monitoring objective /** Activities | **Timeframe** | **Responsible /** supporting **Institution(s)** | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **1.** | **Monitor POPs in the environment** | | | | |
| 1.1 | Identification of locations and matrices to be monitored | 2007 | **CEA**/ITI/CEA/ **ROP** | List of locations and matrices | |
| 1.2 | Development of a monitoring system | 2008 | **CEA**/ITI/CEA/ **ROP** | Monitoring system | |
| 1.3 | Regular monitoring of identified locations | Continuous | -do- | Database Regular reports | |

## 2. Monitor POPs in imported food and other relevant materials.

**Table 15 (b): Monitor POPs in imported food and other relevant materials.**

| | **Monitoring objective /** Activities | **Timeframe** | **Responsible /** supporting **Institution(s)** | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **2.** | **Monitor POPs in imported food and other relevant materials.** | | | | |
| 2.1 | Make mandatory the submission of a POPs free certificate for imported food | 2008 | **MoH** | Legislation | |
| 2.2 | Random checking of food samples for POPs | Continuous | **MoH**/ITI/Other labs | Database Regular reports | |

## 3. Monitor POPs in exposed populations

**Table 15 (c): Monitor POPs in exposed populations**

| | **Monitoring objective /** Activities | **Timeframe** | **Responsible /** supporting **Institution(s)** | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **3.** | **Monitor POPs in exposed populations** | | | | |
| 3.1 | Identification of exposed populations | 2007 | **ME**/MoH/ MoAgr | List of exposed populations | |
| 3.2 | Carry out monitoring of POPs levels in blood of the exposed populations | Continuous | **MoH**/DL(OH), others | Database Regular reports | |

## 4. Mobilize resources for monitoring

**Table 15 (d): Mobilize resources for monitoring**

| | **Monitoring objective /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **4.** | **Mobilize resources for monitoring** | | | | |
| 4.1 | Identification of priority areas to be monitored | 2007 | **ME**/CEA/RoP | List of priority areas | |
| 4.2 | Identification of resource requirements | 2007 | **ME**/CEA/RoP | Inventory of resources required | |
| 4.3 | Identification of available resources | 2007 | **ME**/CEA/RoP | Inventory of available resources | |
| 4.4 a | Identification of potential resource sources to be tapped | . 2007 | **ME**/CEA/RoP | Inventory of potential resource sources | |
| 4.5 a | Development of plan to mobilize the resources for monitoring of POPs | 2007 | **ME**/CEA/RoP | Resource mobilization plan | |

### 3.3.5.2.1 Research and development

Following research and development actions were identified to facilitate the NIP implementation in Monitoring:

The proposed research and development actions are described in more detail in the following text. For each proposed R&D action an explanatory text describes the rationale behind selecting the particular option as well as its expected capacity to facilitate NIP implementation.

An implementation strategy table contains information on activities associated with the particular R&D action, implementation timelines, responsible and supporting agencies for implementation, and indicators of success. Links to existing country programmes on chemical management, environmentally sound waste management and environmental pollution control as well as linkages with the national activities on sustainable development are provided.

In the resource requirements human, capital and operation costs of the identified activities are described, considering the established timeline.

## 5. Identification of low-cost methods for monitoring

**Table 15 (e): Identify of low cost methods for monitoring**

| | **Research & Development Action /** Activities | **Timeframe** | **Responsible /** supporting **Institution(s)** | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **5.** | **Identification of low cost methods for monitoring** | | | | |
| 5.1 | Evaluation of available methods | 2007 | **ME**/ITI/CEA/RoP | Evaluation report | |
| 5.2 | Selection of suitable methods* | 2007 | **ME**/ITI/CEA/RoP | List of suitable methods | |
| 5.3 | Carrying out a pilot testing (if required) | 2007-2008 | **ME**/ITI/CEA/RoP | Pilot test results | |
| 5.4 | Recommendation on available options | 2007 | **ME**/ITI/CEA/RoP | List of recommended methods | |

* Includes the selection of processes (Collection of samples, preliminary qualitative testing, etc.)

### 3.3.5.3 Resource requirements

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | **Monitor POPs in the environment** | H | 5,000 | 27,800 | 8,400 | 8,400 | 8,400 | 8,400 | 8,400 | 8,400 | 8,400 | 0 |
| | | C | - | 273,000 | 250,000 | 250,000 | 10,000 | 200,000 | 20,000 | 20,000 | 20,000 | 0 |
| | | O | 2,000 | 24,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 0 |
| | | **T** | **7,000** | **324,800** | **270,400** | **270,400** | **30,400** | **220,400** | **40,400** | **40,400** | **40,400** | **0** |
| 1.1 | Identification of locations and matrices to be monitored | H | | 2,400 | | | | | | | | |
| | | C | | 8,000 | | | | | | | | |
| | | O | | 4,000 | | | | | | | | |
| | | **T** | **-** | **14,400** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **0** |
| 1.2 | Development of a monitoring system | H | 5,000 | 17,000 | | | | | | | | |
| | | C | | 15,000 | | | | | | | | |
| | | O | 2,000 | 8,000 | | | | | | | | |
| | | **T** | **7,000** | **40,000** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **0** |
| 1.3 | Regular monitoring of identified locations | H | | 8,400 | 8,400 | 8,400 | 8,400 | 8,400 | 8,400 | 8,400 | 8,400 | |
| | | C | | 250,000 | 250,000 | 250,000 | 10,000 | 200,000 | 20,000 | 20,000 | 20,000 | |
| | | O | | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | |
| | | **T** | **-** | **270,400** | **270,400** | **270,400** | **30,400** | **220,400** | **40,400** | **40,400** | **40,400** | **0** |

**H – Humon costs C – Capital costs O – Operational costs T – Total costs**

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | **Monitor POPs in imported food and other relevant materials.** | H | - | 12,000 | 7,200 | 7,200 | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 | 0 |
| | | C | - | 2,400 | - | - | - | - | - | - | - | 0 |
| | | O | - | 26,200 | 25,000 | 25,000 | 25,000 | 50,000 | 50,000 | 50,000 | 50,000 | 0 |
| | | **T** | **-** | **40,600** | **32,200** | **32,200** | **35,000** | **60,000** | **60,000** | **60,000** | **60,000** | **0** |
| 2.1 | Make mandatory the submission of a POPs free certificate for imported food | H | | 4,800 | | | | | | | | |
| | | C | | 2,400 | | | | | | | | |
| | | O | | 1,200 | | | | | | | | |
| | | **T** | **-** | **8,400** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **0** |
| 2.2 | Random checking of food samples for | H | | 7,200 | 7,200 | 7,200 | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 | |
| | | C | | | | | | | | | | |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | POPs | O | | 25,000 | 25,000 | 25,000 | 25,000 | 50,000 | 50,000 | 50,000 | 50,000 | |
| | | **T** | **-** | **32,200** | **32,200** | **32,200** | **35,000** | **60,000** | **60,000** | **60,000** | **60,000** | **0** |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3** | **Monitor POPs in exposed populations** | H | - | 15,600 | 15,600 | 7,200 | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 | 0 |
| | | C | - | 12,400 | 12,400 | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 | 0 |
| | | O | - | 27,400 | 27,400 | 25,000 | 25,000 | 50,000 | 50,000 | 50,000 | 50,000 | 0 |
| | | **T** | **-** | **55,400** | **55,400** | **42,200** | **45,000** | **70,000** | **70,000** | **70,000** | **70,000** | **0** |
| 3.1 | Identification of exposed populations | H | | 8,400 | 8,400 | | | | | | | |
| | | C | | 2,400 | 2,400 | | | | | | | |
| | | O | | 2,400 | 2,400 | | | | | | | |
| | | **T** | **-** | **13,200** | **13,200** | **-** | **-** | **-** | **-** | **-** | **-** | **0** |
| 3.2 | Carry out monitoring of POPs levels in blood of the exposed populations | H | | 7,200 | 7,200 | 7,200 | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 | |
| | | C | | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 | |
| | | O | | 25,000 | 25,000 | 25,000 | 25,000 | 50,000 | 50,000 | 50,000 | 50,000 | |
| | | **T** | **-** | **42,200** | **42,200** | **42,200** | **45,000** | **70,000** | **70,000** | **70,000** | **70,000** | **0** |

All costs are in US$

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | **Mobilize resources for monitoring** | H | 4,800 | 28,000 | - | - | - | - | - | - | - | - |
| | | C | - | 10,000 | - | - | - | - | - | - | - | - |
| | | O | 1,200 | 12,000 | - | - | - | - | - | - | - | - |
| | | **T** | **6,000** | **50,000** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| 4.1 | Identification of priority areas to be monitored | H | 4,800 | | | | | | | | | |
| | | C | | | | | | | | | | |
| | | O | 1,200 | | | | | | | | | |
| | | **T** | **6,000** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| 4.2 | Identification of resource requirements | H | | 16,000 | | | | | | | | |
| | | C | | 6,000 | | | | | | | | |
| | | O | | 4,800 | | | | | | | | |
| | | **T** | **-** | **26,800** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| 4.3 | Identification of available | H | | 4,800 | | | | | | | | |
| | | C | | | | | | | | | | |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | resources | O | | 2,400 | | | | | | | | |
| | | **T** | **-** | **7,200** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| 4.4 | Identification of potential resource sources to be tapped | H | | 4,800 | | | | | | | | |
| | | C | | | | | | | | | | |
| | | O | | 2,400 | | | | | | | | |
| | | **T** | **-** | **7,200** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| 4.5 | Development of plan to mobilize the resources for monitoring of POPs | H | | 2,400 | | | | | | | | |
| | | C | | 4,000 | | | | | | | | |
| | | O | | 2,400 | | | | | | | | |
| | | **T** | **0** | **8800** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **5** | **R&D Identify low cost methods for monitoring** | H | 8,400 | 25,200 | - | - | - | - | - | - | - | - |
| | | C | 2,400 | 12,400 | - | - | - | - | - | - | - | - |
| | | O | 1,200 | 26,000 | - | - | - | - | - | - | - | - |
| | | **T** | **12,000** | **63,600** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| 5.1 | Evaluation of available methods | H | 8,400 | | | | | | | | | |
| | | C | 2,400 | | | | | | | | | |
| | | O | 1,200 | | | | | | | | | |
| | | **T** | **12,000** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| 5.2 | Selection of suitable methods* | H | | 8,400 | | | | | | | | |
| | | C | | 2,400 | | | | | | | | |
| | | O | | 3,600 | | | | | | | | |
| | | **T** | **-** | **14,400** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| 5.3 | Carrying out a pilot testing (if required) | H | | 8,400 | | | | | | | | |
| | | C | | 10,000 | | | | | | | | |
| | | O | | 20,000 | | | | | | | | |
| | | **T** | **-** | **38,400** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| 5,4 | Recommendation on available options | H | | 8,400 | | | | | | | | |
| | | C | | | | | | | | | | |
| | | O | | 2,400 | | | | | | | | |
| | | **T** | **-** | **10,800** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |

## 3.3.6 ACTION PLAN 6: PUBLIC AWARENESS, INFORMATION DISSEMINATION AND TRAINING

Based on the analysis of the country baseline situation, considering the provisions of the Stockholm Convention and national policies, pursuant to the national priorities and objectives for POPs management, options for awareness raising, information dissemination and training were identified for the particular areas.
The proposed options are targeted to awareness raising of the relevant population groups in support of successful NIP implementation.
An implementation strategy table contains information on activities associated with the particular option, implementation timelines, responsible and supporting agencies for implementation, and indicators of success. Links to existing country programmes on chemical management, environmentally sound waste management and environmental pollution control as well as with the national activities on sustainable development are provided.
In the resource requirements human, capital and operation costs of the identified activities are described, considering the established timeline.
The management activities and strategies have been set out for the separate activities such as on the Stockholm Convention, Pesticides, PCBs, Unintentional Releases, Monitoring etc as given below.

### 3.3.6.1 Awareness Creation on Stockholm Convention

### 3.3.6.1.1 Management Activities

1. Create public awareness on existing and proposed legislations and regulations.

2. Conduct seminars/workshops among stakeholders (industrialists, policy makers, provincial government officials) on compliance requirements for Stockholm Convention.

3. Maintain Web Site for Sri Lanka NIP

### 3.3.6.1.2 Implementation strategy

### 1. Create Public Awareness on existing and proposed legislation & Regulations

**Table 16 (a): Creat Public Awareness on existing and proposed legislation & Regulations**

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **1.** | **Create Public Awareness on existing and proposed legislation & Regulations** | | | | |
| 1.1 | Particular legal documents | 2007 | **CEA**, ME & Stakeholders Institutions | Legislation implemented and complied with | |
| 1.2 | Specific regulations | 2007/8 | **CEA**, ME & Stakeholder Institutions | -do- | |
| 1.3 | Identify methodologies | 2008 | **CEA**, ME, | Methodology | |
| | | | Dept. of Information | adopted | |

**2. Conduct Seminars/Workshops among stakeholders (Industrialists, policy makers, provincial povernment officials) on comliance requirements for Stockholm Convention**

**Table 16(b): Conduct seminars/Workshops among stakeholders on compliance requirements for Stockholm Convention**

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **2.** | **Conduct Seminars/Workshops among stakeholders on comliace requirements for Stockholm Convention** | | | | |
| 2.1 | Identify target groups | 2007 | **ME** | Target groups identified | |
| 2.2 | Organize & conduct seminars | 2007 | **ME** | Feedback and best practices | |

**3. Maintain Web site for Sri Lanka NIP**

**Table 16(c): Maintain Web Site for Sri Lanka NIP**

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **3.** | **Maintain Web Site for Sri Lanka NIP** | | | | |
| 3.1 | Create a Web Site | 2007 | **ME** | Functioning Website | |
| 3.2 | Regular updating | On going | **ME** | Update Reports | |

### 3.3.6.2 Awareness on Pesticides

### 3.3.6.2.1 Management Activities

1.Development and implementation of a database

2.Training of stakeholders

3.Public awareness campaigns

4.Establishment of an information dissemination system

### 3.3.6.2.2 Implementation strategy

## 1. Development and implementation of a Database

**Table 16 (d) : Development and implementation of a Database**

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **1.** | **Development and implementation of a Database** | | | | |
| 1.1 | Networking among stakeholders | 2008-2009 | **ROP**/stake holders | Network in place | |
| 1.2 | Data base development | 2008-2009 | **ROP** | Database ready | |
| 1.3 | Internet/communication facilities | 2007 | **ROP**/stake holders | Connected | |

## 2. Training of stakeholders

**Table 16 (e): Training of stakeholders**

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **2.** | **Training of stakeholders** | | | | |
| 2.1 | Identification of target groups | 2007 | **ROP**/CEA, Private Sector | Target groups identified | |
| 2.2 | Resource development on training | 2007 | **MoE**/ROP, Private Sector | No of training programmes conducted | POPs project-consultant |
| 2.3 | Module preparation | 2007-2008 | **RO**P/CEA Pesticide Industry, Private Sector | prepared | |
| 2.4 | TOT programs | 2008-2009 | **ROP**/CEA, **DOA**, ITI, CEA, Pesticide Industry, Private Sector | Programmes conducted | |
| 2.5 | Awareness raising among stakeholders | From 2009 | **ROP**/CEA, DOA, ITI, CEA, Pesticide Industry, Private Sector | Report of Feedback from Stakeholders | |

## 3. Public awareness campaigns

### Table 16 (f): Public awareness campaigns

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **3.** | **Public awareness campaigns** | | | | |
| 3.1 | Mass media programs | From 2007-2008 | **ROP**, CEA, MoH, DOA, ITI, Industry, Res. Institutions,NGOs, Private Sector | No of programs conducted | |
| 3.2 | Competitions, quiz programs | From 2007 | **ROP**, CEA, MoH, DOA, ITI, Industry, Res. Institutions, MoEdu.,NGOs, Private Sector | No, in different media and reports | |
| 3.3 | Poster campaigns | From 2008 | **ROP**, CEA, MoH, DOA, ITI, Industry, Res. Institutions,NGOs, Private Sector | No. of campaigns | |
| 3.4 | Inclusion in student curricula | 2009 | **MoEdu**, UGC. | Part of Syllabus | |

## 4. Establishment of an information dissemination system

### Table 16(g): Establishment of an information dissemination system

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **4.** | **Establishment of an information dissemination system** | | | | |
| 4.1 | Identification of reporting authorities | 2007 | **ROP**, ME | System in place | |
| 4.2 | Development of a reporting format | 2008 | **ROP**, ME | Format ready | |
| 4.3 | Establishment of a reporting protocol | 2008 | **ROP**, ME | Protocol ready | |

### 3.3.6.3 Awareness on PCBs

#### 3.3.6.3.1 Management Activities

1. Upgrade the capabilities of Management task forces within stakeholder institutions
2. Awareness within the stakeholder organizations
3. Awareness of Chambers, BOI, IDB Ministry of Industries, Small and Medium Industries, recyclers
4. Awareness of Customs, ports authority, import & Export control, CEA and enforcement officers and laboratories.

#### 3.3.6.3.2 Implementation strategy

### 1. Upgrade the capabilities of management task force within stakeholder institutions

In order to control and manage PCB contaminated equipment, task force should be established and trained

**Table 16 (h): Upgrade the capabilities of the management task force within stakeholder institutions**

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **1.** | **Upgrade the capabilities of the management task force within stakeholder institutions** | | | | |
| 1.1 | Establishment of the Management Task Force | 2007 | **MPE**, Stakeholders | Established | |
| 1.2 | Formulation of training plan | 2007 | **ME**, MPE | Plan Ready | |
| 1.3 | Implementation | 2007 onwards | **ME**,MPE, stakeholders | Monitoring reports | |

### 2. Awareness within stakeholder organizations

Officers and workers should be trained by specially trained trainers (on operation and maintenance)

**Table 16 (i) Awareness within stakeholder organizations**

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **2.** | **Awareness within stakeholder organizations** | | | | |
| 2.1 | Formulation of training plan | 2007 | **CEA**, Stakeholders | Plan | |
| 2.2 | Preparation of training modules | 2007 | **CEA**, stakeholders, | Modules | |

| | | | | | |
|---|---|---|---|---|---|
| | | | external institutions | | |
| 2.3 | Training of trainers | 2007 | **Stakeholders**, external institutions | | |
| 2.4 | Implementation | 2007 - onwards | **stakeholders** | | |

## 3 Awareness of Chambers, BOI, IDB Ministry of Industries, Small and Medium Industries, recyclers

Small and medium scale Industrial sector (importers and recyclers) should be made aware of the issues through relevant institutions

**Table 16 (j): Awareness of Chambers, BOI, IDB Ministry of Industries, Small and Medium Industries, recyclers**

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting **Institution(s)** | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| 3. | **Awareness of Chambers, BOI, IDB Ministry of Industries, Small and Medium Industries, recyclers** | | | | |
| 3.1 | Formulate awareness plan | 2007 | **ME**, relevant organization | Plan | |
| 3.2 | Implement plan | 2007 | **Relevant organizations** | | |

## 4.Awareness of BOI, Customs, ports authority, import & Export control, CEA , enforcement officers and laboratories – legislation, monitoring etc.

Enforcement officers should be educated in relevant institutions to enforce legal provisions

**Table 16 (k): Awareness of Customs, Ports authority, Import and Export control, CEA, Enforcement officers and laboratories**

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **4.** | **Awareness of Customs, Ports authority, Import and Export control, CEA, Enforcement officers and laboratories** | | | | |
| 4.1 | Formulation of the plan | 2007 | **ME,** relevant organizations | Plan | |
| 4.2 | Establish awareness training material | 2007 | **ME** | Training material | |
| 4.3 | Implement plan | 2008 onwards | **Relevant organizations** | | |

### 3.3.6.4 Awareness on Unintentional by-products

#### 3.3.6.4.1 Management Activities

1.Awareness on formation of unintentional by products and their impacts on nature

2.Awareness on 3 Rs and waste prevention measures

3.Training on BAT& BEP

#### 3.3.6.4.2 Implementation strategy

### 1. Awareness on formation of unintentional by products and their impacts on nature

Almost all sectors of the society are unaware of impacts due to PCDD/PCDF, although their normal life patterns are closely associated with activities producing them unintentionally. Therefore, awareness among all sectors of the society regarding PCDD/PCDF formation and its impacts on nature is a necessity. This will make the community to understand the importance of adopting relevant precautionary measures and techniques/ practices required to minimise/prevent PCDD/PCDF formation/release. These awareness programmes can be made enthusiastic by including topics such as mechanism of PCDD/PCDF formation, its chemical properties and its mode of transport etc.

**Table 16 (I): Awareness on formation of unintentional by products and their impacts on nature**

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **1.** | **Awareness on formation of unintentional by products and their impacts on nature** | | | | |
| 1.1 | Relevant officers from government institution | 2007 | **ME**,CEA, BOI,Customs, MoH, NCPC | Increased support | |
| 1.2 | Industrialist | 2007 | **CEA**, Chambers | Increased support | |
| 1.3 | Environmental journalists & NGOs | 2007 | **ME**, CEA | Increased support | |
| 1.4 | School Teachers & student | 2007 | **CEA** | Increased support | |
| 1.5 | Conduct awareness programs through electronic and print media in all three languages | 2007 | **ME**, Private Sector | Increased support | |
| 1.6 | Conduct competitions /quiz programs/billboards, etc | 2008 | **CEA**, Private Sector | Increased support from society to implement relevant precautionary measures. | |

## 2. Awareness on 3Rs and waste prevention measures.

Haphazard management/disposal of solid wastes is a major root cause for PCDD/PCDF formation and release. This situation is same for other countries too. Implementation of 3R practices will considerably reduce the quantity of solid waste and thereby will ease their proper management especially during disposal. Hence, introduction of 3R practices and waste prevention practices will prevent/minimise PCDD/PCDF release into the environment. Therefore, awareness of 3R practices among all sectors of the society is a necessity and effective implementation of such practices can be encouraged by introducing incentives and national award schemes to those who are implementing 3R practices.

### Table 16 (m): Awareness on 3Rs and waste prevention measures.

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting **Institution(s)** | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **2.** | **Awareness on 3Rs and waste prevention measures.** | | | | |
| 2.1 | Identify target groups | 2007 | **CEA**, BOI, MLG, MoH, WMA, NCPC, ITI , Private Sector | Target groups identified | |
| 2.2 | Organize awareness campaign | On going | **CEA**, BoI, MLG, MoH, WMA, NCPC, ITI, Private Sector | Number of campaigns | |
| 2.3 | Organized national award for selected categories | 2007 | **CEA**, Chambers, Private Sector | Annual awards | |
| 2.4 | Identify existing best practices and disseminate to the relevant parties | 2007 | **CEA**, ITI, NCPC, Private Sector | Greater use of 3RS | |
| 2.5 | Involve NGOs | On going | **CEA** | Reduction in material requiring disposal | |

## 3. Training on BAT & BEP

Although resources for BAT/BEP are made available, their implementation will not be successful without technical know how. Hence, capacity building of those personnel engaged in unintentional by-products producing activities in the field of BAT/BEP implementation is a necessity.

### Table 16 (n): Training on BAT & BEP

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting **Institution(s)** | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **3.** | **Training on BAT & BEP** | | | | |
| 3.1 | Capacity building of BAT & BEP on identified unintended by product | 2007-8 | **CEA**, BoI, ME, MLG, MoH, WMA, NCPC, ITI | Effective implementation of BAT/BEP | |

### 3.3.6.5 Monitoring

### 3.3.6.5.1 Management Activities

1.Introduction of the issue of POPs to educational curricula

2.In service training of relevant officials

3.Media campaigns

4.Community based IEC (Health Education) activities

### 3.3.6.5.2 Implementation Strategy

### 1. Introduction of the issue of POPs to educational curricula

**Table 16 (o): Introduction of the issue of POPs to educational curricula**

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **1.** | **Introduction of the issue of POPs to educational curricula** | | | | |
| 1.1 | Induction of relevant authorities/agencies | 2007-8 | **ME** | No. of awareness programs held | |
| 1.1 | Identification of relevant curricula | 2007-8 | **Relevant Ministries**/ME | Lists of curricula | |
| 1.2 | Inclusion of the issue of POPs in identified curricula | 2008 | **Relevant Ministries**/ME | Revised curricula | |

### 2. In service training of relevant officials

**Table 16 (p): In service training of relevant officials**

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting Institution(s) | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **2.** | **In service training of relevant officials** | | | | |
| 2.1 | Induction of relevant authorities/agencies | 2007 | **CEA** | No. awareness programmes held | |
| 2.2 | Identification of groups of officials to be trained | 2007 | **Relevant Ministries**/ME | List of relevant officials | |
| 2.3 | Development of training modules | 2007 | **ME**/Relevant Ministries/NIE, SLIDA | Training modules | |
| 2.4 | Training of trainers | 2007 | **Relevant Ministries**/ME SLIDA | Training programme for trainers | |

| | | | | | |
|---|---|---|---|---|---|
| 2.4 | Conduct of training programs | 2007-2008 | **ME**/CEA | No. of training programmes | |

## 3. Media campaigns

### Table 16 (q): Media campaigns

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting **Institution(s)** | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **3.** | **Media campaigns** | | | | |
| 3.1 | Radio Programs | 2007 | **CEA**, Private Sector | No. awareness programmes held | |
| 3.2 | TV programme | 2007 | **Relevant Ministries**/ME Private Sector | List of relevant officials | |
| 3.3 | Print Media | 2007 | **ME**/Relevant Ministries/NIE, Private Sector | Training curricula | |
| 3.4 | Bill Board/ | 2007 | **ME**/CEA, Private Sector | No. of training programmes | |

## 4. Community based IEC (Health Education) activities

### Table 16 (r): Community based IEC (Health Education) activities

| | **Management option /** Activities | **Timeframe** | **Responsible /** supporting **Institution(s)** | **Requested output / indicator of success** | **Related activities/ projects/ issues** |
|---|---|---|---|---|---|
| *0* | *1* | *2* | *3* | *4* | *5* |
| **4.** | **Community based IEC (Health Education) activities** | | | | |
| 4.1 | Prepare Awareness Programmes and conduct same | 2007 | **ME**, MOH | No. awareness programmes held | |
| 4.2 | Identify officials to be trained | 2007 | **Relevant Ministries/**ME | List of relevant officials | |
| 4.3 | Develop Curricular | 2008 | **ME**/Relevant Ministries/NIE/ University Medical schools – community medicine streams | Training curricula | |
| 4.4 | Conduct Training Programmes | 2008 | **ME**/CEA, MoH, PHIs | No. of training programmes | |

Chapter

4

## 4.0 CAPACITY BUILDING PROPOSALS AND PRIORITIES

Current capacity and capability available in Sri Lanka needs to be strengthened to achieve the objectives of the NIP. Priorities based on the need to meet Convention obligations and country priority issues are highlighted for the particular priority areas. Details on the capacity building and development proposals are included in the particular action plans:

### 4.1 INSTITUTIONAL AND REGULATORY FRAMEWORK:

- Strengthening & networking relevant institutions including provincial agencies;
- Upgrade human resources in policy and legal issues related to chemical management, including POPs;
- Strengthen capacity in risk assessment and management;
- Data collection, evaluation & management;
- Develop/upgrade systems including norms and guidelines, facilities and support services for proper management of chemicals, including POPs, through their life cycle in order to minimize health & environmental impacts;
- Set up research priorities.

### 4.1.1 POPS PESTICIDES

- Strengthening of laboratory analytical facilities and training capacities;
- Development of expertise on analytical instrumentation, risk assessment and environmental modelling;
- Infrastructure development on communication, networking and mobility.

### 4.1.2 PCBS AND EQUIPMENT CONTAINING PCBS

- Awareness for all stakeholder institutions – policy, enforcement, testing, operational, maintenance levels;
- Equipment for testing;
- Establish inventories and database;
- Guidance manuals and guidelines on decontamination/disposal;
- BAT/BEP for stakeholders;

- Resources for management up to and including final elimination.

### 4.1.3. UNINTENTIONALLY PRODUCED BY-PRODUCTS

- Develop capacity on sampling and testing including equipments (D/F);
- Develop capacity on analysis of air emissions of HCl, Cl, VOC, SOx, NOx ;
- Skills development on assessment of pollutants in differences processes for regulatory bodies ;
- Develop and implement pilot projects on integrated waste management system for selected local authority;
- Development of environmentally sound technologies for cottage industries (metal recycling, lime kilns, brick & tile kilns;)
- Best Available Technology & Best Environment Practices.

### 4.1.4 MONITORING

- Strengthening the existing expertise and facilities;
- Strengthening the supporting infrastructure for monitoring;
- Ensuring operational expenditure for regular monitoring;
- Coordination and sharing of information among stakeholders effective monitoring.

## 4.2 RESOURCE MOBILISATION STRATEGY

The action plans in this NIP stipulates specialised needs for specific activities under each prioritised issue. Costing for same has been indicated considering requirements of Local and Foreign expertise, Equipment, disposal and treatment facilities. Human, Capital and Operational Costs have been quantified and mentioned separately in this NIP. The Costs in US Dollars for the different activities over a three, six and over six year periods are as follows:

**TABLE 17: COST ESTIMATES FOR IMPLEMENTATION OF ACTION PLANS**

| Period | Estimated Costs in US $ | | | | |
|---|---|---|---|---|---|
| | Pesticides | PCBs | Unintended Releases | Monitoring | Management |
| **Short Term (Three Years) 2007-2009** | **1,583,320** | **1,591,150** | **1,402,100** | **917,400** | **1,407,400** |
| **Medium Term (Six Years) Including Continuation of short term activities up to year 2012** | **2,407,100** | **1,979,800** | **7,005,300** | **805,600** | **7,194,500** |
| **Long Term –including Continuation of Medium Term Activities up to 2016** | **291,100** | **845,200** | **177,604** | **511,200** | **211,204** |
| **Total Estimated up to 2016** | **4,281,520** | **4,416,150** | **8,585,004** | **2,234,200** | **8,813,104** |

**TABLE 18: TOTAL COSTS FOR SHORT, MEDIUM AND LONG TERM ACTIVITIES**

| Period | Estimated Costs in US $ |
|---|---|
| **Short Term (Three Years) 2007-2009** | **6,901,370** |
| **Medium Term (Six Years) Continuation of short term activities included up to year 2012** | **19,392,300** |
| **Long Term – Continuation of Medium Term Activities included up to 2016** | **2,036,307** |
| **Total Estimated up to 2016** | **28,329,977** |

For the three year period from 2007 to 2009 approximately US $ 7.0 Million is required for short term activities. A six year term from 2007 to 2012 for continuation of short term activities and additional activities would require a further US $ 19.4 million. For continuation of medium term activities and additional long term activities up to the year 2016 would require a further US $ 2 million. Thus a total of US $ 28.329 million is estimated to be needed up to the year 2016 for all activities related to management and control of POPs in Sri Lanka scheduled to commence in 2007.

While a high input of local funds may be available, through the annual budgets of the Ministry of Environment and other Ministries and government agencies, the major funding has to be from external sources. It is estimated that approximately 30 % of the funding estimates would be in-kind contributions of state resources such as the services of permanent staff, office space, equipment and services.. In addition to that, allocations will be made available from the government budget for implementation of the NIP based on the availability of funds; The government has already allocated US$ 130,000 to the Ministry of Environment directly for POPs implementation activities in 2007.

Following tables provide a summary of the timeframe, resource assessment and proposed sources of funding of the NIP-Action Plans, as well as of the supporting research and development activities.

With regard to the timing the following is considered:

| | |
|---|---|
| **Short-term activities**: | to be implemented within 3 years |
| **Medium-term activities** | to be implemented in the framework of 3-6 years |
| **Long term activities** | to be implemented in the framework over 6 years |

With regard to assessment of cost necessary for implementation the following is considered:

| | |
|---|---|
| **Low costs** | mostly human costs (predominantly from governmental offices) operation costs to run the offices; no capital costs. |
| **Medium costs** | human costs (partly governmental officers, partly consultants/experts); operation costs to run the offices / laboratories and purchase in-country services; capital costs up to 0.5 mil USD. |
| **High costs** | human costs (governmental officers, consultants/experts, managers, workers); operation costs to run facilities; to purchase services overseas; capital costs over 0.5 mil USD. |

With regard to sources of financing the following is considered:

| | |
|---|---|
| **State budget** | usual budget of the governmental institutions as well as additional budget earmarked for a particular purpose. |
| **Private sector** | any input from the concerned private sector. |
| **Expatriate donors** | funding from international donors (e.g. GEF, World Bank) or bi-lateral funding (e.g. JICA). |

Though single cost items are presented there will be supporting funds made available through GOSL programs. While a high input of local funds may be available, through the annual budgets of the Ministry of Environment and other Ministries and government agencies, the major funding has to be from external sources. It is estimated that approximately 30 % of the funding estimates would be in-kind contributions of state resources such as the services of permanent staff, office space, equipment and services. There is a significant component matched through 'in kind' funds – recurrent costs on staff, transport , building and floor space etc. The Government has already allocated US$ 130,000 directly for POPs implementation activities in 2007.

## 4.3 SUMMARY OF THE TIMEFRAME, RESOURCE ASSESSMENT AND PROPOSED SOURCES OF FUNDING OF THE NIP-ACTION PLANS

| ACTION PLANS | TIMEFRAME | | | ASSESSED COSTS | | | SOURCES OF FINANCING | | |
|---|---|---|---|---|---|---|---|---|---|
| | Short | Medium | Long | Low | Medium | High | State | Private | External |
| **AP: Institutional and Regulatory Strengthening Measures** | | | | | | | | | |
| Formulating regulation under NEA on management, handling, phase out and disposal of PCBs and PCBs containing equipment | ■ | | | ■ | | | ■ | | |
| Establish legislation on setting up of new foreign investment projects related to POPs Chemicals | ■ | | | ■ | | | ■ | | |
| Legislation requiring the use of BAT/BEP for new installations and upgrading the existing systems | | ■ | | ■ | | | ■ | | |
| Identification of contaminated sites and development of a de-contamination programme | | | ■ | | ■ | | ■ | | |
| Strengthening of monitoring and institutional capacities | ■ | | | | ■ | | ■ | | |
| Hazardous chemical management including POPs | ■ | | | ■ | | | ■ | | |
| **AP: POPs pesticides** | | | | | | | | | |
| Improvement of pesticide regulatory system to adequately address the specific issues | ■ | | | ■ | | | ■ | | |
| Mechanism to minimise accumulation and safe disposal of outdated pesticides, at all levels | ■ | ■ | ■ | | | ■ | ■ | ■ | ■ |
| Development and implementation of proper information gathering and dissemination system | ■ | | | ■ | | | ■ | | |
| Monitoring and surveillance of environmental and human health effects | ■ | ■ | | | ■ | | ■ | | |
| **AP: PCBs and equipment containing PCBs** | | | | | | | | | |
| Develop and put in place legislation for PCB Management | ■ | | | ■ | | | ■ | | |
| Establish full inventory of PCB equipment | ■ | | | ■ | | | ■ | ■ | |
| Establish procedures for equipment maintenance | ■ | | | ■ | | | ■ | ■ | |
| Establish appropriable PCBs laboratory facilities | ■ | ■ | | | ■ | | ■ | | |
| Develop and implement guidelines for phase out, transportation, storage, and disposal of PCBs equipment/ | | ■ | ■ | | | ■ | ■ | ■ | ■ |

| ACTION PLANS | TIMEFRAME | | | ASSESSED COSTS | | | SOURCES OF FINANCING | | |
|---|---|---|---|---|---|---|---|---|---|
| | Short | Medium | Long | Low | Medium | High | State | Private | External |
| Establish progress monitoring mechanisms | | ■ | | | ■ | | ■ | | |
| Capacity building for control and management of PCBs | ■ | | | ■ | | | ■ | | |
| Disposal of existing stocks and stockpiles | ■ | ■ | ■ | | ■ | | ■ | ■ | ■ |
| Rehabilitation and decontamination of contaminated sites | | | ■ | | | ■ | ■ | ■ | ■ |
| **AP: Unintentionally produced POPs** | | | | | | | | | |
| Implement into legislation BAT/BEP requirement for new sources | ■ | | | ■ | | | ■ | | |
| Review & upgrade relevant legislation/s on solid waste management | ■ | | | ■ | | | ■ | | |
| Implementation of proper solid waste management/disposal mechanism | ■ | ■ | | | ■ | | ■ | ■ | ■ |
| Implementation of proper medical wastes disposal techniques | ■ | | | | ■ | | ■ | | |
| Review existing technology on secondary metal recycling plants, and identify necessary changes for upgrading | ■ | | | ■ | | | ■ | | |
| Review existing crematories designs for their acceptance and identify changes | ■ | | | ■ | | | ■ | | |
| **AP: Monitoring** | | | | | | | | | |
| To mobilise resources for monitoring | ■ | | | ■ | | | ■ | | |
| To monitor POPs in the environment | ■ | ■ | | | ■ | | ■ | | |
| To monitor POPs in imported food | | ■ | ■ | | ■ | | ■ | | |
| To monitor POPs in exposed populations | | ■ | ■ | | ■ | | ■ | | |
| **AP: Awareness raising and information dissemination** | | | | | | | | | |
| Public awareness about the regulations through print and electronic media. | ■ | | | ■ | | | ■ | | |
| Seminar/workshop among stakeholders on compliance requirements for Stockholm Convention | ■ | | | ■ | | | ■ | | |
| Web Site for Sri Lanka NIP | ■ | ■ | ■ | ■ | | | ■ | | |
| Development and implementation of proper information | ■ | | | ■ | | | ■ | | |

| ACTION PLANS | TIMEFRAME | | | ASSESSED COSTS | | | SOURCES OF FINANCING | | |
|---|---|---|---|---|---|---|---|---|---|
| | Short | Medium | Long | Low | Medium | High | State | Private | External |
| gathering | ■ | | | ■ | | | ■ | | |
| Training of stakeholders | ■ | | | ■ | | | ■ | | |
| Public awareness campaigns | ■ | | | ■ | | | ■ | | |
| Establishment of an information dissemination system | ■ | | | ■ | | | ■ | | |
| Upgrade the capabilities of PCB management task forces within stakeholder institutions | ■ | | | ■ | | | ■ | | |
| Awareness within the stakeholder organizations | ■ | | | ■ | | | ■ | | |
| Awareness of Chambers, BOI, IDB Ministry of Industries… | ■ | | | ■ | | | ■ | | |
| Awareness of Customs, ports authority, import & Export control, CEA and enforcement officers | ■ | | | ■ | | | ■ | | |
| Awareness on formation of unintentional by products and their impacts on nature | ■ | | | ■ | | | ■ | | |
| Awareness on 3 Rs and waste prevention measures | ■ | | | ■ | | | ■ | | |
| Training on BAT &BEP | ■ | | | ■ | | | ■ | | |
| Introduction of the issue of POPs to educational curricula | | ■ | | ■ | | | ■ | | |
| In service training of relevant officials | ■ | | | ■ | | | ■ | | |
| Media campaigns | ■ | | | ■ | | | ■ | | |
| Community based IEC (Health Education) activities | ■ | | | ■ | | | ■ | | |

## 4.4 SUMMARY OF THE TIMEFRAME, RESOURCE ASSESSMENT AND PROPOSED SOURCES OF FUNDING OF THE NIP-SUPPORTING RESEARCH AND DEVELOPMENT ACTIVITIES

| RESEARCH AND DEVELOPMENT ACTIVITY | TIMEFRAME | | | ASSESSED COSTS | | | SOURCES OF FINANCING | | |
|---|---|---|---|---|---|---|---|---|---|
| | Short | Medium | Long | Low | Medium | High | State | Private | External |
| **R&D in support of AP on legal and institutional strengthening** | | | | | | | | | |
| Promote Research and Development in alternative technologies | | ■ | | | ■ | | ■ | ■ | ■ |
| Evaluation of PTS for candidate POPs | | ■ | | | | | | | ■ |
| Improve pesticide regulatory system | | ■ | | | | | | | ■ |
| Review and upgrade relevant legislation on solid waste management | | ■ | | | | | | | ■ |
| **R&D in support of AP on POPs pesticides** | | | | | | | | | |
| Study of possible correlation of environmental levels and adverse impacts | | ■ | | | | | ■ | | |
| Study of environmental impact indicators | | ■ | | | ■ | | | | |
| Fate and effects modelling | | ■ | | | ■ | | | | |
| **R&D in support of AP on PCBs** | | | | | | | | | |
| R&D on PCB disposal technologies | | ■ | | | ■ | | ■ | ■ | ■ |
| R&D on containment and decontamination of sites | ■ | | | | ■ | | ■ | ■ | ■ |
| Research for preventing cross contamination | ■ | | | ■ | | | ■ | ■ | |
| Research on health/environmental effects due to PCB exposure | | ■ | | | ■ | | ■ | | |
| **R&D in support of AP on unintentionally produced POPs** | | | | | | | | | |
| Development of emission factor for production of charcoal (Coconut shell). | ■ | | | | ■ | | ■ | | ■ |
| Investigate unintentional by products & AOX in leachate and soil in the contaminated open dump site (Bloemendal) | | ■ | | | ■ | | ■ | ■ | ■ |
| Investigation of contamination of animal milk and human milk in the scavenging animals and people living close vicinity to the dump sites | | ■ | | | ■ | | ■ | | ■ |
| Research on recycling potential for flammable material | | ■ | | | ■ | | ■ | | ■ |

| RESEARCH AND DEVELOPMENT ACTIVITY | TIMEFRAME | | | ASSESSED COSTS | | | SOURCES OF FINANCING | | |
|---|---|---|---|---|---|---|---|---|---|
| | Short | Medium | Long | Low | Medium | High | State | Private | External |
| Assessment of unintentional by products in process sludge / air emission and treatment of sludge in BOI plants & smelting plants | | | | | | | | | |
| Assessment of unintentional by products in the soil contaminated from the waste water and sludge releases from service stations | | | | | | | | | |
| Life cycle assessment of PVC materials used | | | | | | | | | |
| Risk assessment on use of biomass for cooking | | | | | | | | | |
| **R&D in support of AP on monitoring** | | | | | | | | | |
| Identification of low-cost methods for monitoring | | | | | | | | | |

# ANNEX I

**COMMUNICATIONS AND REPORTING OBLIGATIONS UNDER THE STOCKHOLM CONVENTION**

This annexure details the various reporting requirements of the Stockholm Convention and the connected responsible agencies and institutions.

Parties are required to facilitate or undertake the exchange of information detailed in paragraph 1 of Article 9. This information shall be exchanged directly or through the Convention Secretariat. In addition parties are also required to designate a national focal point for the exchange of such information.

Parties are also required, pursuant to Article 15, to report to the Conference of the Parties on the measures they have taken to implement the provisions of the Convention and on the effectiveness of such measures in meeting the objectives of the Convention. Such reporting shall be at periodic intervals and in a format to be decided by the Conference of the Parties at its first meeting.

The national focal point designated under Article 9 of Convention, has the primary responsibility for the submission of the national report to the Secretariat of the Convention. Other departments and national institutions that are responsible for implementing aspects of the Convention, will be responsible to provide to the national focal point, the relevant information required in order for the Party to comply with its reporting obligation.

**Reporting obligations under the Stockholm Convention and the strategy of information exchange and reporting in Sri Lanka**

| CONVENTION OBLIGATION | DESCRIPTION OF REQUIREMENT | PERIODICITY | RESPONSIBLE INSTITUTION |
|---|---|---|---|
| Article 5, sub paragraph (a) Measures to reduce or eliminate releases from unintentional production | Requires each Party to develop an action plan, or, where appropriate, a regional or subregional action plan, and subsequently to implement it as part of its national implementation plan specified in article 7, designed to identify, characterize and address the release of the chemicals listed in Annex C of the Convention. | Within two years of the date in which the Convention enters into force for that Party | ME with the assistance of relevant stakeholders |
| Article 5, subparagraph (a) (v): Measures to reduce or eliminate releases from unintentional production | A review to be undertaken of those strategies pursuant to the development of an action plan to identify, characterize and address the release of the unintentionally produced persistent organic pollutants listed in Annex C, and of their success. | Every five years | ME, ITI, CEA, BOI with the assistance of FD, AD, WL, MLG, CEB & Plantation Sector |
| Article 7: Implementation plans | Requires each Party to develop and endeavour to implement an implementation plan and transmit it to the Conference of the Parties, and requires each Party to review and update its plan on a periodic basis and in a manner to be specified in a decision of the Conference of the Parties. | Transmission to the Conference of the Parties within two years of the date on which the Convention enters into force for that Party. | ME with the assistance of other implementation Agencies |
| Article 15: Reporting | Each Party shall report to the Conference of the Parties on the measures it has taken to implement the provisions of the Convention and on the effectiveness of such measures in meeting the objectives of the Convention. Each Party shall provide to the Secretariat: (a) Statistical data on its total quantities of production, import and export of each of the chemicals listed in Annex A and Annex B or a reasonable estimate of such data; and (b) To the extent practicable, a list of the States from which it has imported each such substance and the States to which it has exported each such substance. | To be decided by the Conference of the Parties. | Customs, BOI, Dept of Import and Export, Ministry of Industries, Ministry of Trade & Commerce, CEA |
| Annex A, Part II Subparagraph (g) | Requires each Party to provide a report every five years on progress in eliminating polychlorinated biphenyls and submit it to the Conference of the Parties pursuant to Article 15 | Every 5 years | Use and elimination – CEB, LECO, LTL, industries, any other users report to SC focal point |

| CONVENTION OBLIGATION | DESCRIPTION OF REQUIREMENT | PERIODICITY | RESPONSIBLE INSTITUTION |
|---|---|---|---|
| Annex B, Part II, paragraph 4 | Each Party that uses DDT is required to provide to the Secretariat information on the amount used, the conditions of such use and its relevance to that Party's disease management strategy in a format to be decided by the Conference of the Parties in consultation with the World Health Organization. | Every 3 years | DDT is not used in Sri Lanka. |
| Article 4, paragraph 6 | A Party that requests an extension of a specific exemption is required to submit a report to the Secretariat justifying its continued need for registration of that exemption. | Before the expiration of the specific exemption (five years after the entry into force of the Convention for that POP) | No specific exemptions are required by Sri Lanka |

## ANNEX II

# Socio –Economic issues of POPs Management, Control and Final Elimination.

**Ministry of Environment , Sri Lanka**

**December 2006**

# Contents



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# Abbreviations used

| | | |
|---|---|---|
| BAT | - | Best Available Techniques |
| BEP | - | Best environment practices |
| BET | - | Best environment technologies. |
| BHC | - | Benzene Hexachloride |
| CB | - | Central Bank of Sri Lanka |
| CEA | - | Central Environment Authority |
| CEB | - | Ceylon Electricity Board |
| CRI | - | Coconut Research Institute |
| DDT | - | Dichlorodiphenyltrichloroethane |
| DOA | - | Department of Agriculture |
| GC | - | Gas Chromatography |
| GEN AUX | - | Generation Auxiliary Transformers |
| HS | - | Harmonized System |
| IPM | - | Integrated Pest Management |
| ITI | - | Industrial Technology Institute |
| I-TEQ | - | International Toxic Equivalent |
| LECO | - | Lanka Electricity Board |
| LTL | - | Lanka Transformer Limited |
| MRI | - | Medical Research Institute |
| MENR | - | Ministry of Environment & Natural Resources |
| MPE | - | Ministry of Power and Energy |
| MW | - | Mega watt |
| NEP | - | National environment policy |
| NIP | - | National implementation plan |
| PBB | - | Polybrominated biphenyls |
| PCB | - | Polychlorinated biphenyls |
| PCDD | - | Polychlorinated dibenzo dioxin |
| PCDF | - | Polychlorinated dibenzo furans |
| POPs | - | Persistent Organic Pollutants |
| ROP | - | Registrar of Pesticides |
| SIL | - | Special Import License |
| UNEP | - | United Nations Environment Program |
| WHO | - | World Health Organization. |

## Socio-economic issues on POPs management, control and final elimination.

Even though the impacts of persistent organic pollutants are more or less similar, their use, impacts and control measures differ significantly and hence cannot be reviewed together. POP pesticides had its use in the agriculture sector, domestic sector, in industrial pest control and in vector control by health authorities. Industrially produced POPs such as PCB is used in the power and energy sector.

## 1. Characterization of problems leading to POPs use.

### 1.1 POPs Pesticides use

***(i) Dominance of small agricultural holdings and the need to use high levels of agricultural inputs to achieve high output from agriculture to earn a living from agriculture;***

The average size of an agricultural land holdings size is below one hectare and therefore, to obtain adequate income from these land parcels, farmers have to use increased amounts of inputs such as chemical fertilizer and pesticides. For example, with these efforts the yield per hectare of paddy has increased to 4.05 tons by the cropping year 2004/2005, which is one of the highest yield levels in South East Asia. According to Department of Census Statistics 74% of the paddy farmers use insecticides and almost 80% of the farmers used herbicides for weed control in the same cropping year.

***(ii) Increased incidence of pest attacks with the introduction of high yielding crop cultivars;***

High yielding crop varieties show significant yield responses to increased use of inputs such as chemical fertilizer. Subsidies for chemicals fertilizer was available further promoting their use. The higher emphasis given for nitrogen fertilizer promoted use of nitrogen fertilizer in particular, which made plants more succulent and making them more susceptible to pest attack. The traditional systems of pest control favoring biological control could not provide a solution to increased pest attacks with high yielding varieties of crops. Hence farmers had to rely on chemical methods of pest control.

***(iii) Introduction of POPs pesticides almost coincided with the `green revolution' in agriculture in 1960's in developing countries;***

POPs pesticides had been introduced to Sri Lanka around 1960 and provided an answer to emerging enhanced pest problems in the country at that time. The POP pesticides were relatively cheap pesticides that farmers could afford and also had broad spectrum effect on pests. And their persistence in the environment further enhanced effectiveness in pest control over a longer period. Non adoption of good agricultural practices such as crop rotation systems by some farmers aggravated the pest problem as pests attacking one type of crop multiply rapidly under mono-crop systems.

***(iv) Familiarity with POPs pesticides by farmers;***

Even though the POPs pesticides had been banned one by one over the period 1970 to 1994 in Sri Lanka, farmers are aware of the effectiveness in control of pests in agriculture. Therefore, given the opportunity some farmers may revert to use of POPs pesticides.

***(v) High level of sales promotion by pesticide trade and the recommendation to use pesticide as a preventive measure, rather than as a control measure of pesticides;***

At present there about 5000 authorized retailers of pesticides in the country, having close contacts with farmers. Farmers tend to get advice from retailers regarding the pesticide use because of the inadequacy of trained agricultural instructors in the agriculture sector at the field level. Often, the general advice given is to use pesticides as a preventive measure rather than a control measure. Therefore, regular application of pesticides takes place at field level involving several applications at regular intervals. This implies high volume of pesticide application at a considerable cost farmer. Furthermore, importers provide high commissions to retailers compared to other trades, and this helps sales promotion substantially through various programs.

***(vi) Illegal entry;***

Even though all POPs pesticides had been legally banned there is a possibility of illegal entry through various means. Smuggling from India where POPs pesticides such as DDT is still used in vector control, incorrect classification at customs, adulteration with imported formulations are some possible avenues for illegal entry.

***(vi) Unhealthy practices and abuse in pesticide use by some farmers;***

Fields studies have shown that some farmers resort to unhealthy practices in pesticide use leading to occupational exposure. Application of pesticides without protective gear, over use, harvesting of crop produce before the natural decomposition of pesticides are some of these problems.

***(vii) Need to extend `Integrated pest management' (IPM) practices to other crops and other farmers;***

Some paddy farmers had received training in IPM practices and adopted these practices. This had been a successful program in curtailing pesticide use and farmers have reduced pesticide application and made substantial savings on cost of pesticides. But this program needs to be extended to other farmers who have hitherto not adopted this practice and also to other crops such as vegetables where pesticides are used widely.

***(viii) Need for vector control, for elimination of diseases such as malaria, dengue, filarial;***

Sri Lanka being a humid tropical country, mosquito infestation is high. This problem is further aggravated due to unhealthy practices of the general public, water logged conditions in low lying areas, retention of irrigated water in paddy fields etc. Large quantities of DDT had been used in malaria infested areas in the dry zone and some parts of wet zone over a number of years before banning. There is a high possibility of the residue remaining in all environment compartments and the limited studies on this subject confirm the presence of DDT even in the sea bed. Build up of resistance to DDT by some mosquito larvae also was a problem.

***(ix) Difficulties in preservation of wood in domestic use and in the industry;***

Under the warm and humid conditions of whether in Sri Lanka the pest attacks on wood products is high. For control of insects and rodents attacking wood and wood products, highly toxic pesticides need to be used. In order improve the durability of wood products pesticides with long lasting properties are used. If these pest are not controlled the economic loss from pest damage can be very high.

## 1.2 Problems leading to use of Industrial POPs;

Industrial POPs had been intentionally produced without the initial knowledge of their harmful effects. Now, the harmful effects are known but the equipment containing industrial POPs are still in use. In the context of Sri Lanka, PCBs are the most important industrial POP that needs consideration in elimination.

***(i) Long life span of PCBs containing equipments;***

The life span of PCB containing equipment such as transformers is about 30 to 35 years. Equipments procured before official termination (1986) of import of PCB containing transformers are still in use.

***(ii) High cost of replacement of PCBs containing equipments;***

Due to high cost of replacement, organizations using them tend to get the maximum operational use out of such equipments. The period of operational use may some times exceed the declared life span of the equipments. The inventory study indicates that some equipment that had passed the expected life span is still in use. It would be economical for any organization to use them even after the equipment reaches the scrap value after reaching zero depreciated value, provided they are in good operational condition.

***(iii) Lack of legislation to prevent import of PCB containing equipments;***

Unlike for POPs pesticides, the PCBs have no legislation dedicated to them to prevent imports and use. Therefore, in the event of import of PCBs, no penalties could be imposed.

***(iv) Weaknesses in the procurement systems to prevent import of PCB contaminated equipments;***

There is no requirement for obtaining a `PCB free certificate' from the supplier or manufacturer at the time of procurement of equipments containing dielectric oils or in the import of dielectric oils. Therefore, the status of PCB contamination is unknown unless tests are done to detect them. Also, when equipments are imported age of equipments are not considered as a important criteria. Thus when procurements are made through the tender procedure old equipments with PCB contamination may be offered at low prices, and it is difficult to reject such offers, if relevant clauses are not included in the tender conditions.

***(v) Lack of facilities in testing for PCBs;***

There are no adequate testing facilities to detect presence of PCB in equipments that may contain them. Even if PCB free certificates are provided it would not be a guarantee, unless tests are carried to detect them.

***(vi) Recycling of transformers without testing for presence of PCBs;***

Recycling is a environment friendly activity. However, issue of transformers for recycling without testing for PCBs is a problem. If these equipments are PCB contaminated, there could be a series of contaminations at various stages of the recycling process.

***(vii) Closed systems using dielectric oils can be a future source of PCB contamination;***

When closed systems for dielectric oils such as capacitors and electrical switch gear are discarded out of use, they can become sources of contamination in future. Lack of an inventory of these items in the country further aggravates the problem.

## 1.3 Problems leading to use of unintentionally produced POPs – Dioxins and Furans.

Unintentionally produced POPs do not have any use, but are unwanted bi-products of certain combustion and chemical processes. With the discontinuation of use of chlorine in paper mills the

problems of dioxins and furans derived mainly from incomplete combustion. The unintentional emissions of dioxins and furans are a major source of environment pollution.

***(i) Improper solid waste management;***

Improper solid waste management by local authorities and the general public is major problem, which often lead to dumping of waste in dump yards. This waste is mixture of both bio-degradable and non bio-degradable substances. The bio-degradable substances continue to decompose in dump yards and leachate percolate down to soil, but non bio-degradable substances such as polythene and plastics catch fire due to methane emissions or due to human activities. This results in release of dioxins and furans. If solid waste is managed properly, these emissions can be reduced.

***(ii) Improper medical waste incineration;***

In some medical institutions medical waste is incinerated by incomplete combustion processes and some institutions dispose medical waste through local authorities. Both these practices are not satisfactory and therefore, improvements should be done in the incineration process.

***(iii) Unimproved production technologies with traditional industries;***

Traditional industries such as ferrous and non-ferrous metal extraction, extraction of copper from scrap copper emit dioxins and furans as a result of incomplete combustion. Cost of adoption of new technologies also may be a problem for particularly for the cottage type industries; wherein capital investment is a constraint.

***(iv) Use of heavy oils in thermal power generation plants;***

Use of heavy oils in some thermal power generation plants also leads to emissions dioxins and furans.

***(v) Incomplete burning in the use of bio-mass as a fuel;***

Bio-mass provides about 50 percent of the primary energy in the country, with major bio-mass sources such as fuel wood, rice husk, coconut shells etc. The processes involved in bio-mass combustion are cooking, lime production, brick production etc. Incomplete burning results in emissions of dioxins and furans.

***(vi) Uncontrolled burning of forests;***

In forest, scrub jungle fires and in cultivation of chena, burning take place under uncontrolled conditions and this leads to emission of dioxins and furans. Such burning occurs due to acts of vandalism or due to illegal activities.

***(vii) Crematoria;***

Use of crematoria is a traditional practice of both Buddhists and Hindus. Emissions are there from crematoria due to incomplete combustion. Improvements have to be made in the present incineration process.

## 2. Characterization of the impacts of using POPs;

## A. Impacts on humans;

***(i) Impacts leading to health hazards on humans*** ;

The health impacts on humans can be short term or long term. The short term impact includes poisoning, irritations in skin, eyes, and in mucus membranes. The long term impacts are carcinogenic effects, immunological effects, endocrine disruption by some POPs, neurological effects, effects on reproductive system etc.

***(ii) Secondary impacts due to health hazards;***

- High expenditure on health treatment.

- Shortening of the life span.
- Loss of quality of life due to immunological effects, endocrine disruption and neurological effects.
- Reproductive problems leading to complication.
- Severe health problems due to occupational and accidental exposure.

***(iii) Impacts on occupation and productivity;***

- Loss of productivity and lowering of work efficiency.
- Increased sick leave and early retirement of trained and skilled workers.
- Need for appointment and training of new workers take the place of casualties.

***(iv) Impacts on accidental exposure.***

- Payment of compensation.
- Human suffering.

***(v) Impacts due to long term persistence in the environment***

- Accumulation of POPs in fatty tissues of the body therby bringing about various health hazards later on.
- Deposition of POPs residues on food substances and ingestion leading to bio-accumulation.

***(vi) Major source of poisons for self harming attempts; for example POP pesticides.***

## B. Impacts on the environment;

**(i)** Biological hazards to wild life include;

- Birth defects.
- Lowering of survival rate.
- Dysfunctional immune and reproductive systems.
- Extinction of species and loss of bio-diversity.

**(ii)** Pollution of all environment compartments, trans-boundary movement of POPs resulting in wide spread impacts all over the globe, thereby increasing the potential for hazards.

**(iii)** Continuity of environment hazards over a long period of time due to their persistence.

**(iv)** Entry to the food chain of wild life and ending up in large animals such as mammals causing them various hazards leading to reduction in their numbers.

## 3. An assessment of the social and economic values of activities producing or POPs contribution to GDP, to public health improvement, impact on human health and environment.

There had been no intentional production of POPs in Sri Lanka. All POP pesticides and industrially produced POPs had been past imports to the country. Lack of quantitative information on impacts of POPs is serous problem in computing social and economic costs. Moreover, there are no correlation studies made regarding POPs contamination and their impacts in Sri Lanka. All POPs pesticides had been banned some ten years back and their residues can be expected in various environment compartments. Even though there had been use of POPs in the past decade, there had been a simultaneous improvement in the health related indices during corresponding period due to general improvement in the health standards including various immunization programs, control of malaria etc For example the life expectancy as increased from 46 years in 1946 to 73 years by the year 1991 in the country. Under these circumstances and attempt was made to develop some values using latest available health statistics (2002) with some reasonable assumptions. Following methodology was used in this regard.

Various indices related to the annual health situation in the country are presented in the National Health Bulletin of the Dept. of Health Services. The identified health impacts due to POPs are; toxic effects, diseases in the liver, endocrine system, nervous system etc. From these indices total number of people affected for the whole population for the particular year was assessed. The total expenditure on health expenditure was apportioned among in patient and out patients on percent ratio of 80 to 20 and the expenditure on health for treatment was computed. According to the inventory study on POPs pesticides, it reveals that 80 percent of the people contaminated with pesticides does not obtain treatment from the hospitals. Their health cost was assumed to be half the health cost of out patients from hospitals. Since no estimate was available on health impacts from POPs, three levels of impacts due to pesticides, that is at 10%, 20% and 30% were assumed; the moderate level assumed was 20%.

The inventory study on PCB provides cost estimate foe disposal of PCB oil and the cost on disposal of PCB contaminated transformers. Accordingly, there annual total costs were also assessed.

*Impact of POPs on health;*

| | *Percent level of patients due to POPs ** | | |
|---|---|---|---|
| | 10% | 20% | 30% |
| Estimated health cost.(Rs. million) | 87.52 | 175.04 | 262.56 |
| Adjustment for untreated patients | 3.70 | 7.40 | 11.10 |
| Total annual cost (Rs. million) | 91.22 | 182.44 | 273.66 |
| As a percent of GDP (2002) | 0.0057 | 0.012 | 0.017 |

***** Hospitalized patients were considered as in patients.

The above data provide some estimated health cost related to hazards from POPs. Since POPs pesticides are banned it may reflect the effect due to residues in the environment and quantities accumulated in fatty tissues. Since, there are no quantitative assessments available on health hazards, above information may be some what arbitrary. The social cost cannot be estimated due absence relevant information.

An estimated cost on disposal of PCB contaminated transformers and transformer oil based on cost factors indicated in the inventory study is furnished below.

*Estimated number of PCB contaminated transformers - 1060*

*Cost of replacement of PCB contaminated transformers ( 1060 x 20,000) = US $ 21.20 million or Rs. 2162.4 million ( 1US $ = SLRs. 102) As a percent of GDP (2005) it is 0.035 percent.*

However, the disposal process would be spread over number of years. Therefore, the annual cost would have to be divided among those years. Since, the replacement cost of transformers is fairly high, an alternative would be to dispose them at the end of the expiry date of transformers and to avoid any possible contaminations during this period.

*The estimated quantity of PCB contaminated transformer oil is 2292 tons. Therefore the cost of replacing transformer oil is (2295 x 3500) US $ 8.022 million or SLRs. 818.24 million, which is 0.035 percent of GDP in 2005.* .

## 4. An analysis of alternative management options such as regulations, replacement, stakeholder involvement.

### 4.1 POPs Pesticides;

The introduction of the Control of Pesticide Act no. 33 of 1980 followed by the Control of Pesticides (Amended) Act No.6 of 1994 provided the legal requirement dedicated to control of pesticides in Sri Lanka. This Act provides the Registrar of Pesticides the authority for registration of pesticides, approval of labels and containers, prohibition of sale of adulterated, decomposed or deteriorated products, prevent contamination of food products, prevention of contamination of food stuffs in storage, transport and sale, regulation of imports, regulation of advertisements, bulk storage and to oversee the time period after harvest after last pesticide application. This provides adequate legislation to control POPs pesticides as well.

All POPs pesticides had been banned during the period 1970 to 1994. Furthermore, entry of POPs into the country is contained by a system of control involving coordination with authorities responsible for control of import/export and the Customs Department under the provisions of Import and export Law and the Customs Ordinance. It is mandatory for hazardous chemicals including pesticides to obtain `Special import license' (SIL) for import from the Controller of Imports and Exports. Approval of the registering authority is required for this purpose.

All POPs pesticides had been replaced by better alternative substitutes and therefore, it can be considered that POPs pesticides now have no opportunity cost. Although chemical pesticides are not produced in Sri Lanka, there were 179 approved pesticides formulations in the market in the year 2002. Even though this is not a static figure, due to in and out of pesticides from the registry or the market; this indicates that an adequate number of pesticide formulations are available in the country to deal with the pest problem. But the problems remains that the present capacity of Registrar of Pesticides is not sufficient in terms of improved laboratory facilities to identify POP pesticide contaminations and also the availability of trained man power for implementation of its duties.

### 4.2. Intentionally produced POPs – PCBs;

In the past PCBs had been imported as a dielectric fluid for the power and energy sector. Even after identification of its POPs characteristics, it is continued to be used in the power and energy sector because of the long life span of the electrical equipments using it and also as the replacement cost is very high. Because of these reasons there is an opportunity cost associated with PCBs until they are disposed. Producing countries have stopped producing PCBs some twenty years back and Sri Lanka had discontinued official import of PCB containing equipments since 1986. Better alternative dielectric fluids are now used in the sector. But there is no legal ban on import of PCBs.

As correctly listed under NIP; the present management options of PCBs involving introduction of legislation for management and prevention of new entry, establishment of the full inventory of equipments containing PCBs, establishment of procedures for maintenance of equipment, establishment of PCB laboratory facilities, establishment of and implementation of guidelines for phase out, transport, storage, disposal, progress monitoring, capacity building for control and management of PCBs, disposal of existing stocks and stockpiles and finally rehabilitation of contaminated stocks are essential components of the elimination process of an hazardous chemical in use.

Since NEA has controlling authority over emission of hazardous chemical to the environment; the most suitable organization to implement new laws related to PCBs would be the CEA.

Preparation of a complete inventory requires participation of stake holders and MENR may be the most suitable organization to coordinate this activity. Support of the Ministry of Power and Energy is required at the national level. Necessary funds for this purpose have to be raised.

Draft manual for the maintenance of equipment is already available and this could be improved by the stake holders.

Upgrading of present laboratories for testing of PCB is necessary and for accomplishment of this task, avenues for funding this activity have to be identified. Perhaps ITI is the most suitable accredited local laboratory for the purpose of providing necessary guidance.

Phasing out, transport, storage and disposal of equipments would be in accordance with the UNEP guidelines and should be carried out by the users with monitoring and supervision of CEA. But a separate approach may have to be adopted regarding the equipment with private sector. CEA has to play a major role in the preparation of an inventory and in the disposal of contaminated equipment with the private sector. The monitoring of above activities need to be done by MENR and MPE with required assistance from CEA.

The major stake holder institutions require capacity building for control & management of PCBs. A task force or a management team is essential within each organization. The required capacity building has to be supported with necessary guidance and support.

Disposal of existing stocks is a long term process as some of the equipments are still in use. The initial step would be to be to develop guidelines with expert assistance and identification of facilities for this purpose. The existing mechanism for disposal also needs to be reviewed to identify contaminations.

For research and development related to assessment of impacts and for the elimination process support should be availed from the scientific community in the country. Research plans to be prepared with appropriate time frames to accomplish this task.

## 4.3 Unintentionally produced POPs – Dioxins and Furans

Dioxins and Furans are produced under different circumstances and therefore, require a completely different management approach compared to other POPs. The major thrust under the NIP, is through the `Best Available Technologies' (BAT) and `Best Environment Practices' (BEP). The BAT/BEP would be both technically feasible and economically viable practices and not necessarily very high-tech practices. It is possible and also necessary to introduce BAT/BEP to new sources of dioxins and furans. Traditional industries need to be studied with a view to improving particularly their combustion technologies in an economically feasible manner. One advantage in this process is that there is no requirement for using very expensive methods of testing for detection of emissions of dioxins and furans.

The legal authority for solid waste management is vested with the local authorities. The present composition of solid waste is heterogeneous and include both bio-degradable and a variety of non bio-degradable types of waste. This requires a higher level of management than in the past. This management system should cover activities from the point of waste generation to the point of ultimate disposal. All possibilities of economic utilization of waste, such as power generation, recycling and composting are some activities that could be utilized effectively. As a consequence

of the present practice of uncontrolled burning of solid waste it has become a major source of emissions of dioxins and furans. Therefore, burning of waste in urban areas should be prohibited for many reasons. The local government authorities need to be assisted by formulation of effective legislation for this purpose. For rural areas, prohibition of waste burning is not practical due to lack of alternative methods of disposal. Adoption of BAT/BEP practices through awareness programs appears to be a solution for rural areas. Creation of awareness among rural masses is necessary for this purpose. Agriculture sector is carrying out a program against burning of straw in paddy fields; furthermore, action needs to be taken against burning of rice husk in the open areas. A better method of disposal of rice husk may be to look in for more avenues of economic use of rice husk.

The current disposal system of medical waste is not is not satisfactory and should be reviewed and development plans should be made to replace current practices with BAT/BEP in collaboration with medical authorities. Medical waste should not be allowed to be dumped in common dump yards for obvious reasons.

The existing technology of secondary metal recycling plants and also traditional industries without air pollution control systems has to be reviewed with a view to introduction of BAT/BEP. The residues formed and their disposal also may be an area to be reviewed and suitable systems should be worked out.

Local authorities are responsible for any improvements in the crematoria. The existing crematoria should be studied with a view to improve them under BAT/BEP. Improved designs for crematoria with temperature control system need to be introduced. Since more number of crematoria would be established in future, standard guidelines should be provided to the local authorities in the correct direction.

## 5. Recommendations on meeting the social and economic cost of POPs control and elimination;

Availability of government funds is limited for research, development and environment improvement. There can be market based instrument or other revenue generating measures which can be effectively utilized for this purpose. Some recommendations in this regard are furnished below.

- At present a low level of customs duties are applied to pesticides to ensure low market price of this commodity, particularly for agricultural production. Similar situation exists even for fertilizer. According to Sri Lanka Customs; the custom and other duties charged on import of pesticides are a general duty of 4.13% (1.63 + 2.5) except for mosquito coils and a value added tax (VAT) of 15% on the import value. Nearly about 200 pesticide formulations are registered with the Registrar of Pesticide and there are several alternative pesticides in the market to control similar pests. Among them some pesticides are more hazardous than others. However, importers continue to supply relatively more hazardous pesticides as there is a demand for them. If more hazardous pesticides discouraged, they will be replaced by better alternatives already available in the market. Therefore, it is proposed to introduce a `cess' on more hazardous pesticides at higher rate, particularly when better alternative pesticides are available in the market. Normally funds generated from cess collection are available for designated development purposes. Technical guidance in identification of hazardous pesticides for this purpose could be obtained from the Technical and Advisory Committee under the Pesticides Act. This can be a environment friendly proposal as it would help to replace more hazardous pesticides in use.

- Introduction of a special tax on waste produced by applying the `polluter pays the cost' principle;

Certain business enterprises and some households produce large amount of waste. Sometimes agricultural produce is brought to the urban areas without prior cleaning and sorting out and also more waste is produced due to improper methods of transport. This activity takes place in urban markets and large amount waste is produced for clearing by local authorities. Therefore, those enterprises and households producing large quantities of solid waste should be identified to impose a waste clearing tax over and above the normal rate payment depending on the volume of waste they produce. Simple guidelines need to be developed for this purpose. If such a tax is introduced it would be an incentive to reduce the volume of waste as well.

- Creation of an environment development fund/trust by an Act of law or under NEA;

  It is desirable to create an environment fund for under taking identified environment development activities. There may be number sources financing this fund. There are a large number of general public, environment societies and organizations willing to contribute to an environment fund. It is necessary to maintain transparency and regular auditing of such a fund to gain the confidence general public. Also, provision should be made to allocate part of penalties imposed on violation of environment regulations to this fund. Penalties could be imposed on dumping waste in public places, places of aesthetic value, open burning of waste in urban areas. .

- Introduction of a special fee for crematoria development;

  A special fee could be levied in addition to regular cremation charges for crematoria development as a fixed fee by local authorities.

- The current cess applied on import of scrap metal could be further increased to enhance revenue.

- PCB contaminated equipments have to be decontaminated before disposal. Once decontaminated, it could be utilized for recycling purposes. Part of cost may be recovered through selling for recycling process. Large number of such equipments would be available at the envisaged stage of disposal of decontaminated equipment.

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