Government of India
Ministry of Environment and Forests
HSM Division
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As per Article 7 of the Stockholm Convention, Parties are required to develop the "National Implementation Plan (NIP) of the Stockholm Convention on Persistent Organic Pollutants (POPs)" to demonstrate how the obligations under the Convention would be implemented.

The various activities related to the preparation of the NIP was assigned to - Central Pollution Control Board (CPCB), Delhi; Central Power Research Institute (CPRI), Bangalore; Hindustan Insecticides Limited (HIL), New Delhi; National Environmental Engineering Research Institute (NEERI), Nagpur; National Institute for Interdisciplinary Science and Technology (NIIST), Thiruvananthapuram.

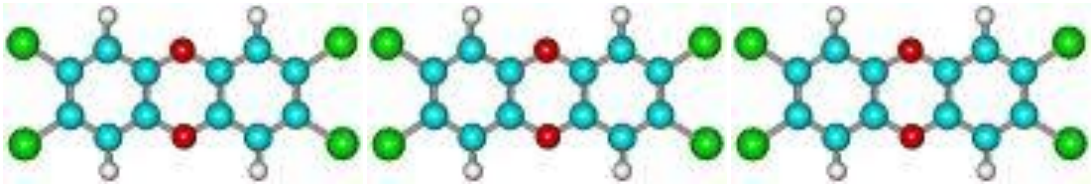
The suggestion /comments, if any, be sent electronically to the following Email address: **nip.moef@gmail.com** by **1st April, 2011** for appropriate incorporation in the report.

Government of India

National Implementation Plan

Stockholm Convention on Persistent Organic Pollutants

March 2011



National Implementation Plan (NIP) Development Team:

MoEF	**UNIDO**
Shri Rajiv Gauba, Joint Secretary Dr (Mrs) Chhanda Chowdhury, Director	Dr S P Dhua, Regional Coordinator Dr Y P Ramdev, Asst. Regional Coordinator
Consultants	**Assistant Project Coordinators**
Ms Papiya Pal Shri Bipin Rakesh, Legal Consultant	Dr Ashwani Sharma Shri Rajeev Mishra

Institutions involved

Central Pollution Control Board (CPCB), Delhi
Central Power Research Institute (CPRI), Bangalore
Hindustan Insecticides Limited (HIL), New Delhi
National Environmental Engineering Research Institute (NEERI), Nagpur
National Institute for Interdisciplinary Science and Technology (NIIST), Thiruvananthapuram

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List of abbreviations	
AI	Active Ingredient
AICRP	All-India Coordinated Research Project (AICRP)
ASEM	Advisory Services in Environment Management
API	Annual Parasite Incidence
BAT	Best Available Techniques
BEP	Best Environmental Practices
CPCB	Central Pollution Control Board
CPRI	Central Power Research Institute
DPPQ&S	Directorate of Plant Protection Quarantine and Storage
EDXRF	Energy Dispersive X-ray Fluorescence
EPA	Environment Protection Act
FICCI	Federation of Indian Chambers of Commerce and Industry
GDP	Gross Domestic Product
GOI	Government of India
HWM	Hazardous Waste Management
HIL	Hindusthan Insecticides Limited
ICAR	Indian Council for Agriculture Research
IPM	Integrated Pest Management
INC	Intergovernmental Negotiating Committee
ITN	Insecticide Treated Net
IRS	Indoor Residual Spray
ICT	Institute of Chemical Technology
MIS	Management Information System
MoEF	Ministry of Environment and Forest
MOUD	Ministries of Urban Development
NAAQS	National Ambient Air Quality Standards
NEP	National Environment Policy
NVBDCP	
NIP	National Implementation Plan
NEERI	National Environmental Engineering Research Institute
NRTOL	National Reference Trace Organics Laboratory
NSC	National Steering Committee
NIIST	National Institute of Interdisciplinary Science and Technology
POPs	Persistent Organic Pollutants
PCBs	Polychlorinated Biphenyls
PHC	Primary Health Centre
PPE	Personal Protective Equipment
SDP	State Domestic Product
SHD	State Health Departments
SIL	Submission of Import License

SC	Stockholm Convention
TJ	Terajoule
MCF	Ministry of Chemicals and Fertilizers
MOA	The Ministry of Agriculture
MEA	The Ministry of External Affairs
MOH&FW	The Ministry of Health and Family Welfare
TEQ	Toxic Equivalent
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
UPOP	Unintentional Persistent Organic Pollutant
	Uunintentional Produced Persistent Organic Pollutant
UNITAR	United Nations Institute for Training and Research
VOC	Volatile Organic Compound

Executive Summary

Since 1998 India actively participated in the negotiations related to the Stockholm Convention. The Stockholm Convention on POPs, which was adopted in May, 2001 with the objective of protecting human health and the environment from POPs, came into force on 17th May 2004. India signed the Convention on the 14th of May, 2002 and ratified it on the 13th of January, 2006. The Convention came into force on 13th April ,2006 in India .The Government of India (GOI) has expressed its strong interest to play a role as a Party to the Stockholm Convention. India understands that to comply with the obligations on Parties set out in the Convention will have a significant and positive influence not only on India's own chemicals management regime but also on the ultimate global success of the Convention to protect human health and the environment from the threat of POPs. Moreover, successful efforts for moving towards compliance will also serve as a model for other developing countries.

Parties to the Stockholm Convention are required to develop a National Implementation Plan (NIP) to demonstrate how their obligations to the Convention will be implemented. The Government of India has expressed its commitment to the Stockholm Convention on Persistent Organic Pollutants (POPs) when India ratified the Treaty on 13th January, 2006.

- Recognizing the central role of the national environmental policies and sustainable development policies to the India's development, the need for attainment of Agenda 21 targets and the need to integrate the POPs issues and implementation of the NIP within the national policy of India,
- Recognizing that the NIP is the outcome of close consultation between relevant government ministries and departments, and respective NGOs, Community Based Organizations and the private sector,
- Understanding that the successful implementation of the Stockholm Convention and the NIP will depend on assistance from international as well as local government, non governmental and private partners,

India established a National Steering Committee (NSC) within the MOEF to facilitate its full participation in the Inter - governmental Negotiating Committee (INC) for an International Legally Binding Instrument for implementing international action on certain POPs that aims to harmonize the interests and stand points of different sectors involved and to determine the position of the Indian government with regard to POPs issues and the Convention negotiations.
The Government of India endorses the National Implementation Plan (NIP), and commits itself to its implementation subject to adequate assistance.

The Ministry of Environment and Forests (MOEF), Government of India is the nodal agency for planning, promoting and coordinating environmental programmes in India. The MOEF is the nodal ministry for the GEF and Stockholm Convention in the country.

MOEF is empowered to promulgate rules under the Environment Protection Act 1986 and is responsible for ensuring effective implementation of legislation, monitoring and control of pollution (including pesticide levels in soil and water), environmental clearances for industrial development projects, promotion of environmental education, training and awareness, and coordination with concerned agencies at the national and international level. To ensure inter-ministerial coordination that is required to cover all aspects of multidisciplinary nature of implementing the convention, the National Steering Committee guides and oversees the activities. A special unit to monitor the Convention implementation and monitoring has been set up in the Ministry of Environment & Forests.

The broad objectives of the Ministry of Environment & Forests are:

- Conservation and survey of flora, fauna, forests and wildlife.
- Prevention and control of pollution.
- Afforestation and regeneration of degraded areas.
- Protection of the environment and
- Ensuring the welfare of animals.

India is one amongst the first few countries in the world that has made provisions for the protection and improvement of the environment. In the 42nd amendment to the Indian Constitution in 1976, provisions in this regard were incorporated with effect from 3rd January1977. In the Directive Principles of State Policy in Chapter IV of the Constitution, Article 48-A was inserted which enjoins the State to make endeavour for protection and improvement of the environment and for safeguarding the forest and wildlife of the country. Another landmark provision in respect of environment was also inserted, by the same amendment, as one of the Fundamental Duties of every citizen of India 'to protect and improve the natural environment including forests, lakes, rivers and wild life and to have compassion for living creatures'.

For the development of the NIP, the MOEF works closely with The Central Pollution Control Board (CPCB), The Ministry of Agriculture (MOA)-the nodal ministry for dealing with pesticides, the Ministry of Chemicals and Fertilizers (MCF) where the Department of Chemical and Petrochemical, responsible for policy, planning, development and regulation of the chemical, petrochemical and pharmaceutical industries, the Ministry of Power dealing with PCB in the power sector, the Ministry of Health and Family Welfare (MHFW) which determines and manages the risks from chemicals in consumer products and foods, the various State Health Departments (SHD) which controls shipment, storage and distribution of DDT authorized for use for public health purposes and with the Ministry of Science & technology through their research institutions.

During the NIP preparation stage, the ground level situation of all 12 POPs has been assessed through proper inventorization, sample collection, analysis and interpretation.

Most of the POP pesticides in India are banned from use, production, import . India has the legal regulations in place for restriction of manufacture/ use of POPs candidates in India. As of now only, one pesticide product DDT out of 9 POP pesticides POPs are being manufactured in India, therefore, it is easy to implement the Stockholm convention with respect to pesticides. That too DDT is manufactured only for vector control and not allowed for use as a pesticide anymore. Moreover, there is only one manufacturer of DDT which is Hindustan Insecticides Limited, a Government of India enterprise.

India has registered specific exemption on DDT for acceptable purposes for Disease Vector control only as per WHO guidelines till viable alternatives are found. India also has registered specific exemption for viz. DDT as intermediate of dicofol production in close system in batches. Production & use quantity is permitted for 150 Ton/annum. Specific exemption for use of DDT as intermediate of dicofol production is valid up to 2014. India will further evaluate the need or optimize to apply for extending such an exemption.

The PCBs have never been produced in India. The data on the transformers containing PCBs were inventorized covering 28 States and 7 Union territories. The inventory data showed that around 9837 tonnes of PCBs exist in the country. Large number of transformer oil samples have been drawn from power utilities, major industries and private sector industries for inspection and analysed for PCB concentration in the oil. Most of the transformers have been found to contain PCBs in high concentration. Another source of PCB is in the importation of ocean liners for ship-breaking. This operation releases several hazardous materials such as asbestos, PCBs, etc.

In accordance with the Convention requirements, India would review and update the NIP according to the timeframe given by the COP and included in the action plans.

The annual PCDD/Fs releases calculated using UNEP toolkit was estimated at 9776.97 g TEQ for the year 2009-2010. The major contribution of PCDD/F emission is from waste incineration and ferrous and non-ferrous metal production categories followed by heat and power generation sector. Waste incineration has 66.75% share of the total annual releases. The second highest source is ferrous and non-ferrous metal production. Copper recycling is the most leading industrial activity contributing to the PCCD/Fs releases. These are the most important sectors that will require special attention and control. The highest amount of PCDD/Fs is released into residues 63.12%, followed by air emission which accounts for 32.66% of the total releases. Main source categories are waste incineration, ferrous and non-ferrous production, heat and power generation, production of minerals, transport, uncontrolled combustion processes, production of chemicals, consumer goods and disposal/ Landfill and miscellaneous.

During the NIP preparation, India analysed samples and measured to compare with the emission factor as provided under the UNEP Toolkit. For this purpose**, s**ampling and

analysis of flue gases were carried out with the objective of developing measured emission factor as the incineration procedure along with the Advanced Pollution Control Systems (APCS) availability are markedly different from the case studies mentioned in the toolkit. By applying measures emission factors the PCDD/Fs releases were of the order of 13,241.70g TEQ/a. It is 35% more when compared to emission using the UNEP Toolkit. This is a very significant difference and needs further investigations. One of the reasons for the difference could be that the Toolkit emission factors are derived from technologies and raw materials used in developed countries and the operations performed under rigidly controlled conditions. Interestingly the major differences were observed at main source category No 4 production of mineral products and main category No 7; production of chemical and consumer goods and exactly these are the sectors where in India local technologies are prevalent.

Since among the POPs only DDT and PCBs are used in the country the inventory concentrated on DDT storages and facilities where PCB-containing electrical equipment were found. As per information provided by Hindustan Insecticides Limited (HIL) and National Vector Borne Disease Controlled Programme (NVBDCP) regarding annual allotment of supply of DDT in various states in India during 2002-03 to 2008-09 and from Health and Family Welfare Department, Himachal Pradesh, NEERI team has visited eight states of India (Mizoram, West Bengal, Chhattisgarh, Maharashtra, Himachal Pradesh, Assam, Meghalaya and Tripura) which received major allocations of DDT for vector control for survey and collection soil and water samples and secondary data from the suspected contaminated sites for quantitative analysis of DDT in the samples. As anticipated, high levels of DDT were found in the sample collected from different location which might be due to improper storage of DDT at various storage facilities.

Studies in Uttar Pradesh have revealed that DDT levels in blood of people, occupationally exposed to DDT as part of malaria control, were significantly higher than those in groups not so exposed (Dua 1998). Further, in India, the population residing near estuaries polluted by agricultural discharges, industrial activity and shipping activities are likely to have significantly higher DDT levels in their blood than those living in non-estuarine areas (Srivastava 1993).

Priorities and action plan strategies

Based on the consultative NIP development process, the Government of India has identified the following priorities for the implementation of the NIP:

- Development and promotion of non POPs alternatives to DDT
- Inventorization of newly listed POPs
- Implementation of the BAT/ BEP strategies for elimination / reduction of unintentional POPs emissions of the priority industry sectors identified in the NIP of India

- Capacity building, demonstration of production and promotion of bio-botanical neem derived bio-pesticides as viable, eco-friendly, bio-degradable alternatives to POPs pesticides
- Identification of sites contaminated by POPs chemicals and of remediation process at the potential hotspots
- POPs and pesticides management in India
- National POPs monitoring India program
- Strengthening institutions and capacity building for effective and efficient implementation of the NIP in India
- Environmentally sound management of un-intentional release of PCDDs and PCDFs in the metallurgical Industry in India

The NIP implementation has been harmonized with the five-year planning process in India and with the five-year replenishment of the GEF. In this regard the first NIP is planned until 2022. The five-year planning seeks to provide guidance to development policies and programmes that promote sustainable management of the nation's resources to attain the ultimate objective of sustainable development. The NIP implementation will also be integrated within the five year plans of the Government of India.

In order to effectively implement the NIP under the Convention, India has strategically put its plan in three phases viz. Short term, Medium term and Long term.

Short term priorities and proposals (2011-2015)

Short term measures coincide with the first five years of NIP implementation. Drawing from the said objectives and principle, India specific priorities (short term) 2011-2015 have been identified which would include:

1. Environmentally Sound Management and disposal of PCBs in India

This capacity building project will complete and make the national inventory of PCBs comprehensive covering the power sector, ship-breaking sector and other sectors including non-electrical equipment such as those with hydraulic fluids.

Three disposal facilities (non-combustion technology based facilities) will be set up: one stationary unit and two mobile units to be placed in Delhi and Bangalore, Karnataka. The disposal facilities will be located in such a way that it would enable these to service all 13 selected states based on geographical and logistical considerations. The project will dispose of at least 7,700 tonnes of PCBs, PCB-containing equipment, PCBs-containing mineral oil and wastes. PCB disposal technologies will be transferred to India and thus national capacity will be created to manage and dispose of PCBs.

2. Environmentally Sound Management of Medical Wastes in India

Medical waste management is a key problem in India as the population increases and access to medical services improves. Since the management of dioxins and furans is a complex issue, requiring strong cooperation among the authorities involved and a coherent legal infrastructure, the GOI decided to address this issue.

3. Strengthen capacities of Convention implementation bodies
   - Strengthen the coordination capabilities of the National Steering Committee POPs members on emerging issues and priorities on POPs. This would promote informed decisions on issues pertaining to Convention implementation incorporating policy and technical inputs.
   - Strengthen capacity of Government focal point for Convention implementation and Convention implementation office
   - Improve Convention implementation awareness at the Central level and strengthen capacities for developing relevant national policies.

4. Establish the National POP Centre at the Central level and the advisory board of the intergovernmental departmental committee for the chemical safety of POPs.

5. Implementation of BAT and BEP
   - Assess the technological requirements for Convention implementation, identify economically and technically feasible industry specific technologies, and establish a process for best available technology transfer

   - Strengthen technological capacity for the removal of PCBs, waste treatment containing POPs contaminated soil sediments and control of dioxin and furan releases based on BAT and BEP.

6. Establish a mechanism and a structure for ensuring financial resources for the pursuance of the identified NIP activities.

7. Improve POPs monitoring capacity by improving the existing system of monitoring at National and State levels. Strengthen networks, include POPs in monitoring targets of National and State level projects and establish standard analytical methods for POPs, thus improving capacity for conducting nationwide monitoring of POPs so as to scientifically comprehend effectiveness of Convention implementation.

8. Improvement of policies and the regulatory framework. According to Convention implementation requirements, analyze existing policies and identify gaps pertaining to POPs and suggest relevant revisions.

9. Conduct awareness on Convention implementation whereby relevant activities are conducted relating to the hazards of POPs targeting decision-making levels (government departments at all levels and concerned ministries), technology levels (industries and associations involved in projects), institutions directly involved in the production, distribution and use of DDT, and the general public. This would create an enabling environment so that people have an understanding of POPs and convention implementation becomes a participatory process involving general public stakeholders and ensuring their support.

Medium term priorities and proposals (2016-2022)

NIP implementation at the country level requires the development of adequate capacities at Central ,State and Local levels. Targeted capacity building activities enhancing the decision-making process within the GOI, as well as technical capabilities of government institutions and private and public industries to implement the NIP provisions need to be developed.

1. Development and promotion of non POPs alternatives to DDT

   The project will assist the producing enterprises in identifying alternatives and a strategy for phasing out of DDT.
2. Implementation of the BAT/ BEP strategies for elimination / reduction of Unintentional POPs **(**UP POPs) emissions of the priority industry sectors identified in the NIP of India

   The project would aim at reducing and, where feasible, eliminating UP-POPs releases by building capacity to implement BAT/BEP measures in the priority industry sector identified in the NIP including UP-POPs monitoring. The project will reduce UP-POPs releases intended under Stockholm Convention.
3. Management of PVC plastic waste to avoid incineration / dumping the landfill for preventing releases of Dioxins and Furans due to burning
4. Capacity building, demonstration of production and promotion of bio-botanical neem derived bio-pesticides as viable, eco-friendly, bio-degradable alternatives to POPs pesticides.

   To assist the pesticide manufacturing enterprises in identifying alternatives and strategy for replacing POP pesticides, the project will take the following measures both at central and state levels: detailed situation analysis of pesticides in the country; evaluate alternatives - both botanical and bio-pesticides; evaluation and demonstration of alternative technologies of the production of bio and botanical pesticides; and transfer of technology to the industry.
5. Identification of sites contaminated by POPs chemicals and its risk assessment to health and the environment and demonstration of remediation process including in-sited remediation at the potential hotspots

   Action through this program will help India to develop a long-term monitoring and site remediation strategy and demonstrate proper site remediation to minimize/eliminate unintentional releases of POPs into the environment. It also

supports site safeguards for highly-contaminated sites while waiting for remediation, including activities on restriction of access to the sites, isolation and monitoring of the sites and public awareness.

6. POPs and pesticides management in India
7. National POPs monitoring programme
8. Monitoring being a continuous assessment of the risk management actions it takes place at all levels of management and uses both formal reporting and informal communications.
9. Strengthening institutions and capacity building for effective and efficient implementation of the NIP in India.
10. Environmentally sound management of un-intentional release of PCDDs and PCDFs in the metallurgical Industry in India.

Long term priorities

- These are based on the principle of gradual reduction, phase out and elimination of the POPs chemicals from production and use.
- Promoting BAT and BEP in all industrial sectors.
- Regular updating of inventory of POPs and new POPs
- Regular reporting to the Convention Secretariat as per the guidelines.

Actions and Financial requirements to implement the NIP

Financial requirements (both baseline and incremental cost) for short term and long term goals of the National Implementation Plan for India for the priority sectors are as follows:

Pesticides

1. Elimination of aldrin and dieldrin waste stocks;
2. Elimination of obsolete DDT stocks;
3. Establishment of Management Information System for regular reporting of DDT to the Stockholm Convention on POPs;
4. Development and production of alternatives to POPs pesticides;
5. Development and production of Botanical alternatives to DDT;
6. Development and production of Bio pesticide alternatives especially Bt based bio-pesticides to DDT;
7. Development and production of chemical alternatives to DDT;
8. Development and production of alternatives pesticides to Dicofol; and
9. Disposal of DDT packaging material in an environmentally sound manner.

PCBs

10. Strengthening policy and regulatory framework to comply with the obligations under the Stockholm Convention;
11. Building national capacity
12. Management of PCB , PCB contaminated equipment and wastes

13. Monitoring the PCB levels in the soil, water and sediment;
14. Monitoring the PCB levels in the food crops, aquatic fauna, poultry, animal feed, higher mammals including human beings, etc.;
15. Monitoring PCBs contaminated sites and its remediation measures
16. R&D actions on
    a. Development of vegetable/synthetic liquids.
    b. ESM technology for PCB destruction.

Dioxins & Furans

17. Strengthening existing policies and regulations with regard to unintentional releases of POPs;
18. To promote information, education and raise public awareness;
19. Augmenting analytical Infrastructure for monitoring Dioxin and Furans releases from source categories listed in Part II and Part III of Annex C;
20. Upgrading and continually updating the inventory of unintentional POPs using indigenously developed tools to measure UP-POPs. Using the upgraded tools estimate more precisely current and projected releases;
21. Based on more realistic estimates identify strategies to meet release reduction obligations of UP-POPs;
22. Promote the application of available, feasible and practical measures for achieving release reduction or source elimination;
23. Promote the development and use of substitute or modified materials, products and processes to prevent the release of Annex C chemicals;
24. Promote/adopt the use of BAT/BEP for new installations for industrial sources listed in Part II of Annex C;
25. Promote BAT/BEP for existing installations for industrial sources listed in Part II and III of Annex C.;
26. Review the strategies and report UP-POPs release reduction obligations every five years.

Contaminated sites and wastes

27. Ensure total disposal of the Aldrin and Dieldrin obsolete stocks located in Regional Plant Protection and Quarantine Station (RPPQS) in Mumbai; Barmer, Bikaner, Sikar, Jaisalmer and Kota in Rajasthan; Imphal in Manipur and Palampur in Gujarat;
28. Out of 9837.6 Tons of pure PCBs and contaminated PCBs (3000 Tons of pure PCB) and 9600 tons of PCBs contaminated equipment and a waste is expected. To start with disposal of 1700 tons of pure PCBs and 6000 tons of PCBs contaminated equipment by the end of 2015 is planned;
29. Initiate measures to contain and clean PCBs in the ship breaking industry in Alang.
30. Continue with the updating of nationwide inventory preparation on PCBs containing transformers and capacitors in use as well as PCBs containing articles in the non power sectors;
31. Enhance and continuously update and upgrade national inventory for

POPs stockpiles and wastes;

32. Secured storage of PCBs and PCBs contaminated equipment and wastes in the power generation/distribution units, industrial plants and transformer repair sites to ensure that it does not contaminate the environment;
33. Strengthening institutional capacities to undertake extensive coverage of preventive measures required for the management of releases from POPs stockpiles and wastes;
34. Enhance the quality of temporary storages for DDT at various spray sites wherever considered appropriate;
35. Wherever feasible provide dedicated transport facilities for carrying DDT;
36. Environmentally sound disposal of used DDT bags
37. Develop policy and legal frameworks for management of contaminated land/sites;
38. Strengthen institutional capacities for mitigation of contaminated sites;
39. Identification and prioritization of potential contaminated sites;
40. Selection of appropriate low-cost environmentally sound technologies required for remediation; and
41. Remediation of selected contaminated sites.

Financial requirement for NIP implementation

Action plan or action	**Budget (US Dollar in millions)**		
	Baseline	**Incremental**	**Total**
1.Legal and Regulatory and Institutional Strengthening Measures	11.6	7.86	19.46
2.Action Plan pertaining to production, import and export, use, stocks, landfills and wastes from chemical substances listed (Annex A, Part I of the Stockholm Convention)	19.50	6.00	25.50
3. Action Plan pertaining to production, import and export, use, identification, labeling, removal, storage and disposal of PCBs and of facilities containing PCBs (Annex A, Part II)	30.04	17.69	47.73
4. Action Plan pertaining to production, import and export, use, stocks and wastes containing DDT (Annex B) if used and produced in the Party to the Convention	35.50	17.0	52.5
5. Action Plan – Releases from the unintentional production (by-products of PCDDs/Fs, HCB and PCBs)	135.5	81.5	217.0
6. Strategies to identify POPs stockpiles, articles in use and wastes (Annexes A, B and C)	9.3	7.7	17.0
7. Actions and measures to properly manage POPs stockpiles and proper disposal of articles containing POPs in use	17.0	10.0	27.0

Action plan or action	Budget (US Dollar in millions)		
	Baseline	**Incremental**	**Total**
8. Action Plan – Identification and corresponding management of contaminated sites (Annexes A, B and C)	56.0	38.0	94.0
9. Strategy pertaining to information access and exchange			
10. Action Plan: Promote information exchange for concerned parties, public information, awareness and education	9.71	5.63	15.34
11. Action Plan: Reporting	0.5	0.0	0.5
12. Monitoring and Evaluation and Research and Development	13.5	6.0	19.5
13. Technical and financial assistance			
14. Coordination for NIP Implementation	16.21	6.13	22.34
Total NIP Implementation	**354.36**	**203.51**	**557.87**

For implementing the National Implementation Plan, funds would be derived from the Central Government, State Governments, private and public corporate and from multilateral agencies. Additional fund requirement to deal with new POPs and updating of the NIP in the future would be worked out and supplemented through various sources.

Chapter 1 Introduction

1.1 Objective and Aims

1.1.1 Objective

The objective of the Stockholm Convention on Persistent Organic Pollutants (SC) is to protect human health and the environment from POPs. The SC requests Parties to protect the citizens and the environment from POPs through activities stipulated in the articles of the treaty. Article 7 of the SC calls for the development of the National Implementation Plan (NIP) that discusses how Parties aim to meet their obligations under the SC. This document has been developed to provide an understanding of what measures India aims to undertake in this regard.

1.1.2 Aims

To achieve the objectives, the NIP has:

- assessed infrastructure capacity and proposed management options, including institutional arrangements, regulatory frameworks, and requirements for capacity building, raising stakeholders and public awareness and research and development, to ensure the effective and sustainable implementation of the proposed strategies and action plans and thus facilitate India's preparedness for compliance with the Convention;
- established inventories or otherwise developed strategies to establish inventories on the production, use, trade, stockpiles and wastes of, and sites contaminated by, the chemicals listed in the Annexes of the Convention;
- developed strategies and action plans for the reduction and wherever feasible elimination of the chemicals listed in Annexes of the Convention;
- built sustainable capacity sufficient to prepare the NIP and its component inventories, strategies and action plans and to fulfill ongoing reporting requirements of the Convention;
- developed and demonstrated methodologies representing practical and feasible approaches to priority actions required by India in meetings its Convention obligations; and
- formulated and gained stakeholder endorsement of the NIP including the estimated total and incremental costs likely to be incurred for introduction into development and assistance planning.

1.1.3 Background

“POPs are chemical substances that persist in the environment, bio-accumulate through the food chain and pose a risk of causing adverse effects to human health and the environment. With the evidence of long-range transport of these substances to regions where they have never been used or produced and the consequent threats they pose to the environment of the whole globe, the international community has now, at several

occasions called for urgent global actions to reduce and eliminate releases of these chemicals (United Nations Environment Programme, 2011).

The health impacts of POPs are severe with even very low exposure. They can induce cancer, cause damage to the central and peripheral nervous system, cause immune system diseases and endocrine disruption disturbing the normal growth of infants. Hence, POPs pose great threats to the health of human beings. Due to the trans-boundary movement pattern of POPs it is not just a national but a regional/global issue.

1.1.4 Content

To formulate the NIP, activities have been grouped into components, each focused on a specific objective. These components are as follows:

Component 1: Convention implementation infrastructure at National and State levels;

Component 2: Measures in relation to management of POP pesticides including DDT, the only POP pesticide currently being produced and used in India;

Component 3: Measures in relation to polychlorinated biphenyls (PCBs);

Component 4: Measures in relation to unintentionally produced POPs; and

Component 5: Measures in relation to wastes and contaminated sites

The NIP drew information, results of data processing and analysis from the following institutions/organizations that had been engaged to undertake the various designated activities under the NIP preparation:

- The Ministry of Environment & Forests (MOEF) for Component – 1 i.e. Convention Implementation Infrastructure at National and State levels;
- Hindustan Insecticides Limited (HIL), a Government of India Enterprise, for Component – 2 i.e. Measures in relation to management of POP pesticides including DDT;
- Central Power Research Institute (CPRI), Bangalore for Component – 3 i.e. Measures in relation to PCBs(PCBs);
- National Environmental Engineering Research Institute (NEERI), Nagpur for Component - 4 i.e. Measures in relation to unintentionally produced POPs;
- NIIST, Trivandrum for Component - 4 i.e. Measures in relation to unintentionally produced POPs;
- Central Pollution Control Board (CPCB), New Delhi for Component - 4 i.e. Measures in relation to unintentionally produced POPs; and
- NEERI, Nagpur for Component – 5 i.e. Measures in relation to wastes and contaminated sites.

The NIP development had five phases as follows:

1. Inception phase : establishment of coordinating mechanisms and project
2. Organisation, staff and project management structure and an approved work plan;
3. Conducting POPs inventory preparation, establishment of required national infrastructure and the capacities for its realisation;
4. Determination of priorities, actions to be taken and subjects of implementation;
5. Formulation of the draft NIP - NIP and Specific Action Plans on POPs;
6. Approval of the draft NIP at the level of involved institutions and experts groups and
7. Finalization of the NIP.

1.2 The Global Chemical Management Agenda

All living and inanimate matter is made up of chemicals. Virtually every man-made product involves the use of intentionally produced chemicals in some manner. Once released into the environment, chemicals undergo short and long-range transport as a result of natural environmental processes and become distributed in air, water, soil, sediment and in living organisms. The environment (local, regional and global) becomes contaminated with them and as a result, human beings and wildlife are exposed to them. In some cases, this exposure is toxic. Furthermore, the growth in the use and production of chemicals has raised several environmental and health issues of concern to the global community. It is observed that since the last 30 years the production of bulk chemicals has been shifting from developed to developing countries. While the global output of chemicals in 2020 is expected to increase by 85% over 1995 levels, it is predicted that the OECD's share of global output (78% in 1998) will decrease by about 10%, while the developing world's share will increase from 23% of global demand and 21% of production in 1995 to 33% and 31%, respectively (Africa Environment Outlook 2). It is now recognized and a matter of serious concern that the lack and/or poor enforcement of laws regulating chemical production in developing countries increases environmental pollution and subsequent human exposure.

Scientific evidence suggests that present (and future) generations of human beings and wildlife have risk exposure to a variety of industrial chemicals, pesticides and unintentionally produced by-products, especially substances that are persistent, toxic and bio-accumulative.

There has been sustained international effort to tackle these issues. In 1992, discussions at the United Nations Conference on Environment and Development (UNCED) set the stage for heightened interest and commitment in the area of sound management of chemicals. This strongly influenced the development of international instruments, such as the *Basel Convention on the Transboundary Movement of Hazardous Wastes*, the *Rotterdam Convention on Prior Informed Consent Convention,* the *Stockholm Convention on POPs* and other agreements that have attempted to provide a framework for chemical management across the world. In 2002, the World Summit on Sustainable Development (WSSD) in Johannesburg reaffirmed the commitment to a strategic

approach to international chemical management, including the implementation of the Stockholm Convention, with a focus on strengthening capacities in developing countries. As the most recent international convention on chemical management, the Stockholm Convention entered into force in May 2004. The Stockholm Convention has identified the Global Environment Facility (GEF), a financial mechanism, to assist developing countries and economies in transition in meeting the incremental costs of implementing convention obligations (Global Environment Facility 2010).

The Strategic Approach to International Chemicals Management (SAICM), a policy framework that forms the basis of a newly emerging chemical safety regime and steadily extending internationally through a number of agreements, initiatives and partnerships. In 2006, governments and stakeholders adopted a new global policy and strategy called the *Strategic Approach to International Chemicals Management* (SAICM) .The objective of the Strategic Approach is to change how chemicals are produced and used in order to minimize harmful effects on human health and the environment. SAICM was adopted by a consensus of Environment Ministers, Health Ministers and other delegates from more than one hundred governments participating in the first International Conference on Chemicals Management (ICCM-1), held in Dubai, February 2006. The Strategic Approach to International Chemicals Management (SAICM), a policy framework that forms the basis of a newly emerging chemical safety regime and steadily extending internationally through a number of agreements, initiatives and partnerships. The GOI has proactively participated in all SAICM meetings and conferences. The India Government continues to integrate SAICM into relevant programmes and plans pertaining to chemicals and sustainable development. While developing these programmes and plans the government tries to ensure relevant stakeholder participation. The government is in the process of establishing arrangements for implementing SAICM on an inter-ministerial and inter-institutional basis so that all concerned stakeholder interests are represented and all relevant substantive areas are addressed.

The Stockholm Convention

The Stockholm Convention on POPs aims to reduce, eliminate and prevent POPs pollution to protect human health and the environment. The Convention includes 30 Articles and 6 Annexes. POPs chemicals as specified in the Convention's Annexes need to be restricted/controlled summarized in Table 1:

Table 4: Synopsis of annexes of the Stockholm Convention

	Synopsis of annexes of Stockholm Convention		
	Annex A (intentionally produced chemicals)	**Annex B (intentionally produced chemicals)**	**Annex C (unintentionally produced chemicals)**
Actions to be taken	aldrin, chlordane, dieldrin, endrin, heptachlor, HCB, mirex, toxaphene and PCBs	DDT	polychlorinated dibenzo-p-dioxins and dibenzofurans (collectively referred to as Dioxin), HCB and PCBs.
	Under specific exemptions chlordane, HCB and mirex can be produced and used. Both production and use of endrin and toxaphene has to be stopped. The rest of the chemicals of Annex A can be used under the provision of specific exemption but only within the specified timeframe. .	For disease vector control DDT can be used under the provision of acceptable purposes. It can be also produced and used as intermediate in the production of dicofol. Dicofol under the provision of specific exemption within a specified timeframe.	Within two years of the date of entry into force of the Convention, develop and implement action plans to identify release of chemicals listed in Annex C and gradually reduce their release by BAT/BEP; phase in use of BAT for new sources in the categories listed in Part II of Annex C as soon as practicable but no later than four years after the entry into force of the Convention; and for existing release sources listed in Annex C, gradually implement BAT/BEP to reduce their releases.
Stockpiles and wastes of Annex A, Annex B and Annex C	Develop appropriate strategies for identifying POPs stockpiles and wastes; manage stockpiles, as appropriate, in a safe, efficient and environmentally sound manner; take appropriate measures so that such wastes, including products and articles upon becoming wastes are handled, collected, transported and stored in an environmentally sound manner; and gradually reduce or eliminate releases from stockpiles and wastes.		

Source: Adapted from United Nations Environment Programme Chemicals 2011

According to Article 8, the Conference of Parties can add new chemicals to the lists of Annex A, B and C consistent with procedures set out by the Convention.

1.2.1 Government of India's efforts

Since 1998 India participated actively in the negotiations related to the Stockholm Convention. India established a National Steering Committee (NSC) within the MOEF to facilitate its full participation in the Intergovernmental Negotiating Committee (INC) for an International Legally Binding Instrument for implementing international action on certain POPs that implies to harmonize the interests and stand points of different sectors involved and to determine the position of the Indian government with regard to POPs issues and the Convention negotiations. India signed the Convention on the 14th of May 2002 and ratified it on the 13th of January 2006. By virtue of this the Government of India (GOI) has expressed its strong interest to play a role as a Party to the Stockholm

Convention. India understands that to comply with the obligations on Parties set out in the Convention Parties will have a significant and positive influence not only on India's own chemicals management regime but also on the ultimate global success of the Convention to protect human health and the environment from the threat of POPs. Moreover, successful efforts moving towards compliance will also serve as a model for other developing countries.

The Table 2 presents the ways how the implementation of the Stockholm Convention and other toxic hazardous chemicals related activities are supported by the GOI.

Table 5: India's Support to the implementation of the Stockholm Convention on POPs

Strategic Stance (in ascending order of involvement and resource intensity)	**Prerequisites/Triggers**	**Identified Priority activities**
Demonstration of capability, establishment of implementation structure, understanding policy implications and conducting relevant Projects	On-going work on relevant projects On going work on policy and institutional aspects Identification of opportunities for financing	Identified through inter-ministerial dialogue and dialogue with all stakeholders
Capacity Building and Technical Assistance	Clarity of roles and responsibility of various agencies/institutions/organizations active in country	Capacity building workshops and exercises
Policy Analysis and Institutional Development	Inviting UNIDO as GEF executing agency Completion of project entitled *"*Development of a NIP in India as a first step to implement the Stockholm Convention on POPs*",* Readiness to address policy aspects of chemical management according to convention requirements	Identified through dialogue and discussion
Knowledge Management and Dissemination - External (i.e., Outreach)	Endorsement of a regional POPs strategy and work program More sustained support from all concerned Ministries (technical and strategic)	Prepare and disseminate technical and policy notes on POPs issue Establish informal contact groups and stakeholder contacts – develop community of practice Establish contacts with key government departments and agencies and lay foundation for dialogue
Knowledge Management and Dissemination – Internal (i.e., Mainstreaming)	Commitment to global environment Commitment to establishing a POPs program Mobilization of adequate resources	Develop general guidelines for mainstreaming POPs actions across sectors (including health and agriculture) Enhance efforts on the Integrated Pest Management

		front Explore links with other environmental issues already on regional agenda (waste management, transboundary movement of toxic waste, air pollution issues, mercury and open mining amongst others)

Source: MOEF, 2010

The Stockholm Convention puts forward the requirement to reduce, eliminate and prevent POPs pollution, and will provide technical and financial assistance for developing countries and countries with economies in transition at the same time. Therefore, implementing the international convention will help improve the level of environmental protection in India and promote institutional strengthening of environmental management, cleaner production, adjustment of industrial and product structure and promote sustainable development.

Taking into consideration the requirements of the Convention and to protect human health and the environmental protection of India, the Indian government worked towards the development of the NIP, based on the national situation and features of POPs issues, in order to prevent and eliminate harmful impacts of POPs pollution on the social and economic development, human health and environment.

1.2.2 Financial resources for the formulation of the NIP

The Stockholm Convention on POPs, which was adopted in May, 2001 with the objective of protecting human health and the environment from POPs, come into force on 17th May 2004. Parties to the Stockholm Convention are required to develop NIP to demonstrate how their obligations to the Convention will be implemented. India recognizes its obligation, under Article 7 of the Convention to develop and submit a NIP to the COP. India after the ratification of the Stockholm Conventions on Persistent Organic Pollutants on the 13th of January 2006 accelerated the preparatory activities for the NIP.

The 12 POPs listed by the Convention are DDT, Aldrin, Dieldrin, Endrin, Chlordane, Heptachlor, Mirex, Toxaphene, Hexachlorobenzene (HCB), PCBs, dioxins and furans. Of these, nine are organochlorine pesticide. DDT has been listed in Annex B with specific exemption for acceptable purposes.

The Stockholm Convention sets out control measures covering the production, import, export, disposal and use of POPs. In implementing the Convention, governments are expected to take measures to eliminate or reduce the release of POPs into the environment; Governments are to promote the best available technologies and practices for replacing existing POPs, prevention of environmental contamination and develop action plans for carrying out their commitments.

The GEF has provided US$ 3,074,700 for the preparation of India's NIP project to meet the incremental costs with a co-financing of US$ 6,880,000 from GOI and US$ 200,000

from UNIDO. The project document was signed on 8th November, 2007 by the GEF Operational Focal Point in India. United Nations Industrial Development Organization (UNIDO) is acting as the GEF Implementing Agency. This project has prepared the NIP (NIP) for India as required under the Stockholm Convention on POPs.

1.3 Methodology for development of NIP

1.3.1 The NIP development process

The Ministry of Environment and Forests(MoEF) ,Government of India is the nodal agency for planning, promoting and coordinating environmental programmes in India. The MOEF is the GEF and Stockholm Convention focal point in the country for the Stockholm Convention. The MOEF is empowered to promulgate rules under the Environment Protection Act and is responsible for ensuring effective implementation of legislation, monitoring and control of pollution (including pesticide levels in soil and water), environmental clearances for industrial development projects, promotion of environmental education, training and awareness, and coordination with concerned agencies at the national and international level. To ensure inter-ministerial coordination that is required to cover all aspects of multidisciplinary nature of implementing the convention, the National Steering Committee guides and oversees the activities. A special unit to monitor the Convention implementation and monitoring has been set up in the

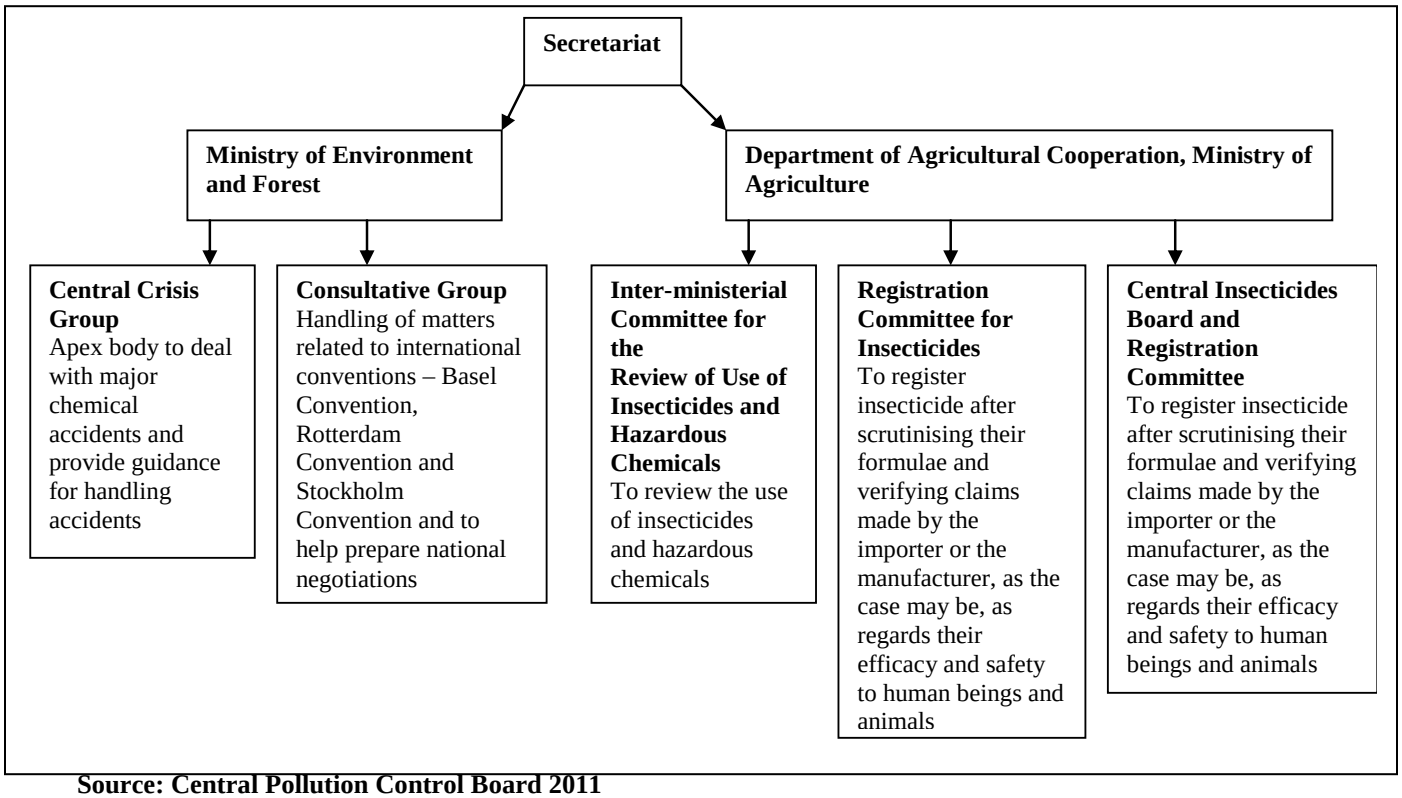
For the development of the NIP, the MOEF works closely with CPCB, The Ministry of Agriculture (MOA)-the nodal ministry for dealing with pesticides, The Ministry of Chemicals and Fertilizers (MCF) where the Department of Chemical and Petrochemicals, is responsible for policy, planning, development and regulation of the chemical, petrochemical and pharmaceutical industries, The Ministry of Health and Family Welfare (MHFW) which determines and manages the risks from chemicals in consumer products and foods, the various State Health Departments (SHD) which control shipment, storage and distribution of DDT authorized for use for public health purposes and The Ministry of External Affairs (MEA)- responsible for the administration of foreign affairs and supervise the execution of State foreign policies. Also, The Ministry works with the State Departments of Labour to regulate chemical safety in the workplace. The GOI is aided by the Council of Scientific and Industrial Research (CSIR) which has 38 research and development laboratories in various disciplines, several of their activities are related to chemical safety and environmental management. The GOI has also involved a large number of industrial associations, environmental protection societies and medical societies which have interest in the sound management of chemicals; some of them have undertaken monitoring programme related to estimating levels of pesticides, etc. generating public awareness. All these institutions and organizations have actively contributed and supported in NIP development process. The NIP development process has also greatly benefited from the National Chemical Management Profile for India prepared with the assistance by United Nations Institute for Training and Research (UNITAR) under the Indo-Canada Environment Management Initiative (work on the profile initiated in February 2005). The NIP also benefited from a mini chemical profile prepared during 1999-2000 with assistance of the World Health Organization (WHO).

National Experts Committee for the project identified five representative zones in the country for core assessment and nation wide projections on POPs ad POPs related activities. Need to be confirmed from MOEF.

For the development process of the NIP, the various stakeholders were consulted several times through coordination meetings. Specific questionnaires were prepapred and circulated. Sector-wise meetings, a series of capacity building workshops and international technical coordination meetings.

Though the roles and responsibilities of various ministries and government agencies are well defined for POPs, yet there are issues which are cross cutting and require inputs from more than one ministry or government bodies under different ministries. For inter-ministerial coordination on POPs the following Figure 1 coordinating mechanism is set up the government.

Figure 1: Overview of the Inter-ministerial Commissions and Coordinating Mechanisms



Source: Central Pollution Control Board 2011

1.3.2 Update of NIP

In accordance with the Convention requirements, India would review and update the NIP according to the timeframe given by the COP. Being a vast and populous country, development of NIP was restricted by the scope of the study. In the NIP development process, in-depth investigation, monitoring, research data, alternatives to DDT, PCB containing equipment identification and estimation of PCBs, identification of stockpiles and contaminated sites were areas of challenge.

POPs waste and identification of contaminated sites were made based on surveys. The preparation of inventory of PCB-containing equipment in use was a real challenge as tracing unused equipment and its disposal was extremely difficult. While the actual monitoring of Dioxin was conducted in a few important sources in consultation with leading institutes, the release inventory of Dioxin in the NIP was computed using the parameters of the UNEP toolkit. Overall the GOI is in broad agreement on new POPs under the Convention but is yet to complete the full assessment of the country specific needs and priorities. To this effect the GOI is in the process of requesting the GEF to assist in undertaking the assessments of the newly added POPs. Hence, the present NIP does not elaborate on new POPs. Under the Convention, India needs to assess feasibility of technology transfer and assistance pertaining to the identified areas needing intervention. The cost estimation on application of Best Available Techniques/ Best Environmental Practices (BAT/BEP) is industry specific and based on parallel activities and does not cover all sectors and all technology options.

In accordance with the Convention requirements, India would review and update the NIP according to the timeframe given by the COP and include in the action plans.

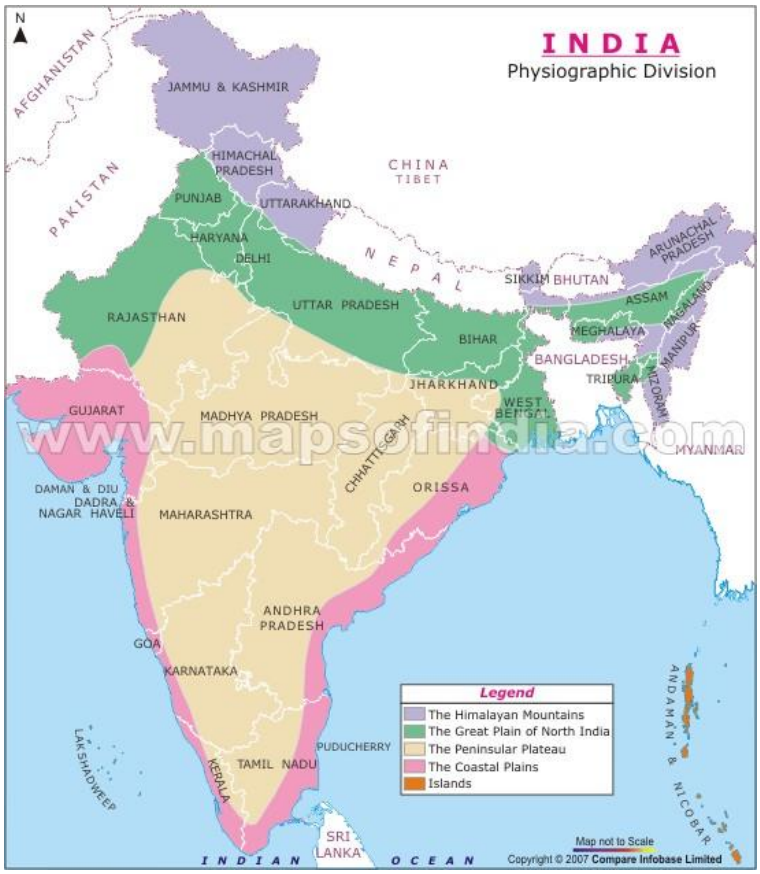
Chapter 2 Country Baseline

2.1 Country Profile

India is one of the oldest civilizations in the world with a kaleidoscopic variety and rich cultural heritage. It has achieved all-round socio-economic progress during the last 62 years of its Independence. India has become self-sufficient in agricultural production and is now one of the top industrialized countries in the world and one of the few nations to have gone into outer space to conquer nature for the benefit of the people.

2.1.1 Geography

Figure 2: Physiographic Division of India



Source: Maps of India, 1999

India occupies a major portion of the south Asian subcontinent. It covers an area of 32,870,263 sq. km, extending from the snow-covered Himalayan heights to the tropical rain forests of the south. As the 7th largest country in the world, India stands apart from the rest of Asia, marked off as it is by mountains and the sea, which give the country a distinct geographical entity. Bounded by the Great Himalayas in the north, it stretches southwards and at the Tropic of Cancer, tapers off into the Indian Ocean between the Bay of Bengal on the east and the Arabian Sea on the west (Figure 2, Map of India 1999).

Lying entirely in the Northern Hemisphere, the country extends between 8° 4' and 37° 6' latitudes north of the Equator, and 68° 7' and 97° 25' longitudes east of it. The whole country lies in one time zone, the Indian Standard Time, which is GMT + 05:30. The country is surrounded by Afghanistan and Pakistan to the north-west; China, Bhutan and

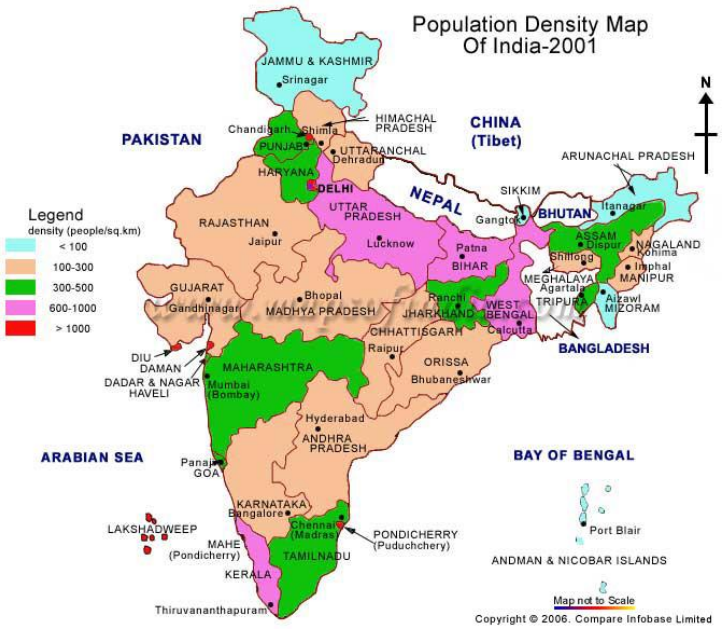
Nepal to the north; Myanmar to the east; and Bangladesh to the east of West Bengal. Sri Lanka is separated from India by a narrow channel of sea, formed by Palk Strait and the Gulf of Mannar. Its coastline is 7,516.6 km encompassing the mainland, Lakshadweep Islands, and the Andaman & Nicobar Islands. The mainland comprises of four regions, namely the great mountain zone, plains of the Ganga and the Indus, the desert region, and the southern peninsula.

The climate of India can broadly be classified as a tropical monsoon one. But, in spite of much of the northern part of India lying beyond the tropical zone, the entire country has a tropical climate marked by relatively high temperatures and dry winters. The four seasons are winter (December-February), summer (March-June), south-west monsoon season (June-September) and post monsoon season (October-November). The Himalayas act as a barrier to the frigid katabatic winds flowing down from Central Asia. Thus, North India is kept warm or only mildly cooled during winter; in summer, the same phenomenon makes India relatively hot. Although the Tropic of Cancer—the boundary between the tropics and subtropics—passes through the middle of India, the whole country is considered to be tropical. India's climate is affected by two seasonal winds - the northeast monsoon and the southwest monsoon. The north-east monsoon, commonly known as winter monsoon blows from land to sea, whereas south-west monsoon, known as summer monsoon blows from sea to land after crossing the Indian Ocean, the Arabian Sea, and the Bay of Bengal. The south-west monsoon brings most of the rainfall during a year in the country.

2.1.2 Demography

The population of India, which at the turn of the twentieth century was around 238.4 million, increased to reach 1,028 million at the dawn of the twenty-first century. The population of India as recorded at each decennial census from 1901 has grown steadily except for a decrease during 1911-21. India accounts for a meagre 2.4 per cent of the world surface area of 135.79 million sq km, yet, it supports and sustains a whopping 16.7 per cent of the world population. The per cent decadal growth of population in the inter-censal period 1991-2001 varies from a low of 9.43 in Kerala to a very high 64.53 in Nagaland. Delhi with 47.02 per cent, Chandigarh with 40.28 per cent and Sikkim with 33.06 per cent registered very high growth rates. In addition to Kerala, Tamil Nadu and Andhra Pradesh registered low growth rates during 1991-2001 Figure 3 (Maps of India, Census 2001).

Figure 3: Population Density map of India



Source: Maps of India, Census 2001

The population density of India in 2001 was 324 per sq km. The density of population increased in all States and Union Territories between 1991 and 2001. Among major states, West Bengal is still the most thickly populated state with a population density of 903 person/km2 in 2001. Bihar is now the second highest densely populated state, pushing Kerala to the third place. Sex ratio, defined, as the number of females per thousand males, is an important social indicator to measure the extent of prevailing equality between males and females in a society at a given point of time. According to census data 2001, the sex ratio (females per thousand males) is 933 in India (946 rural, 900 urban).

For the purpose of census 2001, a person aged seven and above, who can both read and write with understanding in any language, is treated as literate. The results of that census revealed that there has been an increase in literacy and is 64.84 per cent, 75.26 for males and 53.67 for females. Kerala retained its position by being on top with a 90.86 per cent literacy rate, closely followed by Mizoram (88.80 per cent) and Lakshadweep (86.66 per cent). Bihar with a literacy rate of 47.00 per cent ranks last in the country preceded by Jharkhand (53.56 per cent) and Jammu and Kashmir (55.52 per cent).

2.1.3 Political and Economic Profiles

India comprises 29 States and 6 Union Territories (Figure 4, One World- Nations Online 2009) as shown in Figure 4. They are:
Andhra Pradesh, Assam, Arunachal Pradesh, Bihar, Chhattisgarh, Delhi, Goa, Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Punjab, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh and West Bengal.

Figure 4: State and Union Territories of India

Source: One World- Nations Online 2009

Union Territories are:

1. Andaman and Nicobar Islands,

2. Chandigarh,

3. Dadra and Nagar Haveli,

4. Daman and Diu,

5. Lakshadweep and

6. Puducherry.

2.1.3.1 Form of Government

India has a Parliamentary Government, based on universal adult franchise. The Indian Union currently is constituted by 29 states and six centrally administered Union Territories. The largest democratic nation as prescribed in the Constitution of India is a Sovereign, Socialist, Secular Democratic Republic. It is on the basis of these guidelines that the country is governed by elected representative of the state voted to power on the basis of Universal Adult Suffrage. The state is governed at various levels with separate roles assigned to the Executive, Legislature and the Judiciary.

India enjoys a federal form of government with the Union Government heading the state of India led by the Prime Minister. The twenty eight states of India are governed by elected local governments having independent charge and free from interference of the Central Government. Nonetheless the state and Union Government work in harmony for the progress of the country as a whole. The Indian polity is governed according to the Constitution, which was framed by the Constituent Assembly on 26 November 1949 and came into force on 26 January 1950. The Union Executive consists of the President, the Vice-President and Council of Ministers with the Prime Minister at the head to aid and advise the President (Trade Chakra 2008).

2.1.3.2 Executive power

The Union executive consists of the President, the Vice-President, and the Council of Ministers with the Prime Minister as the head to aid and advice the President. The President of India is the constitutional head of Executive of the Union and is the supreme commander of the armed forces of the country. The Vice-President is elected by members of an electoral college consisting of members of both Houses of Parliament. The Vice-President is ex-officio Chairman of the Rajya Sabha and acts as President when the latter is unable to discharge his functions. The real executive power vests in the Council of Ministers with the Prime Minister as its head. It is mentioned in the Article 74(1) of the Constitution that there shall be a Council of Ministers headed by the Prime Minister to aid and advise the President who shall, in exercise of his functions, act in accordance with such advice. The Council of Ministers is the directly elected members of the state on the basis of Universal Adult Franchise and hence is the true representative of the people of the country. This makes the Council of Ministers collectively responsible to the Lok Sabha which is the House of the People.

In the states also a similar power structure is enforced as is applied at the Union level. The Governor, as the representative of the President, is the head of State, but real executive power rests with the Chief Minister who heads the Council of Ministers. The Council of Ministers is collectively responsible to the elected legislative assembly of the state which looks after the affairs of state interest. In the Constitution of India it is clearly outlined that it is mandatory to share legislative power between Parliament and the State Legislatures, and provides for the vesting of residual powers in Parliament. The power to amend the Constitution solely vests in the Parliament (Trade Chakra 2008).

2.2.3.3 Legislative power

Legislative power of the Union lays in the hand of the Parliament. It consists of the President and two Houses, known as Council of States (Rajya Sabha) and House of the People (Lok Sabha). Each House has to meet within six months of its previous sitting. A joint sitting of two Houses can be held in certain cases. Figure 5 and Figure 6shows the political structure at the national and state level respectively. As in other parliamentary democracies, the Parliament in India has the cardinal functions of legislation, overseeing of administration, passing of the Budget, ventilation of public grievances and discussing various subjects like development plans, national policies and international relations (Government 2010).

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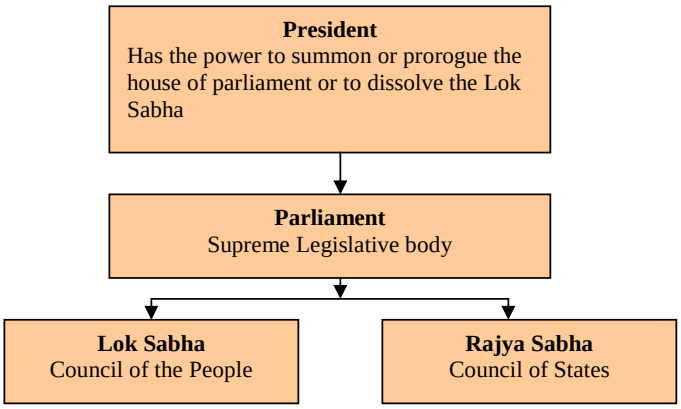
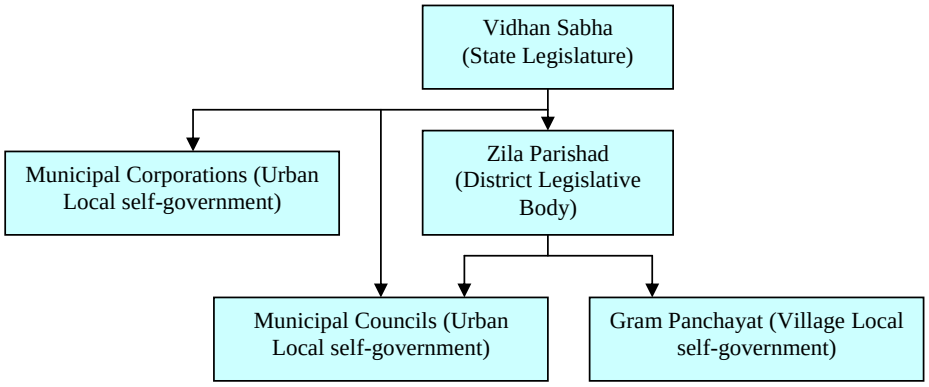
Figure 5: Political structure at the national level



Source: Government 2010

Figure 6: Political Structure at the State level



Source: Government 2010

2.1.3.4 Judiciary power

The Apex Judiciary body in the country is the Supreme Court followed by the High Courts of the state. The Judiciary is independent of the executive.

2.1.3.5 Administrative structure of India

India has a multi-level Administrative Structure. Within a state there is generally a four-tier structure of administration - division, district, taluka/tehsil/block, and village. The district has been so far the most important unit of administration. Some of the states have introduced the system of Panchayati Raj, generally a three-tier structure of local self-government in rural areas at the village, block and district levels.

In India the local government is the third level of government apart from the State and Central governments. There are two types of Local Governments in operation: Panchayats in rural areas and Municipalities in urban areas (Datta, 2009). The Panchayats are a linked-system of local bodies with village panchayats (average population about 5,000), panchayat samities at the intermediate level (average population about 100,000), and district panchayats (average population about 1,000,000) (Twelfth Finance Commission 2010).

2.1.3.6 Economic Profile

India experienced rapid economic growth in the 1990s, following economic reforms as markets opened for international competition and investment. Presently, in the 21st century, India is an emerging economic power with vast human and natural resources, and a huge knowledge base. India is the eleventh largest economy in the world by nominal Gross Domestic Product (GDP) and the fourth largest by purchasing power parity (PPP). The GDP at current prices is Rs 13618710 million with agriculture contributing Rs 2332170 million, industries Rs 3813670 million and services Rs 7472870 million (Ministry of Finance 2010). India Gross Domestic Product (GDP) expanded 7.90% over the last 4 quarters and is worth 1217 billion dollars or 1.96% of the world economy, according to the World Bank (Trading Economics 2010). After almost 7% growth in 2008/09 fiscal year, in the first three months of 2010 India's economy expanded 8.6% boosted by industrial production and services (Trading Economics 2010).

Total foreign exchange reserve is US$ 277,042 million (as on 26th March 2010) out of which foreign currency assets is US$ 252,755 million (Reserve Bank of India 2010). The 2009 Union budget of India had a total estimated expenditure for 2009-10 as Rs.10208380 million, of which Rs.6956890 million was towards Non Plan and Rs.3251490 million towards Plan expenditure. Total estimated revenue was Rs 6198420 million, including revenue receipts of Rs 6144970 million and capital receipts of Rs 53450 million, excluding borrowings (Union Budget and Economic Survey 2010). The energy production and consumption (from petroleum, natural gas, coal and electricity) of India both show an increasing trend over the last 28 years (Trading Economics 2010), with the primary energy percent annual growth rates projected for 2002 to 2022 as 4.6% (Trading Economics 2010).

There are substantial differences in the per capita per capita State Domestic Product (SDP) between various States of India. Over the last five decades there has been an improvement in the per capita SDP in most of the states, but the rate of improvement varies. States like Punjab, Haryana, Maharashtra have high SDP over Rs.15,000 while States like Bihar has less than Rs 5000 SDP (National Commission on Population 2010).

2.1.4 Economic Sectors

Economic liberalization, including reduced controls on foreign trade and investment, began in the early 1990s and has served to accelerate the country's growth, which has averaged more than 7% per year since 1997. India's diverse economy encompasses

traditional village farming, modern agriculture, handicrafts, a wide range of modern industries, and a multitude of services. Slightly more than half of the work force is in agriculture, but services are the major source of economic growth, accounting for more than half of India's output, with only one-third of its labor force. India has capitalized on its large educated English-speaking population to become a major exporter of information technology services and software workers.

An industrial slowdown early in 2008, followed by the global financial crisis, led annual GDP growth to slow to 6.5% in 2009, still the second highest growth in the world among major economies. India escaped the brunt of the global financial crisis because of cautious banking policies and a relatively low dependence on exports for growth. Domestic demand, driven by purchases of consumer durables and automobiles, has re-emerged as a key driver of growth, as exports have fallen since the global crisis started. India's fiscal deficit increased substantially in 2008 due to fuel and fertilizer subsidies, a debt waiver program for farmers, a job guarantee program for rural workers, and stimulus expenditures. The government abandoned its deficit target and allowed the deficit to reach 6.8% of GDP in FY10. Nevertheless, as shares of GDP, both government spending and taxation are among the lowest in the world. The government has expressed a commitment to fiscal stimulus in FY10, and to deficit reduction the following two years. It has increased the pace of privatization of government-owned companies, partly to offset the deficit. India's long term challenges include widespread poverty, inadequate physical and social infrastructure, limited employment opportunities, and insufficient access to basic and higher education. Over the long-term, a growing population and changing demographics will only exacerbate social, economic, and environmental problems.

From 2005 onwards it is observed that agriculture, power generation, steel, ferrous and non-ferrous metal industries, mining, chemical, pharmaceutical, leather, cement and textile production have shown an increasing trend as given in table 3 (Ministry of Finance 2010).

Table 6: Production Index

Production Index (Index of Industrial Production) Baseline index is 100% in years 93-94 =100 (April 2010)			
Unit of description	**Latest data (Jan 2010 to Mar 2010)**	**Data for previous period**	**Percentage change from previous to latest period**
General	316.7	269.3	17.6
Mining	197	176.9	11.4
Manufacturing	341.5	286.1	19.4
Electricity	246.9	232.9	6
Used-Based Classification			
Capital Goods	508.8	294.4	72.8
Intermediate Goods	307.1	277.2	10.8
Consumer Goods	344.5	301	14.5

Source: Ministry of Finance 2010

2.1.5 Environment and Health Overview

Environment Overview

Major Environmental Issues in India are deforestation; soil erosion; overgrazing; desertification; air pollution in India from industrial effluents and vehicle emissions; water pollution from raw sewage and runoff of agricultural pesticides and ground water contamination. The huge and rapidly growing population is overstraining natural resources.

Presently, the primary concerns of the Ministry of Environment and Forests under the Government structure and Implementation of policies and programmes relates to conservation of the country's natural resources including lakes and rivers, its biodiversity, forests and wildlife, ensuring the welfare of animals and prevention and abatement of pollution.

While implementing these polices and programmes, the Ministry is guided by the principle of sustainable development and enhancement of human well-being. The Ministry also serves as the nodal agency in the country for the United Nations Environment Programme (UNEP), South Asia Co-operative Environment Programme (SACEP), and International Centre for integrated Mountain Development (ICIMOD) and for the follow-up of the United Nations Conference on Environment and Development (UNCED). The Ministry is also entrusted with the issues relating to multilateral bodies such as the Commission on Sustainable Development (CSD), Global Environment Facility (GEF) and of regional bodies like Economic and Social Council for Asia and Pacific (ESCAP) and South Asian Association for Regional Co-operation (SAARC) on matters pertaining to environment.

The broad objectives of the Ministry are:

- Conservation and survey of flora, fauna, forests and wildlife.
- Prevention and control of pollution.
- Afforestation and regeneration of degraded areas.
- Protection of the environment and
- Ensuring the welfare of animals.

These objectives are well supported by a set of legislative and regulatory measures, aimed at the preservation, conservation and protection of the environment. Besides the legislative measures, a Natural Conservation Strategy and Policy Statement on Environment and Development, 1992, National Forest Policy, 1988, a Policy Statement on Abatement of Pollution, 1992 and a National Environment Policy 2006 has also been evolved.

A Government-constituted group at the highest level has identified six priority programme areas, namely urban low cost sanitation, urban waste water management, urban solid waste management including hospital waste management, rural environmental sanitation, industrial waste management and air pollution control, and

strengthening of health surveillance and support services. There are many constitutional provisions and laws pertaining to the environment and its protection and improvement (WHO 2010).

The Central Pollution Control Board (CPCB) regularly formulate programmes and undertake research and development activities covering different thrust areas related to prevention and control of pollution. CPCB had constituted its first Research Advisory Committee in 2002 comprising experts from the leading environmental laboratories of CSIR, Department of Science and Technology and Ministry of Environment & Forests and other eminent scientists for guiding and reviewing the research activities of the organization.

Health Overview

Premature death and illness due to major environmental health risks account for nearly 20 percent of the total burden of disease in India (WHO 2010). India has health risks of both categories: traditional hazards related to poverty and lack of development, such as lack of safe water, inadequate sanitation and waste disposal, indoor air pollution and vector borne diseases; and modern hazards caused by development that lacks environmental safeguards, such as urban air pollution and exposure to agro-industrial chemicals and waste.

The Tenth Plan period witnessed a transition in health care policies and strategies with the effecting of an architectural correction in the healthcare delivery system at the primary and secondary level and the steps taken to set in motion regional balance in the availability of tertiary healthcare facilities. Wide ranging reforms and policy initiatives have been taken for improving health infrastructure and addressing the healthcare needs of the population. Several initiatives have also been undertaken on the disease front to contain morbidity and mortality.

Healthcare is one of the 7 thrust areas under the National Common Minimum Programme (NCMP) and improvement in health continues to be an important part in the overall strategy for socio-economic development over the planning period. The special focus given to Health Sector in the NCMP has formed the core of the programmes formulated under both Health and Family Welfare. The National Rural Health Mission (NRHM) is the key plank for giving effect to the mandate of the NCMP. The NRHM also provides an overarching umbrella to the existing programmes of Health & Family Welfare including RCH-II, Vector Borne Disease Control Programme, TB, Leprosy, NPCB and the Integrated Disease Surveillance Project. It also addresses the issue of health in the context of a sector wide approach encompassing sanitation and hygiene, nutrition and safe drinking water as basic determinants of good health and also advocates greater convergence with related social sector Departments. The core strategies of the Mission include identification and selection of the Accredited Social Health Activist (ASHA), decentralized planning, strengthening of existing infrastructure like sub-centres, PHCs and CHCs, adoption of a sector wide approach, flexible financing, community participation, manpower development and partnership with non-government

stakeholders. Maternal and child health will be given a basic thrust on the programme front. Monitoring would be community based and through stringent internal reviews and external surveys.

The Pradhan Mantri Swasthya Suraksha Yojana (PMSSY) is a major initiative for developing tertiary healthcare in the country, particularly to enable the availability of such facilities on a regional basis. It is also expected to reduce imbalance in human resources development by providing health care services through establishment of medical colleges and an improved delivery of services. Under PMSSY, 6 All India Institute of Medical Science (AIIMS) like institutions are to be set up and 13 medical colleges upgraded.

To tackle the menace of other communicable and non-communicable diseases, the Ministry of Health and Family Welfare continues to implement National Health Programmes throughout the country for Blindness, AIDS, Cancer, Mental Disorders, etc. A Disease Surveillance mechanism is also being put in place for communicable and non-communicable diseases and their risk factors to facilitate quick response and evaluate control strategies. Central Institutions and organisation engaged in health care, medical education and research are continuously being strengthened to tackle the emerging diseases.

The general condition of India's population has improved significantly since the 1990s. The average life expectancy at birth has increased from 59.7 years in 1991 to 63.7 years for males and 60.9 to 66.9 years during the same period for females.

Infant mortality, crude birth rate and death rates have also registered a decline during the period. The strategies put in place in respect of the communicable diseases particularly leprosy and TB has met with sufficient success. In the case of Vector borne Diseases, concerted efforts are being made under the programme while under AIDS, the key strategy has been to build up infrastructure and go in for targeted interventions.

The major areas of current focus include continued high morbidity due to communicable diseases, rising disease burden due to non-communicable diseases and nutritional problems. The unmet need for contraception and high unwanted fertility are the other areas of major concern (India.gov.in 2010).

2.2 Institutional, political and legislative framework

2.2.1 Policies pertaining to Environment and Sustainable Development and general Legislative Framework

Environmental Policy

Environmental considerations have been an integral part of the Indian culture. The need for conservation and sustainable use of natural resources has been expressed in Indian scriptures and is reflected in the constitutional, legislative and policy framework as also

in the international commitments of the country. Prior to India's independence in 1947, several environmental legislations existed but the real impetus for bringing about a well-developed framework came only after the UN Conference on the Human Environment (Stockholm, 1972). Under the influence of this declaration, the National Council for Environmental Policy and Planning within the Department of Science and Technology was set up in 1972 which later evolved into the Ministry of Environment and Forests (MOEF) which is the apex administrative body in the country for regulating and ensuring environmental protection.

The present policies for environmental management are contained in the National Forest Policy, 1988; the National Conservation Strategy and Policy Statement on Environment and Development, 1992; Policy Statement on Abatement of Pollution, 1992; the Wildlife Conservation Strategy 2002; the National Environment Policy, 2006. Some sector policies such as the National Agriculture Policy, 2000; National Population Policy, 2000 and National Water Policy, 2002 have also contributed towards environmental management. All of these policies have recognized the need for sustainable development in their specific contexts and formulated necessary strategies to give effect to such reorganization.

In 2006, India adopted the National Environment Policy (NEP) as a comprehensive policy to mainstream environmental concerns in all development activities. The policy outlines strategies for addressing the key environmental challenges facing the country. It promotes economic efficiency for environmental conservation and internalization of the costs of environmental damages. The dominant theme of NEP is that while conservation of environmental resources is necessary to secure livelihoods and well–being of all, the most secure basis for conservation is to ensure that people dependent on particular resources obtain better livelihoods from the fact of conservation, than from degradation of the resource. The objective of NEP, which relate to current perceptions of the key environmental challenges, are such as conservation of critical environmental resources, intra-generational equity, livelihood security for the poor, inter-generational equity, integration of environmental concerns in economic and social development, efficiency in environmental resource use environmental governance, enhancement of resources for environmental conservation.

The NEP spells out principles for application in environmental governance in the country such as human beings are at the centre of sustainable development, the right to development for all environmental protection is an integral part of the development process, the precautionary approach, economic efficiency, legal liability such as fault based liability and strict Liability, public trust doctrine, decentralization, integration, environmental standard setting, preventive action and environmental offsetting.

To achieve the objectives and the principles, the NEP provides strategies and actions on different themes including regulatory reforms; revising the policy and legislative framework; process related reforms including framework for legal action; substantive reforms such as Environment and Forests clearances, monitoring of compliance, use of economic principles in environmental decision making; enhancing and conserving

environmental resources; land degradation; desert ecosystems; Forests and Wildlife; Biodiversity, traditional knowledge, and natural heritage; freshwater resources such as river systems, groundwater ;mountain ecosystems; coastal resources; pollution abatement such as air pollution, water pollution, soil pollution; conservation of manmade heritage; climate change; Environmental standards, management systems, certification and indicators; environmental management systems, eco-labeling and certification; clean technologies and innovation; environmental awareness, education and information; partnerships and stakeholder involvement; capacity building; research and development, international cooperation.

Sustainable Development Policy

India, since Independence, has followed a planned approach to development, which has not only included the objectives of growth in economic terms, but also the conservation and sustainability of natural resources.

India has been, over the years, signatories of various international environmental agreements relevant to sustainable development including Ramsar Convention on wetlands, Conservation on International Trade in Endangered Species of Wild Fauna and Flora, Montreal Protocol on Ozone Depleting Substances, the Wild life Trade Monitoring Network, Catagena Protocol on Biosafety, Strategic Approach to International Chemicals Management, Basel Convention on the control of Tranboundary Movements of Hazardous Wastes and their Disposal (Basel Convention), Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, United Nations Framework Convention on Climate Change, Kyoto Protocol, Convention on Biological Diversity . India has also been at the forefront in the United Nations Conference on Environment and Development (UNCED), held in Rio de Janeiro in June 1992 and the Johannesburg World Summit on Sustainable Development in 2002. India was among the first countries to enshrine environment protection in its Constitution .This Constitution mandate has been, over the years, translated into series of statutes in the realm of environment.

Sustainable development concerns have been mainstreamed across various sectors of Indian economy through the implementation of the National Environment Policy and sectoral policies in areas like mining, biofuels, urban transport, agriculture and relief and rehabilitation. With concerted efforts to mainstream sustainability in its development policies, India has emerged as a major economy in the world in the 21st century. Economic reforms since 1991 have transformed in to one of the fastest growing economies and have averaged country's growth more than 7% per year since 1997.While pursuing economic growth India remains committed to ensuring that the principles of sustainable development guide our growth strategy.

India has a federal policy with a vibrant parliamentary democracy and a system of independent judiciary. Non-governmental organizations and civil society have also been active. Public Interest litigations have been filed in the Apex court and the High Courts on a environmental issues. The judicial activism has been an important force in

environmental protection in the country. The courts have accepted the doctrine sustainable development such as precautionary principle , polluter pays principles as Law referring to Articles 14, 21, 48-A and 52-A (g) of the Constitution of India.

Over all legal frameworks in India (Source: website of Supreme Court of India)

The Constitution of India is the Supreme Law of the land, providing for the democratic function of the Government of India. It contains 395 Articles and 12 Schedules. India's commitment to law is built in the Constitution which constituted India into a Sovereign Socialist Secular Democratic Republic, securing to all its citizens justice, social, economic and political, liberty of thought, expression, belief, faith and worship –equality of status and of opportunity, containing a federal system with Parliamentary form of Government in the Union and the States, an independent judiciary, guaranteed Fundamental Rights and Directive Principles of State Policy.

The chief source of law in India is the Constitution which, in turn, gives due recognition to statutes, case law and customary law consistent with its dispensations. Statutes are enacted by the Parliament, State Legislatures and Union Territory Legislatures. There is also a vast body of laws known as subordinate legislation in the form of rules, regulations, notifications as well as by-laws made by Central and State Governments and local authorities like Municipal Corporations, Municipalities, Gram Panchayats and other local bodies. This subordinate legislation is made under the authority conferred or delegated either by Parliament or State or Union Territory Legislature concerned.

The Indian Parliament is competent to make laws on matters enumerated in the Union List under Article 246(1). The State Legislatures are competent to make laws on matters enumerated in the State List under 246(3). While both the Union and the States under Article 246(2) have power to legislate on matters enumerated in the Concurrent List, only Parliament has power to make laws under Article 248 on matters not either included in the State List or the Concurrent List. In the event of repugnancy, laws made by Parliament shall prevail over law made by State Legislatures, to the extent of the repugnancy. The State law shall be void unless it has received the assent of the President, and in such case, shall prevail in that State. Moreover Article 253 empowers the Union to make laws implementing India's international obligations as well as any decision made at an international conference, association or other body.

Laws made by Parliament may extend throughout or in any part of the territory of India and those made by State Legislatures may generally apply only within the territory of the State concerned. Hence, variations are likely to exist from State to State in provisions of law relating to matters falling in the State and Concurrent Lists.The Indian Constitution has provided a unified judicial system. It provides for the single integrated judiciary having jurisdiction and providing remedies in all cases arising under the Constitutional Law, the civil or criminal including the environmental Laws. At the apex of the entire judicial system is the Supreme Court of India having jurisdiction all over India, hearing appeals from lower courts including High Courts, hearing petitions involving fundamental rights under the constitution. Below the Supreme Court, there exist a High

Court for each State or group of State and under High Courts; there is a hierarchy of subordinate courts. Each state is divided into judicial districts presided over by a district and sessions judge, who is the principal civil court of original jurisdiction and can try all offences including those punishable with death. He is the highest judicial authority in a district. Below him, there are courts of civil jurisdiction, known in different states as munsifs, sub-judges, civil judges and the like. Similarly, criminal judiciary comprises chief judicial magistrate and judicial magistrates of first and second class.

Constitutional Mandate on Environmental protection

India is one amongst the first few countries in the world that has made provisions for the protection and improvement of Environment in its Constitution such as Articles 47, 48-A and 51(g). Fundamental rights have regulated into the rights to healthy environment from Articles 14, 19 (6) and 21by the Judiciary. The subjects related to environment in the seventh schedule of the Constitution in Union List Entries are 52 ,53,54,56 & 57; State List Entries are 6,14,18,21&23 ; Concurrent List Entries are 17A,17B,20&20A.

In making decentralized environmental management a core area for conservation of natural resources, the constitution of India sanctions to democracy at the grassroot levels through Panchayats and Municipalities.

The constitutional provisions are backed by a number of laws – acts, rules and notifications. India has an elaborate legal framework with over two hundred laws related to environment protection.

Key national Environmental Regulations in India are as follows:-

The Environment (Protection) Act, 1986 (EPA)
The Act is an umbrella legislation which provides a holistic framework for the protection and improvement of environment, is designed to provide a framework for the co-ordination of central and state authorities established under the Water (Prevention and Control) Act, 1974 and Air (Prevention and Control) Act, 1981. Under this act, the central government is empowered to take all such measures as it deems necessary or expedient for the purpose of protecting and improving the quality of environment and preventing, controlling and abating environmental pollution and also take measures necessary to protect and improve the quality of the environment by setting standards for emissions and discharges; regulating the location of industries; management of hazardous wastes, and protection of public health and welfare. From time to time the central government makes rules and issues notifications and guidelines for the matters under the act.

The Environment (Protection) Rules, 1986
These rules lay down the procedures for setting standards of emission or discharge of environmental pollutants from various Industries. The Rules prescribe the parameters for the Central Government, under which it can issue orders of prohibition and restrictions on

the location and operation of industries in different areas. The rules lay down the procedure for taking samples, serving notice, submitting samples for analysis and laboratory reports. The functions of the laboratories are also described under the Rules along with the qualifications of the concerned analysts. The rules also prescribe National Ambient Air Quality Standards in respect of noise which lay down specific standards for industrial, residential, rural and other sensitive areas.

The Environment Impact Assessment Notification, 2006

It lays down that a construction of new projects or activities or the expansion or modernization of existing projects or activities listed in the Schedule to this notification entailing capacity addition with change in process and or technology shall be undertaken in any part of India only after the prior environmental clearance from the Central Government or as the case may be, by the State Level Environment Impact Assessment Authority, duly constituted by the Central Government. There are four stages in impact assessment, viz. screening, scoping (Term of References), Public Consultation and Environmental appraisal. All the projects and activities are broadly categorized into two categories – Category 'A' and Category 'B' based on the spatial extent of potential impacts on human health and natural and man made resources . Moreover, Category 'A" projects/activities would be appraised at the Central Level by Expert Appraisal Committee (EAC) while Category 'B' Projects/activities would be appraised at the State Level Expert Appraisal Committee (SLEAC). Based on the recommendations of the EAC/SLEAC, the project is either granted the environmental clearance subject to certain conditions or rejected it.

The Coastal Regulation Zone Notification, 2011

The main objectives of the notifications are to ensure livelihood security to the fishing communities and other local communities living in the coastal areas, to conserve and protect coastal stretches and to promote development in a sustainable manner based on scientific principles, taking in to account the damages of the natural hazards in the coastal areas and sea level rise due to global warming. It regulates activities along coastal stretches and restricts the setting up and expansion of any industry, operations or processes and manufacture or handling or storage or disposal of hazardous substances as specified under the rules made under EPA in the Coastal Regulation Zone (CRZ).

The Water (Prevention and Control of Pollution) Act, 1974

This Act represented India's first attempts to comprehensively deal with environmental issues. The Act prohibits the discharge of pollutants into water bodies beyond a given standard, and lays down penalties for non-compliance. It set up the CPCB (Central Pollution Control Board) which lays down standards for the prevention and control of water pollution. At the State level, the SPCBs (State Pollution Control Board) function under the direction of the CPCB and the state government.

The Water (Prevention and Control of Pollution) Cess Act, 1977

This act provides for a levy and collection of a cess on water consumed by industries and local authorities. It aims at augmenting the resources of the central and state boards for

prevention and control of water pollution. Following this Act, The Water (Prevention and Control of Pollution) Cess Rules were formulated in 1978 for defining standards and indications for the kind of and location of meters that every consumer of water is required to install.

The Water (Prevention and Control of Pollution) Rules, 1975
The rules provide for the power to take samples, application for consent, procedure for making inquiry into application for consent and manner of giving notice etc.

The Air (Prevention and Control of Pollution) Act, 1981
To counter the problems associated with air pollution, ambient air quality standards were established, under the 1981 Act. The Act provides means for the control and abatement of air pollution. The Act seeks to combat air pollution by prohibiting the use of polluting fuels and substances, as well as by regulating appliances that give rise to air pollution. Under the Act establishing or operating of any industrial plant requires consent from state pollution control boards/Pollution Control Committee (In case of Union Territories). The boards are also expected to test the air in air pollution control areas, inspect pollution control equipment, and manufacturing processes. The boards are also authorized to take immediate measures to tackle such emergencies and recover the expenses incurred from the offenders. The power to cancel consent for non-fulfillment of the conditions prescribed has also been emphasized in the Air Act Amendment.

National Ambient Quantity Standards (NAAQS)
The National Ambient Air Quality Standards is revised under the Air (Pollution and Control) Act, 1981 by the Central Pollution Control Board (CPCB), a statutory authority of the Ministry of Environment and Forests on 18th November, 2009. The NAAQS are deemed to be levels of air quality necessary with an adequate margin of safety to protect health, vegetation and property (MOEF 2010, *WSSD*). The NAAQS prescribe specific standards for industrial, residential, rural, and other sensitive area. Industry –specific emission standards have also been developed .The ambient quality standards prescribed in India are similar to those prevailing in many developed and developing countries.

The Air (Prevention and Control of Pollution) Rules, 1982
The rules define the procedures for conducting meetings of the boards, the powers of the presiding officers, decision-making, the quorum; manner in which the records of the meeting were to be set etc. They also prescribed the manner and the purpose of seeking assistance from specialists and the fee to be paid to them.

The Air (Prevention and Control of Pollution) (Union Territories) Rules, 1983
The rules provide for manner of declaration of air pollution control area, procedure for making enquiry on application seeking consent, furnishing of information by the occupier, manner of taking samples etc.

The Hazardous Wastes (Management, Handling and Tranboundary Movement) Rules, 2008,

The rules cover waste and hazardous waste ; waste constituent with concentration limit (BASEL Convention); authorization on handling and storage with proper recording ; comprehensive record of sales ,transfer and recycling ; registration of recycling and reprocessing facilities with CPCB ; import only for recycling and recovery ; export allowed to only actual users /disposal facilities with prior informed consent of the importing country ;guidelines for standalone Transportation Storage and Disposal ;packing ,labeling and transportation of hazardous waste .

The Manufacture, Storage and Import of Hazardous Chemical Rules, 1989

It is primarily aimed at providing procedures and safeguards for handling of hazardous chemicals at a site (industry, isolated storage, and pipeline) and lays down requirements for the industries and authorities to manage chemicals emergencies. It provides procedure for notification of major accident, prior approval and notifications of sites, preparation of on-site emergency plan by the occupier ,preparation of off-site emergency plans by the authority .

The Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996

It is aimed at providing administrative structure at different levels such as national, state, district and local levels for effective planning, preparedness and responses to chemicals accidents and also ensuring availability of information to the public likely to be affected by an accident.

The Rules for the Manufacture, Use, Import, Export and Storage of Hazardous Micro-organisms/Genetically Engineered Organisms or Cells, 1998

It introduces with a view to protect the environment, nature and health, in connection with the application of gene technology and microorganisms.

The Bio-Medical Waste (Management and Control) Rules, 1998

The rules lay down that it is binding on the health care institutions to streamline the process of proper handling of hospital waste such as segregation, disposal, collection and treatment. It lays down that the bio-medical waste shall be treated and disposed of in according with Schedule –I and in compliance with the standards prescribed in Schedule V. It also covers the responsibility of Municipal bodies or Urban Local Bodies and occupiers responsibilities in case of common disposal /Incineration sites.

The Noise Pollution (Regulation and Control) Rules, 2000

The rules seek to regulate and control generation of noise from various sources, such as industry, construction, generator sets, loud speakers, music, vehicles etc. The rules provide for penalties for violations of their provisions.

The Ozone Depleting Substances (Regulation and Control) Rules, 2000

The rules lay down regulation of production and consumption of ozone depleting substances, prohibition on export to or import from countries not specifies in Schedule VI, regulation of the sale/purchase/use /reclamation /destruction of ozone depleting

substances etc. It also calls for monitoring and reporting.

The Municipal Solid Wastes (Management and Handling) Rules, 2000

The rules apply to every municipal authority responsible for collection, segregation, storage, transportation, processing, and disposal of municipal solid wastes. It also lays down that the waste processing and disposal facilities to be set up by the municipal authority on their own or through an operator of a facility shall meet the specifications and standards as specified in schedules III and IV.

The Batteries (Management and Handling) Rules, 2001

The rules shall apply to every manufacturer, importer, re-conditioner, assembler, dealer, auctioneer, consumer, and bulk consumer involved in the manufacture, processing, sale, purchase, and use of batteries or components so as to regulate and ensure the environmentally safe disposal of used batteries.

The Recycled Plastics (Manufacture & Usage) Rules, 1999

The rules provides for definition of Plastic carry bags ,banning of manufacture, use, stock & sale of carry bags made of virgin or recycled plastic below 8x12 inches in size (as well as below 20 microns thickness) and mandatory registration of units manufacturing plastic carry bags with SPCBs . However, a new rule namely the Plastics (Manufacture, Usage and Waste Management) Rules, 2010 is being drafted and will come into force soon.

The Fly Ash Notification, 1999

The Notification provides for use of fly ash, bottom ash or pond ash in the manufacture of bricks and other construction activities; procedure for utilization of ash by thermal power plants etc.

The National Green Tribunal Act, 2010

The act provides for the establishment of National Green Tribunals for the effective and expeditious disposal of forests and other natural resources including enforcement of any legal right relating to environment and giving relief and compensation for damages to persons and property and for matters connected therewith or incidental thereto .

The Wildlife (Protection) Act, 1972

The act provides for protection to listed species of flora and fauna and establishes a network of ecologically-important protected areas. The act empowers the central and state governments to declare any area a wildlife sanctuary, national park or closed area. There is a blanket ban on carrying out any industrial activity inside these protected areas. It provides for authorities to administer and implement the Act; regulate the hunting of wild animals; protect specified plants, sanctuaries, national parks and closed areas; restrict trade or commerce in wild animals or animal articles; and miscellaneous matters. The Act prohibits hunting of animals except with permission of authorized officer when an animal has become dangerous to human life or property or as disabled or diseased as to be beyond recovery.

The Indian Forest Act, 1927

The act is to consolidate the law relating to forests, the transit of forest-produce and the duty leviable on timber and other forest-produce. The act empowers the state government to declare any land a reserved forest, protected forests. The State government may regulate or prohibit in any forest or waste-land.

The Forest (Conservation) Act, 1980

The basic objective of the Act is to regulate the indiscriminate diversion of forest land for non-forestry uses and to maintain a ecological balance between the developmental needs of the country and the conservation of natural heritage. Prior approval of the competent authority is essential for diversion of forest land for non-forestry purposes under the act .Guidelines are issued under the Act, from time to time to simplify the procedures, cut down delays, and to make the Act more user-friendly.

The Biological Diversity Act, 2002

The Act is to provide for the conservation of the biological diversity, sustainable use of its components, and fair and equitable sharing of the benefits arising out of the used biological resources, knowledge and for matters connected therewith or incidental thereto.

The Factories Act, 1948

It is intended to ensure the safety, health and welfare of the workers employed in factories, and also to a certain extent, of the people and the environment located in the vicinity of the factory. The Act covers workers potentially exposed to hazardous substances while at work including establishing maximum permissible threshold limits of exposure for the chemicals and toxics.

The National Disaster Management Act, 2005

The act is to provide the effective management of disasters and matters connected therewith or incidental thereto. It deals with creation of national, state and district Disaster Management Authority (DMA), as measures by the government for disaster management and creation of National Institute of Disaster Management (NIDM) for managing both natural and industrial disasters.

The Public Liability Insurance Act (PLIA), 1991

The act provides for public liability insurance for the purpose of providing immediate relief to the persons affected by accident occurring while handling hazardous substances and for matters connected to it. It lays down duty on the owner to take out insurance policies and imposes liability to give relief, claim and award of relief, establishment of environment relief fund, power to make applications to courts for restraining the owner from handling hazardous substances and provides for dealing with offences by the government departments.

The Public Liability Insurance Rules, 1991
The rules provide for application for relief, establishment and administration of fund, manner of giving notice, extent of liability, and contribution of owner to the environmental relief fund.

The Railways Red Tariff Rules, 1960
The Railways Red Tariff Rules, 1960 lay down procedure and conditions for the carriage by rail of dangerous goods.

The Central Motor Vehicles Rules, 1989
The rules issued under the Motor Vehicles Act, 1988, regulate the transport of dangerous and hazardous goods by road, with a view to preventing accidents.

The Indian Explosives Act, 1884
The act regulates the manufacture, possession, use, sale, transport, export and import of the explosives.

The Petroleum Act, 1934
The act regulates the import, transport, storage, production, refining and blending of petroleum.

The Insecticides Act, 1968
It is enacted to regulate the import, manufacture, sell, transport, distribution and use of insecticides with a view to prevent risk to human beings or animals and for matters connected therewith. However, the Pesticides Management Bill 2008 is in process of becoming an act in supersession of the existing act namely the Insecticides Act,1968 for better regulation of import, manufacture, export, sale, transport, distribution, quality and use of pesticides with a view to control pests, ensure availability of quality pesticides, allow its use only after assessing its efficacy and safety, minimize the contamination of agricultural commodities by pesticide residues, create awareness among users regarding safe and judicious use of pesticides, and to take necessary measures to continue, restrict or prohibit the use of pesticides on reassessment with a view to prevent its risk on human beings, animals or environment, and for matters connected therewith or incidental thereto.

The Insecticides Rules, 1971
The rules lay down the procedure for registration of insecticides, publication of refusal to register or cancelation of certificate of registration licenses to manufacture insecticides, segregation and disposal of date-expired pesticides, prohibition against sale or storage of insecticides in certain places, packing and labeling, duties of insecticides inspector etc.

The Prevention of Food Adulteration Act,1955
It establishes maximum residue limits for pesticides in food and food articles and prevent food adulteration.

The Dock Workers (Safety, Health and Welfare) Act, 1986
The act prescribes for the safety of Dock workers including handling of dangerous goods.

The Poisons Act, 1919
The act regulates the import, possession and sale of poisons.

The Mines Act, 1952
The act is to amend and consolidate the law relating to the regulation of labour and safety in mines.

The Drug and Cosmetics Act, 1940
The act regulates the import, manufacture, sale distribution and quality standards of drugs and cosmetics, including insecticides.

The Customs Act, 1962
The act is to prevent import and export of illegal hazardous goods or banned goods including hazardous or banned chemicals.

The Indian Ports Act, 1908
The act provide for control of activities on ports including safety of shipping and conservation of ports.

Indian Penal Code(IPC) ,1860
It makes various acts affecting environment as offences. It can be used to prevent pollution of atmosphere. Thus no trade, business or manufacturing process can be carried out in residential area which produces noxious and offensive smell.

Chapter XIV of IPC containing Sections 268 to 290 deals with offences affecting the public health, safety, convenience, decency and morals. Its object is to safeguard the public health, safety and convenience by causing those acts punishable which make environment polluted or threaten the life of the people.

The Criminal Procedure Code, 1893
It provides some of the very strict punishments for the environmental offences under the criminal law. Sections 133 to 144 in the Chapter XII of the Criminal Procedure under the heading Public Nuisance provides for the punishment under criminal procedure for the commission of any nuisance, which affects the public at large. The environmental degradation is also included in it as any degradation of the environment is automatically supposed to be affecting the public at large.

The Foreign Trade (Development and Regulation) Act, 1992
An Act provides for the development and regulation of foreign trade by facilitating imports into, and augmenting exports from India and for matters connected therewith or incidental thereto.

2.2.2 Existing Legislation and regulations addressing Chemicals including POPs

Regarding chemicals, legislation in India is fairly comprehensive capturing various stages of chemicals lifecycles through different legal instruments. However, due to cross - sectoral nature of chemical management, several pieces of legislation, regulations or standards in the country address chemicals in different ways. Additionally, there are specific legal instruments dealing with a particular category of chemicals, such as pesticides, petroleum, explosives, Industrial Chemicals etc.

Broadly production, use, import and export, packing, storage, transportation of pesticides and Industrial Chemicals and Chemicals Wastes related to POPs chemicals are regulated and managed in India under the following Acts/ Rules / Notifications given in table 4.

Table 4: References to Existing Legal Instruments which address the Management of POPs

S. No.	Category of Chemical	Relevant Legal Instruments	Actions being taken
1	Pesticides	• The Insecticides Act, 1968 • The Insecticides Rules, 1971 • The Manufacture Storage and Import of Hazardous Chemicals Rules, 1989 • The Factories Act, 1948 • The Water Act, 1974 • The Air Act, 1981 • The Central Motor Vehicles Rules, 1989 • The Environment(Protection) Act,1986 • The Chemical Accidents (Emergency Planning, Preparedness and Response)Rules, 1996 • The Public Liability Insurance Act, 1991 • The Public Liability Insurance Rules, 1991 • The Environmental Impact Assessment Notifications, 2006 • The Customs Act ,1962	Reviewing and strengthening the existing laws so as to achieve convention implementation goals.
2	Industrial Chemicals	• The Manufacture Storage and Import of Hazardous Chemicals Rules, 1989 • The Factories Act, 1948 • The Water Act, 1974 • The Air Act, 1981 • The Central Motor Vehicles Rules, 1989	

		• The Environment Protection Act ,1986 • The Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996 • The Public Liability Insurance Act, 1991 • The Public Liability Insurance Rules, 1991 • The Environment Impact Assessment Notifications ,2006 • The Customs Act ,1962	
3	Chemicals Wastes	• The Insecticides Act, 1968 • The Factories Act, 1948 • The Air Act, 1981 • The Water Act, 1974 • The Central Motor Vehicles Rules, 1989 • The Hazardous Wastes (Management , Handling and Transboundary Movement) Rules, 2008 • The Environment (Protection) Act, 1986	
4	Unintentionally Produced Chemicals		Reviewing and strengthening the existing laws and if required, to be developed a regulatory framework with a goal of the reduction and /or control of unintentional POPs chemicals

The table 5 given below are the detailed of acts /rules /notifications of the table mentioned above relevant to the management of intentional POPs chemicals. In this table the legal instruments are covered which address POPs chemicals in one –way or the other. For each legal instrument, responsible ministries or bodies, chemicals use categories, objective of legislation relevant to the management of POPs chemicals are discussed.

Table 5: Detailed of acts /rules /notifications

S. No.	Legal Instrument (Type, Reference, Year)	Responsible Ministries or Bodies	Chemical Use Categories /Chemical Byproducts	Objective of Legislation	Relevant Provisions
1.	The Air (Prevention and Control of Pollution) Act,1981 and amended till date	Central Pollution Control Board(CPCB), State Pollution Control Boards (SPCB) and Pollution Control Committees (PCC) in Union Territories (UT)	Air pollutants from chemical industries	Prevention, control and abatement of air pollution	Section 2: Definitions Section 21: Consent from State Boards Section 22: Not to allow emissions exceeding prescribed limits Section 24: Power of entry and inspection Section 25: Power to obtain

					information Section 26: Power to take samples Sections 37 - 43:Penalties and procedures
2	The Water (Prevention and Control of Pollution) Act, 1974 amended 1988	CPCB, SPCB and PCC for UT	Water pollutants from water polluting industries	Prevention and control of water pollution and also maintaining or restoring the wholesomeness of water bodies	Section 2: Definitions Section 20: Power to obtain information Section 21: Power to take samples Section 23: Power of entry and inspection Section 24: Prohibition on disposal Section 25: Consent from the State Board Section 27: Refusal or withdrawal of consent by the State Boards Sections 41-49: Penalties and procedures
3.	The Environment (Protection) Act, 1986	Ministry of Environment & Forests (MoEF), CPCB, SPCB and PCC for UT	All types of environmental pollutants	Protection and Improvement of the Environment	Section 2: Definitions Section 6:- to make rule for procedure , safeguards, prohibition and restrictions of handling of hazardous substances Section 7: Not to allow emission or discharge in excess of prescribed standards Section 8: Handling of hazardous substances Section 10: Power of entry and inspection Section 11: Power to take samples Section 15 - 19:Penalties and procedures
4.	Environmental (Protection) Rules, 1986	MoEF, CPCB, SPCB and PCC for UT	All types of environmental pollutants	Protection and Improvement of the Environment	Rule 3: prescribe standards for emission or discharge of environmental pollutions
5.	Environment Impact Assessment Notification ,2006	MoEF, State/Union territory Environment Impact Assessment Authority (SEIAA), SPCB and PCC for UT	Chemicals /Pollutions expected to be generated from Industrial activities	Requirement of environmental Clearance before establishment /any industries or operation and process mentioned in the schedule	Schedule : List of Project or activities requiring prior Environmental Clearance
6.	Hazardous Waste(Manage-ment ,Handling	MoEF, CPCB, SPCB, Directorate General of Foreign	Hazardous wastes generated from	Management ,handling and Transboundary	Rule 2: Application Rule 3: Definitions Rule 4: Responsibility of

	and Transboundary) Rules, 2008	Trade (DGFT),Port Authority and Customs Authority	industries using hazardous chemicals	Movement of hazardous wastes in line with the Basel Convention	the occupier and operator of a facility for handling of wastes Rule 5: Grant of authorization for handling hazardous wastes Rule 6: Power to suspend or cancel an authorization Rule 7: Storage of Hazardous Waste Rules 12-17: Import and export of hazardous wastes Rule 18: Treatment ,Storage and Disposal Facility for Hazardous wastes Rules 19-21: Packaging, labelling and transport of hazardous wastes Schedule –VII : List of authorities and corresponding duties
7.	Manufacture, Storage and Import of Hazardous Chemical Rules, 1989	MoEF, Chief Controller of Imports and Exports, CPCB, SPCB, PCC, Chief Inspector of Factories, Chief Inspector of Dock Safety, Chief Inspector of Mines, Atomic Energy Regulatory Board (AERB), Chief Controller of Explosives, District Collector or District Emergency Authority, Centre for Environment & Explosive Safety (CEES) under Defence Research & Development Organisation (DRDO)	Hazardous chemicals - Toxic, Explosive, Flammable and Reactive ; listed in Schedule – I (Part II), Schedules-2,3,4	Regulate the manufacture, storage and import of hazardous chemicals	Rule 2: Definitions Rule 4: Responsibility of the occupier Rule 5: Notification of major accidents Rules 7 - 8: Approval and notification of site and updating Rules 10 - 11: Safety Reports and Safety Audit reports and updating Rule 13: Preparation of onsite Emergency Plan Rule 14: Preparation of offsite Emergency Plan Rule 15: Information to persons likely to get affected Rule 16: Disclosure of information Rule 17: Material Safety Data Sheets Rule 18: Import of hazardous chemicals Schedule 5 : List of authorities and corresponding duties
8.	Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996	Central Crisis Group (CCG), State Crisis Group (SCG), District Crisis Group (DCG), Local Crisis Group (LCG) and Major Accident	Hazardous chemicals - Toxic, Explosive, Flammable and Reactive & listed in	Emergency planning preparedness and response to chemical accidents	Rule 2: Definitions Rule 5: Functions of CCG Rule 7: Functions of SCG Rule 9: Functions of DCG Rule 10: Functions of LCG

		Hazard (MAH) Units	Schedule – I (Part II), Schedules-2,3,4		
9.	Public Liability Insurance Act, 1991 amended till date	MoEF, District Collector	Hazardous Substances	To provide immediate relief to persons affected by accident involving hazardous substances	Section 2: Definitions Section 3: Liability to give relief in certain cases on principle of no fault Section 4: Duty of owner to take out insurance policy Section 7A: Establishment of Environmental Relief Fund (ERF) Section 14 - 18: Penalties and Offences
10.	Public Liability Insurance Rules, 1991	MoEF, District Collector	Hazardous Substances	To provide immediate relief to persons affected by accident involving hazardous substances and also for Establishing an ERF	Rule 2: Definitions Rule 6: Establishment of administration of fund Rule 10: Extent of liability Rule 11: Contribution of the owner to ERF
11.	The Insecticides Act, 1968	Ministry of Agriculture, Central Insecticides Board, and Registration Committee	Insecticides including fungicides and weedicides	Regulate the import, manufacture, sale, transport, distribution and use of insecticides with a view to prevent risk to human beings or animals	Section 3: Definitions Section 9: Registration of Insecticides Section 13: Grant of License Section 17: Prohibition of import and manufacture of certain insecticides Section 18: Prohibition of sale etc. of certain insecticides Section 25: Confiscation Section 26: Notification of poisoning Section 27: Prohibition of sale etc. of insecticide for reasons of public safety Section 28: Notification of cancellation of registration, etc. Section 29: Offences and Punishment
12.	The Insecticides Rules, 1971	Ministry of Agriculture, Central Insecticides Board, and Registration Committee	Insecticides including fungicides and weedicides	Regulate the import, manufacture, sale, transport, distribution and use of insecticides with a view to prevent risk to	Rule 2: Definition Rule 6: Manner of registration Rule 9: License to manufacture insecticides Rule 10: License for sale etc. of insecticides Rule 10A: Segregation and disposal of date-expired

				human beings or animals	pesticides Rule 10C: Prohibition against sale or storage of insecticides in certain places Rule 15: Issuing cash memo and maintenance of records Rule 16: Prohibition of sale or distribution unless packed and labelled Rule 17: Packaging of insecticides Rule 18: Leaflet to be contained in a package Rule 19: Manner of labelling Rule 20: Prohibition against altering inscriptions etc. on containers, labels or wrappers of insecticides Rule 35: Manner of packing, storage while on transit by rail Rule 36: Conditions to be specified for storage of insecticides Rule 37: Medical examination Rule 38: First-aid measures Rule 39: Protective clothing Rule 40: Respiratory devices Rule 41: Manufacturers etc. to keep sufficient quantities of antidotes and first-aid medicines Rule 42: Training of workers Rule 43: Aerial spraying operations Rule 44: Disposal of used packages, surplus materials and washings of insecticides
14.	Factories Act, 1948	Ministry of Labour, Directorate General, Factory Advice Service and Labour Institutes (DGFASLI) and Directorate of Industrial Safety and Health/Factories Inspectorate	Chemicals as specified in the Table	Control of workplace environment, and providing for good health and safety of workers	Section 2: Interpretation Section 6: Approval, licensing and registration of factories Section 7A: General duties of the occupier Section 7B: General duties of manufacturers etc., as regards articles and substances for use in factories

					Section 12: Disposal of wastes and effluents Section 14: Dust and fume Section 36: Precautions against dangerous fumes, gases etc. Section 37: Explosion or inflammable dust, gas etc. Chapter IVA: Provisions relating to hazardous processes Section 87: Dangerous operations Section 87A: Power to prohibit employment on account of serious hazard Section 88: Notice of certain accident Section 88A: Notice of certain dangerous occurrences Chapter X: Penalties and procedures
15.	The Central Motor Vehicles Rules, 1989	Ministry of Shipping, Road Transport and Highways	Hazardous and dangerous goods	To consolidate and amend the laws relating to motor vehicles including regulating the transportation of dangerous goods with a view to preventing loss of life or damage to the environment	Rule 2: Definition Rule 9: Educational qualification for drivers of goods carriages carrying dangerous or hazardous goods Rule 129: Transportation of goods of dangerous or hazardous nature to human life Rule 129A: Spark arrestors Rule 130: Manner of display of class labels Rule 131: Responsibility of the consignor for safe transport of dangerous or hazardous goods Rule 132: Responsibility of the transporter or owner of goods carriage Rule 133: Responsibility of the driver Rule 134: Emergency Information Panel Rule 135: Driver to be instructed Rule 136: Driver to report to the police station about accident Rule 137: Class labels
16.	The Customs Act, 1962	Central Board of Excise and Customs (CBEC), Ministry of	Hazardous goods	To prevent entry of illegal hazardous	Section 2: Definitions Section 11: Power to prohibit importation or

		Finance		goods or banned goods including hazardous or banned chemicals	exportation of goods

2.2.3 Roles and Responsibilities of various Ministries, Agencies and Other Governmental and non governmental Institutions Involved in POPs Management

The Ministry of Environment and Forests (MoEF) is the focal point in the Government of India for all matters relating to the environment and also for the Stockholm Convention on Persistent Organic Pollutants and Global Environment Facility (GEF). As the nodal Ministry, its first and foremost responsibility is to ensure coordination with all other Ministries that come into the picture. The Ministry is also the nodal agency at the Central level for planning, promoting and coordinating the environmental programs apart from policy formation. The Ministry is mandated to protect India's land, air and water systems, and is responsible of the prevention and control of pollution, including hazardous substances. The MOEF is empowered to promulgate rules under the Environment Protection Act and also under various Acts and is responsible for ensuring effective implementation of legislation; monitoring and control of pollution (including pesticide levels in soil and water); environmental clearances for industrial and development projects; environmental research ; promotion of environmental education, training and awareness; and coordination with concerned agencies at the national and international level; Forest Conservation development and Wildlife protection . The MOEF establishes standard for the quality of the environment, including emissions and/or discharges of environmental pollutants from various sources. The MOEF is the nodal Ministry for the management of chemical disasters in India, and has powers to establish procedures and safeguards for the prevention of accidents that may cause environmental pollution. The MOEF can issue direction for the closure and prohibition or regulation of an industry, operations or processes. For Construction of new projects or activities / the expansion or modernization of existing projects or activities entailing capacity addition with change in process and technology are required environmental clearance from MoEF in case of category A project including POPs chemicals under Environmental Impact Assessment Notification ,2006 issued under the Environment (Protection) Act, 1986.

The Central Pollution Control Board (CPCB): The executive responsibility is for the industrial pollution prevention and control are practically executed by the Central Pollution Control Board at the central level which is a statutory authority attached to the Ministry of Environment and Forests(MoEF) . The CPCB advises the central Government on matters concerning prevention, control and abetment of water and air pollution, and assists in the establishment of standards for water and air quality. The CPCB assists in ensuring compliance with the Environment Protection Act and develops nation-wide programs for the prevention, control and abatement of water and air pollution.

The State Pollution Control Boards (SPCBs)/Pollution Committee (for Union Territories)

They are the designated agencies to protect India's land, air and water systems at the state level. The SPCBs monitor emission levels and are responsible for enforcement, including initiating legal action against defaulters, of the provisions of the Water and Air Pollution Acts, and the Environmental Protection Act , the Public Liability Act and other relevant acts . The SPCBs authorize the establishment of waste processing and disposal facilities, and oversee compliance of the Hazardous Waste Rules, including providing authorization for the operation of a facility that deals with hazardous waste within their respective states. The SPCBs advises the state government on prevention, control and abetment of water and air pollution and setting of industries ; provides consent for the establishment of any industries ,process or operation ; advises industry on pollution prevention processes and are responsible for establishing emergency response centers to manage chemical disasters in coordination with the CPCB. Any industry intends to manufacture, store, use of any chemicals including hazardous wastes, needs to obtain Consents / Authorization from the concerned State Pollution Control Board / Pollution Control Committee. In the Consents / Authorization issued to the manufacturing units, the name of products handled with quantities is specifically mentioned. Hence these rules and procedures of issuing the Consents can restrict the manufacturing, storing and importing of POP Chemicals.

Ministry of Family Health and Welfare

The Ministry of Family Health and Welfare determines and manages the risks from chemicals in consumer products and foods in India . The Ministry, the only authorized user of DDT(one of the POPs chemicals) in India, mandates the amount and use of DDT for health programs for the control of insect vectors that vary malaria and kala-azar. The Ministry oversees the National Anti-Malaria Program (NAMP), leading a government committee that develops an annual disease eradication plan based on input from State Health Departments. The Ministry purchases supplies from Hindustan Insecticides Limited (HIL), a public sector industry that is the only authorized producer of DDT in India.The Ministry sets permissible residue limits in foods, under *The Prevention of Food Adulteration and Safety Rules*. The focus is food safety, and risk assessment is undertaken on the basis of technical data provided by manufacturers, research studies and the review of levels established under North American and European standards. The Prevention of Food Adulteration Authority administers the Act through Food Inspectors in the respective State Health Administrations who are responsible for enforcement of the Act. Responsibility for monitoring the level of pesticides in edible items is shared jointly by the Ministry of Health and Family Welfare, the Ministry of Agriculture and the MOEF respectively.

The State Health Departments

They control shipment, storage and distribution of DDT authorized for use for public health purposes. The States also oversee the application of DDT, including the hiring and training of seasonal laborers. The states are also responsible for disposal of date-expired pesticides used in health programs.

Department of Chemicals and Petrochemicals
The Department of Chemical and Petrochemicals has been the part of the Ministry of Chemicals and Fertilizers, Government of India and is responsible for policy, planning, development and regulation of the chemical, petrochemical and pharmaceutical industries. The Ministry is administratively responsible for Hindustan Insecticides Limited manufacturing DDT.

Ministry of Labour
The Ministry of Labour is mandated to protect the health, prevent injuries to and save lives of workers in India. The Ministry works with the State Departments of Labour to regulate chemical safety in the workplace, including the establishment of permissible exposure limits and standards for the control of chemical exposure hazards to workers in most industries. The Factory Advice Service and Labour Institutes Division advise Central and Stage Governments on the administration of the Factories Act and coordinates factory inspection services in the States.

Ministry of Foreign Affairs:
The ministry is responsible for the administration of foreign affairs within the Indian Government and supervises the execution of State foreign policies and also protect India's interest, both at home and abroad on a wide variety of issues . These include bilateral political and economic cooperation, trade and investment promotion ,cultural interaction ,press and media liaison as well as a whole host of multilateral issues . The Ministry is participating in international negotiations related to treaties including the Stockholm Convention on POPs.

Ministry of Power
The Ministry is primarily responsible for the development of electrical energy and concerned with perspective planning, policy formation, processing of projects for investment decision ,monitoring of the implementation of the power projects ,training and manpower development and the administration and enactment of legislation in regard to thermal, hydro power generation ,transmission and distribution .The Ministry is dealing with PCBs in the power sector .

Directorate General of Foreign Trade
Directorate General of Foreign Trade has been the part of Ministry of Commerce and Industry, GOI and is responsible for the formulation of exim guidelines and principles for Indian importers and Indian exporters of the country. Before 1991, DGFT was known as the Chief Controller of Imports & Exports (CCI&E).

Central Board of Excise and Customs (CBEC)
Central Board of Excise and Customs (CBEC) is a part of the Department of Revenue under the Ministry of Finance, Government of India. It deals with the tasks of formulation of policy concerning levy and collection of Customs and Central Excise duties, prevention of smuggling including prevention of entry of illegal hazardous goods and banned goods and administration of matters relating to Customs, Central Excise and Narcotics to the extent under CBEC's purview. The Board is the administrative authority

for its subordinate organizations, including Custom Houses, Central Excise Commissionerates and the Central Revenues Control Laboratory.

Ministry of Roads Transport & Highways
An apex organization under the Central Government is entrusted with the task of formulating and administering, in consultation with other Central Ministries/Departments, State Governments/UT Administrations, organizations and individuals, policies for Road Transport, National Highways and Transport Research with a view to increasing the mobility and efficiency of the road transport system in the country. The ministry is responsible for the transportation of hazardous and dangerous chemicals by roads including the POPs chemicals.

Ministry of Urban Development
The Ministry of Urban Development is responsible for formulating policies, supporting programs, monitoring programs and coordinate the activities of various Central Ministries, State Governments and other nodal authorities in so far as the relate to urban development concerning all the issues in the country .

Ministry of Water Resources
The Ministry is responsible for laying down policy guidelines and programmes for the development and regulation of country's water resources, and is also important for the management and elimination of POPs chemicals.

Ministry of Railways
The Ministry is responsible for transportation of hazardous chemicals through rail and storage at railways go downs.

The Ministry of Agriculture (MOA)
The Ministry of Agriculture, the nodal ministry for dealing with pesticides, is responsible for assessing the benefits and hazards of pesticides, encouraging proper use of pesticides and developing alternatives to pesticides. Three main bodies are under the MOA to regulate pesticides; 1) the Central Insecticides Board is responsible for developing policies regarding pesticides; 2) the Registration Committee is responsible for the registration of pesticides for manufacture, import and export; and 3) the Central Insecticides Laboratory is responsible for quality control, safety, packaging and efficacy of pesticides.

The MOA carries out research and technology development at the Pesticide Research Institute and the Indian Council of Agricultural research. As well, the MOA promotes sustainable agriculture and Integrated Pest Management (IPM) practices, including biological and cultural control systems, with a goal of implementing IPM programs throughout India.

The State Departments of Agriculture

The Departments grant licenses for production of pesticides under central regulations, and Insecticide Inspectors are responsible for enforcement of the Insecticide Act, including implementing pesticide bans and ensuring non-registered products are not used. As well, training for users of pesticides through extension programs is the responsibility of state authorities.

The Council of Scientific and Industrial Research (CSIR)

CSIR which aids the Government of India has 38 research and development laboratories in various disciplines, several of their activities related to chemical safety and environmental management. The Government of India has also involved a great number of public organizations, such as Industrial Associations, environmental protection societies and medical societies which have shown great interest in the sound management of chemicals ; these organizations may be instrumental in promoting schemes to introduce Best Available Techniques (BAT) and Best Environmental Practices (BEP) into various sectors of Indian industry ;some of them have also undertaken monitoring programme related to estimating levels of pesticides ,metals etc. generating public awareness

2.2.4 International Commitments and Obligations

India has been actively involved in environmental protection at International forums and is a member of almost all major Multilateral Environmental Agreements (MEAs). There are more than 21 major MEAs under four clusters, namely Nature conservation, Hazardous material, Atmospheric emission and Marine environment, to which India is a signatory. The MEAs which are related to the Stockholm Convention include the Basel Convention on the control of Tranboundary Movements of Hazardous Wastes and their Disposal (Basel Convention) and the Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (Rotterdam Convention).

The Basel Convention requires minimizing hazardous waste at source; strictly controlling the tranboundary movement of hazardous waste; and ensuring that the hazardous wastes are disposed of in an environmentally sound manner. The Convention requires that a prior informed consent system be put in place to control and monitor the transboundary movement of hazardous waste among the Parties to the Convention on March 15, 1990, India signed the Basel Convention ,which came into effect in India in 1992. The convention requires countries to ensure that hazardous wastes and hazardous recyclable materials are managed in an environmentally sound manner. The Government of India participates in various meetings of the Basel Convention regularly and has taken effective measures to fulfill obligation under the convention including harmonized the domestic legislation with the provisions of the convention and notified the Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008.

The Rotterdam Convention requires exporting states that trade in a list of hazardous substances to obtain the prior informed consent (PIC) of importing states before proceeding with the trade. By providing the tools and information needed to identify

potential hazards, the Convention allows importing countries the chance to exclude chemicals they cannot manage safely. Moreover, the Convention promotes the safe use of hazardous chemicals once imported through labelling standards, technical assistance and other forms of support. Notably, the Convention implicitly places the primary duty to provide information on the manufacturer or packager of the export. India signed the Rotterdam Convention which came in to effect on 24 May 2005. The Government of India has taken effective measures to fulfill obligation under the convention, including adoption of the prior informed consent procedure for import and export of some poisonous chemicals and pesticides, and prohibition or restriction measures on some poisonous chemicals.

Chapter 3 Evaluation of Country Situation on POPs

3.1 Assessment with respect to Annex A, part I chemicals (POPs pesticides)

3.3.1 Introduction

POPs Pesticides originate almost entirely from anthropogenic sources and are associated largely with the manufacture, use and disposition of certain organic chemicals (POPs: An assessment report on DDT-aldrin-dieldrin-endrin-chlordane Heptachlor-HCB Mirex-toxaphene PCBsDioxins and furans 1996).

Most of the POPs pesticides are banned in India from use, production and import . India has the legal regulations in place for restriction of manufacture/ use of POPs chemicals in India. The manufacture, storage and import of Hazardous Chemicals Rules 1989, The Hazardous Waste (Management ,Handling and Transboundary Movement) Rules ,2008 and The Insecticide, Act. 1968 are very important regulations. As of now only one pesticide product DDT out of nine POP pesticides are being manufactured in India. It is, therefore, easy to implement the Stockholm Convention with respect to pesticides. DDT is manufactured only for vector control and not used as a pesticide in agriculture anymore. Moreover, there is only one manufacturer of DDT that is the Hindusthan Insecticides Limited (HIL), a GOI enterprise.

3.1.2 Institutional policy and regulatory framework

The Ministry of Agriculture (MOA), the nodal ministry for dealing with pesticides, is responsible for assessing the benefits and hazards of pesticides, encouraging proper use of pesticides and promoting alternatives to pesticides. Three main bodies are under the MOA to regulate pesticides: 1) the Central Insecticides Board is responsible for developing policies regarding pesticides; 2) the Registration Committee is responsible for the registration of pesticides for manufacturing, import and export 3) the Central Insecticides Laboratory is responsible for quality control, safety, packaging and efficacy of pesticides.

The MOA carries our research and technology development at the Pesticides Research Institute and the India Council of Agricultural Research. As well, the MOA promotes

sustainable agriculture and Integrated Pest Management (IPM) practices, including biological and cultural control systems, with a goal of implementing IPM programs throughout India.

The Insecticides Act, 1968 and Rules, 1971 has been framed by the Government of India to regulate, import, manufacture, sale, transport, distribution and use of insecticides with a view to prevent risk to human beings or animals and for matters connected therewith. The Insecticides Rules has been framed by the Government of India, which came in to force on the 30th day of October 1971.

The MOA is responsible for the overall supervision and administration of the Insecticide Act. It works in cooperation with the MOEF to assess pesticides. The Registration Committee for Pesticides of the MOA, a statutory committee under the Insecticides Act, administers the entire pesticide registration process, including application, examination of detailed data (application, waiting period, bioefficacy, toxicity, etc.), testing, review of results, manufacture, import, export, application and handling rules. Once a product is proved safe and effective, it is registered as a pesticide. The Central Insecticides Laboratory advises the Registration Committee, providing verification of claims of insecticides through chemical testing.

Enforcement of the Insecticides Act 1968 is the joint responsibility of the central and state governments. The MOA holds regular meetings with the states through zonal and national conferences, during which the pesticide registration process is discussed. The State Departments of Agriculture grant licences for production of pesticides under federal regulations, and Insecticides Inspectors are responsible for enhancement of the Insecticides Act, including implementing pesticide bans and ensuring non-registered products are not used. As well, training for users of pesticides through extension programs is the responsibility of state authorities.

As per the Insecticides Act 1968 and Rules 1971, no pesticides are allowed to produce, use, export and import without registration with the Insecticides Board. Pesticides which are banned in the country are not permitted to produce, use, export and import; and registration certificates are called back by the Insecticides Board and treated as cancelled.

DDT is covered by the Insecticides Act 1968 and Rules 1971 under the Ministry of Agriculture. As per order No. S.O 378(E) dated 26th May 1989 has withdrawn the use of DDT in agriculture.As per order No. S.O 378(E) dated 26th May 1989 use of DDT is restricted for Disease Vector Control Purpose only to 10,000 MT per annum.

As per revised order No. S.O 295 (E) dated 8th March 2006 manufacture, domestic use and export to the parties and State non-parties are in accordance with paragraph 2 (b) of Article 3 of the Stockholm convention on POPs for Vector Control purpose.

3.1.3 Status of POP pesticides listed in Annex A of the convention in India

All the POPs pesticides are covered under the Insecticides Act 1968 and Rules 1971 of the Ministry of Agriculture, Government of India. Most of the POPs pesticides are banned for manufacture, use and import. DDT is being used for vector control purpose only. Detail information on legal staus POPs pesticides in India is as follows:

Sr No.	Name of Chemical	Category	Situation in India	Notification
1	Aldrin	Pesticide	Banned for manufacture, use and import	648(E);Sept20,1996
2	Chlordane	Pesticide	Banned manufacture, use and import	648(E); Sept 20,1996
3	Dieldrin	Pesticide	Banned manufacture,use and import	382(E);May 15 ,1990
4	Endrin	Pesticide	Banned manufacture,use and import	382(E);May 15 ,1990
5	Heptachlor	Pesticide	Banned manufacture,use and import	648(E);Sept 20,1996
6	Hexachlorobenze (HCB)	Pesticide/Industrial Chemical	Never registered as pesticide	
7	Mirex	Pesticide	Never registered	
8	Toxaphene	Pesticide	Banned manufacture,use and import	569(E);July 25,1989
9	DDT	Pesticide	Banned with restricted use	382(E);May 15 ,1990

Note :- GOI is in the process of banning HCB as industrial chemical .

Annex A

Dieldrin was recommended and extensively used for locust control. These are the recommended source It has been recommended to be replaced with Malathion, Chlorpyriphos and Deltamethrin. Aldrin for termite control is recommended to be

replaced with Chlorpyriphos, Ehtion and Imidacloprid. Chlordane, Heptachlor used previously agaist soil borne pests of agricultural crops have been recommended to be replaced with Organophosphorous and Carbamate group of insecticides like Chlorpyriphos, Carbosulfan, Carbafuron, etc. Endrin has been recommended to be replaced with Organophosphorus, Carbamates and Synthetic Pyrethroid group of insecticides. Investigations were made to find out the use of DDT in the non prescribed segment, especially in the field of agriculture. As per collected information from the state agriculture departments, pesticides dealers and farmers, it has been concluded that there is no use of DDT in the agriculture field in the country (HIL Report).

3.1.4 Stocks of POPs pesticides

The status of POP pesticides wastes identified through preliminary investigation of the areas of POPs pesticides production and distribution. Because the production and use of Aldrin, Chlordane, Heptachlor, Endrin, Dieldrin and toxaphene has been completely stopped, no stockpiles of these POP pesticides except Aldrin and Dieldrin were found. At present, identified pesticide POPs wastes stocks are mainly Aldrin and Dieldrin. The identified and registered stocks are included in Table 8.

Table 8: Stockpiles of Other POP Pesticides

State	Location	Other POP Pesticides	Quantity
Gujarat	Palanpur	Dieldrin (Technical)	276 Kg.
Manipur	Imphal	Aldrin 30% EC	45 Ltr.
Rajasthan	Sikar	Aldrin 30% EC	26 Ltr.
	Kota	Aldrin 30% EC	30 Ltr.
	Bikaner	Dieldrin 18% EC	4397.1 Ltr.
	Barmer	Dieldrin (Technical)	31935 Kg.
		Dieldrin 18% EC	7372 Ltr.
	Jaisalmer	Dieldrin 18% EC	3875 Ltr.
	Palanpur	Dieldrin 18% EC	5100 Ltr.
Maharashtra (RPQS)	Mumbai	Dieldrin (Technical)	900 Kg.

Source: HIL

An amount of 33111 kg of technical grade dieldrin and 20744 litres of dieldrin 18 EC has been reported from Maharashtra, Rajasthan and Gujarat States. In India, its manufacture and import were banned through an order dated 17 July 2001, but marketing and restricted use (locust control) was permitted for a period of two years from the date of the ban, or up to the date of expiry, whichever was earlier. Restricted use of dieldrin is reported from Bangladesh, Myanmar and Nepal (UNEP, 2002c).

3.1.6 Specific exemptions

India has not conducted exemption registration for the production and use of POP pesticides.

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

3.2.1 Introduction

PCBs were never produced in India. The use of PCBs began in 1950's in India. Due to the large size of India and due to the limited time available for the development of the preliminary inventory on PCBs, the geographic area of country was divided into five regions, the North, West, East, Central and South.
North- Janmmu and Kashmir, Punjab, Haryana, Uttar Pradesh, Jharkhand
West- Rajasthan, Gujrat, Maharashtra
Central- Andhra Pradesh, Madhya Pradesh, Chattisgarh
East- Orissa, Bihar, West Bengal and North Eastern States

The first step involved in the inventory preparation was the identification of sources where PCBs could be located. As it is well known that major inventory of PCB would be in power sector, hence a list of addresses of utilities and energy intensive industries covering different sectors like steel, cement, fertilizer, paper etc., were compiled. In this process data was requested from the identified enterprises on the transformers in their premises. The information obtained in response to the request letters were analyzed and following procedure were adopted for the estimation of PCBs. In case the nameplate declares that the transformers were filled with PCBs, from the data available on the nameplate the quantity of PCB was estimated. In case of transformers installed before 1985, the oil samples were collected and tested for PCBs contamination, and contaminated quantity of oil estimated.

3.2.2 Characterization of the electrical sector

The State Electricity Boards which controlled the electrical power sector have been divided into different organizations namely, Power Generating Company, Power Transmission Company, and Power Distribution Company. Most of the PCBs containing transformers have been found with Power Generating and Transmission companies. Only small quantities of PCBs were detected in distribution transformers. Most of the phased-out transformers are recycled and reused. The out of service capacitors are stored at the owner's facilities. Generally, the PCBs containing equipment and oil is not managed in an environmentally sound manner. Investigations show that out of service electrical devices in the Power Sector are temporarily stored in the owners' yards throughout the country. Since these companies lack the strict documentation procedures, the exact number of PCBs containing electrical devices could not be retrieved.

3.2.3 Import, export, and production of PCBs

India never was a manufacturer of PCBs. The requirements of PCB for numerous applications were met through imports. The problem in India with respect to PCBs is due to unaccountability of the used transformer oils and those used in open and partially open applications.

The Government of India notified the Hazardous Waste (Management & Handling) Rules 1989 under the provisions of the Environment (Protection) Act, 1986 and was further amended in the year 2000 and 2003. However, the GOI has made the Hazardous Wastes (Management ,Handling and Transboundary Movement) Rules ,2008 in supersession of the Hazardous Wastes(Management and Handling) Rules ,1989 India never was a manufacturer of PCBs. The requirements of PCB for numerous applications were met through imports. The problem in India with respect to PCBs is due to unaccountability of the used transformer oils and those used in open and partially open applications.The rule defines the various hazardous wastes in categorised manner including the contamination limits and their classifications. The clauses clearly define the trans-boundary movement, import, export, illegal traffic of hazardous waste and material. Procedures have been clearly laid for export with prior informed consent, import for recycling, free importable materials for recycling. Clear cut procedures for recycling, reuse, handling, storage and transportation has also been made. Treatment, storage, disposal facility for hazardous wastes are also subjected to strict norms described. The details of formats for all these aspects are also given under the notification. Unlike earlier notifications, polychlorinated biphenyl has been mentioned as a hazardous material under schedule II, A16 and concentration limit as ≥ 50 mg/kg for contamination. The import and export of waste ,substances and articles contaning ,consisting of ,or contaminated with PCBs are prohibited as per schedule VI of the said rules . Moreover, the GOI is also in the process of banning manufacture, use and import of pure PCBs and PCBs contaiminted equipments**.**

India is a signatory to the Basel Convention and the Table 9 giving description of material which requires countries to ensure that hazardous wastes and hazardous recyclable materials are managed in an environmentally sound manner. The MOEF participates in various meetings of the Basel Convention regularly. India is also actively involved in the work relating to preparation of technical guidelines for environmentally sound management of ship-breaking along with Norway and the Netherlands under this Convention.

Table 9: Description of hazardous wastes including PCBs prohibited under Basel Convention

Basel No*	OECD No. **	Description of Material
A 3180	AC 120	Waste, substances and articles containing, consisting of or contaminated with polychlorinated biphenyls (PCBs) and/or polychlorinated terphenyls (PCTs) and/or polychlorinated napthalenes (PCN) and/or polybrominated biphenyls (PBB) or any other polybrominated analogues of these compounds

.Note: * Basel Convention on Control of Trans-boundary Movement of Hazardous Waste and their Disposal
** Organization for Economic Cooperation and Development

Until the 1980's, India used to import PCBs-containing electrical equipment from various countries most of which were transformers and capacitors for large facilities for specific

applications. The imported PCBs-containing electrical devices were mostly distributed in large enterprises and the rest were distributed in the electrical power sector.

3.2.4 Stocks of PCBs

3.2.4.1 Closed and partially closed systems

Main owners of PCB containing equipment and PCBs oil in the public sector are the power generation and transmission companies (State Electricity Boards), heavy industries like cement, fertilizer and steel and in the private sector the mining, lubricant and ship-breaking industries, etc.

During the inventory preparation 1548 transformers confirmed to be containg pure and contaminated PCBs. Oil samples have been taken from power utilities, major industries and private sector industries for inspection and analysed for PCB concentration in the oil. The analysis has been carried out using Gas Chromatography with ECD/ Mass Spectrometry (GC-ECD/MS). All the transformers have been found to contain PCBs in high concentration. In addition, 400 drums stockpiled on different yards in the country were found to contain pure PCBs. The data on the transformers containing PCBs were collected from 28 States and 6 Union Territories. The data as collected and collated is presented as distribution of PCBs containing equipment region-wise and industrial sector-wise in Table 10 and Figure 8 and Table 11 respectively.

Table 10: Region wise distribution of PCBs

Region	No. of transformers	Weight of PCB containing oils (tons)
East	76	1064.289
West	138	2044.889
North	79	2138.234
South	342	2678.826
Central	913	1911.430
Total	**1548**	**9837.662**

Figure 8: Percentage weight of PCB containing oils region-wise

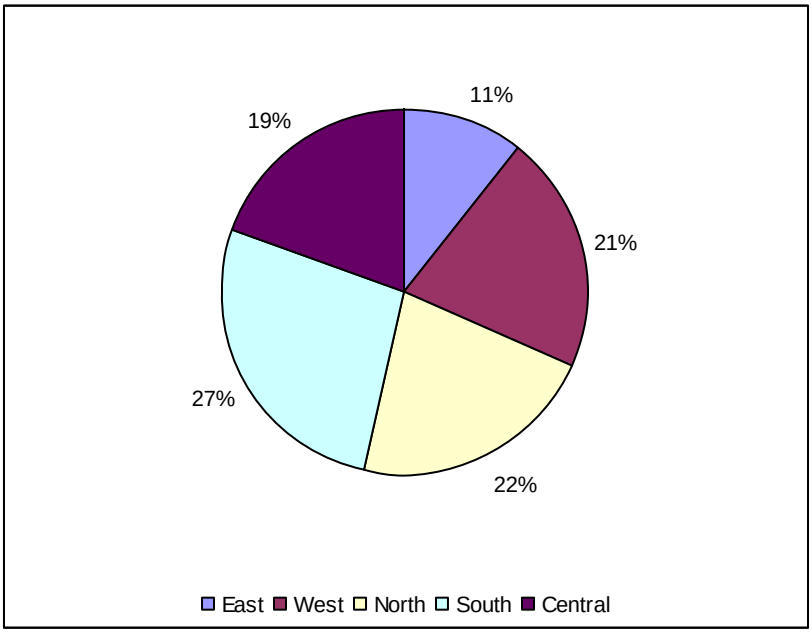


Table 11: Sector wise distribution of PCBs

Sector	No. of Transformers	Percentage weight of PCB containing oils	Weight of PCB containing oils (tons)
Power Sector	407	71.3	7016.034
Steel Sector	913	18.0	1772.428
Cement Sector	34	0.5	49.290
Fertilizers	16	0.3	28.680
Others	178	9.9	971.230
Total	**1548**	**100.00**	**9837.662**

A total number of 1548 transformers were found PCBs positive. The total weight of the PCBs oils and PCB contaminated oils is 9837.662 Tonnes. The major sector that owns PCBs containing equipment is the power sector (71%) followed by the steel industries (18%).

The major users of PCBs were power generation units and the State Electricity Boards. These users do not store transformer oil. They subcontract the maintenance of transformers to third parties.

Potentially PCBs containing transformer oils that need to be replaced from time to time are collected by local agents. These local agents sell them to oil reprocessing units wherein the moisture content is removed. It is then repacked and sold in the market. The

electricity companies auction the decommissioned transformers. Agents then buy these transformers and use them for reprocessing activities. The oil contained in these transformers are removed and sold out to transformer oil re-processors. It has been found that transformer oils containing large amount of polychlorinated biphenyls (PCBs) are mixed in the general pool, thus rendering the entire lot hazardous.

Capacitors are closed systems; they cannot be opened and sampled. The preliminary inventory of capacitors considered the nameplates of these equipment only. Most of the capacitors nameplates did not specify the type of oil used in the equipment. If the inventory considered these equipment as PCB containing it would not provide a realistic information for decision making. Therefore it was decided that in the first PCBs inventory capacitors will not be included. India will implement a GEF founded project addressing the inventory and management of PCBs and capacitors will be then be considered.

Another source of PCB is importing ocean liners for ship-breaking. This practice can release several hazardous materials such as asbestos, paint chips, engine oil, bilge water , sludge, etc.

3.2.4 PCBs elimination technologies

India is yet to carry out PCBs pollutants elimination or replacement work on electrical Equipment containing PCBs. India continues to recycle ships containing PCBs and lacks related technologies for environment friendly recycling.

3.3 Chemicals in Annex B of the Convention (particularly DDT)

3.3.1 Introduction

Malaria is endemic in India and active transmission has been reported from many areas. Malaria is a public health problem in several parts of the country. About 95% population in the country resides in malaria endemic areas and 80% of malaria reported in the country is confined to areas consisting 20% of population residing in tribal, hilly, difficult and inaccessible areas. Currently, 80.5% of the population of India lives in malaria risk areas. (National Vector Borne Disease Control Program 2010). More than 980 million Populations, out of 1.0 billion are living in malaria areas. The north-eastern region (population 28.5 million), and the forests and forest fringes on the hill ranges of peninsular India occupied by minority ethnic groups (population 71 million) are highly endemic to malaria. Reported confirmed malaria cases are 1.56 million in 2009 down from 2.03 million in 2000. About 37% of the population is at high risk region (Annual Parasite Incidence > 10). DDT is still in use as insecticide to control malaria. At present around 6830 tons of DDT-50WP is used as Indoor Residual Spray (IRS) for malaria vector control purpose (Please mention source).

As per the national report, 50 million population in 61 districts of 10 states of India, namely Andhra Pradesh, Assam, Chhattisgarh, Jharkhand, Madhya Pradesh, Meghalaya,

Mizoram, Orissa, Tripura & West Bengal are in highly malaria endemic areas, having API>10 and contributing more than 60% of all malaria cases in India (please mention source). As on date in India, 31 States and Union Territories have been identified as malaria endemic states infested with various species of malaria vector Anopheles mosquitoes. Out of 31 malaria infested States and Union Territories, 23 States including 10 highly endemic States as stated above are using DDT-50WP in their malaria control program.

Kala-azar (Leishmaniasis), another vector borne disease, is endemic in eastern states of India namely Bihar, Jharkhand, Uttar Pradesh and West Bengal. An estimated 165.4 million population is at risk in 4 States, mostly poor socio-economic groups of population primarily living in rural areas. An organized centrally sponsored control programme was launched in endemic areas in 1990-91. Government of India provided kala-azar medicines, insecticides including DDT IRS and technical support. The State Governments implemented the programme through primary health care system and district/zonal and State malaria control organizations and provided other costs involved in its implementation. Reports confirmed that *Leishmaniasis* cases were around 24,000 and 94 death incidences in 2009 compared to 35,000 cases and 154 death incidences in 2005.

In India malaria is transmitted by 9 vector species, out of which 6 are of primary importance as listed in Table 12.

Table 12: The malaria vector species and areas where it transmits malaria

Malaria vector species	Areas where it transmits malaria
Anopheles culicifacies	Transmits malaria in rural & semi urban.
Anopheles fluviatilis	Area in plains, in hills & foothills
Anopheles stephensi	In urban areas.
Anopheles minimus	In forested north eastern states.
Anopheles dirus	In forest areas
Anopheles sundaicus	In Andaman & Nicobar islands
Anopheles annularia	Sporadic
Anopheles phillippinensis	Sporadic
Anopeles varuna	Sporadic

Source: National Vector Borne Disease Control Program 2010

Of these *Anopheles culicifacies*is responsible for the transmission of 60-70% and *Anopheles fluviatilis*, 15-20% malaria cases in India. Presently different formulations of synthetic chemical insecticides are in use for vector control. Water Dispersible Powder (WP) formulation is used for indoor residual sprays while emulsifiable concentrate (EC) formulations are used to control mosquitoe larvae.

Currently, the states of Orissa, Jharkhand, West Bengal, North Eastern states, Chhattisgarh, Madhya Pradesh have the highest incidence of malaria cases in India. Most of the malaria attributable mortality as reported from Orissa & other forested areas are occupied by tribal population especially in North Eastern states in India. Vector Control

in India is mainly based on IRS of insecticides in rural areas and anti larval operations in urban area. DDT, Malathion and synthetic pyrethroids are used for IRS.

In the 1940's, malaria was rampant in India. The arrival of DDT changed this scenario. The indoor application of residual insecticide DDT was introduced in 1950s and was developed as main weapon for eradication of malaria. DDT spraying was spectacular success in malaria control. But, malaria was never eradicated, only reduced to low levels waiting for an opportunity to emerge again. This is precisely what happened in India and in other tropical countries. Resurgent malaria developed new forms such as the vectors developed resistance to insecticides, learnt to avoid resting on the sprayed walls.

The Stockholm Convention on POPs has listed DDT as one of the 12 POPs. But use of DDT is permitted for disease vector control purposes only as per WHO guidelines and if the party to the Convention decides to use DDT for the said purposes have to notify the secretariat of the Stockholm Convention for its continued use. The restriction permits IRS of DDT in malaria control as per the WHO specifications for its production and following safety precautions for its proper use and disposal. Phasing out of DDT is delayed till effective, affordable and safe alternatives are available. Parties to the SC shall assure that the use of DDT is solely for malaria vector control.

A priority component of the NIP action plan is to develop mechanisms to monitor the use of this chemical and, periodically, to test the continued need for its production and use in India. The action plan addressing DDT will also examine the viability of environmentally sound techniques and alternatives chemicals. In considering the viability of techniques and alternatives it takes into account best practice developments within the Ministry of Health and Family Welfare and WHO and their experience in delivering such practice.

Malaria has been effectively controlled in vast areas covering almost 80% population of the country in spite of increased population, rapid and unplanned urbanization, increased migration etc. The country has been able to contain malaria incidence between 1.5-2.0 million cases annually for more than a decade in spite of increased population at a rate of 2.1% annually (National Vector Borne Disease Control Program 2010).

As per Article 3 of Stockholm Convention, DDT use is restricted for disease vector control, provided that no locally safe, effective and affordable alternatives are available.

3.3.2 Institutional policy and regulatory framework

DDT is covered under the Insecticides Act, 1968 and Rules 1971 of the Ministry of Agriculture, Government of India. As per order No. S.O 378(E) dated 26th May 1989 GOI has withdrawn the use of DDT in agriculture. As per order No. S.O 378(E) dated 26th May 1989 use of DDT is restricted for Disease Vector Control purpose only up to 10,000 MT per annum. As per revised order No. S.O 295 (E) dated 8th March 2006 DDT is manufactured for domestic use and export to the Parties and State non-Parties in

accordance with paragraph 2 (b) of Article 3 of the Stockholm Convention on POPs for Vector Control purpose.

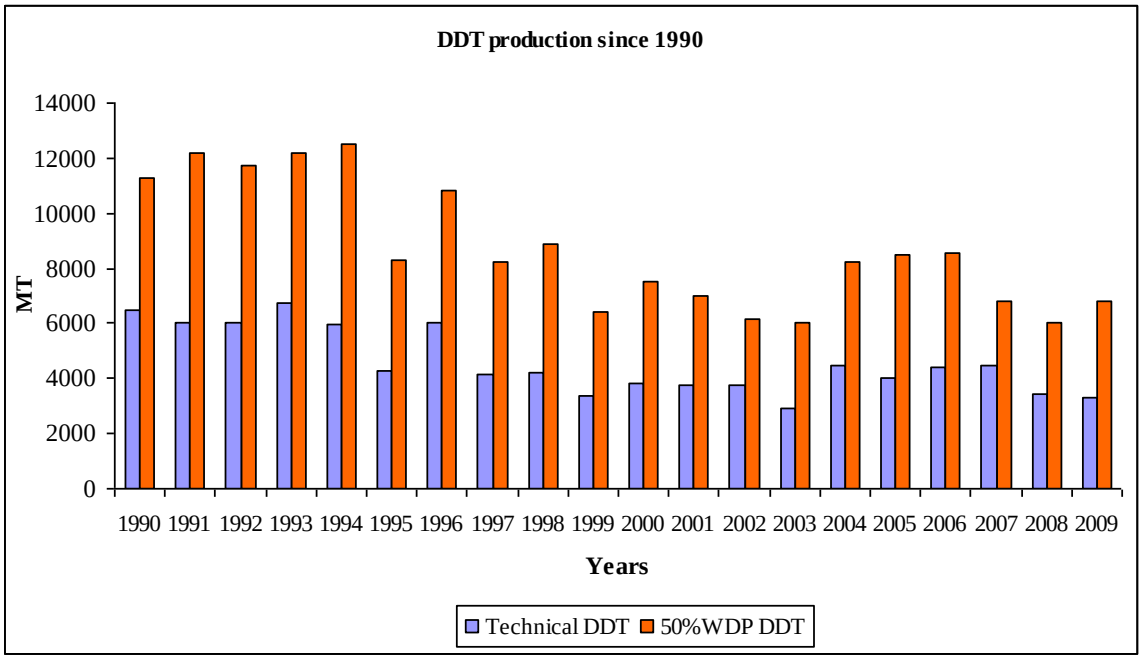
3.3.3 Production, Registration, Import and export, Use, Stocks, unused reserves, contaminated sites of Annex B chemicals (DDT)

3.3.3.1 Production

Hindustan Insecticides Limited, a Government of India enterprise, is the sole producer of DDT in the country. Production of DDT started in 1955. The first manufacturing plant was setup in 1954 at Delhi. The second unit was setup at Udyogmandal in Kerala and the third unit was setup at Rasayani in Maharashtra State. Minimum production was 286.310 MT in 1955-56 while the highest production of 8116.962 MT in 1986-87. Complete data regarding production of DDT right from 1955-56 to 2008-2009 is available unit-wise in Table 12. Later the Delhi facility was closed down.

The annual production of DDT in 2008 and 2009 was 2886 MT in Maharashtra and 428 MT in Kerala respectively. DDT is formulated as 50% WP for in-country use. Limited amount is formulated as 75% DDT WP for export Purpose only. HIL solely produces DDT for malaria and kala-azar vector control and supplies it to NVBDCP. All the State Departments of Health get their supplies from NVBDCP. Therefore, the information regarding DDT production, supply to NVBDCP and various states were collected through the records of producer and user of DDT i.e. HIL and NVBDCP respectively. District-wise supply was gathered through HIL and the Health Departments of various states.. In the year 2009, HIL produced 3314 MT of technical garde DDT and 6830 MT DDT 50 WP formulation. Production of DDT since 1990 to 2009 is depicted in Figure 10.

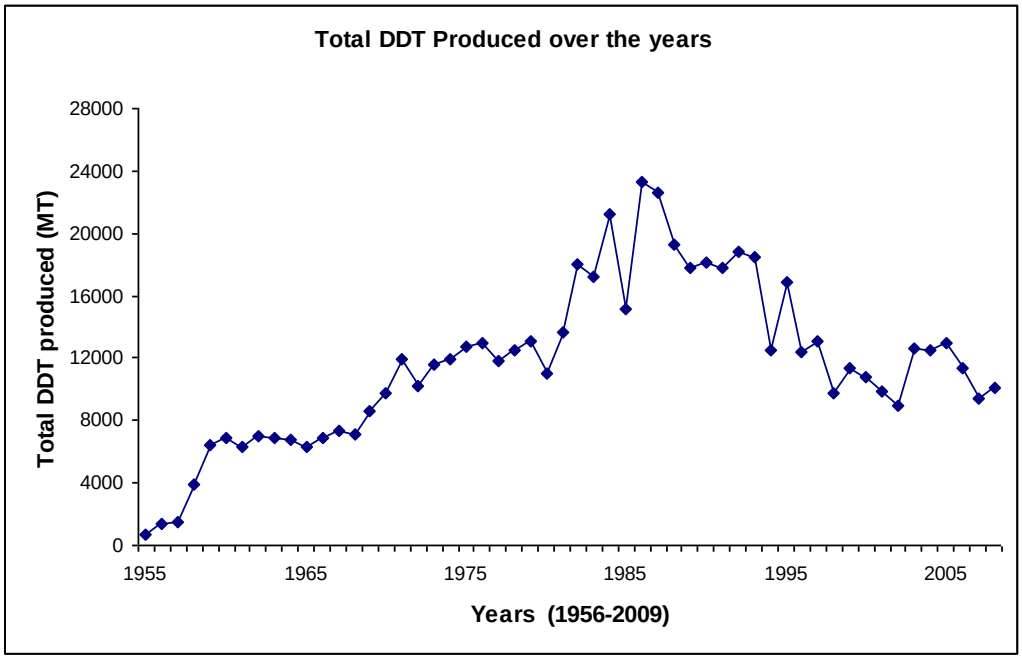
Figure 10: DDT production since 1990



Source: HIL

Data presented in Figure 11 show the total DDT produced since 1955 to 2008.

Figure 11: The total DDT produced from 1955 to 2008



The 5 yearly average of DDT production in MTs is given in figure 12. The figure shows that between 1984-1988 average DDT production in (MTs) was at it's highest. Between 1989-1993 also DDT production was relatively high. However, thereafter DDT production is showing a decreasing trend. This is indicated in figure 13 and table 13.

Figure 12: Five yearly average DDT production in MTs.

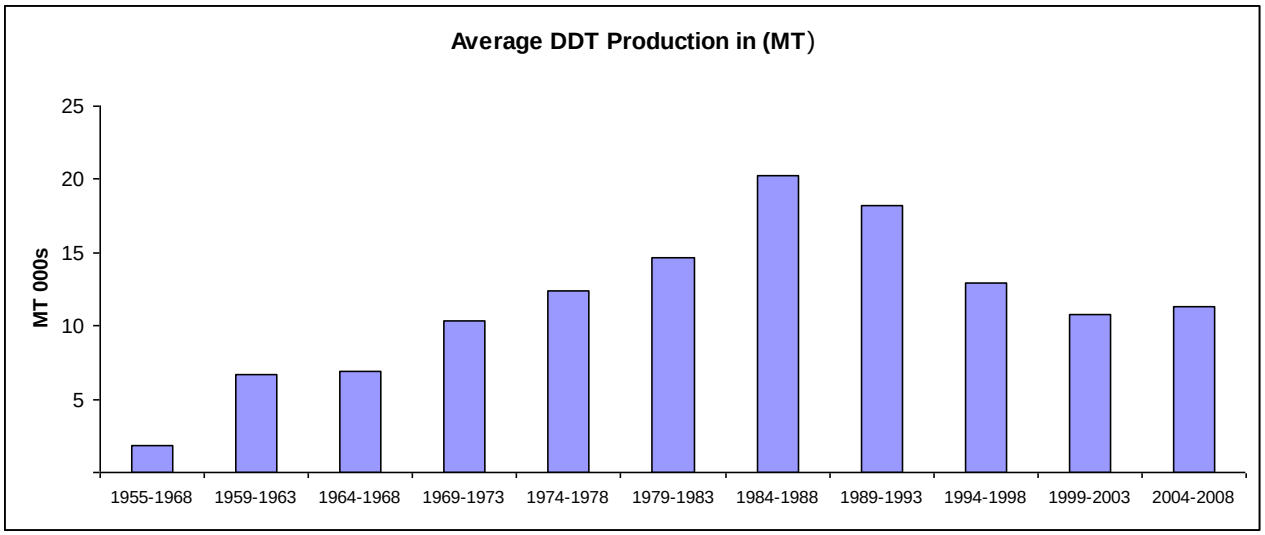


Figure 13 shows DDT produced in the last decade. It should be noted that there is no sharp increase in DDT production in the last decade and the graph shows a decreasing trend.

Figure 13: DDT produced in the last decade

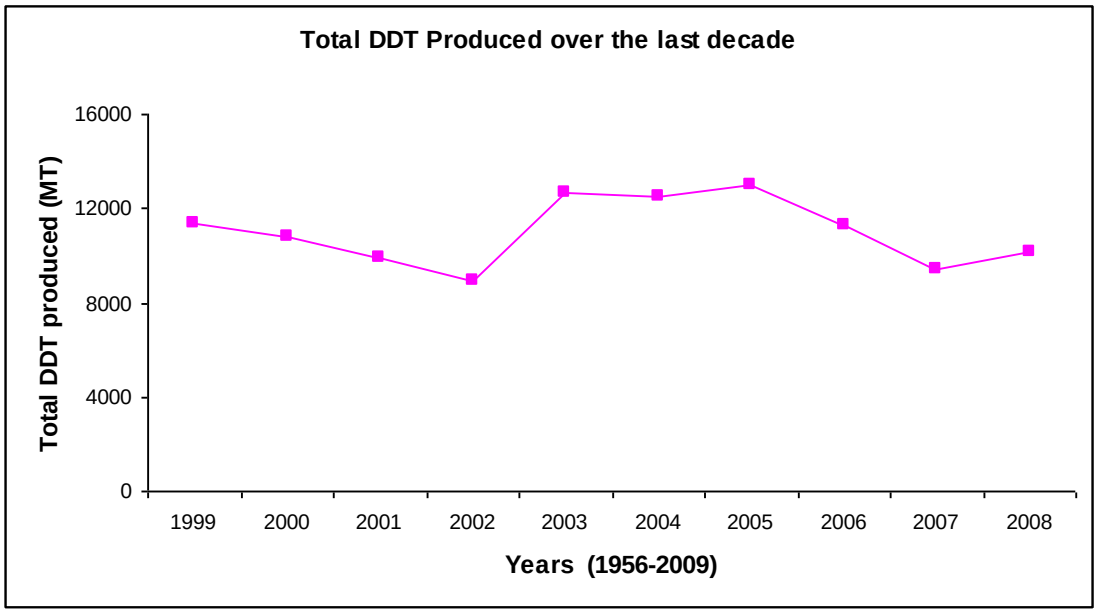


Table 13: DDT production year wise

	Tech. DDT				50% DDT			
Year	**Delhi**	**Udl.**	**Rasayani**	**Total**	**Delhi**	**Udl.**	**Rasayani**	**Total**
1955-56	286.310			286.310	402.980			402.980
1956-57	526.060			526.060	844.460			844.460
1957-58	705.126	104.372		809.498	667.770	46.800		714.570
1958-59	1288.615	825.868		2114.483	1117.327	692.705		1810.032
1959-60	1465.997	1109.000		2574.997	1638.859	2232.500		3871.359
1960-61	1449.949	1371.220		2821.169	2098.939	1959.410		4058.349
1961-62	1502.553	1223.600		2726.153	2109.880	1518.930		3628.810
1962-63	1394.594	1219.000		2613.594	2702.000	1716.880		4418.880
1963-64	1444.512	1166.480		2610.992	2799.500	1486.300		4285.800
1964-65	1480.281	1244.000		2724.281	2513.000	1515.000		4028.000
1965-66	1513.180	1170.000		2683.180	2644.000	1024.920		3668.920
1966-67	1559.741	1536.800		3096.541	2744.500	1037.060		3781.560
1967-68	1495.525	1606.100		3101.625	2423.500	1843.500		4267.000
1968-69	1429.161	1547.150		2976.311	2417.000	1686.713		4103.713
1969-70	2091.755	1356.400		3448.155	3666.000	1467.500		5133.500
1970-71	2768.531	1170.100		3938.631	4514.950	1263.100		5778.050
1971-72	2796.207	1347.500		4143.707	5333.000	2404.950		7737.950
1972-73	2952.505	1129.415		4081.920	4242.500	1859.850		6102.350
1973-74	2107.909	1334.024		3441.933	5101.000	3077.650		8178.650

1974-75	2309.334	1358.850		3668.184	5240.500	3006.600		8247.100
1975-76	2971.012	1450.201		4421.213	5518.000	2784.400		8302.400
1976-77	3105.336	1372.942		4478.278	5745.000	2695.480		8440.480
1977-78	3024.092	1152.548		4176.640	5491.000	2181.800		7672.800
1978-79	3118.549	1356.909		4475.458	5758.000	2228.900		7986.900
1979-80	3371.859	1362.355		4734.214	5761.000	2551.300		8312.300
1980-81	3000.769	1001.200		4001.969	5041.000	2001.000	15.000	7057.000
1981-82	2285.340	955.483	8.368	3249.191	5401.000	2747.000	2216.180	10364.180
1982-83	2915.162	1415.100	868.430	5198.692	5775.000	3114.250	3966.030	12855.280
1983-84	2868.443	1022.792	2644.650	6535.885	3289.000	2000.733	5441.000	10730.733
1984-85	2507.509	838.374	3931.615	7277.498	4002.000	1746.000	8179.000	13927.000
1985-86	421.738	791.840	4002.730	5216.308	1050.000	1250.000	7650.000	9950.000
1986-87	2310.627	1011.075	4795.260	8116.962	3771.000	1951.000	9415.000	15137.000
1987-88	2668.046	1158.000	4187.283	8013.329	4300.000	1608.930	8656.000	14564.930
1988-89	2103.770	1177.590	3494.155	6775.515	3520.000	1924.250	7042.000	12486.250
1989-90	2251.080	1109.350	3133.350	6493.780	3852.000	1602.000	5802.000	11256.000
1990-91	1911.365	881.517	3202.600	5995.482	4109.000	1857.000	6216.000	12182.000
1991-92	2007.110	1057.765	2977.800	6042.675	3874.000	2126.250	5728.000	11728.250
1992-93	2088.770	1185.370	3446.800	6720.940	3142.000	2175.000	6837.000	12154.000
1993-94	1429.558	1050.640	3480.400	5960.598	2451.000	2140.200	7906.000	12497.200
1994-95	1217.109	830.740	2203.600	4251.449	2303.000	1589.500	4410.000	8302.500
1995-96	1820.460	1070.510	3124.800	6015.770	3252.000	1833.350	5742.000	10827.350
1996-97	1266.269	1103.810	1777.800	4147.879	1544.000	2059.850	4621.000	8224.850
1997-98		1313.860	2900.800	4214.660		2448.600	6409.000	8857.600
1998-99		939.900	2419.200	3359.100		1524.300	4900.000	6424.300
1999-2000		843.110	2984.800	3827.910		1459.650	6048.000	7507.650
2000-2001		860.280	2926.000	3786.280		1345.950	5657.000	7002.950
2001-2002		706.120	3050.000	3756.120		1306.000	4844.000	6150.000
2002-2003		667.230	2234.400	2901.630		1193.000	4849.000	6042.000
2003-2004		676.630	3794.000	4470.630		1191.000	7017.000	8208.000
2004-2005		533.810	3502.800	4036.610		1123.000	7377.000	8500.000
2005-2006		444.281	3984.400	4428.681		1051.000	7509.000	8560.000
2006-2007		757.050	3738.000	4495.050		1418.000	5407.000	6825.000
2007-2008		585.200	2856.800	3442.000		1079.000	4921.000	6000.000
2008-2009		428.900	2886.800	3315.700		1180.000	5650.000	6830.000
Total	**83231.818**	**54932.361**	**84557.641**	**222721.820**	**144170.665**	**92328.061**	**170430.210**	**406928.936**

3.3.3.2 Forecast Future Production

Annual requirement of DDT is decided by the DDT mandate committee of NVBDCP on the basis of API report of each state and production depends on the orders received from NVBDCP. Demand of NVBDCP is calculated based on the orders received from Health Departments of various State Governments. In any case, it might not be more than 10,000 MT technical grade DDT. Table 12 gives the total DDT produced from 1955 to 2008.

Year wise supply to NVBDCP

National Vector Borne Disease Control Program (NVBDCP) and State Health Department are educating general pubic regarding proper use of DDT and safety precaution to be taken during and after spraying. Audio-visual aids, bulletins, pamphlets and observing 'Malaria Day' are some of the methods used in educating the general public.

The distribution pattern of DDT

Ministry of Health and Family Welfare raises indent based on the demand of various State Health Departments on annual requirement of DDT to HIL and approved by DDT Mandate Committee HIL contacts various State Program Officers to find out distributions at different districts / locations.

DDT is supplied to different storage sites as per the instructions of State Program Officer. From storage sites DDT goes to Primary Health Centre (PHC)/Sub Centre for spraying purpose.

The movement of DDT of NVBDCP is as follows:

State (Health Directorate) to District (District Malaria Officer) to District wise stock points to Primary Health Centre/Sub Centre Villages.

Available data clearly show that maximum supply of DDT-50% WP was highest in the year 1990-91 and minimum was in the year 2007-08. Table 14 and Figure 14 show year wise supply of DDT to NVBDCP during 1990-91 to2008-09

Figure 14: shows year wise supply to NVBDCP

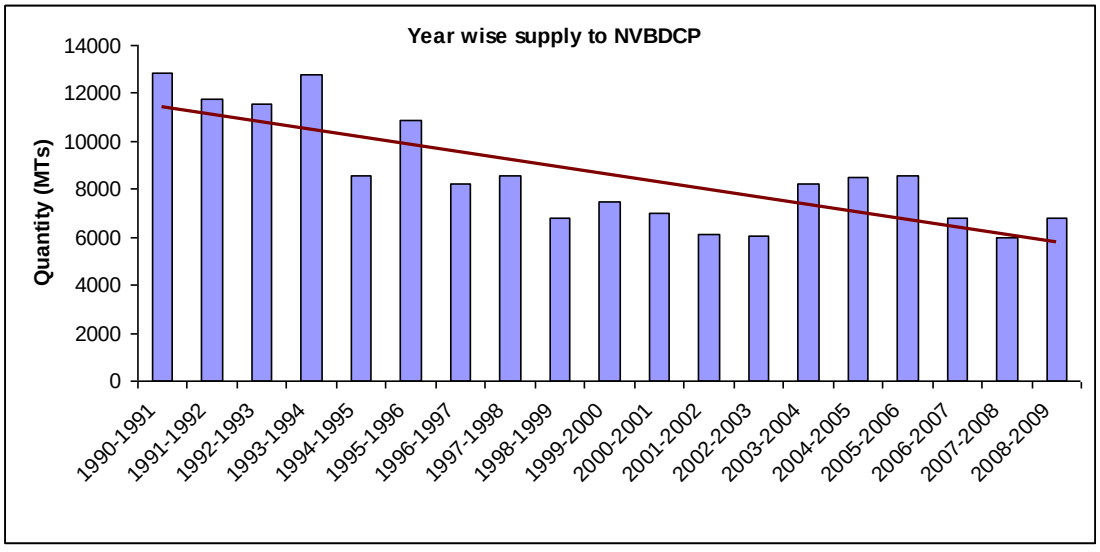


Table 14: Year wise supply to NVBDCP

Year	Total
1990-1991	12844.950
1991-1992	11733.500
1992-1993	11525.000
1993-1994	12752.400
1994-1995	8533.8000
1995-1996	10850.000
1996-1997	8206.200
1997-1998	8542.000
1998-1999	6800.00
1999-2000	7500.000
2000-2001	7000.000
2001-2002	6150.000
2002-2003	6042.000
2003-2004	8208.000
2004-2005	8500.000
2005-2006	8560.000
2006-2007	6825.000
2007-2008	6000.00
2008-2009	6821.000
Total	**403447.390**

3.3.3.3 Use

DDT is used by following states for malaria and filaria control- Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Gujarat (upto 2004-05), Jharkhand, Karnataka, Kerala (upto 2005-06), Madhya Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Sikkim, Punjab, Rajasthan, Tripura, Uttar Pradesh, Uttarakhand, West Bengal, Andaman & Nicobar island, Pondicherry and Chandigarh. DDT is used in West Bengal, Bihar, Jharkhand, Uttar Pradesh state for malaria and kala-azar control purpose (Figure 12).

State wise supply of DDT 50% WP – Malaria

In 2008-09 highest amount of DDT-50% WP was supplied to Assam to the tune of 1185 MT, followed by Chhattisgarh, Jharkhand, Bihar 440 MT each, West Bengal and Jharkhand 150MT each and Uttar Pradesh 90 MT. DDT was supplied to 22 states in India for malaria control. The map (Figure 15) shows region-wise supply for malaria control in India.

Figure 15: Region-wise supply of DDT

Figure 15 depicts region wise supply of DDT 50 WP for malaria control during

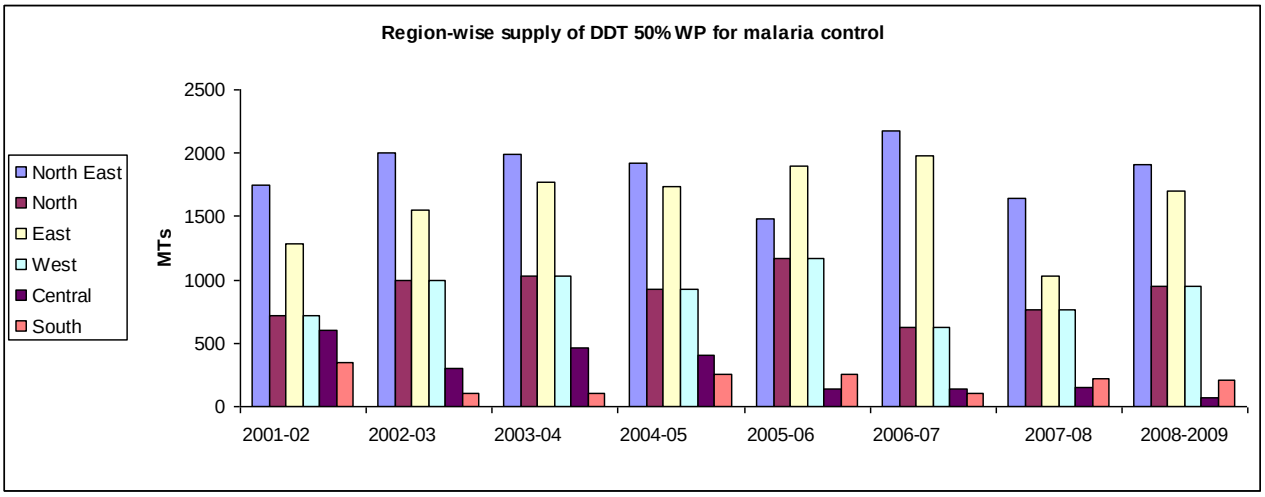
2001-2002 to 2008-2009. The regions from where data are available are clubbed as follows:

- North East- Arunachal Pradesh, Assam, Meghalaya, Manipur, Mizoram, Nagaland, Tripura and Sikkim.
- North – Jammu and Kashmir, Uttar Pradesh, Uttaranchal, Chandigarh, Punjab and Rajasthan
- East- West Bengal, Bihar, Jharkhand and Orissa
- West- Gujarat
- Central- Madhya Pradesh and Chhattisgarh
- South- Karnataka, Kerala and Andhra Pradesh

Figure 16 shows the region-wise supply of DDT where North-East States, historically received the highest amount of DDT for malaria control. The bulk of malaria cases are found in the flood prone plains of northern India and coastal plains of the east and west coasts. The north-eastern region (population: 28.5 million), and the forests and forest fringes on the hill ranges of peninsular India occupied by minority ethnic groups (population: 71 million) are highly endemic to malaria (World Health Organization, Malaria 2011). This justifies the disproportionate supply of malaria to these states as compare to southern and central states.

Region wise there is no significant variation in DDT consumption for the last 5 years. Along with DDT other synthetic pyrethroid group of insecticides is used as IRS and Long Lasting Insecticidal Net (LLIN) for malaria control.

Figure 16: Region-wise supply of DDT 50% WP for malaria control



Source: Compiled from HIL data

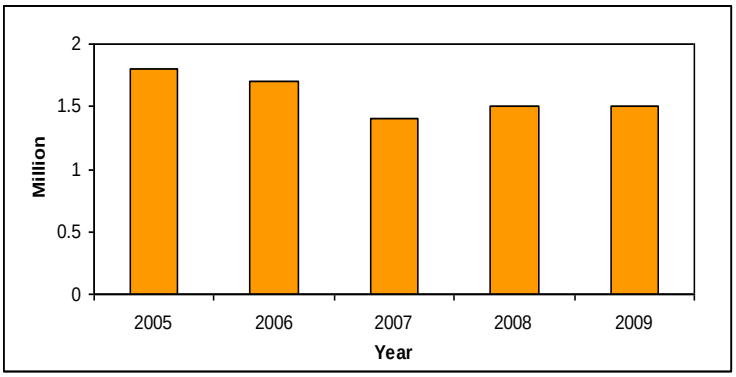
Effectiveness of DDT use

DDT is one of the tools in the disease vector control program in India. Trend of malaria cases in India for last 5 years is presented in Figure 17. Malaria cases in India in 2008

and 2009 was found to be static (1.5 million cases each). Probable reasons are poor IRS coverage in the country, refusal of IRS by the dwellers, improper spraying, etc.

Usually malaria cases are reported round the year from different areas, the number hardly exceeds 5000 per month from January to June and December every year but the number of malaria cases starts increasing from the month of July with a peak in September and a decline thereafter.

Figure 17: Reported malaria cases between 2005 and 2009 (in million cases)



3.3.3.4 Stocks

DDT production facilities produce only on demand and after production DDT is immediately dispatched to the requesting states for application.

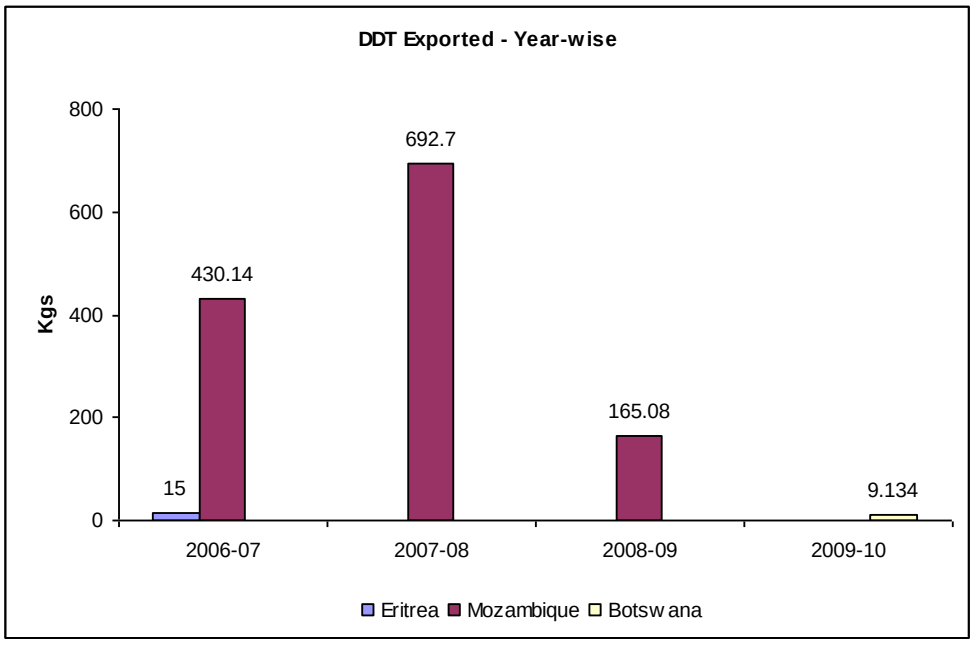
Storage facilities in almost all the states were inspected during the inventory and it was found that DDT and other existing POP pesticides (aldrin and dieldrin) are stored properly in housed condition under supervision of the Government officials and measures taken to prevent environmental contamination. DDT bags are stored in concrete godowns, stacked on floor. Store rooms are properly locked under the supervision of Medical Officer. Stock register is maintained. It was also gathered through questionnaires that there is no illegal use of DDT in agriculture. Stockpiles of aldrin and dieldrin are stored in concrete go down in drum under the custody of Ministry of Agriculture.

The inventory exercise located 41 tons of expired DDT 50WP in Himachal Pradesh.

3.3.3.5 Export

Some malaria endemic African nations are using DDT in 75 WP formulations in their malaria control programme. As per their requirement, India formualtes DDT 75WP for export. Year-wise DDT export to different countries is presented in Figure 18. Since the last reporting of India on DDT to the SC, Botswana and Senegal have started to use DDT in their malaria vector programme. Only 67 kg of DDT was exported to Senegal.

Figure 18: Year-wise quantities of DDT exported



3.3.3.6 Import of DDT

Before 1986 DDT was sometimes imported from Russia, but thereafter it was stopped. At present India is not importing DDT.

3.3.4 Studies on Insecticide Resistance

The indoor application of residual DDT was introduced in 1950s and was deployed as main weapon for eradication of malaria with considerable success. Although the subsequent decades saw emergence of resistance in vectors in many parts of the world and also re-emergence of malaria, the reliance on insecticidal approach continued with the introduction of replacement insecticides such as HCH/Dieldrin, Malathion, Pirimiphos methyl, Fenitrothion, Propoxure and Bendiocarb and synthetic pyrethroids like Deltamethrin, Cyfluthrin, Alphacypermethrin and lambdacyhalothrin. The usefulness of Malathion has been diminishing in the last two decades as reported in many resistance related studies. Development of resistance in vectors to synthetic pyrethroids has also been documented (National Institute of Malaria Research 2010).

The insecticide resistance is generally restricted to particular target vector species within the geographical confines and appears after a prolonged use in health sector and /or exacerbated by the use of same class of insecticide in the agriculture. The best way to prolong the life of an insecticide in vector control program is to devise rotation policy whereby use of unrelated compounds are rotated. In this program, three insecticides were annually rotated which slowed down build up of resistance against pyrethroids. This

strategy can be applied to both IRS and Insecticide Treated Nets (ITNs). In case of ITNs, carbamates can be rotated with synthetic pyrethroids or even the use of mixture of two unrelated compounds for impregnation has been shown to be promising (WHO2006). Spraying of different insecticides in a mosaic fashion and their rotation in the adjoining areas has been shown to work and may be helpful in preventing resistance in vectors.

The development of resistance in malaria vector has been reported to be due to the selection by IRS in the public health programs and also by the use of pesticides in agriculture, Biochemical studies to determine the resistance mechanism for OP & carbamate insecticides indicated non insolvent of insensitive acetyl cholinesterase conferring broad spectrum of resistance. Information thus generated by insecticide bioassays, biochemical and Cyto taxanomical studies, will be of immense use for suggesting suitable situation specific methods for management of insecticide resistance especially in view of limitation of new insecticide molecules for vector control. Information thus generated by insecticide bioassays, biochemical and cytotaxanomical studies, etc. will be of immense use for suggesting suitable situation specific methods for management of insecticide resistance especially in view of limitation of new insecticide molecules for vector control. In the management of insecticide resistance so far the approach has been the replacement of insecticide by an effective and preferably a new group of insecticides. Subsequent replacement of insecticides has led to the development of multiple-resistant malaria vectors. Subsequent change of insecticide has burdened the program with increased costs. The cost of spraying with malathion and deltamethrin is approximately 2.5 folds than the cost of spraying of DDT. Not many new insecticide molecules are available for vector control in the immediate future.

What is needed for the present day vector control program is an approach for the management of existing resistance in malaria vectors and to limit its further spread. The strategy for this approach is to use the available insecticides rationally. Carbamates are not yet used in the program. These compounds can be used rationally and in rotation with the available insecticides to manage the resistance. It is worth mentioning that the biochemical resistance mechanism against malathion in *A. culicifacies* and *A. stephensi* is specific and does not exhibit cross resistance to other organophosphate (except compounds with ester linkage) and carbamate insecticides ((National Institute of Malaria Research 2010).

3.3.5 Requirement for continuing use of DDT

On the basis of bio-efficacy, cost and earlier experiences there is no viable alternative of DDT. Malathion has a different mode of action therefore it can be used wherever mosquitoes have developed resistance to DDT but it is not cost effective. Synthetic pyrethroids have same mode of action & hence develops cross-resistance with DDT. Therefore, it can be concluded that DDT has no alternative so far as IRS in concerned.
Some bio-pesticides such as *B. bassiana* and metarhizium have been tried abroad and have been found to be effective as adulticide. These can be developed for IRS.

The loss of revenue due to banning of DDT can be made up by entering into bio-pesticides business as has been done by China. China is manufacturing abamectin and emamectin for this purpose. Integrated Vector Management and ecological management is the only viable solution.

Being party to the Stockholm Convention, Government of India is committed to phase out DDT but in a systematic way. Ministry of Health through NVBDCP is the nodal ministry to take a final decision in this matter. The phasing out of DDT depends upon finding out suitable alternatives to control mosquitoes in an effective way. The factors governing the decision would be (a) cost effectiveness, (b) bioeffectiveness (c) safety to human beings and the environment.

An Expert Group chaired by Secretary (Health), Government of India, representatives from Planning Commission, Department of Biotechnology, Department of Agriculture & Cooperation, Directorate General of Health Services and NVBDCP to mandate on use of DDT on annual basis has been formed. NVBDCP proposes to reduce the use of DDT by adopting following strategies:

- Integrated Vector Management strategies.
- Rotational Spraying of IRS.
- ITN/LLIN
- Use of bio-larvicides in urban areas, larvivorous fish and environmental management by manipulating the sources of mosquitoes breeding

Few states like Maharashtra, Gujarat, Tamil Nadu and Haryana are using Malathion/ synthetic pyrethroids group of insecticides in place of DDT.

3.3.6 Specific exemption and acceptable purposes

Use of DDT for Disease Vector Control Purpose- India has registered with Stokholm Convention Secretariat the exemption on DDT for acceptable purposes for Disease Vector control only as per WHO guidelines till viable alternatives are found.

Use of DDT for Dicofol Production purpose-India also has registered with Stokholm Convention Secretariat the specific exemption for DDT as intermediate in the production of dicofol in close system in batches. Production and application is permitted for 150 MT/annum. Specific exemption for use of DDT as intermediate of dicofol production is valid up to 2014. India will further evaluate the need to apply for extending such an exemption.

Dicofol manufacturing process- Dicofol is produced in closed system in batches. Through condensation of Chloral and mono-chloro-benzene (MCB), DDT is produced which is further dehydrochlorinated to DDE followed by tetra-chloro through chlorination. Tetra-chloro further hydrolysed by an acidic medium to produce dicofol. Non transformed manufacture wastes ethylene dichloride (EDC) is recovered from the final product for re-use through distillation. Whole manufacturing process is done in

closed system where after every step transformed materials are transferred through closed lines and reaction process occurs in closed vessel.

3.4 Assessment of releases from unintentional production of Annex C chemicals (PCDDs/Fs, HCB and PCBs)

3.4.1 Introduction

Article 5 of the SC requires parties to take measures to reduce or eliminate releases of the unintentionally produced POPs listed in Annex C: PCDD, PCDF, PCBs and HCB. Present inventory of dioxins and furans has been prepared to provide information on the sources and releases of Annex C POPs. Based on this preliminary inventory the Government of India developed an action plan to comply with the obligations of Article 5 of the Stockholm Convention. For ease of reference, PCDD, PCDF are sometimes collectively referred to in this Plan as "dioxins".

All the sources listed in Annex C of the Convention can be found in India and industrial activities in many of these sectors have contributed significantly to India's impressive economic growth in recent years. India has implemented stringent regulations to control air pollution emissions from large and medium scale enterprises, and hazardous waste incinerators including medical waste incinerators that have at the same time served to reduce emission of unintentionally produced POPs. However, a feature of many industrial sectors in India is the prevalence of relatively small scale enterprises and these are yet to be covered systematically by environmental monitoring regimes.

Three agencies were identified to undertake the first inventory of dioxins and furans in India. National Environmental Engineering Research Institute (NEERI), Nagpur was responsible for making the inventory of the Central and Western States of India. The National Institute for Interdisciplinary Science and Technology (NIIST), Thiruvanthapuram was given the task to conduct the inventory development in Southern India and the Central Pollution Contr ol Board (CPCB) Delhi was responsible for the collecting information on PCDD/F releases in the Northern & Eastern States of India. NEERI was identified as the overall co-ordinator of the process. CPCB developed a harmonised sampling and analytical protocol for the inventory exercise. Activities were supervised by the MOEF.

National Reference Trace Organics Laboratory (NRTOL) of the CPCB, Delhi has been nominated as the POPs laboratory and analysed the collected samples. NRTOL has participated in inter-laboratory calibrations and is accredited for PCDD/Fs sampling and analysis. Thirty six samples from fourteen locations representing all main source categories of the UNEP toolkit have been collected and analysed. Samples of different matrices like air, water, soil, land, product and residue were collected in order to refine the emission factors provided by the UNEP toolkit. The transport sector, open burning processes and hot spots have not been sampled, as they are diffuse sources and no meaningful emission factors could be retrieved from a few samples that the inventory budget allowed. It was decided that the certain sectors, which might have important role

in the dioxin releases, such as household heating and cooking by using biomass, waste burning and accidental fires and hot spots, require further in-depth studies before realistic release estimates could be developed and the consent of the Government obtained. Therefore, the first preliminary country inventory is missing these sectors.

Given the scale of industrial operations in the large, medium and small scale industries across the country it is difficult to give an authentic total estimate of dioxins – furans generation from each of the main categories (and sub-categories) even if the default emission factors of the Toolkit are used. In view of the above the PCDD/Fs inventory cannot be considered to represent the country's total generation of dioxins and furans. Most of the industries were not aware of dioxins and furans, hence the poor response to the questionnaires. In view of this, awareness programme for small and medium scale industries will be organized.

3.4.2 Summary of Dioxin and Furans release during 2009-2010

The annual PCDD/F releases calculated using UNEP toolkit was estimated at 9776.97 g TEQ. The major contribution of PCDD/F emission is from waste incineration and ferrous and non-ferrous metal production categories followed by heat and power generation (Table 15).

Table 15: Annual releases of PCDD/Fs in India

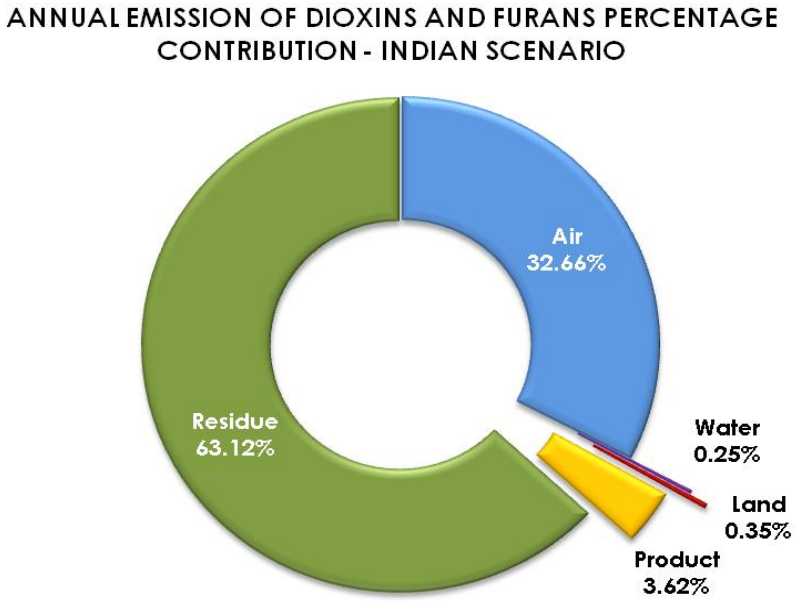
Source	Annual Release of PCDD/Fs (gTEQ/a)						
	Air	Water	Land	Products	Residues	Total	%
Waste incineration	1812.14				3965.83	5777.97	66.75
Ferrous and non-ferrous metal production	539.68				1210.36	1750.04	20.22
Heat and power generation	308.65				195.50	504.15	5.82
Production of mineral products	141.33					141.33	1.63
Transportation	9.57					9.57	0.11
Uncontrolled combustion processes	15.19		30.29			45.48	0.53
Production and use of chemicals and consumes goods	0.174	20.27		243.51	88.51	352.46	4.07
Miscellaneous	0.566				0.16	0.73	0.01
Disposal/Landfill		1.22		70.16	3.44	74.82	0.86
TOTAL	2827.30	21.49	30.29	313.67	5463.80	8656.55	100.00
Release To Matrix (%)	32.66	0.25	0.35	3.62	63.12		100.00

Waste incineration has 66.75 %share from the total annual releases. Nearly 4.4million tons of hazardous waste is generated every year in India from Petrochemical processes and pyrolytic operations, Drilling operation for oil and gas production, Cleaning, emptying and maintenance of petroleum oil storage tanks including ships, Petroleum refining/re-refining of used oil/recycling of waste oil, Industrial operations using mineral/synthetic oil as lubricant in hydraulic systems or other applications, Secondary production and/or use of zinc, Primary production of zinc/lead/copper and other non-ferrous metals except aluminium, Secondary production of copper, Secondary production of lead, Production and/or use of cadmium and arsenic and their compounds, Production of primary and secondary aluminium, Metal surface treatment, such as etching, staining, polishing, galvanising, cleaning, degreasing, plating, etc. This alone accounts for 66.75% of the total dioxin releases. The second highest source is ferrous and non-ferrous metal production. Copper recycling is the leading industrial activity concerning PCCD/Fs releases. These are the two most important industrial sectors that will require special attention and control.

Minimization or elimination of the formation and releases of PCDD/PCDF are requirements under the Stockholm Convention on POPs. To achieve this goal, the implementation of best BAT and BEP are required to be undertaken and promoted.

The data sampling carried out by the agencies was not completely reflecting the present dioxin release activities in the country. Hence, the inventory presented herewith is considered as preliminary inventory. The data sampling is needed to be strengthened further to obtain a real situation of the country. The inventory table reflects that the major quantity of dioxin has been released first to residues and secondly to air. The potential contributing calories are waste incineration and ferrous and non-ferrous metal production.

Figure 19: Annual emissions of dioxins and furan



The highest amount of PCDD/F is released into residues 63.12% (5463.80g TEQ), followed by air emission which accounts for 32.66% of the total releases (Figure 19). Waste incineration and ferrous and non-ferrous industries discharge large amount of dioxins and furans into residues. The detailed PCDD/Fs inventory is presented in Annex 2. PCDD/PCDF concentrate in solid

waste streams from combustion and thermal industrial processes such as fly ash, bottom ash, and other dust. Particulate matter from combustion and thermal industrial processes contains unburned carbon where PCDD/PCDF adsorbs. Fine fly-ashes and dusts collected from thermal industrial processes contain by-product PCDD/PCDF in a concentrated form so that they are not emitted to the air. The potential for residues to cause environmental contamination or exposure to PCDD/PCDF depends to a great degree on how the residue is treated and disposed of. For example whereas contaminated wastes from the chemical industry may be incinerated and effectively destroy any PCDD/PCDF present, dumping of such residue may result in the creation of a reservoir source. Further, residues from one process may be used as a raw material in another process and without adequate controls, PCDD/PCDF releases to air, water or product can occur. Although the mobility of PCDD/PCDF within residues is generally quite low and exposure to airborne PCDD/PCDF typically results in higher impacts on man or the environment. This is important, since most of the regulatory schemes consider mostly emissions, so only air releases. In the case of these pollutants current regulatory mechanisms need to be updated to address pollutant releases in a holistic way.

The pattern of dioxins and furan releases in the three main regions of the inventory exercise, north and east, west and central and south, show significant differences due to the diversity of the industries in the different parts of India (Figure 20).

Figure 20: The pattern of dioxins and furan releases in the three main regions of the inventory exercise

Release estimates by main source categories

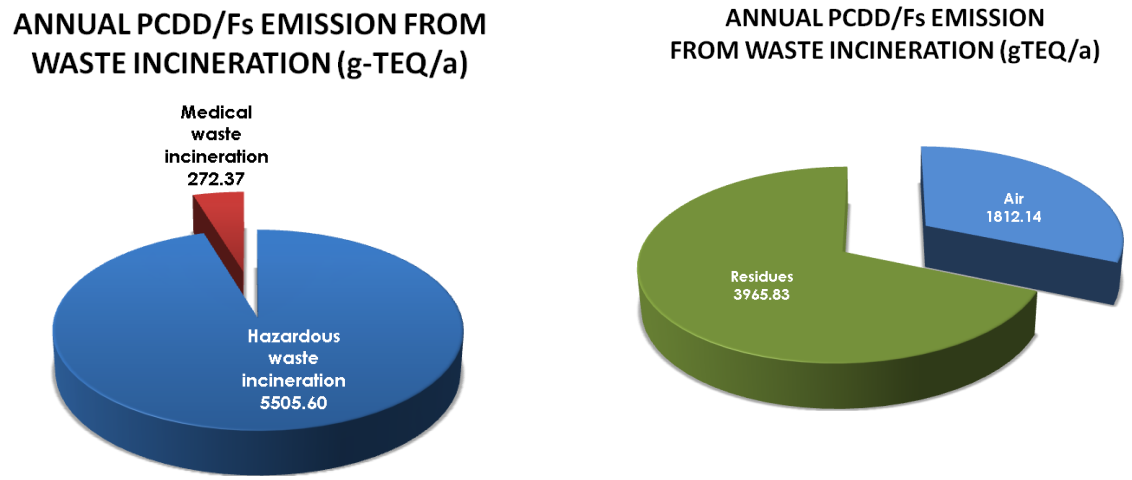
Category 1 Waste incineration

There are 92 common medical waste incinerators available in the country. Apart from that 60 small and medium scale waste incineration facilities owned by private and public hospitals spread across the country. As per the medical waste management rule in India (Bio Medical Waste Management and Handling Rules, 1998), the wastes are segregated at source and incinerable wastes are burnt. There are 98 hazardous waste incinerators including common facilities available in the country among which 18 are in northern region, 31 are in central region and 49 are in southern region.

Hazardous waste incinerators have the potential to be significant sources of environmental pollution in particular PCDD/F. The hazardous waste generated in the country per annum is estimated to be around 4.4 million tons (ENVIS 2006). Petrochemical processes and pyrolytic operations, Drilling operation for oil and gas production, Cleaning, emptying and maintenance of petroleum oil storage tanks including ships, Petroleum refining/re-refining of used oil/recycling of waste oil, Industrial operations using mineral/synthetic oil as lubricant in hydraulic systems or other applications, Secondary production and/or use of zinc, Primary production of zinc/lead/copper and other non-ferrous metals except aluminium, Secondary production of copper, Secondary production of lead, Production and/or use of cadmium and arsenic

and their compounds, Production of primary and secondary aluminium, Metal surface treatment, such as etching, staining, polishing, galvanising, cleaning, degreasing, plating, etc. This estimate of around 4.4 million MTA is based on the 18 categories of wastes which appeared in the Hazardous Waste Management (HWM) Rules first published in 1989. The top four waste generating states are Maharashtra, Gujarat, Andhra Pradesh and Tamil Nadu. On the other hand, states such as Himachal Pradesh, Jammu & Kashmir and all the North Eastern States excepting Assam generate less than 20,000 tons per annum. There are also 11 hazardous waste landfills in India, for which emission factor for Class 2 in the toolkit is chosen. Medical waste incineration is also an important source of PCDD/Fs releases, particularly because of its contagious waste generation potential (Figure 21). Sampling and analysis of flue gases were carried out with an objective to develop measured emission factors.

Figure 21: Annual PCDD/Fs Emission from waste incineration



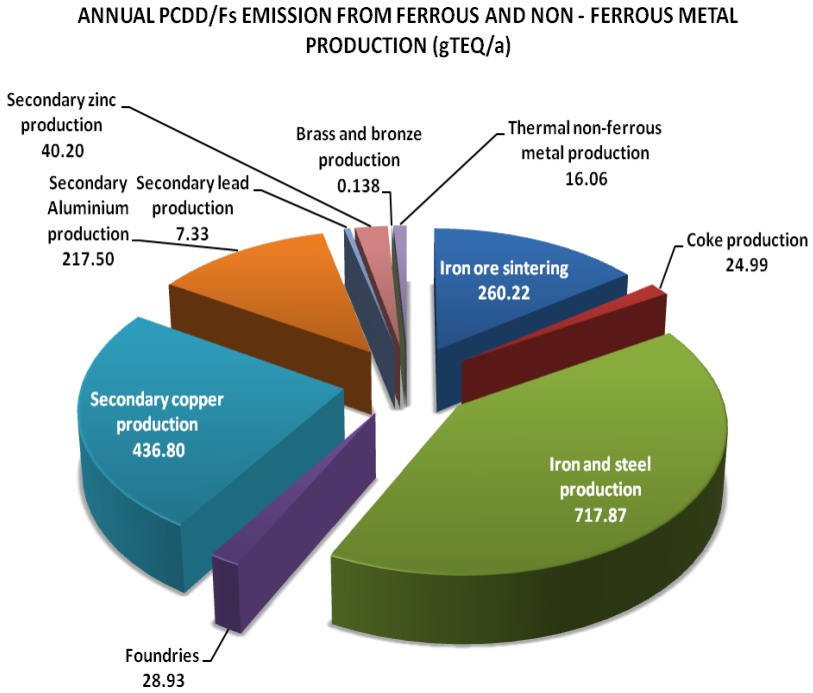
There is no municipal Solid Waste incinerator operating in India. Land filling of municipal solid waste is widely practised across the country. The survey of 22 cities by FICCI on the management of municipal solid waste has revealed that 14 cities dump 75% of their solid waste. While Mumbai sends 100% of its waste to dumpsites, Delhi dumps 94% of its waste (The Financial Express 2009). Considerable percentage of waste specifically organic wastes are being composted and used as manure. Light - Fraction Shredder waste incineration, sewage sludge incineration, waste wood and waste biomass incineration and destruction of animal carcasses have not been considered in the inventory.

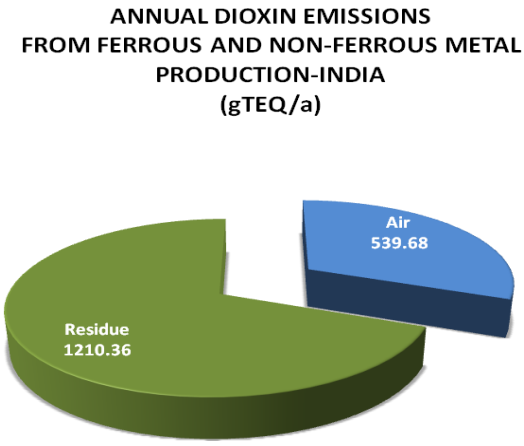
Given the wide variations in quantity and nature of waste generated across states and union territories (UTs) and also considering the wide variations in climatic as well as hydro-geological conditions in different regions of the country, the approach to waste management has to be essentially state-specific.

Consequent upon amendments made in the year 2000 and subsequently in 2003, the State Pollution Control Boards (SPCBs) and Pollution Control Committees (PCCs) are in the process of re-inventorising hazardous waste generated. The current exercise has brought to light the serious short-comings in the earlier inventorisation.

Category 2: Ferrous and non-ferrous production

Figure 22: Releases of PCDD/Fs from ferrous and non-ferrous





There are 951 ferrous and Non-ferrous metal industries available in the country. Apart from that 100 industries are using high technology facilities and good environment and others are small and medium scale facilities spread across the country. There are 770 Iron and steel and foundries and most of them are small and medium scale and the production rate is increased year by year.

A ferrous and Non-ferrous metal industry shows an annual production capacity of 192054881 tons as per data collected during 2008 – 2009. Based on the UNEP toolkit guidelines the category 2 falls under various classes. The total dioxin released to air was 539.68 gTEQ/a and 1210.36 gTEQ/a to residue. The total dioxin release from this activity was 1750.04 gTEQ/a.

Sinter plants in the iron and steel industry are a pre-treatment step in the production of iron whereby fine particles of iron ores and, in some plants, secondary iron oxide wastes

(collected dusts, mill scale) are agglomerated by combustion. Sintering involves the heating of fine iron ore with flux and coke fines or coal to produce a semi-molten mass that solidifies into porous pieces of sinter with the size and strength characteristics necessary for feeding into the blast furnace. Chemicals listed in Annex C appear to be formed in the iron sintering process mainly via de novo synthesis. PCDF generally dominate in the waste gas from sinter plants. The PCDD/PCDF formation mechanism appears to start in the upper regions of the sinter bed shortly after ignition, and then the dioxins, furans and other compounds condense on cooler burden beneath as the sinter layer advances along the sinter strand towards the burn-through point (11). There were 12 number of sintering plants in 2009. Based on testing results, investigation and research of demonstration projects, emission factor for class 2 was adopted. The dioxin released to air was 260.06 gTEQ/a and 0.16 gTEQ/a to residue. The total dioxin release from Iron ore sintering was 260.22 gTEQ/a.

At the end of 2009, there were 22 coke production enterprises. Based on the UNEP toolkit guidelines the Coke production falls under Class 1. The total dioxin released to air was 24.99 gTEQ/a .

Secondary steel is produced through direct smelting of ferrous scrap using electric arc furnaces. The furnace melts and refines a metallic charge of scrap steel to produce carbon, alloy and stainless steels at non-integrated steel mills. Generally, ferrous feed materials include scrap, such as shredded vehicles and metal turnings, or direct reduced iron. In addition sometimes, scrap is added to other melting furnaces in the foundry and primary iron and steel sectors. Chemicals listed in Annex C of the Stockholm Convention, such as PCDD and PCDF, appear to be most probably formed in the electric arc furnace steel-making process via de novo synthesis by the combustion of non-chlorinated organic matter such as plastics, coal and particulate carbon in the presence of chlorine donors. Many of these substances are contained in trace concentrations in the steel scrap or in process raw materials such as injected carbon.

The emissions have been calculated based on the specific emission factor of the respective category. There are 770 numbers of Iron and steel production and foundries plants for which emission factor Class 2 in the UNEP Toolkit is adopted. The total dioxin released to air was 144.08 gTEQ/a and 602.72 gTEQ/a to residue. The total dioxin release from Iron and steel production and foundries was 746.8 gTEQ/a .

Secondary copper smelting involves copper production from sources that may include copper scrap, sludge, computer and electronic scrap, and drosses from refineries. Processes involved in copper production are feed pre-treatment, smelting, alloying and casting. Factors that may give rise to chemicals listed in Annex C of the Stockholm Convention include the presence of catalytic metals (of which copper is a highly effective example); organic materials in feed such as oils, plastics and coatings; incomplete combustion of fuel; and temperatures between 250° and 500° C.

There were large numbers of small and big enterprises with annual use of waste copper about thousands of tons. Based on the UNEP toolkit guidelines the Copper Production

falls under Class 2. The dioxin released to air was 32.12 gTEQ/a and 404.68 gTEQ/a to residue. The total dioxin release from Copper Production activity was 436.8 gTEQ/a .

Secondary aluminium smelting involves the production of aluminium from used aluminium products or process waste to recover metals by pre-treatment, smelting and refining. Fuels, fluxes and alloys are used, while magnesium removal is practised by the addition of chlorine, aluminium chloride or chlorinated organics. Chemicals listed in Annex C of the Stockholm Convention probably results from demagging additions, incomplete combustion and organics in the feed, chlorine compounds and formation in the system at temperatures between 250 and 500° C. The total dioxin released to air was 17.5 gTEQ/a and 200 gTEQ/a to residue. The total dioxin release from Secondary Aluminium Production activity was 217.5 gTEQ/a.

Secondary lead smelting involves the production of lead and lead alloys, primarily from scrap automobile batteries, and also from other used lead sources (pipe, solder, drosses, lead sheathing). Production processes include scrap pre-treatment, smelting and refining. Incomplete combustion; high levels of oils, plastics and other organic materials in feed; and temperatures between 250° and 500° C may all give rise to chemicals listed in Annex C of the Stockholm Convention. There is over 100s of units in the small and medium scale enterprises for which emission factor of class 2 was adopted. The total dioxin released to air was 4.53 gTEQ/a and 2.8 gTEQ/a to residue. The total dioxin release from Lead Production activity was 7.33 gTEQ/a.

Secondary zinc smelting involves the production of zinc from materials such as dusts from copper alloy production and electric arc steel making, and residues from steel scrap shredding and galvanizing processes. Production processes include feed sorting, pre-treatment cleaning, crushing, sweating furnaces to 364°C, melting furnaces, refining, distillation and alloying. Contaminants in the feed (including oils and plastics), poor combustion and temperatures between 250° and 500° C may give rise to chemicals listed in Annex C of the Stockholm Convention. There are many units in the small and medium scale enterprises for which emission factor based on the UNEP toolkit guidelines of class 2 was adopted. The total dioxin released to air was 40.20 gTEQ/a.

Most of the units belong to small and medium scale enterprises for which emission factor based on the UNEP toolkit guidelines class 2 was adopted. The total dioxin released to air was 0.138 gTEQ/a.

Magnesium is produced either from raw magnesium chloride with molten salt electrolysis, or magnesium oxide reduction with ferrosilicon or aluminium at high temperatures, as well as through secondary magnesium recovery (for example, from asbestos tailings). The addition of chlorine or chlorides, the presence of carbon anodes and high process temperatures in magnesium production can lead to the formation of chemicals listed in Annex C of the Stockholm Convention and their emission to air and discharge to water. But due to non availability of extensive data, PCDD/Fs release from this source has not been considered.

Based on the UNEP toolkit guidelines appropriate class 1 has been adopted. The total dioxin released to air was 16.06 gTEQ/a

Category 3: Heat and Power generation

Power generation, Heating & cooking accounts for very small quantity of the unintentional POPs releases. There are 39 power plants in Northern & Eastern region and 40 power plants in Central & Western region and 159 power plants in southern region and totally 238 power plants in the country. Among this, Fossil fuel based power plant are 152 and biomass based power plants are 86 and totally produced power of 14300419 TJ/a. Based on the 2005 UNEP toolkit guidelines, the power generation facilities falls under class 2. Dioxin released to air was 308.65 gTEQ/a and 195.5 gTEQ/a to residue. The total dioxin release from this activity was 504.15 gTEQ/a.

The fossil fuels – coal, oil and gas – are used, either individually or in combination with energy containing fuels from other processes, for steam generation in boilers. The type of fuel used depends on fuel availability and process economics. Efficient coal combustion in large coal-fired power plants results in very low levels of emissions. Coal use in less-efficient sectors could be a significant source of local emissions. However, it is acknowledged that while techniques for the reduction of particles, sulphur oxides (SO_x) and nitrogen oxides (NO_x) may result in the reduction or removal of PCDD/PCDF (and presumably PCB and HCB), the removal efficiencies will be variable. Lignite-fired power plants are typically operated close to the mining region. Due to the significantly lower calorific value of lignite compared to coal it is mainly transported via belt conveyors from the storage area of the mine to the power station. Pulverised lignite-fired combustion and fluidised bed combustion are appropriate techniques for power generation from lignite. Based on the UNEP toolkit guidelines this sub category falls under class 2. The total dioxin released to air was 139.62 gTEQ/a and 195.5 gTEQ/a to residue. The total dioxin release from fossil fuel power plants activity was 335.12 gTEQ/a .

The main purpose of firing installations for wood and other biomass fuels is energy conversion. Large-scale installations for firing wood and other biomass fuels mainly use fluidized bed combustion and grate furnaces. Technologies for small-scale plants include underfeed furnaces and cyclone suspension furnaces. Recovery boilers in the pulp and paper industry apply specific combustion conditions. Technology selection is related to fuel properties and required thermal capacity. Chemicals listed in Annex C of the Stockholm Convention can result from the firing of wood and other biomass fuels, particularly in the case of fuel contamination. Based on the UNEP toolkit guidelines, biomass power plants falls under class 1. The total dioxin released from biomass power plants activities to air was 169.03 gTEQ/a.

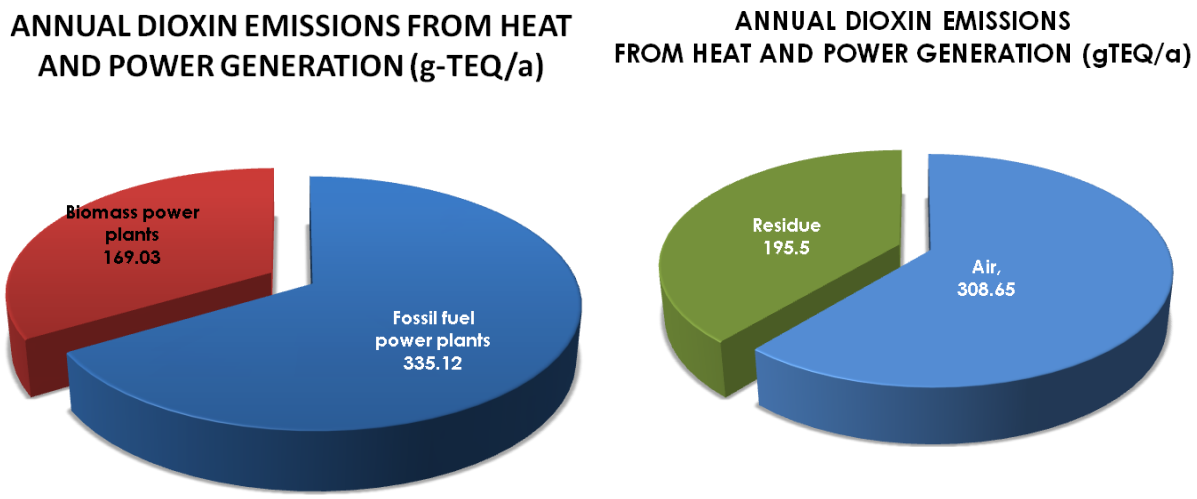
Landfill gas and biogas are both generated from anaerobic digestion of organic matter. The resulting gas is a mixture of carbon monoxide (CO), carbon dioxide (CO_2), methane (CH_4), and ammonia (NH_3), and smaller fractions of combustible gases as well as a large fraction of water (H_2O). The combustible portion of the gas is usually around 50 % and

the heating value is 15–25 MJ/Kg depending on the origin of the gas. The combustion of landfill and biogas either occurs in a flare, in gas motors or turbines and or other power generating devices. PCDD/Fs release from this source has not been considered here.

Heating and cooking in residential households with biomass is common practice in many countries. In most cases the fuel of preference is wood; however, other biomass fuels may be used such as straw, peat, etc. Air, residue, and in some cases land are the release vectors under consideration.

Biomass for residential heating and cooking is burned in a wide array of devices ranging from small, open pit stoves and fireplaces to large elaborate highly sophisticated wood burning stoves and ovens. However, PCDD/Fs release from this source has not been considered due to lack of clear data base.

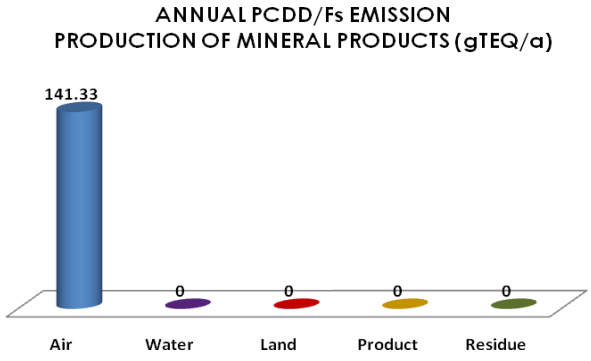
Figure 23: Releases of dioxins from heat and power generation

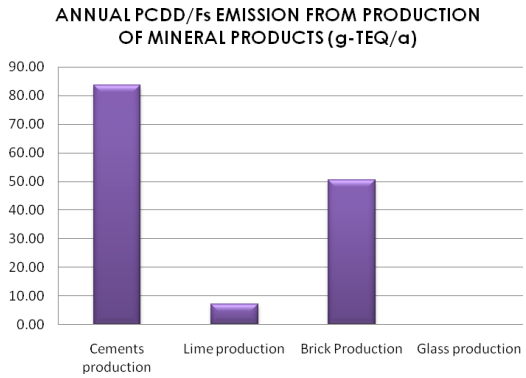


Category 4: Production of mineral products

There are 151 cement production industries, 72 lime production industry,153 brick production facilities were identified, 13 glass production industries, 61 ceramics production industries, 98 asphalt mixing facilities, and there is no oil shale processing unit in India. In these mineral products industries which 122 are Northern and Eastern region, 178 are Central and Western region and 157 are Southern region. Totally there are 548 mineral products industries in India.

Figure 24: Annual PCDD/Fs releases from production of mineral products





The total production capacity of 392947880 tons was recorded in the country as per data sampling. Based on the 2005 UNEP toolkit guidelines, the total dioxin release from mineral products activity to air was 141.33 gTEQ/a.

The main purpose of cement kilns is clinker production. The manufacturing process includes the decomposition of calcium carbonate ($CaCO_3$) at about 900 °C to calcium oxide (CaO, lime) (calcination) followed by the clinkering process at about 1450 °C in a rotary kiln. The clinker is then ground together with gypsum and other additives to produce cement. According to the physical and chemical conditions the main process routes for the manufacture of cement are termed dry, wet, semi-dry and semi-wet. The combustion process in the kiln has the potential to result in the formation and subsequent release of chemicals listed in Annex C of the Stockholm Convention. It comprises of 140 large and more than 365 mini cement industries. Emission factor of class 3 has been adopted. The total dioxin released to air was 83.64 gTEQ/a .

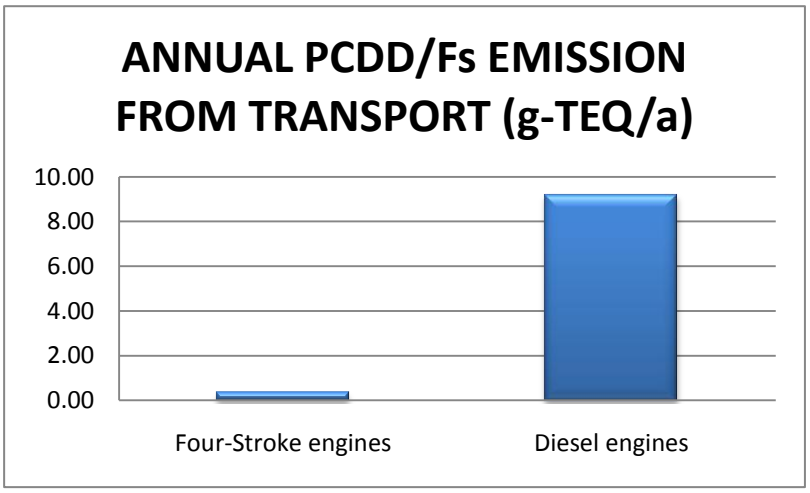
A large number of small and medium scale Lime production enterprises, for which emission factor of class 1 has been adopted. The total dioxin released to air was 7.12 gTEQ/a (18).

Modern brick production where fuel oil is used covers less than 2% of the total annual brick production. Therefore, biomass fuels, especially fuel wood, are the main fuels used in clay brick firing. Consumption of biomass fuels (fuel wood, crop residues, dried animal waste etc.) is often considered to be neutral with respect to emissions of carbonaceous greenhouse gases, which means all the CO_2 emitted in the burning process. There are many brick manufacturing units across the country for which emission factor of class 1 has been adopted. The total dioxin released to air was 50.54 gTEQ/a.

There are more than 50 large and medium scale Glass production enterprises, for which emission factor for class 1 has been adopted. The total dioxin released to air was 0.03 gTEQ/a.

Category 5: Transport

Figure 25: Annual PCDD/Fs releases from transport sector



Since India is a developing country, the vehicle population increasing rapidly, so measures to reduce pollution from vehicles is encouraged.
There is no leaded petrol usage in country. In the 4 stroke, 2 stroke and diesel engines were consumed fuel as 95647944 t/a.

In this category, fuel of 95647944 tons was consumed in the country as per data collected. Based on the 2005 UNEP toolkit guidelines the PCDD/Fs emission from 4 stroke engine and diesel engine were calculated using class 2 and 1 respectively. The total dioxin released to air was 9.57 gTEQ/a.

For 4-stroke engines the emission factor of class 2 has been adopted. The total dioxin released to air was 0.37 gTEQ/a.

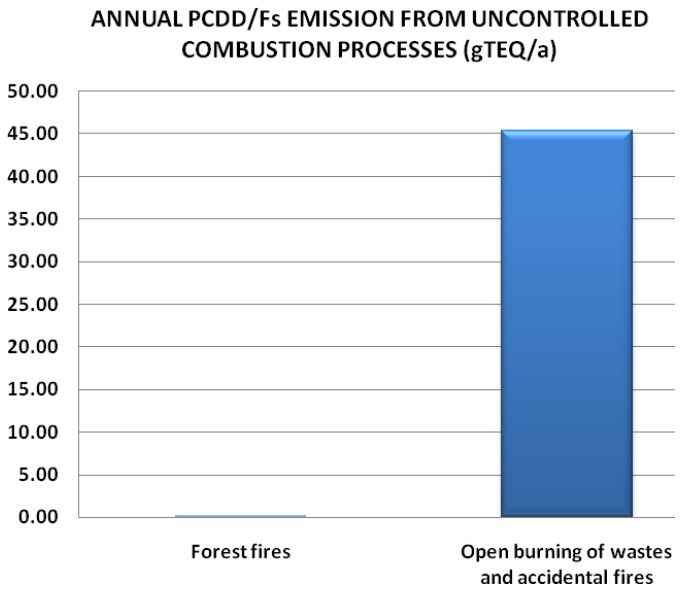
Used for heavy truck, light trucks, passenger cars, large-sized building equipments, boats, diesel generators, pumps and agricultural machines, for which emission factor of class 1 has been used. The total dioxin released to air was 9.20 gTEQ/a .

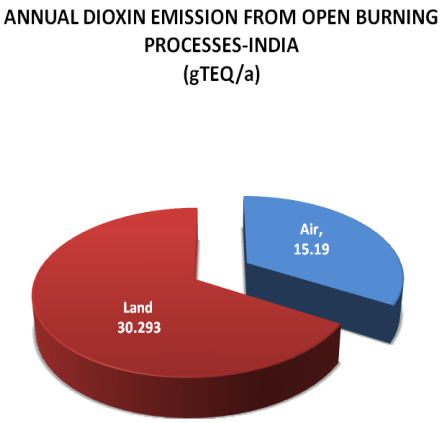
Category 6: Uncontrolled combustion processes

Burning of waste has the potential for comparatively high unintentional formation and release of dioxins and furans to the environment. Open burning is one of the waste disposal practices in the country. Open Burning covers a wide range of different uncontrolled waste combustion practices including dump fires, pit burning, fires on plain soil and barrel burning.

The Forest fires, agricultural residue burning, Land fill fires, Accidental fires in factories and houses and domestic waste burning of 51738 tons were burning in the country as per data collected during 2008 –till date.

Figure 26: Annual PCDD/Fs releases from Uncontrolled combustion processes



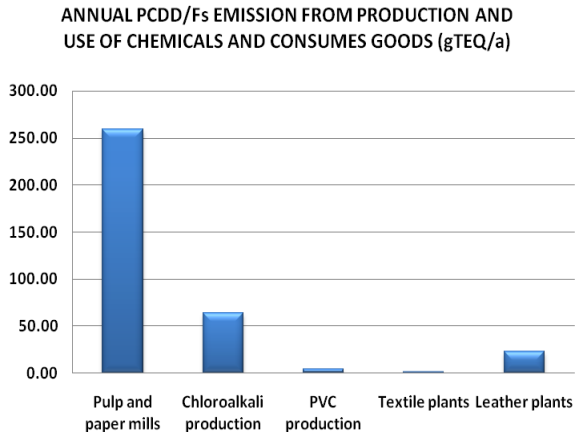


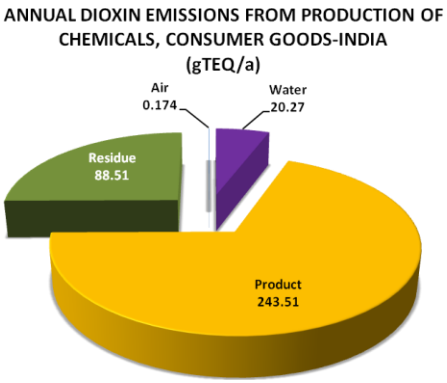
Based on the 2005 UNEP toolkit guidelines, the total dioxin released to air was 15.19 gTEQ/a and 30.293 gTEQ/a to land. The total dioxin release from open burning activity was 45.48 gTEQ/a (20 - 21).

Category 7: Production of chemicals, consumer goods

There are 169 pulp and paper production industries, 13 chemical processing industries (where chlorine is involved), 6 petroleum industries (Flare stack), 432 textile industries and many leather refining industries available in the country. Based on the 2005 UNEP toolkit guidelines the annual emissions were calculated was 0.174 gTEQ/a to air, 20.27 gTEQ/a to water, 243.51 gTEQ/a to product and 88.51 gTEQ/a to residue. The total dioxin release from production and use of chemical and consumer goods industries activity was 352.46 gTEQ/a (22).

Figure 27: Annual PCDD/Fs releases from Production of chemicals, consumer goods





The main processes involved in making pulp and paper products are raw material handling and preparation, storage (and preservation for non-woods), wood debarking, chipping and agricultural residue cleaning, deknotting, pulping, pulp processing and bleaching if required and, finally, paper or paperboard manufacturing. Most of the formation of the 2,3,7,8-TCDD and 2,3,7,8-TCDF is generated in the stage of bleaching via the reaction of chlorine with precursors of TCDD and TCDF. Based on the 2005 UNEP toolkit guidelines the annual emissions were calculated in various classes. The dioxin released to water was 20.05 gTEQ/a, to product was 218.81 and 20.05gTEQ/a to residue. The total dioxin release from pulp and paper production activity was 258.91 gTEQ/a.

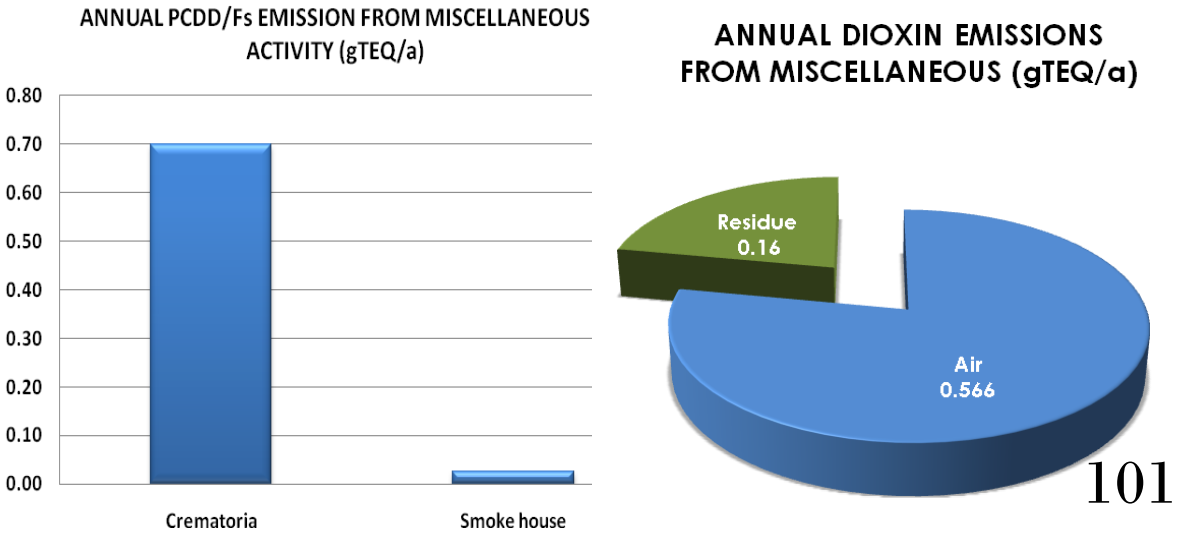
Chloroalkali production: Emission factor of class 2 has been adopted. PVC production: Emission factor of class 2 has been adopted. The total dioxin released to air was 0.174 gTEQ/a, to water was 0.22 gTEQ/a, to product was 0.013 and 68.46 gTEQ/a to residue. The total dioxin release from chemical industries activity was 68.87 gTEQ/a (23).

Contamination with PCDD and PCDF has been found in both textile and leather products. The occurrence of PCDD/PCDF in the textile and leather industries is due to use of chlorinated chemicals, especially pentachlorophenol and chloronitrofen, to protect the raw material (e.g. cotton, wool or other fibres, leather); and use of dioxin-contaminated dyestuffs (e.g. dioxazines or phthalocyanines). Smaller quantities of PCDD/PCDF may be formed during finishing, and during incineration of process-generated sludge. Alternatives to the above-listed dye pigments exist and those listed should not be applied. Emission factors in the Toolkit class 2 were adopted. The total dioxin released to product was 1.38 g TEQ/a (24). For leather refining emission factors in the Toolkit class 1 were adopted. The total dioxin released to product was 23.3 g TEQ/a.

Category 8: Miscellaneous

In this category, crematoria and smoke house facilities are present in India. Under this category, annual capacities of 56950 tons were disposed in the country as per data collected. Based on the 2005 UNEP toolkit guidelines, the dioxin released to air was 0.566 gTEQ/a and to residue was 0.16 gTEQ/a. The total dioxin release from miscellaneous activity was 0.73 gTEQ/a.

Figure 28: Annual PCDD/Fs releases from miscellaneous activity



The UNEP Toolkit indicates that dioxin emissions can occur from the drying of biomass if contaminated wood is used as fuel. The drying of biomass using combustion does not widely take place in India, as most wood chip and green fodder are air dried. Furthermore, the combustion of contaminated wood does not commonly occur in India. Therefore, dioxin emissions from the drying of biomass are expected to be insignificant.
Crematoria are used to reduce human bodies to ash for the purposes of burial. They are typically fired by natural gas. The formation and release of PCDD and PCDF, HCB and PCB from crematoria is possible due to the presence of these chlorinated materials, precursors and chlorine in the cadavers and in some co-combusted plastics. Based on the 2005 UNEP toolkit guidelines the total dioxin released to air was 0.56 gTEQ/a and to residue was 0.14 gTEQ/a. The total dioxin release from miscellaneous activity was 0.70 gTEQ/a (25).

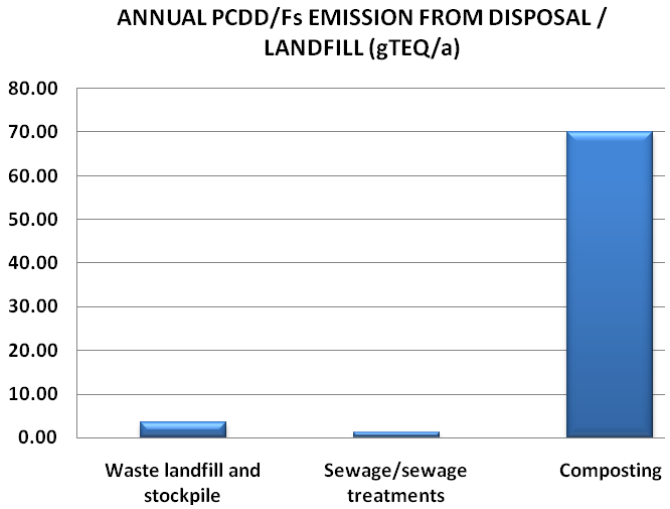
Smoke houses use the combustion of biomass to produce smoke in a closed chamber to preserve food. Dioxin emissions to air from the combustion products of biomass and to land from ash disposal are possible. It is assumed that smoke house activity is small and dioxin emissions are negligible. Based on the 2005 UNEP toolkit guidelines the total dioxin released to air was 0.006 gTEQ/a and to residue was 0.02 gTEQ/a. The total dioxin release from miscellaneous activity was 0.026 gTEQ/a.

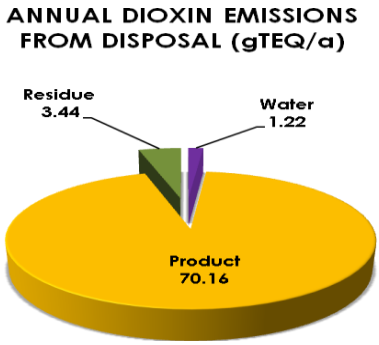
Category 9: Disposal/ Landfill

There are 91 disposal/ landfill facilities in India. Among these, 61 are sewage treatment facilities, and 5 landfill facilities and 25 are composting facilities. There are no open water dumping and waste oil treatment facilities in India.

The operation of disposal/ landfill facilities operate with approximately 600299645 tons/a as per data collected during 2008 –2010. Based on the 2005 UNEP toolkit guidelines the total dioxin released to water was 1.22 gTEQ/a, to product was 70.16 gTEQ/a and to residue 3.44 gTEQ/a. The total dioxin release from category 9 was 74.82 gTEQ/a.

Figure 29: Annual PCDD/Fs releases from Disposal/landfill





For landfills and waste dumps emission factor in the Toolkit adopted was class 2. Total dioxin released to water was 0.017 gTEQ/a and to residue 3.44 gTEQ/a. The total dioxin release from landfills and waste dumps activity was 3.46 gTEQ/a.

There are a number of sewage treatment plants in India. Sewage treatments include, Pre-treatment, screening, grit removal, fat and grease removal, primary treatment and secondary treatment. Based on the 2005 UNEP toolkit guidelines the total dioxin released to water was 1.2 gTEQ/a

Composting is predominant municipal organic waste treatment option in the country where significant fractions of household waste will biodegrade. Some organic wastes may contain persistent organic pollutants or materials that could be converted to persistent organic pollutants under composting conditions, and they should be treated separately in order to guarantee high-quality compost with low content of such pollutants. In some cases, composting can be enhanced by substitution of certain biodegradable materials for alternatives. Based on the 2005 UNEP toolkit the total dioxin released to product was 70.16 gTEQ/a.

3.4.3 Category-wise release estimation

Table 16 The release estimates for each source category with the activity statistics

No.	Release source and category	Total amount (t/a)	Scale and calculation basis	Release (g TEQ/a)					
				Air	Water	Land	Products	Residue	Total
1	**Waste incineration**			**1812.14**				**3965.83**	**5777.97**
1.1	Municipal waste incineration	NA	There is no municipal waste incinerator (MWI) in India. 94% of the total municipal solid waste generated is dumped and 4% is composted, and only 2% recycled.						
1.2	Hazardous waste incineration	4404475	There are more than 120 hazardous waste incinerators and 11 hazardous waste landfills in India, for which emission factor for Class 2 in the toolkit is chosen.	1541.57				3964.03	5505.6
1.3	Medical waste incineration	90189	Cities across the country at the regional level generally have centralized disposal facilities for medical wastes, for which emission factor for Class 3 in the Toolkit were chosen	270.57				1.80	272.37
1.4	Light-fraction shredder waste incineration	NA	Partly open burn and partly sent to HW incineration						0

1.5	Waste wood and waste biomass incineration	NA	Used as fuel for domestic heating/ stoves						0
1.6	Sewage sludge incineration	NA	This type of waste is not incinerated, release of PCDD/ PCDFs has not been considered.						0
2	**Ferrous and non-ferrous metal production**			**539.68**				**1210.36**	**1750.04**
2.1	Iron ore sintering	52012006	There are a number of sintering machines in 2009. Based on testing results, investigation and research of demonstration projects, emission factor for class 2 was adopted.	260.06				0.16	260.22
2.2	Coke production	8329445	At the end of 2009, there were many coke production enterprises,	24.99					24.99
2.3	Iron and steel production	37864845 22300000 62838000	The emissions have been calculated based on the specific emission factor of the respective category.	116.45				601.42	717.87
2.4	Foundries	6425944	There are large numbers of foundries for which emission factor Class 2 in the UNEP Toolkit is adopted.	27.63				1.3	28.93
2.5	Hot-dip galvanizing plants	Very little output							
2.6	Secondary copper production	642356	There were large numbers of small and	32.12				404.68	436.8

			big enterprises with annual use of waste copper about thousands of tons, for which emission factors for Category 2 was adopted.						
2.7	Secondary aluminum production	500000	No emission of PCDD/PCDFs has been considered as most of the aluminium production is from the primary sector.	17.5				200	217.5
2.8	Secondary lead production	565840	There is over 100s of units in the small and medium scale enterprises for which emission factor of class 2 was adopted.	4.53				2.8	7.33
2.9	Secondary zinc production	402029	There are many units in the small and medium scale enterprises for which emission factor of class 2 was adopted..	40.20					40.20
2.10	Brass and bronze production	13776	Most of the units belong to small and medium scale enterprises for which emission factor of class 2 was adopted.	0.138					0.138
2.11	Magnesium production	Very little output	PCDD/Fs release from this source has not been considered.						
2.12	Thermal non-ferrous metal production	160640	Appropriate class 1 has been adopted.	16.06					16.06
2.13	Shredder	Very little output	PCDD/Fs release from this source has not been						

			considered.						
2.14	Thermal wire reclamation	Very little output	PCDD/Fs release from this source has not been considered.						
3	**Heat and power generation**			**308.65**				**195.5**	**504.15**
3.1	Fossil fuel power plants	13962367	Relevant emission factors in the Toolkit were adopted.	139.62				195.5	335.12
3.2	Industrial boiler	Very little output	PCDD/Fs release from this source has not been considered.						
3.3	Biomass power plants	338052	There are few biomass fired power plants generating electricity in the country.	169.03					169.03
3.4	Landfill and biogas	NA	PCDD/Fs release from this source has not been considered.						
3.5	Stalk combustion	NA	PCDD/Fs release from this source has not been considered.						
3.6	Firewood combustion	NA	PCDD/Fs release from this source has not been considered.						
3.7	Household heating and cooking	NA	PCDD/Fs release from this source has not been considered.						
4	**Production of mineral products**			**141.33**					**141.33**
4.1	Cements production	139399261	It comprises of 140 large and more than 365 mini cement industries. Emission factor of class 3 has been adopted.	83.64					83.64
4.2	Lime production	712017	A large number of	7.12					7.12

			small and medium scale enterprises, for which emission factor of class 1 has been adopted.						
4.3	Brick Production	252700865	There are many brick manufacturing units across the country for which emission factor of class 1 has been adopted.	50.54					50.54
4.4	Glass production	135737	There are more than 50 large- and medium scale enterprises, for which emission factor for class 1 has been adopted.	0.03					0.03
4.5	Ceramic production	NA	PCDD/Fs release from this source has not been considered.						
4.6	Asphalt remixing	NA	PCDD/Fs release from this source has not been considered.						
5	**Transportation**			**9.57**					**9.57**
5.1	Four-Stroke engines	3701226	The emission factor of class 2 has been adopted.	0.37					0.37
5.2	Two-stroke engines	NA	PCDD/Fs release from this source has not been considered.						
5.3	Diesel engines	91946718	Used for heavy truck, light trucks, passenger cars, large-sized building equipment, boats, diesel generator, pumps and agricultural machines, for which emission factor of class	9.20					9.20

			has been used.						
5.4	Heavy oil fired engines	NA	PCDD/Fs release from this source has not been considered.						
6	**Uncontrolled combustion processes**			**15.19**		**30.29**			**45.48**
6.1	Forest fires	13338	Release of this type of pollution sources can be ignored at the present stage.	0.067		0.053			0.12
6.2	Grassland fires	Very little output	Release of this type of pollution sources can be ignored at the present stage.						
6.3	Stalk open burning	Very little output	Release of this type of pollution sources can be ignored at the present stage.						
6.4	Open burning of wastes and accidental fires	50400	It again needs the extensive survey. The emissions have been calculated with emission factor from the toolkit.	15.12		30.24			45.36
7	**Production and use of chemicals and consumes goods**			**0.174**	**20.27**		**243.51**	**88.51**	**352.46**
7.1	Pulp and paper mills	11068937	There are several papermaking enterprises using chlorine gas for bleaching boilers. Emission factors in the Toolkit were adopted by giving consideration to demonstration		20.05		218.81	20.05	258.91

			projects.						
7.2	Na-PCP production	NA	PCDD/Fs release from this source has not been considered.						
7.3	PCBs production	NA	PCBs are not produced in the country.						
7.4	Production of chlorinated phenols and their derivatives	NA	Emission factors were determined based on testing.						
7.5	Tetrachlorobenzene production	NA	Release of this type of pollution sources can be ignored at the present stage.						
7.6	Production of2,4,6-Trichlorophenyl1-4'-nitrophenyl ether (CNP)	NA	PCDD/Fs release from this source has not been considered due to lack of data.						
7.7	Chlorobenzene production	NA	PCDD/Fs release from this source has not been considered due to lack of data.						
7.8	Chloroalkali production	64105	Emission factor of class 2 has been adopted.					64.11	64.11
7.9	PVC production	435000	Emission factor of class 2 has been adopted.	0.174	0.22		0.013	4.35	4.76
7.10	Chlorinated aliphatic chemicals production	Very little output	Release from this type of sources can be ignored at the present stage.						
7.11	Chlorinated inorganic chemicals	Very little output							
7.12	Petroleum refineries	NA	Information on flare gas burning is not available						
7.13	Textile plants	13804727	Cotton Cloth, Mixed/Blend Cloth, Man Made Fibre				1.38		1.38

			Fabrics, etc.						
7.14	Leather plants	23300	Emission factors in the Toolkit were adopted.				23.3		23.3
8	**Miscellaneous**			**0.566**				**0.16**	**0.73**
8.1	Drying of biomass	NA	PCDD/Fs release from this source has not been considered.						
8.2	Crematoria	55950	Data from the source keep varying.	0.56				0.14	0.7
8.3	Smoke house	1000	There are a number of smoke houses for smoking food s.	0.006				0.02	0.03
8.4	Dry cleaning residue	NA	PCDD/Fs release from this source has not been considered.						
8.5	Tobacco Smoking	NA	PCDD/Fs release from this source has not been considered.						
9	**Disposal/Landfill**				**1.22**		**70.16**	**3.44**	**74.82**
9.1	Waste landfill and stockpile	574080	Emission factors in the Toolkit were adopted.		0.017			3.44	3.46
9.2	Sewage/sewage treatments	599023990	There are a number of sewage treatment plants in India.		1.2				1.2
9.3	Open water dumping	NA	PCDD/Fs release from this source has not been considered.						
9.4	Composting	701575	Composting is predominant municipal organic waste treatment option in the country				70.16		70.16
9.5	Waste oil disposal	NA	PCDD/Fs release from this source has not been considered.						
	Total								**8656.55**

3.4.4 Measured emission factors

Sampling and analysis of flue gas were carried out with an objective to develop measured emission factor as the incineration procedure along with the Advanced Pollution Control Systems (APCS) availability are different from the case studies mentioned in the toolkit (Table 17).

Table17: Comparison of PCDD/Fs release estimates by adopting the emission factors of the UNEP Tolkit or measures ones

Source	Annual Release of PCDD/Fs (gTEQ/a) MEASURED						TOOLKIT VS	
		Air	Water	Land	Products	Residues	Total	%
Waste incineration	TOOLKIT	1812.14				3965.83	5777.97	**66.75**
	MEASURED	3173.98				4148.50	7322.48	**62.79**
Ferrous and non-ferrous metal production	TOOLKIT	539.68				1210.36	1750.04	**20.22**
	MEASURED	657.23				1210.79	1868.02	**16.02**
Heat and power generation	TOOLKIT	308.65				195.50	504.15	**5.82**
	MEASURED	482.48				261.80	744.28	**6.38**
Production of mineral products	TOOLKIT	141.33					141.33	**1.63**
	MEASURED	1055.23					1055.23	**9.05**
Transportation	TOOLKIT	9.57					9.57	**0.11**
	MEASURED	9.57					9.57	**0.08**
Uncontrolled combustion processes	TOOLKIT	15.19		30.29			45.48	**0.53**
	MEASURED	15.19		30.29			45.48	**0.39**
Production and use of chemicals and consumes goods	TOOLKIT	0.174	20.27		243.51	88.51	352.46	**4.07**
	MEASURED	0.174	156.19		296.98	88.51	541.85	**4.65**

Miscellaneous	TOOLKIT	0.566				0.16	0.73	**0.01**
	MEASURED	0.566				0.16	0.73	**0.01**
Disposal/Landfill	TOOLKIT		1.22		70.16	3.44	74.82	**0.86**
	MEASURED		1.22		70.16	3.44	74.82	**0.64**
TOTAL (TOOLKIT EF)		**2827.30**	**21.49**	**30.29**	**313.67**	**5463.80**	**8656.55**	**100.00**
Release To Matrix (%) (TOOLKIT EF)		**32.66**	**0.25**	**0.35**	**3.62**	**63.12**		**100.00**
TOTAL (MEASURED EF)		**5394.42**	**157.4**	**30.29**	**367.14**	**5713.20**	**11662.46**	**100.00**
Release To Matrix (%) (MEASURED EF)		**46.25**	**1.35**	**0.26**	**3.15**	**48.99**		**100.00**

By applying measures emission factors the PCDD/F releases were 13,241.70g TEQ/a. It is 35% more than if the emission factors of the UNEP Toolkit were applied. This is a very significant difference and needs further investigations. One of the reasons for the difference could be that the Toolkit emission factors are derived from technologies and raw materials used in developed countries. Interestingly the major differences were observed at main source category No 4: Production of mineral products and main category No 7: Production of chemical and consumer goods and exactly these are the sectors where in Indian local technologies are prevalent.

3.5 Information on the state of knowledge on Stockpiles, Wastes and Contaminated Sites

3.5.1 Introduction

Survey and collection of soil and water samples from suspected contaminated sites, as identified through the information received from different agencies were undertaken. This was conducted through letters and questionnaires to respective agencies. Since among the POPs only DDT and PCBs are used in the country the inventory concentrated on DDT storages/warehouses and the facilities where PCB-containing electrical equipment were found. As per information provided by HIL and NVBDCP regarding annual allotment of supply of DDT in various states in India during 2002-03 to 2008-09 and from the Health and Family Welfare Department, Himachal Pradesh, NEERI team has visited eight States of India (Mizoram, West Bengal, Chhattisgarh, Maharashtra, Himachal Pradesh, Assam, Meghalaya and Tripura) which received major allocation of DDT for vector control. The team surveyed and collected soil and water samples and gathered secondary data from the suspected contaminated sites for quantitative analysis of DDT in the samples.

During the visit, 5 districts of Mizoram, 2 districts of West Bengal, 7 districts of Chhattisgarh, Hindustan Insecticides Limited, the sole DDT producer, (Rasayani, Maharashtra), 6 districts of Himachal Pradesh, 2 districts of Assam, 1 district of Meghalaya and 2 districts of Tripura were covered where DDT was stored for distribution and application. The storage sites were inspected and soil and ground water samples around the area were collected. Secondary data on DDT spray in various districts were also collected. Medical/Malaria officers of the respective health centre/block provided relevant informarion asked for in the questionnaires prepared for the public health departments related to DDT IRS. Inventorization of the secondary data with respect to population, number of households, number of sections under each Primary Health Centre (PHC), amount of DDT used in respective sections, percentage of population covered under spray was carried out in the respective regions.

CPRI Bangalore provided information as to the probable PCB contaminated sites. The locations included steel plants, storage and disposal facility, thermal power plant and a ship breaking facility to provide a cross section sample of the PCB management situation in the country. The following locations had been visited and samples were drawn during the inventory exercise for analysis:

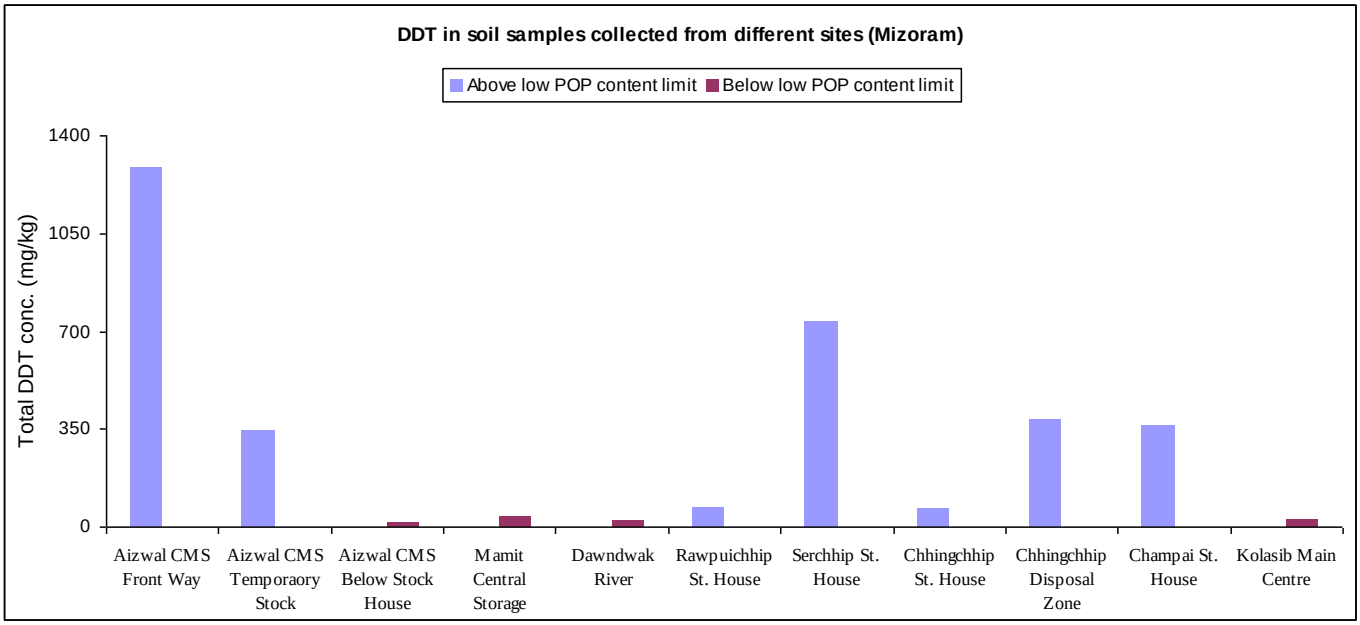
- Bhilai Steel Plant, Bhilai (Chattisgarh)
- Rourkela Steel Plant, Rourkela (Orissa)
- Neyveli Lignite Corporation Limited, Block-1, Cuddalore District, Neyveli (Tamilnadu)
- IISCO Steel Plant, Burnpur (West Bengal)
- Dhulekote storage and disposal facility, Haryana
- Panki Power House, Uttar Pradesh
- Ship Breaking Yard, Alang, Gujarat

3.5.2 Contaminated sites with DDT

Mizoram

In Mizoram transportation and storage of DDT were inadequate and not proper in most of the centers. In most of the places, permanent storage facilities were not available with the distributors. DDT bags were temporarily stored in houses, hospital rooms and health centre premises. The empty DDT bags were disposed in garbage dump. Often empty DDT bags as well as the date expired DDT were buried. Masks were being used but no document/information was available about its disposal., Empty bags of DDT are disposed through incineration. None of these incinerators are, however, designed to handle hazardous wastes. Due to the improper storage condition the analysis of most of the soil samples showed DDT level above 50mg/kg which is above the low POP content limit (Figure 30).

Figure 30: Total DDT in soil samples collected from different sites at Mizoram



West Bengal

In Canning-1 Block, it was recorded that the empty bags and the bags containing date expired DDT were randomly disposed into the pits near the storage area and in the pond within the hospital premises. Spray workers quite often reuse the empty bags after washing for their domestic purposes. It was further informed that outdoor spray was not practiced in the region. Two samples were collected from ground water sources near the warehouse. The analysis results of the collected samples showed that DDT was present in water samples. In one of the samples it was above the permissible limit (0.001mg/l) as per WHO guidelines 2006 for drinking water. The high level of DDT (0.035mg/l), which was 35 times higher than the permiscible limit value, was found in pond water in Canning Block. The contamination might be attributed to disposal of DDT bags into the pits near the storage area and in the pond.

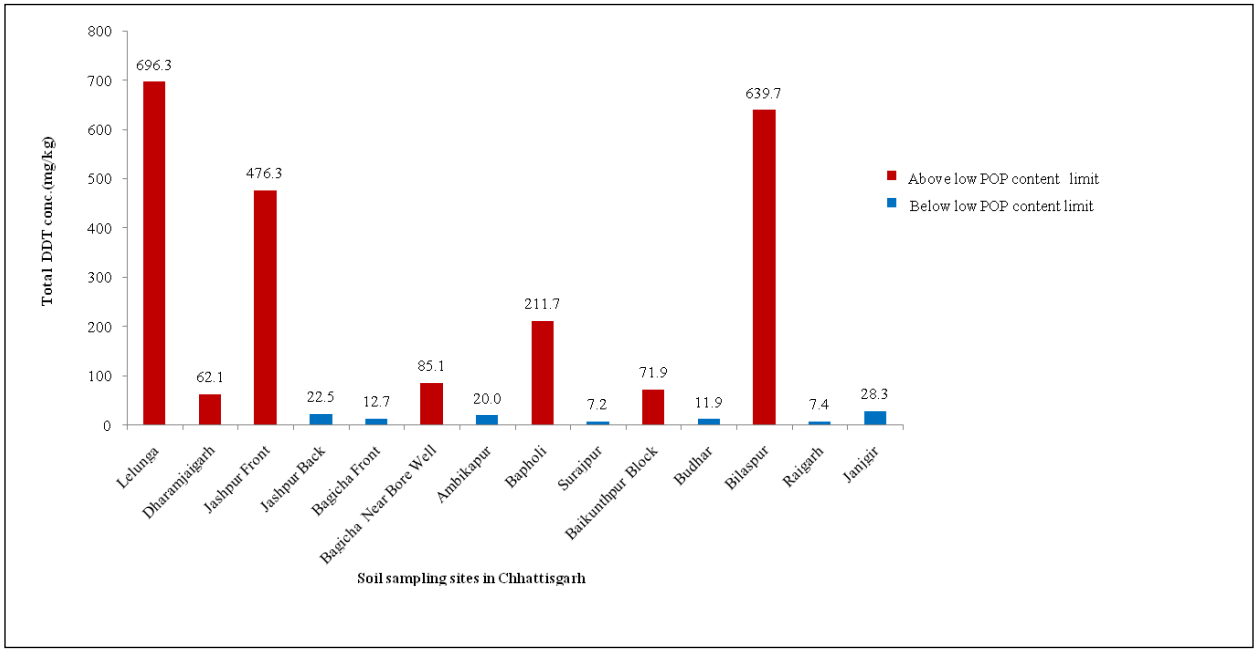
Table 18: DDT concentration of water samples collected from a public health centre at Canning, West Bengal in January 2010

Sr. No	Water Sample	DDT Conc. (mg/l)
1	Canning Ground Water	0.00016
2	Canning Pond Water	0.035

Chhattisgarh

NEERI team visited 14 major blocks in 7 districts of Chhattisgarh, where DDT was stored for distribution and application. In each block, storage sites were inspected and soil and ground water samples were collected. At seven location DDT concentration in the soil samples was much higher than the limit value (50mg/kg). The highest were found in Lelunga and Bilaspur where the total DDT concentration was above 600 mg/kg, thus more than 12 times higher than the limit value (Figure 31). The high concentration of DDT in soil samples might be due to improper storage of DDT bags at the storage houses.

Figure 31: Total DDT in soil samples collected from different sites at Chhattisgarh



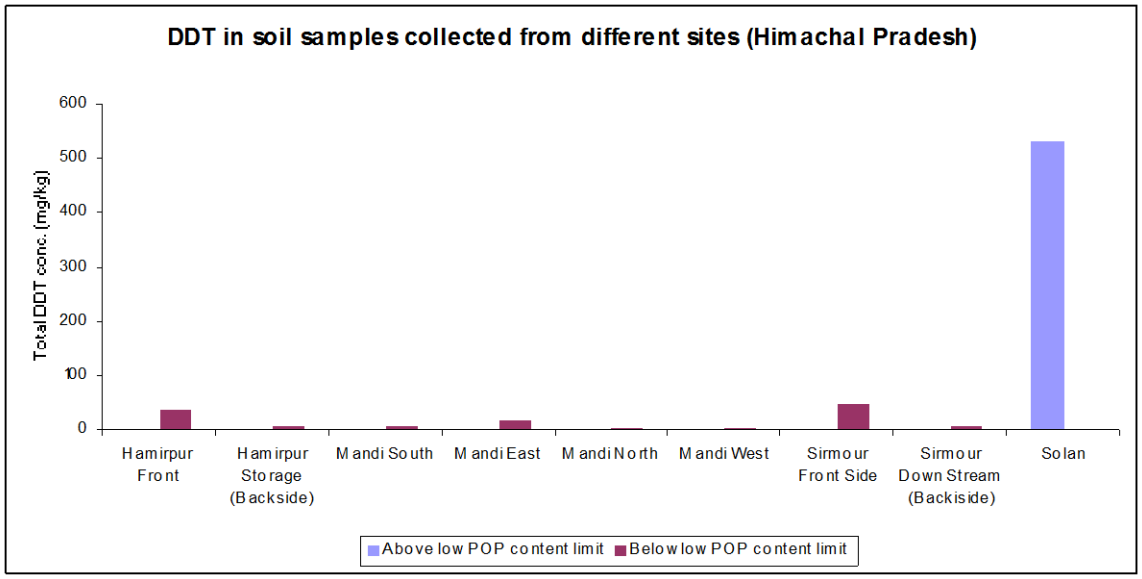
Himachal Pradesh

The State Programme Officer (Malaria), Himachal Pradesh provided important information that 40 MT of date expired DDT was lying in the state. NEERI team visited the sites and observed on inspection that last stock of DDT was received in 2001.

The obsolete DDT stocks were stored at isolated places in the rooms on concrete/cemented floor and were fully covered. There is a proposal to establish an incinerator at Baddi (Himachal Pradesh) where all the obsolete DDT stocks would be disposed of in near future. Till that time, DDT stocks are to be kept in well covered concrete pits as instructed by the State Government.

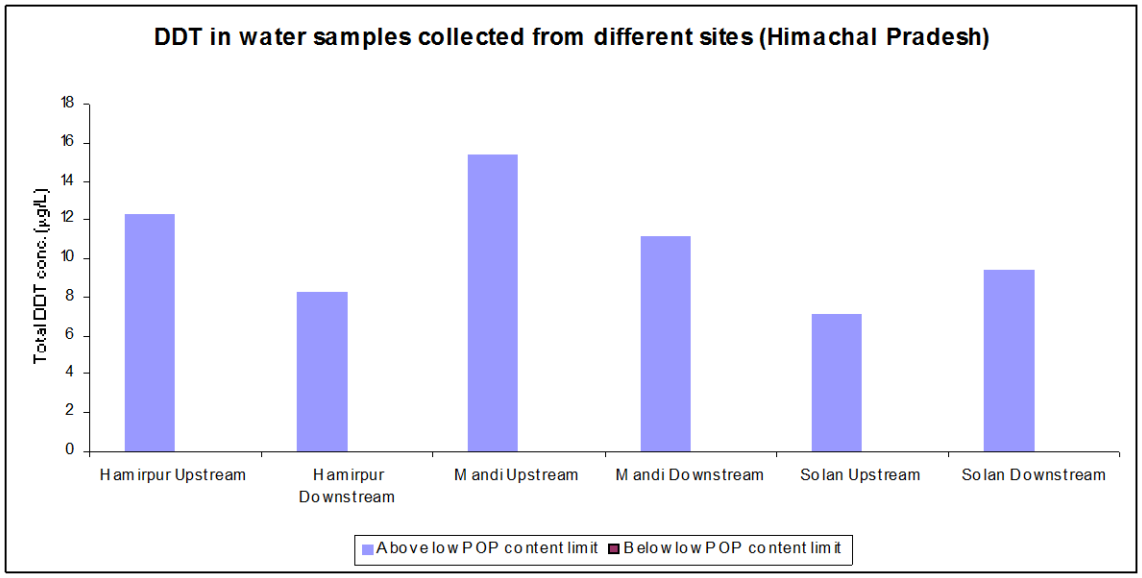
Soil and water samples were collected from six districts of Himachal Pradesh. In each district, storage sites were inspected and soil and ground water samples were collected around the area. A total of 9 soil samples and 6 water samples were collected. The highest concentration of DDTs was found in the sample collected from Solan (530.161 mg/kg) which might be due to improper storage of DDT bags (Figure 32).

Figure 32: Total DDT in soil samples collected from different sites at Himachal Pradesh



All the water samples contained DDT in higher concentration than the permissible limit value (Figure 33). The highest concentration of DDTs was found in the sample collected from Mandi Upstream (0.01537mg/l) which might be attributed to the percolation of DDT in soil and surface runoff due to rain water. In this case the DDT concentration was 15 times higher than the WHO limit value, which is particularly important, since people use this water resource for drinking purposes.

Figure 33: Total DDT in water samples collected from different sites at Himachal Pradesh during March 2010



Assam

NEERI team visited 2 districts of Assam viz. Nagaon and Sonitpur where DDT was stored for distribution and application. The storage sites were inspected and soil and ground water samples were collected from and around the area. In some places empty DDT bags were disposed of through open burning while at some places these were used by spray workers for their domestic purposes.

Meghalaya

NEERI team visited two public health centers in Meghalaya, namely Umden and Marngar subordinte to the hospital, Nongpoh (Ri-Bhoi District) and collected soil and ground water samples from the visited sites. The storage conditions were appropriate.

Tripura

The team visited 2 districts of Tripura viz. South Tripura and West Tripura where DDT was stored for distribution and application. The storage sites were inspected and soil and ground water samples were collected from and around the area. At all locations the storage rooms were well covered;and with concrete floor and dedicated for DDT storage. It was recorded that empty DDT bags are randomly buried in soil and sometimes used by spray workers.

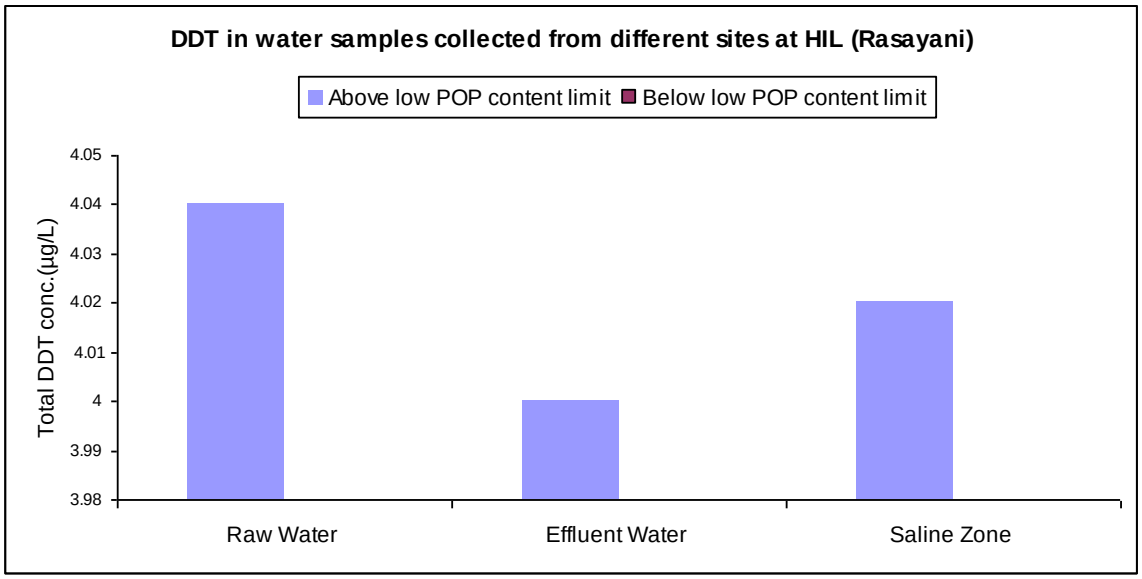
Hindustan Insecticides Ltd. (HIL), Rasayani, Maharashtra

HIL,the Government-owned DDT production factory, has two plants, one in Rasayani, Maharastra and other in Udyogmandal, Kereala. The inventory team visited the Rasayani plant, because it produces the major quantity of DDT.. The sludge generated during DDT production is dried and disposed in the Mumbai Waste Management plant (Taloja, MIDC area). DDT is not stored at the plant. Once DDT production is completed, it is dispatched to the destination. Soil and sludge samples were collected for analysis.

Three water samples viz. raw water from the open channel, effluent from cooling plant/reactor and effluent discharged at sea 12 km away from the factory were also collected during the survey.

The highest concentration of DDT was found in the sample collected from the sludge (330.315 mg/kg). DDT concentration in soil sample was below the limit value (7.7mg/kg). All of the water samples were found to have DDT more than permissible value. The highest concentration of DDTs was found in the sample collected from Estuarine Zone (4.12 µg/L) though their concentration did not differ significantly.

Figure 34: Total DDT in water samples collected from different sites at HIL (Rasayani) during August 2009



3.5.3 Contaminated sites with PCBs

Bhilai Steel Plant, Chhattisgarh

NEERI team visited Bhilai Steel Plant (BSP) for field survey, collection of soil and water samples for the identification of contaminated areas in BSP. A total of 12 soil samples and 3 water samples from different locations in the plant were drawn for analysis. There are 465 transformers in the BSP which contain pure PCBs (Sovtol and Clophen). It was observed that most of the phased-out transformers as well as the stocks of pure PCB oil in the drums were kept in open place at different locations in the plant without the proper arrangements.

Rourkela Steel Plant, Orissa

NEERI team visited Rourkela Steel Plant (RSP) for field survey, collection of soil and water samples for the identification of contaminated areas in RSP. Inspection revealed that there was no PCB containing oil drums in RSP. Most of the transformers in RSP contained mineral oil. It was also found that all PCB containing transformers were kept

in separate room. The rooms were concrete floored and no spillage of oil from the transformers was found. Details of the PCB oil containing transformers were collected. It was found that there were only 7 working transformers in the RSP which contained PCBs. As per information provided by officials of RSP, all PCB oil transformers would be replaced by mineral oil transformers in near future.

Neyveli Lignite Corporation Limited, Tamil Nadu

The team found that there were 24 working transformers containing PCBs at Neyveli Lignite Corporation Limited (NLCL). Details of transformers and the PCB containing oils used in the transformers were collected. During inspection, it was found that there was no PCB containing oil drums. Most of the transformers contained mineral oil. It was also found that all the PCB containing transformers were kept on open terrace which is situated at the height of approximately 50 feet from ground. The terrace had concrete floor and no spillage of oil from the transformers was observed. As per information provided by officials of NLCL, all the PCB oil transformers would be replaced by mineral oil transformers.

IISCO Steel Plant, West Bengal

At IISCO Steel Plant, Burnpur, West Bengal, the team observed that all 39 transformers were in working condition and each transformer was kept on well maintained three feet thick concrete platform roofed with tin shed or concrete slab at different locations in the plant. It was also observed that they don't have PCB containing transformer oils containers and there were proper arrangements to avoid the spillages and ground water contamination during the monsoon season.

Dhulekote storage and disposal facility, Haryana

NEERI team visited Uttara Haryana Vidyut Prasaran Nigam (UHVPN), store and disposal yard Dhulekote, near Ambala for field survey and sample collection. During the visit soil and ground water samples from the nearby area were collected. It was observed that the officials of UHVPN were unaware of hazards of PCBs. It was also observed that many transformers were kept in open space in the yard. The floor of the storage yard was made of concrete, but there was no discrimination between PCB and mineral oil. Indeed, the workers were unaware of the difference between PCB and mineral oil in terms of hazard potential.

Panki Thermal Power Plant, Uttar Pradesh

At Panki Thermal Power Plant (PTPP), Panki, Kanpur most of the transformers were found to contain mineral oil. It was also observed that all PCB containing transformers were kept separately. The rooms were concrete floored and no spillage of oil from the transformers was found. Details of the PCB oil containing transformers were collected. It was found that there were only 10 working transformers in the PTPP which contains PCBs and were manufactured in the year 1974. As per information provided by officials of Panki Thermal Power Plant, all PCB oil transformers will be replaced by mineral oil transformers in near future.

Ship Breaking Yard, Alang, Gujarat

During survey of the Ship breaking yard at Alang, 9 soil and 3 sediment samples from different depths and 7 water samples including sea water sample were collected for testing. In addition, PCBs containing scrap paint chips samples (one from ship breaking site and other from temporary scrap storage) were also collected. Samples of engine oil, sludge,and bilge water were collected. Workers in the yard were taking all necessary precautionary measures.

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

3.6.1 Monitoring of POPs releases

CPCB(CPCB) is a statutory organization under the aegis of Ministry of Environment & Forests (MoEF), GOI. CPCB(CPCB) has on-going programme on Water and Air Quality Monitoring through State Pollution Control Boards (SPCBs) and Pollution Control Committees (PCCs) and Inter-state water quality monitoring of rivers and assessment of micro pollutants. There are other monitoring programs like monitoring of Extractable Organic Halides (EOX), trace metal characterization of solid and hazardous waste using ICP-OES and characterization of non-ferrous industries solid waste through Energy Dispersive X-ray Fluorescence (EDXRF), monitoring and analysis of PAH, Volatile Organic Compounds (VOCs), Tri-halo-methane (THM), Pesticides and Dioxin (PCDDs) and Furan (PCDF). CPCB has established Ultra Trace Organic Laboratory as the National Reference Laboratory in collaboration with GTZ-ASEM (Advisory Services in Environment Management). This laboratory has the country's first Dioxin & Furan sampling and analytical facilities for ambient air and source emissions.

Indian Council for Agriculture Research (ICAR) started the All-India Coordinated Research Project (AICRP) on Pesticides Residues in 1984-85 with a view to develop protocols for the safe use of pesticides. The project was later re-designated as the All-India Network Project (AINP) on Pesticide Residues. Under this project, supervised field trials are carried out to study the persistence of pesticides on different crops. Based on the data generated, waiting periods are worked out for the safety of consumers. The data of these trials are also useful to the national regulatory authorities to take appropriate decisions regarding safe use of pesticides in the country.

3.6.2 Environmental impacts

Air: DDT and aldrin have been detected as the primary POPs pollutants in the air in some large cities. These studies are however not conclusive as time trend analysis are not available. It is however believed that air transport of POPs might be an important factor for long range environmental distribution of POPs. Since the studies have not mapped the whole country in a planned manner, important regions for POPs accumulation, such as the colder Himalayas are have not been included in the studies (POPs in South Asia).

Water POPs contamination of water bodies have been extensively addressed in several studies. The NIP inventory exercise collected drinking water samples from locations close to DDT storage and production facilities. The results indicate that the ground water and surface water resources are heavily contaminated with DDT. For more information on the results please see previous chapter. In some cases 35 times higher total DDT concentration was found than the WHO limit value of 0.001mg/l. Earlier studies have addressed major rivers like the Gomti and the Yamuna but these studies have also lacked the long-term monitoring of the levels of the pollutants 16(Dua, V.K., Kumari, R., Johro, R.K., Ojha, V.P., Shukla, R.P., and Sharma, V.P. 1998), (CPCB. 2000.), (Sarkar UK, Basheer VS, Singh AK, Srivastava SM. 2003). From literature resources one can see results showing high level of DDT during the mid to late 1990s, in the Yamuna close to Delhi, especially during the monsoon season. Similarly in Uttar Pradesh several lakes were sampled and high level of DDT was confirmed. In some cases, DDT residues in water and fish samples have exceeded the international limit values. Aldrin and dieldrin have also been present in environmental samples (Nair, Amit, Dureja, P., and Pillai, M.K.K., 1991). It is suspected that these high levels in water sources could be due to improper DDT disposal practices, which was confirmed during the inventory process. Another possible source could be run off from agricultural areas indicating illegal use of DDT in agriculture, though the likelihood for this is limited as the GOI puts stringent control on the DDT use in the health sector. Other studies have confirmed aldrin, dieldrin and heptachlor in high concentration from groundwater samples from Jharkhand, West Bengal, Himachal Pradesh and Delhi (CPCB. 1995), (Singh RP. 2001). A 2002 study of 17 bottled drinking water samples indicated DDT in about 80% of the samples at much higher levels than the European Union standards for drinking water (Mathur HB, Johnson Sapna, Mishra Rashmi, Kumar Avinash, Singh Bhupinder. 2003). This indicates that water is an important source for human exposure to POPs. Drinking water samples from Delhi, Mumbai, Chennai, Kolkata, Varanasi, Allahabad, Ahmedabad and Nagpur show DDT contamination higher than the WHO drinking water recommendations.

Soil samples taken during the inventory of contaminated sites confirmed the presence of DDT above 50mg/kg in almost all of the locations where samples were taken. This shows that DDT storage practices need imporvement. The disposal of the expired stocks is also a problem. In many cases it was found that empty bags and expired DDT was buried in the soil. Scientific studies showed the presence of aldrin, dieldrin, chlordane and DDT in soil sediments of rivers and drain sediments (Sethi PK, Bhattacharya AK, Sarkar A. 1999). In marine sediments at the mouth of estuaries in the west and east coasts of India aldrin, dieldrin and DDT contamination was confirmed (Sarkar A, Nagarajan R, Chaphadkar S, Pal S, Singbal SYS. 1997), (Sarkar A, Everaarts JM. 1998).

3.6.3 Human health impacts

High concentrations of POPs in South Asia, home to 40% of the world's poor, have likely contributed to disturbing public health trends in the region. Scientific evidence from the region comes mostly from India and Pakistan where exposures to POPs in occupational and agricultural settings are significant (UNEP 2002).

The long biological half life of POPs facilitates the accumulation of seemingly small unit concentrations over extended periods of time. Serious health consequences are associated with POPs impacting humans. International studies have revealed that wild life exposed to POPs have showed high rates of malformed genitalia, aberrant mating behaviour, sterility, cancer and immune system and thyroid dysfunction which might be the reason for decline in population of bottle-nosed dolphin, and beluga, common seals etc (S. Tanabe, An. Subramanian, A. Ramesh, P.L. Kumaran, N. Miyazaki and R. Tatsukawa 2000). Other known effects are thinning of the eggshells of fish-eating birds due to DDT exposure. These studies are suggestive of the fact that humans would experience similar effects as well. Scientific evidences suggest that some POPs have the potential to cause significant adverse effects to human health, at local level, at regional and at global level through long-range transport.

Very high levels of DDT have been reported in human fat tissues from India. Dieldrin and aldrin have been detected in Delhi, while PCB, dioxins and furans have been detected in South India though at levels lower than developed countries. Studies in Uttar Pradesh have revealed that DDT levels in blood of people occupationally exposed to DDT as part of malaria control were significantly higher than that in groups not so exposed (Dua VK, Pant CS, Sharma VP, Pathak GK. 1998). Further, in India, the population residing near estuaries polluted by agricultural discharges, industrial activity and shipping activities are likely to have significantly higher DDT levels in their blood than those living in non-estuarine areas (Srivastava AK, Bihari V, Mathur N, Pangtey BS, Gupta BN. 1993).

An issue of particular concern is the exposure of the human foetus and newborn infants to POPs through placental blood, breast milk and baby food as high levels of these contaminants have been reported in these substances. Indian samples showed the highest levels of dioxin-related compounds in human breast milk in a study comparing data from Asian developing countries (POPs in South Asia).

Several Indian studies point to high levels of POPs in human body fluids and tissues (Kunisue, Tatsuya, Watanabe, Mafuni, Monirith, In, Subramanian, Annamalai, Tana Seang Touch, Prudente Maricar, and Tanabe Shinsuke. 2001). In 1996, a study in North India found that the daily intake by newly born infants of DDT and aldrin was 7 and 27 times greater than the respective ADI set by the WHO (Siddiqui MK, Nigam U, Srivastava S, Tejeshwar DS, Chandrawati. 2002), (Siddiqui MKJ, Srivastava S, Srivastava SP, Mehrotra PK, Mathur N, Tandon I. 2003). Similarly, another study in North India found that the daily intake of DDT residues in one-month old infant was above the ADI in 85% of the samples.

Studies in India indicate relationships between DDT exposure and elevated blood pressure, abnormalities in thyroid function and intra-uterine growth retardation in pregnant women, which are a contributor to infant mortality (Srivastava 1995, Siddiqui and others 2002, 2003, Rathore and others 2002). It is postulated that some POP pesticides are responsible for declining vulture and crane populations in India (Muralidharan 1993, Prakash 1999).

In India, breast milk is highly contaminated, posing a threat to infants. dioxins can weaken the immune system and result in greater susceptibility to a variety of infections: they are emitted mainly from combustion sources, such as poorly regulated waste incineration facilities. A recent study in Southern India estimated dioxin levels (PCDD/DFs) in women's milk to be 13.8 pg TEQ/g milk fat, which is in the same range of levels estimated in 1993-94 from 18 countries. However, daily intake of dioxins among infants in India is estimated to be 100pg TEQ/kg/day, much higher than the upper limit of 4 pg TEQ/kg/day set by WHO (Kunisue and others 2001, WHO 2002a). An issue of particular concern is the exposure of the human fetus and newborn infants to POPs through placental blood, breast milk and baby food as high levels of these contaminants have been reported in these substances (Smith 1999). Some fertility problems are likely due to the endocrine disrupting ability of POPs and could include the causation of endometriosis in women and lowered sperm counts in men (PANNA 2001).

Indian studies provide evidence that a contributing factor to infant mortality is the linkage between DDT exposure and elevated blood pressure as well as intrauterine growth retardation (IUGR)1 in pregnant women. Other effects of POPs include its influence on the functioning of the thyroid in adults (Srivastava and others 1995, Siddiqui and others 2002, 2003, Rathore and others 2002).

3.6.3.1 POPs in food

Food items collected from different regions in India were analysed for the presence of HCH, DDT, HCB, aldrin, dieldrin, heptachlor, and PCBs by Kannan et al. Significantly high levels of food contamination with HCH, DDT, aldrin and dieldrin were observed. Dairy products and livestock meat were found to be the major sources of human dietary exposure to POPs. Concentration of these chemicals were above the maximum residue limits (MRLs) set forth by WHO/FAO and the Ministry of Health of the GOI. Food pollution and dietary intake of PCBs and HCB and heptchlor were relatively low according to the study (Kannan K., Tanabe S., Ramesh A., Subramanian A. and Tatsukawa R. 1992). Food contamination by POPs is an issue of concern in the South-Asian region although most of the information comes from India.

Indian dietary intake of DDT is amongst the highest in the world. It is estimated to be 231 µg/person/day compared to the allowable daily intake (ADI) specified by the Agency for Toxic Substances Disease Registry (ATSDR) of 35 µg/person/day (Sarkar 2001). Dairy products, that constitute a principal component of the Indian daily diet, contribute as much as 80% of the dietary intake of all pesticide residues (Sarkar 2001).

Health risks and regulatory measures associated with food contamination are areas requiring attention in India. Food surveys point to the presence of aldrin, dieldrin and chlordane in practically all kinds of foodstuffs, particularly in dairy products (IARI 1999). In July 2007, the European Commission issued a health warning to its Member States after high levels of dioxins were detected in a food additive - guar gum - used as

[1] Birth weight is below the 10th percentile of birth weight for gestational age.

thickener in small quantities in meat, dairy, dessert or delicatessen products. The source was traced to guar gum from India that was contaminated with pentachlorophenol (PCP), a pesticide no longer in use. PCP contains dioxins as contamination (WHO 2010).

3.6.3.2 Wildlife

Worldwide, the known effects of POPs include the role of DDT in thinning eggshells in fish-eating birds and their subsequent reduced reproduction rates in several parts of the industrialized world. DDT and dieldrin have been linked to cancer and reproductive abnormalities while the relationship between PCBs and dioxins and reproductive and nervous system disorders are also well established (Stober 2003).

Recent surveys indicate significant levels of DDT, PCBs and dieldrin and its metabolites in inland as well as offshore fish samples (Shailaja and Nair 1997, Senthilkumar and others 2001). Dioxins and furans have also been detected in dolphin tissue (Kumari and others 2002).

Numerous studies provide evidence of the presence of POPs in aquatic and terrestrial species in the region. The studies looking at aquatic fauna have focused on India. As with most of the other data about POPs in the region, the information is dispersed both temporally and spatially and thus provides a limited picture of contamination of aquatic life forms. However, recent surveys indicate significant levels of DDT, PCBs and dieldrin and its metabolites in inland as well as offshore fish samples (Shailaja and Nair 1997). Pesticide residues in fish are indicative of contamination of water sources and bioaccumulation higher up in the food chain.

Dolphins are at the highest level of the food chain in the large river systems of India. They have been found to contain high levels of DDT, chlordane, aldrin, dieldrin, heptachlor, HCB and PCBs -- far in excess of standards laid down for edible meat. dioxins and furans have also been detected in dolphin tissue (Kannan and others 1994, Kumari and others 2002). These findings highlight the potential for significant damage to the dolphin population due to POPs contamination. High levels of PCBs measured in turtle and fish tissue in Southern India could be connected to oil leaks from transformers in the region. Dioxin and furan levels have also been measured in fish in North and South India and that indicates their presence in the environment. To understand the effect of industrial activity in the region further sampling and analysis of dioxins and furans is required.

High levels of POPs found in bird species are also of concern and representative of high exposure of wildlife and the environment (Sanpera and others 2003). A study has indicated that the levels of PCBs in birds may be increasing in India. However, on the whole, DDT accumulation is of greater concern in birds migrating to India with lower concentrations of PCBs (Tanabe and others 1998). It has also been postulated that DDT may be the cause of declining populations of some bird species, such as sarus crane and vultures, in parts of India (Muralidharan 1993, 2000, Prakash 1999).

3.7 Current level of public information, awareness and education

3.7.1 Initiatives taken by Governmentof India

The Ministry of Environment and Forests (MOEF), Government of India is the nodal agency for planning, promoting and coordinating environmental programmes in India. MOEF is the nodal ministry in the country for the implementation of Stockholm Convention. MOEF is empowered to promulgate rules for the Protection of Environment and is responsible for ensuring effective implementation of legislation, monitoring and control of pollution, environmental clearances for industrial development projects, promotion of environmental education, training and awareness, and coordination with concerned agencies at the national and international level.

To ensure inter-ministerial coordination that is required to cover all aspects of multidisciplinary nature of implementing the convention, a National Steering Committee has been formed under the chairmanship of Secretary (E&F) to guide and oversees the activities of the development of NIP. The meeting of National Steering Committee has taken place on 23.12.04. The other members of the NSC are:-

1. Secretary, Dept. of Agriculture and Cooperation, New Delhi
2. Secretary, Dept. of Chemicals & Petrochemicals, New Delhi
3. Secretary, Ministry of Health and Family Welfare, New Delhi
4. Secretary, Ministry of External Affairs, New Delhi
5. Secretary, Department of Industrial Policy and Promotion, New Delhi
6. Addl. Sec. MoEF, New Delhi
7. AS& FA, MoEF, New Delhi
8. Director, ITRC, Lucknow
9. Director, NIOH, Ahmedabad
10. Representative form CII
11. Jt. Secretary, MoEF, New Delhi

The Terms of Reference of the NSC are as follows:-

(i) The Committee would plan, guide and monitor all actions needed for the preparation of National Implementation Plan

(ii) The Committee would assess the existing institutional infrastructure and its capacity to meet future Convention Obligations.

(iii) The Committee would provide a platform for ensuring closer interaction of all the stakeholders for ensuring comprehensive compliance of the various provisions of the Stockholm Convention.

(iv) The Committee shall meet as often as may be necessary.

Since MoEF is the nodal Ministry to carry out the implementation of the Stockholm Convention in India. A meeting with industry associations was convened to take the view of the industries on Feb 2005 under the Chairmanship of Secretary (E&F). After the meeting it was decided that India should ratify the convention as it has:

- Already banned 9 chemicals out of the 12 POPs listed under the SC.
- Indian already has a strong pesticide manufacturing base.
- MoEF in its obligation to implement SC in India had identified institutions like NEERI Nagpur, NIIST Thiruvananthapuram, CPCB New Delhi, CPRI Bangalore, HIL New Delhi to carry out different objectives under the NIP.

After the ratification of the SC by India on 13 April 2006, an inception / Kick-off meeting for the project was held with different stakeholders. The training needs were assessed on the inputs provided by the State departments of Agriculture, Health, and State Pollution Control Board. Thereafter, a series of capacity building workshops were organized to raise the awareness of national and state officials and industry to the requirements of the Stockholm Convention.

The NIP calls for the development of inventory of the initial 12 POP's chemicals. The MoEF in its implementation of the SC in India has identified partnering institutions for the inventorization of the 12 POP's . The institutions have the relevant expertise and infrastructure to carry out studies regarding the status of 12 POP chemicals India. The institutions were given the following responsibilities under the respective objectives assigned to them:-

1. Collect information regarding the POP chemicals
2. Develop an inventory on the POP chemicals.
3. Suggested action plans for management the sound disposal of the initial 12 chemicals.

Prior to the start of NIP, a series of five interactive workshops, one in each zone were organized for representatives of national as well as the States and Union Territories' along with Government institutions, commerce and industry, public and private testing laboratories, research institutes, enforcement entities, public health institutes, non-governmental organizations (NGOs) and other associations that were relevant to the implementation of the Stockholm Convention, for assessing the regulatory control provisions, enforcement capacity, research and development, health and environmental risks and also to assess the capacity building needs.

The availability of the data on the 12 POPs was collected from different State Governments. Similar information was also collected from different research

organisation/ Institutions dealing with the 12 POPs in India. The data was reviewed to set the national priority and action plan for the implementation of the NIP Project under Stockholm Convention in India. During the course of development of NIP, the data collected by the partnering institutions through first hand survey , site visits and through questionnaires has been reviewed and has been reflected in the final reports submitted by these institutions.

Monitoring mechanism has been developed to review the information related to the POP's chemicals. The status of the POPs chemicals is being reviewed by the concerned institution working on the particular POP chemical. A study was sanctioned by MoEF for the monitoring of the levels POPs in the environment. The study highlighted the following results:-

- The samples of the POPs collected from the indentified five places of the sampling, were below the detection limit
- Hexachlorobenzene (HCB) and Polychlorobiphenyls (PCB) were detectable but were not exceeding the permissible limits of the POPs.
- The active air PUF samples, water and soil samples of Coimbatore, New Delhi and Solan have HCB and PCB within permissible limits.
- The passive PUF samples do not show any detectable POPs and PCBs.
- The POPs pesticides in the air samples from different agro climatic zones in India were below the detectable limits at the non point source and hence do not pose a problem of environmental load and contamination

The Ministry of Environment and Forest is the designated nodal agency to carry out the implementation of the Stockholm Convention in India. The ministry is implementing the National Implementation Plan (NIP) Project .For the project the Ministry has identified technical institutions as partners for carrying out the different objectives under the NIP. Five different institutions, having proven track record in the field of POPs chemicals have been engaged for the development of the NIP. These institutions are:-

- CPCB, New Delhi (for objective 5)
- NEERI, Nagpur (for objective 5)
- CPRI, Bangalore (for objective 3)
- HIL, New Delhi (for objective 2)
- NIIST, Thiruvananthpuram (for objective 4)
- MoEF has been coordinating the activities under the objectives 1 & 6

Another important activity of the NIP was to develop a Management Information System (MIS) in order to ensure the reporting of national and state information in formats

compatible with Convention requirements. The National Informatics Centre (NIC) is the nodal agency for hosting and maintaining the website of MoEF. NIC has the available IT infrastructure to host the site. A webpage on Stockholm Convention is being developed which will provide the following information:

- Brief information on Stockholm Convention
- Information on National Implementation Plan
- Information about the partnering institutions in the development of NIP
- The reports of the partnering institutions on the respective objectives handled by them
- The draft NIP for viewing of the stakeholders and the final NIP after its endorsement by the NSC
- Other relevant information

A dedicated email:nip.moef@gmail.com has been provided to the stakeholders to post their queries regarding the NIP. The institutions working for the development of NIP are being encouraged to provide the relevant findings/information on the NIP under the objectives assigned to them. The information is being provided as per the reporting requirements of the Convention so that this can be exchanged with the IMS. The partnering institutions are in the process of uploading the data available with them on their websites. The above information will be hyperlinked to the webpage of the Stockholm Convention on the MoEF website.

The draft NIP has been prepared and the process of reviewing it and incorporating the relevant changes as per the requirements of Article 7 and the guidelines is under process. The national priorities have been reflected in the draft NIP under the different objectives. Action plans and their concomitant cost have also been reflected under each objective. The Drat NIP contains the results of the works carried out under each objective. These objectives were assigned to the partnering institutions having proven track-record in the field of research on chemicals.

The draft NIP reflects the inventorization of the POPs chemicals, action plans and strategies for the environmentally safe disposal of each Chemical listed under the 12 POPs. The draft NIP also has the financial costs required for the disposal of the POP chemicals. The draft NIP is being reviewed by the UNIDO and MoEF. The queries raised in the draft NIP are being sought form the institution responsible for carrying out studies under the respective objectives. The NIP is being reviewed keeping in view the national priorities and as per the guidelines of the Stockholm Convention. The Draft NIP is being reviewed as per the guidelines of the Stockholm Convention and it is being ensured that the NIP is in conformity with the multilateral environmental agreements like:-

- Rotterdam Convention
- Basel Convention

After the finalisation of the draft NIP, a meeting to review the NIP by the Technical Group will take place. Thereafter, the NIP will be put before the NSC for endorsement of

the same. The executive summary of the Draft NIP shall be translated in Hindi its approval by the Ministry and will be sent to the Government for endorsement. After the endorsement of the NIP by the Government it will be submitted to Stockholm Secretariat during The Fifth Conference of Parties (COP 5) scheduled from 25-29 April 2011 in Geneva.

After the endorsement of the NIP by the Government, it will be submitted to the Stockholm Secretariat. The action plans for the disposal of the respective POP's chemical shall be taken up subject to the financial assistance provided for carrying out the Disposal strategies for the respective POP chemicals under the Post –NIP projects

The existing regulatory provisions in respect to the initial 12 POP chemicals are being reviewed as per the requirement of the Stockholm Convention. The existing regulatory gaps have been identified and appropriate steps to strengthen the regulatory provisions covering the 12 POP chemicals are being taken. The Draft NIP is being reviewed as per the guidelines of the Stockholm Convention and it is being ensured that the NIP is in conformity with the multilateral environmental agreements and as per the objectives of the Stockholm Convention and the priorities set by the National Steering Committee.

A project management unit (PMU) has been established in MoEF for the implementation of the NIP Project. The PMU is coordinating with the institutions /organisation involved in the development of NIP. Also the PMU is organising POPs awareness workshops in different states.

MoEF has been conducting awareness programmes for the promotion of awareness and education of the 12 initially listed Pop's throughout the country by organising awareness workshops in different states. Awareness programmes have been conducted in Northern region, western region and the north- eastern region. Four awareness programmes have been conducted by the MoEF in the states of Gujarat, Meghalaya, Punjab and Rajasthan. The awareness programmes were conducted in places which had industrial locations and at places where Mining activities were being carried out.

The awareness programmes conducted by MoEF aims to educate the stakeholders from Agriculture and Health departments of different states along with their State Pollution Control Boards, Incinerator facility, about the types of POPs (intentional/ unintentional), their sources of production and the environmental and health hazards posed by these POPs. The States are also encouraged to take appropriate steps to reduce the release of unintentionally produced POPs i.e Dioxins and furans.

MoEF has brought out a pamphlet for spreading education and awareness on the hazards posed by the use and inappropriate management of intentionally produced POPs. Information Pamphlet on 12 POPs has been published and is being distributed to the

stakeholders. The pamphlet is also being distributed during the awareness workshops to ensure wider dissemination of the information.

Another pamphlet/ booklet on 9 new POPs highlighting their sources and usage is being developed. The pamphlet/booklet will also inform about the possible environmental and health hazards of the Nine new chemicals.

The programme for the promotion of environmentally sound alternatives to POPs is under consideration under the GEF-5 funding. The programme aims to develop new pesticides which are efficient against pests and are safe for handling by the workers using them. The programme envisages developing and promoting integrated pest management alternatives t the intentionally produced POPs.

The programme for the safer manufacturing, handling and development of alternatives for efficient management of POPs chemicals is under consideration in the GEF-5 cycle. The programme aims to highlight the Best Available Technologies (BAT) and promote the Best Environmental Practises (BEP) for the POPs chemicals. The project for the sound disposal and management of the PCB's is being implemented by the Ministry with technical inputs of CPRI Bangalore and UNIDO. The technology selection for the disposal of PCB's is under process. Under the Post NIP –PCB project, it is proposed to install one static unit at Bhilai along with two mobile units for the treatment of pure PCB's.

3.7.2 Overview of Public Policy on Awareness and Information Dissemination

GOI intends to establish long term effective mechanisms for public awareness and education on Convention implementation. The Government will make sustained effort to increase awareness level in all States by 2022. The benefits of public participation are multifold as it can bring important information, innovative approaches and solutions and enhance public perception of plans and helps make projects viable. The government already has a robust public participation process in place but will further encourage and improve the capacity of the public to participate in decision making with regard to environmental protection. The National Environment Awareness Campaign (NEAC) is organized by the Ministry of Environment & Forests every year since 1986 with the objective of creating environmental awareness at the national level.

In order to predict environmental impacts of any development activity and to provide an opportunity to mitigate against negative impacts and enhance positive impacts, the Environmental Impact Assessment (EIA) procedure was developed in the 1970s. MOEF introduced the EIA Law through a gazette notification passed on 27 January 1994, for obtaining "environmental clearance" for certain types of projects. To make it more participatory the provision of "public hearing" was added.

The GOI has issued the Environment Impact Assessment(EIA) Notifications 2006 in supersession of the EIA notification ,1994 . the EIA notifications ,2006 lays down that a construction of new projects or activities or the expansion or modernization of existing projects or activities listed in the Schedule to this notification entailing capacity addition with change in process and or technology shall be undertaken in any part of India only after the prior environmental clearance from the Central Government or as the case may be, by the State Level Environment Impact Assessment Authority, duly constituted by the Central Government. There are four stages in impact assessment, viz. screening, scoping (Term of References), Public Consultation and Environmental appraisal.The public consultation shall ordinarily have two components comprising of : (a) a public hearing at the site or in its close proximity –district wise for ascertaining concerns of local affected persons (b) obtain responses in writing from other concerned persons having a plausible stake in the environmental aspects of the project or activity . All the projects and activities are broadly categorized into two categories – Category 'A' and Category 'B' based on the spatial extent of potential impacts on human health and natural and man made resources . Moreover, Category 'A" projects/activities would be appraised at the Central Level by Expert Appraisal Committee (EAC) while Category 'B' Projects/activities would be appraised at the State Level Expert Appraisal Committee (SLEAC). Based on the recommendations of the EAC/SLEAC, the project is either granted the environmental clearance subject to certain conditions or rejected it.

The following are the specific actions that the government would take:

1. Develop public awareness programs, under the NEAC,
2. Develop educational and training programs for specific target groups for enhancing awareness pertaining to Convention implementation

   - Create and maintain information on progress in Convention implementation on the website, *India's activities for Convention Implementation*

   - compile and publish readings knowledge materials for different target groups, to provide information on POPs and its related hazards to health and environment, sources, pathways, protective measures against POPs related hazards, best available technologies for controlling POPs, relevant policies and regulatory framework,environmentally sound substitutes/alternative technologies, etc.;

3. Conduct training for Central and State government officials regarding Convention implementation requirements and counter measures with the, aim to enhance their capacity for decision making and management of POPs.

4. Conduct trainings and workshops for industrial associations

5. Conduct trainings on POPs substitutes, alternative technologies and release control technologies;

6. Provide training to workers in DDT production facility with regard to safety in production, so as to reduce their exposure to POPs in production and use;

7. Encourage and train nongovernmental organizations so that they play a constructive role in Convention implementation.

3.7.3 Present public information tools and mechanisms

The PCBs pollution control and elimination in India will firstly involve owners of PCBs storage sites and direct pertinent persons in regulatory agencies involve with a number of relevant parties in PCBs storage sites and also involve with extensive masses affected directly or indirectly. Therefore, conducting propaganda and education of PCBs pollution control policies and actions, raising the consciousness of general public for PCBs and strengthening public's obligation and sense of responsibility in executing the POPs convention should be considered as the important preferential actions during the performance process.

Six POPs awareness training programs were held at different parts of the countries with the Health Officials, Agricultural officials and General Public. The programmes discussed on status of DDT and other POP pesticides as Persistent Organic Pollutant (POP). Discussed on toxicity of DDT and other POP pesticides, precautions, symptoms of poisoning, first-aid measures, antidote, storage, application technique, etc. It was clearly emphasized that POP pesticides should not be used (except DDT for disease vector control purpose). The meetings also discussed on judicious use of DDT. POPs awareness materials have been distribted. Public awareness is being augmented through putting up posters, banners,and distributing pamphlets

3.7.4 Mechanisms for information exchange

The National Focal Point serves as a link for all stakeholders in the country by providing information as necessary to all stakeholders. The provision of information relates to that generated internally as well as internationally, so that interested persons are kept abreast of developments on issues of POPs. The National Focal Point therefore also acts as a link between the Convention Secretariat, other Parties to the Convention and national stakeholders. A national committee (National Steering Committee, NSC) comprising of various stakeholders with interest in the area of POPs has been established to direct and advice on the POPs and chemicals management in general as well as in the implementation of the Convention.

3.8 Relevant activities of NGOs

Several NGOs and INGOs work in various countries on issues related to chemicals and POPs. NGOs have several strengths as given below.

NGOs and their strengths in India

- Advocate with governments to consider the broader perspectives and suggest alternative policies and vision
- Provide a mechanism for civil society participation and highlight ground realities.
- Intervene for reforms and improved implementation.
- Advocate for governments to ratify conventions pertaining to chemicals for a safer world
- Assist in making National Implementation Plans
- Monitor how governments comply with laws, treaties, etc.
- Stimulate creative and critical policy debates and dialogue.
- Enrich civic education about chemicals and strengthen civic participation.
- Build networks with civic society including trade unions, academics, churches, environmental and human rights groups, etc.
- Push corporate officials to think more responsibly beyond the "bottom line."
- Add new information and analysis.
- Bring greater transparency and accountability
- Help institutions forge positive social support for good programs.
- Change public attitudes.

NGOs working together to fight against toxic chemicals- IPEN

The International POPs Elimination Network (IPEN) is a global network of more than 600 public interest non-governmental organizations working together for the elimination of persistent organic pollutants, on an expedited yet socially equitable basis. This mission includes achieving a world in which all chemicals are produced and used in ways that eliminate significant adverse effects on human health and the environment, and where persistent organic pollutants (POPs) and chemicals of equivalent concern no longer pollute our local and global environments, and no longer contaminate our communities, our food, our bodies, or the bodies of our children and future generations. IPEN has several representative NGOs in India. The following are the IPEN representatives India working on POPs.

- Kheti Virasat Mission
- Association for Rural and Tribal Development (ACTION) Environment Centre
- Toxics Link
- Prithvi Innovations
- Gramin Vikas Evam Paryavaran Sanstha (GVEP)
- Students Relief Society
- Thanal
- Janhit Foundation

Other NGOs in India working on POPs are

- Green Peace International
- Center for Science and Environment

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

3.9.1 Waste disposal capacity

PCB is an environmental issue and final solution to PCBs is to dispose it in an environmentally sound manner. Therefore, the capacity building in the country with regard to the technology for disposal of PCbs is the key task for India to implement the Convention obligations in earnest. However, great gap exists between India and international advanced level of PCB disposal technologies in many aspects such as the central control of incineration system, on-line monitoring of incineration flue gas, characteristic identification and analysis of factory entry wastes and security emergency treatment. Definite difficulties also exist in performing the obligation of Convention. In addition, India also lacks corresponding technical and equipment supports in PCBs collection, transportation and safe storage. Therefore, there is strong need to build capacity and strengthen the existing facilities to facilitiate work to meet the requirements under the Convention.

There are 98 hazardous waste incinerators including common facilities available in the country among which 18 are in northern region, 31 are in central region and 49 are in southern region. Further there are 157 bio-medical waste incineration facilities. There are several cement production facilities that are allowed to co-incinerate hazardous wastes. These facilities can be utilized in POPs waste disposal.

3.9.2 Environmental monitoring capability

Central Pollution Control Board is executing a nation-wide programme of ambient air quality monitoring known as National Air Quality Monitoring Programme (NAMP). The network consists of 342 operating stations covering 127 cities/towns in twenty six 26 States and 4 Union Territories of the country.

CPCB in collaboration with concerned SPCBs/PCCs established a nationwide network of water quality monitoring comprising 1019 stations in 27 States and 6 Union Territories. The monitoring is done on monthly or quarterly basis for surface waters and on half yearly basis in case of ground water. Among the 1019 stations of the monitoring network 592 are on rivers, 65 on lakes, 17 on drains, 13 on canals, 5 on tanks, 3 on creeks, 3 on ponds and 321 are groundwater stations.

Presently the inland water quality-monitoring network is operated under a three-tier programme i.e. Global Environment Monitoring System (GEMS), Monitoring of Indian

National Aquatic Resources System (MINARS) and Yamuna Action Plan (YAP). Water samples are being analysed for 28 parameters consisting of 9 core parameters, 19 other physico-chemical and bacteriological parameters apart from the field observations. Besides this, 9 trace metals and 22 pesticides are also analysed in selected samples. Biomonitoring is also carried out on specific locations. In view of limited resources, limited numbers of organic pollution related parameters are monitored i.e. micro pollutants (toxic metals & POPs) are analysed once in a year to assess the water quality.

The MOEF has launched the charter on "Corporate Responsibility for Environmental Protection (CREP)" in March 2003 with the purpose to go beyond the compliance of regulatory norms for prevention and control of pollution through various measures including waste minimization, in-plant process control and adoption of clean technologies. The charter has set targets concerning conservation of water, energy, recovery of chemicals, reduction in pollution, elimination of toxic pollutants, process and management of residues that are required to be disposed off in an environmentally sound manner. The Charter enlists the action points for pollution control for various categories of highly polluting industries. The Task Force was constituted for monitoring the progress of implementation of CREP recommendations/ action points.

Presently, regional plans that in-build environmental components and provide for industrial zones compatible to the surrounding land uses do not exist in India. Hence, the industrial entrepreneur is allowed to purchase a site convenient to him and then apply for clearances. Normally, an industrial site even if is presently not in an earmarked/notified industrial land use, the land use conversion is made based on clearances from environmental aspects and other considerations, such as availability of electricity, water supply, *etc*.

A proposed site for starting an industry is cleared from environmental angle, after reviewing its pollution potential and probable impact on the environment, by the State Pollution Control Boards and the State Environmental Committees or Site Clearance Committees. An industry cleared from environmental angle will, however, cause pollution to some extent since the discharge/emission of pollutants are permitted up to a certain amount of tolerable levels.

Such tolerable levels are set based on technological and economic feasibility considerations. Furthermore, appropriate pollution control equipment provided in an industry to meet the standards, may not be performing or operating at its desired efficiency all the time which implies that there is an additional risk of pollution. The site may turnout to be either suitable or unsuitable.

The present site clearance procedures also insist on carrying out Environmental Impact Assessment (EIA) for certain projects. The EIA process turns out to be a myopic assessment as the reports are several times engineered to meet the desired results. Even if an impact is found as a result of the EIA, the impacts are nullified by changing the manufacturing process or the treatment technology. However, subsequently the industry may find it not feasible to operate those modified systems. Also, an EIA is carried out

considering the existing surrounding land use. The industry has no control on land use changes. If a sensitive land use comes up in the vicinity of the industry, impacts might be noticed even if the industry is meeting the required standards. Also, EIA is lengthy procedure besides being expensive and, in addition, is proving to be a set back in fast and realistic decision-making process. Due to lack of land use controls around the industrial sites, areas/uses sensitive to pollution come up in the vicinity of the industrial areas. The impacts, which are mainly depending on the distances to the receiving environment, are noticed due to such uncontrolled land use changes. Adoption of strategic EIA region-wise is being considered appropriate rather than site-specific or project-specific EIA.

Municipal Solid Wastes (Management & Handling) Rules, 2000 (MSW Rules) are applicable to every municipal authority responsible for collection, segregation, storage, transportation, processing and disposal of municipal solid.

3.9.3 Health monitoring capability

Since the inception of the planning process in the country, the successive Five Year Plans have been providing the framework within which the States may develop their health services infrastructure, facilities for medical education, research, etc. Similar guidance has sought to be provided through the discussions and conclusions arrived at in the Joint Conferences of the Central Councils of Health and Family. Welfare and the National Development Council. Besides, Central legislation has been enacted to regulate standards of medical education, prevention of food adulteration, maintenance of standards in the manufacture and sale of certified drugs, etc. India is committed to attaining the goal of "Health for All by the Year 2000 A.D." through the universal provision of comprehensive primary health care services. Table18 gives the national health programmes.

Table 18: The national health programmes

1.	National Vector Borne Disease Control Programme (NVBDCP)
2.	National Filaria Control Programme
3.	National Leprosy Eradication Programme
4.	Revised National TB Control Programme
5.	National Programme for Control of Blindness
6.	National Iodine Deficiency Disorders Control Programme
7.	National Mental Health Programme
8.	National Aids Control Programme
9.	National Cancer Control Programme
10.	Universal Immuization Programme
11.	National Programme for Prevention and Control of Deafness
12.	Pilot Programme on Prevention and Control of Diabetes, CVD and Stroke
13.	National Tobacco Control Programme

14	School Health Programme

Source: http://mohfw.nic.in/healthprogmain.html

3.9.4 Research and Development in the field of POPs

In order to support national management activities, India would require research and development to address the areas of particular concern as well as to provide regular and systematic monitoring. The Convention provides in Article 11, indications of topics that Parties should address in defining research, development and monitoring objectives. During the development of the NIP, India's existing capabilities to address these objectives have been reviewed.

Research and Development in the field of persistent organic pollutants (POPs) in India has been undertaken in decentralized manner. The pesticides work is being undertaken under various schemes of the Ministry of Agriculture viz. Indian Council for Agriculture Research (ICAR) started the All-India Coordinated Research Project (AICRP) on pesticides residue in 1984-85 with a view to develop protocols for the safe use of pesticides. The project was later re-designated as the All-India Network Project (AINP) on pesticide residues to undertake work on the persistence of pesticides on different crops. Based on the data generated, waiting periods have been worked out for the safety of consumers. The data of these trials are also useful for the national regulatory authorities to take appropriate decisions regarding safe use of pesticides in the country.

R& D activities have been initiated to look for alternatives to POPs pesticides and in this regard substantial research activities have undertaken at the national level at different research intuitions to develop non persistent biodegradable botanical pesticides to replace POP pesticides.

No systematic R&D work on monitoring of PCBs in the environment has been undertaken so far. Only different groups have conducted research monitoring in some areas. Research shows that PCBs exist in sediments of a few estuaries and marine coastal areas.

However, in the area of dioxins and furans, there is a lack of centralized/coordinated research activities at the national level. Many research institutes are engaged in R&D activities with different goals. In the NIP formulation, attempts have been made to address the issues in a coordinated manner. Research on dioxins and other persistent organic pollutants (POPs) has become increasingly important in India and Indian Ocean region. There has been increasing need for dioxin analysis at trace levels in order to support scientific studies such as toxicological and human health effects, fate and transportation, prevention, and remediation of hazardous chemicals in India. Even though few researchers published levels of dioxins and furans in fish and mothers milk samples collected during late 90s, it was not considered as organised research to reflect dioxin contamination levels or emission levels in the country. However first work on dioxin

emission monitoring from medical waste incinerator emissions was initiated by the Ministry of Environment and Forests during the year 2003 - 2005. The work was carried out by National Institute for Interdisciplinary Science and Technology (NIST), Trivandrum, one of the laboratories of Council of Scientific and Industrial Research (CSIR) of India. Following the ratification of Stockholm Convention on POPs, Central Pollution Control Board (CPCB) and National Environmental Engineering Research Institute has initiated research on dioxins. In recent years CPCB has established the National Referral Facility for Dioxins and NIIST has participated and qualified in the international inter-laboratory calibration studies on dioxins and furans. The extensive research to reveal the dioxin emission levels from industrial and non industrial activities in India, toxicity and body burden of dioxins among Indian public and the health impacts related to dioxin exposure is yet to be initiated by the government. Over the last 7-8 years India has developed the capacity for the estimations of dioxins and furans in environmental samples. There are few National laboratories and nongovernmental organizations (NGOs) who have developed the skills for monitoring and analysis of dioxins and furans in various environmental matrices. However, there are limited number of institutions working on R&D aspects of dioxins and furans. NEERI has undertaken research studies for characterization and management of unintentionally produced POPs in environment. Our thrust in this area is to establish a sound R&D program for the degradation of dioxins by means of photochemical, chemical and biochemical processes.

Research on PCBs, their effects, and risk assessment and on the environmental fate of the PCBs and PCDDs/Fs, toxic and eco-toxic effects, the study of transport and transfer processes, degradation mechanisms, bioaccumulation and bio-magnification, and destruction have been reported in the literature. The solution to POPs issue requires legislative background, financial preconditions, technical possibilities and laboratory and institutional capacities.

3.10 Identification of Impacted Communities and Environment

3.10.1 Management of chemicals in the workplace

India has considerable legislation for protection of workers' rights and health. But despite this, India has a very poor health and safety record because of poor implementation of regulations and occupational health and safety measures. In general, the workforce is abundant, unskilled, but easily available due to the high rate of unemployment with greater importance being given to obtaining work than to the health risks involved. As per the information provided by DMO, Raigarh Dist., protective measures for the workers are not taken in most of the places where DDT is sprayed. However, spray workers normally apply pieces of clothes to cover their head and faces.

3.11 Institutional assessment and listing of new chemicals

Amongst the various legislations there are 40 major legal instruments at the National level, which address chemical management in some form or the other. Out of these, there

are certain instruments, which are specifically designed for registration of pesticides and chemicals

Most importantly POP pesticide are governed by The Insecticides Act, 1968 and Insecticides Rules, 1971 with respect to the import, registration process, manufacture, sale, transport, distribution and use of insecticides (pesticides) with a view to prevent risk to human beings or animals and for all connected matters, throughout India. There is a stringent mechanism whereby all insecticides (pesticides) have to necessarily undergo the registration process with the Central Insecticides Board and Registration Committee (CIB & RC) before they can be made available for use or sale.

Under the Insecticides Act the main bodies which regulate the pesticide in the country are the Central Insecticides Board, the Registration Committee and the Central Insecticides Laboratory as described in Figure 31. These bodies function under the Ministry of Agriculture which is the nodal ministry dealing with pesticides in the country.

Other ministries directly dealing with pesticides are Ministry of Chemicals and Fertilizers, Ministry of Health and Family Welfare and Ministry of Environment and Forests.

The Registration Certificate mandates that a label be put on the packaging, which clearly indicating the nature of the insecticide (Agricultural or Household use), composition, active ingredient, target pest(s), recommended dosage, caution sign and safety precautions.

3.11.1 Pesticides registration process

Amongst the various legislations there are 40 major legal instruments at the National level, which address chemical management in some form or the other. Out of these, there are certain instruments, which are specifically designed for registration of pesticides and chemicals

Most importantly POP pesticide are governed by The Insecticides Act, 1968 and Insecticides Rules, 1971 with respect to the import, registration process, manufacture, sale, transport, distribution and use of insecticides (pesticides) with a view to prevent risk to human beings or animals and for all connected matters, throughout India. There is a stringent mechanism whereby all insecticides (pesticides) have to necessarily undergo the registration process with the Central Insecticides Board and Registration Committee (CIB & RC) before they can be made available for use or sale.

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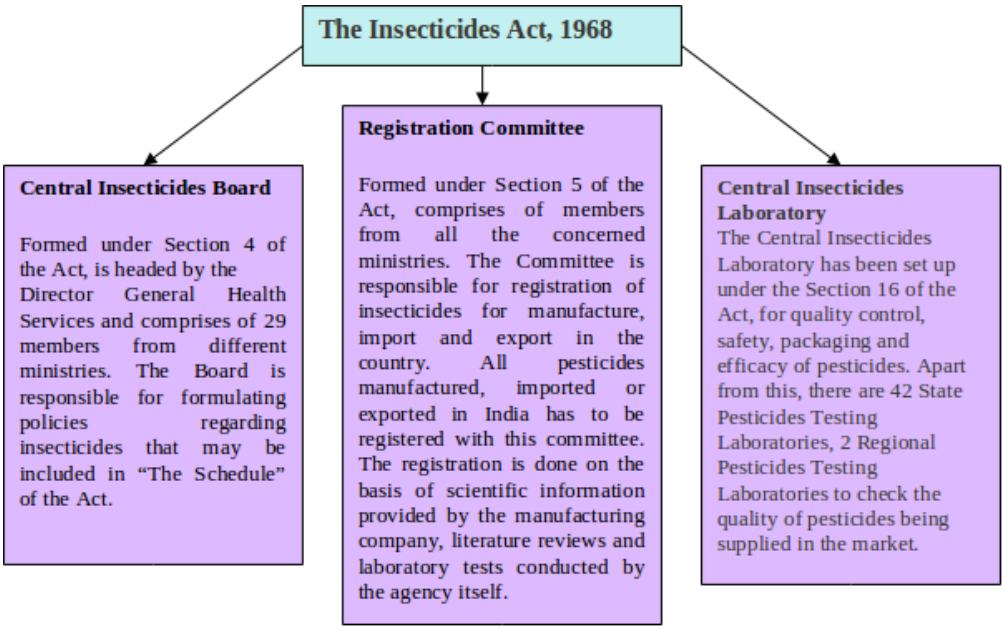
The Registration Certificate mandates that a label be put on the packaging, which clearly indicating the nature of the insecticide (Agricultural or Household use), composition, active ingredient, target pest(s), recommended dosage, caution sign and safety precautions.

Figure35: Main bodies in volved in pesticides registration under the Insecticides Act, 1968



Changes in Pesticides and chemicals registration

The government has decided to replace the Insecticides Act 1968 by introducing and passing, in the Parliament, the Pesticides Management Bill 2008 for improving the quality of pesticides available to farmers and production of new, safe and efficacious pesticides. With this view The Pesticides Management Bill has been placed before the Rajya Sabha and is in the process of becoming an act.

The proposed Bill once approved is also aimed at better regulation of import, manufacture, export, sale, transport, distribution and use of pesticides to prevent the risk to people, animals and the environment. It would help detailed categorisation of offences and punishments for greater deterrence to violators and delicensing of retail sale of household insecticides. This Bill would also facilitate timely disposal of obsolete pesticides in an environmentally safe manner.

Under the Insecticides Act the Central Government has constituted a Central Insecticide Board to advise the Central and State Governments on matters related to the law such as:

(a) prevention of risk to human beings, animals and environment during the manufacture, sale and transport of pesticides;
(b) monitoring performance of registered pesticides; and
(c) review of the safety of pesticides.

Under the Insecticides Act the Central Government has established a Registration Committee which is mandated to :-

(a) register pesticides after scrutinizing their formulae and verifying claims made with regard to its efficacy and safety;
(b) specify requirements of necessary infrastructure; and
(c) specify protocols and good manufacturing practices for manufacture of pesticides.

The applicant has to apply to the Registration Committee for registration of its intended pesticide to start manufacture, import or export pesticides. No pesticide should be registered unless its tolerance level is specified for its residues on crops and commodities under the Food Safety and Standards Act, 2006.

Under the Insecticides Act an order of refusal, suspension or cancellation of registration certificate may be appealed to the Central Government within a period of 30 days. Any person who wants to manufacture or sell pesticides or undertake commercial pest control operations with the use of pesticides may apply for a licence. The State Government may appoint licensing officers to grant such licences in the prescribed manner. The officers shall

(a) maintain a register of persons engaged in manufacture or sale of pesticides;
(b) provide information to the State Government on performance of registered pesticides; and
(c) provide information to the State Government on infrastructure facilities of manufacturers.

The licence may be revoked or suspended on grounds specified in the law. The decision can be appealed with such authority as prescribed.

The Bill prohibits the manufacture, import and export of misbranded, spurious or sub standard pesticides and any pesticide that contravenes the law. A pesticide cannot be sold, stocked or used if it is not registered.

The Central or State Governments may appoint pesticide analysts and pesticide inspectors in the prescribed manner. A Pesticide Inspector shall have the power to enter and search a premise if he has reason to believe that a violation of the law has taken place; to take registers and records maintained by the manufacturer; to stop the distribution, sale or use of pesticide with the permission of the Executive Magistrate; and

to take samples of any pesticides and send it for analysis by a pesticide analyst within 48 hours.
The Bill also mentions the procedure to be followed by the pesticide inspector in commission of his duties. It also states that the pesticide analyst shall furnish his report within 45 days.

3.12 Institutional assessment and regulations pertaining to chemicals already in the market

The Central government periodically sets up expert committees to review the registration of different pesticides. It can ban, restrict or allow a pesticide or a pesticide formulation to be used, exported or imported in the country. Currently there are two main expert committees which are reviewing and advising the Government of India (GOI) on pesticide registration in the country.

The Supreme Court Committee: Constituted by the Supreme Court of India in 1997 is an inter-ministerial committee comprising of Secretaries from Ministry of Agriculture (Chairman), Ministry of Chemicals and Fertilizers, Ministry of Health and Family Welfare and Ministry of Environment and Forests respectively. This committee does not have any statutory powers or any fixed tenure, it acts as a watch dog. According to its Terms of Reference it reviews the use of insecticides and chemicals found hazardous to health once every three months and take suitable remedial measures. The TOR also says that the Committee can take assistance of the technical expert committee whenever required.

Technical Expert Committee: Under the directions of the Supreme Court Inter-ministerial technical expert committee was formed in 1997 to assist the Supreme Court Committee in reviewing the pesticides. The Expert Committee too does not have any statutory powers or fixed tenure. It reviews the pesticides and potentially hazardous chemicals and gives its recommendations, after consultation with the Registration Committee, to the Supreme Court Committee.

The final decision to ban or restrict the use of any pesticides lies with the MOA, GOI. The CIB and RC scrutinize and periodically review all pesticides and their use. There are pesticides that are banned from registration such as POPs pesticides. Sometimes a pesticide can be banned even after registration especially if it turns out that it causes serious environmental and public health concerns like aldrin, chlordane, dieldrin, endrin, heptachlor and hexachlorobenzene. Some pesticides are meant for "Restricted Use" which means that they can be used only for prescribed purposes and by authorised personnel by obtaining the appropriate Government license like DDT.

The Registration Committee may suspend the registration certificate for a maximum period of three months if it is satisfied that any violation of the provisions of the Bill has taken place. It may also inspect the manufacturing premises or processing facilities of the registrant and cancel the certificate if found inadequate.

Chapter 4 NIP- Strategies and Action Plans

4.1 Overall objective

The overall objective is to reduce, eliminate and prevent the health and environmental risks posed by POPs through effective implementation of the Stockholm Convention, thereby promoting human health, ecological and environmental safety and overall sustainable development.

GOI was given the support by the Convention's financial mechanism and technology transfer mechanism and commits to fulfill the relevant responsibility specified by the Convention in compliance with the national environmental and health policies and strategy for sustainable development.

4.1.1 NIP Implementation Objectives

The main objective of the NIP is to enable India to comply with the obligations of the Stockholm Convention within the stipulated deadlines. It will further strengthen India's capacity to actively participate on the international platform of the Stockholm Convention.

Specific NIP implementation objectives of India are: -

- To put in place a comprehensive national POPs management policy as part of broader national policies on chemicals management, environmental protection, public health and sustainable development;
- To provide a clear, realistic and meaningful list of activities for the governmental institutions in response to the obligations set out in the Stockholm Convention on POPs;
- To gain and strengthen India's eligibility status for international financial assistance in the field of POPs;
- To facilitate efforts of dealing with broader environmental issues such as management of pollution, hazardous wastes and monitoring of pollutant releases; and
- To facilitate country's overall efforts in coordinating national approaches to other chemical related Regional and International Agreements; specifically, the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade and the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, and the Strategic Approach for International Chemicals Management (SAICM).

4.1.2 General outcomes of NIP Implementation

Through the implementation of the NIP India will be able to protect its environment and the health of its population from POPs. In a systematic manner POPs production, use and

releases will be minimized and where possible completely eliminated. The implementation process will lead to

- Detailed information on the management of POPs, including updated inventories on the current stocks, environmental releases and fate of these chemicals;
- Broad awareness on the effects of POPs on human health and the environment;
- Enhanced institutional, organizational and legal capacity to respond to the obligations of the SC in an effective and timely manner;
- Appropriate technical capacities to control UPOPs releases, to store, handle, transport and dispose of POPs;
- Efficient cooperation of the main stakeholders involvement in the management of POPs in the country.

4.1.3 Priority Areas

Under the National Implementation Plan the priority areas include the following:

- Strengthen and improve policies and regulations required for Convention implementation
- Undertake and strengthen capacity building on POPs
- Undertake replication projects
- Develop alternatives/alternative technologies, BAT/BEP, contaminated site remediation technologies and waste disposal technologies
- Explore effective alternatives to DDT
- Investigate in detail inventory of unintentionally generated POPs releases and update the same specifically inventories of electrical equipment containing PCBs and wastes containing POPs
- Establish a financial mechanism so as to ensure the implementation of various action plans

4.2 Policy statement

The GOI has expressed its commitment to the Stockholm Convention on Persistent Organic Pollutants (POPs) when India ratified the Treaty on 13th January 2006.

- Recognizing the central role of the national environmental policies and sustainable development policies to the India's development, the need for attainment of Agenda 21 targets and the need to integrate the POPs issues and implementation of the NIP within the national policy of India,
- Recognizing that the NIP is the outcome of close consultation between relevant government ministries and departments, and respective NGOs, Community Based Organizations and the private sector,
- Understanding that the successful implementation of the Stockholm Convention and the NIP will depend on assistance from international as well as local government, non governmental and private partners.

The GOI endorses the National Implementation Plan (NIP), and commits itself to its implementation, subject to adequate assistance.

The Government also commits itself to place the POPs issue and the NIP within the overall national policy and legislative framework relating to environmental protection, sustainable development, public health and agriculture.

4.3 Implementation strategy

4.3.1 Overview

The Stockholm Convention on Persistent Organic Pollutants (POPs), which was adopted in May 2001 with the objective of protecting human health and the environment from POPs, came into force on 17th May 2004. Parties to the Stockholm Convention are required to develop National Implementation Plans (NIPs) to demonstrate how their obligations to the Convention will be implemented. India signed the Convention on 14 May 2002 and ratified it on 13 January 2006. India recognizes its obligation, under Article 7 of the Convention, to develop and submit a NIP to the COP (Articles 7, 1a-b of the Convention).

The NIP implementation was harmonized with the five-year planning process in India and with the five-year replenishment of the GEF. In this regard the first NIP is planned until 2022. The five-year planning seeks to provide guidance to development policies and programmes that promote sustainable management of the nation's resources to attain the ultimate objective of sustainable development.

The NIP implementation will also be integrated within the five year plans.

4.3.2 Implementation Principles

Efficient and timely implementation of the NIP requires that the principles of the process are clearly articulated. During the NIP preparation process several workshops were organized to discuss and agree on what those principles are on which the NIP should be based. This consultative process concluded the following six principles:

- Equal public and private and NGO stakeholders participation;
- Transparency in information sharing and exchange particularly related to monitoring and reporting on implementation activities;
- Adherence to the polluter – pays and precautionary principles;
- Coherent integration of POPs issues within the overall environmental management, chemicals management and sustainable development policies; and
- Adherence to and use of BAT and BEP for the reduction of POPs releases;
- Commitment to public awareness and education.

4.3.3 The NIP preparation process

India invited the United Nations Industrial Development Organization (UNIDO) to act as the GEF Implementing Agency for the development of the NIP and opted to undertake this work in two phases through the full GEF project cycle rather than by taking up the so-called 'Enabling Activities'. The GEF-funded, UNIDO-executed PDF-B project entitled "*Development of a National Implementation Plan in India as a first step to implement the Stockholm Convention on POPs*", whose objective was to identify the requirements for developing the NIP through a preliminary assessment, was implemented during 2004 by the MOEF through the Industrial Toxicology Research Centre (ITRC), Lucknow. The Project Brief, which was approved by the GEF Council in June 2007, is the principal outcome of the preparatory phase project.

During the preparatory phase, GEF through UNIDO provided funding for a series of capacity building workshops to raise the awareness of national and state officials and industry to the requirements of the Stockholm Convention. These workshops were of particular assistance in the preparation of the project brief. A coordinating mechanism drawing together India's international development partners was established to ensure that NIP development takes full advantage of the findings and experience of associated projects and programmes executed by intergovernmental organizations and bilateral donors. Studies on exposure and health impacts of POPs on living systems and of integrated approaches for the replacement of POPs, as well as further capacity building to improve the management of PCBs wastes and the assessment of sources, releases and pathways of unintentional by-products will be undertaken during the full project.

A series of five interactive workshops, one in each zone, were organized for representatives of national as well as the States and Union Territories' infrastructure of Government institutions, commerce and industry, public and private testing laboratories, research institutes, enforcement entities, public health institutes, non-governmental organizations (NGOs) and other associations that are relevant to the implementation of the Stockholm Convention, to facilitate assessment of regulatory control, enforcement capacity, research and development, health and environmental risks and also assess capacity building needs.

As party to the Stockholm Convention, the National Implementation Plan (NIP) on Persistent Organic Pollutants (POPs) in India was prepared under the project "Development of National Implementation Plan under the Stockholm Convention" UNIDO Project No. GF/IND/07/004. The MOEF is the nodal agency of Government of India for the development of a National Implementation Plan as the first step to implement the Stockholm Convention on Persistent Organic Pollutants (POPs).

The NIP was developed in reference to the *Interim Guidance for Developing a National Implementation Plan for the Stockholm Convention,* which was adopted by the Conference of the Parties (COP 1) in May, 2005.

4.3.4 Priorities and Conditionality

4.3.4.1 Priorities

Based on the consultative NIP development process the Government of India has identified the following priorities for the implementation of the NIP:

- Environmentally Sound Management and Final Disposal of PCBs
- Environmentally Sound Management of Medical Wastes
- Environmentally sound management of hazardous waste
- Development and promotion of non POPs alternatives to DDT
- Inventorization of newly listed POPs
- Implementation of the BAT/ BEP strategies for elimination / reduction of U POPs emissions of the priority industry sectors identified in the NIP of India
- Management of PVC plastic waste to avoid incineration / dumping the landfill for preventing releases of Dioxins and Furans due to burning
- Capacity building, demonstration of production and promotion of bio-botanical neem derived bio-pesticides as viable, eco-friendly, bio-degradable alternatives to POPs pesticides
- Identification and remediation of sites contaminated by POPs chemicals
- POPs and pesticides management in India
- Monitoring of POPs in the core media- Air, Sediment and human milk and blood.
- Strengthening institutions and capacity building for effective and efficient implementation of the NIP in India
- Environmentally sound management of un-intentional release of PCDDs and PCDFs in the metallurgical Industry in India

India is currently implementing two GEF projects in the field of POPs. One is addressing the environmentally sound medical waste management and the other foresees the environmentally sound management and disposal of PCBs as part of the integrated waste management systems priority area.

4.3.4.2 Conditionality

India is one of the largest economies in developing countries with a steadily growing industrial output supported by the growing local consumption and international trade. This rapid growth in many areas goes beyond India's sustainable development potential. The Government of India has recognized during the NIP development process that POPs management, phase-out and disposal is beyond the current capacities of the country. Therefore the Global Environmental Facility, the financial mechanism of the SC, was requested for a multi-component program in GEF-5 with a total value of $ 75,000,000 for ten full-sized projects.

The proposed projects will also support India's efforts to meet its national priorities with regard to the environmentally sound management of chemicals. The projects will generate both global and local benefits, and India without this incremental assistance can not fully implement the measures indicated in the NIP.

The proposed GEF project concepts which are essential for the NIP implementation are as follows:

- Environmentally Sound Management and Final Disposal of PCBs
- Environmentally Sound Management of Medical Wastes
- Environmentally sound management of hazardous waste
- Development and promotion of non POPs alternatives to DDT
- Inventorization of newly listed POPs
- Implementation of the BAT/ BEP strategies for elimination / reduction of U POPs emissions of the priority industry sectors identified in the NIP of India
- Management of PVC plastic waste to avoid incineration / dumping the landfill for preventing releases of Dioxins and Furans due to burning
- Capacity building, demonstration of production and promotion of bio-botanical neem derived bio-pesticides as viable, eco-friendly, bio-degradable alternatives to POPs pesticides
- Identification and remediation of sites contaminated by POPs chemicals
- POPs and pesticides management in India
- Monitoring of POPs in the core media- Air, Sediment and human milk and blood.
- Strengthening institutions and capacity building for effective and efficient implementation of the NIP in India
- Environmentally sound management of un-intentional release of PCDDs and PCDFs in the metallurgical Industry in India

Since the NIP is a plan, for its successful implementation further conditions should be fulfilled Throughout the NIP development process the following conditions were considered to be available, present and assured:

- Government commitment in providing the necessary financial and human resources as well as the requested in-kind contributions,
- Commitment among the stakeholders, who participate in the implementation process,
- The availability of international assistance, technical and financial,
- The necessary qualification of the personnel is available for the NIP implementation

Implementation of chemical related programs falls within the mandate of several government departments within different Ministries. The MOEF is charged with the coordination of all Multilateral Environmental Agreements including the Stockholm Convention on POPs and therefore the MOEF is responsible for the coordination of the implementation of the POPs NIP.

4.3.5 Institutional/Organizational Arrangements and Responsibility

The overall NIP implementation will be the responsibility of MOEF of GOI. MOEF will oversee the whole NIP implementation process, will organize regular consultations with the lead agencies of the implementation of each action plan.

The primary decision taking body of the NIP implementation process will be the National Steering Committee on POPs which is already in place.

The committee will meet from time to time to review and monitor the NIP implementation progress, and to take decisions related to its technical and managerial aspects. The expenditure associated with the coordination of the implementation of the NIP is shown in the Table 19.

Table 19: Budget for NIP coordination

Objectives	**Activities**	**Time Frame**	**Responsible Institutions**	**Budget (US $ million)**		
				Baseline	**Incremental**	**Total**
NIP implementation is timely, coherent, transparent and cost-effective	Review and monitoring of NIP implementation, Steering Committee meetings, Transportation	2011-2012	National Steering Committee on POPs	0.50	0.50	1.00
Public sensitization	Information and publication programs	2011-2022	MoEF and stakeholders	15.71	5.63	21.34
Total		**2011-2022**	**MoEF**	**16.21**	**6.13**	**22.34**

The coordination and monitoring of the NIP implementation will approximately require US$ 22.34 million.

Performance monitoring indicators will be used to assess the effectiveness of implementation activities. These would be done firstly through evaluation of reports from implementing bodies, for example evaluation of the extent to which that body has been able to deliver/complete particular elements of the action plan. Secondly, it is envisaged that the executive agency, MOEF, performs independent reviews of the different activities to ascertain whether the objectives have been achieved. Such reviews shall take into account the principles defined in the implementation strategy. The performance monitoring indicators will be developed for each action plan, before its implementation begins.

For project addressing elements of the NIP implementation independent implementation arrangements can be developed as per the requirements of the funding organization and technical assistance partners.

The GOI has a five year planning cycle. The implementation of the eleventh five year plan will finish in 2012. Donor nations fund the GEF every four years, when they commit money through a process called the "GEF Replenishment." GEF-5 replenishment started in 30th June 2010 and will cover four years. The planning cycle in India and the GEF will coincide in 2022, when both India's thirteenth five year plan and the GEF-7 replenishment will finish. Therefore the actions of the NIP were developed for twelve years, from 2011 up to 2022. The total NIP implementation is estimated to be US$ 203.51 million, which includes 75,000,000 US$ requested from GEF-5, balanced from the contribution from GEF 6 and GEF -7.

4.4 Strategies and Action Plans part of the NIP

4.4.1 Action Plan – Legal and Regulatory and Institutional Strengthening Measures

4.4.1.1 Objectives and priorities of the action plan

The implementation of the Stockholm Convention requires the revision and strengthening of the current legislations that would assure that the implementation process is cost-effective, efficient and institutional responsibilities are clear and are not overlapping. POPs management at the government level requires a coherent, multi-sector approach, where information is transparent and easy to access. Decisions should be based on appropriate and accurate information. In this regard the GOI has decided to approach the GEF with a project addressing "Strengthening Institutions and Building Capacity for Effective and Efficient Implementation of the National Implementation Plan (NIP) in India".

The Objective of the action plan is to effectively and efficiently assist India in implementing the Stockholm Convention by strengthening Indian institutions managing POPs chemicals in an environmentally sound manner and enhance the immediate capacities for management of POPs chemicals at the national and state levels. The project's objectives are to create an enabling regulatory and policy environment in India by establishing/amending laws, regulations and standards.

4.4.1.2 Gap analysis

During the preparation of the NIP, the Government of India has identified gaps which are essentially required to be bridged to meet the obligations under the Stockholm

Convention on POPs. A closer analysis of the identified gaps has shown that, in order to meet the various provisions under the Convention, there is an urgent need to strengthen and build capacity of the relevant technical institutions and also the skill of the human resources.

There is a need to strengthen the existing policies and regulations to make the legal framework comprehensive and improve, for effective implementation of the NIP under the Stockholm Convention on POPs. This would enhance the national capacity; management of chemicals both intentionally and unintentionally produced POPs. This would ultimately improve the environment and the human health management.

4.4.1.3 Action plan implementation

The action plan would strengthen and/or build capacity of the institutions for monitoring, Research and Development promotion, technology transfer promotion, facilitating data and information collection, enforcement, and evaluation capabilities so as to allow for continuous improvement and raising stakeholder awareness on POPs issues.

The following actions need to be taken:

1. Strengthening/revising existing laws and regulations through reviewing the existing provisions under the laws and regulations and incorporating the appropriate requirements of the Convention implementation.
2. Strengthening/developing a regulatory framework on the reduction and/or control of POPs chemicals.

4.4.1.4 Timeframe, budget and coordination

Table 19: Legal and Regulatory and Institutional Strengthening Measures

Action plan	Time frame	Budget (US$ millions)		
		Baseline	Incremental	Total
Strengthening policy and regulatory framework with respect to PCBs to comply with the obligations under the Stockholm Convention	2011-2012	0.55	0.68	1.23
Strengthening existing policies and regulations with regard to unintentional releases of POPs	2012-2014	2.00	1.00	3.00
Develop policy and legal frameworks for management of contaminated land/sites	2012-2015	3.00	2.00	5.00
Total		**5.55**	**3.68**	**9.23**

4.4.2 Action Plan pertaining to production, import and export, use, stocks, landfills and wastes from chemical substances listed (Annex A, Part I of the Stockholm Convention)

4.4.2.1 Objectives and priorities of the action plan

In a developing economy like India, any action on POPs must take into consideration the difficulties faced by the Government because of the huge population load and large geographical area, especially in the provision of financial and technical resources to deal with POPs pollution and the availability of non-chemical alternatives for use of DDT in vector control. As alternatives to POPs are introduced, an orderly, equitable and just transition must be ensured. In some cases, financial and technical assistance will be required to enable technology transfer, or to help build the capacity to employ clear methods for crop protection, vector control, and the productions of goods and / or the destination of POP stockpiles.

The primary objective of this action plan is therefore to eliminate the current stocks of obsolete pesticides, to locate and remediate POPs contaminated sites. For the future extensive studies are necessary to replace persistent and bio-accumulative chemicals with environmentally sound alternatives.

The objectives of the action plan are as follows:

- Environmentally sound disposal method is in place for Annex A POPs.
- Environmentally sound alternatives to POPs pesticides are found and introduced in India.
- Identification and remediation of POPs contaminated sites (addressed in the action plan on contaminated sites).

4.4.2.2 Gap analysis

Most of the Annex A Part I chemicals of the SC are banned in India. There is, however a limited stock of aldrin (101 lt) and dieldrin (33 MT technical and 20.7 KL 30 EC), which need to be disposed of in an environmentally sound manner.

Information on such stockpiles is extremely poor. A FAO inventory of stockpiles in India suggests the total obsolete and banned stocks in India amounts to 3346 tons (both POPs and non-POPs) though it could not determine the exact formulations, chemical names or locations of the stockpiles (RFI 2000) The identification of stockpiles in India and appropriate measures for their disposal requires greater attention. Disposal of the available stockpiles is pending. The stocks are deteriorating and pose immense risk to the environment. Information on the potentially contaminated sites is also limited.

POP pesticides have been used in the agriculture in large quantities. They were effective with long-term effects. The ever increasing agricultural production in India is demanding better crop yields, consequently better crop protection. In this regard it is crucial and priority for India to find cost-effective environment-friendly alternatives. Extensive

research and development are undertaken to find bio-pesticides that could replace the persistent chemicals that are currently in use.

4.4.2.3 Action plan implementation

The action plan will be implemented by MOA in cooperation with the Directorate of Plant Protection Quarantine and Storage (DPPQ&S) and along with the State Governments (Agriculture Departments) where stocks of the obsolete POP pesticides are stored. Ministry of Environment and Forests, Ministry of Chemicals and Fertilizers, Ministry of Commerce would also be the stakeholders in the implementation of the actions.

The following activities are planned:

- Based on the inventory developed during NIP, field survey/assessment and monitoring of the inventorised chemicals listed under Annex A would be carried out to update the inventory.
- Analysis of the active ingredient (a.i.) content in the stocks for verification
- Transportation and temporary storage of the stocks for disposal
- Disposal of the stocks in an environmentally sound manner
- Environmentally sound disposal method to be in place for POP pesticides disposal.
- Environmentally sound alternatives to POPs pesticides to be introduced in India

Amongst the alternatives, use of biologically derived pesticides have been found to be effective, safe and eco-friendly. Also organic farming is looked upon as a sustainable alternative to chemical intensive farming. These could provide viable solutions to replace POP pesticides. There is need to develop a phase out strategy of existing future POP pesticides POP pesticides in the country. To assist the private sector in finding out the alternatives and a strategy for replacing future POP pesticides the following measures are essentially required to be taken both at the central and state levels:

- Detailed situation analysis of pesticides in the country.
- Evaluation of alternatives such as botanical, bio-pesticides and integrated pest management (IPM).
- Evaluation and demonstration of alternative technologies of the production of bio and botanical pesticides.
- Evaluation of feasibility of organic farming as a sustainable alternative to chemical farming
- Transfer of technology to the industry.
- Capacity building through institutional strengthening, including addressing regulatory requirements.

The action plan implementation process is presented in Table 20.

Table 20: POP Pesticides Action Plan

Objectives	Activities	Time Frame	Responsible Institutions	Budget (US$ million)		
				Baseline	Incremental	Total
Environmentally sound disposal method, is in place for Annex A POPs.	Elimination of aldrin and dieldrin waste stocks	2011-2012		0.50	0.00	0.50
Environmentally sound alternatives to POPs pesticides are found and introduced in India	Development and production of alternatives to POPs pesticides	2011-2015		5.00	0.00	5.00
	Development and production of biopesticide alternatives especially Bt based biopesticdes to POPs	2011-2015		6.00	3.00	9.00
	Development and or production of biopesticides alternatives (IPM, organic farming); biopesticdes other than Bt based to POPs	2011-2015		8.00	3.00	11.00
Total		**2011-2015**	**Ministry of Agriculture**	**19.50**	**6.00**	**25.50**

4.4.2.4 Timeframe, budget and coordination

The timeframe for the POP pesticides action plan is five years starting from 2011 to the end of 2015. The total budgetary requirement is US$ 25.5 million. Most of the finances will be allocated for finding alternatives to POPs for crop protection. Majority of the funding will come from the GOI (US$ 19.5 million). The incremental part of the budget of the action plan is US$ 6.0 million. The Ministry of Agriculture and the Ministry of the Chemicals and Fertilizers will be the coordinating agencies.

4.4.3 Action Plan pertaining to production, import and export, use, identification, labelling, removal, storage and disposal of PCBs and of facilities containing PCBs (Annex A, Part II)

4.4.3.1 Objectives and priorities of the action plan

The preliminary inventory of PCBs indicated that nearly 10,000 Tonnes of PCBs are present in India. The sound management and gradual phase-out of these stocks are important. To this end the necessary legislations need to be put in place, institutions need to be strengthened; the management practices should be developed including disposal options. The replacement of the stocks and equipments would entail very high costs, therefore, research and development programmes are planned to support PCBs disposal and replacement activities. To actively involve PCBs owners in this process and assure their acceptance and support of this program, public awareness campaigns are necessary. Accordingly, the objectives of the PCBs action plan are as follows:

- Capacity augmentation within the GOI to manage PCBs;
- Environmentally sound management , phase-out and disposal of PCBs;
- Research and development in the field of PCBs;
- Public awareness on PCBs.

4.4.3.2 Current gaps in PCB management

India lacks an effective management system for handling PCBs. Import and export of PCBs and PCBs-containing devices are banned, however the enforcement of this provision is weak. The inventory estimated that the current stocks PCB-containing oil is nearly 10,000 Tonnes..

The inventory preparation of PCB's was undertaken covering 28 States and 6 Union Territories. This was done through letters requesting self reporting of PCB containing equipment. Major industries namely steel, cement fertilizer, sugar, paper, ship breaking as well transformer manufacturers were proactively contacted. Out of 1800 letters issued 1500 responses were received. Ten industries voluntarily declared PCBs containing transformers. The inventory concluded 3000 Tonnes pure PCBs, 6717.557 Tonnes of contaminated PCBs above 500ppm and 120 Tonnes of PCBs wastes stored in drums. The team of experts took samples from transformers, and on testing were found to be PCB positive. The total weight of the PCB-containing oil was 9837.662 Tonnes. To have a more precise determination of the PCB situation at the country level the inventorisation need to be broadened and undertaken more vigorously.

Due to the limited information on PCBs even in the electrical sector the management of PCB-containing devices is very weak. The disposal of PCB waste is unsound as all waste oils are sold to local enterprises for different uses. The disposal options for PCBs are generally lacking.

Though PCBs management is framed under the Hazardous Waste Management Rules, it does not appropriately comply with the obligations of the SC. There is no dedicated manpower to monitor implementation of rules and regulations either. The legislation pertaining to handling hazardous waste at ship-breaking yards needs to be better enforced. Though there are policies that ships entering ship-breaking yard to be well inspected for all hazardous commodities, practice of the same is weak. Monitoring body

has to be set up at the central, state and district level for regular enforcement of PCBs related legislations, backed up by well-equipped and accredited laboratories.

Lack of good management practices for PCBs was observed even at the owners of such equipment. Maintaining proper data and management of hazardous waste is lacking as well.

4.4.3.3 Action plan implementation

Due to the prevalence of severe PCBs management and disposal problems in India a post NIP project was submitted to the GEF through UNIDO. The proposed project is addressing most of the elements of this action plan, particularly the first two objectives.

Elements of the action plan are presented below:

Capacity within the GOI to manage PCB

This will improve the capacity of the GOI to manage the PCBs in a coherent and professional manner. The gaps between Stockholm Convention requirements and existing legal / regulatory framework will be assessed and recommendation to the legislative bodies for amendment and/or development of regulatory infrastructures/regulation will be undertaken. The above process would be undertaken at the national level and extended to the state level.

Strengthening policy, regulatory framework and institutions to comply with the PCB related obligations under the Stockholm Convention would be achieved through

- Reviewing legal and regulatory framework for the ESM of PCBs
- Establishing/upgrading legal and regulatory framework at the national level
- Enforcement of national laws and regulations at the field level.
- Evaluation of institutional capacity for ESM of PCB-containing equipment and wastes.
- Establishing accredited laboratories.
- Strengthening national, state and local level institutions
- Regular country reports shall be filed at the Secretariat of the SC. MoEF is responsible for collating and completing the report.
- The mechanism of such reporting will be developed and put in place.

Environmentally sound management, phase-out and disposal of PCBs

The present inventory concluded close to 10,000 Tonnes of PCB in transformers. 30% is found to be pure PCB liquid. Steel sector alone has at least 1700 Tonnes of pure PCBs. To gradually phase out all PCBs before 2025, it is important to strengthen the compliance of PCB owners to the planned self reporting regulation. Local authorities will be

responsible to disseminate this information. In this process the inventory of PCBs will be regularly updated by the state level and national level authorities. These processes will be supported with an on-line database. Environmentally sound PCB management practices will be introduced by all PCB owners that would assure that PCBs do not enter the environment and they are not mixed with other waste streams. PCBs waste disposal technologies will be established to assure that PCBs are eliminated as per the requirements of the SC and Basel Conventions.

The GEF supported post NIP project on PCBs will demonstrate the feasibility of this action plan in selected states and will eliminate 1700 tonnes of pure PCBs and 6000 Tonnes of PCB containing equipment and wastes as the first step in the implementation of this action plan.

Research and development in the field of PCBs

This objective of the PCB action plan includes undertaking research and development to find out alternatives to PCBs and development of BAT for the disposal of PCBs.

India is lacking the capacity for environmentally sound disposal of PCBs. There are number of technologies available in this regard. Their adaptation and if necessary improvements are planned. Due to the high volume of pure PCBs this question is very relevant, since most technologies are cost effective for PCB-containing oils. Even incineration is complicated for pure PCBs. In this matter, more research is needed.

Public awareness on PCBs

Public awareness is crucial particularly in protecting human health from PCBs. There is a need to train trainers on PCBs, their health effects, the proper ways of handling PCBs and phase out process and disposal methods. This would be augmented through organizing regional and national workshops/ training programmes and would cover the following aspects:

- Planning and organization of PCB phase out and treatment methods.
- Occupational safety monitoring by safety engineers.
- Identification and labelling of PCB equipment.
- Use of personal protective gears.

Training workshops would deliberate on the information available on the latest destruction technologies for PCBs, particularly on those that will be established in India. The action plan is presented in Table 21.

Table 21: PCB related action plan

Objectives	Activities	Time frame	Responsible Institution	Budget (US$ millions)		
				Baseline	Incremental	Total
Capacity within	Strengthening	2011-2012		0.55	0.68	1.23

Objectives	Activities	Time frame	Responsible Institution	Budget (US$ millions)		
				Baseline	Incremental	Total
the GOI to manage PCBs	policy, regulatory framework and institutions to comply with the PCB related obligations under the Stockholm Convention					
	Regular Country reports on PCBs	2011-2022		1.00	–-	1.00
Environmentally sound management , phase-out and disposal of PCBs	i. Strengthening PCB-owners including power sector and other industries with regard to self declaration, registration, environmentally sound maintenance. ii. Continuous updating of national inventory of PCBs and PCBs containing equipment and wastes in power sector and other industries. iii. Implementation of ESM of PCBs, PCB containing equipment and wastes through establishing static and mobile treatment facilities.	2011-2015		20.84	9.89	30.73
Research and development in the field of PCBs	i. Development of PCB alternatives for the electrical sector. ii. BAT for PCB disposal.	2011-2022		4.0	2.0	6.0
Public awareness on PCBs	Public awareness and information programs	2011-2015		7.21	3.13	10.34
Total		**2011-2022**	**MOEF**	**33.60**	**15.70**	**49.30**

4.4.3.4 Timeframe, budget and coordination

The timeframe for the PCBs action plan would span over eleven years starting from 2011 and ending in 2022. Its total budgetary requirement would be US$ 49.30 million. Most of the finances will be allocated to the ESM system and the disposal of PCBs. Majority of the finances will come from the GOI (US$ 33.6 million). The incremental part of the budget of the action plan is US$ 15.7 million. The MOEF would be the coordinating agency.

4.4.4 Action Plan pertaining to production, import and export, use, stocks and wastes containing DDT (Annex B) if used and produced by the Party to the Convention

4.4.4.1 Objectives and priorities of the action plan

India is the only country in the world where DDT is produced and used in disease vector control programme. In India, most vectors of malaria can be found and thus has very long expertise in fighting this disease. India has also expertise in chemical and pesticides research and development work. The NIP aims to assure that DDT is used in an environmentally sound manner, while protecting human health. It is also important to assure that DDT wastes are collected, handled and disposed off appropriately in environmentally sound manner. Due to the vast experience on the production, use and Research and Development of DDT in the country India is best suited for and committed to the development and testing of DDT alternatives in the field.

The DDT action plan of the NIP will concentrate on the following objectives:

- Life-cycle management of DDT, specifically its environmentally sound disposal method, is in place and enforced.
- Environmentally sound alternatives to DDT are found and introduced in the malaria vector control programme.
- General public awareness on DDT alternatives use in the health sector is achieved.
- Identification and remediation of POPs contaminated sites (addressed in the action plan on contaminated sites).

4.4.4.2 Gap analysis

DDT, a POP pesticide, is still produced and used in vector control in India. The use of DDT in agriculture was banned by the government in 1989. Since then, it is produced and used in vector control program only. Besides consumption in the country, India exports DDT to a number of countries. India has got exemption under the provision of Stockholm Convention of POPs to produce and use DDT for acceptable purpose in disease vector control till an effective, affordable and safe alternative is available. There is lack of viable alternatives to DDT on cost / benefit ratio or risk / benefit ratio. Since synthetic pyrethroids have same mode of action as that of DDT, those should not be promoted on large scale. Bio-efficacy of DDT should be tested regularly and the formulation of DDT 50WP might be improved for better effectiveness. Many Malaria Officers have emphasized the need for change in size of packing for better storage and handling.

Approximately 41 MT of date expired DDT stocks have been documented. Used protective gears, the packaging material of the DDT 50 WP are generally disposed off through incineration, though the process is not documented. In some cases the inventory concluded that used materials and empty containers are placed in a pit and covered with soil. This unsound practice seriously and adversely impacts human health and the environment.

Generally the control and enforcement mechanism that would assure the complete disposal of the DDT-contaminated materials in an environmentally sound manner is lacking. India has cement kilns that can be upgraded for treating these wastes. There are a number of hazardous waste incinerators, which can also be upgraded and utilized in this regard.

Since DDT has adverse effects on human health and the environment, the GOI is ready to take appropriate measures to phase out DDT. However currently due to resistance and cross resistance to the available alternatives to DDT, DDT cannot be replaced.

Awareness raising on DDT and malaria is important. Refusal for getting houses sprayed with IRS insecticides is common in all the states. In many cases workers do not wear Personal Protective Equipment (PPE) during spraying. They may be apprised/educated on the hazards involved in spraying and encouraged to wear minimum PPE while spraying. For achieving best results, seasonal variation should be taken into consideration,and thereby modifying the spraying schedule..

4.4.4.3 Action plan implementation

The action plan will be implemented through the Ministry of Health and Family Welfare along with the Hindustan Insecticides Limited and the National Vector Borne Disease Control Programme.

The following activities are planned:

- *Disposal of Stockpiles and wastes*
- *Improving workers safety for IRS*
- *Establishment of an information management system (IMS) for the POP pesticides including DDT*

A website will be developed and updated regularly. It should be on lines with the MIS launched by UNEP in November, 2007. The information on the website will include:

- Stockholm Convention decision and the responsibilities of Parties to the Convention with respect to DDT.

- *Country profile*: information on DDT production, use pattern, supply to different states, dumping sites, quantity of expired obsolete DDT, resistance status, progress towards DDT phase out, etc.

- *DDT related activities:* Projects, case studies, action plans.

- DDT alternatives and their feasibility for production and usage (both chemical and non-chemical)

Development of alternatives to DDT

HIL, a Government of India Enterprise is the sole DDT manufacturer in India. HIL has designed a project proposal on development of DDT alternative molecule with the technical assistance of the Institute of Chemical Technology (ICT), a reputed institute in India, engaged in synthesis of molecules. Initiation of the activities depends on the approval of fund under the NIP and the GEF.

Objectives of the action plan are as follows::

- DDT situation analysed in different malaria and Kala azar endemic areas/states of India;
- Viable alternatives, both chemical and biological, for DDT evaluated,
- Alternative technologies evaluated for the production of compounds such as dicofol where DDT is used as the raw material/intermediate,
- Costs of substitutes and implementation plans for such substitution worked out,
- DDT phase out strategy in placed, and
- Iinstitutional capacity strengthened

India is the only country that produces and exports DDT. With the continued use of DDT in the country and elsewhere in the world, namely in Africa, the mosquitoes have developed resistance and the recommended dose of DDT no longer remain effective to combat the mosquitoes menace. Hence, there is an urgent need to develop a phase-out strategy of DDT in the country. The project will take a holistic and country-wide approach to address the issue and support the nation in establishing viable alternatives for protection against malaria. Through a close coordination mechanism, the relevant government authorities and specifically the MOEF, MOCF and MOH&FW ensure that the new policy and legislative framework will be prepared in time taking into account the overall interest of the country

The activities of the DDT action plans are summarized in the Table 22.

Table 22: DDT Action Plan

Objectives	**Activities**	**Time Frame**	**Responsible Institutions**	**Budget (US $ million)**		
				Baseline	**Incremental**	**Total**

Life-cycle management of DDT, specifically its environmentally sound disposal method, is in place and enforced.	Elimination of obsolete DDT stocks	2011-2012		0.50	0.00	0.50
	Disposal of DDT packaging material in environmentally sound manner	2011-2015		1.00	0.00	1.00
General public awareness on DDT use in the health sector is achieved	Establishment and maintenance of an information management system (IMS) for DDT	2012-2022		5.00	0.00	5.00
	Improving workers safety for IRS	2011-2022		1.00	0.00	1.00
Environmentally sound alternatives to DDT are found and introduced in the malaria vector control programme.	Development and production of botanical alternatives to DDT	2011-2015		15.00	9.00	24.00
	Development and production of chemical alternatives to DDT	2011-2015		4.00	2.00	6.00
	Development and production of Bt based alternatives to DDT	2014-2019		9.00	6.00	15.00
	Registering specific exemption for Dicofol	2014-		-	-	
Total		**2011-2022**		**35.50**	**17.00**	**52.50**

4.4.4.4 Timeframe, budget and coordination

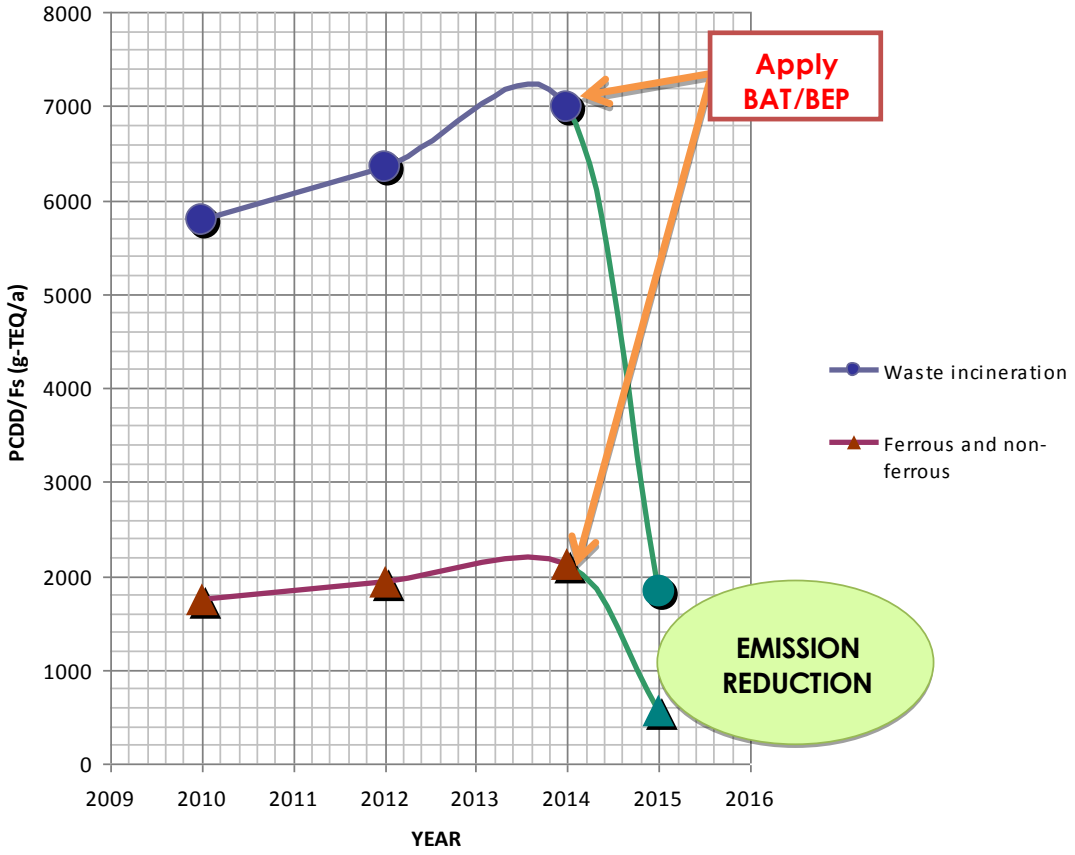
The timeframe for the DDT action plan is twelve years starting from 2011 and ending in 2022. The total budgetary requirement would be US$ 52.50 million. Some of the activities will be covered under the government budget. The incremental part of the budget is US$ 17.00 million. The Ministry of Health and Family Welfare will be the coordinating agency through HIL and NVBDCP.

4.4.5 Action Plan – Releases from the unintentional production (by-products of PCDD/F, HCB and PCBs)

4.4.5.1 Objectives and priorities of the action plan

Waste incineration and ferrous and non-ferrous metal production sectors have the highest PCDD/F releases in India according to the PCDD/F inventory. The promotion and introduction of BAT and BEP in these sectors are therefore, particularly important. The primary objective of this action plan is to achieve significant PCDD/F release reduction in these two sectors by 2015. In the waste incineration sector, less than 2 kg TEQ annual PCDD/Fs releases are planned, while in the ferrous and non ferrous sector the releases should be below 1 kg TEQ/a (Figure 36).

Figure 36: Projected PCDD/F releases by 2016 in the priority main source categories



Further there are a number of objectives which are addressed in this action plan. These are as follows:

- Strengthen legal and institutional framework for the management of POPs as contained in Annex C ;
- Achieve significant release reduction in unintentional PCDD/PCDF, HCB and PCBs formed in certain industrial processes;
- Raise general public awareness on POPs as contained in Annex C;
- Establishment of an evaluation system to ensure effectiveness of the Annex C POPs release reductions;

- Strengthen analytical capacity for research and development for monitoring on POPs as contained in Annex C of the SC;
- Promote BAT/BEP application

4.4.5.2 Gap analysis

The current legislation does not require the adoption of BAT/BEP in the industrial sectors to reduce the releases of UP-POPs. POPs monitoring activities have not yet started in the country. Basically, there aren't any database or research results available on POPs releases in the environment and their levels in human body, animals and foodstuff. During the preliminary inventory, started in 2008, analyses of dioxins in polluted soil, emissions from stationary sources, and cow and goat milk from contaminated sites were made and this action was the first ever attempt to conduct analyses of dioxins and dioxin like chemicals. Emission limit values for Annex C POPs are generally lacking and authorities responsible do not monitor their releases. Consequently, the laboratory capacity for UP-POPs analysis although in place, needs significant strengthening, specifically upon introducing limit values and regular monitoring.

The first PCDD/Fs inventory of India developed contain important information on the releases of PCDD/Fs. The inventory is backed up by laboratory analysis in some of the representative industrial sectors. Significant difference was observed between the release estimates based on the Toolkit emission factors and the release estimates based on the measured emission factors. This should be pursued further and authenticated during the NIP implementation.

There are a number of sub sectors which were not considered in the first inventory preparation, due to lack of available information and/or lack of general consensus on the assumption techniques that should be applied to estimate the annual source strength, e.g.: open water dumping, open burning of waste, cigarette smoking, etc. Future inventories will need to clarify and develop a meaningful estimation method for these diffused sources.

The information management system concerning the reporting of PCDD/F release estimates at the state level and at the country level need to be established.
The knowledge of the general public and more importantly the industry on Annex C POPs was found to be lacking. For the successful implementation of the SC further activities need to undertaken.

4.4.5.3 Action plan implementation

Strengthen legal and institutional framework for the management of POPs of Annex C

In order to implement the Convention at the national level, it is very essential to assess the current situation of the national infrastructure and institutions to manage the issue and to define a collaborative structure for POPs management, control, monitoring and R & D including the responsibilities of the involved organizations.

Specific actions are as follows:

- Develop UP POPs emission standards;
- Develop national standardized methods for their sampling, and analysis;
- Developing coherent share of responsibilities between the authorities that register and monitor industrial processes,
- Develop a procedure for collecting, storing, transporting, eliminating and decontaminating dioxin containing wastes;
- Financial facilitation and promotion of introducing BAT/BEP.

Achieve significant release reduction in unintentional releases of PCDD/PCD, HCB and PCBs formed in certain industrial processes

Waste incineration and ferrous and non-ferrous metal production are the two major sources of POPs releases as categorized in Annex C. These are the two sectors that will receive particular attention in this action plan.

Concerning the waste incineration, improving waste management, reducing volume of wastes by way of recycling and introducing BAT/BEP in waste elimination processes would have direct impact on the dioxins/furans emissions. In order to do so specific actions will to:

- establish waste sorting out system,
- reduce volume of waste by way of re-using and recycling,
- build and/or upgrade waste incineration facilities, especially medical and hazardous wastes, to reduce the releases of UP POPs. In this regard a full size GEF project is proposed,
- prohibit intentional burning of wastes in dump areas and/or public areas, which will provide a clear picture on the releases from open burning of waste, and
- ban burning hazardous wastes such as plastics, rubbers, plastic packages, PVCs and tyres. This activity will concentrate on those wastes streams that have high chlorine content. This part of the action plan will also be developed into a full-size GEF project addressing the management of PVC plastic waste in closed loops to avoid the landfill practices and for preventing releases of dioxins and furans from open burning.

To have general public awareness on POPs as contained in Annex C

Awareness and information raising activities are planned for SPCBs to train the trainers. Then the pollution control boards can conduct various POPs awareness programs for the general public and relevant industries.

Awareness raising activities for general public have vital importance in encouraging them to protect themselves and the environment from POPs impacts. These activities shall address general public and “groups at risk”. The groups at risk can be the workers who directly work at dioxin releasing operations, workers of thermal plants and boilers,

workers who handle agricultural pesticides, workers of waste metal processors and workers from minerals production.

Specific actions include:

- Preparation of a set of educational materials for students
- Implementation of education programmes for teachers of ecology and doctors of toxicology
- Preparation of instruction for workers who directly handle dioxin contaminated articles such as PCB-containing equipment and wastes and organise training and awareness raising activities on POPs
- Training programme for customs officers, environmental inspectors and officers from professional inspection agencies

Establishment of an evaluation system for the effectiveness of the Annex C POPs release reductions

Methodology for conducting monitoring of UP POPs chemicals as contained in Annex C in air, water, soil, and sediment and food products will be developed and monitoring sites and sampling frequencies will be defined. Measurement results will be integrated and used for preparing monitoring reports. Monitoring results will also be used for national and regional information sharing and decision making.

The programme will also concentrate on monitoring of levels of UP POPs chemicals as contained in Annex C in products from agricultural produce and imported/ exported goods. Also, a constant monitoring will be undertaken for drinking water sources in the surrounding areas of major sources of UP POPs and contaminated sites. This action will enable to control the concentration of UP POPs chemicals in food products and drinking water and enable identifying polluting sources and concentration trends of Annex C POPs.

Specific activities are as follows:

- Establishment of constant monitoring system;
- Promote the application of available, feasible and practical measures for achieving release reduction or source elimination;
- Review the strategies and reports of UP POPs release reduction obligations;
- Preparation of regular monitoring reports and maintenance of related database.

Strengthen analytical capacity for research & development for monitoring of UP POPs chemicals as contained in Annex C of the SC

A national laboratory with capacity to conduct analysis of POPs chemicals is required for monitoring emissions and releases of UP POPs chemicals, their impacts on the environment and human health and undertaking research in this field. NIIST, NEERI and CPCB undertake quality analyses for environmental samples, however only CPCB is able to undertake Annex C UP POPs analyses in an accredited manner. In this regard, it is necessary to set up a national facility, responsible for monitoring, research and

development in these laboratories and provide this unit with the required equipment and methodology, as well as qualified and specialized experts. The following actions shall be commenced as part of the action plan:

- Research on UP POPs chemicals in air, water and soil;
- Research on UP POPs chemicals from industrial sources;
- Research on contamination level of "risk groups", and
- Research on pollution in foodstuffs and drinking water by POPs chemicals.

Promote the use of BAT/BEP

The action plan aims at reducing and, where feasible, eliminating UP-POPs releases by building capacity to implement BAT/BEP measures in the priority industry sectors. In this regard the two most important sectors are the waste incineration and ferrous and non-ferrous industries. The scope of this objective also incorporates the promotion of technology transfer and investment by identification and implementation of innovative mechanisms for waste management. The following activities are planned:

- Promote the development and use of substitute or modified materials, products and processes to prevent the release of Annex C chemicals
- Promote/require the use of BAT/BEP for new installations for industrial sources listed in Part II of Annex C.
- Promote BAT/BEP for existing installations for industrial sources listed in Part II and III of Annex C.

India is seeking assistance from the GEF in order to Implement BAT/BEP measures for elimination/reduction of UP POPs releases of priority industry sectors identified in the NIP. The detailed action plan is provided in Table 23.

Table 23: Annex C UP POPs related Action Plan

Objectives	Action Plan	Time Frame	Responsible Institution	Budget (US $ million)		
				Baseline	Incremental	Total
Strengthen legal and institutional framework for the management of Annex C POPs	Strengthening existing policies and regulations with regard to unintentional releases of POPs.	2012-2014		2.00	1.00	3.00
To have general public awareness on Annex C POPs	To promote information, education and raise public awareness.	2012-2015		2.50	2.50	5.00
Strengthen analytical capacity for	Augmenting analytical Infrastructure for monitoring Dioxin and	2012-2014		5.00	0.00	5.00

Objectives	Action Plan	Time Frame	Responsible Institution	Budget (US $ million)		
				Baseline	Incremental	Total
research & development for monitoring Annex C POPs of the SC	Furans releases from source categories listed in Part II and Part III of Annex C					
	Upgrading and continually updating the inventory of unintentional POPs using indigenously developed tools to measure UP-POPs. Using the upgraded tools estimate more precisely current and projected releases.	2011-2022		4.70	3.00	7.70
Establishment of an evaluation system for the effectiveness of the Annex C POPs release reductions	Identify strategies to meet release reduction obligations of UP-POPs. Through establishment of a constant monitoring system	2014-2016		0.50	0.00	0.50
	Promote the application of available, feasible and practical measures for achieving release reduction or source elimination.	2011-2022		10.00	5.00	15.00
	Review the strategies and report UP-POPs release reduction obligations every five years.	2012, 2017 & 2022		0.30	0.00	0.30
Promote the use of BAT/BEP	Promote the development and use of substitute or modified materials, products and processes to prevent the release of Annex C chemicals	2011-2022		10.00	5.00	15.00
	Promote/require the use of BAT/BEP for new installations for industrial sources listed in Part II of Annex C.	2011-2015		40.00	26.50	66.50
	Promote BAT/BEP for existing installations for industrial sources listed in Part II and III of Annex C.	2012-2022		65.00	42.00	107.00
Total		**2011-2022**	**MoEF**	**140.00**	**85.00**	**225.00**

4.4.5.4 Timeframe, budget and coordination

MoEF is the nodal ministry for planning, promoting and coordinating environmental programs including the management of chemical disasters in India. The Ministry is mandated to protect the land, air and water systems and is responsible for the prevention and control of pollution from hazardous substances. MOEF is empowered to promulgate

rules under the Environment Protection Act (EPA) and is responsible in ensuring effective implementation of legislation, monitoring and control of pollution (including pesticide levels in soil and water), environmental clearances for industrial development projects, promotion of environmental education, training and awareness raising and coordination with concerned agencies at the national and international level. MoEF has established standards for ensuring the quality of the environment, including emissions and/or discharges of environmental pollutants from various source releases. Therefore, MOEF will be the main coordinating agency.

The time frame for the Annex C POPs related action plan would span over twelve years starting from 2011 and ending in 2022. Its total budget for undertaking this activity is US$ 225.0 million. The assistance of the GEF will be required to finance this important activity. Majority of the finances will come from the GOI (US$ 140.0 million). The incremental part of the budget of the action plan is US$ 85.0 million.

4.4.6 Strategies to identify new POPs stockpiles, articles in use and wastes (Annexes A, B and C)

4.4.6.1 Objectives and priorities of the action plan

In addition to the twelve chemicals initially listed under the Stockholm Convention, the Conference of the Parties (COP) at its fourth meeting in May 2009 decided to amend the Convention by adding nine new chemicals to its Annexes A, B and C. Some of the listed chemicals, especially the industrial chemicals are still produced in some countries and used in many countries and some exist globally in stockpiles and waste that might be eventually recycled, therefore, reintroduced for use.

The new POPs represent not only an increase in the number of chemicals covered by the Convention but also an expansion of the scope of work to be undertaken by the Parties. Some are industrial chemicals that have many uses and involve different users and producers. India has no inventories of the new POPs, added to the list of the Stockholm Convention. The objective of the action plan is to have preliminary inventories for the nine new POPs including their import, export, production, use, stocks and release estimates.

4.4.6.2 Gap analysis

Among the nine new chemicals of the SC, India is producing lindane and thus the side stream products, alpha and beta HCH are also produced. The total installed capacity of lindane (technical) production of 1,300 MT per annum, with two companies producing: Kanoria Chemicals and Industries Ltd with a capacity of 1000 MT per annum, and India Pesticides Limited with 300 MT per annum capacity. According to data available from Department of Chemicals and Petrochemicals, Ministry of Chemicals and Fertilizers, between 1995 and 2005, India has produced 5,387 MT of technical grade lindane. Out of this 434.18 MT has been exported. Available data shows that India has imported lindane twice - in 1996-97 from Korea (11 MT) and in 2003-04 from China (20 MT).

According to the industry sources, 5-8% of the total lindane produced in the country is sold to the pharmaceutical companies in India (with 99.8% purity), 25-30% is used by the industry for formulation (which is used domestically) and 15- 20% is exported annually. There is a lack of information concerning the production statistics of the side stream products (IPEN 2006). According to the CAPE (Community Action for Pesticide Elimination), through an IPEN funded projects, the ineffective isomers of lindane production are dumped in an environmentally unsound manner. The lack of appropriate legislation and institutional capacity at the central and state governments further escalates the problem. There is a strong need to collect more information on the import, export, production and use of these chemicals before any decision could be taken.

The preliminary inventory on Annex C UP POPs has addressed dioxins and furans only. It is presumed that sources and the releases of other Annex C POPs linked to dioxins and furans, still their identification and quantification is pending. Pentachlorobenze has been added to the list of the SC and thus its release inventory would need to be developed.

4.4.6.3 Action plan implementation

The objective of the action plan is to have in place a preliminary inventory on the nine new chemicals of the SC.

The action plan has been divided into three main activities. Activity number one addresses the assessment of the regulatory infrastructure and institutional capacities with the aim to identify the mechanism for integrating these new POPs into the current chemicals management legal and institutional framework.

The next group of activities will include the field assessments of import, export, production, use and stocks of the Annex A and B chemicals. Due to the lack of available information the identification of stocks and the quantification of the uses of these chemicals will be the most labour intensive and would require the most of the finances.

The third group of activities aim to develop the release estimates for HCB, PCBs and pentachlorobenzene. In this regard the sources of the PCDD/Fs release inventory will be considered and measured emission factors will be developed for each industries that are undertaken in India.

The action plan is included in Table 24.

Table 24: Strategies to identify new POPs stockpiles , articles in use and wastes action plan

Objectives	Action Plan	Time Frame	Responsible Institution	Budget (US $ million)		
				Baseline	Incremental	Total
Preliminary inventories for the nine new POPs	Assessment of legal infrastructure and institutional capacities for the management of	2012-2013	MoEF	0.50	0.50	1.00

Objectives	Action Plan	Time Frame	Responsible Institution	Budget (US $ million)		
				Baseline	Incremental	Total
	the new POPs chemicals.					
	Filed assessments to identify and quantify the import, export, production, use, and stocks of new Annex A and B POPs,	2013-2015	MoEF, MoA, MoI, Customs	3.50	3.50	7.00
	Release estimates of HCB, PCBs and Pentachlorobenzene	2013-2015	MoEF, MoI, Industrtial Chambers	1.00	1.00	2.00
Total		**2012-2015**	**MoEF**	**5.00**	**5.00**	**10.00**

4.4.6.4 Timeframe, budget and coordination

The primary responsibility in developing inventories of the new POPs chemicals lies with MOEF. Since assessing production and use of industrial chemicals are targeted to be undertaken, the involvement of Ministry of Industries, Chambers of Commerce and Industries will also be involved. Some of the new POPs are used in the agriculture; therefore, MOA will play a key role in their assessments.

The timeframe of the inventory exercise would be spanning over a period of three years from 2013 to 2015. The total budget is US$ 10.0 million. Most of the finances will be allocated to the field work associated with the inventory preparation of Annex A and B chemicals. To complete this action plan the assistance of the GEF is sought. The GOI plans to finance half of the total costs of the action plan, i.e.: US$ 5.0 million, while the other half is expected from the GEF. Thus, the incremental part of the budget of the action plan is US$ 5.0 million.

4.4.7 Actions and measures to properly manage POPs stockpiles and disposal of articles containing POPs in use

4.4.7.1 Objectives and priorities of the action plan

Appropriate POPs stock/waste management can significantly reduce the negative environmental impacts of POPs in India. Preliminary inventories have confirmed that large stocks are present, large quantities are still produced and used while storage locations are generally inappropriate and disposal options are lacking. To solve this bottleneck this action plan has been built on three objectives:

- Capacity within the GOI for controlling the management of POPs stockpiles;

- Capacity for environmentally sound storage and disposal of POPs stocks/wastes; and
- POPs wastes are disposed off in an environmentally sound manner.

Through the implementation of this action plan the releases of POPs from the stocks and disposal operations can greatly be reduced and human exposure could also be eliminated.

4.4.7.2 Gap analysis

Government of India (GOI) applies the FAO Pesticides Guidelines on Storage, Labelling, and Disposal (1985), which have been amended as part of the International Code of Conduct on the Distribution and Use of Pesticides. Also, the Hazardous Wastes (Management,Handling and Transboundary Movement) Rules 2008 should be applied strictly for the environmentally sound management of the POP wastes. It is also acknowledged that the implementation and enforcement of these legislations are weak. In many cases authorities have overlapping responsibilities.

Insecticides such as DDT are stored at District Headquarters, Public health Centres (PHCs), sub centres and villages. However, some of these places don't have dedicated storage areas for insecticides and items like drugs, bed-nets etc. are all stored in general stores. Owing to scarcity of storage areas, it has been found that facilities not suitable for storage are being used as store by district authorities. Generally POPs stocks are not managed in the most appropriate and environmentally sound manner. There is also little knowledge on the part of the store keepers on the storage protocols.

The main concerns when handling wastes consisting of POPs contaminated materials are human exposure, accidental release to the environment and unwanted release during POPs production and contamination of other waste streams with POPs. NVBDCP has developed occupational safety guidelines for handling and disposal of insecticides; however, these guidelines are not regularly and strictly adhered to in the field.

Large quantity of PCB oils can be found in various places in India. Although, the use of PCB oils is banned now, still in some industries, the old electrical transformers containing PCB oils are in use. Also, ship breaking industries are sources of PCBs contamination in the respective surrounding environment. All POPs stocks and wastes are necessary to be identified and characterized before the management options for the stocks could be decided.

India has limited experience in the environmentally sound disposal of POPs. There are hazardous waste incinerators and cement kilns in the country that can be upgraded for POPs disposal, however, the capacity and expertise in doing so is lacking. Since enforcement is weak, it is cheaper to dump the wastes illegally than to pay for the disposal.

4.4.7.3 Action plan implementation

Capacity within the GOI for controlling the management of POPs stockpiles

Self reporting on POPs stockpiles/wastes includes a draft policy or regulation regarding the tracking of POPs and reporting to the Government for inventory purposes will be developed based on the principles of self reporting. The policy or regulation will require scheduled reporting and subsequent notifications when changes to inventories take place i.e. when disposal occurs.

Updating the national inventory on POPs action will create the mechanism within the government to collect field data on POPs stocks and wastes centrally and to have an information dissemination mechanism in place that could be used for decision making at the national, state and local levels. It will include an electronic database with controlled user access and responsibilities.

Monitoring program for the management of POPs stockpiles/wastes is crucial from the environmental and human health point of view. Monitoring is the continuous assessment of the risk management actions. Authorities will investigate all levels of POPs stock management. It will include both formal site inspections and informal communications.
The monitoring programme will provide an indication of whether POPs management operation is functioning in accordance with the legislations. It will also investigate changes in environmental quality caused by the operation. The information from the monitoring programme should be used to ensure that the proper types of POPs stocks are being managed by appropriate waste management practices. It will discover if an alternative management approach might be more appropriate.

Capacity for environmentally sound storage and disposal of POPs stocks/wastes

Upgrading of the interim storage locations is the primary step in protecting human health and the environment. The actions will strengthen storage locations of the GOI, where the obsolete POPs could be transferred and stored until the final disposal is done.

Since India still produces and uses some of the POPs, it is important that appropriate national capacity is put in place for POPs disposal. There are several options that need to be investigated, such as upgrading hazardous waste incinerators and/or upgrading cement kilns to burn POPs wastes and/or transferring non incineration technologies for this purpose. This activity will investigate all available BAT options in this regard, will look at the advantages and disadvantages, including their costs. Several technologies will be field tested and promoted to compete in the Indian market.

POPs wastes are disposed of in an environmentally sound manner

The disposal of the total identified stocks of Aldrin and Dieldrin is foreseen. These stocks are located in Regional Plant Protection and Quarantine Station (RPPQ&S) in Mumbai; Barmer, Bikaner, Sikar, Jaisalmer and Kota in Rajasthan; Imphal in Manipur and Palampur in Gujarat.

Out of over 9837 tons of pure PCBs and PCBs containing oil, the preliminary inventory has identified 1700 Tonnes of pure PCBs and 6000 tons of PCBs contaminated equipment and waste that needs to be disposed.

The action plan is presented in Table 25 below.

Table 25: Action Plan on Management of POPs Stocks and Wastes

Objectives	Activities	Time Frame	Responsible Institution	Budget (US Dollar in Million)		
				Baseline	Incremental	Total
Capacity within the GOI for controlling the management of POPs stockpiles	Self reporting on POPs stockpiles/wastes	2011-2022		0.50	0.00	0.50
	Updating national inventory on POPs stocks/wastes	2011-2022		4.80	3.20	8.00
	Monitoring program for the management of POPs stockpiles/wastes	2012-2013		1.50	0.00	1.50
Capacity for environmentally sound storage and disposal of POPs stocks/wastes	Upgrading interim storage facilities for POPs stocks/wastes	2012-2014		7.00	3.00	10.00
	Creating national POPs disposal capacity	2012-2016		9.00	7.00	16.00
POPs wastes are disposed of in an environmentally sound manner	Disposal of the Aldrin and Dieldrin obsolete stocks	2011-2012		1.00	0.00	1.00
	Disposal of 1700 tonnes of pure PCBs and 6000 Tonnes of PCBs contaminated equipment and waste	2011-2015		8.20	7.80	16.00
TOTAL		**2011-2022**	**MoEF**	**32.00**	**21.00**	**53.00**

4.4.7.4 Timeframe, budget and coordination

The timeframe for the action plan on management of POPs stocks and wastes is twelve years starting from 2011 and ending in 2022. The core of the activities are planned between 2011 and 2015. The total budget of the action plan is US$ 53.0 million. Most of the finances will be allocated for creating the capacity for the transportation, storage, and final disposal of the identified stocks. Majority of the finances will come from the GOI (US$ 32.0 million). The incremental part of the budget of the action plan is US$ 21.0 million.

4.4.8 Action Plan – Identification and corresponding management of contaminated sites (Annexes A, B and C)

4.4.8.1 Objectives and priorities of the action plan

The contaminated sites action plan is based on two objectives.

- Augmentation of capacity at GOI for POPs contaminated sites management, and
- Contaminated sites are managed in an environmentally sound manner.

Contaminated sites identification and management is one of the priority areas for NIP implementation. The GOI has requested for the financial support of the GEF for identification of sites contaminated by POPs chemicals and its risk assessment to health and the environment and demonstration of remediation process including on-site remediation at the potential hotspots. This GEF project will build the necessary capacities within the country for the sound management of contaminated sites.

4.4.8.2 Gap analysis

Generally contaminated sites related legislations are scattered and incoherent. Information is not kept centrally in an organized manner and is not available for decision making. Consequently information on contaminated sites at the land registry is not available. Liability questions are not addressed in the current regulatory regime either.

Several sites, principally contaminated by DDT and other POPs pesticides as well as PCBs have been identified during the NIP preparation and as the field surveys are progressing, more and more sites contaminated with POP chemicals will be coming to light. The urgency to address these known sites stems not only from how they have been managed in the past with improper containment of pesticide stocks and PCB wastes and dioxins but the fact that local communities continue to settle in surrounding areas, making them susceptible to run-off and groundwater contamination.

4.4.8.3 Action plan implementation

Measures of this action plan will help India to develop a long-term monitoring and site remediation strategy and demonstrate proper site remediation to minimize/eliminate unintentional releases of POPs into the environment. It also supports site safeguards for highly-contaminated sites while waiting for remediation, including activities on restriction of access to the sites, monitoring of the sites and raising public awareness.
Specific components of the action plan are as follows:

Capacity of GOI for POPs contaminated sites management

This objective is related to the development of the necessary regulatory infrastructures for identification and registry of contaminated sites. To this end a contaminated sites register

will be established and linked to the land registry. Liability questions will also be discussed and based on the" polluter pays" principle a new legislation will be developed. The possibility of establishment of an environment fund will be considered.

Government authorities, especially the CPCB and SPCBs will be strengthened to enforce the newly created legislations and to monitor the releases from identified contaminated sites.

Contaminated sites are managed in an environmentally sound manner

This objective will be achieved through several measures. The first one is contaminated site identification. It will be achieved in several stages.

The objective of stage 1 is to gather sufficient information to estimate the likelihood of POPs contamination that may be present at a site. Sampling relevant environmental media and investigations of subsurface conditions are not required at this stage. It includes the following activities:

- Desk review: review of a site's historical use and records to determine current and past activities or uses, accidents and spills, and practices and management relating to potential contamination at the site and at adjacent sites;
- Site visits: one or more walk-through site visits to verify the information gathered during the literature review for indicators or presence of contamination;
- Interviews: interviews with current or former owners, occupants, neighbours, managers, employees, and government officials who can, with reasonable attempts, be contacted about information on activities that may have caused contamination.

Stage 2 should be conducted only if stage 1 indicates there is a likelihood of POPs contamination at the site or if there is insufficient information to conclude that there is no potential for POPs contamination. The objective of stage 2 is to confirm the presence or absence of the suspected contaminants identified in stage 1 and to obtain more information about them. To achieve this objective, site identification needs to be carried out. It includes the following activities:

- development of a conceptual site model;
- development of a sampling plan;
- sampling of relevant environmental media;
- laboratory or field instrumental analysis of samples and selected environmental media for substances that may cause or threaten to cause contamination.

The stage 3 is to classify the contaminated sites. In this regard a ranking system will be developed based on certain criteria that would assist to objectively classify each location.

Stage 4 is the prioritization that would involve a decision making process to select those sites where immediate actions are needed for cleaning up and others where site

containment should be undertaken. The remediation and/or management of a contaminated site, must comply with any regulatory standards that apply to all contaminated media present at the site.

Short Term Strategy

In certain situations, a site may require short-term remedial measures because there are immediate risks to human beings and surrounding environments. These measures include:

- source control;
- site stabilization-immobilization of contaminants, including installing a barrier;
- shifting people temporarily

Mid Term Strategy

In other situations, intermediate measures may need to be established to guide the remediation activity when complete removal of a contaminant source is not feasible in one aggressive remedial effort and contaminants remaining in the sites still exceed the regulatory standards. Intermediate measures include:

- depletion of contaminant source adequately to allow for natural attenuation;
- reduction of dissolved phase contaminant concentration outside a source zone;
- decrease in mass discharge rate or flux from a contaminant source;
- reduction of the mass or volume of a contaminant source;
- prevention of migration of remediation fluids beyond a treatment zone.

Long Term Strategy

Long-term remediation strategies are intended to implement a comprehensive monitoring program that properly characterizes the baseline (pre-remediation) condition and monitors improvements to be achieved through targeted remediation. Long-term remedial measures focus on compliance with all regulatory standards applicable to all contaminated media (e.g., groundwater, soil, and soil vapour) present at the site.

Table 26 presents the time frame and budgetary details of activities for identification and remediation of contaminated sites

Table 26: Action Plan for Identification and Remediation of Contaminated Sites

Objectives	Activities	Time Frame	Responsible Institution	Budget (US Dollar in million)		
				Baseline	Incremental	Total
Capacity at GOI for POPs contaminated sites	Develop policy and legal frameworks for management of contaminated land/sites	2012-2015		3.00	2.00	5.00

Objectives	Activities	Time Frame	Responsible Institution	Budget (US Dollar in million)		
				Baseline	Incremental	Total
management	Strengthen institutional capacities for mitigation of contaminated sites	2012-2015		6.00	4.00	10.00
Contaminated sites are managed in an environmentally sound manner	Identification and prioritization of potential contaminated sites	2012-2014		3.00	2.00	5.00
	Selection of appropriate low-cost environmentally sound technologies required for remediation	2012-2014		3.00	2.00	5.00
	Remediation of selected contaminated sites	2014-2022		44.00	30.00	74.00
TOTAL		**2012-2022**	**MoEF**	**59.00**	**40.00**	**99.00**

4.4.8.4 Timeframe, budget and coordination

The timeframe for the action plan on POPs contaminated sites is eleven years starting from 2012 to the end of 2022. Its total budget is US$ 99.0 million. Most of the finances will be allocated for the remediation of contaminated sites. In this regard a GEF assisted project is foreseen. Majority of the finances will come from the GOI (US$ 59.0 million). The incremental part of the budget of the action plan is US$ 40.0 million.

4.4.9 Strategy pertaining to information access and exchange

4.4.9.1 Objectives and priorities of the action plan

To upgrade and strengthen the information management system of the Coordination cell of the Stockholm Convention on POPs and establish an information exchange system of POPs

4.4.9.2 Gap analysis

Information is not maintained centrally in an organized manner, hence, not available for decision making. The vast information on pesticides, PCBs, stockpiles, wastes, contaminated sites, dioxins and furans, impact of POPs on environment, human health, data on monitoring of POPs, etc. need to be maintained in a centralised manner so as to enable any one to have access to such information in a more comprehensive way through a established network.

4.4.9.3 Action plan implementation

The action plan will be implemented through the MOEF in collaboration with participating institutions viz. National Environmental Engineering Research Institute,

National Institute of Interdisciplinary Science & technology, Central pollution control Board, Central Power Research Institute, Hindustan insecticides Limited.

The following activities are planned:

- Strengthening of the Management Information System (MIS) at the Coordination Cell of the Stockholm Convention on POPs
- Maintenance of the MIS through regular update of the database
- Sharing of information with the stakeholders including industry and the NGOs
- Organise meetings/workshops on the implementation of the obligations under the Stockholm Convention for regular exchange and access to the information though MIS network.
- Collation of information, literature, scientific/research findings, news items, and other relevant information.

4.4.9.4 Timeframe, budget and coordination

The time frame for the action plan implementation would be twelve years starting from 2011 to the end of 2022. The budget for this action plan would be US$5.0 million.The MOEF will coordinate the activities in collaboration with participating institutions viz. National Environmental Engineering Research Institute, National Institute of Interdisciplinary Science and technology, Central Pollution Control Board, Central Power Research Institute, and the Hindustan Insecticides Limited.

4.4.10 Promote information exchange for concerned parties, public information, awareness and education

4.4.10.1 Objectives and priorities of the action plan

An important aspect of the Stockholm Convention is its emphasis set out in Articles 9 and 10, on information exchange, public access to information and building of educational programmes facilitating public participation and awareness, particularly amongst women and children who maybe most at risk.

Information exchange between India and other Parties to the Convention directly or through its Secretariat will form an important function of the national management and information system to be established during the project. This system will ensure that India meets its obligations in respect to reporting requirements and other substantive inputs to the COP and its review and expert group.

The emphasis in the Convention on public access to information and education is not intended merely to inform members of the public of the risks they face but to build active public participation in efforts to reduce and ultimately eliminate the release of POPs chemicals. Public ownership of schemes to provide improved management of POPs chemicals and to develop safe alternative techniques is recognized as an important aspect of the Convention compliance, particularly as India continues with its progress towards a market economy.

Public involvement or public participation is an open dialogue and transparent process that allows affected communities and other stakeholders to participate in and influence the decision-making process at contaminated sites. The participation of the public in the establishment of standards and regulations for POPs is essential. Any Government planning, new or changed regulations or policies should have an open process for soliciting comments from any and all person or groups. This means that a general invitation to comment is given through regular media outlets, the internet, or direct invitation. It is essential that the public and all stakeholder groups have a chance to participate in the development of policy related to POPs, planning of programmes, development of legislation, review of documents and data, and decision-making on local issues related to POPs. Public participation is significant in the enhancement of information exchange, education and awareness-raising in all sectors of society. Also, public authorities, international organizations, industry, non-governmental organizations and academic institutions plays important role in different aspects related to the management of POPs and POPs containing wastes. Actively involving the public in understanding, assessing or resolving issues of concern helps to improve decision-making, and is an important part of risk management. In some instances, custodial departments and agencies are legally obligated to ensure that the public is engaged on matters relating to contaminated sites. Meaningful, timely and effective public involvement will lead to better departmental decision-making and more effective assessment/management of contaminated sites. Public involvement should be considered when:

- Communities are located near the contaminated site
- Traditional and country foods currently being utilized in the area could be impacted
- There is public interest in the project
- There is a perceived threat to public health, whether real or not
- Those directly affected by the project expect to be involved
- There is a policy, program, or regulatory requirement
- There are emerging issues related to the project development (i.e., emerging legislation, policy or legal actions)
- Thus, the major objective is to establish an effective mechanism for awareness raising, public information and education on the Stockholm Convention implementation.

4.4.10.2 Gap analysis

Awareness amongst concerned parties of the obligations under the Stockholm Convention is very limited. The public awareness on the environment and health impact is negligible. No guidelines are available for education and awareness raising purposes.

4.4.10.3 Action plan implementation

The MOEF will devise schemes for public awareness raising and education in collaboration with the Ministries of Health and Family Welfare, Agriculture, Information and Broadcasting, Human Resource Development and their respective development agency partners in providing informative and consultative materials to stakeholders. In this regard, the Agricultural Extension Network of the Ministry of Agriculture may provide not only useful experience but also a suitable vehicle for the dissemination of awareness materials and education to farming communities.

The following action activities are planned:

- Awareness raising among policy and decision makers;
- Public access to available and up-to-date information;
- Ensure free access to the information on POPs for the public.
- Development and implementation of educational and public awareness programmes;
- Public participation and input in developing and implementing measures to address POPs;
- Training and development programmes for stakeholders including workers, scientists, educators and technical and managerial personnel;
- Development and exchange of educational and public awareness materials at the national and international levels;
- Development and implementation of education and training programmes at the national and international levels;
- Encouragement of industry and professional users to promote and facilitate provision of information on all relevant aspects of POPs at the national and other levels;
- Usage of a range of approaches to communicate information on POPs, such as information centers at national and regional levels; and
- development of mechanisms, such as pollutant release and transfer registers (PRTRs), to collect and disseminate information on estimates of the annual amounts of the 12 POPs that are released or disposed of.

4.4.10.4 Timeframe, budget and coordination

The MOEFt in collaboration with the relevant line ministries will coordinate the implantation of this action plan. The activities will spread over a period of 12 years from 2012-2022. The budget for this action plan is US$ 5.00 million.

4.4.11 Reporting

4.4.11.1 Objectives and priorities of the action plan

As per Article 15 of the Stockholm Convention on POPs, each Party has to report to the Conference of Parties on the measure it has taken to implement the provisions of the

Convention and on the effectiveness of such measures. The reporting would be done on periodic basis at a specified time period as decided by the Conference of Parties

4.4.11.2 Gap analysis

Updating of the inventory of the chemicals specified under Annex A, B and C of the Convention is a continuous process, therefore, needs regular updating for proper reporting. Proper management information system need to be in place for proper reporting on the implementation measures.

4.4.11.3 Action plan implementation

Ministry of Environment and Forest is the nodal ministry responsible for implementation.

The following actions are suggested:

- Establishment of Management Information System for regular reporting of DDT to the Stockholm Convention Secretariat on POPs,
- Continuous updating of national inventory of PCBs and PCBs containing equipment and wastes in power and other industrial sectors,
- Upgrading and continually updating the inventory of unintentional POPs using indigenously developed tools to measure UP-POPs. Using the upgraded tools estimate more precisely current and projected releases for reporting,
- Enhance and continuously update and upgrade national inventory for POPs stockpiles and wastes.

4.4.11.4Timeframe, budget and coordination

The MOEF in collaboration with the participating institutions and other stakeholders will be responsible and coordinate the implantation of this action plan. The activities would spread over a period of 12 years from 2012-2022.

4.4.12 Monitoring and Evaluation and Research and Development

4.4.12.1 Objectives and priorities of the action plan

Monitoring of the POPs is meant to assess the level of POPs in the different media and fate of these chemicals in the environment. The monitoring and evaluation of POPs chemicals is undertaken at the national level in tandem with different research institutions/laboratories. Proper monitoring of the potential hot spots is very necessary for the management of the sites. Monitoring is aimed at continuous assessment of the risk management actions. It takes place at all levels of management and uses both formal reporting and informal communications. Monitoring and Evaluation also prompts fresh thinking within organizations and their contacts with external stakeholders. The monitoring of the sites should be made mandatory for air, soil and water quality in and around wastes sites and other potential hot spots.

Monitoring is an ongoing process which reviews:

- whether resources are being mobilized and utilized
- whether activities are being undertaken
- whether the intended outputs and outcomes are being achieved

Monitoring is the critical component in the management of wastes contaminated with POPs and should be given high priority with respect to both capacity building and implementation. Monitoring should be undertaken by trained professionals, according to a well-designed plan and using internationally accepted and nationally approved methods, carried out using the same method each time over the time span of the programme. Monitoring should also be subjected to rigorous quality assurance and quality control measures. Errors in monitoring, or deviation from accepted methods, can result in meaningless data or even programme-damaging data. Each Party should therefore, ensure that training, protocols, and laboratory capability are in place for sampling, monitoring and analytical methods and these standards are enforced. A monitoring programme should provide an indication of whether a hazardous waste management operation is functioning in accordance with its design, and should detect changes in environmental quality caused by the operation. The information from a monitoring programme should be used to ensure that the proper types of hazardous wastes are being managed by the waste management operation, discover and repair any damage and determine if an alternative management approach might be appropriate. By implementing a monitoring programme, facility managers can identify problems and take appropriate measures to remedy them.

4.4.12.2 Gap analysis

There is inadequate understanding of the release sources and the quantum of release of POPs in the environment. The technologies available are inadequate resulting in incomplete monitoring. The data available is not sufficient to assess the releases and its impact on the environment and ecosystem and on the human health.

4.4.12.3 Action plan implementation

Enhancing Monitoring

In order to understand properly the sources and releases of PCBs and their movement, it is essential to establish a monitoring mechanism and the following actions are planned:
augmenting the PCBs monitoring system for identification and control of PCBs release into the environment.

- monitoring the PCBs levels in the soil, water and sediment.
- monitoring the PCBs levels in the food crops, aquatic fauna, poultry, animal feed, higher mammals including human beings, etc.
- monitoring PCBs contaminated sites and its remediation measures.

4.4.13 Actions pertaining to Research and Development

4.4.13.1 Objectives and priorities of the action plan

In order to support national management activities, India would require fresh research and development activities in order to address the areas of particular concern as well as to provide regular and systematic monitoring. The Convention provides in Article 11, indications of topics that Parties should address in defining research, development and monitoring objectives. During the development of the NIP, India's existing capabilities to address these objectives have been reviewed.

Research and Development in the field of POPs in India is being undertaken in a decentralized manner. The pesticides component of the work is being undertaken under various schemes of the Ministry of Agriculture viz. Indian Council for Agriculture Research (ICAR) started the All-India Coordinated Research Project (AICRP) on pesticides residue in 1984-85 with a view to develop protocols for the safe use of pesticides. The project was later re-designated as the All-India Network Project (AINP) on pesticide residues to undertake work on the persistence of pesticides on different crops. Based on the data obtained, waiting periods are worked out for the safety of consumers. The data of these trials are also useful for the national regulatory authorities to take appropriate decisions regarding safe use of pesticides in the country.

Research and Development activities have been initiated to look for alternatives to POPs pesticides and in this regard substantial research activities have been undertaken at the national level at different research intuitions to develop non persistent biodegradable botanical pesticides to replace POP pesticides.

4.4.13.2 Gap analysis

No systematic Research and Development work on monitoring of PCBs in the environment has been undertaken so far. Only different groups have conducted research monitoring in some areas. Research shows that PCBs exist in sediments of a few estuaries and marine coastal areas.

However, in the area of dioxin and furans, there is a lack of centralized/coordinated research activities at the national level. Many research institutes are engaged in R&D activities with different goals. In the NIP formulation, attempts have been made to address the issues in a coordinated manner. Research on dioxins and other persistent organic pollutants (POPs) has become increasingly important in India and Indian Ocean region. There has been increasing need for dioxin analysis at trace levels in order to support scientific studies such as toxicological and human health effects, fate and transportation, prevention, and remediation of hazardous chemicals in India. Even though few researchers published levels of dioxins and furans in fish and mother`s milk samples collected during late 90s, it was not considered as organized research to reflect dioxin contamination levels or emission levels in the country. However first work on dioxin emission monitoring from medical waste incinerator emissions was initiated by the

MOEF during the years 2003 - 2005. The work was carried out by National Institute for Interdisciplinary Science and Technology (NIST) Trivandrum, one of the laboratories of Council of Scientific and Industrial Research (CSIR) of India. Following the ratification of Stockholm Convention, CPCB and NEERI have initiated research on dioxins. Recently CPCB has established the National Referral Facility for Dioxins and NIIST has participated and qualified in the international interlaboratory calibration studies on dioxins and furans. The extensive research to reveal the dioxin emission levels from industrial and non industrial activities in India, toxicity and body burden of dioxins among Indian public and the health impacts related to dioxin exposure is yet to be initiated by the government. Over the last 7-8 years India has developed the capacity for the estimation of dioxins and furans in the environmental samples. There are few National laboratories and nongovernmental organizations (NGOs) who have developed the skills for monitoring and analysis of dioxins and furans in various environmental matrices. However, there are limited number of institutions working on R&D aspects of dioxins and furans. NEERI has undertaken research studies for characterization and management of unintentionally produced POPs in environment. Our thrust in this area is to establish a sound R&D program for the degradation of dioxins by means of photochemical, chemical and biochemical processes.

Research on PCBs, their effects, and risk assessment and on the environmental fate of the PCBs and PCDD/F, toxic and ecotoxic effects, the study of transport and transfer processes, degradation mechanisms, bioaccumulation and bio-magnification, and destruction have been reported in the literature. The solution of the POPs issue requires legislative support, financial support, technical capacities and laboratory and institutional capacities.

Table 27 describes the action plan for Monitoring and Research and Development on POPs.

Table 27: Action Plan for Monitoring and Research and Development on POPs

Objectives	Activities	Time Frame	Responsible Institution	Budget (US Dollar in Million)		
				Baseline	Incremental	Total
Enhancing monitoring of POPs	i. Monitoring the PCBs levels in the soil, water and sediment. ii. Monitoring the PCBs levels in the food crops, aquatic fauna, poultry, animal feed, higher mammals including human beings, etc. iii. Monitoring PCBs contaminated sites and its remediation measures	2011-2022	Central Power Research Institute	8.00	4.00	12.00
R&D actions						
Total				8.00	4.00	12.00

4.4.13.4Timeframe, budget and coordination

The Central Power Research Institute of the Ministry of Power in collaboration with the relevant institutions will coordinate the implementation of this action plan. The activities will spread over a period of 12 years from 2012-2022. The budget for this action plan is US$ 12.00 million. The GOI would finance uS$ 8.00 million and the incremental cost is US$ 4.00 million.

4.4.14 Technical and Financial Assistance

4.4.14.1 Objectives and priorities of the action plan

Under Article 12 of the Convention, the Parties would render appropriate technical assistance to the Parties and Parties with economies in transition to assist in implementing the obligation under the Convention. The main objective is to strengthen the institutional capacity, establish relevant operating mechanisms and mobilize technical and financial resources in the country.

4.4.14.2Gap analysis

India is lacking in institutional capacity, technical expertise and has limited financial resources to meet its obligation under the Stockholm Convention on POPs. There is a need for technical assistance, technology transfer and financial assistance from the multilateral funding mechanisms.

4.4.14.3Action plan implementation

Technical assistance and technology transfer

The coordination cell of the Stockholm convention would take appropriate action on the followings:

- Setting priority for technical assistance and technology transfer for meeting short term and long term goals of meeting the obligation of the Convention
- Identification and evaluation of the needs for technical assistance and technology transfer.
- Promoting bilateral/multilateral technical assistance and technology transfer especially through South-South Cooperation
- Organizing research projects for development of locally adopted technologies;
- Establishing regional centre for capacity building and transfer of technology and
- Strengthening monitoring capacity for updating the inventory of the POPs

Financial assistance

Under Article 13, each Party to provide financial support and incentives within its capabilities in respect of those national activities that is intended to achieve the objective of the Convention. Thus, the Party would improve the financial assistance mechanisms

to meet financial requirements for reducing, eliminating and preventing releases of POPs. To meet the obligations under the Convention, India meets its financial assistance though GEF, bilateral/multilateral funds besides its own resources. Priorities requiring financial assistance include:

- Establishment and improvement of relevant policies, laws, regulations,
- Standards, guidance and technical specifications, and strengthening of institutional capacity;
- Promotion of the production, use and industrialization of alternatives, and elimination of the production and use of DDT;
- Development and promotion of non POPs alternatives to DDT,
- Capacity building in publicity, education, technical training, etc
- Investigation and update of the inventory of Dioxin releases and inventories of PCBs-containing electrical equipment in use and of POPs wastes;
- Implementation of BAT/BEP demonstrations on reducing Dioxin releases in key industries;
- Implementation of demonstrations on the environmentally sound management and disposal of PCBs
- Inventorization of newly listed POPs,
- POPs and pesticides management in India,
- Managing National POPs monitoring program,
- Implementation of demonstrations on the environmentally sound management and disposal of POPs wastes viz. medical wastes ; and
- Establishment of sound economic policies and long-term effective financial mechanisms regarding the environmentally sound management and disposal of POPs.

4.4.14.4 Timeframe, budget and coordination

The MOEF in collaboration with the participating institutions and other stakeholders will be responsible and coordinate the implantation of this action plan. The activities will spread over a period of 12 years from 2011-2022.

The summary of the action plans are given below in Table 27-1 to 27-11.

Table : 27-1 Action plan for institutional capacity building and policies / regulations

Table : 27-1 Action plan for the building of institutional capacity and of policies and regulations

	Specific Actions	**Implementation Body**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
	Institutions and capacity building													
	Capacity building for Agencies involved in implementation of the Convention	MOEF	√	√	√	√	√	√	√	√	√	√	√	√
	Capacity building for sectors related to Convention Implementation	MOEF	√	√	√	√	√	√	√	√	√	√	√	√
	Strengthen institutional capacities for mitigation of contaminated sites	MOEF/NEERI	√	√	√	√	√							
	Strengthening institutional capacities for management of PCB contaminated wastes	MOEF/CPRI	√	√	√	√	√							
	Develop regulations on POPs management													
	Strengthening policy and regulatory framework with respect to POPs pesticides to comply with the obligations under the Stockholm Convention	MOEF/MOA	√	√	√	√	√	√	√	√	√	√	√	√
	Develop legal frameworks on PCBs including guidelines for safe management and disposal of PCBs	MOEF/MOP	√	√	√	√	√	√	√	√	√	√	√	√
	Develop guidelines for remediation of contaminated land/sites	MOEF/NEERI	√	√	√	√	√	√	√	√	√	√	√	√
	Strengthening existing policies	MOEF/NEERI/NIIST/CPCB/CPRI	√	√	√	√	√	√	√	√	√	√	√	√

	and regulations with regard to unintentional releases of POPs													
	Establishment and maintenance of an information management system (IMS)	MOEF	√	√	√	√	√	√	√	√	√	√	√	√
	Build the standards' systems for POPs management													
	Revision of environmental quality standards related to POPs	MOEF	√	√	√	√	√	√	√	√	√	√	√	√
	Develop cleaner production standards/ technologies for relevant industries	MOEF	√	√	√	√	√	√	√	√	√	√	√	√
	Revise and improve the existing lists relating to POPs management													
	Revision of the list of hazardous chemicals and wastes listed in POPs related legislations	MOEF	√	√	√	√	√							
	Synchronization of POPs related legislations under various chemical related conventions	MOEF	√	√	√	√	√							
	Strengthen enforcement and encourage public participation													
	Strengthen overall enforcement	MOEF/MOA/MHFW	√	√	√	√	√	√	√	√	√	√	√	√
	Encouragement and promotion of public participation	MOEF/MOA/MHFW	√	√	√	√	√	√	√	√	√	√	√	√
	Carry out evaluation and research of the Convention implementation mechanisms and policies													
	Researh & Development, monitoring of POPs chemicals	MOEF	√	√	√	√	√	√	√	√	√	√	√	√
	Studies on health and environmental impacts of newly	MOEF	√	√	√	√	√	√	√	√	√	√	√	√

	listed POPs													
	Development of environment friendly alternative of pesticides and alternative technologies	MOEF	√	√	√	√	√	√	√	√	√	√	√	√
	Continuous monitoring for effective Implementation of NIP	MOEF	√	√	√	√	√	√	√	√	√	√	√	√
	Updation of the NIP in view of listing of nine new POPs under the Convention													

Table: 27-2 Actions for the reduction or elimination of the intentionally produced and used pesticide POPs chemicals listed in Part I of Annexure A under the Convention.

	Specific actions	Implementation Body	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	Action 1: Environmentally sound disposal methods for chemicals listed in Part I of Annex A of the Convention	MOEF/MOA/MOCF												
	Estimation of aldrin and dieldrin waste stockpiles	MOA/PPQ&S	√	√										
	Action 2: Development of Environmentally sound alternatives to POPs pesticides													
	Development and production of environmentally safe alternatives of POPs pesticides	MOCF/MOA	√	√	√	√	√							
	Development and production of biopesticide alternatives especially Bt based biopesticides as an alternative to POPs pesticide	MOCF/MOA	√	√	√	√	√							
	Action 3: Implementation of laws and regulation pertaining to prohibiting the import and export of chemicals listed in Part I of Annex A of the Convention	MOEF												
	Strict enforcement of laws and regulation to prevent the import and export of intentionally produced POPs pesticide listed in Part I of Annex A of the Convention	MOEF	√	√	√	√	√	√	√	√	√	√	√	√

MOA: Min of Agriculture
MOCF: Min of Chemicals and Fertilizers
PPQ&S: Plant Protection Quarantine & Storage

Table : 27-3 Action for the identification, elimination and environmentally sound management of electrical equipment containing PCBs in use.

	Specific actions	Implementation Body	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	Action 1: Strengthening policy and regulatory framework related to PCBs	MOEF/MOP												
	Strengthening policy and regulatory framework with respect to PCBs to comply with the obligations under the Stockholm Convention	MOEF/MOP/CPRI	√	√										
	Develop policy and legal frameworks for management of PCBs contaminated land/sites	MOEF/MOP/CPRI/NEERI		√	√	√	√							
	Regular Country reports on PCBs	MOEF/MOP/CPRI	√	√	√	√	√	√	√	√	√	√	√	√
	Action 2: Environmentally sound management, phase-out and disposal of PCBs	MOEF/MOP												
	Strengthening PCB-owners including power sector and other industries with regard to self declaration, registration, and environmentally sound maintenance.	MOEF/MOP/CPRI/NEERI	√	√	√	√	√							
	Continuous updating of National inventory of PCBs and PCBs containing equipment and wastes in power sector and other industries.	MOEF/MOP/CPRI/NEERI	√	√	√	√	√							
	Implementation of ESM of PCBs, PCB containing equipment and wastes through establishing static and mobile treatment facilities.	MOEF/MOP/CPRI/NEERI	√	√	√	√	√							
	Action 3: Research and development in the field of PCBs	MOP/CPRI												

	Development of PCB alternatives for the electrical sector.	MOEF/MOP/CPRI/NEERI	√	√	√	√	√	√	√	√	√	√	√	√
	BAT for PCB disposal.	MOEF/MOP/CPRI/NEERI	√	√	√	√	√	√	√	√	√	√	√	√
	Action 3: Public awareness on PCBs													
	Public awareness and information programs	MOEF/MOP/CPRI/NEERI	√	√	√	√	√							

Table : 27-4 Action to eliminate and restrict the production, use , import and export of DDT

	Specific actions	Implementation Body	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	Action 1 : Life cycle management of DDT, specifically its environmental sound disposal method and enforcement													
	Elimination of obsolete DDT stocks	MOEF/HIL	√	√										
	Disposal of DDT packaging material in environmentally sound manner	MOEF/HIL	√	√	√	√	√							
	Action 2: General public awareness on the use of DDT in health sector													
	Establishment and maintenance of an information management system (IMS) for DDT	MOEF/HIL		√	√	√	√	√	√	√	√	√	√	√
	Improving workers safety with IRS	MOHFW/HIL	√	√	√	√	√	√	√	√	√	√	√	√
	Action 3: Environmentally sound alternatives to DDT and to use them in disease vector control programme													
	Development and production of botanical based pesticides as an alternative to DDT	HIL	√	√	√	√	√							
	Development and production of chemical based pesticides as alternatives to DDT	HIL	√	√	√	√	√							
	Action 4: Restriction and phase out the production of dicofol													
	Development and production of alternatives pesticides to Dicofol	HIL				√	√	√	√	√	√			
	Registering specific exemption for Dicofol	HIL				√	√	√	√	√	√			
	Temporarily reserve DDT production capacity for disease vector control programme	MOHFW	√	√	√	√	√	√						
	Develop plans for elimination of DDT in phased manner	MOCF	√	√	√	√	√	√						
	To prohibit the export of DDT to other countries	MOEF/DGFT	√	√	√	√								
	Manage safety and environmental protection for disposal of obsolete DDT stockpiles	MOEF	√	√	√	√								

	Specific actions	Implementation Body	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	Elimination of obsolete DDT stocks	MOEF	√	√										
	Disposal of DDT packaging material in environmentally sound manner	MOCF/HIL	√	√	√	√	√							
	Establishment and maintenance of an information management system (IMS) for DDT	HIL		√	√	√	√	√	√	√	√	√	√	√
	Development and production of botanical alternatives to DDT	HIL	√	√	√	√	√							
	Development and production of chemical alternatives to DDT	HIL	√	√	√	√	√							
	Development and production of alternatives pesticides to Dicofol	MOCF/HIL				√	√	√	√	√	√	√	√	√
	Registering specific exemption for Dicofol	MOCF/HIL				√								
	Elimination of obsolete DDT stocks	MOEF	√	√										
	Disposal of DDT packaging material in environmentally sound manner	MOCF/HIL	√	√	√	√	√							

Table :27-5 Actions to reduce and eliminate release of unintentionally produced POPs

	Specific actions	Implementation Body	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	Action 1: Strengthen legal and institutional framework for the management of unintentional POPs	MOEF												
	Strengthening existing policies and regulations with regard to unintentional releases of POPs	MOEF		√	√	√								
	Action 2: To have general public awareness on unintentional POPs	MOEF												
	To promote information, education and raise public awareness.	MOEF/NEERI/CPRI/NIIST		√	√	√	√							
	Action 3: Strengthen analytical capacity for research & development for monitoring unintentional POPs													
	Augmenting analytical Infrastructure for monitoring Dioxin and Furans releases from source categories listed in Part II and Part III of Annex C	MOEF/NEERI/CPRI/NIIST		√	√	√								
	Upgrading and continually updating the inventory of unintentional POPs using indigenously developed tools to measure UP-POPs. Using the upgraded tools estimate more precisely current and projected releases.	MOEF/NEERICPRI/NIIST	√	√	√	√	√	√	√	√	√	√	√	√
	Action 4: Establishment of an evaluation system for the effectiveness of the Annex C POPs release reductions	MOEF/NEERICPRI/NIIST												
	Identify strategies to meet release reduction obligations of unintentional POPs. Through establishment of a constant monitoring system	MOEF/NEERICPRI/NIIST				√	√	√						
	Promote the application of available,	MOEF/NEERICPRI/NIIST	√	√	√	√	√	√	√	√	√	√	√	√

	feasible and practical measures for achieving release reduction or source elimination.													
	Review the strategies and report unintentional POPs release reduction obligations every five years.	MOEF/NEERICPRI/NIIST		√					√					√
	Action 5: Promote the use of BAT/BEP													
	Promote the development and use of substitute or modified materials, products and processes to prevent the release of Annex C chemicals	MOEF/NEERI	√	√	√	√	√	√	√	√	√	√	√	√
	Promote/require the use of BAT/BEP for new installations for industrial sources listed in Part II of Annex C.	MOEF/NEERI	√	√	√	√	√							
	Promote BAT/BEP for existing installations for industrial sources listed in Part II and III of Annex C.	MOEF/NEERI		√	√	√	√	√	√	√	√	√	√	√

Table: 27-6 Action Plan for the identification and disposal of POPs stockpiles, wastes and contaminated sites.

	Specific actions	Implementation Body	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	Action 1: Capacity within the GOI for controlling the management of POPs stockpiles													
	Self reporting on POPs stockpiles/wastes	MOEF/NEERI	√	√	√	√	√	√	√	√	√	√	√	√
	Updating national inventory on POPs stocks/wastes	MOEF/NEERI	√	√	√	√	√	√	√	√	√	√	√	√
	Monitoring program for the management of POPs stockpiles/wastes	MOEF/NEERI		√	√									
	Action 2: Capacity for environmentally sound storage and disposal of POPs stocks/wastes													
	Upgrading interim storage facilities for POPs stocks/wastes	MOEF/NEERI		√	√	√								
	Creating national POPs disposal capacity	MOEF/NEERI		√	√	√	√	√						
	Action 3: POPs wastes are disposed of in an environmentally sound manner													
	Disposal of the Aldrin and Dieldrin obsolete stocks	MOEF/MOA/PPQ&S/NEERI	√	√	√	√	√	√	√	√	√	√	√	√
	Disposal of 1700 tons of pure PCBs and 6000 tons of PCBs contaminated equipment	MOEF/CPRI	√	√	√	√	√							
	Action 4: Preliminary inventories for the nine new POPs													
	Assessment of legal infrastructure and institutional capacities for the management of the new POPs chemicals.	MOEF/CPRI		√	√									
	Filed assessments to identify and quantify the import, export, production, use, and stocks of new Annex A and B POPs,	MOEF/ MOA			√	√	√							
	Release estimates of HCB, PCBs and	MOEF/MOCF/CPRI			√	√	√							

	Pentachlorobenzene													

Table : 27-7 Action Plan for Monitoring

1	**Specific actions**	**Implementation Body**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
	Action 1: Enhancing and improve monitoring of POPs	NEERI/CPRI/MOEF												
	Monitoring the PCBs levels in the soil, water and sediment.	NEERI/CPRI	√	√	√	√	√	√	√	√	√	√	√	√
	Monitoring the PCBs levels in the food crops, aquatic fauna, poultry, animal feed, higher mammals including human beings, etc.	NEERI/CPRI	√	√	√	√	√	√	√	√	√	√	√	√
	Monitoring PCBs contaminated sites and its remediation measures	NEERI/CPRI	√	√	√	√	√	√	√	√	√	√	√	√
	Action 2: Monitor release sources of POPs	NEERI/CPRI												
	Monitoring the release of POPs from industrial units	NEERI/CPRI	√	√	√	√	√	√	√	√	√	√	√	√
	Monitoring of release sources and pollution around polluting units	NEERI/CPRI	√	√	√	√	√	√	√	√	√	√	√	√
	Augmenting analytical Infrastructure for monitoring Dioxin and Furans releases from source categories listed in Part II and Part III of Annex C	MOEF/NIIST		√	√	√								
	Monitoring program for the management of POPs	MOEF/NEERI/CPRI		√	√			√						

	stockpiles/wastes													
	Action 3: Monitoring POPs content in agricultural products in food including fruits and vegetables and drinking water	MOEF/MOA												
	To carry out extensive monitoring of POPs content in agricultural products in food including fruits and vegetables and drinking water	MOEF/MOA/ICAR/IARI	√	√	√	√	√	√	√	√	√	√	√	√
	Action 3: Monitoring of POPs contaminated sites													
	Monitoring of POPs content in contaminated sites and other environmental media such as ground water and ambient air	MOEF/CPCB/NEERI/CPRI												

ICAR: Indian Council of Agricultural Research
IARI: Indian Agricultural Research Institute

Table : 27-8 Action Plan for Research and Development

	Specific actions	Implementation Body	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	Research and development in the field of POP pesticide	MOEF/MC&F/HIL												
	Development and production of alternatives to POPs pesticides	MOEF/MC&F/HIL	√	√	√	√	√							
	Development and production of biopesticide alternatives especially Bt based biopesticdes to POPs	MOEF/MC&F/HIL	√	√	√	√	√							
	Development and production of biopesticides alternatives; biopesticdes other than Bt based to POPs	MOEF/MC&F/HIL	√	√	√	√	√							
	Research and development in the field of PCBs	MOEF/MOP/CPRI	√	√	√	√	√							
	Development of PCB alternatives for the electrical sector.	MOEF/MOP/CPRI	√	√	√	√	√	√	√	√	√	√	√	√
	BAT for PCB disposal.	MOEF/MOP/CPRI	√	√	√	√	√	√	√	√	√	√	√	√
	Development and production of botanical alternatives to DDT	MOEF/MC&F/HIL	√	√	√	√	√							
	Development and production of chemical alternatives to DDT	MOEF /MC&F/HIL	√	√	√	√	√	√	√	√	√	√	√	√
	Strengthen analytical capacity for research & development for monitoring Annex C POPs of the SC	MOEF & other stakeholder ministries		√	√	√								
	Augmenting analytical Infrastructure for	MOEF/NEERI/CPCB/NIIST		√	√	√								

	monitoring Dioxin and Furans releases from source categories listed in Part II and Part III of Annex C													
	Upgrading and continually updating the inventory of unintentional POPs using indigenously developed tools to measure UP-POPs. Using the upgraded tools estimate more precisely current and projected releases.	MOEF/MC&F/NEERI/CPCB/NIIST/HIL	√	√	√	√	√	√	√	√	√	√	√	√
	Promote the development and use of substitute or modified materials, products and processes to prevent the release of Annex C chemicals	MOEF/NEERI/CPCB/NIIST	√	√	√	√	√	√	√	√	√	√	√	√
	Strengthen analytical capacity for research & development for monitoring of POPs chemicals as contained in Annex C of the SC.	MOEF/MC&F/NEERI/CPCB/NIIST	√	√	√	√	√	√	√	√	√	√	√	√
	Research on POPs chemicals in air, water and soil;	MOEF/MC&F/NEERI/CPCB/NIIST/HIL	√	√	√	√	√	√	√	√	√	√	√	√
	Research on POPs chemicals from industrial sources;	MOEF/MC&F/NEERI/CPCB/NIIST/HIL	√	√	√	√	√	√	√	√	√	√	√	√
	Research on contamination level of “risk groups”	MOEF/MC&F/NEERI/CPCB/NIIST/HIL	√	√	√	√	√	√	√	√	√	√	√	√
	Research on pollution in foodstuffs and drinking	MOEF/MC&F/NEERI/CPCB/NIIST/HIL	√	√	√	√	√	√	√	√	√	√	√	√

	water by POPs chemicals													

Table : 27-9 Action Plan for promoting information exchange of parties concerned

	Specific actions	**Implementation Body**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
	Promoting information exchange of parties concerned	MOEF in collaboration with stakeholder ministries												
	Establishment and maintenance of an information management system (IMS) for DDT	MOEF/HIL	√	√	√	√	√	√	√	√	√	√	√	√
	Assessment of legal infrastructure and institutional capacities for the management of the new POPs chemicals	MOEF	√	√	√	√	√	√	√	√	√	√	√	√

Table : 27-10 Action Plan for public information

	Specific actions	Implementation Body	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	Public information, awareness raising and education													
	Strengthening of the Management Information System (MIS) at the Coordination Cell of the Stockholm Convention on POPs	MOEF in collaboration with stakeholder ministries	√	√	√	√	√	√	√	√	√	√	√	√
	Maintenance of the MIS through regular update of the database	MOEF/NEERI/HIL/CPCB/NIIST/ CPRI	√	√	√	√	√	√	√	√	√	√	√	√
	Sharing of information with the stakeholders including industry and the NGOs	MOEF in collaboration with stakeholder ministries	√	√	√	√	√	√	√	√	√	√	√	√
	Organise meetings/ workshops on the implementation of the obligations under the Stockholm Convention for regular exchange and access to the information though MIS network.	MOEF/NEERI/HIL/CPCB/NIIST/ CPRI	√	√	√	√	√	√	√	√	√	√	√	√
	Collation of information, literature, scientific / research findings, news items and other relevant information.	MOEF/NEERI/HIL/CPCB/NIIST/ CPRI	√	√	√	√	√	√	√	√	√	√	√	√
	Awareness raising among policy and decision makers;	MOEF/NEERI/HIL/CPCB/NIIST/ CPRI	√	√	√	√	√	√	√	√	√	√	√	√
	Public access to available and up-to-date information;	MOEF in collaboration with stakeholder ministries	√	√	√	√	√	√	√	√	√	√	√	√
	Ensure free access to the information on POPs for the public.	MOEF in collaboration with stakeholder ministries	√	√	√	√	√	√	√	√	√	√	√	√
	Development &implementation of educational and public	MOEF/NEERI/HIL/CPCB/NIIST/ CPRI	√	√	√	√	√	√	√	√	√	√	√	√

	awareness programmes;													
	Public participation and input in developing and implementing measures to address POPs;	MOEF/NEERI/HIL/CPCB/NIIST/ CPRI	√	√	√	√	√	√	√	√	√	√	√	√
	Training and development programmes for stakeholders including workers, scientists, educators and technical and managerial personnel;	MOEF/NEERI/HIL/CPCB/NIIST/ CPRI	√	√	√	√	√	√	√	√	√	√	√	√
	Development and implementation of education and training programmes at the national and international levels;	MOEF/NEERI/HIL/CPCB/NIIST/ CPRI	√	√	√	√	√	√	√	√	√	√	√	√
	Encouragement of industry and professional users to promote and facilitate provision of information on all relevant aspects of POPs at the national and other levels;	MOEF in collaboration with stakeholder ministries	√	√	√	√	√	√	√	√	√	√	√	√
	Usage of a range of approaches to communicate information on POPs, such as information centers at national and regional levels.	MOEF in collaboration with stakeholder ministries	√	√	√	√	√	√	√	√	√	√	√	√
	Development of mechanisms, such as Pollutant Release and Transfer Registers (PRTRs), to collect and disseminate information on estimates of the annual amounts of the 12 POPs that are released or disposed of.	MOEF in collaboration with stakeholder ministries	√	√	√	√	√	√	√	√	√	√	√	√

Table : 27-11 Action Plan for effectiveness of the evaluation, reporting and financial assistance

Table : 27-11 Action Plan for effectiveness of the evaluation, reporting and financial assistance

	Specific actions	Implementation Body	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	Action for effectiveness of evaluation	MOEF in collaboration with stakeholder ministries	√	√	√	√	√	√	√	√	√	√	√	√
	Evaluation of the POPs monitoring activities in blood, breast milk, air, soil and water	MOEF/NEERI/HIL/CPCB/NIIST/CPRI	√	√	√	√	√	√	√	√	√	√	√	√
	Establishment of a system for reporting of the data generated on regular basis to the Convention	MOEF	√	√	√	√	√	√	√	√	√	√	√	√
	Reporting													
	Regular National reports on PCBs	MOEF/CPRI	√	√	√	√	√	√	√	√	√	√	√	√
	Self reporting on POPs stockpiles/ wastes	MOEF	√	√	√	√	√	√	√	√	√	√	√	√
	Technical and financial assistance	MOEF in collaboration with stakeholder ministries	√	√	√	√	√	√	√	√	√	√	√	√
	Promote bilateral/ multilateral funds / technical assistance besides govoernmental resources	MOEF in collaboration with stakeholder ministries	√	√	√	√	√	√	√	√	√	√	√	√
	Establishment and improvement of relevant policies, laws, regulations,	MOEF in collaboration with stakeholder ministries	√	√	√	√	√	√	√	√	√	√	√	√
	Standards, guidance and technical specifications, and strengthening of institutional capacity;	MOEF in collaboration with stakeholder ministries	√	√	√	√	√	√	√	√	√	√	√	√
	Promotion of the production, use and industrialization of alternatives, and elimination of the production and use of DDT;	MOEF/MC&F/HIL	√	√	√	√	√	√	√	√	√	√	√	√

		MOEF/MOP/CPRI	√	√	√	√	√	√	√	√	√	√	√	√

	Investigation and updating of the inventory of Dioxin releases and inventories of PCBs-containing electrical equipment in use and of POPs wastes;													
	Implementation of BAT/BEP demonstrations on reducing Dioxin releases in key industries;	MOEF/NEERI/HIL/CPCB/NIIST/CPRI	√	√	√	√	√	√	√	√	√	√	√	√
	Implementation of demonstrations on the environmentally sound management and disposal of PCBs	MOEF/MOP/CPRI	√	√	√	√	√	√	√	√	√	√	√	√
	Implementation of demonstrations on the environmentally sound management and disposal of POPs wastes viz. medical wastes ; and	MOEF/MH&FW/State Governments/CPCB/SPCBs	√	√	√	√	√	√	√	√	√	√	√	√
	Establishment of sound economic policies and long-term effective financial mechanisms regarding the environmentally sound management and disposal of POPs.	MOEF	√	√	√	√	√	√	√	√	√	√	√	√

Chapters 5 Proposals on and priorities for long term capacity building for Convention Implementation

5.1 Capacity building as a part of Convention implementation

Capacity building is an integral part of the Convention implementation. It goes in hand in hand with other activities of the Convention implementation and is an important component to ensure successful implementation of the National Implementation Plan and fulfill the objectives of Convention implementation sustainable. In India's Convention Implementation Plans capacity building is taken very seriously. Capacity building is a long term process and objectives have been identified for short term, medium term and long term capacity building.

5.1.1 Short term priorities and proposals (2011-2015)

While a lot of information was already available on the POPs pesticides and DDT, this was the first time that a systematic inventory preparation was undertaken to map the current situation with regard to PCBs and dioxins and furans. These two areas have not been appropriately regulated before and despite the efforts of the task teams in collecting information, still the inventory status needs to be further detailed in certain areas. The dioxin and furan inventory data generated also raises several questions concerning the use of measured emission factors and the way the assumptions should be made to estimate releases from different sources.

To clear the questions concerning PCBs and to better investigate the dioxin and furan releases from medical waste disposal facilities, the Government of India has requested the assistance of the GEF in these two identified areas during the NIP development process. Therefore, the short term capacity building priorities of the GOI concentrate on these two fields. These short term measures coincide with the first five years of NIP implementation. Drawing from the above objectives and principle, India specific priorities (short term) 2011-2015 have been identified. This would include:

1. Environmentally Sound Management and Final Disposal of PCBs in India

This capacity building project will complete and make the national inventory of PCBs comprehensive covering the power sector, ship-breaking sector and other sectors including non-electrical equipment such as those with hydraulic fluids.

The project will target the 4 regions, in particular 3-4 states in each region (altogether 13 states) as follows: Northern Region: Delhi, Punjab, Rajasthan and Uttar Pradesh; Western Region: Gujarat, Madhya Pradesh and Maharashtra; Eastern Region: Bihar, Orissa and West Bengal; and Southern Region: Andhra Pradesh, Karnataka and Tamil Nadu.

Three disposal facilities will be set up: one stationary unit and two mobile units to be placed in Delhi and Bangalore, Karnataka. The disposal facilities will be located in such

a way that it would enable these to service all 13 selected states based on geographical and logistical considerations. The project will dispose of at least 7,700 tonnes of PCBs, PCB-containing equipment, PCBs-containing mineral oil and wastes. PCB disposal technologies will be transferred to India and thus national capacity will be created to manage and dispose of PCBs. The total project cost is US$ 43,450,000. The national executing agency of this project is the Central Power Research Institute (CPRI). The duration of the project is five years.

2. Environmentally Sound Management of Medical Wastes in India

Medical waste management is a key problem in India as the population increases and access to medical services improves. Since the management of dioxins and furans is a very complex issue, which requires strong cooperation among the authorities involved and coherent legal infrastructures, the GOI decided to tackle it sector by sector.

The project will be supported by the GEF and will create a unique opportunity for the healthcare providers, policy makers, implementing agencies and service providers viz. hospitals, environment department, State Pollution Control Board (SPCB) and Common Biomedical Waste Treatment Facilities (CBWTFs) operators respectively to join at a single platform in creating a more environmentally sound healthcare system. Country-wide adoption of best available techniques/best environmental practices (BAT/BEP) in healthcare institutions will be promoted to improve medical waste management infrastructure and industry in a manner that protects human health and reduces adverse environmental impacts.

The overall project objective will be achieved through a well coordinated implementation process including adoption of private-public partnerships (PPPs). Activities will address the following approaches: segregation, decontamination and compaction of the medical wastes (MW), thus reducing its volume as well as deployment of alternative technologies; enhancing and optimisation of incineration technologies; raising of awareness and dissemination of know-how; adoption of appropriate management systems; innovation and adaptation of appropriate and affordable technologies and techniques; introduction of participatory funding systems; and enhancement of relevant existing laws and regulations.

Activities will be undertaken in 5 selected states, so as to spread health and environmental benefits and replicate the outputs and lessons learned in other regions. In these model districts, the project will identify possible options for sound management of medical waste by introducing non-combustion technologies or upgrading the existing incinerators so as to implement BAT/BEP measures. CBWTFs will be set up and upgraded, transportation and compaction of medical waste will be enhanced and "polluter pay principle" will be enforced to finance the operations. In the situation analysis carried out among 57 CBWTFs, which is 40% of total CBWTFs in the country, the amount of PCDD/F emission was estimated to be 105.44 g I-TEQ/y using the UNEP Toolkit. By proper segregation and either by applying non-incineration techniques or upgrading existing incinerators in the 57 CBWTFs the project aims to achieve 50.7 g I-TEQ/y

PCDD/F reduction. The total cost of the project is US$ 41,350,000. The GEF is expected to finance US$ 11,250,000. The implementation will spread over for five years.

3. Strengthen capacities of Convention implementation bodies

- Strengthen the coordination capabilities of the National Steering Committee POPs members on latest issues and priorities on POP. This would promote informed decisions on issues pertaining to Convention implementation incorporating policy and technical inputs.
- Strengthen capacity of Government focal point for Convention implementation and Convention implementation office
- Improve Convention implementation awareness at the Central level and strengthen capacities for developing relevant national policies.
- Improve capabilities at Central level for Convention implementation activities for
- Convention implementation, fund procurement, information collection and reporting;
- Improve Convention implementation awareness at the State level and strengthen capabilities for developing relevant State policies, State level regulations and plans.
- Improve capabilities for effective implementation of Convention related activities at State level including research, and information collection and reporting.
- Strengthen capacities of NGOs with respect to Convention implementation activities in relevant fields
- Strengthen capacities of industrial associations with respect to Convention implementation in relevant areas

4. Establish the National POP Centre at the Central level and the advisory board of the Intergovernmental departmental Committee for the Chemical safety of POPs.

5. Implementation of BAT and BEP

- Assess the technological requirements for Convention implementation, identify economically and technically feasible country specific technologies, and establish a process for technology transfer

- Strength technological capacity for the removal of PCBs, of waste treatment containing POPs and contaminated soils and sediments and control of dioxin and furan releases based on BAT technologies and BEP.

6. Propose to establish a mechanism and a structure for the utilizing of existing financial mechanisms in order to ensure financial resources for the pursuance of the NIP activities.

7. Improve POPs monitoring capacity by improving the existing system of monitoring at National and State level. Strengthen networks, include POPs in monitoring targets of National and State level projects and establish standard analysis methods for

POPs thus improving capacity for conducting nationwide monitoring of POPs so as to scientifically comprehend effectiveness of Convention implementation.

8. Improvement of policies and the regulatory framework. According to Convention implementation requirements, analyze existing policies and identify gaps pertaining to POPs and suggest relevant revisions.

9. Conduct awareness on Convention implementation whereby relevant activities are conducted relating to the hazards of POPs targeting decision-making levels (government departments at all levels and concerned ministries), technology levels (industries and associations involved in projects), institutions directly involved in the production, distribution and use of DDT, and the general public. This would create an enabling environment so that people have an understanding of POPs and convention implementation becomes a participatory process involving general population and receiving their support.

5.1.2 Medium term priorities and proposals (2016-2022)

Capacity building priorities for the period from 2016 to 2022 will be subject to the implementation of the National Implementation Plan.

NIP implementation at the country level requires the development of adequate capacities at central and local levels. Targeted capacity building activities enhancing the decision-making process within the GOI, as well as technical capabilities of government institutions and private and public industries to implement the NIP provisions need to be developed. Ten capacity building priorities have been identified on the medium term, i.e. until 2022, in this regard. In each case the assistance of the GEF will be sought as these project will systematically develop foundational capacities within India to manage POPs and at the same time will achieve significant global environmental benefits. These priorities are as follows:

1. Development and promotion of non POPs alternatives to DDT

DDT, one of the POP pesticides, is produced and used in India. It is produced by a public sector company and used for malaria and Kala-azar vector control program in the country. The production of DDT started in 1955 by M/s Hindustan Insecticide Limited, a Government of India Enterprise, the sole producer of DDT and its formulation in the country. The use of DDT in agriculture was banned by the government in the year 1989. Since then, it is produced and used in vector control program only. The production of DDT for the period 2006-07, 2007-08 and 2008-09 was 4,495; 3,442 and 3,315 MT a.i., respectively. Besides consumption in the country, India exports DDT to a number of countries world over. India has got exemption under the provision of Stockholm Convention of POPs to produce and use DDT for its specific purposes till an effective, affordable and safe alternative is available. Since it is not feasible anymore to continue producing and using there is an urgent need to work a phase-out strategy of DDT in the

country. The project will assist the producing enterprises in identifying alternatives and a strategy for phasing out of DDT.

2. Inventorization of newly listed POPs

The new POPs represent not only an increase in the number of chemicals covered by the Convention but also an expansion of the scope of work to be undertaken by Parties. Some are industrial chemicals that have many uses and involve many different users and producers. India has no inventories of the new POPs, added to the list of the Stockholm Convention. The objective of this project is to have preliminary inventories for the nine new POPs including their import, export, production, use, stocks and release estimates.

3. Implementation of the BAT/ BEP strategies for elimination / reduction of U POPs emissions of the priority industry sectors identified in the NIP of India

The project aims at reducing and, where feasible, eliminating UP-POPs releases by building capacity to implement BAT/BEP measures in the priority industry sector identified in the NIP including UP-POPs monitoring. The project will reduce UP-POPs releases under Stockholm Convention and addresses issue of climate change by application of appropriately selected technologies and energy efficient systems. The scope of this project also incorporates the promotion of technology transfer and investment by identification and implementation of innovative mechanisms for public-private partnership (PPP). The project will develop guidelines and guidance on BAT/BEP and incorporate the regional experience gained through pollution prevention/cleaner production (PP/CP) measures.

4. Management of PVC plastic waste to avoid incineration / dumping the landfill for preventing releases of Dioxins and Furans due to burning

India produces around 6.0 million tones of plastics and subsequently generates about 3.5 million tons per year of plastics wastes. As the consumption of plastics in India is expected to reach the level of 12.5 million tons by 2015, the plastics waste generation will also witness a tremendous increase from the present level of about 6.5 million tons. PVC, the versatile plastics used for a variety of applications ranging from soft flexible rain wears to rigid pipes and profiles, which accounts for around 30% of total consumption in India. In India PVC is recycled predominantly through mechanical recycling for producing wide range of products such as foot wear, detergent bottles, drainage fittings, cable conduits, windows, sheets, profiles for buildings etc. There is no major mixed waste recycling set up and there is no major chemical/feed stock recycling plant for PVC wastes available in the country. Uncontrolled burning of chlorine containing polymers leads to release of PCDD/PCDF. In order to avoid open burning of such wastes in dump/landfill sites or mishandling by recyclers, the establishment of an Eco-town in India will be highly beneficial to introduce policy changes for containing burning of PVC wastes and landfill which ultimately goes into open burning landfill sits to disseminate innovative technologies for waste management and plastic recycling; and to reduce releases of dioxins and furans emanating from the burning of PVC plastic

waste. The project will develop a demonstration site where an area-wide environmental management would be undertaken focusing on collective compliances of all industries located in the Eco-town a concept with the minimum or no waste release as well as supporting compliances with international norms and standards.

5. Capacity building, demonstration of production and promotion of bio-botanical neem derived bio-pesticides as viable, eco-friendly, bio-degradable alternatives to POPs pesticides

The pesticides, which are used in pest control operations include among others, persistent organic pollutant (POP) pesticides that are non-biodegradable and semi-volatile, thus, contaminating all environmental media. The ill effects of chemical pesticides and their residues in soil, air, water and crop produce are well known. Till the recent past, many of the POP pesticides including DDT, BHC, lindane, dieldrin, etc. have been extensively used in the crop protection program of the country. There are various ways to check the impact of these chemical pesticides on the environment and the ecosystem. Amongst the alternatives, use of biologically desired pesticides have been found to be effective, safe & eco-friendly and could provide viable solution. To assist the pesticide manufacturing enterprises in identifying alternatives and strategy for replacing POP pesticides, the project will take the following measures both at central and state levels: detailed situation analysis of pesticides in the country; evaluate alternatives - both botanical and bio-pesticides; evaluation and demonstration of alternative technologies of the production of bio and botanical pesticides; and transfer of technology to the industry.

6. Identification of sites contaminated by POPs chemicals and its risk assessment to health and the environment and demonstration of remediation process including in-sited remediation at the potential hotspots

Article 6 Section 1(e) of the Stockholm Convention on Persistent Organic Pollutants (POPs) states that Parties shall "endeavour to develop appropriate strategies for identifying sites contaminated by chemicals listed in Annex A, B or C; if remediation of those sites is undertaken, it shall be performed in an environmentally sound manner." Several sites, principally contaminated by obsolete pesticides and PCBs have been identified during the NIP preparation and as the field surveys are progressing more and more sites contaminated with POP chemicals are coming to light. The urgency to address these known sites stems not only from how they have been managed in the past with improper containment of pesticide stocks and PCB wastes, and dioxins but the fact that local communities continue to settle in surrounding areas, making them susceptible to run-off and groundwater contamination. Action through this program will help India to develop a long-term monitoring and site remediation strategy and demonstrate proper site remediation to minimize/eliminate unintentional releases of POPs into the environment. It also supports site safeguards for highly-contaminated sites while waiting for remediation, including activities on restriction of access to the sites, monitoring of the sites and public awareness.

7. POPs and pesticides management in India

In India most of the POP pesticides are prohibited from production, use and import . DDT is being used only for vector control . National Vector Borne Disease Control Program (NVBDCP) and State Health Department are educating general pubic regarding proper use of DDT and safety precaution to be taken after spraying. Audio-visual aids, bulletins, pamphlets and observing 'Malaria Day' are some of the methods used in educating the general public.

Being party to the Stockholm Convention, Government of India is committed to phase out DDT but in a systematic way. Ministry of Health (NVBDCP) is the nodal ministry to take a final decision in this matter. The phasing out of DDT depends upon finding out suitable alternatives to control mosquitoes in an effective way. The factors governing the decision would be (a) cost effectiveness, (b) bioefficacy (C) safety to human beings and environment.

An Expert Group chaired by Secretary (Health), Government of India, representatives from Planning Commission, Department of Biotechnology, Department of Agriculture & Cooperation, Directorate General of Health Services and Directorate of NVBDCP mandated on use of DDT on annual basis has been formed.

NVBDCP proposes to reduce the use of DDT by adopting following strategies:

- Integrated Vector Management strategies.
- Rotational Spraying of IRS.
- ITN/LLIN
- Use of bio-larvicides in urban areas, larvivorous fish and environmental management by manipulating the sources of mosquito breeding
- Few states like Maharashtra, Gujarat, Tamil Nadu, Haryana are using Malathion/ synthetic pyrethroids group of insecticides in place of DDT.

8. National POPs monitoring India program

Monitoring is the continuous assessment of the risk management actions. It takes place at all levels of management and uses both formal reporting and informal communications. Monitoring and Evaluation also prompts fresh thinking within organizations and their contacts with external stakeholders. The monitoring of the sites should be made mandatory for air, soil, sediment and water quality in and around wastes sites and other potential stockpiles/wastes.

Monitoring is an ongoing process which reviews:

- whether resources are being mobilized and utilized
- whether activities are being undertaken
- whether the intended outputs and outcomes are being achieved
- whether the actions were implemented as plan
- whether assumptions made during identification of the problem and its context were correct

- whether the actions have resulted in risk reductions
- whether new information has emerged that requires a strengthening and/or modification to the risk management plan

This process may apply both to particular risk management projects or programs and to government-wide sector strategies or multi-sector strategies. It includes both day-to-day and less frequent progress reviews. The monitoring is essential to make an action plan that should be developed to safeguard all stocks, ultimately leading to their environmentally sound disposal. The safeguarding phase includes stock repackaging, transport and interim storage. Safety becomes a central issue and relies mainly on the management procedures for operating and monitoring stocks at the collection centers and the systems for ensuring safe transportation. A safety management system for both the storage and the transport of obsolete POPs must be established which cannot be possible without proper monitoring of the POPs wastes and the respective sites.

Monitoring of insecticide resistance in malaria vectors is an important activity performed by National Institute of Malaria Research (NIMR) and NVBDCP. Resistance monitoring reports are used for formulating vector control strategies and management of insecticide resistance in malaria vectors. Results of insect susceptibility tests carried out by NIMR and NVBDCP during the past two decades have shown that *A. culicifacies*, the major vector of malaria in most rural plains of India, has developed varying degree of resistance to various insecticides in different parts of the country. It has also become resistant to malathion in most parts of Maharashtra and Gujarat and also in various districts of Andhra Pradesh, M.P., Haryana, Punjab, Karnataka and Tamil Nadu. (Insecticide Resistance: Monitoring & Mechanism- 25 years of Malaria Research Centre).

NVBDCP has developed guidelines for safe handling and disposal of insecticides; however, there are reports of the presence of insecticide in blood of spray workers and contamination of soil and water. An environment management plan incorporating legal framework, procurement, storage and transport, application activities, occupational health and safety measures, environmental impacts related to treatment for vector borne diseases (VBDs), capacity building, intersectoral collaboration, reporting and monitoring has been developed for by NIMR implementation at the centre, State/District level.

With regard to the dioxins and furans, monitoring activities have not yet started in the country. Basically there aren't any database or research results available on dioxins and furans releases in the environment and their levels in human body, animals and foodstuffs. During the preliminary inventory, started in 2008, analyses of dioxins in polluted soil, emissions from stationary sources, and cow and goat milk from contaminated sites were made and this action was a first attempt to conduct analyses on dioxins and dioxin like chemicals.

A national laboratory with capacity to conduct analyses of POPs chemicals is a requisite for defining emissions and releases of POPs chemicals, their impacts to the environment and human health and running monitoring and research works in this field. However, NIIST, NEERI and CPCB undertake quality analyses for environmental samples,

however, none of them possess appropriate facilities to make POPs analyses – no apparatus and equipment for analyzing POPs chemicals and no professional staffs available to do the analyses. In this regard, it is necessary to set up a National Facility, responsible for monitoring, research and development, at these laboratories and provide this unit with the required equipment and methodology, as well as qualified and specialized experts. The following *research and development* actions shall commence as soon as possible in order to facilitate the implementation of the Stockholm Convention, including:

- research on POPs chemicals in air, water, sediment and soil;
- research on POPs chemicals from industrial sources;
- research on contamination level of "risk groups", and
- research on pollution in foodstuffs and drinking water caused by POPs chemicals.

9. Strengthening institutions and capacity building for effective and efficient implementation of the NIP in India

During the preparation of the NIP, the Government of India has identified gaps which are essentially required to be bridged to meet the obligations under the Stockholm Convention on POPs. A closer analysis of the identified gaps has shown that, in order to meet the various provisions under the Convention, there is an urgent need to strengthen and build capacity of the relevant technical institutions and also the skill of the human resources. The Objective of the project is to effectively and efficiently assist India in implementing the Stockholm Convention by strengthening Indian institutions managing POP chemicals in an environmentally sound manner and enhance the immediate capacities for management of POPs chemicals at the national and state levels. The project's objectives are to create an enabling regulatory and policy environment in India by establishing/amending laws, regulations and standards. The project would strengthen and/or build capacity of the institutions for monitoring, research and development technology transfer promotion, facilitating data and information collection, enforcement, and evaluation capabilities so as to allow for continuous improvement and raising stakeholder awareness on POPs issues.

10. Environmentally sound management of un-intentional release of PCDDs and PCDFs in the metallurgical Industry in India

The production of ferrous and non-ferrous metal has the potential for comparatively high unintentional formation and release of dioxins and furans to the environment. Ferrous metals are therefore, listed as Part II source categories in Annex C of the Stockholm Convention. There are 951 ferrous and non-ferrous metal industries in the country and the production rate is increasing year by year.

The application of best available techniques and best environmental practices to deal with these sources should take into consideration environmentally sound waste management practices as well. Environmentally sound waste management reduces the release of persistent organic pollutants and is also an important factor in avoiding health problems

and in promoting sustainable use of resources. Important principles applicable to the prevention and reduction of waste include the source reduction principle; the integrated life cycle principle; and the principle of recovery of reusable and recyclable components, to the greatest possible extent. In many cases, this will be facilitated by separating at the source those wastes that can be composted, reused or recycled. The remaining wastes should be treated and disposed of in an environmentally sound way. Reliable solutions for all steps – the collection system, the recycling actions, and the final disposal – should be adapted to the local circumstances, taking into account such factors as opportunities for waste prevention, the composition of waste, the available recycling processes, the existing structures, and financial, economic and social aspects.

Best available techniques include the use of plastic-free and oil-free feed material, high furnace temperatures above 1150°C, effective gas collection, afterburners and rapid quench, activated carbon adsorption, and de-dusting fabric filters.

Process control systems should be utilized to maintain process stability and operate at parameter levels that will contribute to the minimization of PCDD/PCDF generation, such as maintaining furnace temperature above 850 °C to destroy PCDD/PCDF.

Best available techniques include high-temperature advanced furnaces, oil- and chlorine-free feeds (if alternatives are available), afterburners with rapid quench, activated carbon adsorption and de-dusting fabric filters.

5.1.3 Long term priorities and proposals

Objectives of long-term capacity building are as follows:

1. *Create and improve public awareness*

2. *It is necessary to create and improve public awareness through publicity, workshops, seminars etc. This creates an enabling environment for the convention implementation activities. This in turn is a step towards effective implementation of the NIP at the State and the National level.*

3. *Improvement in the policy and regulatory framework*

4. *Strengthening legal and regulatory enforcement capacity*

5. *In India, capacity building is limited by coordination between various departments, institutes etc. and also availability of funds and time. Hence priority is given to the most impending activities depending on existing situation and the requirements under Convention implementation. The following are the principles for selecting priorities:*

    - *Assessment of specific country situation and focus*

- *Assessment of capabilities and capacity to conduct activities for Convention implementation*

- *Relevant capabilities for which the Convention emphasizes that priority be given to take actions*

- *Capabilities associated with achieving immediate objectives of convention implementation*

Chapter 6 Financial requirements and arrangements

Financial requirements (both baseline and incremental cost) for short term and long term goals of the National Implementation Plan for India for the priority sectors are as follows:

Pesticides

42. Elimination of aldrin and dieldrin waste stocks;
43. Elimination of obsolete DDT stocks;
44. Establishment of Management Information System for regular reporting of DDT to the Stockholm Convention on POPs;
45. Development and production of alternatives to POPs pesticides;
46. Development and production of Botanical alternatives to DDT;
47. Development and production of Bio pesticide alternatives especially Bt based bio-pesticides to DDT;
48. Development and production of Bio pesticide alternatives other than Bt based ones,to DDT;
49. Development and production of chemical alternatives to DDT;
50. Development and production of alternatives pesticides to Dicofol; and
51. Disposal of DDT packaging material in environmentally sound manner.

PCBs

2. Strengthening policy and regulatory framework to comply with the obligations under the Stockholm Convention;
3. Building national capacity
4. Management of PCB , PCB contaminated equipment and wastes
5. Monitoring the PCB levels in the soil, water and sediment;
6. Monitoring the PCB levels in the food crops, aquatic fauna, poultry, animal feed, higher mammals including human beings, etc.;

7. Monitoring PCBs contaminated sites and its remediation measures
8. R&D actions on
    c. Development of vegetable/synthetic liquids.
    d. ESM technology for PCB destruction.

Dioxins & Furans

9. Strengthening existing policies and regulations with regard to unintentional releases of POPs;
10. To promote information, education and raise public awareness;
11. Augmenting analytical Infrastructure for monitoring Dioxin and Furans releases from source categories listed in Part II and Part III of Annex C;
12. Upgrading and continually updating the inventory of unintentional POPs using indigenously developed tools to measure UP-POPs. Using the upgraded tools estimate more precisely current and projected releases;
13. Based on the more realistic estimates identify strategies to meet release reduction obligations of UP-POPs;
14. Promote the application of available, feasible and practical measures for achieving release reduction or source elimination;
15. Promote the development and use of substitute or modified materials, products and processes to prevent the release of Annex C chemicals;
16. Promote/require the use of BAT/BEP for new installations for industrial sources listed in Part II of Annex C;
17. Promote BAT/BEP for existing installations for industrial sources listed in Part II and III of Annex C.;
18. Review the strategies and report UP-POPs release reduction obligations every five years.

Contaminated sites and wastes

19. Ensure total disposal of the Aldrin and Dieldrin obsolete stocks located in Regional Plant Protection and Quarantine Station (RPPQS) in Mumbai; Barmer, Bikaner, Sikar, Jaisalmer and Kota in Rajasthan; Imphal in Manipur and Palampur in Gujarat;
20. Out of 9800 tons of pure PCBs and 19000 tons of PCBs contaminated equipment and wastes, 1600 tons of pure PCBs and 6000 tons of PCBs contaminated equipment will be disposed off by the end of 2015 to start with;
21. Continue with the updating of nationwide inventory preparation on PCBs containing transformers and capacitors in use as well as PCBs containing articles in the non power sectors;

22. Enhance and continuously update and upgrade national inventory for POPs stockpiles and wastes;
23. Strengthening institutional capacities to undertake extensive coverage of preventive measures required for the management of releases from POPs stockpiles and wastes;
24. Enhance the quality of temporary storages for DDT at spray sites wherever considered appropriate;
25. Whenever feasible provide dedicated transport facilities for carrying DDT;
26. Environmentally sound disposal of used DDT bags preferably through incineration in the cement kilns;
27. Secured storage of PCBs and PCBs contaminated equipment and wastes in the power generation/distribution units, industrial plants and transformer repair sites to ensure that it does not contaminate the environment;
28. Develop policy and legal frameworks for management of contaminated land/sites;
29. Strengthen institutional capacities for mitigation of contaminated sites;
30. Identification and prioritization of potential contaminated sites;
31. Selection of appropriate low-cost environmentally sound technologies required for remediation; and
32. Remediation of selected contaminated sites.

Table 28: Financial requirement for NIP implementation

Action plan or action	Budget (US Dollar in millions)		
	Baseline	Incremental	Total
1. Legal and Regulatory and Institutional Strengthening Measures	11.6	7.86	19.46
2. Action Plan pertaining to production, import and export, use, stocks, landfills and wastes from chemical substances listed (Annex A, Part I of the Stockholm Convention)	19.50	6.00	25.50
3. Action Plan pertaining to production, import and export, use, identification, labeling, removal, storage and disposal of PCBs and of facilities containing PCBs (Annex A, Part II)	30.04	17.69	47.73
4. Action Plan pertaining to production, import and export, use, stocks and wastes containing DDT (Annex B) if used and produced in the Party to the Convention	35.50	17.0	52.5

Action plan or action	Budget (US Dollar in millions)		
	Baseline	**Incremental**	**Total**
5. Action Plan – Releases from the unintentional production (by-products of PCDDs/Fs, HCB and PCBs)	135.5	81.5	217.0
6. Strategies to identify POPs stockpiles, articles in use and wastes (Annexes A, B and C)	9.3	7.7	17.0
7. Actions and measures to properly manage POPs stockpiles and proper disposal of articles containing POPs in use	17.0	10.0	27.0
8. Action Plan – Identification and corresponding management of contaminated sites (Annexes A, B and C)	56.0	38.0	94.0
14. Strategy pertaining to information access and exchange	5.00	0.00	5.00
15. Action Plan: Promote information exchange for concerned parties, public information, awareness and education	14.71	5.63	20.34
16. Action Plan: Reporting	0.5	0.0	0.5
17. Monitoring and Evaluation and Research and Development	13.5	6.0	19.5
18. Technical and financial assistance			
14. Coordination for NIP Implementation	16.21	6.13	22.34
Total NIP Implementation	**364.36**	**203.51**	**567.87**

For implementing the National Implementation Plan, funds would be derived from the Central Government, State Governments, private and public corporate and from multilateral agencies. Additional fund requirement to deal with new POPs and updating of the NIP in the future would be worked out and supplemented through various sources as mentioned.

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