Persistent Organic Pollutants (POPs) in India

COUNTRY SITUATION REPORT

Toxics Link
for a toxics-free world

IPEN
a toxics-free future

Persistent Organic Pollutants (POPs) in India:
Country Situation Report

Prepared by **Toxics Link**

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About Toxics Link

Toxics Link is an Indian environmental research and advocacy organization set up in 1996, engaged in disseminating information to help strengthen the campaign against toxics pollution, provide cleaner alternatives and bring together groups and people affected by this problem. Toxics Link's Mission Statement is "Working together for environmental justice and freedom from toxics." We have taken upon ourselves to collect and share both information about the sources and danger of poisons in our environment and bodies, and information about clean and sustainable alternatives for India and the rest of the world.

About IPEN

IPEN was founded in 1998 and is registered in Sweden as a non-profit, public interest organization. IPEN is a global network of public interest NGOs working together for a world in which toxic chemicals are no longer produced or used in ways that harm human health and the environment. We are comprised of over 500 Participating Organizations in more than 100 countries, primarily in countries with developing and transitional economies. IPENers take action internationally, working on local, regional and global campaigns and policies to:

- Protect women and children from toxic chemicals
- Reduce and eliminate the world's most harmful chemicals
- Eliminate lead in paint
- Reduce mercury pollution
- Demand that the private sector disclose information about chemicals in their products
- Promote agroecology and toxics-free electronics

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LIST OF ABBREVIATION

AICRP	The All India Coordinated Research Project
BAT	Best Available Techniques
BCD	Base catalysed decomposition
BEP	Best Environmental Practices
Bt	Bacillus Thuringiensis
CAS	Chemical Abstract Services
CII	Confederation of Indian Industry
COP	Conference of the Parties
CPCB	Central Pollution Control Board
CSIR	Council of Scientific & Industrial Research
CSO	Civil Society Organisation
CWM	Chemicals and Waste Management
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
DE	Destruction efficiency
DecaBDE	Decabromodiphenyl ether
DRE	Destruction removal efficiency
EDB	1,2-dibromoethane
ECA	Environmental Chemical Agent
ESM	Environmentally sound management
FAO	Food and Agricultural Organisation
FICCI	Federation of Indian Chambers of Commerce and Industry
GDP	Gross Domestic Product
GEF	Global Environment Facility
GPCR	Gas phase chemical reduction
Ha	Hectares
HCB	Hexachlorobenzene
HCH	Hexachlorocyclohexane
HIL	Hindustan Insect ides Limited
HCBD	Hexachlorobutadiene
HBCDD	Hexabromocyclododecane
HCH	Alpha hexachlorocyclohexane
HP	Himachal Pradesh
HW	Hazardous Waste
IARC	International Agency for Research on Cancer
IARI	Indian Agriculture Research Institute

ICAR	Indian Council of Agriculture Research
ICMR	Indian Council of Medical Research
IFCS	Inter- Governmental Forum on Chemical Safety
ILO	International Labour Organisation
INC	Intergovernmental Negotiating Committee
IOCC	Inter-Organization Coordinating Committee
IOMC	Inter-Organisation Programme for the Sound Management of Chemicals
IPEN	International POPs Elimination Network
IPEP	International POPs Elimination Project
IPM	Integrated Pest Management
ISO	International Organization for Standardization
ITRC	Industrial Toxicology Research Centre
IUGR	Intra-uterine Growth Retardation
LDH	Lactate Dehydrogenase
LWPS	Liquid Waste Pre-heater System
MEA	Multilateral Environment Agreements
MEO	Mediated electro-chemical oxidation
MOA	Ministry of Agriculture
MoEF&CC	Ministry of Environment, Forest and Climate Change
MRL	Maximum Residue Limit
MT	Million Tonnes
NEERI	National Environmental Engineering Research Institute
NIP	National Implementation Plan
NSC	National Steering Committee
NVBDCP	National Vector Borne Disease Control Programme
NGO	Non-governmental Organisation
NIO	National Institute of Oceanography
NIOH	National Institute of Occupational Heath
OCS	Octachlorostyrene
OECD	Organisation for Economic Co-operation and Development
OEWG	Open-ended working group of the Basel Convention
PACT	Plasma Arc Centrifugal Treatment
PAI	Pesticide Association of India
PAN	Pesticide Action Network
PBB	Polybrominated biphenyl
PBDEs	Tetra bromodiphenyl ether or Pentabromodiphenyl ether
PCT	Polychlorinated Terphenyl
PCB	Polychlorinated biphenyls
PCDD	Polychlorinated dibenzo-p-dioxins
PCDF	Polychlorinated dibenzofurans
PCNs	Polychlorinated naphthalenes
PeCB	Pentachlorobenzene
PFOS	Perfluorooctane Sulfonic acid
PIC	Prior Informed Consent

PIL	Public Interest Litigations
POPs	Persistent Organic Pollutants
POPRC	POPs Review Committee
PVC	Polyvinyl Chloride PVO Private Voluntary Organizations
PWC	Plasma Waste Converter
RFI	RCRA Facility Investigation
SAICM	Strategic Approach to International Chemicals Management
SC	Stockholm Convention
SCCP	Short-chain chlorinated Paraffins
SCMC	Supreme Court Monitoring Committee on Hazardous Wastes
SCWO	Super-critical water oxidation
SET	Solvated Electron (process)
SME	Solvent microextraction International
T4	Thyroxine (thyroid hormone)
TCDD	Tetrachloro-p-dibenzodioxin
TEQ	Toxic equivalent
TNC	Transnational Corporations
TRBP	Thermal Reduction Batch Processor
Tris	Tris (2,3 dibromopropyl) phosphate
TSH	Thyroid-stimulating Hormone
TWG	Technical Working Group on Pesticides
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNECE	United Nations Economic Commission for Europe
UNIDO	United Nations Industrial Development Organization
UNITAR	United Nations Institute for Training & Research
WDP	Water-dispersible powder
WHO	World Health Organisation
WWF	World Wild Fund for Nature

UNITS OF CONCENTRATION

mg/kg	Milligram(s) per kilogram. Corresponds to parts per million (ppm) by mass
µg	Microgram(s) per kilogram. Corresponds to parts per billion (ppb) by mass
ng/kg	Nanogram(s) per kilogram. Corresponds to parts per trillion (ppt) by mass

PREFACE

Persistent Organic Pollutants (POPs) are chemicals which persist in the environment for years and they can be highly toxic even if released in small quantities. Hence, due to emerging concern pertaining to chemical safety, the Stockholm Convention on POPs was adopted with an aim to eliminate or restrict the production and use of POPs globally. India submitted the National Implementation Plan in 2011 to take action on the twelve POPs. However, after the National Implementation Plan in 2011, sixteen new POPs were listed in the Convention and there are possible ramifications for the country on listing of these chemicals as POPs. In a significant development the MOEF& CC has promulgated regulations on seven new POPs in 2018; however, there are multiple challenges in the country to manage the newly listed POPs in the Stockholm Convention.

In this context, Toxics Link has prepared a Country Situation Report to examine into the following aspects, overall current management scenario of POPs, gaps in the regulations, major achievements and challenges of POPs management in the country, with an aim to provide a better road map for its management.

This report comprises three chapters. **Chapter 1** gives an overview about the Persistent Organic Pollutants, types, chronology of POPs included in Stockholm Convention and India's position in implementing regulations which were identified in The Stockholm Convention.

Chapter 2 of the report discusses status of POPs in India, including present stockpiles, production and challenges for their management in the country.

Chapter 3 throws light on the major achievements of POPs management in the country. It also focuses on the challenges and recommendations for the better management of POPs in India. The report also reflects upon the current regulations, export/import data and various research studies conducted in the country on POPs to get an insight on management issues around them.

The review of the country's overall situation on POPs management reflects the shortcomings in their management and points out the need of developing a multiple stakeholders platform to address these challenges. So in this context, the report also gives out some suggestions for the Government to take action for POPs management in the country.

REPORT BACKGROUND

Persistent Organic Pollutants (POPs) are chemicals which persist in the environment for decades and can be highly toxic even if released in small quantities. Hence, due to emerging concern pertaining to chemical safety, the Stockholm Convention on POPs was adopted with an aim to eliminate or restrict the production and use of POPs and to destroy stockpiles of existing POPs. Also, in order to reduce their impact on human health and the environment, the Stockholm Convention on POPs was adopted in 2004 and as of now twenty eight chemicals have been accepted as POPs after several rounds of reviews and negotiations. The Stockholm Convention has set measures which need to be taken by each country on the production, import, export, disposal and use of POPs and has put obligations on the parties to the convention to take necessary steps in these directions.

India has signed the Stockholm Convention in 14th May 2002 and ratified it in 2006 and subsequently submitted its National Implementation Plan to phase out the twelve POPs which are well known as the "Dirty Dozen" in 2011. In the National Implementation Plan (NIP), the government developed its strategy to deal with these chemicals and subsequently some regulations were promulgated by the MoEF & CC to act on these chemicals. Further, the MoEFF & CC has come out with a new notification in 2018 to phase out seven new POPs in the country.

In this context, Toxics Link has prepared this country situation report based on an assessment of the existing inventories, stockpiles of banned POPs and the existing regulations on POPs. This report also critically examines the institutional mechanisms and the role of various institutions for POPs management, as well as throws light on the existing gaps in the implementation of existing rules and regulations. Further the report features a compilation of all the research studies on POPs across the country post National Implementation Plan which were completed by the Government of India in 2011. The country situation report has proposed certain recommendations including an urgent need of updating the National Implementation Plan (NIP) for effective management of these new POPs.

Thus, the broad objectives of the country situation reports are as follows;

1. To assess the inventories, stockpiles, regulations on POPs in the country.
2. To gather information on environmental and health studies on POPs in an Indian context.
3. To identify the gaps in implementation in the present POPs management in the country.
4. To suggest and recommend the policymakers on future actions for POPs management.

The report has been prepared with the support from the International POPs Elimination network (IPEN). Inputs from the various stakeholders including Ministry of Environment, Forest and Climate Change (MOEF& CC), Government of India; National Environmental Engineering Research Institute (NERRI); National Vector Borne Disease Control Programme (NVBDCP); Ministry of Health (Government of India); Mu Gama Consultants Pvt Ltd, India; Department of Civil Engineering, Sri Ramaswamy Memorial (SRM) University, Chennai and Garmin Vikas Evam Paryavaran Sanstha (GVEPs) have helped in finalizing the report.

Further the support of Mr Ravi Agrawal, Director, Toxics Link and Mr Satish Sinha, Associate Director, Toxics Link and each team members of Toxics Link were crucial in finalizing the report.

Chapter

01 INTRODUCTION

Persistent Organic Pollutants (POPs) are organic chemical substances, which are highly persistent, carbon based and are toxic in nature that can adversely affect human health and environment around the world because of their characteristics of long range transport by wind, soil and water. POPs released in one country can impact the people and wildlife far from where they are used or released. Most importantly they can persist in the environment for long periods of time are accumulated in fatty tissues and magnify through the food chain. Some of the characteristics of POPs are as follows:

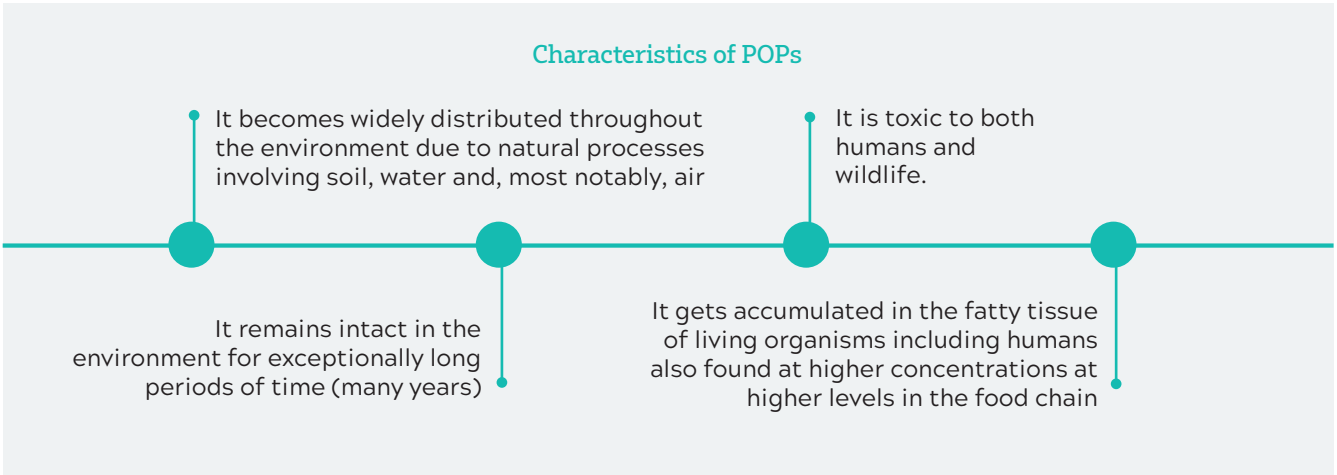


Figure 1.1 Characteristics of Persistent Organic Pollutants (POPs)

1.1 Categories POPs

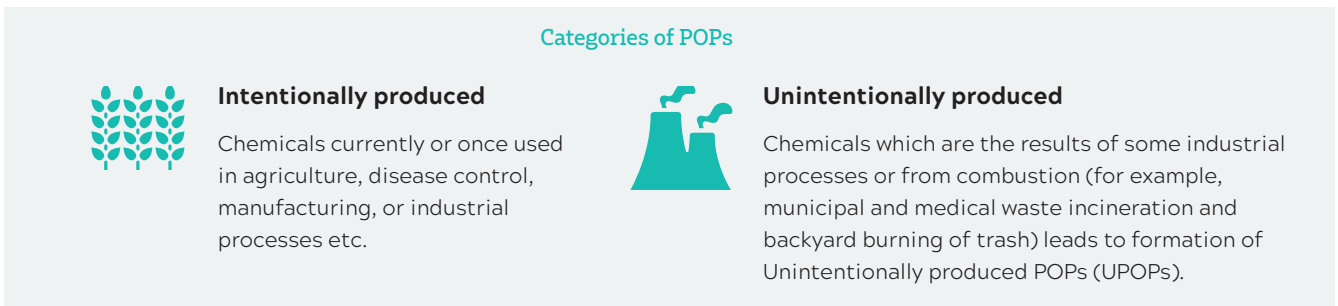


Figure 1.2 Type of Persistent Organic Pollutants

1.2 Stockholm Convention on Persistent Organic Pollutants

The Stockholm Convention on Persistent Organic Pollutants is a global treaty which aims to protect human health and the environment from chemicals that remain intact in the environment for long periods. The convention was adopted by the Conference of Parties on 22nd May 2001 in Stockholm, Sweden and the Convention entered into force on 17th May 2004.

1.2.1 Objective of Stockholm Convention

As set out in Article 1 of the Stockholm Convention on Persistent Organic Pollutants 2001. It was formulated with an objective of "*Protecting human health and the environment from persistent organic pollutants*". There are certain provisions in the Stockholm Convention and each party is required to follow certain guidelines as follows:

- Prohibit and/or eliminate the production and use, as well as the import and export of the intentionally produced POPs that are listed in Annex A to the Convention (Article 3).
- Annex A allows for the registration of specific exemptions for the production or use of listed POPs. The import and export of chemicals listed in Annex A can take place under specific restrictive conditions.
- Restrict the production and use, as well as the import and export of the intentionally produced POPs that are listed in Annex B to the Convention. (Annex B allows for the registration of chemicals with acceptable purposes for the production and use of the listed POPs).
- Reduce or eliminate releases from unintentionally produced POPs that are listed in Annex C to the Convention (Article 5).
- The Convention promotes the use of best available techniques and best environmental practices (BAT and BEP) for preventing releases of POPs into the environment.
- Ensure that stockpiles and waste consisting of or containing or contaminated with POPs are managed safely and in an environmentally sound manner.
- To target additional POPs (Article 8)

1.2.2 Classification of POPs in Stockholm Convention

Annex A (Elimination)

Chemicals which are listed to be eliminated from production and use are listed under Annex A. However, there are specific exemptions for use or productions of these POPs listed in the Annex B and C and it applies only to Parties that register for them.

Annex B (Restriction)

Chemicals for which measures are taken to restrict their production and use are listed under Annex B in light of any applicable acceptable purposes and/or specific exemptions listed in the Annex.

Annex C (Unintentional production)

Chemicals which are unintentional releases are listed under Annex C with the goal of continuing minimization and where feasible absolute elimination.

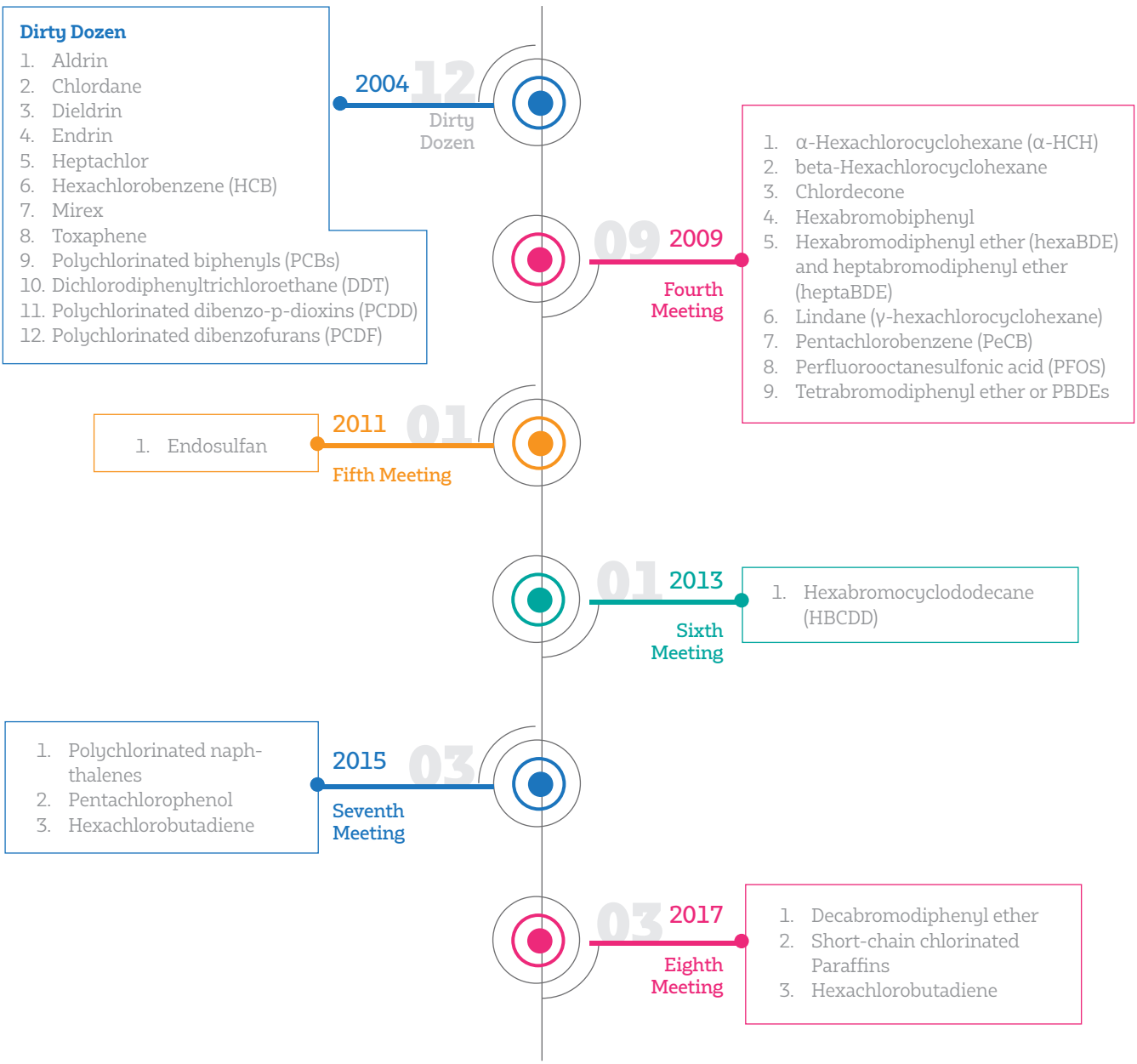


Figure 1.3 Year wise distribution of POPs added in Stockholm Convention

1.2.3 Chemicals Listed in the Convention

The Stockholm Convention on POPs aims to reduce, eliminate and prevent POPs pollution to protect human health and the environment. There are 28 chemicals listed as both Intentional and Unintentional, listed as POPs in the Convention.

Table 1.1 Year-wise Chemicals Listed in the Stockholm Convention (in Annexure)

Annex A (Elimination)	Annex B (Restriction)	Annex C (Unintentional Production)
2004	**2004**	**2004**
Aldrin Chlordane Dieldrin Endrin Heptachlor Hexachlorobenzene (HCB) Mirex Toxaphene Polychlorinated biphenyls (PCB)	DDT	Hexachlorobenzene (HCB) Polychlorinated biphenyls (PCB) Polychlorinated dibenzo-p-dioxins (PCDD) Polychlorinated dibenzofurans (PCDF)
2009	**2009**	**2009**
Alpha hexachlorocyclohexane Beta hexachlorocyclohexane Chlordecone Hexabromobiphenyl Hexabromodiphenyl ether & heptabromodiphenyl ether Lindane Pentachlorobenzene (PeCB) Tetrabromodiphenyl ether and pentabromodiphenyl ether	Perfluorooctane Sulfonic acidits saltsand Perfluorooctane Sulfonyl fluoride	Pentachlorobenzene(PeCB)
2011	**2011**	**2011**
Technical Endosulfan and its related isomers		
2013	**2013**	**2013**
Hexabromocyclododecane (HBCDD)		
2015	**2015**	**2015**
Polychlorinated naphthalenes Pentachlorophenol and its salts and esters		Polychlorinated naphthalenes Hexachlorobutadiene (HCBD)
2017	**2017**	**2017**
Decabromodiphenyl ether (commercial mixture, c-decaBDE) Short-chain chlorinated paraffins (SCCPs) Hexachlorobutadiene		

1.3 India's position on the Stockholm Convention

India ratified the Convention on 13th January 2006 and came in to force on 13th April 2006 and subsequently came out with the National Implementation Plan in 2011. The Indian government has made efforts to act on the POPs through various regulations in place in order to ban the, production, use, import and export of POPs in the country. In the National Implementation Plan the Government of India developed its strategy to deal with the twelve POPs known as the "Dirty Dozen". However, after the inclusion of the Dirty Dozens in 2004, sixteen new chemicals were listed as POPs in the Stockholm Convention. Out of these sixteen chemicals, India came up with a regulation to deal with Nine POPs. At present there are 28 POPs (intentional and unintentional) and out of these 28 POPs India has policy, laws, legislation or restriction on use in certain sectors for 24 POPs. Some of these POPs are partially banned from production. However, some are still used in agriculture, printing ink used for food packaging under BIS standard and leather industries, etc.

1.3.1 National Implementation Plan

The National Implementation Plan was submitted in 2011 by the Government of India which outlines the detailed plan for the management of the initial twelve POPs known as the "**Dirty Dozen**". The National Implementation Plan was developed in order to fulfill the following objectives:

In the National Implementation Plan the Government of India developed its strategy to deal with the twelve POPs known as **"Dirty Dozen"**

- To protect human health and the environment.
- To establish inventories or strategies in order to establish inventories on the production, use, trade, stockpiles, wastes and sites contaminated by the chemicals listed in the Annexes of the Convention;
- 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.
- To developed strategies and action plans for the reduction and wherever feasible elimination of the chemicals listed in Annexes of the Convention;

In the NIP under the Stockholm Convention, India has strategically put its plan in three phases, 1) Immediate priorities, 2) Medium-term and 3) Long-term. The priorities and proposals of the NIP are as follows:

Table 1.2 Priorities of National Implementation Plan[1]

Immediate priorities & proposals (2011-13)	Medium term priorities and proposals (2012-22)	Long term priorities
Environmentally Sound Management and final disposal of PCBs in India 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, Karnataka and Bhilai.	Development and promotion of non-POPs alternatives to DDT	Long-Term Priorities are based on the principle of gradual reduction, phase out and elimination of the POPs chemicals from production and use.

1 National Implementation Plan (2011) http://envfor.nic.in/sites/default/files/NIP_0.pdf. pp. 5.

Immediate priorities & proposals (2011-13)	Medium term priorities and proposals (2012-22)	Long term priorities
Environmentally Sound Management of Medical Wastes in India.	The project will assist the producing enterprises in identifying alternatives and a strategy for phasing out of DDT.	Promoting BAT and BEP in all industrial sectors.
Strengthen capacities of Convention implementation bodies	Implementation of the BAT/ BEP strategies for elimination / reduction of Unintentionally Produced POPs (Unintentional POPs) emissions of the priority industry sectors identified in the NIP of India	Regular updating of inventory of POPs and new POPs
Establish the National POP Centre at the Central level and the advisory board of the intergovernmental departmental committee for the chemical safety for the POPs.	The project would aim at reducing and, wherever feasible, eliminating Unintentional POPs releases by building capacity to implement BAT/ BEP measures in the priority industry sector identified in the NIP including Unintentional POPs monitoring. The project will reduce Unintentional POPs releases.	Regular reporting to the Convention Secretariat as per the guidelines.
Implementation of Best Available Techniques (BAT) and Best Environmental Practices (BEP).	Management of PVC plastic waste to avoid incineration and dumping to landfill for preventing releases of dioxins and furans due to burning.	Create and improve public awareness.
Establish a mechanism and a structure for ensuring financial resources for the pursuance of the identified NIP activities.	Inventorisation of newly listed POPs	Improvement in the policy and regulatory framework.
Improvement of policies and the regulatory framework.	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.	Strengthening legal and regulatory enforcement capacity
Conduct awareness on Convention implementation whereby relevant activities are conducted relating to the hazards of POPs targeting decision-making levels	Capacity building, demonstration of production and promotion of bio-botanical Neem derived bio-pesticides as viable, eco-friendly, bio-degradable alternatives to POPs pesticides.	

1.3.1.1 Institutional Arrangements in India to implement Stockholm Convention

India has a federal structure of governance in place and there is a division of power in between the central and state government. The Constitution of India has not earmarked anything specifically on the environmental issues. Thus, the legislative power on the environmental protection lies with the central government. However, the state governments has an important role to play in implementing the rules and regulations. The Ministry of Environment, Forest and Climate change, Govt. of India is the focal agency to deal with environmental protection in India including the international environmental treaties and conventions such as Stockholm Convention. However, other concerned ministries (Ministry of Chemicals and Fertilizer, the Ministry of Health and Family Welfare and the Ministry of Agriculture) also have specific roles to play in managing POPs in the country.

The MoEF& CC has developed the National Implementation Plan to manage these POPs and some of the key central government agencies who are executing the National Implementation Plan are, the Central Pollution Control Board, Central Power Research Institute, National Environmental Engineering Research Institute (NEERI, Nagpur) and National Institute for Interdisciplinary Science and Technology (NIST), Trivandrum. NEERI has been acting as the

regional center for Stockholm Convention for South East Asian countries. Further, along with the Central Pollution Board, the State Pollution Control Boards have been bestowed with the responsibilities for monitoring the emission levels and enforcement of the regulations on POPs at various levels.

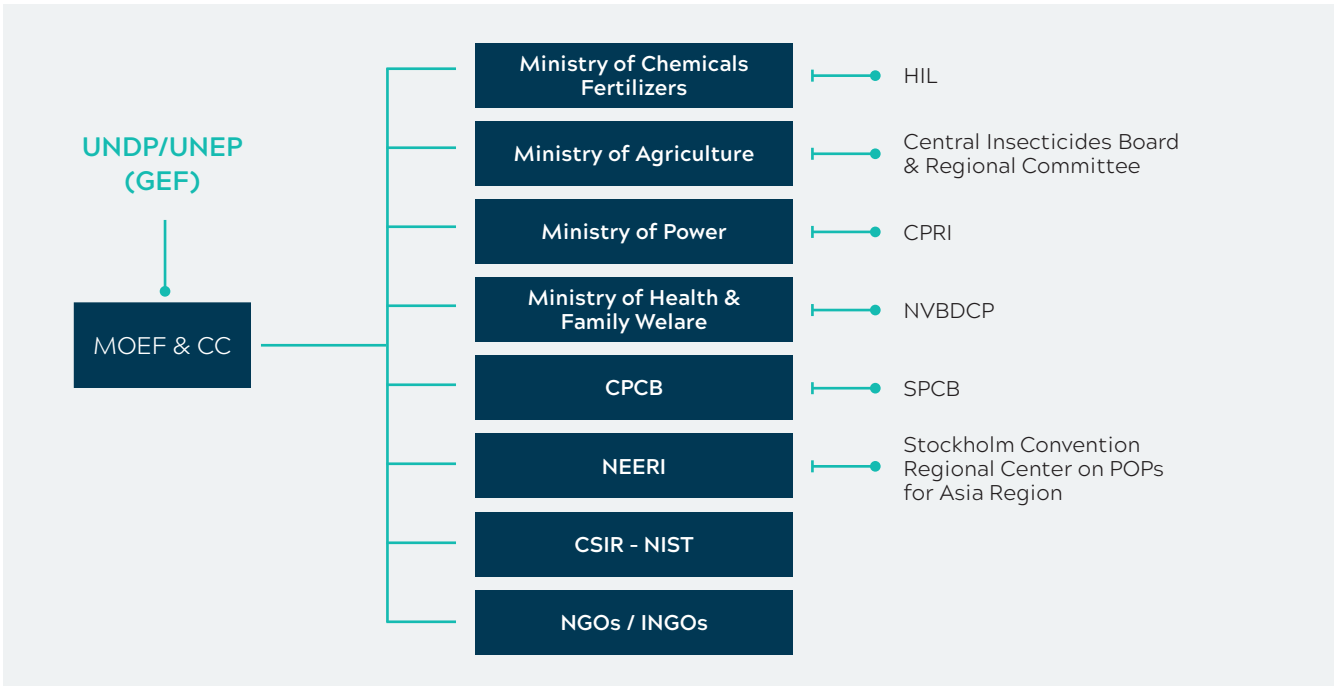


Figure 1.4 Institutional Arrangements in India for implementing SC

Chapter

02 STATUS OF POPs IN INDIA

2.1 POPs listed in 2004:

In the year 2004, twelve chemicals were listed as POPs in Stockholm Convention. These POPs are also termed as the "Dirty Dozen" as they are highly toxic chemicals. These POPs are generally used in agriculture, industry and some household products such as pesticides, solvents etc. After ratifying the Stockholm Convention, India has banned manufacturing, import, export, use etc. of all the 12 POPs.

i. Aldrin

Aldrin was registered as a pesticide in India. It was largely used as a pesticide and also in soil to kill termites, grasshoppers, corn rootworm, and other insect pests.

Production and Stockpiles:

Aldrin was extensively used in agriculture. However, the production and use of Aldrin have been completely stopped though there are reports of the presence of stockpiles of Aldrin reported in some parts of Manipur and Rajasthan (NIP, 2011).

Table 2.1 Stockpile of Aldrin in India (NIP, 2011)

State	Location	Other POP Pesticides	Quantity
Manipur	Imphal	Aldrin30%EC	45Ltr.
Rajasthan	Sikar	Aldrin30%EC	26Ltr.
	Kota	Aldrin30%EC	30Ltr.

Export and Import of Aldrin:

The Ministry of Commerce and Industry database, Government of India data shows that in **2014-15 (439.98 thousand kg)** of Aldrin was exported from India in **2015-16 (57.68 thousand kg) to Bangladesh, Burkina Faso, Taiwan, Denmark etc.** and in **2016-17 (73.17 thousand kg)** were exported from India to countries like **Hong Kong, Iran, Israel, Mauritius, Nepal** etc. There has been gradual decline in the export of Aldrin over the years. Till date the highest amount of Aldrin exported from India is **(175.96 thousand kg)** to **Vietnam** in **2014-15**[2]**.**

2 The information is retrieved from http://commerce-app.gov.in/eidb/default.asp. The information is retrieved from http://commerce-app.gov.in/eidb/default.asp. for detail information refer Annexure III – VI.

Table 2.2 Import of Aldrin in India:

Year	Quantities (in Kgs)
2014-15	501.97
2015-16	33.65
2016-17	79.32

Till date the highest amount of Aldrin (218 kgs) was imported in 2014-15 from Italy.

Regulation:

As per the Ministry of Agriculture order published on 17th July 2001 (vide S.O. 682 (E) sub-section (2) of section 27 read with Section 28 of the Insecticides Act, 1968, the central government constituted the expert group to investigate the use of Aldrin and assess the involved risk on human health and animals. On being satisfied that the import, manufacturing, formulation and use of Aldrin involves health hazards to human beings, hereby the Ministry of Agriculture (Government of India) issued an order to ban Aldrin from manufacture, use, export and import from 17th July 2001.

Government data shows that India in **2014-15 (439.98 THOUSAND KG)** of Aldrin was exported,

2015-16 (57.68 THOUSAND KG)
to Bangladesh, Burkina Faso, Taiwan, Denmark etc.

2016-17 (73.17 THOUSAND KG)
to Hong Kong, Iran, Israel, Mauritius, Nepal etc.

Till date the highest amount of Aldrin exported from India is

(175.96 THOUSAND KG)
to **Vietnam** in **2014-15**.

Food safety and standards (contaminants, toxins and residues)

These regulations may be called the Food Safety and Standards (Contaminants, toxins and Residues) Regulations, 2011. These regulations shall come into force on or after 5th August, 2011. Through Provisions of regulation no insecticides shall be used directly on articles of food. The amount of insecticide mentioned in Column 2 on the foods mentioned in column 3, shall not exceed the tolerance limit prescribed in column 4 of the Table given below:

Sl. No.	Name of insecticides	Food	Tolerance limit Mg/kg. (ppm)
1.	Aldrin	Food grains	0.01
		Milled Food grains	Nil
		Milk and Milk products	0.15 (on a fat basis)
		Fruits and Vegetables	0.1
		Meat	0.2
		Eggs	0.1 (on a shell free basis

Issues on Aldrin:

Aldrin was used extensively in India but its production and use has been completely banned. However, the disposal of its stockpiles is found to be a major challenge in India. Though the production of Aldrin is completely banned in Indiathere are a few companies which are still producing it and this needs to be investigated further.

1. Safex Chemicals Private Limited - Producing Aldrin as household insecticides[3]
2. Muril Mal Ram Dass Shah - Producing Aldrin
3. RPH Crop Science Pvt Ltd. - Producing Aldrin
4. Bharat Seed House - Producing Aldrin[4]

3 Aldrin production by Safex Chemical Delhi http://www.safexchemicals.com/product-category/household-insecticides/
4 Companies found to be producing Aldrin in India http://www.eworldtradefair.com/aldrin-pesticides-manufacturers-india.html

Field Report on Aldrin:

A field study was conducted to understand the use of the banned pesticide Aldrin. Farmers and pesticide shop owners, were interviewed in Dausa district of Rajasthan. Some of the farmers stated that they are using Aldrin especially in vegetables, wheat etc. on every 8th -10th day. According to one, *"We know these chemicals are banned by the government however , still it is available in the markets. We have been using this chemical as it keeps our crops safe from insects. If we don't use these chemicals then all of our crop will rot and we won't be able to feed our family" (Hum jante hai ki Aldrin ko Bharat Sarkar ne ban ka rakha hai magar yeh abhi bhi bazaar mein uplabdh hai. Hum yeh Aldrin apne kheto mein use karte aaye hai, kyunki iss se keede nahi lagte. Agar hum yeh use na kar to humari sari fasal kharab ho jayengi aur khane ko kuch nahi bachega).*

According to the farmers from Dausa, *"Though these chemicals are banned but they are easily available in the market with same or different names and these chemicals are also cheaper than their alternatives so most of the farmers in our village use Aldrin"(Aldrin ko Sarkar ne ban kar rakha hai magar ban hone ke baad bhi yeh bazar mein asani se mil jata hai, wahi ya dusre naam se aur yeh sasta hai unke alternatives se. Isliye jydatar kisan humare gaon mein Aldrin use karte hai). Upon being enquired by the researcher, on how Aldrin which was banned in 2001 was being sold,one of the owners of a pesticide shop in Dausa responded "You should ask these question to administration how Aldrin in available in the market though it was banned in 2001, whatever chemicals we get from our suppliers we sell it and the demand of Aldrin among farmers are high. As, we have the stocks of Aldrin we can't let it rot or expire. Not only us but a lot of other shop keeper are selling Aldrin in Dausa" (Aapko yeh sawal shaasan prabandh ko karna chahiye, ki kaese Aldrin jo ki 2001 mein ban kiya gaya tha abi bhi bazaar mein mil raha hai. Jo koi chemicals humein apne suppliers se milta hai who sab hum bechte hai aur Aldrin ki manng kishano mein jayada hai. Aur humare pas Aldrin ka stock hai, usko hum kharab hona nanhi dena chahte isliye hum hi nahi aur kafi sare log Aldrin beech rahe hai)*[5].

The analysis of the data reflects that though Aldrin and other chemicals were banned by the Government of India, the chemical is continued to be used in rural areas. The most astonishing revelation is the export and import of the chemical to the country and some of the manufactures are still producing this chemical in the country.This raises eyebrows over the implementation of current regulations in place to ban the chemical in 2001. . Hence, it is paramount that the suitable agency needs to investigate the matter considering the deep impact on the human health and environment from this chemical.

ii. Chlordane

Chlordane was approved to be registered by the registration committee on August 1985 as a pesticide[6]. Chlordane is a pesticide used extensively on vegetables, small grains, maize, other oilseeds, potatoes, sugarcane, sugar beets, fruits, nuts, cotton, and jute etc. to control termites as a broad-spectrum insecticide and it remains in the soil for a long time.

Production and Stockpiles in India

Production and use of chlordane has been completely stopped in India after it was banned in 20th September 1996 and no stockpiles of chlordane were reported in India.

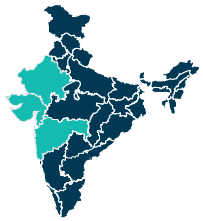
5 Transcript from the Field work data collected in Dausa (Rajasthan) and Chouhan Patti in Delhi, (in order to maintain confidentiality clause, the names of the farmers and shop owner have not been used

6 Directorate of Plant and Protection Quarantine and Storage Faridabad, Know your Pesticideshttp://www.cibrc.nic.in/Anex%2017.pdf

Regulation:

The Ministry of Agriculture (Department of Agriculture and Cooperation) issued a Notification on 20th September 1996; vide no S.O. 648 (E). Government of India set up an expert committee under the Insecticides Act, 1968 (46 of 1968), to investigate the use of Chlordane and the involved risks on human health and animals. The committee made recommendations to the registration committee to stop the use of Chlordane which is likely to causes harm to human beings and animals, thereby the registration committee issued an order to completely ban Chlordane from manufacture, use, import and export in the India from 20th September 1996.

A total amount of **33,111KG** of technical grade Dieldrin and **20,744 LITRES** of Dieldrin



18% EC were reported from Maharashtra, Rajasthan and Gujarat States (NIP, 2011).

Food safety and standards (contaminants, toxins and residues)

Sl. No.	Name of insecticides	Food	Tolerance limit Mg/kg. (ppm)
1	Chlordane (residue to be measured as cis plus trans chlordane)	Food grains	0.02
		Milled food grains	Nil
		Milk and milk products	0.05 (on a fat basis)
		Vegetables	0.2
		Fruits	0.1
		Sugar beet	0.34

iii. Dieldrin

Dieldrin is a pesticide and is used primarily to control termites and textile pests; Dieldrin has also been used to control insect-borne diseases and insects living in agricultural soils. It has a half-life in soil which is approximately five years. Dieldrin was used for locust control.

Production:

There was no available report on the production of Dieldrin in India though the production of and use of Dieldrin was banned by the Government of India in 2001. However, the data shows very less quantity import and export of Dieldrin from India in last few years.

Stockpiles of Dieldrin:

A total amount of 33,111 kg of technical grade Dieldrin and 20,744 litres of Dieldrin 18% EC were reported from Maharashtra, Rajasthan and Gujarat States (NIP, 2011). The table below depicts the state-wise distribution of Dieldrin in India. However, there is no updated information available on the stockpiles and disposal of this obsolete chemical.

Table 2.3 Stockpile of Dieldrin In India (NIP, 2011)

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

Export and Import of Dieldrin:

The table below shows the export of Dieldrin from India

Table 2.4 Export of Dieldrin

Year	Quantities (in thousand KGs)	Name of the country
2014-15	No Export	
2015-16	0.00	Uruguay
2016-17	0.03	Uruguay
2017-18	0.07	Bangladesh, Egypt, Lebanon, Uruguay

On the other hand in **2014-15, (0.04 thousand kgs)** was imported to India from **Germany** and **USA** and after **2014-15** there was no import of Dieldrin in the country[7].

Regulation:

As per the Ministry of Agriculture order published on 17th July 2001 (vide S.O. 682 (E) sub-section (2) of section 27 As per the Ministry of Agriculture order published on 17th July 2001 (vide S.O. 682 (E) sub-section (2) of section 27 read with Section 28 of the Insecticides Act, 1968, the central government after considering the recommendations of the expert group constituted for the said purpose issued an order to ban Dieldrin from manufacture, use, export and import from 17th July 2001. But marketing and restricted use (locust control) of Dieldrin was permitted for a period of two years from the date of the ban, or up to the date of expiry, whichever was earlier.

Food safety and standards (contaminants, toxins and residues)

Sl. No.	Name of insecticides	Food	Tolerance limit Mg/kg. (ppm)
1.	Dieldrin	Food grains	0.01
		Milled Food grains	Nil
		Milk and Milk products	0.15 (on a fat basis)
		Fruits and Vegetables	0.1
		Meat	0.2
		Eggs	0.1 (on a shell free basis

iv. Endrin

Endrin is a pesticide, used as a spray on the leaves of crops such as cotton and grains. It is primarily used as an insecticide in cotton, rice, sugarcane and other crops and is also used as a rodenticide for mice and voles.

Production and Stockpiles:

Production and use of Endrin has completely been stopped in India and no stockpile of this POPs pesticide was reported in India.

Export and Import of Endrin:

There was no export or import of Endrin from 2014- 2018 in India[8]

7 The information is retrieved from http://commerce-app.gov.in/eidb/default.asp. For detail information refer Annexure III – VI.
8 The information is retrieved from http://commerce-app.gov.in/eidb/default.asp. For detail information refer Annexure III – VI.

Regulation:

Endrin imports, export, manufacturing and production has been completely banned in India from 15th May 1990 by the Government of India.

v. Heptachlor

It is a pesticide which was used predominantly for soil-borne pests for agricultural crops. Heptachlor is also used to kill soil insects and termites; Heptachlor has also been used more widely to kill cotton insects, grasshoppers, other crop pests, and malaria-carrying mosquitoes.

Production and Stockpiles:

Production and use of Heptachlor have been completely stopped since 20th September 1996 stockpiles of this POP have not been reported in India.

Regulation:

Government of India set up an Expert Committee under the Insecticides Act, 1968 (46 of 1968), to investigate the use of Heptachlor and the associated risks on human health and animals. The committee made recommendations to the registration committee to ban the use of Heptachlor which is likely to cause harm to human being and animals; thereby the registration committee ordered to completely ban Heptachlorfrom manufacture, use, import and export in India since 20th September 1996.

Food safety and standards (contaminants, toxins and residues)

Sl. No.	Name of insecticides	Food	Tolerance limit Mg/kg. (ppm)
1.	Heptachlor (combined residues of heptachlor and its epoxide to be determined and expressed as Heptachlor)	Food grains	0.01
		Milled food grains	0.002
		Milk and Milk Products	0.15(on a Fat basis)

vi. Hexachlorobenzene

Hexachlorobenzene (HCB) is a chlorinated aromatic hydrocarbon compound which is used for industrial and agricultural purposes. It was first introduced in 1945 to treat seeds and HCB was never registered as a pesticide in India. However, it was permitted for industrial use. HCB is also released unintentionally through various industrial processes. In India, the estimated average daily intake of HCB is 0.13 micrograms per kilogram of body weight (World Bank Report, 1999).

Production:

In India HCBs were never registered as pesticides; However, HCBs were allowed for industrial use. The report of Ministry of Chemical and Fertilizer stated that India has produced **42,612 tonnes** of technical grade HCB during 1995-97 (Ministry of Chemicals and Fertilizers, 2000)[9]. As per the memo issued by the West Bengal Pollution Control Board Memo No. 100-7/WPB-Continue (597)/98 issued on 14/07/2015, M/s. Banshidhar Chemicals (hereinafter referred to as the industry) located in West Bengal were engaged in the production of technical grade of HCBs in India. However, there is no information available on the production of HCBs by any other industries.

Stockpiles:

In India there is no inventory or stockpiles information on HCB.

9 Barber, J., Sweetman, A., Jones, K. (2005) Hexachlorobenzene- Sources, environmental fate and risk characterisation, pp. 18. Retrieved from http://www.eurochlor.org/media/14951/sd9-hexachlorobenzene-final.pdf.

Export and import of HCB:

Table 2.5 Export of HCB

Year	Quantities (in Thousand KGs)	Name of the Country
2014-15	0.01	Germany
2015-16	20.04	China, Egypt

Till date 1**5.04 (thousand Kgs)** was highest amount of Hexachlorobenzene exported to **China People Republic** in **2015-16** and there is no data available on the Import of HCB to India.

Regulation:

HCB was never registered as a pesticide in India. However, in the National Implementation Plan it has been stated that HCBs will be banned for use as an industrial chemical. Toxics Link took up this matter with the Ministry of Environment, Forests and Climate Change and the ministry initiated an action to phase out HCBs in India. The Ministry of Agriculture, Government of India in April 2014 issued an order to ban the use, production of HCBs in any form. Subsequently the MOEF& CC also issued a direction to the West Bengal Pollution Control board to stop production of HCBs. Based on this direction, the West Bengal Pollution Control Board issued a notice on 21/07/2016 to the producer of HCB. However, the order of West Bengal Pollution Control Board has been challenged by the industry and the matter is pending in the court.

The Ministry of Agriculture, Government of India in its notification in in April 2014has banned the production of HCB. However, data of Government of India shows that there has been export and import of the HCBs in last few years that raises suspicion over the management of this POP. Hence there is a need of further investigation to understand the present management practices of HCBs.

vii. Mirex

The insecticide Mirex is a chlorinated hydrocarbon which is used against control of ants and also as a fire retardant for plastics, rubber, paint, paper and electrical goods.

Production:

Mirex was never produced or registered as a pesticide in India (Persistent Peril report, 2004).

Stockpiles:

There is no information available on the current stockpiles of Mirex in India.

Regulation:

The Ministry of Agriculture issued a notification on 27th March, 2014 vide S.O. 910(E) on exercise of the powers conferred by clause (a) of sub-section (1) of Section 18 read with subsection (2) of Section 27 and Section 28 of the Insecticides Act, 1968 (46 of 1968), the central government on being satisfied that the use of Mirex involves health hazards to human beings or animals, thereby made the order to ban Mirex from manufacturing, formulation, distribution, stock, sale, import, export, transport or use or caused to be used by any worker. However, there are exemptions provided that Mirex may be imported and used in the quantities required for research and development activities with the prior approval of the Central Insecticides Board and Registration Committee constituted under the Insecticide Act, 1968.

viii. Toxaphene

Toxaphene, also known as camphechlor, chlorocamphene, polychlorocamphene, and chlorinated camphene,is used extensively for cotton pests, vegetables, fruits and cereal grains and it is also used to combat livestock parasites (Scabies control in cattle).

Production:

Toxaphene is neither produced nor imported in India. Hence, there is no information reported on that.

Stockpiles:

There are no stockpiles of Toxaphene reported in India as this chemical was never registered in the country.

Regulation:

The Ministry of Agriculture issued a notification on 25th July 1989, S. O. 569 (E) under which an expert committee was formed and in consultation with the Registration Committee set up under the Insecticides Act, 1968, the central government, in exercising the powers conferred on it, under sub-section (2) of section 27 read with section 28 of the Insecticides Act, 1968, thereby passed the order to completely ban Toxaphene from production, use, import, export, manufacturing in India from 25th July 1989.

ix. Polychlorinated biphenyls (PCB)

PCB is an industrial chemical product. These compounds are used in industry as heat exchange fluids, in electric transformers and capacitors, and as additives in paint, carbonless copy paper, and plastics.

Use of PCB in India:

The use of PCBs began in 1950's in India though PCBs were never produced in India. The major inventory of PCB lies in the power sector in the form of (Transformers and capacitors) and utilities or energy intensive industries covering different sectors like steel, cement, fertilizer, papers etc. Secondary data analysis of NIP 2011 indicates that PCB containing transformers have been reported with Power Generating and Transmission companies and only small amount of PCBs were reported in the distribution transformers.

Production of PCBs:

India has never been a manufacturer or producer 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 or those used in open and partially open applications. Polychlorinated biphenyl has been mentioned as a hazardous material under schedule II, Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008. 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 used 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.

Inventory of PCBs in India:

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. 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.

Table 2.6 Region wise distribution of PCBs in India (NIP, 2011)

Region	No of Transformers	Weight of PCB containing oils (tons) including retro fillings
East	76	1064.283
West	138	2044.889
North	79	2138.234
South	342	2678.826
Central	913	1911.430
Total	1548	9837.662

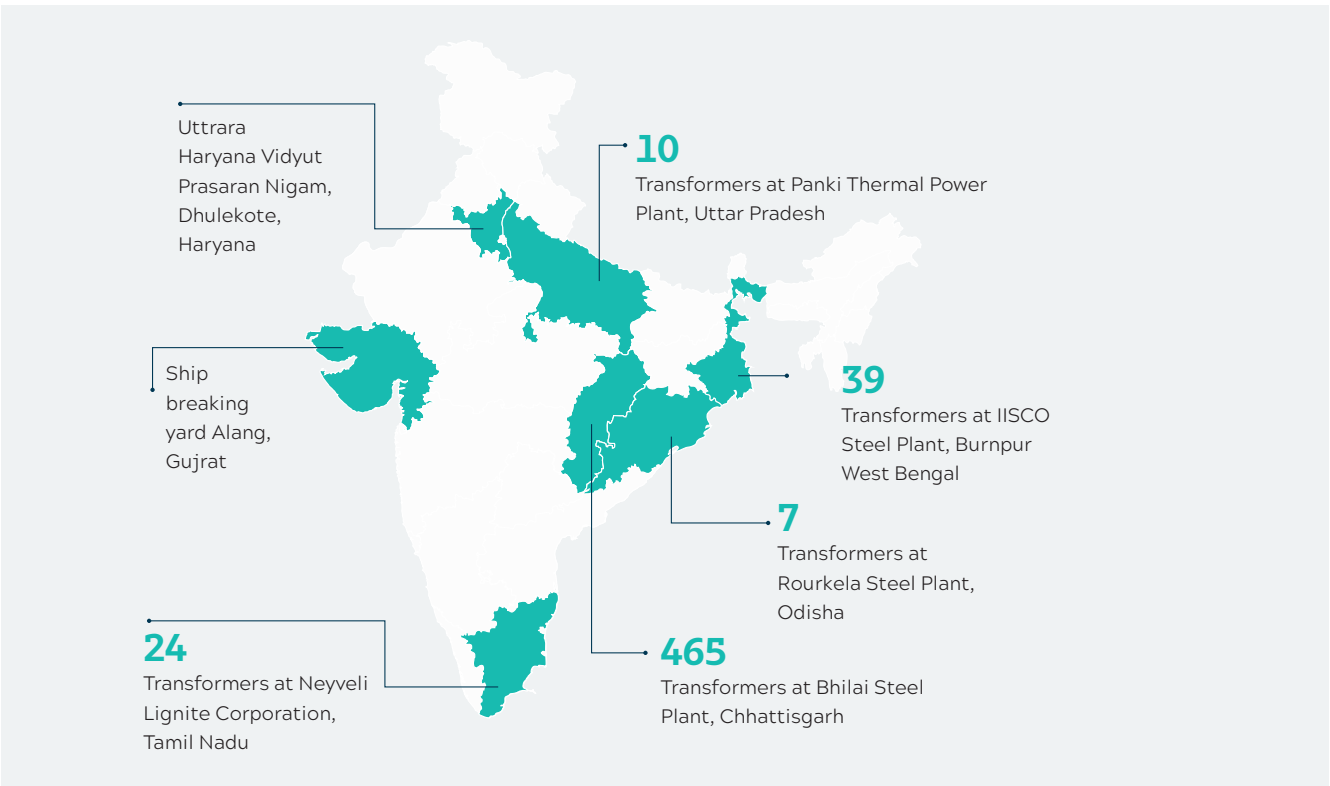


Figure 2.1 PCBs contaminated sites (NIP, 2011)

Export and Import of PCB:

In India Polychlorinated Biphenyls (PCBs), Polychlorinatedterphenyls (PCTs) or Polybrominated Biphenyls (PBBs) was exported from the 2014- 17. The table below shows the export of PCBs in India.

Table 2.7 Export of PCB

Year	Quantities (in Thousand KGs)	Countries of Export
2014-15	1	**Nepal**
2015-16	10	**Ghana**
2016-17	0.30	**Nepal**
2017-18	No export	

Till date **10.00 (Thousand kilo)** was the highest amountof PCB exported to **Ghana** from India **in 2015-16.** On the other hand, PCBs was Imported to India in **2014-15 (0.02 thousand Kg)** to **Switzerland** and 2016-17 **(0.05 thousand Kg)**[10] to **Singapore, USA** and **Switzerland**.

Regulation:

The Ministry of Environment, Forests and Climate Change has issued an order to regulate PCBs in India on 6th April, 2016. The salient features of this order are as follows:

Read with rule 13 of the Environment (Protection) Rules, 1986, the central government hereby, issued order to ban the manufacture, import and export of the Polychlorinated Biphenyls and of the Polychlorinated Biphenyls containing equipment. Further, the order has stated that the import, export or trade of Polychlorinated Biphenyls contaminated equipment shall be regulated as per the provisions of the Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008. The use of Polychlorinated Biphenyls in any form shall be completely prohibited by 31st December, 2025. Moreover, the exemption of PCBs use have been allowed only for the research purpose after due permission from the Ministry of Environment, Forests and Climate Change.

Food safety and standards (contaminants, toxins and residues)

Sl. No.	Name of insecticides	Food	Tolerance limit Mg/kg. (ppm)
1	Polychlorinated biphenyls (Sum of PCB28, PCB52, PCB101, PCB138, PCB153 and PCB180)	Inland and Migratory Fish	2.0 ppm
2	Polychlorinated biphenyls (Sum of PCB28, PCB52, PCB101, PCB138, PCB153 and PCB180)	Marine Fish, Crustaceans and molluscs	0.5 ppm

Disposal of PCB:

Polychlorinated Biphenyls or Polychlorinated Biphenyls contaminated equipment shall be disposed of as per the provisions of the Hazardous Wastes (Management,Handling and Transboundary Movement) Rules, 2008 by 31st December, 2028. Stockpiles of Polychlorinated Biphenyls if any shall be destroyed in an environmentally beneficial manner by 31st December, 2028.

Currently India is implementing the GEF project to dispose the PCBs and the Central Power Research Institute (CPRI) has been given responsibility to dispose the pure PCBs as well as PCBs containing equipment. A static PCB disposal facility is underway in Bhillai Steel Plant and also some mobile units will be operational soon for disposal of PCBs. The plant will be non combustible and it will use Plasma Arc Gasification technology.

Challenges of PCBs Management in India:

PCBs are one of the highly toxic POPs and it needs adequate measures to prevent contamination in the environment. Though India has created a detailed inventory of PCBs, there are still concerns on the storage of PCB stockpiles by the state electricity boards. Toxics Link tried to get data from the state electricity boards but many of the state electricity boards were unaware about the stockpiles of PCBs. Another major challenge in India is to get the information on PCBs stockpiles from the private sector industries. Further, in India, there is no estimation or data available on non-legacy PCBs, which has also been accepted as a major challenge.

10 The information is retrieved from http://commerce-app.gov.in/eidb/default.asp. For detail information refer Annexure III – VI.

The Ministry of Environment Forest and Climate changed came up with an order on 2016 which bans the production, manufacturing, import and export of PCBs with immediate effect. However, the import and export data of Government of India depicts that there has been export and import of the PCBs in last few years is an issue of concern which needs to be investigated.

x. Dichloro Diphenyl Trichloroethane (DDT)

DDT is a pesticide which is used for both agriculture as well as vector control in India DDT was registered as a pesticide in India under section 9(3) of the Insecticides Act, 1968 and was used for various crops especially cotton. However, after the DDT use for agriculture has been stopped in India, it is continued to be used as vector control for diseases like malaria, dengue and kala-azar. Moreover, DDT use for vector control in India is also highly regulated. India is the only major country which is still using DDT and has an exemption for the DDT use in the vector control till 2022.

Production:

Production of DDT started in 1955 and HIL, a Government of India enterprise, is the sole producer of DDT in the country. It produces DDT for malaria and kala-azar vector control and supplies it to NVBDCP and all the State Departments of Health get their supplies from NVBDCP. As per the government of India notification which came on 26th May 1989, use of DDT is restricted up to 10,000 MT per annum, except in the case of a major outbreak. Currently, the Indian government is undertaking a project with UNIDO and UNEP to end the use of the insecticide DDT by 2020. DDT had been used in agriculture for decades until it was restricted in 1989, at present about **6,000 tonnes** of DDT is still produced annually for the eradication of mosquitoes and other pests[11]. However, over the years the production of DDT is gradually declining in the country. In the year 2009, HIL produced 3314 MT of technical grade DDT and **6830** MT DDT 50 WP formulation. In **2013 - 14 (3640 MT), in 2014- 15 (3870 MT), 2015-16 (2790 MT) in 2016-17 (3630 MT)** (Source: Annual Report 17-18, Ministry of Chemical and Fertilizers, pp. 82).

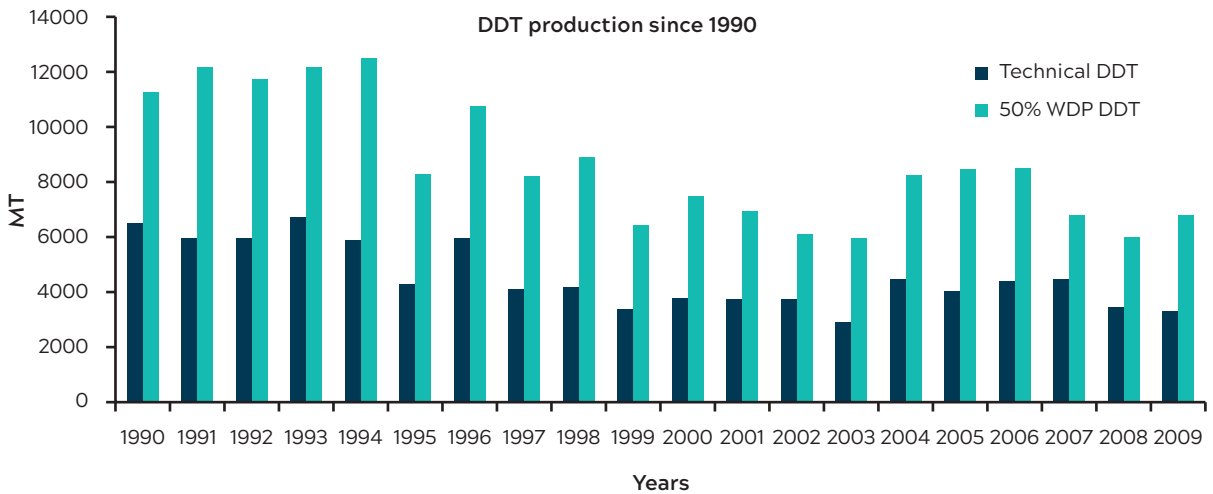


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Figure 2.2 DDT production since 1990 (NIP, 2011)

11 DNA (2015), India is phasing out the use of DDT, but it's not tackling its long-term effects. Retrieved from http://www.dnaindia.com/analysis/standpoint-india-is-phasing-out-the-use-of-ddt-but-it-s-not-tackling-its-long-term-effects-2125945.

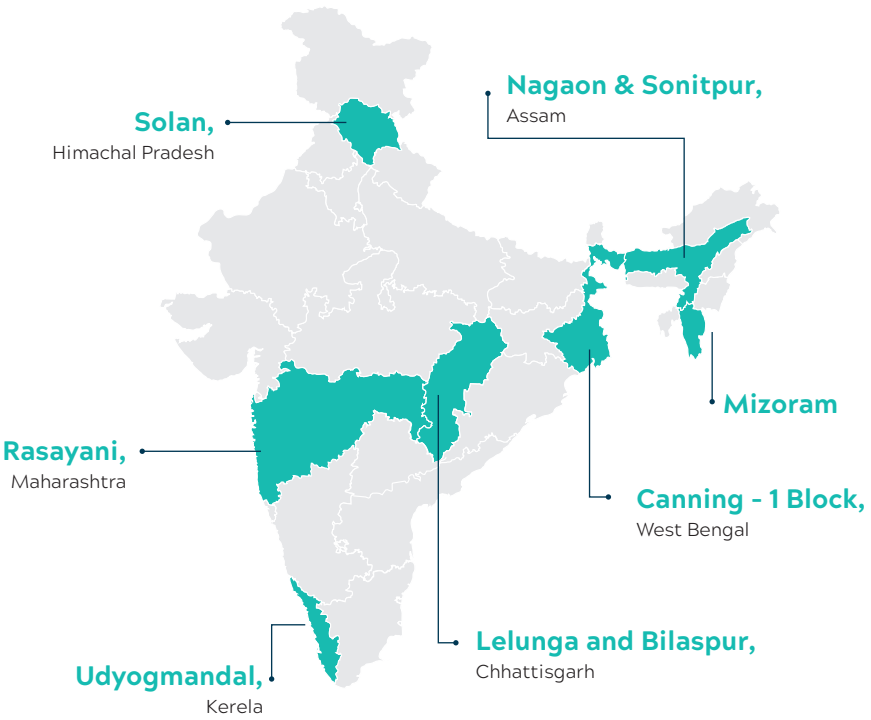

Figure 2.3 DDT Contaminated Sites

Stockpiles:

DDT production facilities produce only on demand and after production DDT is immediately dispatched to the requesting states for application. There is little information available on the stockpiles of the DDT as there is a well controlled system in place on its use and storage of DDT in India. As per the National Implementation Plan report approximately 40MT of date expired DDT is lying in Himachal Pradesh.

Export:

At present India is the only producing country in the world. Some of the malaria - affected African nations are using DDT for their malaria control programme and they are importing DDT from India.

Table 2.8 Countries where DDT is Exported from India (NIP, 2011)

Name of the countries (DDT is Exported)	Quantity in KGs
Bostwana	9.134 (2009 -10)
Senegal	67
Eritrea	15
Mozambique	165. 08 (2008 - 09)

Export and Import of DDT and Other DDT[12]:

DDT was exported from India only in **2017-18 (0.03 Thousand kgs) to Netherlands, Philippines, Uganda** and **other DDT** is primarily exported from India in **2014-15 (448.8 thousand kgs) in 2015-16 (573.35 thousand kgs)** to **Iran, Israel, Italy in 2016-17** it was **(962.73thousand kgs and 2017-18 (991.01Thousand kg) exported** to countries like **Belgium, China.**

12 Other DDT is imported to exported not as pesticides rather it is imported or exported as chemicals

Estonia, Finland etc. Till date the highest amount of DDT was exported to **China People Republic** is **(990 thousand kgs)** in 2017-18. On the other hand from **2014-2018,** there was no import of DDT in India[13].

Regulation and Institutional framework:

DDT is covered under the Insecticides Act, 1968 and 1971 of the Ministry of Agriculture, Government of India. As per vide order No. S.O 378(E) dated 26th May 1989 GoI has withdrawn the use of DDT in agriculture. But the use of DDT is restricted for Disease Vector Control purpose only.

Food safety and standards (contaminants, toxins and residues)

Sl. No.	Name of insecticides	Food	Tolerance limit Mg/kg. (ppm)
1.	DDT. (The limits apply to DDT., DDD and DDE singly or in any combination)	Milk and milk products	1.25 (on a fat basis)
		Fruits and vegetables including potato	3.5
		Meat, poultry and fish	7.0 (on a whole product basis)
		Eggs	0.5 (on a shell free basis)
		D.D.T. (singly) Carbonated Water	0.001

Specific exemption for the use of DDT:

Use of DDT for Dicofol Production purpose:

India has also registered with Stockholm Convention Secretariat for the specific exemption of DDT as an intermediate in the production of Dicofol in close system in batches. Production and application are permitted for 150MT/annum. Specific exemption for use of DDT as intermediate of Dicofol production is valid up to 2019.

Field Report:

The analysis of field investigation shows the farmers in Dausa district of Rajasthan claimed to be using DDT for agriculture purpose. However, it's difficult to verify the information provided by the farmers as there was no labels of DDT in the packets sold as an DDT in the markets.

Challenges for DDT:

- There is a need for comprehensive assessment about DDT's efficacy in vector control in India. This would help in clearing the doubt whether use of DDT is necessary any further;
- Promising innovative technologies, particularly non-chemical and simple practices, need further impetus in terms of research funding and promotion;

The pervasive presence of DDT and other POPs is a consequence of their long life and slow degradation process. The DDT-infused indoor insecticide which was used as a spray thirty years ago still lingers on the walls of homes. Crops which are grown in fields that were sprayed with DDT in the last decades show substantial traces of the insecticides. Hence, the concerned stakeholders need to ensure that POPs are disposed of safely and used in a limited manner – or even better, replaced with environmental friendly insecticides and pesticides.

13 The information is retrieved from http://commerce-app.gov.in/eidb/default.asp. For detail information refer Annexure III – VI.

xi. Polychlorinated Dibenzo-p-Dioxins (PCDD)

xii. Polychlorinated Dibenzofurans (PCDF)

Polychlorinated Dibenzo-p-Dioxins (PCDD) are produced unintentionally due to incomplete combustion, as well as during the manufacture of pesticides and other chlorinated substances. They are emitted mostly from the burning of hospital waste, municipal waste, and hazardous waste, and also from automobile emissions, peat, coal, and wood.

Annual release info of PCDF/PCDD:

The annual PCDD/F releases calculated using UNEP toolkit was estimated to be 8656.55g 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. Waste incineration has 66.75% share from the total annual releases. Nearly 4.4 million tonnes of hazardous waste is generated every year in India from petrochemical processes and pyrolyticoperations, drilling operations for oil and gas production, cleaning, emptying and maintenance of petroleum oil storage tanks including ships, etc. Production of primary and secondary aluminium, metal surface treatment, such as etching, staining, polishing, galvanizing, cleaning, degreasing, plating, etc. This alone accounts for 66.75% of the total dioxin releases when this waste is incinerated. The second highest source is ferrous and non-ferrous metal production. Copper recycling is the leading industrial activity concerning PCCD/Fs releases.

Nearly

4.4 million tonnes

of hazardous waste is generated every year in India from petrochemical processes and pyrolyticoperations, drilling operations for oil and gas production, cleaning, emptying and maintenance of petroleum oil storage tanks including ships, etc.

Table 2.9 Annual releases of PCDD/Fs in India (NIP, 2011)

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

Regulation:

There are regulations in India to contain Dioxins and Furans from Hazardous Waste, Biomedical Waste and Municipal waste incineration facilities. As per the regulations the dioxins and furans emission standards have been kept as 0.1 ng TEQ/Nm3 (at 11% O2) equivalent to EU stringent standards.

Issues of Dioxins and Furans in India:

The National Implementation Plan has identified the major sources of Dioxins and Furans in India. At present there are stringent standards in place to regulate the Dioxins and Furans from the incineration facilities in India. But there are few laboratories in the country to monitor the Dioxins and Furans or conduct sampling of emissions. Further, there is no updated estimation of release of Dioxins and Furans in India to measure the impact of the regulations on its release. There are a number of recent studies conducted by scientists in India that indicate the release of Dioxins and Furans from various sources. Further currently there is no limit of Dioxins and Furans content in the food, which is needed to be looked into considering the changing food habits, lifestyle of the country's population.

Few Dioxins and Furans testing laboratories in India:

1. National Environmental Engineering Research Institute (NEERI), Nagpur
2. Center Pollution Control Board, New Delhi
3. CVR Labs Private Limited, Chennai
4. Shiva Analytical (India) Private Limited, Bangalore
5. SGS Laboratories
6. VIMTA laboratory, Hyderabad

2.2 POPs listed in 2009:

In the year 2009, at its Fourth meeting held in Geneva, Switzerland, from 4th to 8th May 2009, the Conference of the Parties added nine new chemicals in the Stockholm Convention as Persistent Organic Pollutants. These POPs are as follows:

1. Alpha hexachlorocyclohexane
2. Beta hexachlorocyclohexane
3. Chlordecone
4. Hexabromobiphenyl
5. Hexabromodiphenyl ether & heptabromodiphenyl ether
6. Lindane
7. Pentachlorobenzene (PeCB)
8. Tetrabromodiphenyl ether and pentabromodiphenyl ether
9. Perfluorooctane Sulfonic acidits salts and perfluorooctane Sulfonyl fluoride

Out of these nine POPs, India has banned six POPs from manufacturing, import, export, trade and use of these chemicals in India. The six chemicals are as follows:

1. Chlordecone,
2. Hexabromobiphenyl,
3. Hexabromodiphenyl ether and heptabromodiphenyl ether (commercial octabromodiphenyl ether)
4. Lindane
5. Pentachlorobenzene
6. Tetra bromodiphenyl ether or Pentabromodiphenyl ether (PBDEs)

xiii. Alpha-Hexeachlorocyclohexane

Alpha-HCH is a pesticide, which is mostly brownish to white crystalline colour (ATSDR, 2005). The intentional use of alpha-HCH is as an insecticide which was phased out years ago, but this chemical is still produced as an unintentional by-product of lindane. For each ton of lindane produced, around 6-10 tons of the other isomers including alpha- and beta-HCH are created. Alpha-HCH is the only chiral isomer of the eight isomers of 1,2,3,4,5,6-HCH and it is a predominant isomer present in the ambient air and in ocean water (Walker, 1999).

Production:

In 1990, India has banned technical HCH from agricultural use but kept it for public health uses (AMAP, 2004).

Stockpiles:

There is no information available about the stockpiles of Alpha-hexeachlorocyclohexane.

Regulation:

Currently India doesn't have any specific policy for Alpha-hexeachlorocyclohexane.

xiv. Beta-hexachlorocyclohexane

Beta-HCH is a pesticide and one of the five stable isomers of technical HCH, an organochlorine pesticide formerly used in agriculture . It is produced as constituent of technical HCH used as organochlorine insecticide or chemical intermediate to manufacture enriched HCH (lindane).

Production:

There is no information reported about the production of Beta-hexachlorocyclohexane.

Stockpiles:

There is no information available about the stockpiles of Beta-hexachlorocyclohexane.

Regulation:

In India there is no regulation to ban the production, manufacturing, use of Beta HCH. However, there is limited export of Beta HCH from the country.

xv. Chlordecone

Chlordecone was used for control of a wide range of pests. In particular, it was used extensively in the tropics to control banana root borer , used as a fly larvicide, as a fungicide against apple scab and powdery mildew, to control the Colorado potato beetle, rust mite on non-bearing citrus, potato and tobacco wireworm on gladioli and other plants. Chlordecone has also been used as a household product such as ant and roach traps. Production and use of Chlordecone may have ceased over the last decades in developed countries but it is assumed that it is still produced or used as an agricultural pesticide in some developing countries (Stockholm Convention website).

Production and Stockpiles:

Currently there is no information available on the production or stockpiles of this chemical.

Export and import of Chlordecone:

In **2017-18 (1.56 thousand kilos)** of Chlordecone is exported from India to **Bangladesh** and **Switzerland**. In the same year **(0.09 thousand kilos)** of Chlordecone is being imported to India[14] from **USA**.

14 The information is retrieved from http://commerce-app.gov.in/eidb/default.asp. For detail information refer Annexure III – VI.

Regulation:

The Ministry of Environment, Forest & Climate Change notification which came into effect on 5th March 2018 G.S.R. 207 (E) section 3 and section 6 of the Environment (Protection) Act, 1986 (29 of 1986), read with rule 13 of the Environment (Protection) Rules, 1986, thereby passed the order to ban Chlordecone from manufacture, trade, use, import and export.

Exemption (Use of chemicals for scientific purpose):

Notwithstanding anything contained in these rules, the chemicals mentioned in rule 2 may be used, sold or imported in quantities as required for research and development activities in Central Universities, Council of Scientific and Industrial Research Laboratories, government institutions or other research institutions accredited laboratories in the government or private sector after the approval of the Ministry of Environment, Forest and Climate Change, Government of India[15].

xvi. Hexabromobiphenyl

Hexabromobiphenyl is used as a fire retardant in acrylonitrile-butadiene-styrene (ABS) thermoplastics for constructing business, machine housings and in industrial and electrical products and also in polyurethane foam for auto upholstery.

Production and Stockpiles:

Currently, there is no production or stockpiles information available on Hexabromobiphenyl in the country.

Regulation:

The Ministry of Environment, Forest and Climate Change Notification which came into effect on 5th March 2018 G.S.R. 207 (E) section 3 and section 6 of the Environment (Protection) Act, 1986 (29 of 1986), read with rule 13 of the Environment (Protection) Rules, 1986, thereby passed the order to ban Hexabromobiphenyl from manufacture, trade, use, import and export.

Exemption (use of chemicals for scientific purpose):

Notwithstanding anything contained in these rules, the chemicals mentioned in rule 2 may be used, sold or imported in quantities as required for research and development activities in Central Universities, Council of Scientific and Industrial Research Laboratories, government institutions or other research institutions or accredited laboratories in the government or private sector after the approval of the Ministry of Environment, Forest and Climate Change, Government of India.

xvii. Hexabromodiphenyl ether and heptabromodiphenyl ether (commercial octabromodiphenyl ether)

Hexabromodiphenyl ether and heptabromodiphenyl ether are the main components of commercial octabromodiphenyl ether. Commercial mixture of octaBDE is highly persistent, has a high potential for bioaccumulation and food-web biomagnification, as well as for long-range transport. These synthetic brominated compounds are mainly used as flame retardants.

Production and Stockpiles:

Currently, there is no production or stockpiles information available on Hexabromodiphenyl ether and heptabromodiphenyl ether in India.

15 Ministry of Environment, Forest and Climate Change notification (2018) published on 5th march 2018.

Regulation:

The Ministry of Environment, Forest and Climate Change notification which came into effect on 5th March 2018 G.S.R. 207 (E) section 3 and section 6 of the Environment (Protection) Act, 1986 (29 of 1986), read with rule 13 of the Environment (Protection) Rules, 1986, thereby passed the order to ban Hexabromodiphenyl ether and heptabromodiphenyl ether from manufacture, trade, use, import and export.

Exemption (use of chemicals for scientific purpose):

Notwithstanding anything contained in these rules, the chemicals mentioned in rule 2 may be used, sold or imported in quantities as required for research and development activities in Central Universities, Council of Scientific and Industrial Research Laboratories, government institutions or other research institutions or accredited laboratories in the government or private sector after the approval of the Ministry of Environment, Forest and Climate Change, Government of India.

xviii. Lindane

Lindane is a pesticide and it is a common name for the gamma isomer of Hexachlorocyclohexane (HCH). Lindane has been used as a broad-spectrum insecticide for seed and soil treatment, foliar applications, tree and wood treatment and against ectoparasites in both veterinary and human applications. In the last few years, the production of Lindane has rapidly decreased and it appears that only Romania and India were the producing countries of these chemicals.

Production:

Lindane is no longer produced in the country as the chemical is banned in India by the Central Insecticides Board and Registration committee.

Lindane was banned as per the (vide Gazette Notification No S.O. 637(E) dated 25/03/2011) - from manufacture, import or formulate w.e.f. 25th March, 2011 and banned for use in Agriculture w.e.f. 25th March, 2013.

Stockpiles:

Currently, there is no stockpiles information available on Lindane.

Export and Import of 1, 2, 3, 4, 5, 6- Hexachlorocyclohexane (HCH) (ISO), including Lindane:

1,2,3,4,5,6-Hexachlorocyclohexane **(HCH)** was only exported in **2014-15 (0.01 Thousand kilos)** from India. On the other hand there is no information on the import of 1, 2, 3, 4, 5, 6-Hexachlorocyclohexane **(HCH)** from 2014-2018[16]. The available data contains information of all the chemical compounds rather than each chemical in 1, 2, 3, 4, 5, 6-Hexachlorocyclohexane **(HCH)**[17].

Regulation:

Lindane was banned as per the (vide Gazette Notification No S.O. 637(E) Dated 25/03/2011) - from manufacture, import or formulate w.e.f. 25th March, 2011 and banned for use in Agriculture w.e.f. 25th March, 2013. As per the Stockholm Convention due to its use in eco-parasites control in veterinary and human application it is allowed to be used under the responsibility of authorities other than those primarily as agricultural chemicals.

16 The information is retrieved from http://commerce-app.gov.in/eidb/default.asp. For detail information refer Annexure III – VI.
17 The information is retrieved from http://commerce-app.gov.in/eidb/default.asp. For detail information refer Annexure III – VI.

Food safety and standards (contaminants, toxins and residues)

Sl. No.	Name of insecticides	Food	Tolerance limit Mg/kg. (ppm)
1.	Gamma (ɣ) (Isomer (Known as Lindane)	Food grains except rice	0.10
		Milled food grains	Nil
		Rice grain Unpolished	0.10
		Rice grain polished	0.05
		Milk	0.01 (on whole basis)
		Milk products	0.20
		Milk products (having less than 2 per cent fat)	0.20 (on whole basis)
		Fruits and vegetable	1.00
		Fish	0.25
		Eggs	0.10 (on shell free basis)
		Meat and poultry	2.00 (on whole basis)
		Carbonated Water	0.001

xix. Pentachlorobenzene (PeCB)

PeCBs are produced both intentionally and unintentionally, it is used in PCB products, in dyestuff carriers, as a fungicide, a flame retardant and as a chemical intermediate e.g. previously for the production of quintozene. PeCB might still be used as an intermediate but it is also produced unintentionally during combustion, thermal and industrial processes as well. It is also present as impurities in products such as solvents or pesticides.

Production and Stockpiles:

Currently, there is no production or stockpiles information available about Pentachlorobenzene.

Regulation:

The Ministry of Environment, Forest and Climate Change Notification which came into effect on 5th March 2018 G.S.R. 207 (E) section 3 and section 6 of the Environment (Protection) Act, 1986 (29 of 1986), read with rule 13 of the Environment (Protection) Rules, 1986, thereby passed the order to ban Pentachlorobenzene from manufacture, trade, use, import and export.

Exemption (Use of chemicals for scientific purpose):

Notwithstanding anything contained in these rules, the chemicals mentioned in rule 2 may be used, sold or imported in quantities as required for research and development activities in Central Universities, Council of Scientific and Industrial Research Laboratories, government institutions or other research institutions or accredited laboratories in the government or private sector after the approval of the Ministry of Environment, Forest and Climate Change, Government of India.

xx. Perfluorooctane Sulfonic acid (PFOS)

PFOS is a fully fluorinated anion, which is commonly used as a salt or incorporated into larger polymers. It is also used as fire fighting foams, carpets, leather/apparel, textiles/upholstery, paper and packaging, coatings and coating additives, industrial and household cleaning products, pesticides and other insecticides, photographic industry, photolithography and semiconductor manufacturing, hydraulic fluids, and metal plating. PFOS-related substances have been used to provide soil, oil and water resistance to textiles, apparels, home furnishings and

upholstery, carpets, and leather products. Also PFOS-related substances have been used in the packaging and paper industries in both food packaging and commercial applications to impart grease, oil and water resistance to paper, paperboard and packaging substrates.

Production and Stockpiles:

Currently, there is no production or stockpiles information available on PFOS.

Regulation:

Currently India doesn't have any specific regulation and policy onPerfluorooctane Sulfonic acid.

xxi. Tetra bromodiphenyl ether or Pentabromodiphenyl ether (PBDEs)

Tetrabromodiphenyl ether and pentabromodiphenyl ether are the main components of commercial pentabromodiphenyl ether. It is used as commercial pentabromodiphenyl ether mixture (C-PentaBDE) for flame retardant purposes as additives in consumer products.

Production and Stockpiles:

Currently, there is no production or stockpiles information reported in the Indian context. Research studies have indicated the cross contamination of POPs in various products including the children products in India. A research study undertaken by International POPs Elimination Network (IPEN) titled "POPs recycling contaminates children's toys with toxic flame retardants" (2017) found the presence of PBDEs (OctaBDE, DecaBDE and HCBD) in Indian toys (Rubrik's cubes). The study further concluded that the recycling of plastics containing toxic flame retardant chemicals found in electronic waste results in contamination of new plastic children's products. Another study conducted by Toxics Link also found the presence of some of the POPs (largely BFRs) in the plastic stream. Thus the cross contamination of banned chemicals in various products are cause of concern considering its impacts on human health.

Regulation:

The Ministry of Environment, Forest and Climate Change notification which came into effect on 5th March 2018 G.S.R. 207 (E) section 3 and section 6 of the Environment (Protection) Act, 1986 (29 of 1986), read with rule 13 of the Environment (Protection) Rules, 1986, thereby passed the order to ban Tetra bromodiphenyl ether or Pentabromodiphenyl ether (PBDEs) from manufacture, trade, use, import and export.

Exemption (Use of chemicals for scientific purpose):

The chemicals mentioned in rule 2 may be used, sold or imported in quantities as required for research and development activities in Central Universities, Council of Scientific and Industrial Research Laboratories, government institutions or other research institutions or accredited laboratories in the government or private sector after the approval of the Ministry of Environment, Forest and Climate Change, Government of India.

2.3 POPs listed in 2011:

At the fifth meeting held in Geneva, Switzerland, from 25th to 29th April 2011, the Conference of the Parties added Technical Endosulfan and its related isomers in the Stockholm Convention.

COP - 5 held in Geneva, from 25th - 29th April 2011, India and other countries requested POPRC to assess alternatives to Endosulfan to use in open application. But India has changed its position on several hazardous chemicals in the

Stockholm Convention and Rotterdam Conventions. Despite raising objections to the absence of alternatives in the recommendations for a global ban on Endosulfan at Conference of Parties (COP) in Geneva, on April 29th 2011, India agreed to list Endosulfan in Annex A of The Stockholm Convention with a five year exemption for 14 crops. Yearly, India produces around 60%-70% of the world's total Endosulfan. On June 25th 2011, India accepted listing Endosulfan (along with chrysotile) at the Conference of Parties of Rotterdam Convention after resisting the listing of both chemicals for many years (International Institute for Sustainable Development (IISD), 2011).

xxii. Endosulfan

It was registered as an Insecticide/Pesticide under Section 9(3) of the Insecticides Act, 1968. Endosulfan was used as an insecticide for control of aphids, thrips, beetles, foliar feeding larvae, mites, borers, cutworms, bollworms, whiteflies, and leaf hoppers. It is used on cotton, tobacco, cantaloupe, tomatoes, squash, eggplant, sweet potato, broccoli, pears, pumpkins, corn, cereals, oilseeds, potatoes, tea, coffee, cacao, soybean, and other vegetables.

Production:

From 1920 to 2012, India produced a total of 4500 tonnes of Endosulfan, making it one of the biggest players in production and consumers of the chemicals (Sharma et al. 2014b). It is no longer produced in India as it is banned by the Supreme Court of India.

Stockpiles:

Currently, there is no stockpile information reported on Endosulfan in the country.

Export and Import of Endosulfan:

It was only exported in the year 2017- 18 (0.13 thousand kilo) to Nepal and Zambia apart from this it has not been exported or imported in India.[18]

Regulation:

A per the Writ petition (civil) no. 213 of 2011 filed by Democratic Youth Federation of India in the Supreme Court of India. Endosulfan a serious health hazard and the Court has got an obligation to protect human life, which is guaranteed under Article 21 of the Constitution of India. Further, it was pointed out that its ill-effects have been clearly felt in the State of Kerala and its use has been completely banned. Considering harmful health impacts of the chemical, the Supreme Court of India put an interim order to ban the manufacture, sale, use and export of Endosulfan throughout the country from 13 may 2011. However the Supreme Court later allowed export of the chemical produced before the ban was in place[19].

Though Endosulfan as per the interim order in 2011 has been banned from production, export and import. The import and export data of the Government of India depicts that there has been export of Endosulfan in last few years which raises eyebrows over implementation of the Supreme Court order. Hence there is a urgent need of further investigation of this matter as it violates the order of the Hon'ble Supreme Court.

18 The information is retrieved from http://commerce-app.gov.in/eidb/default.asp. For detail information refer Annexure III – VI.

19 Records of Procedding of Supreme Court of India Writ petition (civil) no.213 of 2011. Retrieved from http://agricoop.nic.in/sites/default/files/2132011313122011p.pdf. Accessed on 25th Feb 2018.

Food safety and standards (contaminants, toxins and residues)

Sl. No.	Name of insecticides	Food	Tolerance limit Mg/kg. (ppm)
1.	Endosulfan (residues are measured and reported as total of endosulfan A and B and endosulfan-sulphate)	Fruits and Vegetables	2.0
		Cottonseed	0.5
		Cottonseed oil (crude)	0.2
		Bengal gram	0.20
		Pigeon Pea	0.10
		Fish	0.20
		Chillies	1.0
		Cardamom	1.0

Sl. No.	Name of insecticides	Food	Tolerance limit Mg/kg. (ppm)
1.	Endosulfan A	Carbonated Water	0.001
2.	Endosulfan B	Carbonated Water	0.001
3.	Endosulfan-Sulphate	Carbonated Water	0.001

Development on Endosulfan:

A Public Interest Litigation was filed in the Supreme Court of India to put a ban on the use of Endosulfan in India. The Supreme Court of India, appointed a high-powered expert committee in 2011which mentioned that 13.35% of the registered pesticides, including Endosulfan, pose serious health risks especially to the reproductive system and also leads to congenital deformities among humans. Then the committee recommended phasing out of these pesticides instead of destroying them through incinerators, since the latter would have cost over Rs 1000 crore to the exchequer.

A three-judge bench was constituted to address the health hazard caused due to the use of Endosulfan, it consists of Chief Justice of India (CJI) S.H. Kapadia and Justices K.S. Radhakrishnan and Swatanter Kumar, In their brief order, they said: *"Keeping in mind various judgments of this court under Article 21 [right to life and liberty] of the Constitution and particularly keeping in mind the precautionary principle, we, hereby, direct and pass an ad interim order for immediate ban on production and use of Endosulfan all over India." The Bench directed the statutory authorities to freeze the production licenses granted to the manufacturers of Endosulfan till further order".*

The Chief Justice of India of the Supreme Court of India also told that, *"We don't want even one child to suffer either for six or seven weeks as human life was the paramount consideration. We go by Article 21 and polluter pay principle laid down by this court. Whether there is valid license or not Article 21 is higher than the statute. Don't go by money alone. You have corporate social responsibility also."*

The petitioner said, *"Considering the harmful side effects on the people, the State of Kerala had imposed a ban on Endosulfan. The excessive use of chemicals and pesticides for optimizing agricultural production created alarming danger to health and safety of living beings in general and agricultural workers in particular"* It sought an all India ban (Hindustan Times, 2017). As per the Supreme Court order which came on 13th May 2011. Endosulfan is banned from manufacture, sale, use and export throughout the country, considering its harmful health effects.

Field Report of Endosulfan use:

The use of Endosulfan has been completely banned for use agriculture by the Supreme Court of India. But during the data collection in Chouhan Patti (Delhi) and Dausa (in Rajasthan) farmers asserted that they use Endosulfan on Ladies Finger, Pumpkin, tomatoes etc. As mentioned by a farmer, *"We don't use Aldrin. Endrin or DDT in our farms but we do use Endosulfan as an Insecticide on Ladies Finger, Tomatoes, Pumpkin etc. We have to use Endosulfan after every 5 days on these vegetables or else the vegetables will start rotting. He added that quality of Endosulfan has deteriorated over the years as it used to be and it was very effective before but nowadays the shopkeepers are selling different chemicals as Endosulfan or low grade Endosulfan is being sold in the market. However, we know few shop who sells Endosulfan. He also mentioned that there is a shop near the village which sells these chemicals to his known farmers only as these chemicals are banned by The Supreme court of India"(Hum Aldrin, Endrin ya DDT toh use nahi karte hai magar Endosulfan use karte hai Bhindi, tamatar ki kheti mein. Aur har 5 din mein iska chidkaw hota hai inn sabziyon mein. Agar hum yeh istamal na kare toh sari fasal kharab ho jayenge. Pehle bahut achi quality ka endosulfan milta tha magar ab dukardar Endosulfan ke naam mein koi aur chemical bech rahe hai ya low grade ka endosulfan bech rahe hai, Magar hum ek dukan dar ko jante hai, jo yeh bechta hai aur woh apne jaan pechan ke logo ko hai yeh chemicals aasani se bechta hai, kyunki Endosulfan ko ban kar diya gaya hai).*

The analysis of the data reflects that, though the use of Endosulfan is banned by the Supreme Court of India the farmers asserted using Endosulfan as insecticides. They were well aware about its health impacts caused due to consumption. The farmers from Dausa village accepted use of Endosulfan on vegetables and mentioned that in order to keep these vegetables fresh they use Endosulfan. Though farmers accepted using Endosulfan as insecticides its needs to be further investigated to establish the facts about ongoing Endosulfan supply to farmers despite the moratorium in its use.

2.4 POPs listed in 2013:

In the sixth meeting held in Geneva, Switzerland, from 28th April to 10th May 2013, the Conference of the Parties added Hexabromocyclododecane (HBCDD) as a POP in the Stockholm Convention. India has banned manufacture, trade, use, import and export of hexabromocyclododecane from 5th March 2018.

xxiii. Hexabromocyclododecane (HBCDD)

HBCD is used as a flame retardant additive, providing fire protection during the service life of vehicles, buildings or articles, as well as providing protection during storage of commercially available Hexabromocyclododecane which is a white solid substance. The main uses of HBCDD globally are in expanded and extruded polystyrene foam insulation while the use in textile applications and electric and electronic appliances is smaller.

Production and Stockpiles:

Hexabromocyclododecane is not manufactured or produced in India. As it is not produced in India, there is no stockpile information available about Hexabromocyclododecane.

Regulation:

The Ministry of Environment, Forest and Climate Change Notification which came into effect on 5th March 2018 vide number G.S.R. 207 (E) section 3 and section 6 of the Environment (Protection) Act, 1986 (29 of 1986), read with rule 13 of the Environment (Protection) Rules, 1986, thereby passed the order to ban Hexabromocyclododecane from manufacture, trade, use, import and export.

Exemption (Use of chemicals for scientific purpose):

Notwithstanding anything contained in these rules, the chemicals mentioned in rule 2 may be used, sold or imported in quantities as required for research and development activities in Central Universities, Council of Scientific and Industrial Research Laboratories, government institutions or other research institutions or accredited laboratories in the government or private sector after the approval of the Ministry of Environment, Forest and Climate Change, Government of India.

2.5 POPs listed in 2015:

In the seventh meeting held in Geneva, Switzerland, from 4th to 15th May 2015, the Conference of the Parties added 3 new chemicals Polychlorinated Naphthalenes, Pentachlorophenol, Hexachlorobutadiene as POPs in the Stockholm Convention. Out of these 3 POPs India has been able to ban Hexachlorobutadiene from manufacture, trade, use, import and export from 5th March 2018 and Pentachlorophenol and its salts has been banned from production, import. Use of Penta or PCP is banned from agriculture by Central Insecticides Board and Registration in 1998. Currently, use of PCNs is banned in printing ink for food packaging under BIS standard IS 15495:2004 but India doesn't have any regulation or policy in place for Polychlorinated naphthalenes (PCNs).

xxiv. Polychlorinated Naphthalenes

Polychlorinated naphthalenes (PCNs) make effective insulating coatings for electrical wires and others. It is mainly used in the electrical industry as separators in storage batteries, capacitor impregnates, as binders for electrical grade ceramics and sintered metals, and in cable covering compositions.

PCNs are also found to be used as wood preservatives, as rubber and plastic additives, for capacitor dielectrics and in lubricants.

Production and Stockpiles::

In India, details of use and production of PCNs are not available. Hence, there is no stockpiles information available about Polychlorinated Naphthalenes.

Export and import of PCN:

It was exported from India in **2014-15 (30.52 thousand KGs), 2015-16 (3.47 thousand KGs)to countries like Canada, China, Germany, Haiti** etc. and **2016-17 (11.08 thousand KGs)** and in **2017-18 (3.3 thousand KGs)** to countries like B**elgium, France, Germany, Japan** and **Mexico** etc. Till date **23.50 Thousand KGs** was the highest amount of PCN exported from India to **Haiti**. On the other hand in **2014-15 (112.95 Thousand KGs)** of PCN was imported to India, in **2015-16 (8.90 Thousand KGs)** to China, **2016-17 (6.60 Thousand KGs)** and in **2017-18 (16.92 Thousand KGs)** was imported by India from China. Till date, the highest amount of PCN which imported is **112.95 Thousand KGs** from **China people's Republic**[20].

Regulation:

Polychlorinated naphthalenes (PCNs) is banned in printing ink for food packaging under BIS standard IS 15495:2004 as it is not produced in India. But currently, India does not have any specific policy, laws or legislations to regulate Polychlorinated Naphthalenes.

20 The information is retrieved from http://commerce-app.gov.in/eidb/default.asp. For detail information refer Annexure III – VI.

xxv. Pentachlorophenol and its salts

PCP, commonly known as "Penta", is used as pesticide and disinfectant. It was first produced in 1930s[21] and is available as pure PCP, or as the sodium salts & esters. PCP can be found in two forms: PCP itself or as the sodium salt of PCP, which dissolves easily in water. PCP has been used as herbicide, insecticide, fungicide, algaecide, disinfectant and as an ingredient in antifouling paint. Some applications were in agricultural seeds, leather, wood preservation, cooling tower water, rope and paper mill system.

Production and Stockpiles:

In India 1,800 tons per year of Na-PCP is being produced in the state of Maharashtra and West Bengal[22-23].

Export and Import of Na-PCP:

There has been export of Na-PCP from India in **2014-15 (11.9 thousand kilos)**, in **2015-16 (1.78 thousand kilos)** was exported to **Bangladesh, Ghana** and **Nepal, 2016-17 (3 thousand kilos)** and in **2017-18 (20.08 thousand kilos)** was being exported from India to **Brazil, Kenya, Mexico, Nepal** and **Congo** as well. Till date the highest amount of Pentachlorophenol exported from India is **20.08 thousand KG to Nepal**. On the other hand, negligible amount of Pentachlorophenol was imported from **China only in 2016-18** which was (0.0 thousand kilos) by India . Rest India has not imported this POP.

Regulation

Pentachlorophenol and its salts have been banned from production, import and use of Na-PCP was banned from agriculture by Central Insecticides Board and Registration in 1998 . Also, it is banned from the leather industry as well. However, the use of Na-PCP is allowed mainly as a wood preservative on impregnated wood/ particle boards and also for the preservation of water-based 'distemper paints' while in storage.

India's Position on Pentachlorophenol and its salts:

India is one of the leading producers and exporters of Pentachlorophenol to other countries. At the same time India has banned the use of Pentachlorophenol from leather and agriculture. But, it is largely used as a wood preservative in the country. Howeverduring the 7th COP meeting of The Stockholm Convention, 2015 India opposed the inclusion of PCP and its salt and esters to be included as POPs in The Stockholm Convention. And most of the countries supported the inclusion of PCP as POPs. As a result for the first time in the history of The Stockholm Convention voting took place to include PCP as POPs. In India PCP is still used inspite of its toxic properties and perhaps the government needs to rethink on its continued use when it has been phased out globally.

xxvi. Hexachlorobutadiene (HCBD)

Hexachlorobutadiene is produced unintentionally. This POP is a halogenated aliphatic compound, mainly created as a by-product in the manufacture of chlorinated aliphatic compounds. It is most commonly used as a solvent for other chlorine-containing compounds. It is also used as scrubber to recover chlorine containing gas or to, remove volatile organic components from gas; hydraulic, heat transfer or transformer fluid; in gyroscopes, in production of aluminium and graphite rods, an insecticide in vineyards (a pesticides fumigant). HCBD is also released unintentionally by the industries and during waste management.

21 Consumer Factsheet on: Pentachlorophenol. United States Environmental Protection Agency. 2006-11-28. Retrieved 2008-02-26.
22 UNEP (2014) Report of the Persistent Organic Pollutants Review Committee on the work of its tenth meeting. UNEP/POPS/POPRC.10/10/Add.1.
23 Indian Chemical Council. (2014), 'Wood preservation: Its socio economic importance in India andunique role of sodium penta chloro phenate (SPCP), presented in 9th January 2014.

At COP-8, HCBD has been listed in Annex C for unintentional release but the Indian government was apprehensive about listing of HCBD in the Convention. However, it finally supported listing of this chemical in SC. During the Ninth POPRC meeting in India with the support of Argentina, the Indian government asserted that addressing unintentional releases of HCBD at this time would put an undue burden on developing countries of the world. India gave the counter argument that information of the socioeconomic impacts of HCBD is insufficient in the country's context (IISD, 2013).

Emission of HCBD:

HCBD is produced in chlorinolysis in plants as a byproduct in the production of carbon tetrachloride and tetrachloroethane. Chlorinolysis is a process of radical chain reaction in which hydrocarbons are exposed to chlorine gas under pryolytic conditions. The manufacturers of Carbon tetrachloride in India are Gujarat Alkalies & Chemicals Limited (Dahej)[24], Adarsh Chemicals (Chennai)[25] and Nutan Chemicals (Pune)[26].

Release of HCBD:

There is no information reported on the release of Hexachlorobutadiene in India.

Regulation:

The Ministry of Environment, Forest and Climate Change notification which came into effect on 5th March 2018 vide number G.S.R. 207 (E) section 3 and section 6 of the Environment (Protection) Act, 1986 (29 of 1986), read with rule 13 of the Environment (Protection) Rules, 1986, thereby passed the order to ban Hexachlorobutadiene from manufacture, trade, use, import and export.

Exemption (use of chemicals for scientific purpose):

Notwithstanding anything contained in these rules, the chemicals mentioned in rule 2 may be used, sold or imported in quantities as required for research and development activities in Central Universities, Council of Scientific and Industrial Research Laboratories, government institutions or other research institutions or accredited laboratories in the government or private sector after the approval of the Ministry of Environment, Forest and Climate Change, Government of India.

2.6 POPs listed in 2017:

In the eighth meeting held from 24th April to 5th May 2017, two POPs were included in the Stockholm convention as POPs (DecaBDE, SCCP) and Hexachlorobutadiene which was earlier in Annexure A and was moved to Annex C post the eighth meeting. Currently, in India DecaBDE is covered under the E-waste management Rules 2016. New electrical and electronic equipment and their components or consumables or parts should not contain Polybrominated Biphenyls and Polybrominated Diphenyl ethers beyond a maximum concentration value of 0.1% by weight in homogeneous materials but there isn't a specific policy on DecaBDE. India currently doesn't have any policy or regulation on second listing Short-chained chlorinated paraffins (SCCPs).

xxvii. Decabromodiphenyl ether (DecaBDE)

DecaBDE is used as an additive flame retardant, and has a variety of applications in plastics/polymers/composites, textiles, adhesives, sealants, coatings and inks. DecaBDE containing plastics are used in housings of computers and TVs, wires and cables, pipes and carpets.

24 http://www.gacl.com/public_html/new/carbontetra_chloride.html.
25 http://www.adarshchem.com/cholirianned_solvents.html.
26 http://www.nutanchemicals.com/

POPRC listed Deca-Bromodiphenyl Ether (DecaBDE) in Annex A of the Stockholm Convention during COP-8 held in Geneva in May 2017 with specific exemptions for critical spare parts for automotive and aerospace sector, polystyrene and polyurethane foam for housing insulation. As per the agreed text of the Convention, Deca-BDE has been allowed to be used in the automobiles until 2036.

Production and Stockpiles:

Currently, there is no information available on production or Stockpiles of DecaBDE in India.

Regulation:

Currently India doesn't have any specific policy for Decabromodiphenyl Ether (DecaBDE). But according to E-Waste (Management) Rules, 2016, new electrical and electronic equipment and their components or consumables or parts do not contain Lead, Mercury, Cadmium, Hexavalent Chromium, Polybrominated Biphenyls and Polybrominated Diphenyl ethers beyond a maximum concentration value of 0.1% by weight in homogeneous materials (RoHS Regulation, 2016) and European Union also has the same requirement on Deca-BDE.

xxviii. Short-Chained Chlorinated Paraffins (SCCPs)

SCCPs are used primarily in metalworking applications. Other uses include use as flame retardants or plasticizers in PVC, paints, adhesives, sealants in buildings, PCB substitutes in gaskets, leather fat liquors, and flame retardants in rubber, car carpets, textiles, and other polymers. SCCPs used as flame retardants are added to rubber in a proportion of 1-10%.

SCCPs was added to Annex A in the Stockholm Convention in COP-8 held in Geneva in May 2017 with specific exemptions for mining and forest industries, leather production and lubricant additives and plasticizer of PVC except toys and children products.

Production and Stockpiles:

No information is available on production or stockpiles of SCCP in India.

Regulation:

Currently India doesn't have any specific policy for short-chained chlorinated paraffins (SCCPs).

Chapter

03 ACHIEVEMENTS AND CHALLENGES OF POPs MANAGEMENT IN INDIA

3.1 Major Achievements of POPs Management in India:

Some of the major achievements towards POPs management in India are as follows:

1. Pesticides designated as POPs have been banned for production, export and use.
2. Regulations are in place to stop using of PCBs by 2025 and disposing the PCBs containing equipments by 2028.
3. Initiatives have been taken to dispose PCBs and PCBs containing equipments in an environmentally sound manner. The PCBs disposal facilities in Bhillai will use Plasma Arc Technology for disposal of PCBs.
4. Gradual reduction of DDT use for vector control and adoption of suitable alternatives.
5. Regulations are in place to limit dioxins/furans released from hazardous waste incineration facilities, municipal waste incineration facilities and biomedical waste incineration facilities.
6. Efforts have been made to set a system in place to check the release of dioxins and furans from illegal burning of waste.
7. Adoption of RoHS regulation to restrict the use of BFRs and some of the BFRs are well known POPs.
8. Regulations are in place to ban the production, use, import and export of some of the new POPs.

3.2 Challenges of POPs management in India:

1. **Delay in submission of the National Implementation Plan(NIP):**

   India ratified the Stockholm Convention in 2006 and was supposed to submit its National Implementation Plan by 2008. However, there is a substantial delay from Government of India leading to the late initiatives to mitigate the POPs in the country. Further, many countries have submitted the updated NIP. However, India is still lagging behind and has not initiated any action to update the NIP.

2. **Coordination among the agencies:**

   The MoEF&CC is the focal point which has created the National Implementation Plan for India and there are multiple agencies which have been identified to implement management of POPs in India. However, there is a lack of proper coordination among the implementing agencies to manage POPs in the country. As an example, when Toxics Link asked information from the state electricity boards on the storage of PCBs transformers, it was found that many of the state electricity boards were not aware about the PCBs transformers.

3. **Status of stockpiles:**

   The National Implementation Plan has assessed the stockpiles of some of the POPs. However, there is no updated information available on the stockpiles of these POPs and most importantly how the stockpiles of POPs have been stored and disposed in an environmentally sound manner. As of now, there is no public information

available on the status of the stockpiles, how that has been stored and that will be disposed creating doubt on the overall POPs management in the country.

4. **Availability of Data:**

The data available on POPs is scattered and limited and it becomes difficult to analyse the trend of usage of POPs in India. Also, data pertaining to POPs effect on human health shows the lack of research in examining the issue from the health and environmental perspective. The available data is scattered and scanty and it is difficult to analyse in terms of trends. Data pertaining to effects and exposures in the region is scarce. Doubts have also been cast on the reliability of data and on the uniformity of methods used across studies.

5. **Monitoring and regulations capabilities:**

The Government of India has issued stringent emission norms for Dioxins and Furans and certain regulations to monitor the POPs. However, the lack of adequate infrastructure and testing facilities are the major challenges to monitor and regulate the POPs in the country. India is promoting incineration based technology to manage the biomedical waste, hazardous waste and medical waste. However, there are limited laboratory facilities available in the country to monitor the level of Dioxins and Furans from these facilities. Most importantly, the State Pollution Control Boards are not well equipped to regulate the POPs in the country.

6. **Public Information on POPs:**

POPs management requires a multipronged strategy and public information which is a very important aspect to manage the POPs in India. The NIP has also outlined the need of public information, awareness generation and identified the role of key stakeholders to create awareness on POPs. However, considering the size and population of the country, enough efforts have not been made to make the public aware on the issues of POPs. Though a website was developed by the MoEF&CC on Stockholm convention however, it was not updated and later the website was deleted.

The country has also witnessed large protests against incineration of the waste showing lack of public outreach and information on the issues of Dioxins and Furans. Further, during interaction with the farmers it was found that many of those POPs pesticides which have been banned are still being sold and used in the countryside and the farmers had no information about the ban of these chemicals for agricultural purpose. This shows lack of penetration of information on POPs at the ground level.

7. **Remediation of the contaminated sites:**

The National Implementation Plan has identified number of POPs contaminated sites. Though, the Ministry of Environment, Forests and Climate Change has developed an action plan to remediate the contaminated sites. No priority has been given to decontaminate the existing POPs contaminated sites of the country. Further, there is no information available on the status of POPs contaminated sites identified in the National Implementation Plan.

8. **Impact on the vulnerable population:**

Almost everyone is seen vulnerable to POPs due to their long range but there are groups which are seen as more vulnerable compared to others. Large numbers of the population are at particular risk due to POPs exposure, including people whose diets include large amounts of fish, shellfish, or wild foods that are high in fat and are locally obtained. The indigenous population may be particularly at risk because they observe cultural and spiritual traditions related to their diet. Through various research studies done in the Indian and global context, women are also vulnerable. 44% of women from 50 countries surveyed by the Women's Environment and Development Organization (WEDO) reported reproductive health disorder as a result of chemicals exposure in the work place like e-waste recycling site, landfills and other occupational hazards that have increased manifold (WHO, 1999). However, after adoption of the NIP, no studies have been undertaken on the possible impact of the POPs on the vulnerable population.

9. **Adoption of Best Available Technology and Best Environmental Practices:**

   Adoption of BAT and BEP to mitigate the POPs are found to be the major challenge for the country. India has witnessed lots of protest on adoption of incineration based technology for all types of waste. As an example, the waste to energy plant set up in Okhla (Delhi) was emitting high quantity of Dioxins and Furans and the court has to interfere and monitor the release of Dioxins and Furans from the waste to energy plants. Further, in India, technology is mostly imported and sometimes not suited as per the local conditions.

10. **POPs and Foods safety:**

    Food is an important exposure route from POPs. However, in India, the food safety regulations have not been able to address the impact of POPs on the foods. Most importantly, there is no regulation in place to prevent contamination by POPs on the food chain. There are a number of empirical studies conducted in India which have established the presence of POPs in various food items however the existing regulation has not addressed to contain the POPs in the foods.

11. **Role of the Industries:**

    In India, the participation of the industries on POPs management is found to be very challenging. As chemicals are largely deregulated in India, the industries are not generating enough data and information on the chemicals they are dealing with and the possible impact on the human health and environment. Further, Indian industries are not well aware of the developments of the Stockholm Convention and the issues of POPs and in many cases argue against the listing of chemicals without having any data and inventories.

12. **Illegal sale of POPs pesticides:**

    Though India has banned the use of pesticides such as DDT, Endosulfan, Aldrin and Dieldrin etc. during the field visit and interaction with the farmers, it has been found that the banned pesticides are still being used and sold openly in the country. Even some of the sellers have put advertisement of banned POPs on their websites. It was also found that other pesticides are being sold in the name of the banned pesticides, like DDT and Endosulfan, which needs to be further investigated. Also it seems that there is lack of information among the government bodies about the illegal export and import of the POPS.

13. **Issue of cross contamination:**

    Research studies have indicated the cross contamination of POPs in various products including the children products in India. A research study undertaken by International POPs Elimination Network (IPEN) titled “POPs recycling contaminates children’s toys with toxic flame retardants” (2017) found the presence of PBDEs (OctaBDE, DecaBDE and HCBD) in Indian toys (Rubrik’s cubes). The study further concluded that the recycling of plastics containing toxic flame retardant chemicals found in electronic waste results in contamination of new plastic children’s products. Another study conducted by Toxics Link also found the presence of some of the POPs (largely BFRs) in the plastic stream. Thus, the cross contamination of banned chemicals in various products is a concern considering the human health.

Chapter

04 OBSERVATION OF NIP AND CONCLUSION

4.1 Observation on action plans of NIP

Table 4.1 Observation

S. No.	Action Plan	Implementation Bodies	Timeline	Observations
1	Building of institutional capacity and of policies and regulations	MOEF CPRI NEERI MOA MOP NIIST CPCB MHFW	2011-2022	There are some regulations in place to manage POPs. However, there is a need to strengthen the capacity of the institutions to implement the rules and regulations. There is also a need of greater public participation and awareness is required on the issue of POPs.
2	Reduction or elimination of the intentionally produced and used pesticide POPs chemicals listed in Part I of Annexure A under the Convention	MOEF MOA MOCF PPQ&S	2011-2022	Regulations in place to phase out POPs pesticides. All the POPs pesticides listed in Stockholm Convention have been banned for production, use and export. However, there are reports that some companies are selling these banned pesticides.
3	The identification, elimination and environmentally sound management of electrical equipment containing PCBs in use	MOEF CPRI MOP NEERI	2011-2022	Regulation is in place to phase out the use of PCBs as well as environmentally sound disposal of PCBs within the set timeline. After much delay, the PCBs disposal facilities have been set up though it is yet to start. However, there are concerns on the storage of PCBs by the state electricity boards.
4	Elimination and restriction of the production, use, import and export of DDT	MOEF MHFW HIL MOCF DGFT	2011-2022	Data shows that there is a gradual reduction of production and use of DDT in India in compliance with India's commitment to phase out DDT
5	Reduction and elimination of the released unintentionally produced POPs	MOEF CPRI NEERI NIIST	2011-2022	India has taken some affirmative action to reduce the unintentional release of Dioxins and Furans. However, there is no data available on the release of other unintentional POPs. Further, there is a need to update the national inventory on Dioxins and Furans.

S. No.	Action Plan	Implementation Bodies	Timeline	Observations
6	The identification and disposal of POPs stockpiles, wastes and contaminated sites.	MOEF NEERI CPRI MOA PPQ&S MOCF	2011-2022	The National Implementation Plan has identified some of the stockpiles and the contaminated sites of POPs. However, there are concerns on the disposal of these POPs in an environmentally sound manner as well as remediation of the contaminated sites.
7	Monitoring	MOEF NEERI CPRI NIIST MOA ICAR IARI CPCB	2011-2022	There are some mechanisms in place to monitor the POPs in India. However, the use of banned POPs, pesticides is also reported in some parts of India which raises doubt on the effectiveness of monitoring mechanism in place.
8	Research and Development	MOEF HIL MC&F MOP NEERI CPRI NIIST	2011-2022	There are number of research studies on POPs that have been conducted from India. However, India is still lagging behind in research and development on POPs. There are limited studies available on new POPs and hardly any efforts are being made to develop alternatives to various POPs.
9	Promoting information exchange of parties concerned	MOEF HIL Stakeholder ministries	2011-2022	The MOEF&CC is the national focal point for the Stockholm Convention and needs to strengthen the co-ordination cell on Stockholm Convention in the Ministry for sharing information among the stakeholders as well as the relevant ministries.
10	Public information	MOEF NEERI CPRI NIIST CPCB HIL	2011-2022	The MOEF&CC has come out with a website to disseminate the information on Stockholm Convention. However it has not been updated. As India is a big country, the public information dissemination mechanism needs to be strengthened to reach the large public. There is also a need to engage the state government agencies so that they can also play a key role in POPs management.
11	Effectiveness of the evaluation, reporting and financial assistance	MOEF NEERI CPRI NIIST CPCB MC&F MOP HIL MH&FW SPCBs	2011-2022	There should be periodic reporting on the progress of POPs management in the country and should be put in the public domain. Further adoption of better technology, enhancement of the financial outlay for better POPs management and updating of the regulations are required.

4.2 Conclusion:

India is one of the emerging economies in the world and is looking for high economic growth to sustain the economy as well as to pull out the large section of the population out of poverty. Traditionally in India, environment was given paramount importance since antiquity. Therefore, India is committed to protect the environment since 1972 (the Stockholm Declaration) and is a part of all the international conventions, treaties and discussions. India is one of the countries at the forefront which did an early ratification of the Stockholm Convention and was committed to eliminate POPs from the country.

During these years, the Indian government has taken decisive action to eliminate the POPs from the country. However, after reviewing the country's overall scenario of POPs management, it seems that India has a lot of challenges and needs to work in a coordinated manner to address these challenges to manage the POPs in an environmentally sound manner. Further, when many countries have updated their National Implementation Plan, India is still lagging behind and has not taken any steps to update the NIP. So it is in this context, that these are some of the immediate suggestions for the Government which needs to be considered for an effective POPs management.

4.3 Suggestions:

1. Need of strengthening the infrastructure for POPs management in the country.
2. Setting up of a national coordination cell in the MOEF&CC, Govt. of India to coordinate the concerned departments and agencies involved in the POPs management.
3. Adequate allocation of the financial resources for POPs management.
4. Enhance capacity of the stakeholders, mostly state government agencies, and other regulatory agencies and NGOs.
5. More data needs to be generated on POPs in the country.
6. Suitable mechanism needs to be created for information dissemination and large public outreach.
7. Prioritizing the food safety issues in the context of POPs.
8. Setting up adequate laboratory facilities for monitoring and analysis of POPs.
9. Industries need to be proactive and should voluntarily phase out the POPs and come out with inventories and data.
10. There should be periodic reporting by the concerned agencies to get the updated information on POPs.
11. Adoption of BAT and BEP considering the need of the local condition.
12. Strengthening the customs to check the illegal export and import of POPs.
13. Capacity building of the NGOs to serve as a watchdog on these issues.
14. Use of mainstream media for information, dissemination and awareness on POPs.
15. The website on Stockholm Convention also needs to be updated periodically with the latest developments/ data on POPs.

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Annexure I: Regulations on POPs in India

Table A:Regulations of POPs in India

SN	Name of Chemical	Category	Regulations	Enacted in
1	Aldrin	Pesticide	Banned from manufacture, use and import	20th Sept 1996
2	Chlordane	Pesticide	Banned from manufacture, use and import	20th Sept 1996
3	Dieldrin	Pesticide	Banned from manufacture, use and import	17th July 2001
4	Endrin	Pesticide	Banned from manufacture, use and import	15th May 1990
5	Heptachlor	Pesticide	Banned from manufacture, use and import	20th Sept 1996
6	Hexachlorobenze (HCB)	Pesticide/ Industrial Chemical	Never registered as pesticide but banned from manufacture, use and import	27th March 2014
7	Mirex	Pesticide	Never registered but it is Banned from manufacture distribution, use and import etc.	27th March 2014
8	Toxaphene	Pesticide	Banned from manufacture, use and import	25th July 1989
9	DDT	Pesticide	Banned with restricted use for Vector control can be used upto 10, 000 MT PA except in case if major outbreak. but it is HIL in continuously decrease in the production of DDT 2013 - 14 (3064 MT) 2014- 15(3087 MT) 2015-16 (2079 MT) 2016-17 (3063 MT) (Source: Annual Report 17-18, Ministry of Chemical and Fertilizers.	26th May 1989
10	PCB	Industrial Chemical	Banned for manufacture, use, import, export, disposal of waste	6th April 2016
11.	Chlordecone	Pesticides	Banned for manufacture, use, import, export etc.	5th March 2018
12.	Hexabromobiphenyl	Industrial Chemical	Banned for manufacture, use, import, export etc.	5th March 2018
13.	Hexabromocyclododecane (HBCDD)	Industrial Chemical	Banned for manufacture, use, import, export etc.	5th March 2018
14.	Hexabromodiphenyl ether and heptabromodiphenyl ether	Industrial Chemical	Banned for manufacture, use, import, export etc.	5th March 2018
15.	Hexachlorobutadiene	Industrial Chemical	Banned for manufacture, use, import, export etc.	5th March 2018
16.	Pentachlorobenzene	Pesticide/ Industrial Chemical	Banned for manufacture, use, import, export etc.	5th March 2018
17.	Tetrabromodiphenyl ether and pentabromodiphenyl ether	Industrial Chemical	Banned for manufacture, use, import, export etc.	5th March 2018
18	Endosulfan	Pesticide	Banned by Supreme Court	13th May 2011
19.	PCDD	By Products	Standard notified by CPCB 0.1ng TEQ/Nm3 (at 11% O2) Bio Medical Waste Management Rule 2016	28th March 2016

32 Lindane got exception in it was allowed to used use up to 24th march, 2013 for termite control in Building including wood, and termite control in Agriculture as per approved label claims by the Registration Committee and for exports.[S.O.637 (E) dated 25thMarch, 2011 AND S.O.1472 (E) dated 29th Aug., 2007]. Central Insecticide Board and Registration Committee-(http://cibrc.nic.in/list_pest_bann.html)

SN	Name of Chemical	Category	Regulations	Enacted in
20	PCDF	By Products	Standard notified by CPCB 0.1ng TEQ/Nm3 (at 11% O2) Bio Medical Waste Management Rule 2016	28th March 2016
21.	Lindane	Pesticides	Banned from Manufacture, Import or Formulate w.e.f. 25th March, 2011 and banned for use w.e.f. 25th March, 2013.[32]	Vide Gazette Notification No S.O. 637(E) Dated 25/03/2011
22.	Alpha-hexeachlorocy-clohexane	Pesticides	Currently India does not have any policy, laws or legisalation for this POPs.	
23.	Beta-hexachlorocy-clohexane	Pesticides	Currently India does not have any policy, laws or legisalation for this POPs.	
24.	Perfluorooctane Sulfonic acid	Industrial Chemical	Currently India does not have any policy, laws or legisalation for this POPs.	
25.	Polychlorinated naphthalenes	Industrial Chemical	It is banned in printing ink for food packaging under BIS standard IS 15495:2004.	

Annexure II: Research Studies

Table B: Indian Research Studies on POPs

Name of the Author	Year of Publication	Tittle	Places/ Institutions	Results and Findings
Consumer Voice	2011	Slow Poisoning by slack standards	Consumer Voice/ Delhi	MRL of Endosulfan in cherry were found to be 5762.92ppb
Pandey. P., Khillare. P. S., Kumar. K.	2011	Assessment of Organochlorine Pesticide Residues in the Surface Sediments of River Yamuna in Delhi, India.	JNU/Delhi	Endosufan sulfate + DDT, Endrin aldehyde, DDD, Endrin and Methoxychlor were found in significant concentrations at all the sites in all the seasons, indicating their wide use.
Malik. et al.,	2011	Levels and distribution of persistent organochlorine pesticide residues in water and sediments of Gomti River (India)–a tributary of the Ganges River	Industrial Toxicology Research Centre/ Lucknow	The study indicates POPs contamination in major riverslike Ganges, Yamuna, Gomti and Cauvery. DDT and HCH in Gomti River water were found to range 6-476 ng/l.
Mishra. K., & Sharma R.C.,	2011	Assessment of organochlorine pesticides in human milk and risk exposure to infants from North-East India	J.M. Environmet Pvt. Ltd, Gurgaon/ Nagaon & Dibrugarh	The research study found 2330 - 3210 ng/g lipid weightt of DDT and HCH were found in human milk samples in Dibrugarh and Nagaon districts of Assam.
Consumer Voice	2011	Vegetables, India's poisoned staple	Cosnumer Voice/Delhi	Out of 193 samples of 35 vegetables tested, most fail European Standard. Presence of banned pesticides as aldrin, Endrin was found in the vegetables. Apart of these other Chemicals like chlordane in «bitter 'gourd , endrin in «bitter 'gourd, heptachlor in spinach etc were found in different vegetable tested.
Pandey P et al.,	2011	Assessment of Organochlorine Pesticide Residues in the Surface Sediments of River Yamuna in Delhi, India.	JNU/ Delhi	The Study shows that presence of Organochlorine pesticide Residues in the Surface Sediments of River Yamuna in Delhi found Endosufan sulfate + DDT, Endrin aldehyde, Endrin and Methoxychlor were found in significant concentrations at all the sites in all the seasons.

Name of the Author	Year of Publication	Tittle	Places/ Institutions	Results and Findings
Bala Krishna M.,	2011	Use of pesticides in commercial vegetable cultivation in Khamamm,	Dhanavanthari Institute of Pharmaceutical Sciences / Andhra Pradesh	Use of pesticides in commercial vegetable cultivation in Khamamm in Andhra Pradesh, wherein the 76% samples which were tested found to contain DDT above the tolerant limit
Kumar B et al.,	2011	Distribution of polychlorinated biphenyls in agricultural soils from NCR, Delhi, India. CPCB.	National Reference Trace Organics Laboratory/ CPCB, Delhi	The concentration of DL-PCBs ranged between 0.37- 19.09 ng g-1 (dry wt.) with an average of 6.26±0.03 ng g-1 (dry wt.). PCB-105 (25%), PCB-114 and PCB-118 (18%), were the dominant congeners.
Singh. L. et al.,	2012	Pesticide concentration in water and sediment of River Ganga at selected sites in middle Ganga plain	Galgotias College of Engineering and Technology, Noida	High concentration of Methylparathion, Endosulfan and DDT were observed both in water and sediment samples of the river.The results of the water and soil samples indicates presence of huge amount of both organochlorine and organophosphate pesticides in Ganga water in Bhalgalpur. The chemicals detected in the water samples were Lindane, Methyl-parathion, Endosulfan (the isomers alpha and beta endosulfan), and DDT (the isomers orthopara and para-para DDT).
Kumar. B., Singh. S K., Kumar. S., Sharma. C. S.	2012	Distribution of Polychlorinated Biphenyls in Surface Waters of Various Sources from National Capital Region Delhi India.	CPCB/NCR	The total concentrations of 28 PCBs were ranged between 14 - 1768 ng L-1 with a mean of 332±42 ng L-1. The concentration of dl-PCBs was ranged between <1-146 ng L-1 with the mean of 40±4 ng L-1 and accounted 12% for total 28 PCBs.
Kumar. B. et. al.,	(2012)	Dioxin-Like Polychlorinated Biphenyls in River Sediments.	CPCB/NCR	The concentration of Σdl-PCBsThe concentration of Σdl-PCBs ranges between 0.04-5.59 with an average of 1.28±0.16 ng g-1. CB-126 and CB-169 congeners represent the higher TEQ values which both had the high toxic potency.
Aslam M et al.,	2013	Quantification of Organochlorine Pesticide Residues in the Buffalo Milk Samples of Delhi City	Jamia Millia Islamia/Delhi	endosulfan were detected in 35% and 40% of the samples analyzed.
Kumar. R., Gupta. B., Gupta. H., Rani. M.	2014	Distribution of Persistent Organic Pollutants in Urban Aquatic Systems	IIT Roorkee/ Bhopal	Pesticide concentrations in water &sediments of the lakes were5.98 ng mL-1 (α-endosulfan) and), 349 ng g-1 (α-endosulfan) respectively. The maximum concentration of pp'-DDT and α-endosulfan in river water was 3.37 ng mL-1 and 3.55 ng mL-1.
Chakraborty. et. al.,	2014	Screening of Atmospheric Short- and Medium-Chain Chlorinated Paraffins in India and Pakistan using Polyurethane Foam Based Passive Air Sampler	SRM and Guangzhou Institute of Geochemistry, China	The highest concentrations of SCCPs and MCCPs were found at the same site (MB 06) in Colaba, Mumbai, India and the concentration were 47.4 and 38.2 ng m−3.
Greenpeace India	2014	Trouble Brewing: Pesticide residues in tea samples from India	Greenpeace	A total of 34 pesticides were found from the 46 samples of branded tea or 94% of tea residues contained at least one pesticides in tea samples. The most frequently detected pesticides Thiamethoxam, Cypermethrin, Acetamiprid, Thiacloprid, DDT, Deltamethrin, Dicofol (-p,p'isomer only), Imidacloprid and Monocrotophos, were present in over half of the samples.

Name of the Author	Year of Publication	Tittle	Places/ Institutions	Results and Findings
Vijayakumar. D. et. al.,	2014	Assessment and evaluation of hexachlorocyclohexane (HCH) and dichlorodiphenyltrichloroethane (DDT) residues and extent of DNA damage in cattle of Kasargoda district, northern Kerala, India	College of Veterinary and Animals Sciences, Kerala	Hexachlorocyclohexane(HCH) and Dichlorodiphenyltrichloroethane (DDT) found Residues and extent of DNA damage in Cattle of Kasargod District, Northern Kerala. The results shows that the mean concentration (ppm) of total HCH and DDT in water sample were 8.073 x 10-4 and 3.51 x 10-5 respectively.
Bharat. et. al.,	2015	Perfluoroalkyl substances (PFAS) in river and ground/drinking water of the Ganges River basin: Emissions and implications for human exposure.	The Energy and Resources Institute, New Delhi	15 PFAS and PFOS were frequently detected in the river with the highest concentrations observed for PFHxA (0.4 e4.7 ng L 1) and PFBS (<MQL e 10.2 ng L 1) among PFCAs and PFSAs, respectively. Prevalence of shortchain PFAS indicates that the effects of PFOA and PFOS substitution are visible in environmental samples from India.
Negi. R. K., Rani. S.,	(2015)	Contamination profile of DDT and HCH in packaged milk samples collected from Haridwar, India.	University of Delhi	Alpha HCH was found more as compared to all the isomers of HCH with mean concentration of 0.083 ppb in Paras brand followed by 0.067 ppb in Amul Gold. Total DDT was found maximum in the samples of Paras brand with mean concentration of 14.50 ppb followed by 8.51 ppb in Amul Gold, 8.05 ppb in Ananda, 7.14 ppb in Dairy Best and 4.21 ppb in Mother Dairy. Similar pattern of HCH isomers and DDT metabolites were reported in whole milk samples of Uttar Pradesh and Madhya Pradesh.[33]
Chakraborty, et. al.,	2016	E-Waste and Associated Environmental Contamination in the Asia/Pacific Region (Part 1): An Overview.	SRM University, Chennai	Maximum PCB contamination in the surface soil of Indian cities was observed in the informal e-waste recycling workshops engaged in precious metal recovery (88%), followed by grinding or shredding workshops (4%), dismantling sites (4%) and open dumpsites (4%). Overall soil PCDD/Fs and dl-PCBs concentrations in Indian cities were higher in all the functional e-waste sites over dumpsites.
Chakraborty. et. al.,	2017	Passive air sampling of polybrominated diphenyl ethers in New Delhi, Kolkata, Mumbai and Chennai: Levels, homologous profiling andsource apportionment.	SRM University, Chennai	PCDF congeners and maximum toxicity equivalents (TEQ) for both PCDDs (17 pg TEQ/g) and PCDFs (82 pg TEQ/g) at Mandoli in New Delhi has been related to intensive precious metal recovery process using acid bath. Among dumpsites, highest TEQ for PCDD/Fs was observed at Kodangaiyur dumpsite of Chennai (CNDS-02, 45 pg TEQ/g) (Chakraborty, 2017).
Bharat. K G.,	2018	Persistent organic pollutants in Indian environment: a wake-up call for concerted action.	The Energy and Resources Institute, New Delhi	Ganges which passes through the industrial belts and agriculture areas with huge fish eating population are at high risk from contamination with POPs and especially women and children, elderly are seen more vulnerable population compared to others

33 Nag, S.K., and Raikwar, K., Mukesh, Organochlorine Pesticide Residues in Bovine Milk. Bull. Environ Contam Toxicol., 80: 5–9 (2008).

Annexure III: Export (Quantities in Thousands):

Table C: Export of banned POP (Quantities in Thousands) data are in Unit = in KGs[34]

SN	Commodity Name	HS Code	2014-15	2015-16	2016-17	2017-18
1	Aldrin	38085000	439.98 (Till date India Exported highest amount of Aldrin from fron Vietnam in 2014-15 (175.96 kg)	57.68	73.17	-
2	DDT	38085200	-	-	-	1.13
3	Other DDT	29039229	448.8	573.35	962.73	991.01 (Till 2017-18 highest amount of DDT was exported to China People Republic 990 Kilos)
4	Endosulfan Technical	38089131	-	-	-	0.13
5	NAPHTHALENE,CHLO-RINATED	29039960	30.52 (Till date 23.50 Thousand kilo was the highest amount exported to Haiti)	3.47	11.08	3.3
6	1,2,3,4,5,6-HEXA-CHLOROCYCLOHEX-ANE(HCH (ISO)), INCLUDING LINDANE	29038100	0.01 kg	-	-	-
7	HEXACHLOROBEN-ZENE	29039210	-	20.04 (Till date 15.04 was highest amount of HEXACHLOROBEN-ZENE exported to China People Republic)	-	-
8	Pentachlorophenol	29081100	11.9	1.78	3	20.08 (Till date 20.08 Thousand kilo was the highest amount of Pentachlorophenol exported to Nepal)
9	Containing polychlo-rinated biphenyls (pcbs), polychlorinat-edterphenyls (PCTS) or polybrominated biphenyls (PBBS)	38248200	1	10.00 Till date 10.00 kilo was the highest amount exported to Ghana	0.30	-
10	DIELDRIN	29104000	0.07	0.03	0.00	-
11	ENDRIN	29105000	-	-	-	-
12	CHLORDECONE (ISO)	29147100	-	-	-	1.56

34 In packings of a net weight content not exceeding 300 G Unit: KGS

Annexure IV: Import (Quantities in Thousands)

Table D: Import of banned POPs (Quantities in Thousands) all data Units = in KGs

SN	Commodity Name	HS Code	2014-15	2015-16	2016-17	2017-18
1	ALDRIN*	38085000	501.97 India imported highest amount of Aldrin from Italy (218 kgs) in 2014-15	33.65	79.32	-
2	DDT	38085200	-	-	-	0.02
3	Other DDT	29039229	-	-	-	-
4	Endosulphan Technical	38089131	No data (Code missing)	No data (Code missing)	No data (Code missing)	No data (Code missing)
5	NAPHTHALENE,CHLORINATED	29039960	112.95 (Till date 112.95 Thousand kilo was the highest amount exported to China people's Republic)	8.90	6.60	16.92
6	1,2,3,4,5,6-HEXACHLORO-CYCLOHEXANE(HCH (ISO)), INCLUDING LINDANE	29038100	-	-	0.03	-
7	HEXACHLOROBENZENE	29039210	-	-	-	-
8	Pentachlorophenol	29081100	-	-	-	-
9	CONTAINING POLYCHLORIN-ATED BIPHENYLS (PCBS), POL-YCHLORINATEDTERPHENYLS (PCTS) OR POLYBROMINATED BIPHENYLS (PBBS)	38248200	0.02	-	0.05	-
10	DIELDRIN	29104000	0.04	-	-	-
11	ENDRIN	29105000	-	-	-	0.51
12	CHLORDECONE (ISO)	29147100	-	-	-	0.09

Annexure V: Export Data of POPs(Values in Rs. Lacs)

Table E: Export of banned POPs (Values in Rs. Lacs)[35]

S. No.	Commodity Name	HS Code	2014-15	2015-16	2016-17	2017-18
1	Aldrin	38085000	1,780.68	150.46	316.16	-
2	DDT (ISO) (CLOFENOTANE (INN)[36]	38085200			-	1.16
3	Other DDT	29039229	611.53	844.67	1,944.95	2,219.09
4	Endosulfan Technical	38089131	No data (Code missing)	No data (Code missing)	-	0.75
5	NAPHTHALENE,CHLORINATED	29039960	36.10	60.40	26.74	41.04
6	1,2,3,4,5,6-HEXACHLOROCYCLOHEX-ANE(HCH (ISO)), INCLUDING LINDANE	29038100	0.50	-	No Data (Code has been removed)	No Data (Code has been removed)
7	HEXACHLOROBENZENE	29039210	-	19.46	-	-
8	Pentachlorophenol	29081100	18.76	2.46	4.79	6.13
9	CONTAINING POLYCHLORINATED BIPHENYLS (PCBS), POLYCHLORINATEDTERPHENYLS (PCTS) OR POLYBROMINATED BIPHENYLS (PBBS)	38248200	1.24	12.00	0.44	-
10	DIELDRIN	29104000	-	2.66	12.13	19.16
11	ENDRIN	29105000	No data (Code missing)	No data (Code missing)	No data (Code missing)	No data (Code missing)
12	CHLORDECONE (ISO)	29147100	No data (Code missing)	No data (Code missing)	No data (Code missing)	306.31

35 The information is retrieved from http://commerce-app.gov.in/eidb/default.asp
36 In packings of a net weight content not exceeding 300 G Unit: KGS

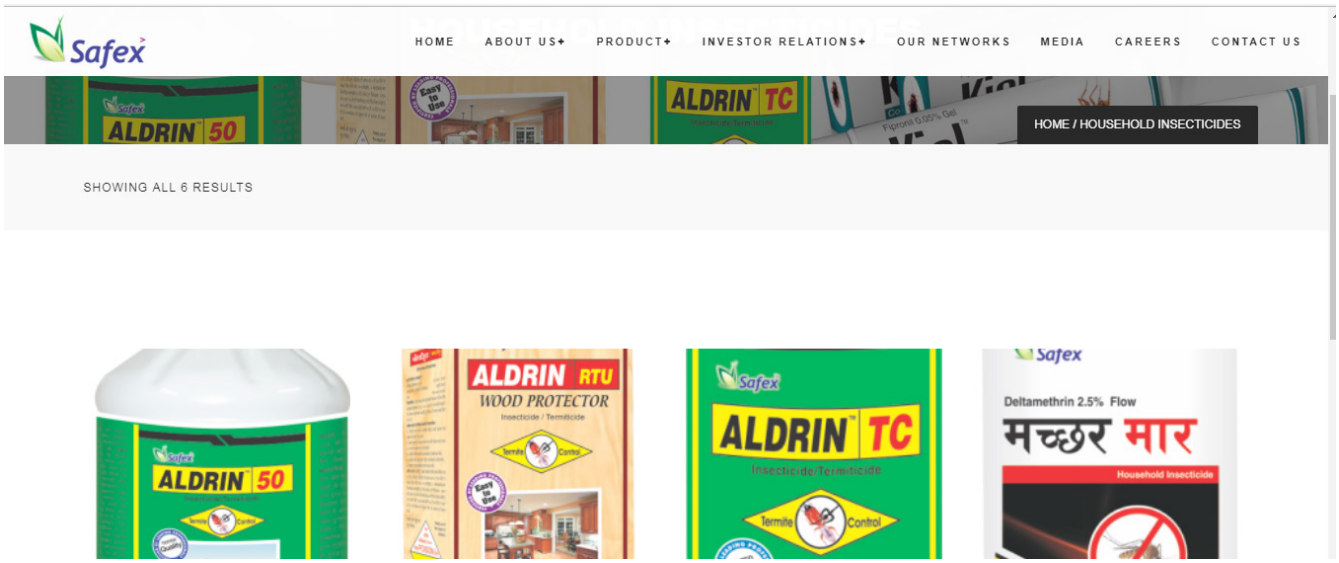
Annexure VI: Import Data of POPs (Values in Rs. Lacs)

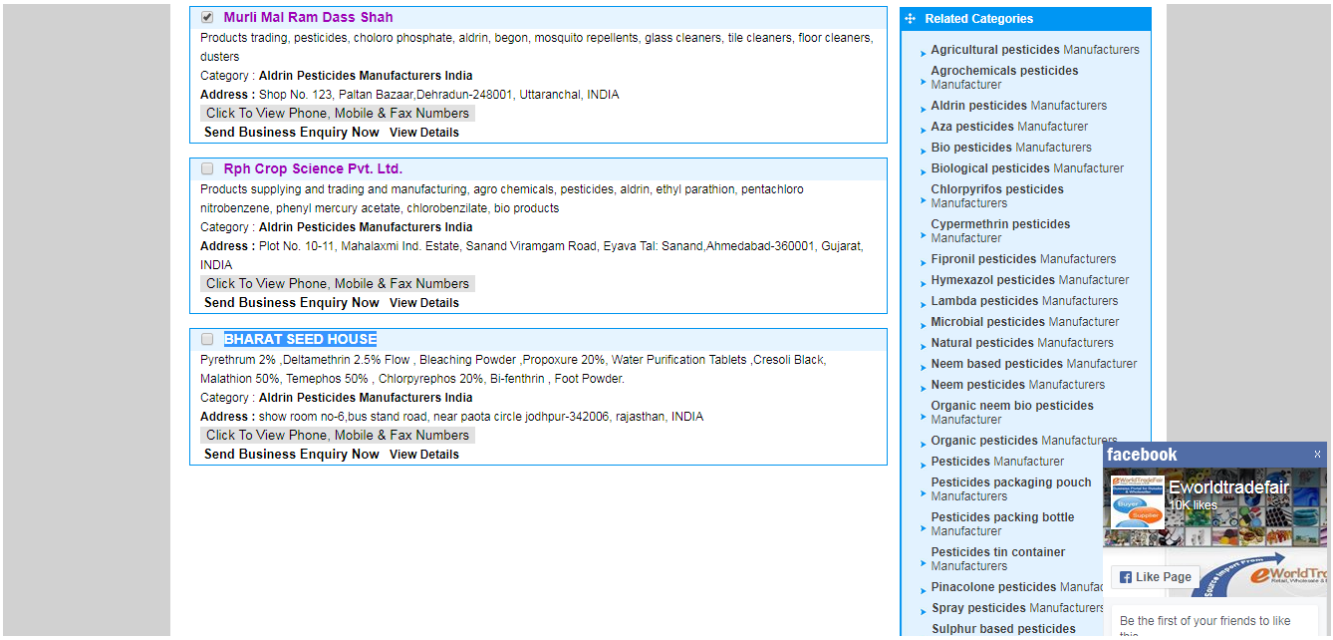
Table F: Import of banned POPs (Values in Rs. Lacs)[36]

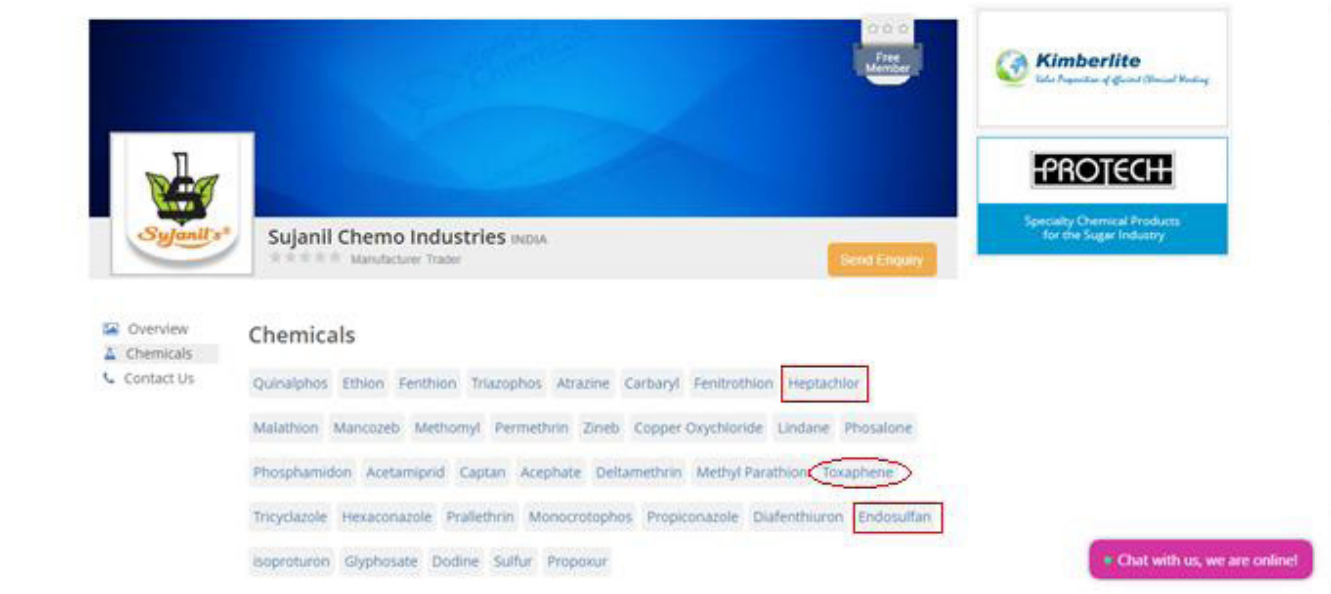
S. No.	Commodity Name	HS Code	2014-15	2015-16	2016-17	2017-18
1	ALDRIN*	38085000	2,767.68	326.76	507.06	-
2	DDT (ISO) (CLOFENOTANE (INN)[37]	38085200	-	-	-	0.02
3	Other DDT	29039229[30]	-	0.06	0.85	-
4	Endosulphan Technical	38089131	No data (Code missing)	No data (Code missing)	No data (Code missing)	No data (Code missing)
5	NAPHTHALENE, CHLORINATED	29039960	354.41	210.11	124.33	257.33
6	1, 2, 3, 4, 5, 6-HEXACHLOROCY-CLOHEXANE(HCH (ISO)), INCLUDING LINDANE	29038100	No data (Code is missing)	-	0.03	-
7	HEXACHLOROBENZENE	29039210	-	-	-	-
8	Pentachlorophenol	29081100	-	-	0.05	0.09
9	CONTAINING POLYCHLORINATED BIPHENYLS (PCBS), POLYCHLORINATEDTERPHENYLS (PCTS) OR POLYBROMINATED BIPHENYLS (PBBS)	38248200	0.22	-	0.49	-
10	DIELDRIN	29104000	2.86	0.53	0.84	1.21
11	ENDRIN	29105000	-	-	-	0.51
12	CHLORDECONE (ISO)	29147100	-	-	-	79.87

36 The information is retrieved from http://commerce-app.gov.in/eidb/default.asp
37 In packings of a net weight content not exceeding 300 G Unit: KGS

Annexure VII: Companies producing banned pesticides Aldrin



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Sujanil Chemo Industries INDIA
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Kimberlite
PROTECH
Specialty Chemical Products for the Sugar Industry
Overview
Chemicals
Contact Us
Chemicals
Quinalphos Ethion Fenthion Triazophos Atrazine Carbaryl Fenitrothion Heptachlor
Malathion Mancozeb Methomyl Permethrin Zineb Copper Oxychloride Lindane Phosalone
Phosphamidon Acetamiprid Captan Acephate Deltamethrin Methyl Parathion Toxaphene
Tricyclazole Hexaconazole Prallethrin Monocrotophos Propiconazole Diafenthiuron Endosulfan
Isoproturon Glyphosate Dodine Sulfur Propoxur
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Annexure VIII: List of banned POPS found to be sold in Dausa

(This need to tested in order to indentify whether it is Aldrin or not):

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Figure A Aldrin being sold in Dausa (Rajasthan)

© Bikash Chetry / Toxics Link

Figure B Chemical Sold as an DDT in Dausa (This need to tested in order to indentify whether it is DDT or not)

** Photos taken during field visit in February 2018*

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