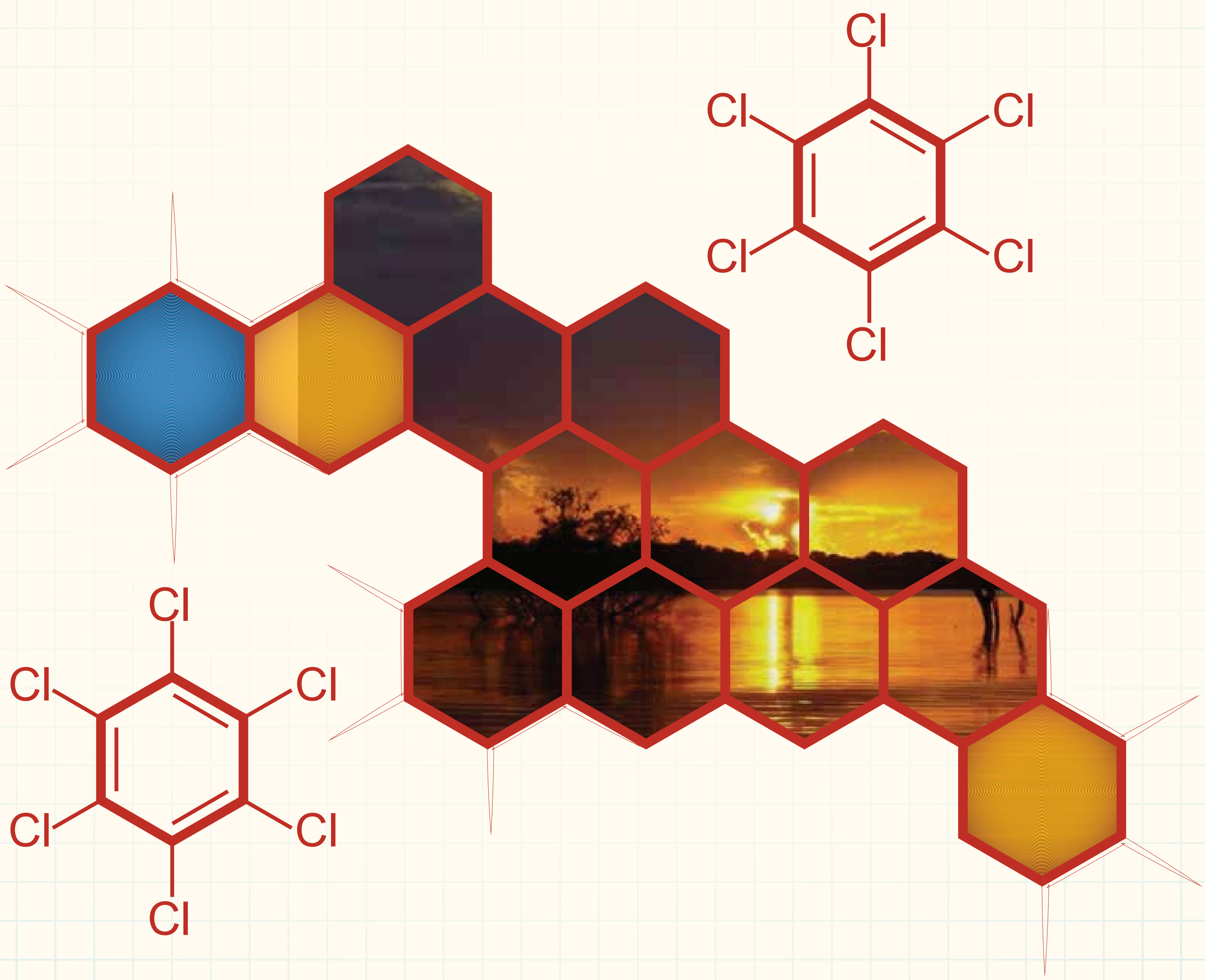
National Implementation Plan
Brazil

Stockholm Convention



BRASIL POPs
Plano Nacional de Implementação
Convenção de Estocolmo

National Implementation Plan
Brazil

Stockholm Convention

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National Implementation Plan Brazil

Stockholm Convention

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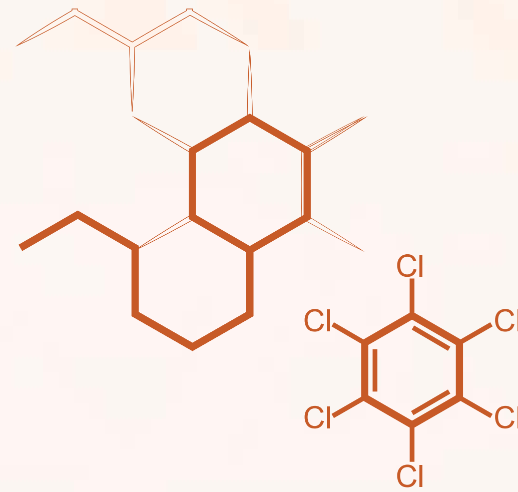


Presentation

Chemicals are part of everyday life and make the lives of millions of people around the world more productive and comfortable. However, there are toxic substances that persist, bioaccumulate and transport over long distances, such as the Persistent Organic Pollutants (POPs).

The increased incidence of cancer, of conditions that affect the reproductive system and other chronic effects are examples of adverse consequences of exposure to these substances, affecting particularly vulnerable populations such as women, children, workers and farmers, notably in developing countries.

Therefore, highly dangerous chemicals such as POPs should be subject to restrictions throughout the production chain, from production and imports controls to the regulation of exports, trade and use. Thereby, completing the cycle and reducing the exposure of workers and vulnerable populations and preventing the contamination of soil, water and air. Hazardous waste management activities should be exempt of taxes.

The Stockholm Convention on Persistent Organic Pollutants requires the adoption of measures to eliminate or reduce releases arising from intentional production and use and from unintentional production and is, therefore, a global structuring milestone in the search for environmentally sound management of chemicals. For this purpose, the Parties shall prepare and publish a National Implementation Plan, which is the document that systematizes and reflects the strategies and measures designed to meet the commitments made by the country.

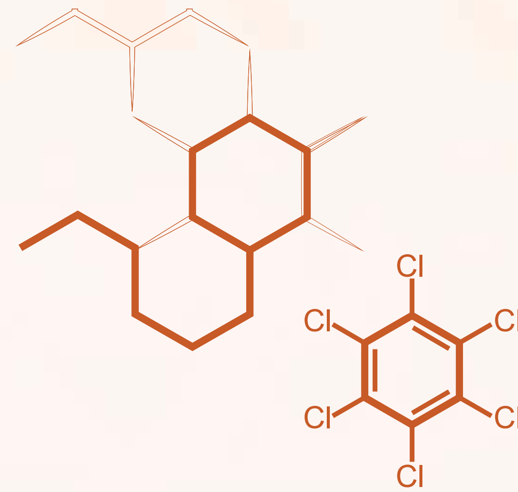
Brazil actively participated in the negotiations that led to the Stockholm Convention in the 90s. It adopted its text in 2001 and ratified it in 2004; and as of 2005 has been making efforts to promote national debate, survey the situation of POPs and establish the necessary measures to control these substances in the country.

The National Implementation Plan of the Stockholm Convention that we now present to the country is a guide for public and private action for the elimination of POPs. It is the result of the collective work of several Inter-institutional Technical Groups formed by representatives of federal agencies, state environment, agriculture and health bodies, sectoral associations, non-governmental environment and health organizations, industry associations and the Academy. In this process, we were greatly supported by the Global Environment Facility (GEF), as a financier, the United Nations Environment Programme (UNEP), as the Implementing Agency, and Cetesb, as the Stockholm Convention's Regional Centre for Latin America and the Caribbean.

As a result of this effort, the Plan outlines the national scene through inventories of sources and emissions of POPs, embraces the ongoing actions undertaken by the various sectors and segments and finally, guides towards further measures required in the upcoming five years, when the Plan shall be reviewed in its progress, scope and effectiveness. It should be noted that Brazil will be one of the first developing countries to consider not only the initial 12 POPs, but also the 11 New POPs included at the latest Conference of the Parties in 2013 in the scope of its national measures.

The National Implementation Plan of the Stockholm Convention embodies an international commitment while representing an essential tool for the country to mobilize resources to eliminate POPs. It is also an important contribution to achieving the Johannesburg Plan's goal of establishing 2020 as the deadline for chemical substances to be managed properly in order to minimize the risks to the environment and to human health.

The Ministry of the Environment



Executive summary

This NIP was developed by the Ministry of the Environment in cooperation with various institutions and national partners from the government, industry associations, civil society and academia, with funding from the Global Environment Facility (GEF), and the support of the United Nations United Environment Programme - UNEP.

The NIP is divided into thirteen sections, whose contents and main conclusions are described below:

Section 1 - Introduction: describes the principles and obligations of the Stockholm Convention, the characterization of POPs listed in its annexes and also details the process of preparation of the NIP, including its objectives and stakeholders.

Section 2 - Country Profile: provides information about Brazil's geography, climate, population, economy, agriculture and livestock, industrial production, chemical industry, environment, vegetation, water resources and energy mix, as well as the context of Regional Cooperation within Mercosul in order to explain the national scene and facilitate the understanding of the strategies adopted.

Section 3 - Institutional and Legal frameworks for the management of chemicals: presents the structure and progress of the Brazilian environmental policy, describes the dynamics of the National Environmental System (SISNAMA) and the National Environment Council (CONAMA) as well as the scope of action of each administrative branch. It also describes the government institutions involved in environment and health protection and chemicals management and their respective responsibilities. It highlights the national legislation related to the management of chemicals and POPs and current national programs and systems to monitor contaminants and pesticide residues in food.

Furthermore, it shows that the presented normative framework established the legal basis for environmental governance in Brazil and allowed for the improvement of the control of potentially polluting processes and activities. However, challenges still exist and the country is committed to meeting them, while seeking to develop on a socially and environmentally sustainable basis.

Section 4 - Status of POPs in Brazil: Annex A and Annex B POPs: presents, in light of the Convention's requirements, the situation of Annex A and Annex B POPs, regarding production, use and foreign trade as well as the measures adopted in Brazil for the identification and disposal of POPs stockpiles and wastes.

The section first addresses POPs used for agricultural and non-agricultural purposes, gathering all information on production, imports and exports of these POPs in the available databases. It then systematizes the legal status of POPs pesticides and presents the results obtained in the National

Inventory of stockpiles and wastes of POPs used as pesticides and other related uses. The inventory showed that the amount of remaining (i.e. awaiting disposal) POPs pesticides in December 2012, was of 666,120.0 kg + 29.0 L; and those which were already disposed of by that period, amounted to 1900490.3 kg and 20 L.

Based on the results of the inventory, the priority actions for the Action Plan, which have been identified are: - elimination of POPs stockpiles and pesticide residues already inventoried; - Engagement of strategic partners in the states for carrying out campaigns for identification s and disposal of stockpiles of obsolete POPs pesticides; and - technical training of state environmental, agriculture and development agencies and preparation of booklets to guide the collection and disposal of POPs pesticides stockpiles.

The section then goes on to address the industrial POPs, starting with polychlorinated biphenyls (PCBs), presenting summarized information on their production and use in Brazil and the results of the National Inventory of PCBs, which, through a survey held among companies accredited for disposal of PCBs, indicated that about 20 tons of this POP were disposed of in an environmentally sound manner. Adding this amount that has already been disposed of to the total amount in the inventory, approximately 25 tons of PCB were found in Brazil.

The inventory gathered information on merely 20% of the PCB supposedly in circulation, indicating that at least 80% of the amount of PCBs still in use must still be inventoried, labeled and handled in an environmentally appropriate manner.

To comply with the provisions of the Stockholm Convention regarding PCBs, Brazil runs an international project funded by GEF and supported by UNDP, whose expected results by 2028 are: 1) strengthening of legal and administrative procedures and establishment of standardized management processes for PCBs and their disposal; 2) management of oils identified as PCBs and of equipment and wastes contaminated with PCBs in partnership with the private sector in order to minimize human and environmental exposure; and 3) storage and environmentally sound disposal of PCBs waste via demonstration projects.

In continuity, the results of the National Inventory of New industrial POPs have been questioned for finding that there is no information about the past use of hexabromobiphenyl (HBB) in Brazil, or the existence of stockpiles or products containing this substance. Regarding pentachlorobenzene (PeCB), there are no records of production and recent use in Brazil. About PBDEs, most answers of a survey for the inventory indicate that respondents did not use articles containing c-Penta-BDE and octa-BDE and that they do not use Deca-BDE. However, some answers indicate that these POPs may have been used in the past and that DecaBDE may still be in use. Likewise, on PFOS, of the list of possible uses, the only categories of use that have been identified in the country during the preparation of the inventory were sulfluramid-based bait insecticide and electroplating. Finally, in relation to Hexabromocyclododecane (HBCD), the initial survey indicated that imports of this substance are increasing as they rose from 90 tonnes in 2012 to 115 tonnes during the first nine months of 2013. According to the information received, this substance is used in Brazil in the manufacturing of EPS, XPS and HIPS, for thermal insulation purposes in the construction industry and as a flame retardant additive for industrial use.

In essence, the Action Plan for these substances presents strategies for appropriate management of articles and wastes containing new POPs as well as strategies for reducing the use, with an aim to eliminate POPs that are still in use in Brazil.

Section 5 – Annex C POPs: Unintentional emissions: provides information on the POPs in Annex C of the Stockholm Convention, namely: Dibenzo-p-dioxins and dibenzofurans (PCDD / PCDF), hexachlorobenzene (HCB), polychlorinated biphenyls (PCBs), and the recently added, pentachlorobenzene (PeCB), which are unintentionally formed POPs and released from thermal processes involving organic matter and chlorine as a result of incomplete combustion or chemical reactions.

The section first addresses the results of the National Inventory of Sources and estimated unintentional POPs emissions, which shows that Brazil has all emission sources listed in UNEP's guide Chemicals, Standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases, and the potential to release 2,235 g-TEQ of dioxins and furans. The largest share was of releases to air, with 42.3% of the total releases in 2008. Next is the release in waste, with 24.4%, and in third is the release in product, with 18.7%. The largest participation by category of source is Category 2 - ferrous and non-ferrous metals, with 38.2%, followed by Category 3 - Open burning, with 22.8% and in the third, Category 7 - Chemicals and consumer goods, with 17.5%. The Southeast Region proved to have most releases with 58.8%, followed by the South Region with 12.4%. The lowest participation was that of the Northern Region with 8.4%. The State of São Paulo is the state with the highest share, reaching 28.9% of total emissions, followed by the State of Minas Gerais, with 12.9%. The State of Rio de Janeiro contributed 10.1%. These three states together account for 51.9% of releases. The top ten (SP, MG, RJ, ES, PA, PR, RS, MT, BA and GO) account for 86% of emissions.

The summary of the strategy to reduce/eliminate PCDD/PCDF releases is then presented. It proposes an expected reduction of 1,018 g-TEQ over the five-year period of implementation of the Action Plan. This corresponds to a 45.5% reduction in relation to the total estimated releases for the base-year 2008.

Section 6 – Pollutant Release and Transfer Register (RETP/PRTR): presents the RETP/PRTR, demonstrates its relevance and the current stage of implementation.

Section 7 - Contaminated Sites: presents the national legislation related to the control and monitoring of contaminated areas and also some initiatives at the federal, state and local levels to identify and remediate contaminated areas. It then presents the results of the National Inventory of POPs Contaminated Sites, which identified 117 areas, of which nine have been rehabilitated and two are already in reuse, indicating that 9% of the total were decontaminated. Of the 26 Brazilian states, 9 have records of areas contaminated by POPs, 8 reported not having knowledge of the existence of these areas, and the remaining 9 had no information for identification. About 85% of the identified areas are located in the Southeast, with 81 of them in the state of São Paulo, and 31 in the city of São Paulo.

The inventory showed that Brazilian states are at different levels of progress in identifying areas contaminated with POPs, therefore, the following priorities are highlighted in the Action Plan: 1) promote training and guidance to state environment agencies for the management of POPs contaminated sites; 2) develop guidelines and reference documents for the management of contaminated sites; and 3) support the implementation of demonstration projects of remediation of PCB and DDT contaminated sites.

Section 8 - Measures to improve the country's legislative framework and institutional capacity to carry out the activities in compliance with the obligations of the Stockholm Convention: presents the main conclusions outlined in the study on the analysis and review of national legislation concerning POPs. Legal loopholes and the need to review national legislation on the following topics are discussed. 1) Pesticide Registration, Household Cleaning Products, Wood Preservatives and others; 2) Chemicals for Industrial Use; PCBs; 4) New industrial POPs; 5) Labelling of POPs; 6) Customs Codes - Import and

Export; 7) Management of wastes containing POPs; 8) Water and soil quality control; 9) Unintentional emissions of POPs; and 10) Institutional capacity.

Section 9 - Technologies available for disposal of POPs and remediation of POPs contaminated sites: Presents information about the technologies historically used in the country to dispose of POPs. It also states that in order to fully verify the national capacity for the disposal of POPs, the NIP Brazil will include a study on the subject, which should also incorporate a strategy to encourage the installation in Brazil of the latest technology which bring greater environmental benefits, as well as a systematic survey of the techniques to remediate POPs contaminated sites available in Brazil.

Section 10 - Dissemination of information, public awareness and social participation: presents the set of dissemination and training actions that will be undertaken to promote and facilitate access to information by the public, the participation of civil society in the implementation of the Convention and the training of technical staff to meet the obligations of the Convention.

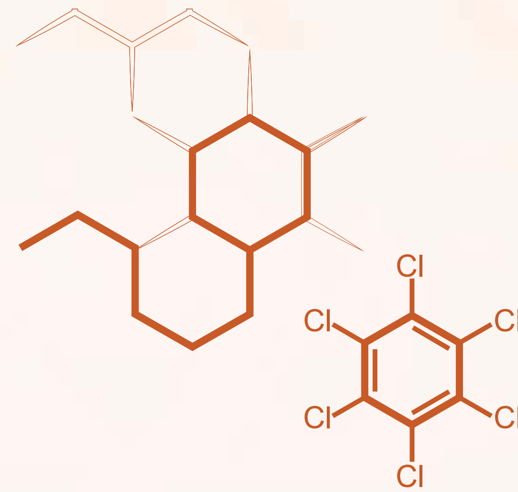
Section 11 - National laboratory infrastructure for analysis and monitoring of POPs: presents the Brazilian laboratory infrastructure for analysis and monitoring of POPs, highlighting the identified shortcomings and indicating the points that need improvement for the following categories of POPs: pesticides, PCBs, Dioxins and Furans and New Industrial POPs.

Section 12 – Capacity for environmental monitoring of POPs: presents the latest results of the Global Monitoring Plan (GMP), which provides a harmonized organizational framework for the collection of comparable monitoring data, or information ont the presence of POPs in all regions in order to identify changes in levels of POPs over time as well as provide information on regional and global environmental transport (UNEP, 2013).

It also presents the efforts made in order to create a National Network of POPs Monitoring in Brazil, indicating laboratories that are willing to participate and their current analysis capacity This section mentions that the Action Plan will include actions to strengthen the Discussion Group, continue discussions regarding the creation of a National or Regional Monitoring Network, and include the issue related to the monitoring of New Industrial POPs in the agenda of the meeting.

It then presents the national and international monitoring programs of POPs by sampling in which Brazil participates, indicating the position of the eleven ambient air sampling points existing in various regions of the country and the main results of monitoring studies of different types of POPs.

Section 13 - Action Plans: details the strategies and actions of the Brazilian National Implementation Plan to meet the Convention's commitments, based on the country's situation in the Inventories and the intervention priorities that were determined. It provides information about the activities' status, deadlines and those responsible for implementing this plan, which will be reviewed and updated every 05 years, and its progress evaluated. The NIP contains the following measures and action plans: 1) measures to strengthen national institutional capacity and the legislative framework of the country for the management of POPs; 2) Action Plan for the management of stockpiles and wastes of POPs used as pesticides and other non-agricultural uses; 3) Action Plan for the management of polychlorinated biphenyls (PCBs); 4) Action Plan for New Industrial POPs; 5) Brazil's Action Plan for the management of sites contaminated with Persistent Organic Pollutants (POPs); 6) Action Plan for the Progressive Reduction of Unintentional Persistent Organic Pollutants (POPs) Releases; 7) measures for information dissemination, public awareness and education; and 8) Measures to improve the national analytical capacity, monitoring of POPs, research, development and innovation.



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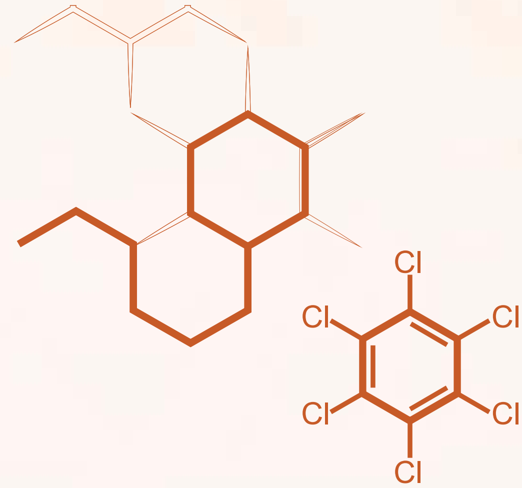

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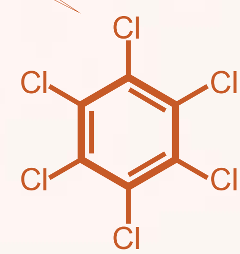

List of abbreviations and acronyms

ABC	Brazilian Cooperation Agency
ABIPLAST	Brazilian Plastics Industry Association
Abiquim	Brazilian Chemical Industry Association
ABNT	Brazilian Technical Standards Association
ABRAPEX	Brazilian Association of Expanded Polystyrene
ACPO	Association Against Pollutants
AI	Active Ingredient
AM	Amazonas (state)
ANA	National Water Agency
ANEEL	Brazilian Electricity Regulatory Agency
Anvisa	National Health Surveillance Agency
APROMAC	Environment Protection Association of Cianorte
ATESQ	Association of Workers Exposed to Chemicals
BA	Bahia (state)
BAT/BEP	Best Available Techniques and Best Environmental Practices
CAS	Chemical Abstracts Service
CDI	Industrial Development Council
CENA	Centre for Nuclear Energy in Agriculture
CEPEL	Electrical Energy Research Centre
CETESB	São Paulo State Environmental Protection Agency
CF	Federal Constitution
CNRH	National Council of Water Resources

CO	Carbon Monoxide
CONAB	National Food Supply Company
CONAMA	National Environment Council
CONASQ	National Chemical Safety Commission
COP	Conference of the Parties
CRESESB	Reference Centre for Solar and Wind Energy
CTA	Technical Advisory Committee for Pesticides
CTF	Federal Technical Cadastre of Activities that are Potentially Polluting or Use Environmental Resources
CTSST	Tripartite Commission on Occupational Safety and Health
CVUA	State Institute for Chemical and Veterinary Analysis
DDT	Dichlorodiphenyltrichloroethane
DF	Federal District
DENATRAN	National Department of Traffic
EaD	Distance Learning
ELV	End of Life Vehicle
Embrapa	Brazilian Agricultural Research Corporation
EPA	Environmental Protection Agency
EPI	Personal Protection Equipment
EPS	Expanded Polystyrene
ES	Espírito Santo
ETFE	Ethylene Tetrafluoroethylene
FAO	Food and Agriculture Organization of the United Nations
FEEMA	State Foundation for Environmental Engineering
Fiocruz	Oswaldo Cruz Foundation
FSP	Faculty of Public Health
Funasa	National Health Foundation
Fundacentro	Jorge Duprat Figueiredo Foundation for Occupational Safety and Medicine
FURG	University of Rio Grande do Sul Foundation
G	Gram
GAPS	Global Atmospheric Passive Sampling

GDP	Gross Domestic Product
GEF	Global Environment Facility
GHS	Globally Harmonized System of Classification and Labelling of Chemicals
GMP	Global Monitoring Program
GNC	National Coordinating Group
GO	Goiás (state)
GRULAC	Latin American and Caribbean Group
GTI	Interinstitutional Technical Group
Hab	Habitantes
HCB	Hexachlorobenzene
HCH	Hexachlorocyclohexane
HIPS	High-Impact Polystyrene
HRMS	High Resolution Mass Spectrometer
HS	Harmonized commodity description and coding System
Ibama	Brazilian Institute for the Environment and Renewable Natural Resources
IBGE	Brazilian Institute of Geography and Statistics
ICCA	International Council of Chemical Associations
ICE	Conformity Index
ICMBio	Chico Mendes Institute of Biodiversity Conservation
INCQS	National Institute for Quality Control in Health
Incra	National Institute for Colonization and Agrarian Reform
Inhab	Inhabitants
INMETRO	National Institute of Metrology, Quality and Technology
inpEV	National Institute for Processing Empty Containers
IP	Inhalable Particle
IPT	Institute for Technological Research
JBPP	Japan-Brazil Partnership Programme
JICA	Japan International Cooperation Agency
LACEN	Central Public Health Laboratory
LANAGRO	National Agricultural Laboratory

LAPAN	Latin American (POPs) Passive Atmospheric Sampling Network
LD	Limit of Detection
LQ	Limit of Quantification
MAPA	Ministry of Agriculture, Livestock and Food Supply
MCTI	Ministry of Science, Technology and Innovation
MDIC	Ministry of Development, Industry and Foreign Trade
Mercosul	Southern Common Market
MG	Minas Gerais (state)
MJ	Ministry of Justice
MLE	Maximum Limit of Emissions
MMA	Ministry of the Environment
MME	Ministry of Mines and Energy
MRE	Ministry of External Relations
MRL	Maximum Residue Levels
MS	Ministry of Health
MT	Ministry of Transportation
MT	Mato Grosso (state)
MTE	Ministry of Labour and Employment
MTM	Man-Technology-Environment Research Centre
NAFTA	North American Free Trade Agreement
NCM	Mercosul Common Nomenclature
NIP	National Implementation Plan
NGO	Non-Governmental Organization
NO_2	Nitrogen Dioxide
O_3	Ozone
OCP	Organochlorine Pesticides
OD	Dissolved Oxygen
ODS	Ozone-Depleting Substances
OEMA	State Environmental Agency
PA	Pará (state)

PARA	Pesticide Residues in Food Analysis Programme
PAS	Passive Air Sampler
PBB	Polybrominated Biphenyl
PBCO	Brazilian Programme for the Elimination of Production and Consumption of Ozone Layer Depleting Substances
PBDE	Polybrominated Diphenyl Ethers
PCBs	Polychlorinated Biphenyl
PCDD	Polychlorinated Dibenzo-P-Dioxins
PCDF	Polychlorinated Dibenzofurans
PeCB	Pentachlorobenzene
PIB	Gross Domestic Product
PLANAPO	National Plan for Agroecology and Organic Production
Plansab	National Sanitation Plan
PLANSAT	National Occupational Safety and Health Plan
PMDBBS	Brazilian Biome Deforestation Monitoring by Satellite Project
PNAPO	National Policy for Agroecology and Organic Production
PNCRC	National Plan to Control Residues and Contaminants
PNMA	National Environmental Policy
PNMC	National Plan on Climate Change
PNRH	National Plan on Water Resources
PNRS	National Solid Wastes Policy
PNSST	National Occupational Safety and Health Policy
POEIRA	Obsolete Pesticides and Lindane Collection Programme
POP	Persistent Organic Pollutant
POPRC	Persistent Organic Pollutants Review Committee
PPA	Potential Environmental Hazard
PPCS	National Plan for Sustainable Production and Consumption
PPE	Personal Protective Equipment
PR	Paraná (state)
PR	Presidency of the Republic
PROCONVE	Programme to Control Air Pollution from Motor Vehicles

PRONAR	National Air Quality Control Programme
PTS	Total suspended particulates
RAPAL-BRASIL	Action Network on Pesticides and their Alternatives in Latin America
RBLH	Brazilian Network of Breast Milk Banks
REBLAS	Brazilian Network of Analytical Laboratories in Health
RECETOX	Research Centre for Toxic Compounds in the Environment
Renaciat	National Network of Information Centres and Toxicological Assistance
RJ	Rio de Janeiro (state)
RNLVISA	National Network of Health Surveillance Laboratories
RO	Rondônia (state)
RS	Rio Grande do Sul (state)
SAICM	Strategic Approach to International Chemicals Management)
SDO	Substâncias que destroem a camada de ozônio
SC	Santa Catarina (state)
SEAB	Agriculture and Food Supply Secretariat
Sinan	Notifiable Diseases Information System
Sinitox	National System of Toxic and Pharmacological Information
SISCOMEX	Integrated Foreign Trade System
SISNAMA	National Environmental System
SMCQ	Climate Change Secretariat (Ministry of the Environment)
SNIP	National Information System for the National Stockholm Convention Plan
SVS	Health Surveillance Secretariat, Ministry of Health
SNVS	National Health Surveillance System
SO_2	Sulfur Dioxide
SP	São Paulo (state)
SRHU	Water Resources and Urban Environment Secretariat (Ministry of the Environment)
Sucam	Superintendency for Public Health Campaigns
SUS	Unified Health System
TCTP	Third Country Training Programme
TEQ	Toxicity Equivalent

Toxisphera	Environmental Health Association
TSI	Trophic State Index
TSP	Total Suspended Particles
ULV	Ultra Low Volume
UF	Unit of the Federation
UFRJ	Federal University of Rio de Janeiro
UFSM	Federal University of Santa Maria
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESP	São Paulo State University
UNIDO	United Nations Industrial Development Organization
UNITAR	United Nations Institute for Training and Research
USA	United States of America
US$	US Dollar
USP	University of São Paulo
VIGIQUIM	National Environmental Health Surveillance related to Chemicals Programme
WEE	Waste of Electrical and Electronic Equipment
WHO	World Health Organization
WQI	Water Quality Index
XPS	Extruded polyestyrene


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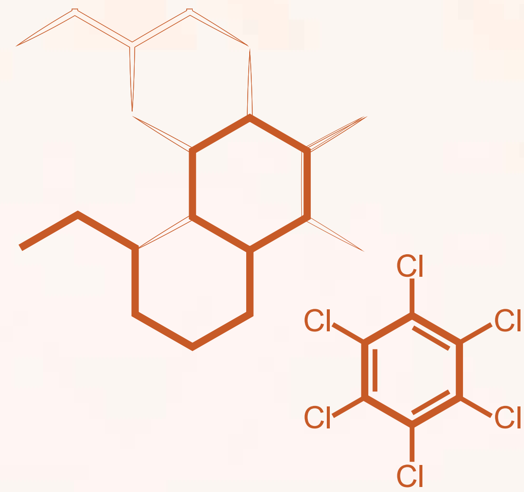

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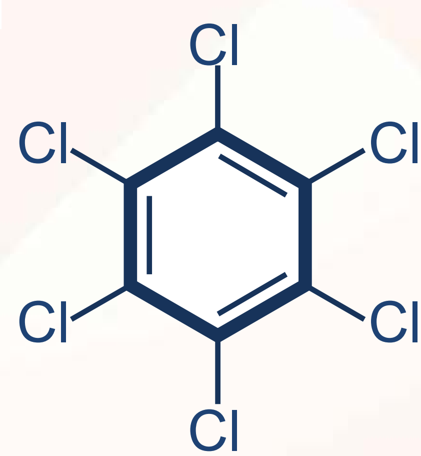
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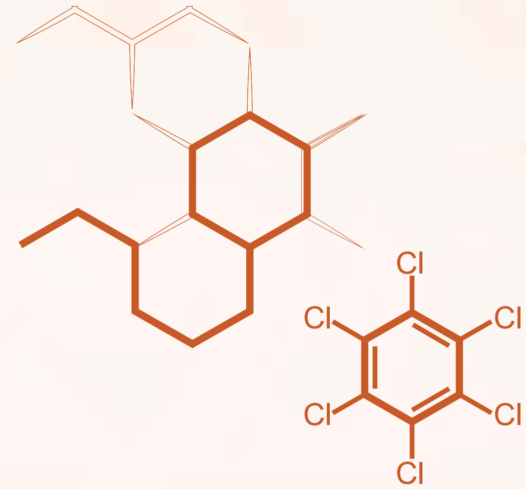


Foreword

On May 23, 2001 the Stockholm Convention on Persistent Organic Pollutants (POPs) was adopted in Stockholm, Sweden, with the aim of protecting human health and the environment from the effects of these pollutants.

The Convention requires the signatory countries to implement actions to phase-out or reduce the production, use, export and import of POPs, to prevent the unintentional release of these substances to the environment, as well as to provide sound disposal of their wastes and stockpiles.

The Convention entered into force on May 17 2004, when 50 countries ratified it. Brazil signed it on May 22 2001 and ratified it on June 16 2004, becoming a Party to this global commitment.

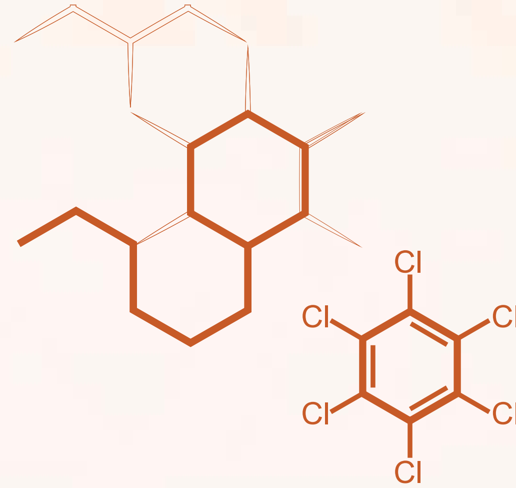
As a signatory country, Brazil recognises its obligation, under Article 7 of the Convention, to develop a National Implementation Plan (NIP), indicating how it will meet the commitments established in the treaty, defining priorities and strategies for this purpose.

This NIP was developed by the Ministry of the Environment, in cooperation with several national institutions and stakeholders from government, industry associations, civil society and academia, with funding from the Global Environment Facility (GEF) and administration by the United Nations Environment Programme (UNEP).

The document presents the findings of an initial investigation of the status of implementation of the Convention in Brazil, the uses of these chemicals in the country, the management of their wastes and stockpiles, POP-contaminated sites, as well as installed national capacity. It identifies the legislative and administrative measures already underway to protect human health and the environment from the effects of POPs and points to gaps that must be overcome. Lastly, it provides an Action Plan that allows Brazil to meet its obligations under the Stockholm Convention.

The progress of the implementation should be continuously evaluated and the Plan revised whenever appropriate.

This NIP comprises the 12 initial POPs, the 9 new POPs added to the Convention Annexes in 2009, Endosulfan, listed in 2011 during the COP 5 and hexabromocyclododecane (HBCD), listed during COP 6, in 2013.



1 Introduction

1.1 Persistent Organic Pollutants and the Stockholm Convention

Persistent organic pollutants (POPs) are organic substances that remain in the environment for a long period of time and bioaccumulate in living organisms, are very stable and toxic, in addition to having a low capacity for chemical, physical or biological degradation.Studies show adverse effects of these substances on human health and the environment worldwide. Diseases may manifest immediately or years after exposure.

POPs can be transported through air, water and migratory species, beyond international boundaries, and be deposited in land and water ecosystems, making them a global concern.

The worldwide occurrence of several cases of contamination associated with exposure to these substances alerted to the need to adopt a comprehensive strategy to eliminate them. These substances have been widely used as insecticides, pesticides and industrial inputs and are produced unintentionally in combustion processes.

In Brazil the largest event of POPs contamination occurred in an area called “Cidade dos Meninos” (Boy’s Town), in the city of Duque de Caxias, State of Rio de Janeiro, where, between the 1950s and 1960s, a factory synthesized and formulated lindane to control the vectors of Chagas disease and Malaria (OLIVEIRA et al., 2003). The factory shut down in 1962, but waste remained exposed on the ground until 1989 along with the factory’s ruins, making up a directly affected area of about 13,000 m^2 (OLIVEIRA et al., 2003). After several years, contamination had spread reaching directly and indirectly an area of about 150,000 m^2. Three hundred and seventy families were directly affected and 1,400 were affected indirectly (MS, 2003).

To address the issue and discuss actions to reduce and eliminate the release of POPs to the environment, the international community came together in 1995 and after a series of negotiations, drew up the Stockholm Convention.

The Stockholm Convention on Persistent Organic Pollutants, which entered into force in 2004, establishes measures to control theses substances, which have been used as pesticides, in industrial processes or released unintentionally in anthropogenic activities as by-products of chemical synthesis processes.

Brazil, who took part in the negotiations, signed the Convention in 2001. Congress ratified it on June 16 2004, through the Legislative Decree No. 204 and, on June 20, 2005, it was promulgated through the Executive Decree No. 5,472. One hundred an fifty two countries had ratified the Treaty at the date of publication of this National Implementation Plan.

This Convention stipulates that the signatory countries, known as country-Parties, should adopt measures to reduce or eliminate the use, production, import and export of POPs, as well as their unintentional release; promote the use of best available techniques and best environmental practices for processes and products to reduce POP emissions; and provide environmentally sound disposal of wastes and stockpiles of these chemicals.

For this purpose, the following are considered: the precautionary, prevention and polluter pays principles; the integrated approach to the life cycle of chemicals; transparency of information on the risks of POPs; cooperation among countries; engagement of the public and private sectors; and the active participation of society.

Twelve POPs were initially included in the Convention for immediate action by countries. This number was increased in 2009, after a decision at the 4th Conference of the Parties to include further 9 substances. In 2011, endosulfan was included. At COP6, in May 2013, hexabromocyclododecane was also added.

The 23 POP chemicals listed in the Stockholm Convention are distributed in three annexes, according to the specific treatment they receive.

Annex A – Elimination: use is banned and commitment is established to eliminate the chemical within specific deadlines;

Annex B – Restriction: some uses are permitted as an acceptable purpose, when no feasible replacement exists; and

Annex C – Unintentional Production: products that may be generated in combustion processes or as intermediates in industrial chemical reactions.

Table1 – POPs listed in the Stockholm Convention

POP	Use	Annex
Aldrin	Pesticide	A
Chlordane	Pesticide	A
Chlordecone	Pesticide	A
Dieldrin	Pesticide	A
Endrin	Pesticide	A
Heptachlore	Pesticide	A
Hexabromobifenyl (HBB)	Industrial	A
Hexabromodiphenyl ether (HexaBDE) andHeptabromodiphenyl ether (HeptaBDE), the main components of commercial Octabromodiphenyl ether (c-OctaBDE)	Industrial	A
Hexachlorobenzene (HCB)	Pesticide, Industrial and Unintentional Production	A and C

Table1 – POPs listed in the Stockholm Convention (continued)

POP	Use	Annex
Alpha-hexachlorocyclohexane (Alfa HCH)	Pesticide and Unintentional Production	A
Beta-hexachlorocyclohexane (Beta HCH)	Pesticide and Unintentional Production	A
Lindane	Pesticide	A
Pentachlorobenzene	Pesticide, Industrial and Unintentional Production	A and C
Tetrabromodiphenyl ether (TetraBDE) andPentabromodiphenyl ether (PentaBDE), the main components of commercial pentabromodiphenyl ether (c-PentaBDE)	Industrial	A
Perfluoroctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOSF)	Industrial	B
DDT	Pesticide	B
Toxaphene	Pesticide	A
Dodecachlor (Mirex)	Pesticide	A
Polychlorinated Biphenyls (PCBs)	Industrial and Unintentional Production	A and C
Dioxins (PCDDs)	Unintentional Production	C
Furans (PCDFs)	Unintentional Production	C
Endosulfan	Pesticide	A
Hexabromocyclododecane HBCD)	Industrial	A

New Persistent Organic Pollutants may be added to Annexes A, B and C of the Convention at each Conference of the Parties. The Convention text establishes the criteria and conditions for inclusion of substances and regulates the entire procedure for this analysis under the POP Review Committee (POPRC).

The Convention also determines that the Parties should prevent the development of new pesticides or new industrial chemicals with the characteristics of persistent organic pollutants.

The Convention encourages the Parties to conduct research and develop better technologies and alternatives.

1) Measures to reduce or eliminate the production, use, import and export of POPs;
2) Measures to identify and adequately dispose of stockpiles, products and items in use that may contain POPs or be contaminated by them;
3) Measures to identify, manage and dispose of waste of POPs or that may contain or be contaminated by POPs;
4) Measures to identify POPs contaminated sites;
5) Measures to progressively reduce emissions and eliminate sources of unintentionally produced POPs;
6) Measures to reinforce and expand institutional capacity for the proper management of POPs;
7) Dissemination of information, awareness raising and capacity-building;
8) Measures to reinforce national analytical capabilities and monitoring of POPs; and,
9) Measures to reinforce research, development and innovation for alternative technologies to the use/release of POPs.

According to Article 7 of the Convention, the Parties should develop their National Plan to implement the Stockholm Convention and submit it to the Conference of the Parties informing the measures and strategies that will be implementedand integrated into their national sustainable development plans in order to meet the commitments assumed in the framework of the treaty.

To assist developing countries in preparing their national inventories and their Action Plans for the elimination and reduction of POPs, the Stockholm Convention promotes technical assistance and the GEF financial support. Thus, to undertake all the necessary processes to elaborate this NIP, Brazil used funds from the GEF and was supported by UNEP through an international cooperation project.

1.2 Development of the National Implementation Plan

In Brazil, the focal points for the Stockholm Convention are the Ministry of the Environment (MMA) and the Ministry of External Relations (MRE). The MMA also coordinates the Convention’s implementation plan with the participation of several of the country’s institutions within the framework of their respective competences.

The process of developing the NIP began with a preparatory stage in which the GEF’s Project Development Facility – Block B (PDF-B) was implemented with the aim of gathering preliminary information on POPs in Brazil and identifying needed resources to develop the NIP. Its main result was the proposal for a Complete GEF Project to develop the NIP. The initial Seminar took place in March 2010 in São Paulo.

When the NIP began to be developed, only the 12 initially listed POPs were addressed, but with the inclusion of new substances to the Convention Annexes, it became necessary to include the new POPs in project activities and generate an updated NIP.

The process for developing the current NIP followed the guidelines of the *"Guidance for Developing, a National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants*" (UNIDO, UNITAR; UNEP, 2012) and included the following stages:

Stage 1: Establishment of the mechanisms for process coordination and organization;

Stage 2: Development of POP inventories and analysis of national infrastructure and capacity;

Stage 3: Establishment of priorities and objectives;

Stage 4: Formulation of the National Implementation Plan and the specific POP Action Plans;

Stage 5: Endorsement of the NIP by stakeholders.

The Ministry of the Environment acted as the project's executing agency, coordinating the development of the plan, using the expertise of its technical staff and hiring consultants.

The NIP was developed in consultation with the National Chemical Safety Commission (Conasq).

The National Chemical Safety Commission (Conasq) was established in 2000 as an intersectoral coordination mechanism for integrating efforts and creating opportunities to strengthen, disseminate and develop intersectoral actions related to chemical safety. Conasq consists of 21 institutions from the public and private sectors, academia and organized civil society. The Ministry of the Environment is the Commission coordinator and the Ministry of Health is its vice-coordinator.

In order for Conasq's participation in the development of the NIP to be more objective, a National Coordinating Group (NIP-GNC) was established under the Commision. This group constituted a consultative mechanism designed to follow the development plan. Its members were the Conasq representatives of government environment, health, labour and industry bodies; and non-governmental representatives from the private sector, workers and environmental protection organizations.

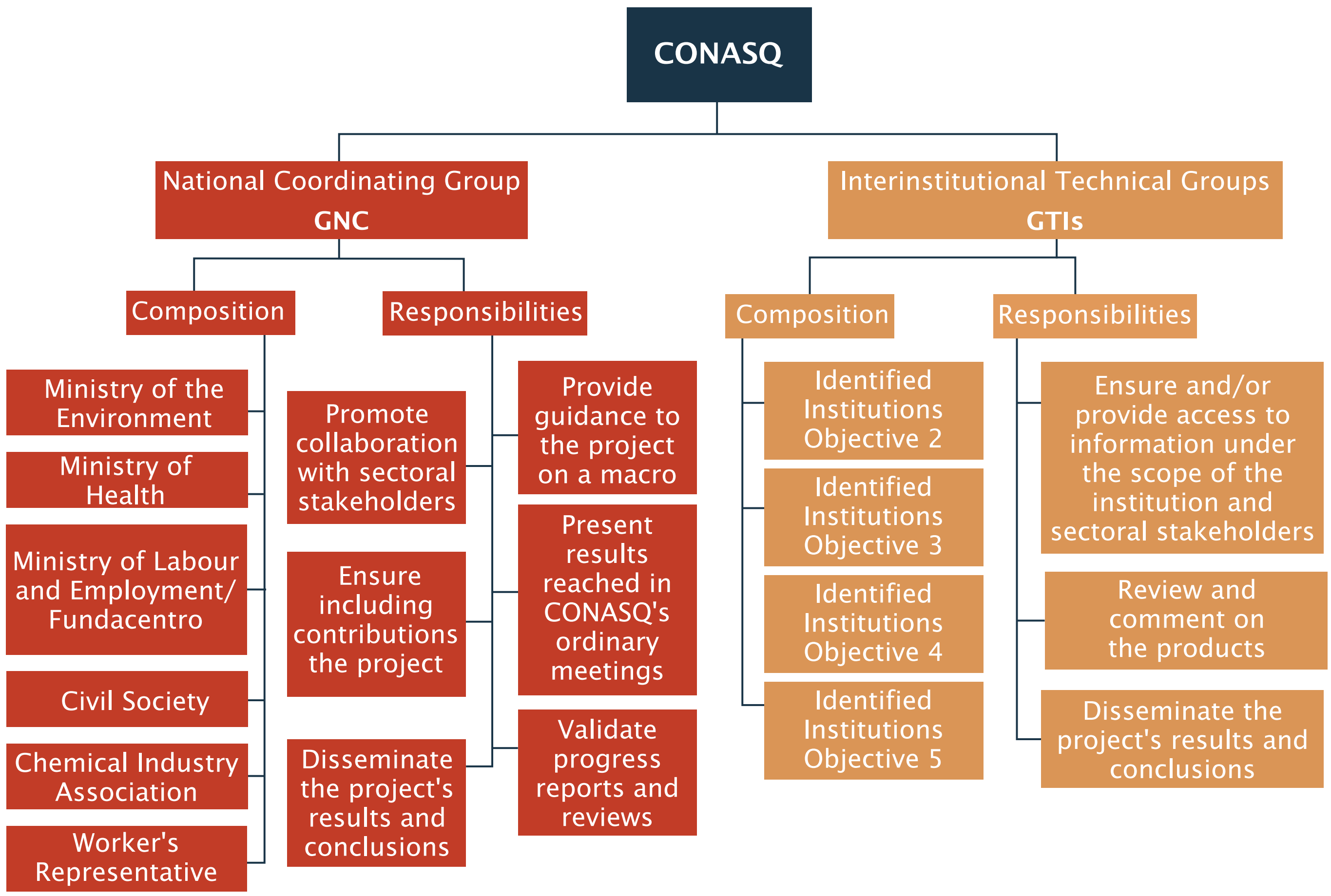
The GNC was responsible for fostering the coordination among sectoral stakeholders and promoting their inclusion in the development of the Plan and the dissemination of its results. It provided guidance and validated progress reports as well as maintained CONASQ informed on the progress of the Plan development efforts.

In addition to the GNC, Interinstitutional Technical Groups (GTIs) were created. GTIs had an operational role and aimed to contribute technical expertise to the development of the inventories and Action Plans that make up the NIP, providing commentaries and suggestions to improve documents. Their composition varied according to the content and needs. As part of the methodology for carrying out the studies used as a basis for the Action Plans, meetings of the GTIs were held to discuss the technical aspects of the results of the inventories and information surveys.

Throughout the process, several government institutions and bodies, private sector organizations and NGOs collaborated in the GTIs in an integrated effort to build this National Plan. We would like to highlight Cetesb's – the environmental body of the State of São Paulo – participation. Cetesb is the Stockholm Convention's Regional Centre for Latin America and the Caribbean.

Figure 1, next page, shows a flowchart with the responsibilities of the GNC and GTIs.

Figure 1 – NIP Management and Coordination Structure



In addition to the GTIs, the MMA held one-to-one meetings with specific sectors of the industry, which enabled greater proximity and cooperation in adjusting and defining actions and tangible goals.

Meetings with civil society, which allowed the gathering of points of views, also confirmed the democratic character of the process.

To support the drafting of the NIP, the following studies and inventories were carried out, consolidating important information on the POP situation in Brazil:

a) National inventory of sources and estimates of unintentional POPs emissions;

b) National inventory of Polichlorinated Biphenyls;

c) National inventory of stockpiles and waste of POPs used as pesticides and for other uses;

d) National inventory of POPs contaminated sites;

e) National inventory of industrial POPs, and

f) Review and analysis of Brazilian legislation on POPs.

A socioeconomic study on the implementation of the Stockholm Convention is underway and will be concluded in 2015, thus, giving support to the implementation of this NIP during its execution.

Studies and inventories were carried out according to the guidance and methodologies contained in the Convention guides. Based on the information gathered in each inventory, actions and priorities were discussed and made up 5 Action Plans:

1) Action Plan for the management of stockpiles and waste of POPs used as pesticides and for other uses;

2) Action Plan for the management of Polichlorinated Biphenyls (PCB);

3) Action Plan for the management of New POPs of industrial use;

4) Action Plan for the management of sites contaminated by Persistent Organic Pollutants (POPs); and,

5) Action Plan for the Progressive Reduction of unintentional releases of Persistent Organic Pollutants.

In addition to those Plans, measures to promote the following actions were also planned: (1) strengthen the institutional capacity and legislative framework for the management of POPs; (2) disseminate information, raise public awareness and educate the public; (3) expand the national analytical capacity, monitor POPs, and (4) promote research, development and innovation.

Each Action Plan comprises the activities and strategies that should be carried out (or that are already in practice) in order to meet the Convention's obligations, with implementation schedules and appointment of people in charge.

By consolidating the collected information, this National Implementation Plan provides an overview of the POPs situation in Brazil and, based on its findings and identified critical points, indicates the main challenges and priorities that should be considered for the efficient implementation of the Stockholm Convention in the country.

As part of the set of actions for sound chemical management of chemicals in Brazil, the development of the National Implementation Plan of the Stockholm Convention aims to:

1) Meet the obligations under the Stockholm Convention;

2) Reduce risks to human health and the environment caused by Persistent Organic Pollutants;

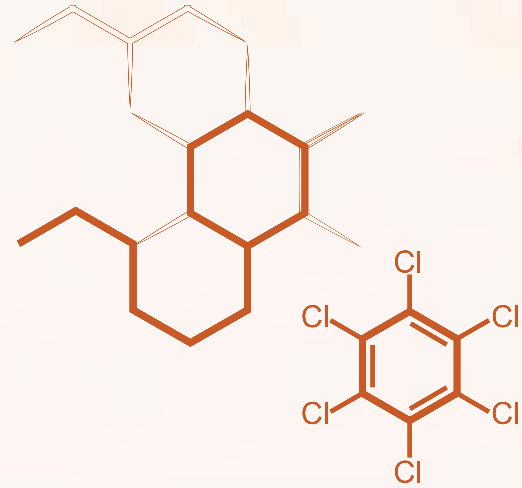
3) Contribute to improving chemicals management in Brazil, establishing broad governance on the issue;

4) Strengthen and expand the capacities of institutions for chemical management and pollution control;

5) Raise public awareness and educate the population on the harmful effects and risks associated to chemicals so that it too can be a part of management improvement process.

The NIP-Brazil was agreed between national stakeholders through a broad process of consultation carried out remotely and in person between 2013 and 2014 and endorsed by Conasq. It contains a series of actions to be executed by several government institutions, withing their scope, and by the private sector. This National Implementation Plan expresses the commitment of the Brazilian Government to meeting the obligations under the Stockholm Convention, incorporating them to the national strategies for improving chemical management.

This is a dymanic document, which should be reviewed and updated every 5 years and as needed to reflect the decisions made by the Conference of the Parties and by the Brazilian Government in the context of improving national environmental policies.



2 Country profile

2.1 General Information

Table 2–General Information on Brazil

Official Name:	Federative Republic of Brazil
Form of Government:	Presidential Republic
Language:	Portuguese
Area:	8,514,204.9 km^2
Border Length:	15,735 km with 10 bordering countries and 7,367 km coastline (Atlantic Ocean)
Capital:	Brasilia
Religion:	Catholic 64.6%, Protestant 22.2%, No religion (8%), Others 5,2 % (IBGE, 2010)
Life Expectancy:	74.6 years in 2012. Men 71 years and Women 78.3 years (IBGE,2013)
Infant Mortality:	16.7 deaths per thousand births (IBGE,2013) – 97thin the world
HDI:	0.744 – 79th (PNUD, 2013)
Literacy:	91.3% (IBGE,2013)
Unemployment Rate:	5.4 % (IBGE,2013)
GDP:	R$ 4.84 trillion (IBGE,2013)
% of GDP:	Agriculture and Livestock 5.7%; Industry 24.9%; Services 69.4% (IBGE, 2013)
Number of land motor vehicles:	53.3 million (2008); 63.4 million (2010); 85.8 million (DENATRAN, 2014)
Tourism:	6 million foreign tourists (MTUR, 2013)
Climate:	Equatorial, tropical, high-altitude tropical, atlantic, subtropical e semi-arid.

2.2 Climate and Geography

Brazil is located in the Western Hemisphere, mostly between the Equator and the Tropic of Capricorn (85% of its territory).

Brazil has a wide territorial extension of 8.5 million km^2 and, therefore, a large variety of physiographic aspects that make up the Brazilian landscapes.

About 90% of its territory lies in the Southern Hemisphere. The country borders nearly all South American countries except for Ecuador and Chile and is the largest country in South America covering about 47% of the continent. Brazil is the 5th largest country in the world and has regions that are often difficult to acces, especially in the Amazon region.

The political and administrative organization of the Federal Republic of Brazil encompasses the Union, the States, the Federal District and the Municipalities. The capital, Brasilia, is located in the Federal District in the country's central region. There are 5,570 municipalities throughout 26 States and the Federal District, in five geographic regions: North, Northeast, Mid-West, Southeast and South (IBGE, 2013), as seen in figure 2.

Brazil has a large variety of climates due to its wide territory, different forms of terrain, altitude and the dynamics of air masses and currents. Nearly 90% of its territory is located between the tropics of cancer and Capricorn, where there is a prevalence of hot and humid climates with average temperatures of about 20ºC.

The country's climate varies from super humid and hot that result from the equatorial masses, as is the case in the Amazon region to harsh semi-arid climates in the Northeastern backlands. The main types of climate in Brazil are: equatorial, tropical, high-altitutde tropical, atlantic, subtropical and semi-arid.

Figure 2 –Brazil in South America and its regional division

Source: Transparency Portal - Federal Government.

2.3 Population

According to the last Census (2010), the population of Brazil was approximately 196 million inhabitants and was estimated at over 201 million inhabitants in 2014 (IBGE, 2013). Ninety-nine million inhabitants were women and 93 million were men. Children up to 9 years of age were 29 million and 45 million were 10 to 19 years old.

By 1980, Brazilian population was considered to be predominantly young. Today, although there are still many children and young adults, changes are perceived with the increase in the number of adults and senior citizens.

With regard to skin color, approximately 91 million inhabitants defined themselves as white (47.7%), 82 million as brown (43.1%), 2 million as yellow (1.14%) and 817 thousand as indigenous (0.4%) in the 2010 Census.

Brazil is also a country with a large religious diversity. The 2010 Census showed that most of the population declared itself Roman Catholic, although this denomination has reduced in the last couple of decades. Next, are the Evangelicals and those without religion. A significant portion of the population identified themselves as followers of spiritualism or Umbanda and Candomblé (religions of African origin).

The population density in Brazil is quite heterogenous, varying from 2.0 inhab/km^2 in the State of Roraima, followed by the State of Amazonas with 2.2 inhab/km^2, to 441 inhab/km^2 in the Federal District and 366.0 inhab/km^2 in the State of Rio de Janeiro. The states with the lowest population densities are located in the North and Mid-West regions and the ones with the highest densities are found in the South, Southeast and Northeast regions, as shown in figures 3 and 4.

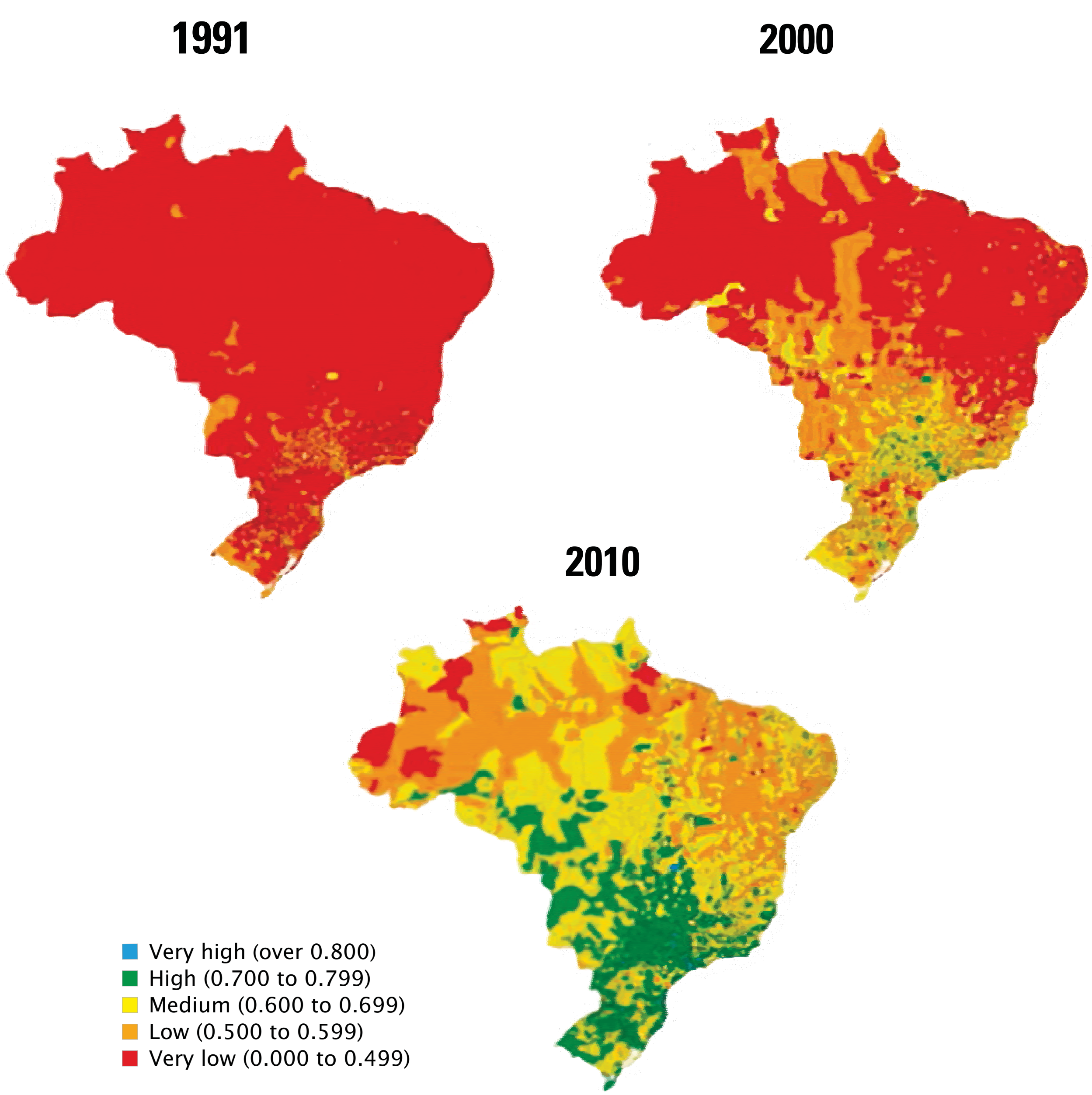
Figure 3 – Distribution of populational density per state, in 2010, according to IBGE (inhab/km^2)

Source: IBGE, 2010 Census.

Regardingthe Human Development Index – HDI, Brazil moved up one position in 2013, exceeding the Latin American and Caribbean average, therefore ranking 79 in the world. The Brazilian HDI is 0.744 while the region's average is 0.74 and world average is 0.702 (UNDP, 2013).

Despite progress, Brazilian states have different levels of development, which also reflect different social and economic realities within the country. Northern and Northeastern states occupy the ranking's bottom positions while Center-South states have high HDIs. The following maps show the HDI of the country's municipalities in 1991, 2000 and 2010.

Figure 4 –The Brazilian Municipal Human Development Index in 1991, 2000 and 2010



Source: UNDP, 2013.

Figure 5 – Municipal Human Development ranges – 1991, 2000 e 2010

Human Development	1991		2000		2010	
	Nº 7 of municipalites	%	Nº of municipalites	%	Nº of municipalites	%
Very high	0	0.0	1	0.0	44	0.8
high	0	0.0	133	2.4	1,889	33.9
Medium	43	0.8	1,451	26.1	2,233	40.1
Low	745	13.4	1,652	29.7	1,367	24.6
Very Low	4,777	85.8	2,328	41.8	32	0.6

Source: UNDP, 2013.

2.4 Economy

Brazil is the world's 7th largest economy, and its GDP in 2013 was 4.84 trillion Reais or 2.2 trillion dollars. The services sector is responsible for 69.4% of the total, the industry for 24.9% and agriculture accounts for 5.7% (IBGE, 2014).

The table below shows the share of each region in the national GDP over the years.

Table 3 – Regional Percentage Share in the Gross Domestic Product (GDP, 2002-2011 (IBGE)

Regions	Percentage participation in the Gross Domestic Product (%)										
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Brazil	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
North	4.7	4.8	4.9	5.0	5.1	5.0	5.1	5.0	5.3	5.4	5.3
Northeast	13.0	12.8	12.7	13.1	13.1	13.1	13.1	13.5	13.5	13.4	13.6
Southeast	56.7	55.8	55.8	56.5	56.8	56.4	56.0	55.3	55.4	55.4	55.2
South	16.9	17.7	17.4	16.6	16.3	16.6	16.6	16.5	16.5	16.2	16.2
Midwest	8.8	9.0	9.1	8.9	8,7	8,9	9.2	9.6	9.3	9.6	9.8

Source: IBGE, 2011.

Five states are responsible for about 70% of Brazilian GDP: São Paulo, Rio de Janeiro, Minas Gerais, Rio Grande do Sul and Paraná. All 5 are located in the South and Southeast regions.

São Paulo is by far the leading state despite improvements in regional inequality during the last decade. The states of Acre and Roraima, in the North, appear on the bottom of the list with 0.2% each.

2.5 Agriculture and Livestock

For historical, socioeconomic and geographical reasons, farming is a relevant activity in Brazil's national scene and foreign trade. In 2014, the sector accounted for 5.7% of the Gross Domestic Product (GDP), (IBGE, 2013).

Regarding the domestic market, the farming sector is noted as thriving industry, supplying products to a large portion of population and, on the other hand, as an important source of jobs. The great diversity of Brazil's agriculture and livestock is pointed out as an important basis for many important agribusiness production chains.

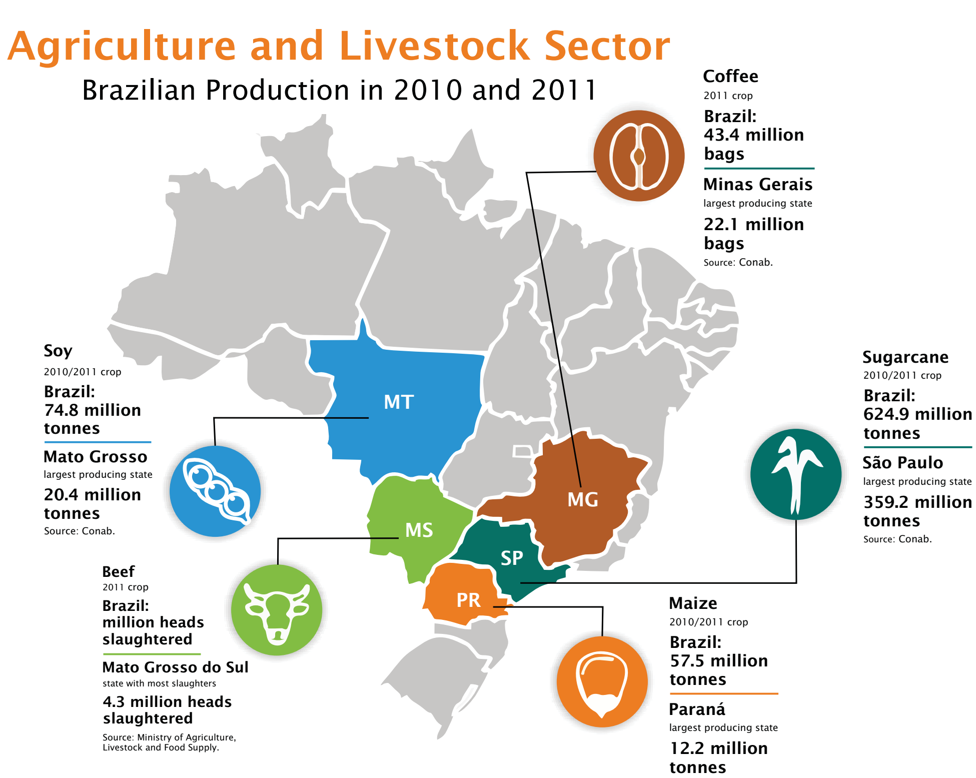
Regarding the external market, Brazil is one of the leading countries in international trade of agricultural products such as soybeans, coffee and meat. Brazil's participation in the world market has contributed to its positive trade balance results.

Brazil's most prominent exported products are: Soy – beans, meal and oil; coffee; sugar and ethanol. Cassava, beans and oranges are also important exports. As for agricultural imports, wheat is the main product imported by Brazil.

Nowadays, Brazil's top five crops are: sugar cane, soybeans, maize, cassava and oranges, respectively (IBGE, 2014). Sugar cane accounted for 78.1% of total production in 2010, roughly covering 14.9% of the total cultivated area. Moreover, soybeans, the second largest crop used 38% of the total cultivated area in 2010, indicating low relative productivity. Figure 6 depictures agricultural and livestock production in Brazil between 2010 and 2011.

According to the National Institute for Colonization and Agrarian Reform – INCRA, in 2012 Brazil had a total of 5,498,505 registered rural properties occupying an area of 605,387,746.06 hectares. These properties are dispersed across the country, but Rio Grande do Sul, with 647,552, Bahia, with 561,682 and Paraná, with 514,632 are the states with the highest concentration of rural properties. Amapá is the state with the lowest number of registered rural properties, 9,895.

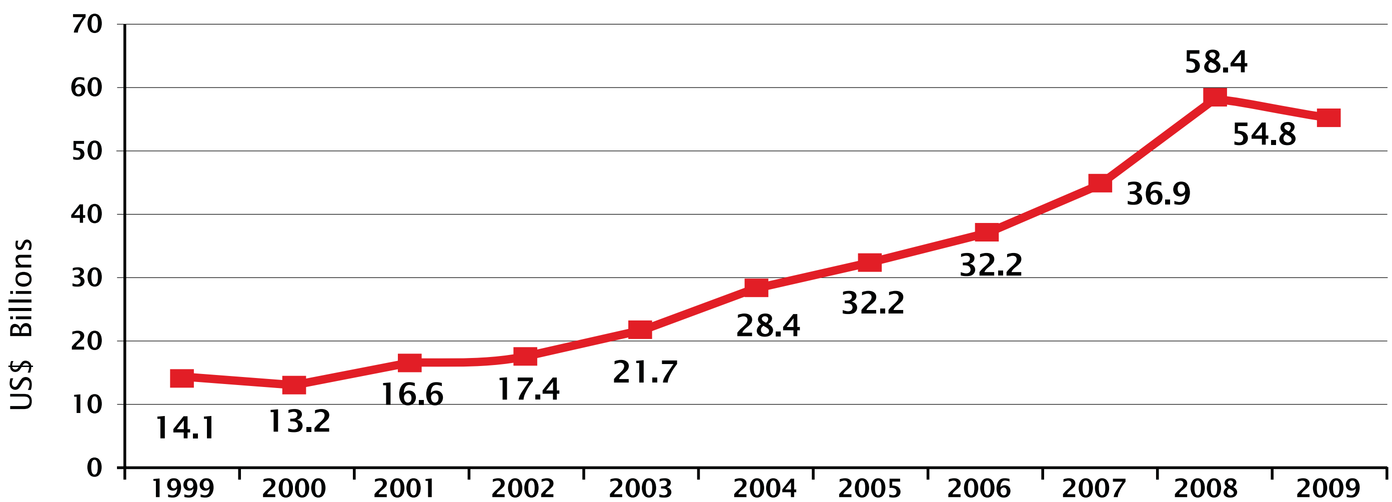
Figure 6 – Agricultural and Livestock Production between 2010 and 2011



Source: Conab, 2012.

Figure 7 shows the expansion of Brazilian agricultural exports between 1999 and 2009. In 2009 there was a drop due to the world economic crisis.

Figure 7 – Expansion of Brazilian Agricultural Exports



Source: MAPA, Agricultural Trade, 2010.

Brazil's bovine herd in 2009 was the 2nd largest in the world, with 205.292 million heads of cattle (MAPA, 2010). Brazil was the world's 2nd largest beef producer after the USA and the world's largest beef exporter. The Mid-West holds 34.4% of the national herd and the state of Mato Grosso is the main producer (13.3%).

2.6 Industrial Production

Industrial acitivity is important to Brazil, accounting for about 25% of the country's production of wealth. It is divided, by category of use, in capital goods industry, intermediate goods industry and consumer goods industry – durable, semi-durable and non-durable. The capital goods industry (produces goods that will be used in the productive process such as machinery and other equipment) is noteworthy among categories, both in terms of production and in terms of revenues.

By sector, Brazilian industry is divided into: mineral extraction industries (especially oil extraction and natural gas industries, in addition to iron ore mining industries), processing industries (with highest revenues coming from the food and beverages, textiles, clothing, wood, shoes and leather sectors), utilities (water, gas and electricity production and distribution) and the construction industry.

According to IBGE, in 2011, Brazil had about 312 thousand industrial companies, employing 8.6 million people with an average of 28 people by company. Compared to 2010, the number of companies grew 4% (299,862, in 2010) and the number of employees grew 3% (8.4 million in 2010).

Industrial companies recorded, in 2011, net sales of about 2.2 trillion reais, an average of 7 million reais per company.

In 2011, activities with the highest share in terms of added value were: Food and beverages (12.6%); mineral extraction (9.9%); petroleum coke, oil subproducts and biofuels (9.8%); motor vehicles and trailers (9.5%); chemical products (6.7%); machinery and equipment production (5.3%); metallurgy (4.9%); metal goods except machinery and equipment (4.4%); nonmetallic mineral products (3.9%); and, rubber and plastic materials (3.6%). Together, these sectors concentrated 70.6% of the industrial sector's total.

In the North, products that stood out in terms of sales were: iron ores (17.7%) and television sets (9.5%). In the Norteast, the highlight was diesel fuel (3.7%). In the Southeast, the prominent products were iron ores (2.9%); crude oil (2.8%) and diesel fuel (2.8%). In the South, diesel fuel (3.5%) and motor vehicles (2.9%) had the highest percentages. In the Mid-West, fresh beef (7.4%) and pies, cakes, meal and other subproducts from soybean oil production (4.9%) were the most representative activities.

São Paulo is the country's leading state in terms of industrial products' sales accounting for 41% of the total, followed by Minas Gerais (10.4%), Rio Grande do Sul (8.0%), Paraná (7.3%) and Rio de Janeiro (7.3%).

2.6.1 The Brazilian Chemical Industry

The chemical industry represents one of the most important sectors for the Brazilian economy and ranks among the 10 largest in the world. According to the Brazilian Chemical Industry Associaton – ABIQUIM, the Brazilian chemical industry is the 6th largestin the world, with revenues of 157 billion dollars in 2011, i.e., 3.1% of the world's revenues, estimated at 5 trillion dollars.

In 2012, the chemical industry accounted for 2.7% of the country's GDP, becoming the 4th largest processing industrial sector in Brazil after food and beverages, oil subproducts and motor vehicles (ABIQUIM, 2014) and employs about 400,000 people.

According to ABIQUIM, there were 973 industrial chemical companies in 2013, particularly in the state of São Paulo, which holds nearly 60% of all chemical industrial plants.[1]

Brazil is a large importer and exporter of chemicals, notedly importing intermediate substances for the production of pesticides and exporting thermoplastic resins.

Despite registering one of the highest revenues for the sector in the world, the Brazilian chemical industry is witnessing a strong transfer of production to other countries; thus, national production is decreasing while imports are rising. Today, imported products meet one-third of national consumption.

2.7 Brazilian Environment

2.7.1 Vegetation

Brazilian vegetation is distributed in six continental biomes: Amazon, Cerrado (Brazilian Savanna), Caatinga (semi-arid), Atlantic Forest, Pantanal (wetlands) and Pampa (grasslands) as shown in figure 8. The Amazon is Brazils largest continental biome with 49.29% of surface area and the smallest is the Pantanal with 1.76%. The area of each biome is shown in Table 4.

The current native or original forest cover in Brazil corresponds to about 69% of original forests, making Brazil one of the countries that best maintains its forest cover in the world.

1 PWC. Brazilian Chemical Industry. Available at: <http://www.pwc.com.br/pt_BR/br/publicacoes/ setores-atividade/assets/quimico-petroquimico/chemicals-port-13.pdf

The Atlantic Forest biome, for example, gathers a wide variety of plants. In addition to diverse forest types, there are peripheral varieties –restingas, mangroves, high-altitude fields and others – subject to more pronounces environmental stresses such as extreme temperature variations, floods, droughts, high salinity, etc.

Fields, on the other hand, are more consistent because of the predominance of grasses. Nevertheless,low herb and grass-exclusive fieldslike the Russian steppes are rare and can be found only in certain parts of the Pampas. In the other country biomes, however, steppes flecked with shrubs and small trees, called "dirty fields", are more common. A greater prevalence of those woody plants characterizes a wooded steppe. Cerrados or Savannas, which predominate in central Brazil, present, in turn, an even higherlevel of afforestation.

At the other end of this scale is the steppe-savanna in the northeastern semi-arid, the famous Caatinga with its stunted and twisted bushes sparsely growing on thin and often rocky soil.

This mosaic of plant combinations fits in varied forms in Brazil's territorial structure. Some Units of the Federation like Acre and Rio de Janeiro are based entirely on a single biome – Amazon and Atlantic Forest, respectively. Most UFs (17 of 27), though, are based in two or more biomes. The most diverse UFs are Bahia, Maranhão, Mato Grosso, Mato Grosso do Sul and Minas Gerais with territories covered by three biomes. In more precise quantitative terms, Bahia is the most plural state as the proportions between its three biomes – Atlantic Forest, Cerrado and Caatinga – are the most balanced: 19%, 27% and 54%, respectively.

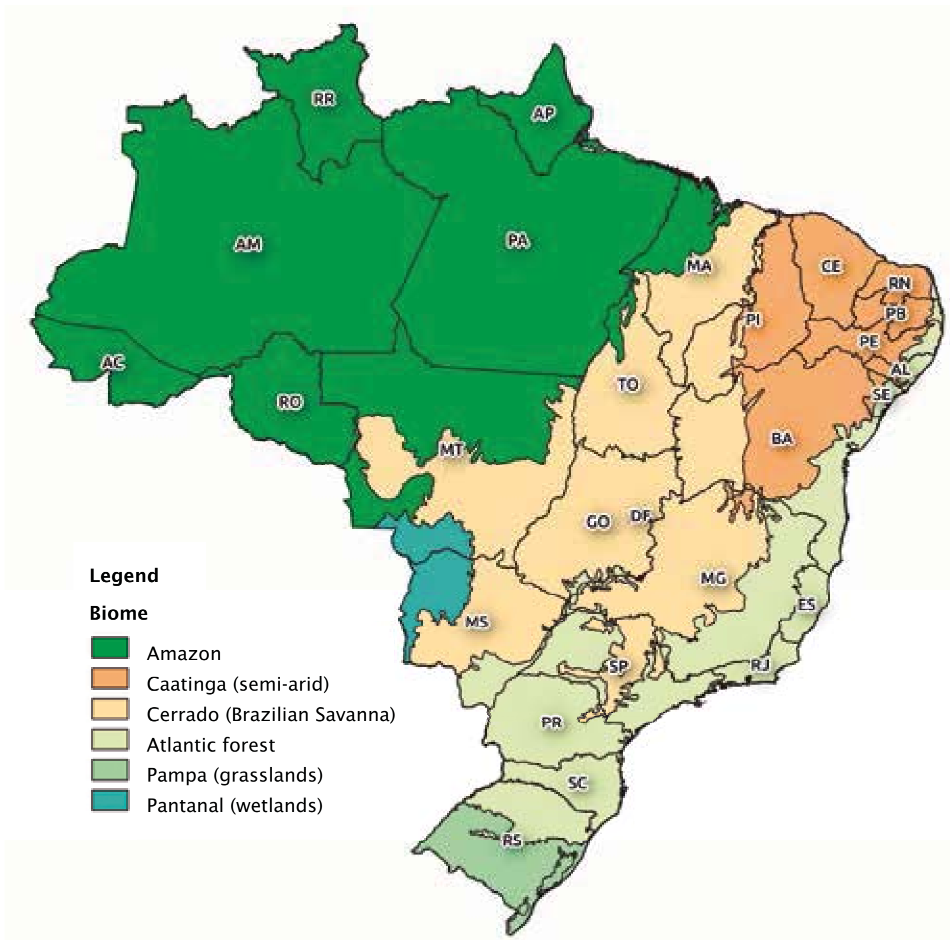
Table 4 – Approximate area of Brazilian biomes

Biome	Approximate Area (km^2)	Share of total area (%)
Amazon	4,196,943	49.29
Cerrado	2,036,448	23.92
Atlantic Forest	1,110,182	13.04
Caatinga	844,453	9.92
Pampa	176,496	2.07
Pantanal	150,355	1.76

Source: IBGE, 2004.[2]

2 IBGE. Available at: <www.ibge.gov.br/home/presidencia/noticias/noticia_visualiza.php?id_no ticia=169>. Accessed in: 30 abr. 2011.

Figure 8 – Brazilian Biomes



Source: Brazilian Biome Deforestation Monitoring by Satellite Project – PMDBBS, IBAMA. Available at: <http://siscom.ibama.gov.br/monitorabiomas>. Acesso em: 18 dez. 2014.

This variety of biomes reflects the richness of Brazil's flora and fauna: the country has the greatest biodiversity on the planet. This abundant variety – which represents over 20% of the world's total number of living species – elevates Brazil to the top of the world's 17 most diverse (or that have the greatest biodiversity) nations (MMA, 2014).[3]

In addition, many of Brazilian species are endemic, and several species of plants that have worldwide economic importance as the pineapple, peanuts, Brazil nuts, cassava, cashew and the carnauba are from Brazil.

The country is also home to a rich socio-biodiversity, represented by over 200 indigenous peoples and various communities as maroons, caiçaras and rubber tappers, to name a few that gather a priceless collection of traditional knowledge on the conservation and use of biodiversity.

But despite all this richness of knowledge and native species, most of the national economic activities is based on alien species: in agriculture, with sugar cane from New Guinea, coffee from Ethiopia, rice from the Philippines, soy and oranges from China, cocoa from Mexico and wheat from Asia; in forestry,

3 MMA. Brazilian biodiversity. Available at: <http://www.mma.gov.br/biodiversidade/biodiversi dade-brasileira>. Accessed in: 12 fev. 2015.

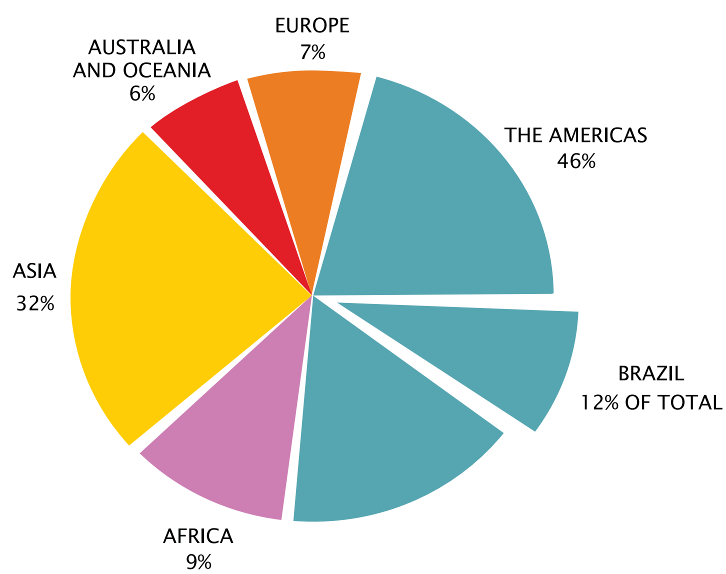
with eucalyptus from Australia and pine trees from Central America; in livestock, with cattle from India, horses from Asia and African grasses; in fish farming, with carp from China and tilapia from East Africa; and in beekeeping, with bee varieties from Europe and Africa.

This paradox brings up a pressing idea: it is essential that Brazil intensify research for a better use of its biodiversity while maintaining access to exotic genetic resources, also essential to improving the country's agriculture, livestock, forestry and fish farming.

2.7.2 Water Resources

Brazil holds a privileged position in the world regarding water resources availability. The average annual flow of rivers in its territory is about 180,000 m^3/s and corresponds to approximately 12% of the world'savailable water resources of 1.5 million m^3/s (ANA, 2007), as shown in the chart below:

Figure 9 – Distribution of Fresh Surface Water in the World



Source: ANA, GEO Brazil Water Resources, Part of the Series of Reports on the State and Perspectives of the Environment in Brazil, National Water Agency, 2007.

The country is considered abundant in terms of average flow per capita, with about 33,000 m^3/person/year, but has a large spatial and temporal variability of flows. The Amazon River Basin, for example, holds 74% of surface water resources and is inhabited by less than 5% of the population.

The lowest average flow per capita is observed in the Eastern Northeast Atlantic river basin, averaging less than 1,200 m^3/person/year. Some basins in this region present less than 500 m^3/person/year.

Some basins of the Eastern Atlantic, Parnaíba and São Francisco rivers are also noteworthy for presenting low availability. In the semi-arid portion of these regions, where drought has more serious repercussions, water is a critical factor for the local population.

Weirs for water storage and regulation of the flow of the wadis is essential and strategic for human consumption, watering livestock, irrigation and other uses.

2.8 Energy Supply Mix

Brazil has one of the cleanest and most renewable energy supply mixes in the world. In 2008, 73% of the electricity supply in Brazil came from hydropower plants and only 10.6% came from fossil fuels, as shown in Figure 10. Globally, renewable energy accounted for 13% of total supply in 2010.

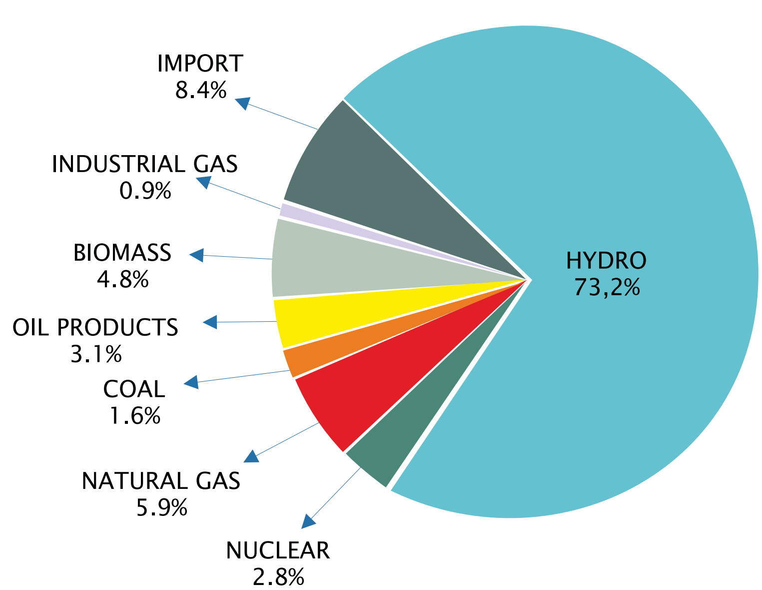
Oil production in the pre-salt layer presents itself as one of the greatest opportunities of the Brazilian economy. The success rate reached by Petrobras in wells drilled, as well as long-term tests conducted so far show that it is feasible to achieve the planned production of 5 million barrels of oil equivalent per day by 2020.

Today, the country has a supply of natural gas that is lower than its demand, and Liquefied Natural Gas (LNG) terminals are used for imports mainly when thermal power stations running on gas are put in operation. The exploitation of the pre-salt layer may change this scenery by significantly increasing gas production associated to the light oil that will be extracted. This is something that is still being evaluated in the early production tests.

Brazil also has a large potential for exploitation of uranium for new nuclear power plants. However, the process is more complex due to environmental issues, high investment costs and the need to import technology, thus delaying the construction of new nuclear power plants.

To compose a new energy mix framework, there is huge potential in renewable sources such as wind and solar power. According to a study of the Reference Centre for Solar and Wind Energy - CRESESB / CEPEL, Brazil has a generation potential of 143 GW in wind power. Part of this potential can be commercially exploited on the coast of the Northeast, Southeast and South regions. In relation to solar energy, there is great potential to be tapped but it requires that investment be made in technology to reduce deployment and generation costs.

Figure 10 – Electricity Supply Mix in 2008



	TWh
TOTAL	498.8
HYDRO	365.1
NATURAL GAS	29.6
OIL PRODUCTS	15.6
NUCLEAR	14.0
COAL	8.2
BIOMASS	20.0
INDUSTRIAL GAS	4.4
IMPORT	42.1

RENEWABLE
Brazil: 86%
OECD: 16%
World: 18%

Note: includes self-generators (50.1 TWh)

Source: MME, 2009.

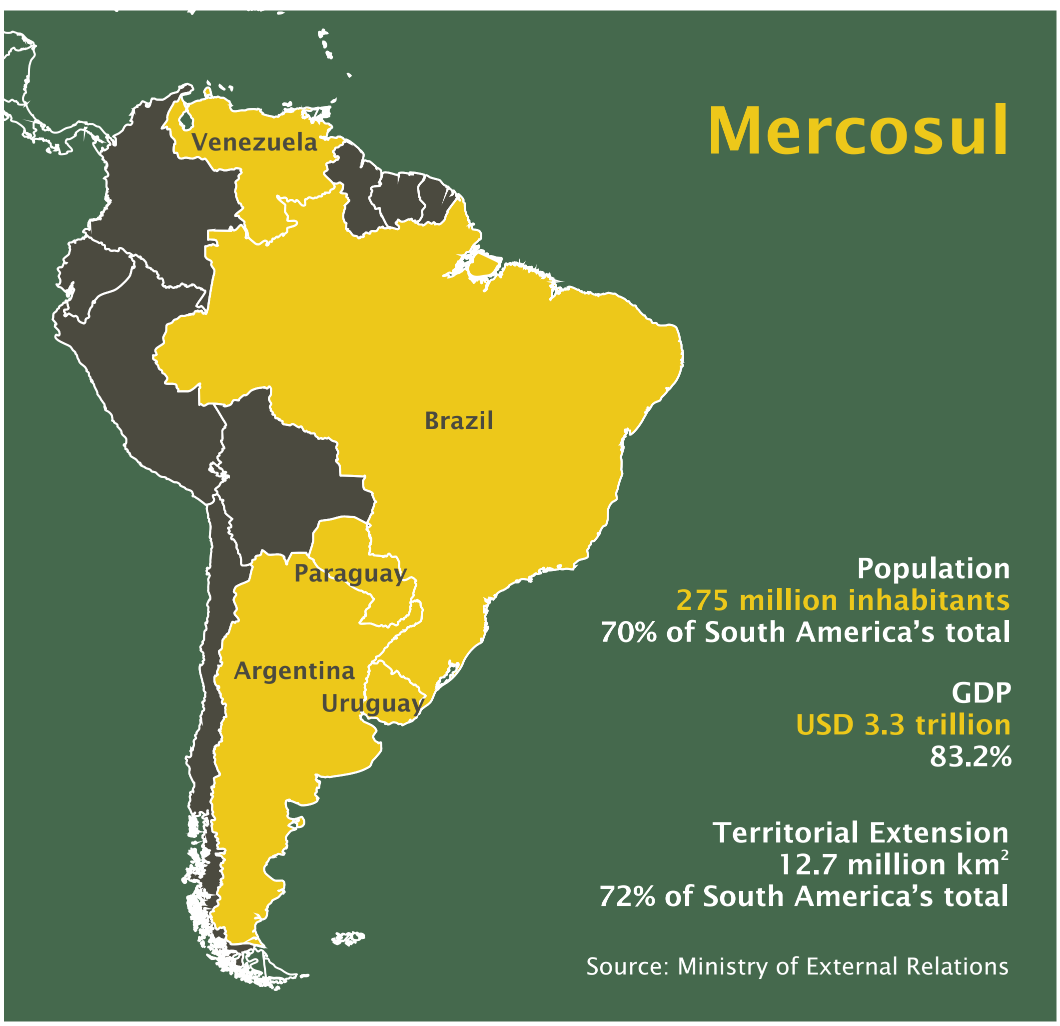
2.9 Regional Cooperation

Brazil is one of the five countries that form the Southern Common Market (Mercosul) together with Argentina, Paraguay, Uruguay and more recently, Venezuela (Figure 11). The Mercosul, which was established in 1991, aims at economic integration, cooperation and development in order to promote trade between the countries.

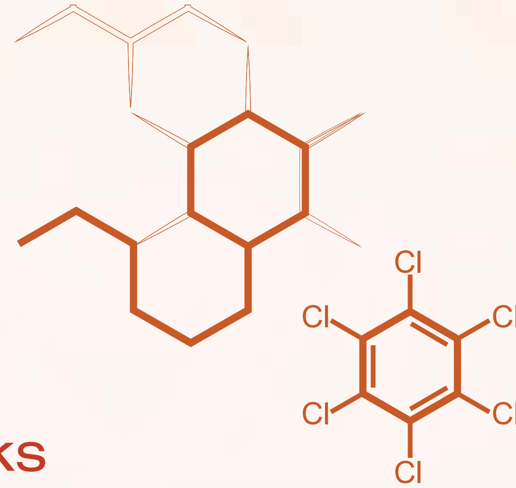
Other countries that participate in the bloc as associates are Bolivia, Chile, Peru, Colombia and Ecuador, and they can take part in Mercosul meetings and sign treaties when mutual interests are involved.

Economically, the bloc ranks third in the world after NAFTA and the European Union, with a Gross Domestic Product (GDP) of approximately US$ 3.19 trillion (2012).

Figure 11 – Mercosul



Source: Ministry of External Relations.



3 Institutional and legal frameworks for chemical management

3.1 Environmental Policy and Legislation

Federal Law Nº 6,938, published in 1981, established the National Environmental Policy (PNMA), which introduced the objectives, guidelines, principles and tools of the Brazilian environmental policy, incorporating aspects of environmental sustainability to the country's development. It was a groundbreaking step in the history of Brazilian public administration.

Since then, along the past thirty years, Brazil has structured environmental policies, approved several environmental regulations, created mechanisms for the control and management of natural resources as well as for preventing pollution; and has also strengthened the participation of society in developing national policies.

Among the instruments created by the PNMA Law, the mandatory environmental licensing of potentially pollutant activities and natural resources use is noteworthy. This mechanism translates the prevention approach into concrete actions, encompassing the polluter-pays principle. Environmental licensing procedures for various activities and undertakings are regulated by National Environment Council (Conama) resolutions.

The prevention, precautionary and polluter-pays principles, which guide environmental law, are depictured in many of the instruments established by the PNMA and other rules that make up Brazilian environmental legislation.

The PNMA also established the National Environmental System (Sisnama), through which the Brazilian government was organized to meet the needs of environmental management, defining the division of responsibilities and the institutional framework to implement the policy, based on the government political-administrative structure.

Sisnama, constituted by bodies and agencies of the Federal Government, the states, the Federal District and the municipalities, represents the coordination of all environment agencies at all levels of government. It assigns an important role to the states in carrying out environmental management activities, thus, making them the true backbone of Sisnama.

Sisnama is structured, basically, in two levels: the first pertains to the formulation of the National Environmental Policy, of government guidelines and the promotion of inter-institutional coordination. The second pertains to the actual implementation of environmental conservation activities and the improvement of environmental quality.

The first level is formed by the National Environment Council – Conama, a consultive and deliberative body, and the Ministry of the Environment, the central body responsible for coordinating the System and the environmental secretariats of the states, Federal District and municipalities. The second level is formed by the Brazilian Institute for the Environment and Renewable Natural Resources – Ibama, body responsible for the implementation of the environmental policy in the framework established by legislation; sectoral federal bodies responsible for implementing public policies related to the environment; State Environmental Agencies – OEMAs and, as they organize, municipal environmental agencies among their scopes and jurisdiction.

In 1988, with the end of the military dictatorship, a new Federal Constitution was promulgated and a new legal-political order began in Brazil, firmly intending to provide democracy to the country, based primarily on the undeniable protection and guarantee of the essential rights of citizens.

The constitution adopted the principles of the National Environmental Policy and dedicated an entire article to the protection of the environment. Article 225 establishes the essential right to an ecologically balanced environment, which is an asset of common use and essential to a healthy quality of life and both the Government and the community shall have the duty to defend and preserve it for present and future generations.

To ensure the effectiveness of this right, article 225 of the Consitution established specific obligations and duties for public authorities. In particular, the obligation established in article 225, paragraph 1, item V: "it is incumbent upon public authorities to control the production, marketing and use of techniques, methods or substances which pose a risk to life, to the quality of life and to the environment". The control exercised by the government over the use and production of hazardous substances, including POPs, is based on this constitutional mandate.

The Federal Consitution establishes that with regard to the administrative responsibility for environmental matters, it is the joint responsibility of the federal government, the states, the federal district and the municipalities to protect the environment, combat pollution and to care for the health and well-being of the population (article 23, FC).

Supplementary Law No 140, dated 8 December 2011, established rules for cooperation among the three levels of government in the exercise of this joint responsibility.

As for the prerogative to legislate on environmental matters, article 24 of the constitution confers concurrent jurisdiction among the three levels of government. It assigns the regulation of issues of national interest to the Federal Government by establishing rules and general guidelines for the entire country. States, in turn, regulate regional problems; and municipalities, local specificities, whereby state and municipal regulations cannot contradict federal law. They are only allowed to adopt more, not less, restrictive measures than those adopted by the federal government.

In cases where there is no federal law establishing general rules, the states may occupy the vacuum and exert full legislative jurisdiction, however, since state law cannot contradict federal law, states must adapt their legislation whenever it conflicts with federal law.

In this manner, each specialized body from the three levels of government has autonomy to establish norms according to its legal jurisdiction.

Conama, an advisory and decision-making body under Sisnama, is responsible for establishing rules, criteria and standards related to environmental quality and control, as well as for licensing potentially polluting activities, which it does routinely through resolutions. Conama is an inter-agency body, presided by the MMA and made up of several government institutions from the three levels of government as well as representatives from civil society. Conama resolutions provide legal frameworks for controlling and monitoring environmental quality standards for air, water, soil and biodiversity, among others.

To punish environmental violations, Law No. 9,605/1998 — known as the Environmental Crimes Law — was enacted establishing criminal and administrative penalties for behaviour and activities that damage the environment.

Other noteworthy legal references on the Brazilian environmental policy are the Laws implementing the National Biodiversity Policy, the National Conservation Units System, the National Water Resources Policy, the National Solid Wastes Policy, and the National Environmental Education Policy.

This framework established the legal bases for environmental governance in Brazil and allowed for the improvement of control mechanisms of potentially polluting processes and activities. However, there are still challenges to meet and the country is committed to doing so while seeking to develop on sustainable social and environmental foundations.

3.2 Unified Health System (SUS)

Brazil's Unified Health System (SUS) was established by article 198 of the Federal Constitution of 1988 and regulated by Law No 8,080/1990 and Law No 8,142/1990. SUS is the official public health care model and is directed by the Ministry of Health on the federal level, by the State Health Secretariats on the state level and by the Municipal Health Secretariats on the municipal level. Hospitals, health centres, foundations and research institutes are also part of SUS.

Law No 8,142, in its article 1 provides for the participation of civil society in SUS and establishes that each level of government, without prejudice to the functions of the Legislative branch, will rely on the Health Conference and the Health Council, as collegial bodies. The private sector has a supplementary role, serving the government through agreements and contracts, which are regulated by Law.

3.3 Roles and Responsibilities of Government Institutions that deal with POPs

This section provides a brief description of the government institutions that deal with the protection of health and the environment and with chemical management and their respective responsibilities.

Table 5 – Roles and Responsibilities of Government Institutions that deal with POPs

Institution	Responsibilities
Ministry of the Environment (MMA)	It is the core Sisnama body and it is responsible for formulating national environmental policies; for the development of strategies, legal, economic and social mechanisms and instruments to improve environmental quality and protection of natural resources, including issues related to pollution, chemical risk and hazardous wastes management. It is also the technical focal point of international conventions related to chemicals: Stockholm, Rotterdam, Basel and Minamata, coordinating the implementation activities. The National Environment Council (Conama) is the MMA's normative, deliberative and consultive collegial body and establishes rules, criteria and standards related to environmental quality and control in order to ensure the rational use of environmental resources.
Brazilian Institute for the Environment and Renewable Natural Resources (IBAMA)	It is the executing branch of the National Environment Policy at the federal level and is linked to the Ministry of the Environment. It is the institution that effectively controls production, use, trade, movement and disposal of chemicals and hazardous waste and also carries out environmental inspections at both regional and national levels. It takes part in the registration of pesticides (agricultural and others) by carrying out assessment of their environmental risks. It also registers wood preservatives and remediation agents. Ibama is responsible for the licensing of imports and exports of several products including chemicals controlled by international conventions.
Ministry of Health (MS)	The Ministry formulates and implements the National Health Policy; coordinates and inspects the Single Health System; promotes environmental health and adopts actions to promote, protect and recover individual and collective health, including workers and indigenous peoples, and maintains the health information system. It acts in environmental monitoring and control related to human health and quality of drinking water: chemical and physical environmental contaminants; natural disasters, accidents involving hazardous chemicals.
National Health Surveillance Agency (ANVISA)	The Agency is linked to the Ministry of Health and acts in the regulation, control and inspection of products and services referring to chemicals that involve risk to public health: diet products and food additives, contaminant levels, veterinary medication and pesticide residues in food, hygiene products, perfumery and cosmetic products, dyes. It takes part in the process of registering pesticides, carrying out toxicological evaluation of these products and reviewing licenses of products that may pose risks to human health. Carries out control and quarantine in ports, airports and borders.
National Health Foundation (FUNASA)	Linked to the Ministry of Health, it acts on the prevention and control of disease and injuries caused by a lack of or inadequacy of basic sanitary conditions in areas of special interest such as settlements, remaining "quilombo" settlements and extractive reserves. It supports and helps carry out research and studies on environmental health. It promotes final disposal of obsolete pesticides such as DDT and Lindane, used by the Foundation itself in past public health campaigns and also identifies sites contaminated by these products.

Table 5 – Roles and Responsibilities of Government Institutions that deal with POPs (continued)

Institution	Responsibilities
Oswaldo Cruz Foundation (FIOCRUZ)	Linked to the Ministry of Health, it develops educational and research activities, and publishes documents on publich health issues, occupational health issues, ecotoxicology and related issues. It also promotes post-graduate studies on these issues. Regarding chemicals, POPs pertain to its scope of action.
Ministry of Labour and Employment (MTE)	The Ministry formulates and proposes guidelines for work inspections as well as standards and rules for worker safety and occupational health. It supervises and monitors safety and health, and inspection activities in the workplace, through decentralized units, and follows the national compliance with international conventions ratified by the Brazilian Government, in particular those of the International Labour Organisation, in areas of its mandate.
Jorge Duprat Figueiredo Foundation for Occupational Health and Safety (FUNDACENTRO)	The Fundacentro is a study and research centre associated to the Ministry of Labour and Employment, responsible for planning, coordinating, following and evaluating programmes, projects, research and services, with the aim of identifying, preventing and controlling the exposure of workers to risk factors, conditions and agents in the workplace. It carries out assays and tests to determine the quality of personal protective equipment through its specialized laboratories, and it investigates and analyses occupational accidents. It identifies chemical agents in crop science and animal husbandry, proposing risk control measures of such agents in the workplace.
Ministry of Transportation (MT)	The Ministry formulates and implements the country's transportation policy, which includes all modes of transportation pertaining all rail, road and water transport, and participates in the coordination of air transportation. Two agencies are linked to the MT: the National Agency for Terrestrial Transport – ANTT and the National Agency for Waterway Transportation – ANTAQ. They are responsible for establishing standards and supplementary technical rules for terrestrial and waterway transportation of special or hazardous cargo.
Ministry of Agriculture, Livestock and Food Supply (MAPA)	The Ministry proposes guidelines for the formulation of agricultural policy with respect to agricultural protection and promotion of competitiveness of agribusiness; controls and inspects production, trade and use of pesticides, its components and similar substances. It takes part in the registration of pesticides, evaluating the agricultural effectiveness of the active ingredients. It also registers veterinary products.
Ministry of Development, Industry and Foreign Trade (MDIC)	The Ministry is responsible for: development policies for industry, services and trade; industrial metrology, standardization, quality and innovation, foreign trade policies, regulation and execution of programmes and activities related to foreign trade. It administers SISCOMEX, a computerized system for integrating registration, follow-up and control of foreign trade operations.

Table 5 – Roles and Responsibilities of Government Institutions that deal with POPs (continued)

Institution	Responsibilities
National Institute of Metrology, Quality and Technology (INMETRO)	Linkes to the Ministry of Development, Industry and Foreign Trade, it is responsible for accrediting calibration test laboratories, proficiency testing providers, certification, inspection and training bodies, and others necessary to the development of a services infrastructure in the country. Activities also include accrediting laboratories that test, identify and detect POPs.
Ministry of Science, Technology and Innovation (MCTI)	The Ministry is responsible for the development and implementation of national policy regarding science and technology; it acts as executive secretariat of the Commission for the Application of the Convention on Chemical Weapons; promotion and development of cleaner industrial production techniques.
Ministry of Mines and Energy (MME)	The ministry is responsible for mining and metallurgy, oil, fuels and electrical power, including nuclear energy, rural power and bioenergy, including rural electrification, when paid for with funds linked to the National Power System. It plays an important role in electrical equipment management (eg. Transformers, capacitors and system breakers) containing PCBs along with the Brazilian Electricity Regulatory Agency (ANEEL)
Ministry of External Relations (MRE)	The Ministry coordinates Brazil`s position during the negotiation of international agreements, participates in meetings of the Conventions, in addition to managing political aspects of environmental matters in general.
Ministry of Justice (MJ)	It supervises national and international transportation of hazardous products and combats smuggling of banned products in the country through the Federal Police and the Federal Highway Patrol. The Federal Police operates on the coast, borders and airspace.
Ministry of National Integration	The Ministry coordinates actions and activities of civil defence throughout the country. Civil defence actions aim to reduce disasters and include actions for preventing, preparing and responding to national emergencies and natural disasters. They involve multi-sectoral action and must be carried out across the three levels of government – federal, state and municipal – with broad community participation.

In addition to these federal bodies, the states, municipalities and the Federal District have their own institutional arrangements and structures to comply with obligations that are their responsibility.

3.4 International Environmental Agreements and Treaties

Brazil has been very active – particularly after the United Nations Conference on Environment and Development in 1992 (Rio 92) – in all the most relevant forums and negotiations related to chemicals and wastes. It is a signatory of important conventions that reinforce the importance of international cooperation on chemicals and, therefore, lead to several internal improvements. Below are the main multilateral agreements adopted by Brazil related to chemicals.

3.4.1 The Vienna Convention for the Protection of the Ozone Layer and the Montreal Protocol

In 1990, Decree No. 99,280 promulgated the Vienna Convention for the Protection of the Ozone Layer and the Montreal Protocol on Substances that Deplete the Ozone Layer. Brazil engaged in adopting actions that reduce the emission of substances that deplete the ozone layer (ODS). To meet the obligations undertaken as a Party to the treaty, the Brazilian Programme to Phase-out Production and Consumption of Ozone Depleting Substances was created.

3.4.2 The Basel Convention on the Tansboundary Movements of Hazardous Wastes and their Disposal

The Brazilian Government acceded to the Basel Convention and it was promulgated through Decree No. 875 on July 19, 1993. Currently, national procedures to control waste imports are governed by Conama Resolution No. 452/2012, which restricted the imports of hazardous waste. When the National Solid Wastes Policy was enacted in 2010, through Law No. 12,305, the importing of hazardous wastes was definitively banned both for final disposal and recycling purposes.

Guidelines drafted and published by the Convention help countries carry out environmentally sound management of various kinds of waste and have been important references for developing national policies and legislation.

3.4.3 The Rotterdam Convention on Prior Informed Consent Procedures for Certain Hazardous Pesticides and Chemicals in the International Trade – the PIC Convention

Brazil signed the Rotterdam Convention in 1998 and promulgated it in Decree No. 5,360, on January 31, 2005. The PIC Convention aims to control the transboundary movement of hazardous chemicals (pesticides and industrial chemicals) that have been banned or severely restricted for health or environmental reasons by the country Parties. It is based on the principle of prior consent of the importing country and in the shared responsibility for the international trade of these chemicals.

3.4.4 The Minamata Convention on Mercury

The Minamata Convention on Mercury emerged after recurring discussions in UNEP on the risks of the use of mercury. Altogether 140 countries participated and approved the final text in October 2013. The new treaty will enter into force on the ninetieth day after the date of deposit of the fiftieth instrument of ratification.

Brazil, who has already signed the Convention, is going through the ratification process, which requires a Legislative Decree from the National Congress. With a balanced text, it includes measures applicable to different realities, an essential element for multilateralism in environmental issues in the 21st century.

In sum, the Convention brings together a set of provisions that can be grouped into: control measures, development of specific policies or voluntary and facilitating measures, in addition to administrative provisions and means of implementation.

Currently, the Ministry of the Environment is undertaking efforts to develop the initial assessment project for ratification and implementation of the Minamata Convention. Among the main activities of the project are the development of a national inventory on mercury emissions and releases in Brazil and a reference and guidance document for Convention implementation, which will have the participation of all affected sectors.

3.4.5 Strategic Approach to International Chemicals Management – SAICM

Adopted in 2006, SAICM aims to support the Johannesburg Plan, agreed upon in 2002 at Rio+10, and to ensure that by 2020 chemicals are produced and used in a manner that significantly reduces their harmful effects on the environment and human health.

To achieve this goal, the Global Action Plan included in SAICM suggests that national infrastructures for chemical management should be built, by establishing responsibilities, institutional governance arrangements, legal framework and formulation of appropriate policies and national programmes.

Brazil, a SAICM signatory, has undertaken efforts to ensure the effective implementation of the objectives of the Global Action Plan in the country. During 2014-2015, Conasq will discuss the development of a National Chemical Safety Policy Law, which will be an important milestone for the agenda. Furthermore, the 2020 goal and measures needed for its achievement were incorporated into the MMA's Strategic Plan for 2014-2022 as a measure of instutionalization and implementation commitment of the SAICM.

3.5 Legislation pertaining Chemicals and POPs Management

Hereafter, we highlight the Brazilian legislative framework on environmental protection related to the life cycle of chemicals and POPs management.

3.5.1 Water Quality

Law No. 9,433/1997, known as the Water Act, established the National Water Resources Policy (PNRH). The law established rules for an innovative decentralized management model, creating committees for each river basin. It established the granting of water use rights, with the aim of ensuring the qualitative and quantitative control of the uses and the effective exercise of rights pertaining to access to water.

There are several legal rules related to quality of surface waters and groundwaters established by Conama resolutions, National Water Resources Council (CNRH) resolutions and National Water Agency (ANA) resolutions. Several POPs listed in the Convention are part of the list of water contaminants that must be controlled.

The National Water Agency (ANA) was established in 2000 with an aim of ruling the implementation, operation, control and evaluation of the management instruments created by the PNRH. In 2012, it published the "Brazilian Surface Water Quality Outlook" presenting the river basin situation based on WQI (Water Quality Index) indicators, TSI (Trophic State Index) indicators, ICE (Conformity Indicator) and DO (Dissolved Oxygen) based on analyses carried out in 2010. The conclusion is not complete because many states, especially in the Amazon region, do not have water resources monitoring networks.

Considering the 1,988 monitored points in the country in 2010, in rural and urban areas, 6% of them presented a “very good” condition, 75% presented a “good” condition, 11% presented a “regular” condition and 7% presented a “poor” or “very poor” condition.

Considering only urban water bodies, in 2010, 47% of monitored points presented a “poor” or “very poor” condition. This is a result of the high urbanization and low wastewater collection and treatment rates in the country.

The report did not present information on water quality based on the presence of other pollutants such as pesticides, hormonal disruptors and POPs. Despite the high use of pesticides in Brazil, studies on the contamination of water bodies by these chemicals are not specific. Chapters 4 and 5 of the report published by ANA show some of these results.

3.5.2 Air Quality

The first regulatory initiative to control levels of atmospheric emissions of pollutants in Brazil occurred in May 1986, when Conama established the Programme to Control Air Pollution from Motor Vehicles (Proconve), Resolution No. 18/1986, to reduce levels of pollutant emissions from motor vehicles. This measure encouraged national technological development, both in automotive engineering as well as in methods and equipment for pollutant measurements and essays.

The reference for government action in air quality is Conama Resolution No. 5, published in 1989, instituting the National Air Quality Control Programme (Pronar). Pronar determined the need to set maximum emission limits per type of pollution source and priority pollutants as well as the adoption of national air quality standards.

In 1990, Conama established the national air quality standards for Pronar, which is currently under review. Conama also set specific maximum limits for emissions of several polluting sources.

Emissions from stationary sources regulated by these Conama resolutions are controlled for the following pollutants: inhalable particles (IP), Total Suspended Particles (TSP), Carbon Monoxide (CO), Sulfur Dioxide (SO2), Nitrogen Dioxide (NO2) and Ozone. Therefore, there are no established limits for emissions of dioxins and furans as part of the general control of air quality as determined by Conama resolutions. Because of the high costs of dioxin and furan analyses and operation difficulties, these pollutants are monitored by indicative parameters such as measurement of particulate material in which part of the dioxins and furans released in the processes is retained.

Emission limits for dioxins and furans were established only for thermal treatment of waste and organic material, and waste co-processing in rotary kilns for clinker production.

As for air quality in the country, there is no compiled data available for the states to present a national monitoring outlook. Some states, with strong industries and a large number of vehicles, have developed monitoring programmes while others have not implemented them yet. The Energy and Environment Institute carried out an analysis of the monitoring network that indicates that only a limited number of areas with specific structures are monitored and that there are difficulties in operational maintenance and in the systematic disclosure of results and reports.

3.5.3 Waste Management – National Solid Wastes Policy

In 2010, after 20 years in Congress, Law No. 12,305 was enacted establishing the National Solid Wastes Policy (PNRS). PNRS is an important law in Brazil as it contains significant instruments that enable

Brazil to address the main environmental, social and economic problems arising from the improper management of solid wastes. It was drafted in close alignment with the Basel Convention.

It provides for the prevention and reduction of waste generation, proposing sustainable consumption practices and a set of tools to foster greater recycling and reuse of solid wastes and the environmentally sound disposal of wastes.

The most common form of final disposal of household waste is in landfills. Burning of this kind of waste is not usual. As for hazardous waste, the most used methods are burnging and industrial landfills.

It is important to note that a large amount of urban waste in Brazilian municipalities does not yet have a sound final disposal being disposed of at open dumps without treatment and with a high risk of environmental contamination and disease proliferation. Eliminating garbage dumps is one of the main objectives of the PNRS published in 2010.

The PNRS set important targets that will contribute to eliminate garbage dumps and established plans for the federal, state, micro-regional, inter-municipal and municipal levels.

It also established reverse logistics of post-consumption waste and packaging for the following products: pesticides, their wastes and packaging; batteries; tyres; lubricants, its wastes and packaging, sodium and mercury fluorescent light bulbs, mixed-light lamps, electronic equipment and components.

Sectoral agreements are being signed to define procedures for this reverse logistics.

Furthermore, the PNRS instruments will help Brazil achieve one of the targets of the National Climate Change Plan, which is to achieve a waste recycling rate of 20% by 2015.

Conama published several resolutions to regulate the management of specific and hazardous wastes. Ibama's Normative Instruction No. 13/2012 published the Brazilian List of Solid Wastes, which was inspired by the European List of Solid Wastes (Commission Decision 2000/532/EC). Ibama's Normative Instruction No. 1/2013 lists the possible final disposal operations for solid wastes in Brazil.

The Brazilian Technical Standards Association (ABNT) also has an important role in drafting voluntary standards, which harmonize and define technical criteria and standards for activities and services. NBR 10004/2004 deals with the criteria for classifying solid wastes and its list was incorporated to Ibama's Normative Instruction 13.

3.5.4 Contaminated Sites

Conama approved Resolution No. 420/2009, which establishes guidelines for the environmental management of contaminated sites. According to the aforementioned resolution the environmental agencies must establish procedures for identification, analysis and remediation of contaminated sites.

To prevent contamination and control the quality of the soil, undertakings that develop pontentially-contaminating activities must implement the Soil and Groundwater Quality Monitoring Programme on their sites and, whenever necessary, on their direct influence area and surface waters. Furthermore, they must present a technical report on the quality of the soil and groundwater prior to shutting down their operations.

According to Conama Resolution 420/2009, Municipal and State environmental agencies are responsible for managing contaminated sites.

3.5.5 Control of Pesticides, Household Products, Wood Preservatives and others

In Brazil, the following products are controlled by different sets of legislation: agrochemicals (agricultural pesticides for farming and products for non agricultural uses, which includes, for example, those to protect native forests, water environments and other ecosystems and environments), household pesticides, wood preservatives, veterinary products and medicines used to control vectors of diseases. These products fall within the concept of pesticide adopted by the Convention.

For all of these products prior registration and approval by the responsible government agencies is mandatory according to specific legislation regulating these procedures. Prior registration is the essential tool for allowing government control of these substances, including their production, exports, imports, marketing and use.

Specifically in regard to agrochemicals, Law No. 7,802/1989, known as the Pesticides (Agrochemicals) Act and its regulating Decree No. 98,816/1990 (later altered by Decree No. 4,074/2002) establish that the following products can not be registered: (1) those with teratogenic, carcinogenic or mutagenic characteristics; (2) those that are hormonal disruptors and cause damage to the reproductive system; (3) those for which there is no antidote or effective treatment; (4) those that prove more dangerous to humans than laboratory testing on animals have shown; (5) those for which Brazil does not have methods to deactivate its components in order to prevent its wastes from posing risks to the environment and to human health, and (6) those whose characteristics cause damage to the environment.

Wood preservatives, veterinary products and products used to control disease vectors are not regulated by the PesticidesAct and have specific legislation.

Currently, the process for analysing registrations of products for agricultural use involves three government bodies: the Brazilian Institute for the Environment and Renewable Natural Resources (Ibama), which evaluates the environmental hazardousness potential; the National Health Surveillance Agency (Anvisa), which carries out the toxicological evaluation; and the Ministry of Agriculture, Livestock and Food Supply (MAPA), which assesses the agricultural effectiveness of the product and grants final registration. Together, these three bodies form the Technical Advisory Commmittee for Pesticides (CTA), which meets monthly to discuss and decide pesticide registration procedures and issues related to the registration of active ingredients.

The Pesticides Act also provides for re-evaluation of pesticides, at any time, when evidence emerges of occurrences/alterations in hazards to human health or the environment that advise against the use of registered products and whenever there is evidence of reduced agricultural effectiveness. When the re-evaluation is concluded, products may have their registrations maintained, altered, suspended or cancelled. This initiative is important because when the registration is granted, it is valid for an indefinite period of time.

Advances and developments in science have permitted risks posed by substances to be re-evaluated so that, in certain cases, an active ingredient that was previously considered safe and had been registered may be banned.

Since 2000, Anvisa, Ibama and MAPA have routinely re-evaluated active ingredients and, as a result, have banned some of them in Brazil, including POPs listed in the Convention, as will be shown later.

An important measure adopted by the Pesticides Act determines the immediate re-evaluation of the registration of organochlorine pesticide products, resulting in most of them being banned, and the re-evaluation of all products registered before its enactment, in order to include a report on the hazardousness of these products to the environment.

Also in tune with the international cooperative effort to reduce and eliminate the risks posed by the use of hazardous chemicals, this Act establishes that re-evaluation should also be conducted by the competent agencies when international organisations responsible for health, food or the environment, of which Brazil is a member or signatory of agreements or treaties, warn of risks or advise against the use of pesticides.

With respect to the administrative responsibilities for controlling pesticides, the federal government is responsible for registering the product, inspecting the product/formulation, and quality control, as well as for approval of exports and imports. The states are responsible for inspecting the use, storage, sale and distribution. Municipalities are responsible for inspecting use and storage (Articles 9, 10 and 11 of the Pesticides Act).

The Pesticides Act has provisions on pesticide packaging and labeling, final disposal of packaging and leftover pesticide, storage and transport of these products, quality control and it also establishes penalties if the law is infringed.

With regards to final disposal of packaging and leftovers, the law determines that users and importers of these products must return empty containers to the where they were purchased or taken to collecting centres. License-holding companies, pesticide producers and traders are responsible for collecting, transporting and disposing of returned packaging.

To make reverse logistics easier, the industry got together and created the National Institute for Processing Empty Containers (inpEV) in 2001. InpEV is a non-profit organization aimed at promoting the correct disposal of pesticides empty containers across the country. It developed the Campo Limpo (Clean Field) System with over 90 manufacturers of pesticide, about 260 distributors and cooperatives associations from around the country, nine recycling companies and five incineration companies. The system relies on 400 collecting units and centres in 25 states and the Federal District integrating its structure. The system also counts on the engagement of farmers and the participation of federal, state and municipal governments.

3.5.6 Classification and Labeling of Chemicals

In Brazil, the GHS (Global Harmonized System of Classification and Labeling of Chemicals) has not been fully implemented by legal mandate yet. Brazil has a standard by the Brazilian Technical Standards Association (ABNT), NBR No. 14,725, which has four parts: Part 1: Terminology; Part 2: Hazard Classification System; Part 3: Labeling, and Part 4: Chemical Product Safety Record (FISPQ). The standard is voluntary.

According to Regulation No. 229/11, which published the Ministry of Labour and Employment's Regulation Norm (NR) No. 26, every chemical used in the workplace must be classified in terms of its hazardousness according to the GHS. However, there is no national legislation establishing guidelines and criteria for this classification.

Brazil, together with the other Mercosul countries, participates in the Economas programme. The programme aims at improving the quality and safety of Mercosul products and strengthening the capacity to align economic growth with sustainable resource management and expanding environmental protection.

One of the lines of action of the Econormas Programme was to promote the implementation of the GHS by the countries. Through cooperation, laboratory equipment used as an alternative to animal use were purchased, national laboratory technicians were trained and a consultancy firm was hired to study and propose a standard structure for GHS implementation legislation in the countries. Conasq is evaluating advances made in the scope of Econormas in order to instruct national debate and draw conclusions on the normative approach adopted by Brazil to expand GHS.

3.5.7 Worker Safety and Occupational Health

There is substantial legal basis on the prevention of accidents and protection of worker safety and occupational health that reflect the implementation of the International Labour Organization's Conventions in the country.

The Tripartite Commission on Safety and Occupational Health – CTSST, established in 2008, represents a milestone in the construction of worker safety and occupational health policies. Comprising an equal number of representatives of government, workers and employers, the CTSST has been working to define guidelines for a systematic and consistent action by the government in promoting safe and healthy work and in preventing work-related accidents and diseases.

Fundacentro is focused on developing educational actions and raising awareness of the population and workers for issues regarding occupational safety and health, including specific programmes on chemical safety and for the agricultural sector.

The Ministry of Health, through Vigiquim (National Environmental Health Surveillance related to Chemicals Programme) also carries out surveillance actions focused on occupational health, particularly of five substances: asbestos, benzene, mercury, lead and pesticides.

In 2012, the National Occupational Safety and Health Plan – Plansat was established to implement the National Occupational Safety and Health Policy – PNSST instituted by Decree No. 7,602/2011.

3.5.8 Import and Export Controls

On the national scope, import and export operations are processed by the Integrated Foreign Trade System (Siscomex), which is administered by the Ministry of Development, Industry and Foreign Trade (MDIC) with the Federal Revenue of Brazil and the Central Bank.

In addition to those managing bodies, Siscomex works with consenting bodies, which are responsible for authorizing the import/export process, both administratively and commercially, of certain goods subject to prior consent.

In Siscomex, goods are classified according to the Mercosul Common Nomenclature (MCN), which is also adopted by Argentina, Paraguay and Uruguay. NCM classification codes are made up of eight digits, based on the Harmonized Commodity description and coding System (HS).

The Ministry of Agriculture, Livestock and Food Supply controles import and export operations of pesticides for agricultural use and is the body responsible for giving prior consent for importing pesticides. Chemicals that are not registered or that are banned in Brazil do not receive consent to enter the country (Decree No. 24,114/1934 and MAPA Normative Instruction No. 67/2002).

As for the import or export of non-agricultural pesticides such as products used in water environments, in the protection of native forests and other ecosystems and as wood preservatives, Ibama is responsible for prior consent (IBAMA, 2012). Anvisa is the consenting body in Siscomex responsible for the sanitary control of several products and services.

Foreign Trade data are registered and recorded by MDIC through an Information System called Alice-web.

3.6 Existing Programmes and Systems to Monitor Contaminants and Residues of Pesticides in Food

As all large agricultural producers, Brazil has always been a large pesticides consumer; currently it is one of the largest. The Brazilian chemical industry also has performed a relevant role in the sector's global ranking.

This scenario lead to the development of government programmes aiming at assessing the presence of contaminants in food and the establishment of surveillance systems for poisoning by chemical contaminants.

3.6.1 Programme to Analyse Pesticide Residues in Food – PARA of the National Health Surveillance Agency

Anvisa began operating the Pesticide Residues in Food Analysis Programme (PARA) in 2001 to continuously assess the levels of pesticides residues in food of plant origin on the consumer's table. Anvisa alongside the Surveillance Agencies (VISA) and the Central Public Health Laboratories (Lacen) coordinates PARA.

The programme aims at verifying whether food sold in retail stores has pesticide residue levels within the Maximum Residue Limits established by Anvisa and published in the individual pesticide monographs. It also allows verification of whether the pesticides used have been duly registered in Brazil and if they were applied only to those crops for which they are authorized.

Some 20 foods are tested for more than 200 types of pesticides, including the POPs aldrin, alpha- and beta-HCH, chlordane, DDT, dieldrin, endosulfan, endrin, heptachlor, hexachlorobenzene, mirex, lindane and pentachlorobenzene (quintozene). The only POPs that are not tested are toxaphene and chlordecone.

PARA has provided information for decisions on the restriction or ban of pesticides that are hazardous to the population; for developing actions for SNVS pesticide controls and to establish a network of laboratories capable of analysing pesticide residues. It has also provided computer tools and databases to speed up actions in the states, and fostered capacity-building actions. As a result, government receives information for regulatory, inspection and educational actions (Anvisa 2013).

Some noteworthy actions are: Educational measures for the use of pesticides according to Good Agricultural Practices (GAP); presentation and discussion of results with representatives of the retail market, whose distribution network is encouraged to perform greater quality control and traceability of food; and coordination in the federal and state levels between the different stakeholders involved in production, consumption and control of pesticides.

In the process of disclosing results, the Programme recommends consumers to purchase certified food products that are traceable to the farmer, and recommends farmers to adopt GAP to reduce the consumption of pesticide residues and prevent damages to health caused by those substances.

3.6.2 National Plan to Control Residues and Contaminants – PNCRC of the Ministry of Agriculture, Livestock and Food Supply

MAPA coordinates the National Plan to Control Residues and Contaminants (PNCRC), a federal programme to inspect and oversee food by analysing plant and animal products for residues of chemicals that are potentially harmful to consumer health, such as residues of veterinary medications, pesticides and similar substances, environmental and inorganic contaminants.

This plan gathers all National Residue Control Programmes although each Programme corresponds to a different crop.

Plant-PNCRC inspects and monitors the quality of products of plant origin produced across the country in relation to biological and chemical residues and contaminants. Products destined both to the domestic and international markets are monitored. Currently, about 80% of analyses focus on the domestic market, but as of this crop-year, analyses of imported products at customs facilities are planned.

Within the monitoring subprogramme, there is a subprogramme that investigates non-complying products based on information from the monitoring of residues and contaminants across the country. The programme also supervises active ingredients that are banned in the country and those whose licenses are limited to certain crops, and violations of the national maximum limits.

Samples are collected on the farms, processing plants and distribution centres. The sampling plan complies with Codex Alimentarius recommendations.

With respect to POP pesticides, tests are carried out to verify the amount of residues of aldrin, alpha- and beta-HCH, chlordane, DDT, dieldrin, heptachlor, hexachlorobenzene, mirex and lindane.

Analyses are performed by the National Agricultural Laboratories (Lanagro) that are the official laboratories of MAPA or by MAPA-accredited public and private laboratories. These laboratories, together, form the National Agricultural Laboratories Network and are required to also be accredited by the National Institute of Metrology, Quality and Technology (Inmetro).

The main objectives of the plan are: to verify and evaluate good agricultural and manufacturing practices, to carry out self-inspections throughout the agro-food chain stages; to verify health-hygiene safety and quality of imported animal and plant based products and by-products of economic importance; and to ensure a system that guarantees that food for consumers is safe and innocuous and complies with international health requirements (MAPA 2013).

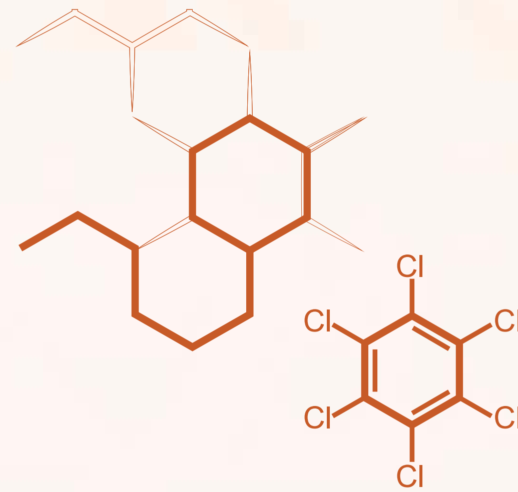
3.6.3 Sinitox and Sinan

The National System of Toxic-Pharmacological Information (Sinitox) was established in 1980 by the Oswaldo Cruz Foundation and is administered by Anvisa. Sinitox is responsible for compilation, analysis and disclosure of cases of poisoning registered by the National Network of Information Centres and Toxicological Assistance (Renaciat). Renaciat, with units in 19 states provides information and guidance on diagnosis, prognosis, treatment and prevention of poisoning.

Sinitox registers cases of poisoning by various toxic agents including agricultural pesticides, household pesticides, veterinary products and rodenticides.

Sinan (Notifiable Diseases Information System) is coordinated by the Ministry of Health and receives information from notifications and investigation on diseases that are part of the national mandatory notification diseases list. State and municipalities may include other important health issues that occur in their regions.

The System contributes to identifying the epidemiological reality of a certain region by providing explanations on causes of mandatory notification diseases.



4 POPs situation in Brazil: Annex A and Annex B POPs

This topic will present the situation of production, use and foreign trade of Annex A and Annex B POPs in Brazil as well as adopted measures to identify and soundly dispose of stockpiles and waste of these POPs in light of the Convention's requirements.

Convention Requirements Summary

Article 3. Production, uses and foreign trade:

Paragraph 1. Each Party shall:

a) Prohibit and/or take the legal and administrative measures necessary to eliminate:

i) Its production and use of the chemicals listed in Annex A;

ii) Its import and export of the chemicals listed in Annex A in accordance with the provisions of paragraph 2;

b) Restrict its production and use of the chemicals listed in Annex B in accordance with the provisions of that Annex, respecting the acceptable purposes.

Paragraph 2. Imports and exports are allowed only in the cases:

a) of specific exemptions in effect and the approved acceptable purposes;

b) for environmentally sound disposal and

c) for non-Party countries, meeting requirements.

Article 6. Stockpiles and wastes:

Paragraph 1. Each Party shall:

a) Develop and implement strategies to identify:

- Stockpiles consisting of or containing POPs listed either in Annex or B;
- Products and articles in use, and wastes consisting of, containing or contaminated with a POPs listed in Annex A, B or C;

b) Manage stockpiles in a safe, efficient and environmentally sound manner;

c) Not permit the recovery, recycling, reclamation, direct reuse or alternative uses of POPs, with the exception of recycling of articles that contain c-octaBDEs and c-pentaBDEs;

d) Not transport the wastes across international boundaries without taking into account international rules.

4.1 POPs Pesticides

4.1.1 Production, Imports and Exports

The first records of the use of organochlorines in Brazil date back to 1946. From 1946 to 1948, the presence of pests such as the migratory grasshopper, coffee borer and cotton pest required health campaigns that increased the consumption of products chiefly formulated with lindane, DDT and parathion.

In Brazil, DDT production began in the 1950s and DDT was widely used in public health campaigns and in agriculture. In the late 1960s, Brazilian production of pesticides was basically limited to two organochlorines — DDT and lindane, which were also imported (ALVES FILHO, 2002).

In the early 60s, the use and production of pesticides was strongly encouraged in Brazil, including funding. This fact, associated to the existence of an outdated and not very strict legal framework, led to the easy registration of pesticides, many of which had already been banned by legislation in developed countries (PELAEZ; TERRA; SILVA, 2010).

The following table gathers information on production, imports and exports of POP pesticides available in databases. It is important to note, however, that past information is not accessible and, therefore, not included.

Table 6 – Production, imports and exports of POPs pesticides

Period	Production	Imports	Exports	
Aldrin				
1961 to 1982	–	17.000 t	–	
1989 a 1996	–	300 t	–	
1997 and 1998	–	0,02 t	–	
Dieldrin				
2004	–	0,02 t	–	
Chlordane				
1989 and 1996	–	0,02 t	–	
DDT				
1959 and 1982	75.500 t	–	–	
1959 to 1975	–	31.300 t	–	
1989 and 1991	–	3.200 t	–	
2001	–	7 t	–	

Table 6 – Production, imports and exports of POPs pesticides (continued)

Period	Production	Imports	Exports	
Endosulfan				
1962 and 1982	–	6.600 t	–	
1997 and 2011	–	26.700 t	–	
2008	14.650 t	1.845 t	1.012 t	
2009	11967,37	1209,02	0,13	
2010	21.533,96	1099,9	0	
Endrin				
1961 and 1982		–	10.600 t	–
Heptachlor				
1961 and 1982	–	4700 t	–	
1989 to 2003	–	1.700 t	–	
Hexachlorobenzene				
1992	–	30 t	–	
1993	–	1 t	–	
1997	–	0,018 t	–	
Lindane				
1955 and 1982	18.400 t	6.500 t	–	
1961 and 1982	–	900 t	–	
1996 to 2003	–	600 t	–	
2005 to 2006	–	64 t	–	
Mirex (data refer to dodecachlor)				
1989	–	191 t	–	
1992	–	104 t	–	
1993 and 1996	–	1 t	–	
1998	–	18 t	–	

Source: National Inventory of Wastes and Stockpiles of pesticides MMA, 2015.

4.1.2 Legislation

Throughout the 70s a series of regulatory directives were published in Brazil restricting the production, trade and use of substances deemed problematic in the international scenario, including DDT and other chlorinated organics. Evidence of problems arising from the use of defoliant herbicides used as chemical weapons during the Vietnam War, from 1954 to 1975, especially “agent orange” (2,4-D + 2,4,5-T), contributed to improvements in the Brazilian legislation.

In 1985, MAPA banned the trade, use and distribution of organochlorine chemicals for agriculture, with some exceptions. Some of the listed substances, such as DDT, could still be used as household pesticides and in public health campaigns, or even in agriculture in emergency situations.

In 1992, in light of the Pesticides Act, introduced in 1989, three organochlorine chemicals were registered in Brazil after interministerial analysis: aldrin, chlorobenzilate and dodecachlor (used in mirex), but in the 90s all of these substances were banned.

In 1998, the MS excluded DDT from the list of substances that could be used in agriculture and household cleaning, banning it for any kind of use. According to the National Health Foundation – Funasa, the product was last used in public health campaigns in 1995.

From 2002 to 2003, already under the influence of the Stockholm Convention, several pesticides suspected of having adverse effects on human health were re-evaluated by Anvisa and were restricted. Heptachlor, then only used as a wood preservative, was banned.

In 2006 a new assessment was carried out resulting in a ban on lindane. In 2010, after yet another toxicological re-evaluation begun in 2008, it was determined that endosulfan would undergo a step withdrawal from the Brazilian market over 3 years — import ban as of 2011, manufacture on Brazilian soil banned as of 31 July 2012 and ban on trade and use as of 31 July 2013.

Table 7 shows the legal situation of POPs pesticides:

Table 7 – Legal situation of POPs pesticides

Product	Uses in Brazil	Legal situation
Aldrin	Used in agriculture for treatment of cotton and rice seeds intended only for planting; treatment of pits for planting banana stumps and tree seedlings; application in sugar cane furrows and treating their setts; and control of termites and ants.	1985 – agricultural use banned, except for bait insecticide and termiticide for use in forestation and reforestation; 1992 – all agricultural uses banned; 2000 – use as wood preservative banned.
Endrin	Agricultural use for cotton, maize and soy crops. Household insecticide uses were not permitted.	1985 – banned
Dieldrin	Never registered for any purpose and there are no signs of its use in Brazil.	Banned

Table 7 – Legal situation of POPs pesticides (continued)

Product	Uses in Brazil	Legal situation
Chlordane	Agricultural insecticide	1980 – banned
Chlordecone	Not registered in Brazil	Banned
Clordecone	Not registered in Brazil	Banned
Dodecachlor (Mirex)	Insecticide used for ant control	1985 – agricultural use banned, except for bait insecticide; 1992 – use as bait insecticide banned.
Toxaphene	Registered as an agricultural insecticide and household pesticide	1985 – banned
DDT	Broad use in Brazil as a pesticide since the 1950s. Also used to control vectors of human and veterinary diseases, especially against malaria in the Amazon region	1971 – use to combat ectoparasites in household animals and pest control in pastures banned; 1985 – agricultural use banned 1986 – veterinary use banned 1998 – public health campaign use banned
Heptachlor	Agricultural use to treat rice and maize seeds, sugar cane billets, pits and seedlings of banana and tree species and also to control termites and ants. Use as a household pesticide was not authorized.	1985 – agricultural use banned 2002 – use as wood preservative banned.
Lindane	Used in agriculture, in wood preservation and as a veterinary and pharmaceutical product against ectoparasites, such as scabies and lice.	1985 – agricultural use banned 1986 – veterinary use banned 2000 – use in medications banned 2006 – use as wood preservative banned.
Alpha-HCH and beta-HCH	There are no records of intentional use of alpha and beta-HCH. Not registered in Brazil	Banned
Hexachlorobenzene	Never registered as a pesticide in Brazil, but it is believed to have been imported for use as an intermediate in industrial production processes.	Banned

Table 7 – Legal situation of POPs pesticides (continued)

Product	Uses in Brazil	Legal situation
Pentachlorobenzene	There is no information which suggests intentional production or use of PeCB in Brazil for manufacturing quintozene.	Banned
Endosulfan	Agricultural use for cotton, cocoa, coffee, sugar cane and soybeans crops as well as to control ants. For non-agricultural uses, only ant control was authorized. Its use as wood preservative was authorized exclusively to treat wood for railway ties, posts, braces and stakes for rural fences, supports and beams.	2010 – progressive ban established, concluded in July 2014.

All POPs pesticides are banned in Brazil. Brazil has not made use of the specific exemptions approved by the Conference of the Parties for aldrin, chlordane, DDT, dieldrin, endosulfan, heptachlor, lindane, mirex, hexachlorobenzene and pentachlorobenzene.

Likewise, it did not register an acceptable purpose for DDT to control vectors of diseases. Although DDT was largely used to control malaria in the past, its use for this purpose was banned in 1998.

DDT is currently replaced by pyrethroid insecticides (particularly cypermethrin) in public health campaigns to combat malaria. Available antivectorial measures include environmental management, chemical treatment of the household through spraying with residual insecticides such as pyrethroids, particularly permethrin, which, although less effective than DDT, are less toxic to humans and less harmful to the environment. Other applicable measures are the chemical treatment of open spaces through space spraying with Ultra Low Volume (ULV) insecticides, thermal fogging ("fumacê) and treatment of breeding sites (MS, 2005).

As of July 2000, Brazil implemented the Plan to Intensify Malaria Control Actions in 254 municipalities in the Legal Amazon region aiming at, through a political commitment of the three levels of government; promote restructuring of the local health care system. It also seeks to capacitate for coordination and execution of malaria control actions thus decentralizing and strengthening the process and guaranteeing its sustainability (MS, 2005).

4.1.3 Inventory of Stockpiles and Waste of Pesticides POPs

As seen, most POP pesticides used in Brazil have been banned since the 1980s by legislation, but bans were not accompanied by strategies for removing stockpiles or by deadlines for their final disposal.

Thereby rural landowners who had organochlorine stockpiles on their properties had an environmental liability and,fearing penalties and lacking guidance, some ended up adopting inappropriate measures of discard such as throwing the material in rivers, leaving it laying on roads or burning it in the open. Others, kept the chemicals stored on the property or buried them, which was the recommended measure to dispose of leftovers and pesticide packaging at the time (MPOG; MMA, 2015).

Today there are still stockpiles of these obsolete pesticides on rural properties around the country.

From 2012 to 2013, the Ministry of the Environment carried out an inventory to identify stockpiles and residues of POP pesticides that are awaiting final disposal or that already had been disposed of by December 2012. Several federal and state environment, health and agriculture agencies were consulted, as well as institutes, trade unions and associations, that could contribute with information on stockpiles and residues of POP pesticides. Rural landowners were not consulted directly.

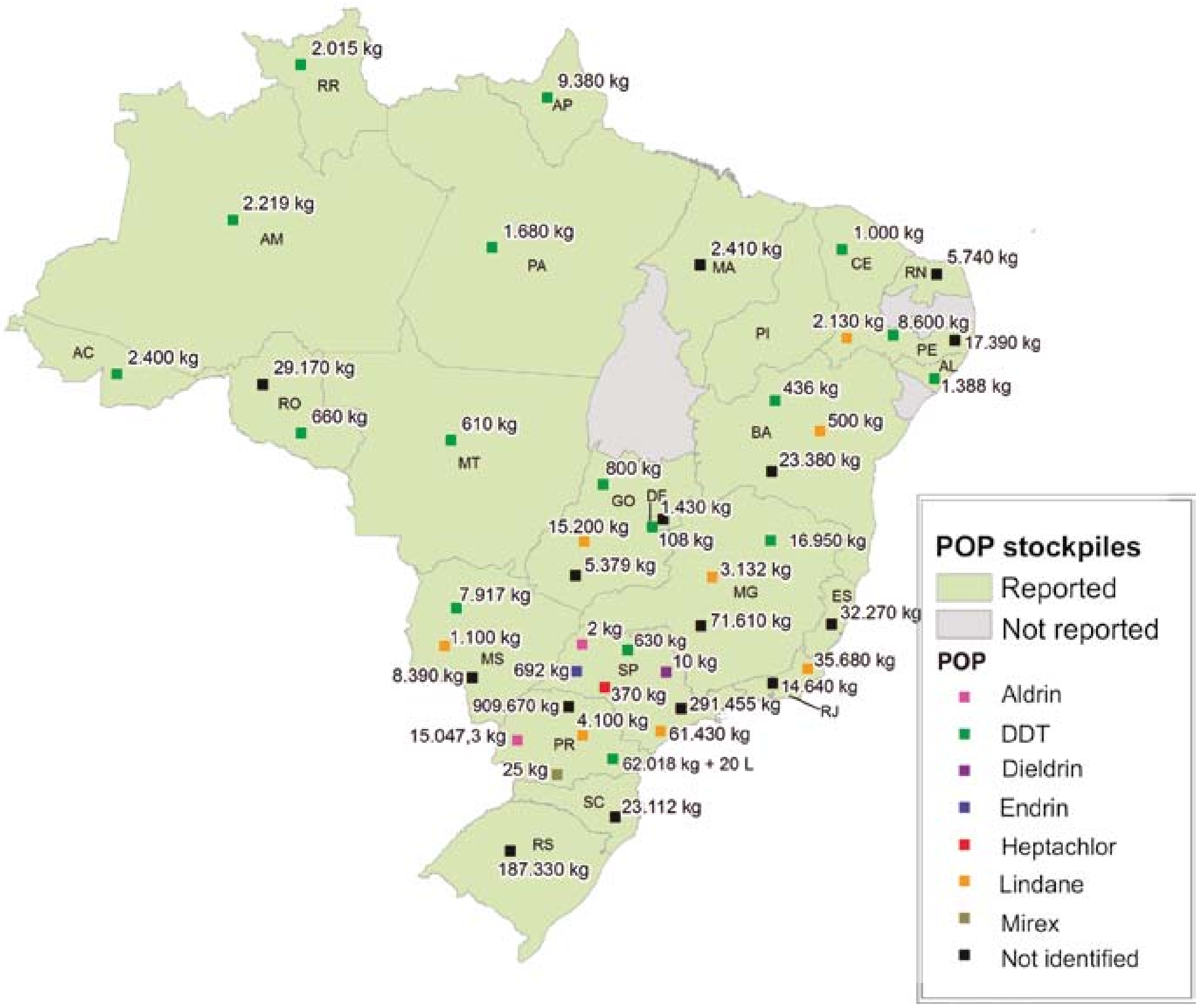
The inventory showed that the amount of remaining POP pesticides, that is, the amount awaiting final disposal, in December 2012, was 588,851.0 kg and 3,345.9 l; and the amount that had already undergone disposal up to this date was 1,900,490.3 kg and 20 l. These data were updated in the second half of 2014, during the preparation of the Action Plan, totaling 666,120.0 kg + 29.0 l still waiting final disposal. There was no change in the amount of pesticide POPs that had been destined.

The map of Brazil (Figures 12 and 13) shows the location of the informed POP pesticide stockpiles that were still awaiting final disposal in December 2012. The map also shows that most Brazilian states have not provided information for the inventory.

Figure 12 – Reported amount of pesticide stockpiles awaiting final disposal in the states

Source: National Inventory of Stockpiles and Wastes of Persistent Organic Pollutants (POPs) used as farming pesticides and for other uses, 2015.

Figure 13 – Amount of POP Pesticides Stockpiles disposed of up to Dec/2012



Source: National Inventory of Stockpiles and Wastes of Persistent Organic Pollutants (POPs) used as farming pesticides and for other uses, 2015.

Despite the large amount of POP pesticides found, it only represents a portion of what exists and has not yet been mapped.

All data presented in this study was obtained through consultations carried out by national agencies responsible for the matter; however, many informed not having data to contribute. We believe that the lack of information does not represent the inexistence of stockpiles and waste, but, instead, a lack of governance over POP pesticides, which should be improved in order to obtain more information and, thus, allow for a better understanding of the national situation. However, with this indicative inventory it is already possible to better qualify the aforementioned perception that there are substantial amounts of products awaiting final disposal and that measures must be undertaken to enable this and phase out the problem.

The lack of information in several Brazilian states on POPs pesticides should, however, be understood considering that this is a developing and vast country where, historically, agricultural activities were scattered, in small and large properties and, at the same time, extensive public health campaigns were carried out.

Moreover, states, which are responsible for promoting management and disposal of stockpiles of obsolete and userviceable pesticides, reported that people who hold these stocks are very reticent in declaring them, as they fear they may have to shoulder the cost of their final disposal and of any recovery measures deemed necessary.

According to current Brazilian legislation, the holder of the stockpile is responsible for its disposal. In most cases, the farmer himself does this by returning the pesticide that is improper to the manufacturer, which must legally dispose of it in an environmentally sound manner. However, since many of these obsolete (out of use) pesticides were stockpiled for over 30 years in precarious storage conditions, it is no longer possible to identify the manufacturer on the label and product information leaflet, so it is not known who is responsible for the disposal of the products.

In the states where there was some kind of exemption of civil, criminal or administrative responsibility over possession of obsolete pesticides, such as in the Campaign to Identify Obsolete Pesticides in the State of São Paulo and the Obsolete Products Fully Eliminated with Environmental Responsibility in Paraná, the number of declarations was high, indicating that extending the experience to other states should be analyzed.

4.1.4 Ongoing activities to identify and collect pesticides stockpiles in Brazil

As mentioned above, two Brazilian states have undertaken relevant actions to remove POP pesticides stockpiles. The Ministry of Health also carried out activities to collect DDT stocks, which were stored in state health centres and used in public health campaigns throughout Brazil.

Below, are presented the campaigns for collection and disposal of these products carried out in the states of Paraná and São Paulo, the two largest agricultural producers in the country, as well as, the project of the Ministry of Health.

4.1.4.1 Poeira Programme – Obsolete Products Fully Eliminated with Environmental Responsibility in Paraná

The state of Paraná has the fifth largest GDP in Brazil, accounting for 5.84% of the national GDP in 2013. A major agricultural state, agriculture and agribusiness accounts for 7.61% of the state GDP in 2010 (IPARDES, 2013). The state is a leader in crops such as maize and beans, in addition to being one of the largest producers of wheat, soy and sugar cane.

Paraná had already undertaken actions to remove BHC stockpiles when this pesticide was banned in 1985. However, it was not a well-planneddeed and the state inspection officers stored stocks rooms of the Agriculture Secretariat improperly, thus overcrowding them with these products. Given this chaotic picture, removals were discontinued and SEAB appointed the farmers as trustees of the BHC stocks that were then kept on the rural properties (MMA; MPOG, 2015).

As a palliative, the already collected stockpiles were removed to an estate where the Prison Farm was to be established in the metropolitan region of the state's capital. Later, from 1997 to 1999, state agencies involved with the problem, undertook a joint action promoted by the Public Prosecutor's Office and removed the stockpiles from the prison farm giving them proper disposal.

The initiative, however, solved only part of the problem since it did not address the question of stockpiles held by farmers across the state. In 2002, in order to expand the scope, SEAB returned to the subject and consolidated the data on pesticide stockpiles on rural properties. As of 2004, other public administration bodies were added to the debate and in 2005 an interdisciplinary working group was created. The group was responsible for elaborating a pilot-project to collect, transport and give sound disposal to these products in the state.

In 2009, a state law entered into force establishing that farmers who held stockpiles of lindane (BHC) or any other banned pesticides had to submit a declaration informing the type of products held on their property, estimated storage period, amount and storage conditions. This law established an important strategy, when it stated that the declarer was exempt from any civil, criminal or administrative penalties related to the storage of these products.

This measure proved relevant because even though the responsibility for environmental damage and for the recovery of degraded areas falls to the polluter, it is the government that must adopt measures required for the final disposal of obsolete pesticides that are stocked in conditions that pose risks to human health or to the environment, warranting immediate action of the state to resolve the environmental liability.

To assist in the packing process, farmers received a kit consisting of bags suitable for packing the products, personal protective equipment (PPE) and a guidance manual. For volumes greater than 4,000 kg, packing was handed over to a specialized firm, hired by the Government of the State of Paraná.

Transport of the product from the farm to the point of delivery, for amounts smaller than 4,000 kg was to be carried out by the farmer, who often relied on the support of local governments, associations or farmer cooperatives. When the amount was greater than 4,000 kg, the hired firm would transport the products.

The Packing of products and their delivery for final disposal was financed by the state government. Disposal of the products was the responsibility of the representatives of the pesticide production companies, through InPEV.

As a result of the programme, approximately 2,000 farmers, in 230 municipalities of the state informed their stocks, resulting in the collection of 1,150.8 tonnes of obsolete pesticides. It is estimated that 80 per cent of these 1,150.8 tonnes are lindane and other chlorinated pesticides and the rest are banned products not listed in the Stockholm Convention. However, due to the inadequate conditions and the long storage period, it was not possible to identify each product individually.

All collected stockpiles were disposed of adequately.

In January 2013, a new state law was enacted and the second stage of the Programme began, establishing a period for farmers that still held banned or obsolete products on their properties to make their declarations for later delivery and proper disposal of the products.

Figure 14 – Unloading material from a producer in Maringá – PR

Source: Paraná Water Institute, 2013.

Figure 15 – Material received from farmers in Londrina – PR

Source: Paraná Water Institute, 2013.

At the end of the aforementioned declaration period, the state received about 290 declarations from farmers informing the existence of about 400 tonnes of obsolete products that needed to be disposed of. However, it is not possible to determine how much of that were POPs. Final disposal of these stocks has not been undertaken for lack of funding.

4.1.4.2 Campaign to Collect Obsolete Pesticides in the state of São Paulo

The state of São Paulo is the main financial centre of the country, concentrating more than 33% of the country`s GDP in 2012 (Investesp, 2014). In the agricultural sector, the state is a major producer of various crops, including, sugar cane, oranges, maize, soybeans, banana, tomato, cassava, potato, beans, cotton and coffee. It is the largest consumer of pesticides and 80% of the pesticides produced in Brazil are manufactured in this state.

Given the need to eliminate obsolete pesticides in the state of São Paulo,a working Group, composed of representatives of government, industry, distributors, class entities and end users was created with the objective of developing a programme to carry out the final disposal of obsolete pesticides, particularly organochlorines held in the state's rural properties. The Regional Centre for the Stockholm Convention on POPs for Latin America and the Caribbean, Cetesb (São Paulo State Environmental Protection Agency), participates as a guest member.

The first stage of the work involved a survey of the quantity and location of obsolete pesticides that may have remained stored in São Paulo rural properties after the ban in the 1980s. With this information in hand, it was possible to plan the subsequent stages and measures for removing these products from the environment.

Over nine months the farmers declared holdings of obsolete pesticides banned by law, without incurring in any type of penalty, if declared within the established period and if products had been maintained within minimum storage conditions until their final disposal.

During the Survey Campaign, 327 declarations were received in 149 municipalities, amounting to 270 tonnes of products held in rural properties throughout the state. Based on the data obtained during the survey, it was possible to plan the logistics for the final disposal with three potential scenarios, combining factors related to safety of farmers, the environment and health; costs; and location of the products. The scenario chosen was the one that posed the smallest risk to health and the environment.

The next stages will include the packing and removal of the products in all properties, their transport and final disposal by licensed and specialized firms. However, the provision of funds is needed.

4.1.4.3 Remediar Project of the National Health Foundation

The Remediar Project consists of an information survey, carried out by the National Health Foundation (Funasa), on the 154 storage sites of products used in public health campaigns to control endemic diseases, distributed in all states and the Federal District. Funasa, the former Superintendence for Public Health Campaigns (Sucam), is associated to the Ministry of Health and used DDT during many years as the most effective means of eliminating mosquitoes that transmitted diseases and other insects, especially in the Amazon region.

After carrying out visits, it was seen that out of the 154 storage sites, 128 had been used as pesticide deposits and 41 of these are still being used for pesticide storage, 9 of which still have stored or buried DDT. Eigthy five are no longer deposits and are currently residences, schools, and shops or have been abandoned. Two have been recovered.

The second phase is underway and aims to carry out a diagnosis of the contamination of those sites by collecting soil samples to determine the level of concentration of contaminants in those areas.

4.1.5 Main Challenges and Priorities for Action

In spite of the significant amount of POP pesticides that has been eliminated, the challenge is in improving this information in other states. The programmes to remove obsolete pesticides carried out in the states of São Paulo and Paraná are important references for developing similar actions in all states, in particular, those that widely use POP pesticides.

Below we identify some priority actions to be included in the Action Plan:

- Eliminate the stockpiles and residues of inventoried POP pesticides;
- Develop strategies to commit and engage strategic stakeholders in the states to carry out campaigns to identify and provide final disposal of obsolete POP pesticides;

- Technical capacity building of state environment and agriculture agencies and draft guides to assist in the removal and final disposal of POP pesticide stockpiles.

4.2 POPs of industrial use

4.2.1 Polychlorinated Biphenyls (PCBs)

Convention Requirements Summary

Annex A, Part II

Each Party shall:

a) Immediately interrupt the production of new PCBs;

b) Eliminate the use of PCBs in equipment by 2025, taking action in accordance with the following priorities:

  i) Make determined efforts to identify, label and remove from use equipment containing greater than 10 per cent polychlorinated biphenyls or more than 0.05 per cent and volumes greater than 5 litres;

  ii) Endeavour to identify and remove from use equipment containing greater than 0.005 per cent polychlorinated biphenyls and volumes greater than 0.05 litres;

c) Promote measures to reduce exposure and risks:

  i) Use PCB only in intact and non-leaking equipment and only in areas where the risk from environmental release can be minimised and quickly remedied;

  ii) Not use in equipment in areas associated with the production or processing of food or feed;

  iii) When used in populated areas, including schools and hospitals, adopt all reasonable measures to protect from electrical failure which could result in a fire, and regular inspection of equipment for leaks;

d) Not export or import PCB-containing equipment except for the purpose of environmentally sound waste management;

e) Not allow recovery of liquids with PCB content above 0.005 per cent for the purpose of reuse in other equipment, except for maintenance and servicing operations;

f) Make efforts designed to lead to environmentally sound waste management of wastes that contain more than 0.005 per cent of PCB by 2028;

g) Endeavour to identify other articles containing more than 0.005 per cent of PCBs, for environmentally sound management;

h) Provide a report every five years on progress in eliminating PCBs and submit it to the Conference of the Parties.

4.2.1.1 Production and Application in Brazil

PCB consumption in Brazil is a result of imports of equipment containing the substance and of commercial formulation oils for various uses. There are no records of production of PCBs in the country (PENTEADO, 2001).

For a very long time, PCBs were mostly used in high voltage transformers as dielectric oil. There are no records of direct use in civil construction; its main use was in the power industry. Other products containing smaller amounts of PCBs were sold in Brazil, such as antiseptic soaps (mainly in hospitals), paints, pesticides and various hydraulic fluids.[4]

A study published in 2000 estimated that there are around 130,000 tonnes of PCBs in Brazil (power industry and other industrial and commercial sectors) (COSTA, 2000).

Because of the growing global concern over PCBs, in the 1970s, Brazil followed the environmental trend and banned the use and sale of PCBs in new equipment, through Joint Interministerial Directive of the Ministries of Interior, Industry and Trade, and Mines and Energy, No. 19, on 29 January 1981.

This directive banned the use of PCB oil in any concentration, regardless of volume and means of containment, and also banned its improper discard into the environment. Although the directive established that the production and importing of PCB-containing equipment should cease within two years, it permitted existing equipment to remain in use until the end of their lifespan.

In the following years, rules were published to assist in the inventory of stockpiles, oversee handling and maintenance of equipment containing the fluid and also to avoid contamination of environment compartments with wastes, stockpiles and articles that contain PCBs. However, several gaps and inconsistencies were identified in legislation pertaining to the environmentally sound management of the life cycle of PCBs.

Among these is the fact that current legislation does not deepen the approach on relevant technical aspects of the problem and does not provide for procedures. Therefore, the elaboration of normatives that address these issues is one of the most expected measures of the Action Plan.

4.2.1.2 PCB Inventory for the National Plan

In 2009, the Brazilian Electricity Regulatory Agency (Aneel) carried out an inventory of equipment - in operation or in storage - that contained insulating oil contaminated by PCBs in all the electricity transmission agents in the country. It is estimated that around 80% of the PCB existing in Brazil is found in the power industry.

75 electricity transmission agents and 64 electricity distribution agents were consulted, but only a small portion (37) replied. Altogether, a volume of 2,664,917 l of oil contaminated with PCBs was found in the power industry, a lower amount than estimated. Although this information is underestimated it is the only data officially reported by the sector up to the present moment.

In order to complement the power industry inventory, the MMA carried out a survey, from 2012-2013, of the stocks, equipment in use and out of use that contain PCBs and the amount (in number of equipment items and in volume, when appropriate) existing outside the power sector.

4 MMA. Management and elimination of PCB. Available at: <http://www.mma.gov.br/cidades-sustentaveis/ residuos-perigosos/gestao-e-eliminacao-do-pcb>. Accessed: 13 feb. 2015.

It included areas at risk, such as schools, shopping centres, hospitals, and universities according to the priorities set forth in Annex A, Part II of the Stockholm Convention (populated areas). The food and beverages sector is also of concern, since the use of PCB-containing equipment is banned from food production areas and drinking water areas. PCB incinerators and treatment providers were consulted regarding the amount incinerated annually of this substance, since the start of the company's activities. The railway sector, which has historically used PCBs in its lines, locomotives and facilities was not consulted for the inventory.

Companies were not consulted individually, but through trade associations, industry federations and cooperatives of the following sectors: a) sugar and ethanol; b) food and beverages; c) automotive; d) carpets and coatings; e) ceramics; f) high pressure cylinders; g) construction/cement; h) leather; i) electronic equipment and home appliances; j) packaging; k) teaching/schools; l) laboratory equipment. m) events; n) hospitals; o) printing industry; p) chemical industry; q) IT; r) various laboratories; s) industrial machinery; t) metallurgy/mining; u) furniture; v) paper and pulp; x) plastics; y) tyres/rubber; w) materials recyclers; z) shopping centres; ab) telecommunications; and ac) textiles.

Altogether the inventory involved 3,339 entities.

Finally, 1,940 equipment items were inventoried, of which 36 had analyses reports attesting to PCB content smaller than 50 ppm, and 1,904 articles have suspected PCB contamination. The declared volumes amounted to 823,866 l of oil suspected of contamination with polychlorinated biphenyls.

According to data received up to now, the sector with the largest number of informed equipment items outside the power sector is the metallurgy/mining sector, with 827 equipment items (43.4% of total). Second in number of items was the construction/cement sector, with 514 items (27% of total) and in third place was the chemical industry with 152 items (8% of the total). These top three sectors in number of equipment items correspond to almost 80% of declared items.

About 70% of all the declared items did not have information on the volume of PCB. This number is high because of the type of equipment declared and/or the sectors' lack of knowledge of the PCB they have. The internal volume of some items like PCB circuit breakers and capacitors is difficult to ascertain because they are usually sealed. We should stress that of all the equipment, 74% is in use, 17% is not being used and only 9% had no information on use.

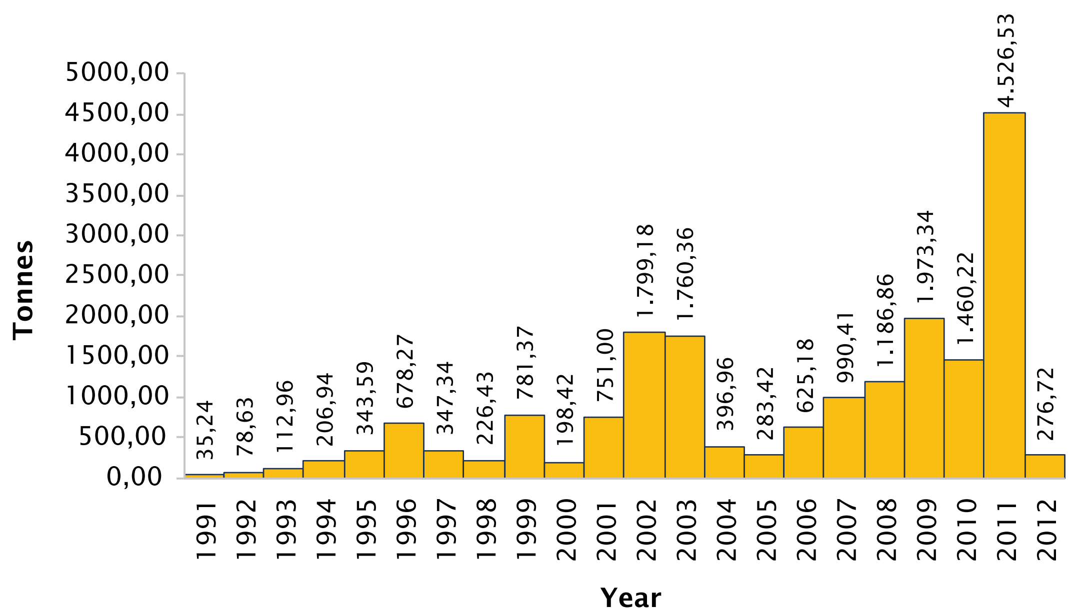
Approximately 80% of all equipment inventoried is found in the states of São Paulo, Minas Gerais and Espírito Santo. 56% of the declared equipment is in the state of São Paulo, followed by Minas Gerais with approximately 15% and Espírito Santo with 8%.

According to global surveys in existing literature, the volume of PCBs inventoried in Brazil could be greater than the amount that was identified in the inventories. Furthermore, given this potential increase in contaminated oil, the volume of PCBs requiring appropriate disposal may increase considerably.

Altogether, with the power industry and other sectors, approximately 3.5 million litres of contaminated oil were identified, corresponding to some 4.9 thousand tonnes of contaminated wastes.

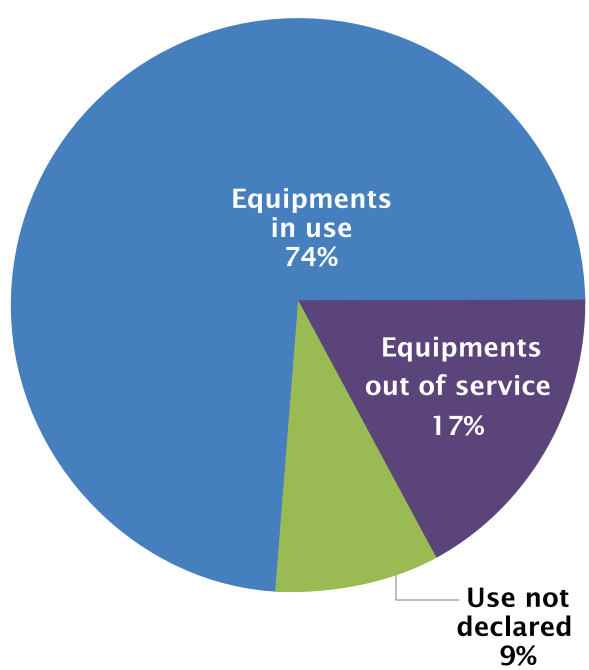
Surveys carried out among companies licensed to dispose of PCBs indicated that approximately 20 thousand tonnes of POPs were disposed of in an environmentally sound manner.

Figure 16 – PCB disposal graph, totals per year from 1991 to 2012



Source: Cetrel, WPA, Haztec, Braskem and Tecori (Declaring companies), 2012.

Figure 17 – Use of equipment



Source: National Inventory of Polychlorinated Biphenyls. MMA, 2015.

Adding that number to the total that was inventoried, about 25 thousand tonnes of PCBs were found in Brazil.

Considering data from Costa (2000) and Brevik et al. (2002), the National Inventory gathered only nearly 20% of Brazilian PCBs, thus indicating that at least 80% of PCBs has yet to be inventoried, labeled and managed in an environmentally sound manner.

In addition to the demands for the remaining volume, the National Inventory also concluded that:

1) Most electrical equipment that use the reported PCBs were manufactured during the time when PCBs were most used (1960 to 1981) and most of them are still in use;
2) Many of the sectors that were consulted did not reply;
3) Some companies filled out the inventory forms with incomplete information and some stated not knowing the volume of insulating oil inside the equipment, thus, demonstrating a lack of knowledge about the real liability that PCBs represent;
4) Few respondents presented analysis reports for the equipment, but these were not from laboratories accredited by Inmetro;
5) Other uses for PCB-contaminated insulating oil were identified other than the traditional ones: electromagnet, vacuum pumps and fills for hydraulic systems;
6) PCB treatment and destruction centres stated to be operating below their monthly capacity due to a lack of demand.

Due to these limitations, the indicative inventory, though providing an approximation, does not reflect the real amount of PCBs in Brazil. It is believed that establishing a mandatory inventory, through legal instruments, will enable better knowledge about the reality of stockpiles in use and equipment containing PCBs in Brazil, as well as, the sound disposal of wastes according to the provisions of the Stockholm Convention. Similarly, the development of guides and technical standards on containment and treatment of abandoned equipment also serves as an important tool for the sound disposal of this liability.

4.2.1.3 Main Challenges and Priorities for Action

To meet the determinations of the Stockholm Convention with respect to PCB, Brazil is implementing a GEF project funded by GEF and supported by the UNDP. The aim of the project is to develop a National Plan for Management and Phase-Out of PCBs, by strengthening the regulatory and institutional arrangements for the control and phase-out of PCBs, detailing the strategy for the gradual and final elimination of all PCBs in Brazil by 2028.

The project aims at having the following results: 1) strengthening of the legal and administrative framework and of the standardised procedures for PCB management and phase-out; 2) management of oils identified as PCB and PCB-contaminated equipment and residues in partnership with the private sector in order to minimise human and environmental exposure; 3) environmentally sound stocking and disposal of PCB residues through demonstration projects.

In order to strengthen PCBs management and phase-out, legislation is being discussed to regulate the management and controlled elimination of equipment, materials and fluids contaminated with PCBs and their wastes, in the power sector, industries and the railway sector.

The proposal establishes:

a) The mandatory registration of equipment, material and fluids contaminated with PCBs and PCBs residues in order to obtain a complete inventory;

b) The limit of concentration of PCBs in equipment, waste and stock according to the Stockholm Convention (50 ppm as maximum limit allowed) and technical recommendations for treatment and reuse of contaminated insulating oil;

c) The labeling of products and equipment;

d) Bans (related to imports, reuse of oil in specific concentration ranges according to Annex A Part II, reuse of out of use PCB equipment);

e) Technical criteria for storage, transport, treatment, disposal and labeling of equipment and waste that are contaminated with PCBs with a view to prevent reuse of contaminated equipment and eliminate cross contamination during the treatment;

f) Requirements for a management or contingency plan and elimination goals (as a schedule) of large PCB holders, particularly in the power generating and distribution sector;

g) The establishment of technical criteria for emergency situations (leaks, local accidents and accidents during transportation);

h) The prohibition of dilution of PCB oils for commercial or for final disposal purposes, requiring documented traceability of oil under suspicion of contamination in insulating non-contaminated oil auctions, and;

i) Deadlines for removing from use and disposing of waste, considering national capacity to treat/ eliminate PCBs and the costs of these operations.

Most of the activities planned in the GEF Project, which will end in December 2015, are at an advanced stage of execution.

We highlight the development of a Guide for the Register and a Manual for PCB Wastes Management that complement legislation being debated.

Training and qualifying activities for PCB management are also part of the project and will be carried out through classroom courses, distance learning and demonstration projects.

The development of a communications plan is underway in order to devise a strategy to engage and dialogue with sectors and institutions involved with PCBs management.

4.2.2 New POPs of industrial use

Brazil does not have legislation that establishes control over industrial chemicals and consequently public authorities do not have systematic information on the production, use, import and export of these substances, nor a National Inventory of Industrial Chemicals that are (or have been) available in the domestic market.

The absence of regulated controls reflects directly on the development of the National Inventories of new POPs of industrial use, hampering the collection of information on these substances.

The existing information are fragmented and dispersed throughout various information systems and registers in both private and public sectors, but often they don't exist or aren't available.

Thus, given the lack of an information source that could provide official consolidated data on the status of production, use, import and export of new POPs of industrial use in Brazil, the MMA carried out an indicative inventory of these substances and of products/stockpiles that may contain them, to provide inputs for the development of the NIP for the Stockholm Convention.

As to the legal status in Brazil of these new POPs of industrial use, there is no legislation that establishes specific bans or restrictions for each of them, nor concentration limits for products.

Among the efforts of the Federal Government to eliminate the risks associated with the use of electrical and electronic equipment procured by the public administration, is the Ministry of Planning, Budget and Management Regulatory Instruction, which allows government entities when procuring goods — computers, for example — to require that these do not contain hazardous substances at concentrations higher than those recommended by the European Directive, RoHS, such as for mercury (Hg), lead (Pb), hexavalent chromium (Cr(VI)), cadmium (Cd), polybrominated biphenyls (PBBs) and polybrominated diphenyl ethers (PBDEs).

Obviously this legislation is limited in scope, referring only to goods procured by government entities, nevertheless, it is useful since it draws attention to the presence of these substances in electrical and electronic equipment that are found all over the country and it generates the expectation that this measure will be broadened, with an effective mandatory nature, in appropriate legislation. Furthermore, the federal government intends through its information and purchasing power to promote market self-regulation and to raise the awareness and level of information of consumers as to the presence of hazardous substances in this type of product.

Thus, regulatory measures should be established in order to determine obligations that will facilitate obtaining information on the situation of new POPs of industrial use in the country and set pertinent prohibitive and restrictive measures, in harmony with the provisions of the Stockholm Convention. They will also guide the process of environmental licensing and implementation of Best Available Techniques and Best Environmental Practices (BAT/BEP) by POPs using sectors and those that recycle articles containing POPs.

4.2.2.1 Inventory of New POPs of industrial use

When these chemicals began to be analysed by the POPRC, in 2005, the member-institutions of Conasq and industry associations were consulted in order to provide information to the Convention Committee.

To carry out the NIP preliminary or indicative inventories, the number of consultations was increased, seeking to identify all the industrial associations that could contribute information on the current and historical uses of new POPs and on alternative substances. The following priority sectors were consulted: flame retardants, polymers, electrical and electronic equipment, coatings, waste of electrical and electronic equipment, car recycling, metal plating, household and industrial cleaning products, photography as well as ant control baits and pesticides.

Development of indicative inventories was based on theoretical analysis, questionnaires and telephone contacts to answer questions, that is, methods that did not require visits or elaborate data collection and analysis.

As there was little information on the status of new POPs in Brazil, we sought to use the indicative method, with some elements from the qualitative method, since the survey was carried out using questionnaires.

The aim of this activity was obtain an overview of the current and previous use of new POPs of industrial use in processes and articles and of the waste/recycling flows.

Inventory Summary

Hexabromobiphenyl (HBB)

Hexabromobiphenyl belongs to the group of polybrominated biphenyls (PBB). PBBs were manufactured worldwide as three commercial products: hexabromobiphenyl, octabromobiphenyl and decabromobiphenyl (HARDY 2002b in UNEP 2006b).

The total production of PBBs in the United States was approximately 13.3 million kg, from 1970 to 1976. Of this total, hexabromobiphenyl (HBB) production represented approximately 5.4 million kg (NEUFELD et al. 1977 in UNEP 2006). Hexabromobiphenyl (FireMaster®) was the main PBB product used in flame retardants in three main commercial products in the US and Canada (Neufeld et al. 1977; IPCS 1994; ATSDR 2004 in UNEP 2010): 1) ABS thermoplastics for the industrial and electrical sectors; 2) polyurethane foams for auto upholstery; and 3) coats and lacquers.

Approximately 5,350 tonnes of hexabromobiphenyl were used in commercial and consumer products in the US, mostly in the manufacture of plastic products, with an estimated lifespan of 5-10 years (Neufeld et al. 1977). Since production was halted, all these products – like TV cabinets and typewriter casings – are believed to have been eliminated in landfills or incinerated (Neufeld et al. 1977; ATSDR 2004 in UNEP 2006).

According to the Convention Guidance document, given this small production and limited use of this POP, it is likely that most of HBB-containing materials were eliminated decades ago. So this chemical is of minor relevance for the inventory process (UNEP 2010).

There is no information on the past use of this product in Brazil or on the existence of stocks or products containing this substance.

Even so, inquiries to obtain information on HBB were made for the same categories consulted for PFOS and PBDEs. All replies indicate that the companies did not use this substance nor had they stocked articles or wastes with HBB.

From 1997 to 2013, there were no imports or exports of polybrominated biphenyls. It wasn't possible to obtain data for 1989-1996, since there was no specific customs code for these products.

Since hexabromobiphenyl was used as a flame retardant, particularly during the 1970s, the stocks and wastes of products and articles were eliminated decades ago or, if still existing, shouldn't be relevant (UNIDO, UNITAR, UNEP 2012a). Thus, this substance will not be further investigated in the Action Plan.

Penthaclorobenzene (PeCB)

According to information submitted to the Convention Secretariat, PeCB is no longer produced in Europe and North America (Van de Plassche et al. 2002 in UNEP 2007). Moreover, most countries that submitted information to the Secretariat of the Stockholm Convention did not report production (Canada, Czech Republic, Germany, Lithuania, Mauritius Islands, Turkey and USA). No intentional production was mentioned in the document submitted by the ICCA/CMI and according to Ullman's Encyclopaedia of Industrial Chemistry, PeCB is of no economic significance (Rossberg et al. 2006 in UNEP 2007). There was no reporting of trade or stocks.

Canada and the US stated that there is no commercial demand for PeCB and that this chemical is no longer used as an end product. Ullman's Encyclopaedia of Industrial Chemistry does not mention any current use of PeCB (Rossberg et al. 2006 in UNEP 2007). However, the following past uses or unintentional uses of PeCB are mentioned in the literature:

1. PeCB was a component of a chlorobenzenes mixture used to reduce the viscosity of PCB products (Environment Canada 2005 in UNEP, 2007), but regulations prohibiting uses of PCB-containing dielectric fluids resulted in a decline of the use of PeCB after 1980 (Environment Canada 2005 in UNEP, 2007);

2. Pentachlorobenzene and tetrachlorobenze could be found in dyestuff accelerators and carriers but these applications have been discontinued (Environment Canada 2005 in UNEP, 2007);

3. PeCB can be found as an impurity in several herbicides, pesticides and fungicides currently in use in Canada (Environment Canada 2005 in UNEP, 2007). The US EPA carried out a study to assess the dietary cancer risk of hexachlorobenzene and PeCB as impurities in chlorothalonil, PCNB, picloram, and several other pesticides;

Pentachlorobenzene was also identified in pentachloronitrobenzene (quintozene), endosulfan, chlorpyrifos-methyl, atrazine, and clopyrilid, but not in simazine, chlorothalonil, picloram and dacthal (US EPA 1998). Technical grade hexachlorobenzene (HCB) contains about 98 % HCB, 1.8% pentachlorobenzene and 0.2 % 1,2,4,5-tetrachlorobenzene (WHO, IPCS 1997). The present situation for the other pesticides is unknown.

4. PeCB was used as an intermediate in the production of pentachloronitrobenzene (quintozene); according to the risk profile, this was the only use of PeCB as an intermediate found in the literature. (Van de Plassche et al. 2002).

5. PeCB may have been used in the past as a flame retardant (Van de Plassche et al. 2002).

According to the risk profile, the manufacturer of quintozene, AMVAC, was consulted on the use of pentachlorobenzene in its production line to which it replied that currently quintozene is manufactured by a process that does not use PeCB (UNEP, 2007).

The company's representative in Brazil is the only one to have a license to produce and market quintozene in the country. In consultations with the Brazilian company, we were informed that it manufactures quintonzene without using PeCB. However, it did not clarify if PeCB was used in the past.

The inventory did not identify if PeCB was used as a flame retardant or dye accelerator and carrier in Brazil (Van de Plassche et al., 2002 in UNEP, 2007).

With regards to the use of pentachlorobenzene as a component of the mixture to reduce viscosity in PCB products, it is possible to find the substance in small concentrations in equipment that use PCB due to the fact that such equipment is still found in use in Brazil. Although it is not possible to determine the amount of PeCB in equipment in Brazil, management measures undertaken to phase out PCB will contribute to eliminate PeCB and PeCB release sources.

There are no records of recent use and production of PeCB in Brazil. In this manner, it is possible to conclude that PeCB is not used in industrial processes in the country. However, the substance may be present in equipment that still uses PCB. Since the use of pentachlorobenzen (PeCB) was not identified, it will not be a priority in the Action Plan.

Polybrominated Diphenyl Ethers (PBDES)

POP-PBDEs are members of a large class of chemicals containing bromine used as flame retardants. These compounds are often added to plastics, upholstery textiles, foams, computers, television sets, furniture, carpets and cushioning.

The main sectors that use PBDEs, or have used it in the past, are: 1) organobromine industry; 2) electrical and electronics industry; 3) transport industry; 4) furniture industry; 5) textile and carpet industry; 6) construction industry; and 7) recycling industry.

Historically, three types of commercial products containing PBDE mixes were used in consumer products: c-pentaBDE, c-octaBDE, and c-decaBDE. Each type of PBDE has different properties and uses. Manufacturers of more toxic PBDEs — pentaBDE and octaBDE — voluntarily ceased production at the end of 2004. Consequently, decaBDE is the only PBDE flame retardant currently manufactured.

These substances were not produced in Brazil and it was not possible to verify if these POPs were imported as a substance.

During the consultations for the POP-PDEs inventory, most of the replies state that the institutions do not use articles containing c-pentaBDE and octaBDE or that they don't use decaBDE. Others informed that they were unsure whether they use or had used PBDEs in articles they produce or import. Some replies indicated that these POPs could have been used in the past, or that decaBDE could still be used.

However, data from the inventory indicate that these products are present in electrical and electronic equipment and in imported vehicles, and that recycling of these products contains PBDEs. In this case, Brazil should request the registration of a Specific Exemption to the Convention's Secretariat.

- The Electrical and Electronic Equipment Sector

The electrical and electronic equipment sector indicated it might have used these substances in the past. The electrical/electronic equipment-recycling sector, which is of major importance to the inventory, did not respond to the survey. Consultations with this category will be expanded in the future.

Since no information was obtained that could be used in the inventory, we used the draft Guidance for developing the inventory of polybrominated diphenyl ethers (PBDEs) listed under the Stockholm Convention on Persistent Organic Pollutants, developed by UNITAR for the Stockholm Convention. This Guidance document presents the methodologies for developing an inventory using national and international statistics for the main categories that used POP-PBDEs in the past, i.e., electrical and electronic equipment, waste electrical and electronic equipment and transports.

The POP-PBDEs indicative inventory was carried out using estimates of the amounts of these substances in electrical and electronic equipment and in vehicles. Other uses of POP-PBDEs, e.g., furniture, bedding/mattresses, textiles, construction materials, rubber, and drilling operations, were thought to be of minor relevance due to the limited use of POP-PBDEs in most of these applications and the difficulty in obtaining information for diffuse uses.

The estimated amount of c-octaBDE in electrical and electronic equipment was approximately 1.6 thousand tonnes (174.9 tonnes of hexaBDE and 683.9 tonnes of heptaBDE).

Although POP-PBDEs were not produced in Brazil, the main challenge to its elimination is the identification of existing stockpiles and imported articles containing POP-PBDEs, as well as their elimination at the end of their lifespan. Recycling PBDE-containing articles results in large amounts of this substance remaining in the global recycling flow and they continue to be present in consumer products.

The document also showed that several companies in Brazil carry out recycling of wastes of electrical and electronic equipment that could contain POP-PBDEs, and that this practice could be increased with the implementation of the National Solid Wastes Policy, which encourages recycling. Thus, we believe that recycling of electrical and electronic equipment warrants attention in the Action Plan.

Large amounts of these materials remain in the global recycling flow and will continue to be present in consumer products.

The reuse and recycling of materials and wastes containing POP-PBDEs are allowed through specific exemptions under certain conditions, with the use of Best Available Techniques and Best Environmental Practices, in the Stockholm Convention.

Since only the plastic components of WEEE contain PBDEs, it is important to check their recycling process in the country.

It is, therefore, necessary to carry out a survey on techniques and practices used by WEEE plastic recycling companies to check the activity’s actual situation in Brazil. It is important to check the necessary adjustments for reducing POP-PBDE releases during the recycling process and occupational exposure to these pollutants.

Thus, the Action Plan will include activities for the collection of information on the sector, the development of a guide to promote the sorting out of equipment that contain POP-PBDEs, the use of technologies that reduce releases of these substances and to indicate the kind of uses that will not be permitted for recycled plastics containing POP-PBDEs. These activities shall be executed in collaboration with the sector, which may also contribute to promoting the BAT/BEP Guide among recycling companies and workers.

Technological improvements as well as the purchase of screening tests to sort out POP-PBDE containing equipment may be acquired through incentives granted to the sector.

Abiplast set out to help carry out the survey on practices and techniques used by plastic recycling companies as well as aid in the development of the aforementioned guide. Plastic recycling companies should receive funding from the government to acquire PBDE-detection equipment.

- The Transportation Sector

Another important sector regarding articles that contain PBDEs is the transportation sector. A great part of c-pentaBDE use occurred in this sector, especially for treating polyurethane foams for vehicles (car seats, head rests, car ceilings, acoustic management systems, etc.), and to less extent for post-upholstery textiles in car seats. C-octaBDE was also used in automobile plastic components (steering wheels, dashboards, doors, etc.) (UNIDO; UNITAR; UNEP, 2012a).

Cars and other vehicles (trucks and buses) make up the largest portion of the transportation sector and represent the largest amount of POP-PBDEs, thus the inventory’s focus and methodology were centered on them.

The amount of c-pentaBDE in vehicles in use was 39.5 tonnes and in end-of-life vehicles was 694.0 tonnes, making a total of 733.5 tonnes of c-pentaBDE. The amount of POP-PBDEs in end-of-life vehicles is considerably larger than in vehicles in use and some of these vehicles must have already been sent to final disposal. That doesn't mean, though, that they were disposed of in a sound manner since studies show that many vehicles are abandoned or taken to junkyards (JOAQUIM F J., 2012).

According to estimates by the Union of Ferrous and Non Ferrous Scrap Wholesale (Sindinesfa), about 98.5% of the national fleet ends up being dismantled or stored and only 1.5% goes to recycling (JOAQUIM FILHO, 2012). Thus, it is estimated that of the total 694,015.0 Kg of POP-PBDEs from end-of-life vehicles, only 10,410.2 Kg are recycled.

End-of-life vehicles management practices available in the country are important information for planning the management of POP-PBDE waste from the sector.

PNRS does not include automobiles in the reverse logistics approach, as vehicle recycling is still fairly insignificant in Brazil (1.5 %). Nevertheless, the sector has shown interest in being included among the reverse logistics category and there is a bill underway in the National Congress (No. 1862/2011) that proposes an amendment to the PNRS to include implementation of this system to vehicles, which should be supported.

Currently, dismantling facilities carry out the whole process of reverse manufacturing to reuse parts in the spare parts market. What is left is recycled as ferrous and non-ferrous scrap. However, these facilities usually operate without an environmental license and do not have trained workers or adequate equipment or infrastructure to decontaminate the vehicles. They usually leave the carcasses exposed to the weather and directly on the ground for long periods of time (JOAQUIM F. J., 2012).

This reality should change due to the enactment of the Law No. 12,977 of May 20, 2014, which regulates the auto vehicles dismantlement activity in Brazil. According to the new Law, companies must register in the National Traffic Council's (Contran) database stating the origin, use conditions and destination of dismantled parts. It is expected that regulation restrains underground operations and reduces theft, robbery, tampering and fraud of cars and motorcycles. In addition, the consumers will know the origin of used parts they purchase.

The Law will take effect one year after it is published and its implementation represents the adoption of best environmental practices in the auto dismantlement sector as it promotes the reuse of used parts and the correct disposal of wastes.

The existence of appropriate tools and technologies for the implementation of the National Solid Wastes Policy and to adopt appropriate strategies to better manage each waste, hazardous or otherwise, and enable their proper disposal.

Regarding the recycling of vehicles in Brazil, despite the low rate of occurrence (1.5%), an option that has been used is sending carcasses to steel mills, which have shredders that can remove the ferrous and non-ferrous materials of ELVs. Typically, materials containing POP-PBDEs end up in automotive shredder residue - ASR or "fluff",during ELV processing. The residue shredder is usually divided in "light ASR" and "heavy ASR". Polyurethane foam, containing PBDE, is found in the light fraction of the residue (UNIDO, UNITAR, UNEP, 2012a).

Large volumes of waste are generated in the steel mills and are disposed of in industrial waste landfills. In recent years, however, several studies have been proposed for its use (Zevenhoven; SAEED, 2003). In principle, the reuse of "fluff" and energy use practices are more advantageous, both environmentally and economicly, than the final disposal in landfills (BOUGHTON; HORVATH, 2006; MORIOKA et al., 2005).

Thus, in addition to the regularization of the dismantling activity, recycling and disposal of ASR waste should be considered in this Action Plan, and will be addressed in the next items.

- Other uses

Other uses of POP-PBDEs, e.g., furniture, bedding/mattresses, textiles, construction materials, rubber, and drilling operations, were thought to be of minor relevance by most contries due to the limited use of POP-PBDEs in most of these applications.

However, these substances were used in countries that had flammability standards for these specific uses. Few countries had these types of standards, such as the United States and the United Kingdom (UNIDO, UNITAR, UNEP 2012a).

Brazil does not have legislation on flammability standards and, according to studies, domestic furniture consumption was entirely supplied by domestic manufacture in the 1990s and imports had a very small share, although they started to grow in that period.

Thus, a small amount of furniture could have been imported from the United States at the time when POP-PBDEs were used, that is, until 2005, but this amount is not significant and, given the elapsed time, part of this furniture has already been eliminated.

Today the only way for these articles to enter Brazil would be by importing second-hand goods containing these flame retardants from countries with flammability standards. However, since importing of second-hand goods is banned in Brazil, we consider that articles containing POP-PBDEs are not entering the country.

Since these are diffuse and not very significant uses, obtaining data for an inventory of POP-PBDEs in these articles for a country like Brazil that does not have specific flammability standards and that does not import articles containing second-hand polyurethane would not be successful, thus this is not a priority for action.

Nevertheless, an effort to obtain information on this and other uses of POP-PBDEs was carried out, consulting associations that could have knowledge on the use of these POPs in the past. Since no significant data was obtained on the use of POP-PBDEs in these sectors, we conclude that these uses of POP-PBDEs will not be a priority for the plan of action.

The priority categories for developing activities in the action plan will be those that use a greater amount of these substances, that is, electrical and electronic equipment and automotive vehicles, with emphasis on plastics and polyurethane foams.

Recycling of wastes from these sectors will also be a priority in the action plan, since recycled articles may contain new POPs. This activity is still limited in Brazil and requires technological investments to meet the needs of reverse logistics and the PNRS.

PFOS, its salts and PFOSF

PFOS and its related chemicals have been produced for more than 50 years and continue to be produced in various countries. Their physical properties, which repel both oil and water, enable PFOS and related chemicals to be used in several products. Currently the intentional use of PFOS is extensive and includes: electrical and electronic components, fire-fighting foam, photo-imaging, hydraulic fluids and textiles.

PFOS, its salts and PFOSF are usually used in surface treatments and are common in non-stick products, stain resistant fabrics and all-weather clothing. Given their surfactant properties, they have been historically used in a wide range of applications, including fire-fighting foams, surface resistance/ repellence to oil, water, grease or soil. (UNIDO, UNITAR and UNEP 2012)

Alternatives to PFOS are available for some applications. Nevertheless, this is not always feasible in developing countries, where existing alternatives may not yet be available. (UNEP 2010a).

Furthermore, some applications such as photo-imaging, use in semiconductors or aviation hydraulic fluids are considered acceptable purposes, since in these cases no technically feasible alternatives to PFOS are currently available (UNEP 2010).

The list of specific exemptions and acceptable purposes for PFOS, its salts and PFOSF provides an idea of the uses of these chemicals, as seen in table 8 below.

Table 8 – Specific exemptions and acceptable purposes for PFOS, its salts and PFOSF

Chemial Substance	Activity	Acceptable purpose or specific exemption
Perfluorooctane sulfonic acid (CAS No.: 1763-23-1), its salts and perfluorooctane sulfonyl fluoride (CAS No.: 307-35-7) For example: potassium perfluorooctane sulfonate (CAS No. 2795-39-3); lithium perfluorooctane sulfonate (CAS No. 29457-72-5); ammonium perfluorooctane sulfonate (CAS No.: 29081-56-9); diethanolammonium perfluorooctane sulfonate (CAS No.: 70225-14-8); tetraethylammonium perfluorooctane sulfonate (CAS No.: 6773-42-3); didecyldimethylammonium perfluorooctane sulfonate (CAS No.: 251099-16-8);	Production	Acceptable purpose In accordance with Part III of this Annex, production of other chemicals to be used solely for the uses listed below. Production for the uses listed below. Specific exemption As allowed for parties listed in the register.
	Use	Acceptable purpose In accordance with Part III of this annex, for the following acceptable purposes, or as an intermediate in the production of chemicals with the following acceptable purposes: **1.** Photo-imaging; **2.** Photo-resist and anti-reflective coatings for semiconductors; **3.** Etching agent for compound semiconductors and ceramic filters; **4.** Aviation hydraulic fluids; **5.** Metal plating (hard metal plating) only in closed-loop systems; **6.** Certain medical devices (such as ethylene tetrafluorethylene [ETFE] layers and radio-opaque ETFE productin in vitro medical diagnostic devices and CCD colour filters); **7.** Fire-fighting foam; **8.** Insect baits for leafcutter ants from Atta spp. and Acromyrmex ssp.

Table 8 – Specific exemptions and acceptable purposes for PFOS, its salts and PFOSF (continued)

Chemial Substance	Activity	Acceptable purpose or specific exemption
	Use	<u>Specific exemption</u> For the following specific uses or as an intermediate in the production of chemicals with the following specific uses: **1.** Photo masks used in semiconductor and liquid crystal display (LCD) industries; **2.** Metal plating (hard metal plating); **3.** Metal plating (decorative plating); **4.** Electrical and electronic parts for some colour printers or colour copiers; **5.** Insecticides for control of red imported fire ants and termites; **6.** Chemically driven oil production; **7.** Rugs and carpets; **8.** Leather and apparel; **9.** Textiles and upholstry; **10.** Paper and packaging; **11.** Coatings and coating additives; **12.** Rubber and plastics.

Source: National Inventory of New POPs of Industrial use. MMA, 2015.

To carry out the PFOS indicative inventory in Brazil, inquiries were made by sending questionnaires to all associations and institutions identified according to the categories that might use these chemicals in their processes or articles. Out of the list of possible uses of PFOS, the only use categories that were identified in the country during the inventory were: sulfluramid-based bait insecticide and metal plating.

Known uses of PFOS in Brazil

a) Bait insecticide

Sulfluramid (N-ethyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-1-octanesulfonamide; CAS No.: 4151-50-2) used as an active ingredient in the production of bait insecticide to control leafcutter ants in Brazil. It is manufactured using a PFOS-related chemical (perfluorooctane sulfonyl fluoride, CAS No. 307-35-7).

Brazil requested the registration of an acceptable purpose for the use of sulfluramid as bait insecticide to control the leafcutter ants *Atta spp*. and *Acromyrmex spp*.

In this regard, it was observed that the authorized use of sulfuramid in Brazil exceeds the exemptions provided for in the Convention. Its use as paste to control termites, paste to control cockroaches, paste and granulated bait to control household ants does not comply with the exemptions listed in the Convention.

In order to adapt national legislation, Anvisa proceeded to re-evaluate the register of sulfluramid-based household pesticides, setting a period of 1 year for companies to sell their stocks and remove products as provided for in Anvisa Resolution, RE No. 41 of 8 January 2015.

Furthermore, scientific studies and research must be undertaken to identify replacements for sulfluramid for all uses in order to reduce the use of this product both in agriculture and in gardening, with the aim of eliminating all uses in the future.

The survey showed that there are currently 10 sulfluramid-based pesticides registered in Brazil, manufactured by 7 domestic companies.

In addition there are 69 registered household sulfluramid-based products that are produced by 31 companies in Brazil. Although the number of companies that have registrations for sulfluramid use for household pesticides is much larger than the number of companies that have registrations for agricultural use, the amount produced for this purpose is probably smaller, since these products are provided in smaller amounts and the treated areas are also smaller. It was also seen that the companies who have registrations for agricultural use also have registrations for household pesticide use.

The amounts of imported and exported sulfluramid were verified from specific codes, but PFOSF imports for sulfluramid production cannot be quantified, since this product is imported with a generic customs code.

Imports of sulfluramid come mostly from China, although a small amount was imported from India in 2011 (25kg).

Latin American countries are the main destination of sulfluramid-based insecticide exports.

The biannual reports for pesticides and similar substances sent to Ibama by the companies who own the registrations for the products made it possible to know the amounts of domestic production, imports, exports and domestic sales of the active ingredient.

The table below shows the average amount of PFOS used in the production of sulfluramid in 2011 and 2012, obtained from import, export and trade data on sulfluramid (AI).

Table 9 – Amount of PFOSF in 2011 and 2012, based on the amount of active ingredient (AI)

	Active Ingredient 2011	Amound of PFOSF Kg (AI x 1,6)	Active Ingredient 2012	Amount of PFOSF Kg (AIx1,6)
Imports	823	1,317	1,265	2,024
Production	35,120	56,192	30,470	48,752
Sales	30,730	49,168	33,290	53,264
Exports Companies	1,000	1,600	1,200	1,920

Table 9 – Amount of PFOSF in 2011 and 2012, based on the amount of active ingredient (AI) (continued)

	Active Ingredient 2011	Amound of PFOSF Kg (AI x 1,6)	Active Ingredient 2012	Amount of PFOSF Kg (AIx1,6)
Exports Aliceweb	2,063	3,301	2,183	3,493
Total (Imp. + Prod.) – Exp.)		54,208		47,283
Average Amount	50,745			

Sources: IBAMA, Aliceweb.

The indicative inventory verified that the annual calculated amount of PFOS was about 54.2 tonnes in 2011 and 47.3 tonnes in 2012, representing an average of 50.7 tonnes/year of PFOS. This amount refers to the amount of sulfuramid produced by the companies who hold registrations for the use of sulfluramid as pesticide.

The amount of sulfluramid used for household pesticide could not be totally verified due to lack of reply by the consulted companies.

With regard to measures to reduce the use of sulfuramid in Brazil, the Action Plan provides for studies to find substitutes for Sulfluramid and the adoption of Best Available Techniques and Best Environmental Practices (BAT/BEP) for the production and use of the product.

To evaluate possible substitutes for Sulfluramid, one should check if the chemicals presented as alternatives do not have Persistent Organic Pollutants (POPs) properties in accordance with the criteria set out in Annex D of the Convention and whether they satisfy the criteria set out in the Stockholm Convention UNEP/POPS/POPRC.8/10, from an integrated pest management perspective, which are: technical feasibility, effects on man and the environment, cost/benefit, efficiency, availability and viability.

Information of the Ministry of Agriculture, Livestock and Food Supply (MAPA) state that sulfluramid cannot be efficiently replaced in Brazil by products that are registered and marketed for the same purpose.

Currently, the active ingredients registered in Brazil for producing bait for the control of leafcutter ants are sulfluramid, fipronil and chlorpyrifos. According to the evaluation of the Committee, the only alternative that does not have POP characteristics is fipronil, which does not mean that this product is not toxic. Studies indicate that fipronil and chlorpyrifos are more acutely toxic to mammals, aquatic organisms, fish and bees than sulfluramid (UNEP, 2012).

Some products such as fenoxycarb, pyriproxyfen, diflubenzuron, teflubenzuron, silaneafone, thidiazuron, tefluron, prodrone and methoprene were tested for leafcutter ants, but were not effective (UNEP, 2010b).

Studies are being developed in order to identify alternative chemical and non-chemical products to replace sulfluramid in the future.

MAPA gathered a group of experts in leafcutter ants, composed of experts in biology, ecology, pest management in forests, monitoring and control of leafcutter ants, as well as professionals working in MAPA, collaborators and observers to conduct studies, including pilot projects, for peer-reviewed information on the feasibility of using alternatives to PFOS, its salts, PFOSF and its related chemicals. The group on an integrated management approach to pests, in compliance with the decision of the Conference of the Parties SC-6/7 item 5 (c) UNEP/POPs/ COP.6/33, which invited Parties that still use PFOS, its salts, PFOSF and its related chemicals to control leafcutter ants *Atta spp.* and *Acromyrmex spp.* to carry out such studies, and present any findings to the Secretariat.

The industrial sector is conducting a study on environmental risk assessment and evaluation of residues of sulfluramid and PFOS. Once the study is completed the results will be made available.

Cetesb is also developing a project to assess the environmental impact of applying these baits in open environments, to verify iftheir use with sulfluramid can lead to degradation of PFOS and if sulfluramid has similar action and toxicity as PFOS/PFOSF.

The study is necessary because, although there is much information about the efficiency of sulfluramid bait insecticides to combat leafcutter ants, little is known about the environmental impacts of their application in open environments.

The project has three main objectives: to study sulfluramid's behavior in the environment — degradation and impact on soil and groundwater —; establish control measures for its implementation; and assess the extent of implementation in Brazil and the Grulac countries that use the sulfluramid-based ant baits.

As expected results are:to identify whether the granulated bait formulated with sulfluramid degrades into PFOS and identify the release and concentration of PFOS during the process of applying baits. The samples can be sent for analysis to the RECETOX Research Centre (Research Centre for Toxic Compounds in the Environment) in the Czech Republic, who has a Cooperation Agreement with Cetesb.

In the search for non-chemical alternatives, Embrapa is conducting a survey on fungi-based ant bait insecticides, which is still in its testing phase.

Since sulfluramid should continue in use until it can be efficiently replaced, the adoption of Best Available Techniques (BAT) for the production of PFOSF and sulfluramid should be promoted, as well as the adoption of best environmental practices in the application of bait insecticides.

b) Metal plating

PFOS and its related substances are used mainly as surfactants/wetting agents/mist suppressants in hard and decorative chrome plating, which can reduce the emission of chromium and improve the work environment in this sector. In addition to their use in chrome plating, fluorosurfactants (including PFOS) are also used in other metal plating applications, such as agents to prevent haziness of plated copper, non-foaming surfactants in nickel-plating baths and agents added to tin-plating baths to ensure that the plating has uniform thickness.

PFOS remains in the metal-plating baths after the metal-coating process. The baths are commonly used many times before being discarded. If they are handled as hazardous wastes, the process is considered a closed process, without release of PFOS. This, however, does not correspond to the situation in Brazil, which has many small-scale companies that may not have a suitable structure to maintain the baths and manage the wastes.

The use of Bayowet FT 248 R, imported from Germany, was identified in Brazil. It inhibits the fog in metal plating processes in order to reduce the surface tension of the solution by capturing the releases of chromic acid and preventing them from being discarded into the air.

Once the industry informed that there are no viable replacements in the country, a request for specific exemption was submitted to the Secretariat. A survey of PFOS alternatives will be required for this sector since at the end of the stated period, the use of PFOS will no longer be allowed.

The company that imports the product does not use it, but only imports it for resale to metal plating firms. These firms were consulted on the amount used, the type of use and waste management.

With respect to the search for alternatives, one of the companies stated that the products that used Bayowet FT 248 were discontinued and that they were replaced by other PFOS-free products. Another company stated that it is developing alternative products for the same purpose, but their performance is still very disappointing. Yet another company stated that it is undertaking research and development of new formulations that use raw materials with fewer impacts for occupational health and the environment and is updating formulations to improve product application and fewer environmental impacts.

The total amount obtained from the replies of the companies who use Bayowet FT 248 was approximately 1.9 tonnes of PFOS a year.

In the final result of the inventory, the total amount of PFOS, its salts and PFOSF was obtained through the sum of the average amounts used by the two categories that have known uses, according to table 10 below:

Table10 – Average total amount of PFOS, its salts and PFOSF used in Brazil per year

Category	Average amount of PFOS/PFOSF Kg/year
Sulfuramid-based bait insecticide	50,745
Metal plating	1,876
Total	52,351

Source: National Inventory of New POPs of industrial use. MMA, 2015.

This amount (52.3 tonnes a year) represents the result of the surveys completed up to now, but does not mean that this is the total amount of PFOS/PFOSF used in Brazil, since we found gaps in the information.

For the Action Plan, measures related to the metal plating sector include the reduction of PFOS use in decorative bromium, the adoption of Environmental Technial Improvments and Best Available Practices for the sector, and the search for chemical substitutes, fluorinated or non-fluorinated, so that PFOS can be eliminated as soon as the exemptions period expires.

4.2.2.2 Priorities for the Action Plan– PFOS

Since sulfuramid and metal plating were the only two categories identified until now for which there is proven use of PFOS/PFOSF, these sectors will be considered a priority for the action plan.

Special attention will be given to the sector of sulfluramid-based bait insecticide for ant control, given the large amount produced and sold and the risks to environment and health that this type of product can engender, since it is used directly in the environment.

In addition, the categories for which PFOS is suspected of being used in production processes or for which the presence of PFOS and its related substances is suspected in articles should be better investigated in the future to improve the inventory.

Categories for which there is direct exposure to PFOS and its related substances, or for which products containing PFOS are released directly into the environment, such as food packaging and fire-fighting foam, will also be considered a priority for further investigations in the action plan.

But, the categories for which there seems to be no PFOS use in Brazil, or for which PFOS does not remain in the final product, will not be a priority and should not be considered in the action plan. The table below shows the categories listed and numbered in order of priority:

Table 11 – Categories in order of priority for the Action Plan

Order of Priority	Category
1	Bait insecticide for ants
2	Metal plating
3	Electrical and electronic equipment
4	Fire-fighting foam
5	Hydraulic aviation fluids
6	Medical devices (ethylene tetrafluoroethylene [ETFE] copolymer, radio-opaque ETFE production, in-vitro diagnostic medical devices and CCD colour filters)
7	Manufacture of plastic and rubber products
8	Paper and packaging
9	Industrial and household surfactants
10	Textiles, upholstery and leather
11	Synthetic carpets and rugs
12	Toners and printing inks
13	Coatings, paints and varnishes
14	Oil and natural gas industry
15	Mining industry
16	Photografic industry
17	Semiconductor industry
18	Ceramic industry

Table 11 – Categories in order of priority for the Action Plan (continued)

Where:

- (yellow) Categories in which the use of PFOS is unknown
- (light pink) Category in which the use of PFOS is suspected
- (orange) Category in which there could be direct exposure to PFOS
- (green) Categories in which PFOS is used in the industrial process but does not remain in the final product

Source: National Inventory of New POPs of industrial use. MMA, 2015.

Hexabromocyclododecane (HBCD)

Hexabromocyclododecane (HBCD) is used as flame retardant additive to retard ignition and the growth of flames in vehicles, buildings and objects. HBCD is used mainly in expanded polystyrene (EPS) and extruded polystyrene (XPS), in polystyrene foam for insulation and construction, as well as, applications on textiles and electrical and electronic equipment (high impact polystyrene/HIPS). In textiles, HBCD is used in upholstering and coating for indoor spaces and vehicles. The amount of articles imported and exported around the world that use HBCD is unknown (UNEP, 2011).

Wastes containing HBCD include production wastes, insulation boards, building wastes, and from other applications such as electrical and electronic products, textiles and transport vehicles. It is not known to what extent end products containing HBCD are landfilled, incinerated, left in the environment or recycled (UNEP 2011).

In developing countries like Brazil, electrical and electronic appliances containing HBCD and other toxic substances are often recycled under conditions, which result in a relatively high release of HBCD to the environment and contamination of the sites and exposure of workers. Open burning and disposal in dumpsites are common destinations for HBCD-containing articles and electronic wastes (UNEP 2011).

According to information received, HBCD is used in the building, electronics, automotive and textile industries in Brazil.

Abiquim reported that it follows the production of industrial chemicals and among them the production of polystyrene. According to the Association, 7 of its associates manufacture and process polystyrene and another 3 work with this product. However, it stated that it was difficult to measure the number of small and medium companies that work with this product.

The information indicates that HBCD is only used as a flame retardant in concentrations of 0.3 to 0.7% for: expanded polystyrene (EPS); extruded polystyrene (XPS) and high-impact polystyrene (HIPS).

The annual production of expanded polystyrene in Brazil used in the production of processed products was 96,124 tonnes in 2012, mostly used in the building sector, which uses it as a flame retardant for applications on cast slabs, blocks, roofing tiles, linings, gutters, friezes and panels.

Data from the Brazilian Expanded Polystyrene Association (Abrapex) indicate that approximately 62.9 thousand tonnes/year of EPS and 20 thousand tonnes/year of XPS were produced, making a total of 82.9 thousand tonnes in Brazil, in 2008.

Still according to Abrapex, EPS is also recycled in Brazil. It is estimated that around 7 thousand tonnes/year are returned to the production process for recycling. More than 80% of this amount was collected by the recyclers associated to the Socio-Environmental Institute for Plastics (Plastivida).

The initial HBCD survey indicated that imports of this substance are increasing, having gone from 90 tonnes in 2012 to 115 tonnes in the first nine months of 2013 alone. According to information received, this substance is used in Brazil for the manufacture of EPS, XPS and HIPS that are used as thermal insulation in the building industry and as flame-retardant additive in industrial uses.

With respect to alternatives to HBCD, Abiquim and Abichama informed there are no domestic products that can replace this substance. In the international market there are alternatives to this product, which the price is being adjusted to market demand. There are international studies aiming at the replacement of HBCD by compounds such as clays, organophosphates, and polimeric halogenated compounds, among others. The replacement is possible on a large scale, since large producers have adopted the new technology. However, Brazil will need a time to carry out the transition.

Consequently, the Association requested in advance the registration of a specific exemption to continue use of HBCD in the applications involving expanded polystyrene (EPS), extruded polystyrene (XPS) in construcion. The use in High-Impact Polystyrene (HIPS) will be eliminated.

Thus, the first activity for the Action Plan should be developing a detailed inventory of this substance. The uses of HBCD in Brazil still require further investigation; however, uses in the production of EPS and XPS can already be considered priorities.

4.2.2.3 Conclusions on the Inventory of New POPs of industrial use

Indicative inventories identified that PFOS, its salts and PFOSF and HBCD are still in use in Brazil. Furthermore, the information received indicates that POP-PBDEs might have been used in the past and that these substances could be present in imported articles in use and in wastes.

In general, the indicative inventory results indicate that information must be improved. Some categories, which are believed to use these substances must be further investigated.

It is important to note that one of the major obstacles encountered in developing the inventory was the difficulty in obtaining information on the new POPs. Since it is a new and technical issue, several institutions, which could be using these substances, or could have in the past, were not aware of this issue. This points to the need for awareness raising and capacity building of the key sectors so that more data can become available. These institutions could also be encouraged to consult suppliers about the presence of POPs in the products and articles used in their industrial processes. Those institutions should be encouraged to consult providers about the presence of POPs in products and articles used in their industrial processes.

As to information on exports/imports of new POPs, it is essential to improve specific custom codes for these products in order to enable better controls over imported quantitites. In addition, expanding Ibama's consenting for importing these substances enables proper control of each operation.

Identification of articles containing POPs is also a challenge not only for Brazil, but for most of the country parties to the Stockholm Convention. Therefore, it is essential to improve customs control of articles containing these substances.

Although the inventories of new industrial POPs presented here need improvement, the results obtained until now provide enough information to develop an action plan for the new POPs, under the National Implementation Plan of the Stockholm Convention.

In sum, the action plan will include strategies for the sound management of articles and wastes containing new POPs, as well as strategies to reduce use, with a view to elimination, of the POPs that are still used in Brazil.

4.2.2.4 Main identified challenges and priorities for action

1) Adopt and implement a suitable legislative framework for the obligations related to the ban and/ or use of industrial POPs in Brazil;

2) For PFOS, its salts and PFOSF:

a) Improve information on other possible uses of PFOS, prioritizing the categories that were thought to be suspect in the inventory, and then, the categories for which the risk of human exposure is greater;

b) Carry out studies to identify replacements for sulfluramid, evaluate the degradation of sulfluramid in PFOSF and environmental impact of applying these baits in an open environment;

c) Verify the techniques and practices used by the metal plating sector and identify measures to reduce risks of exposure and waste management practices in the sector by using BAT/BEP;

d) Carry out studies to identify and test replacements for PFOS in metal plating;

e) Promote measures to reduce risks of exposure to PFOS for the identified uses by applying BAT/BEP;

f) Ensure that residues of PFOS, its salts and PFOSF are managed in an environmentally sound manner;

g) Approve the elimination schedule for the use of PFOS in metal plating by the specific exemption period expiration date.

3) For HBCD:

a) Improve information on the uses of HBCD in Brazil and eliminate the uses for which there is no possibility of requesting a specific exemption, after the entry into force of the amendment to Annex A in November 2014;

b) Send the Secretariat a formal request for registration of specific exemption for the use of EPS and XPS in construction;

c) Carry out studies and prepare a programme to soundly manage EPS and XPS wastes that contain HBCD;

d) Sort out EPS/XPS so that only wastes that are not treated with HBCD are recycled;

e) Identify and test alternatives and present an elimination schedule for the use of HBCD according to the specific exemption period expiration date.

4) Measures to guarantee that destination and recycling of articles containing POP-PBDEs be performed in an environmentally sound manner

4.1) Actions related to recycling of waste of electrical and electronic equipment:

a) Survey of practices and techniques used by plastic recycling companies to verify the current situation and necessary improvements;

b) Preparation of a booklet to promote the adoption of best available techniques and best environmental practices for the recycling of WEEE, and dissemination of the BAT/BEP

Guide among recycling companies as well as conducting seminars (workshops) and courses on BAT/BEP for the sector. The booklet will include a negative list of applications where the recycled material shall not be used, and a positive list specifying applications where these WEEE recycled materials can be used;

c) Financial support for plastic recycling companies to acquire screening tests to detect POP-PBDEs and equipment that reduce the releases of these substances and occupational exposure; and

d) Development of an elimination schedule for the recycling of articles containing POP-PBDEs before the deadline for specific exemptions ends in 2030.

4.2) Actions related to PBDEs in automotive vehicles

a) Adopt Best Environmental Practices through the implementation of Law No. 12,977, of May 20, 2014, which regulates and disciplines the dismantling activity of terrestrial motor vehicles in Brazil;

b) Support initiatives that promote the recycling of vehicles by the states; and

c) Support the adoption of Bill No. 67/2013, which amends Law No. 12.305, of August 2, 2010, establishing the National Solid Wastes Policy, to provide for reverse logistics of automotive vehicles.

5) Sales, Imports and Exports

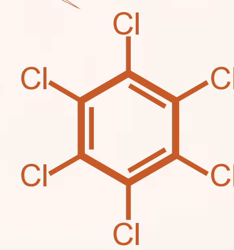
a) Put together a Working Group to create specific MCN codes or highlights to identify POPs and develop strategies to control import and export operations of POPs.

6) Measures to identify and manage in an environmentally sound manner articles containing POPs

a) Create the Conasq Working Group to evaluate existing classification and labeling systems, and develop an appropriate system to improve the exchange of information on articles containing POPs by the supply chains;

b) Develop regulation for the identification of chemicals in articles and products, after the development of the Bill to establish control over industrial chemicals; and

c) Create a Discussion Group to include the issue related to production and consumption of articles containing POPs in the Action Plan for Sustainable Production and Consumption.



5 Annex C POPs: unintentional emissions

Annex C of the Stockholm Convention lists polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/PCDF), hexachlorobenzene (HCB), polychlorinated biphenyls (PCBs) and, more recently, pentachlorobenzene (PeCB), as POPs produced unintentionally and released during thermal processes involving organic matter and chlorine, as a result of incomplete combustion or chemical reactions. These substances and their congeners make up the group of dioxins and furans.

Convention Requirements Summary

Article 5

Each Party shall at minimum take measures to:

a) Reduce the total emissions of unintentional POPs and, where feasible, their ultimate elimination;

b) Replace or modify materials, products and processes;

c) Introduce the best available techniques and the best environmental practices (BAT/BEP) for new and old sources.

d) Develop a Plan of Action.

The Plan of Action shall include the following elements:

i) An evaluation of current and projected releases, including the development and maintenance of source inventories and release estimates, taking into consideration the source categories of Annex C;

ii) An evaluation of the efficacy of the laws and policies relating to the management of these releases;

iii) Strategies to meet the obligations of the Convention, taking into account the evaluations in (i) and (ii);

iv) Steps to promote education, training and awareness raising of these strategies;

v) Timetable for implementation.

Convention Requirements Summary (continued)

With respect to the introduction of BAT/BEP:

1) For new industrial sources identified with comparably high potential for formation and emission of these POPs to the environment, with special emphasis on the source categories identified in Annex C Part II, the Parties should:

a) Promote and require the use of BAT, as early as possible, but no later than four years after the entry into force of the Convention;

b) Promote the use of BEP.

2) For existing sources, from Annex C Part II and Part III: promote the use of BAT/BEP

5.1 National Inventory of Sources and Estimates of Unintentional POPs Emissions

Brazil does not have a history of dioxin and furan measurements. Due to lack of data on the monitoring of emissions from these unintentional POPs, the Ministry of the Environment conducted a National Inventory of Sources and Emission Estimates of unintentional POPs in 2009 and 2010.

The Inventory was based on the 2nd version of the Standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases, UNEP Chemicals.

2008 was chosen as the baseline year for the inventory, as it was considered that two years would be enough to process the information and data, produce statistics and publish reports by bodies, entities, companies and associations involved in the data collection.

It is important to note that, given the absence, in many instances, of replies to the survey on the conditions of sources, capacity (activity), production, raw materials and others, it was necessary to adopt information and statistical data from various sources. Many of these are very reliable. In various cases, estimated values and conditions were adopted so that a subcategory could be subdivided into classes.

The results presented in the inventory are approximations, since several undertakings/emission sources do not yet have real information and measurements of the unintentional production. However, this does not reduce the relevance of the document or its reliability. The drawn up Inventory serves as a reference base, and the validity of its results lies in providing an indicative overview of the national situation to guide the debate on the development of program activities on the subject. Therefore, it should be seen as an open and dynamic platform for the collective construction of knowledge about the country's unintentional emissions.

Furthermore, the National Inventory of Sources and Estimates of Releases of Dioxins and Furans, developed in 2011, is an important basis for the development of strategies for reducing releases of these substances and indicates the priority sources for the Action Plan.

A review of information and updating of the inventory will be carried periodically, when strategies for reducing emissions of the Plan of Action will also be reviewed.

Summary of Results

The inventory results show a systematized scenario of the releases of dioxins and furans in Brazil

The inventory showed that Brazil has all emission sources included in the toolkit and a potential release of 2,235 g TEQ of dioxins and furans.

The largest share was of the air media with 42.3% of total releases in 2008. This is followed by release in residues, with 24.4%, and in third place, release in products with 18.7%.

The largest share by source category is Category 2 – ferrous and non-ferrous metals, with 38.2%, followed by Category 6 – open burning, with 22.8% and in third place, Category 7 – chemicals and consumer goods, with a share of 17.5%.

The Southeast Region proved to be the one with the highest releases, responsible for 58.8%, followed by the South Region with 12.4%. The smallest share was seen in the North Region, with 8.4%.

The state of São Paulo is the federal state with the largest share of releases, 28.9% of the emissions total, followed by the state of Minas Gerais, with 12.9%. The state of Rio de Janeiro is responsible for 10.1% of releases. These three states together account for 51.9% of releases. The ten highest emitters (SP, MG, RJ, ES, PA, PR, RS, MT, BA and GO) account for 86% of releases.

Table 12 shows the general classification of the total releases per source. The five largest sources of these substances were, in decreasing order, iron ore sintering, open burning of biomass, leather industry, iron/steel plants and finally fires and burning of wastes, accidental or otherwise.

Table 12 – General Classification of Total Releases according to the inventory in 2008

Rank	Toolkit Category	Source	Total	%	% Cumulative
1	2	**Iron ore sintering**	406.2	18.17	18.17
2	6	**Open burning - biomass**	336.5	15.06	33.23
3	7	**Leather refining**	253.5	11.34	44.57
4	2	**Iron/Steel Plants**	187.7	8.40	52.97
5	6	**Fires and open burning of wastes, accidental or otherwise**	172.5	7.72	60.69
6	2	**Aluminium production**	151.8	6.79	67.48
7	9	**Sewage and sewage treatment**	104.5	4.68	72.15
8	1	**Medical waste incineration**	76.3	3.41	75.56
9	9	**Landfill leachate**	65.7	2.94	78.50
10	7	**Paper and pulp mills***	63.8	2.85	81.35

Table 12 – General Classification of Total Releases according to the inventory in 2008 (continued)

Rank	Toolkit Category	Source	Total	%	% Cumulative
11	9	**Composting**	53.1	2.38	83.73
12	7	**Textile industry**	52.1	2.33	86.06
13	4	**Lime production**	37.4	1.67	87.73
14	3	**Biomass power plants**	33.3	1.49	89.22
15	2	**Copper production**	25.3	1.13	90.36
16	2	**Thermal reclamation of electrical wires and cables**	24.5	1.10	91.45
17	7	**ECD/VCM/PVC**	21.5	0.96	92.41
18	1	**Hazardous waste incineration**	21.4	0.96	93.37
19	2	**Coke production**	19.9	0.89	94.26
20	2	**Iron and Steel Foundries**	18.0	0.81	95.07
21	3	**Household heating and cooking with biomass**	17.3	0.77	95.84
22	4	**Brick production**	15.1	0.67	96.52
23	2	**Zinc production**	14.7	0.66	97.17
24	1	**Municipal solid waste incineration**	13.9	0.62	97.79
25	9	**Open water dumping**	9.9	0.45	98.24
26	4	**Cement kilns**	9.1	0.41	98.65
27	2	**Lead production**	5.4	0.24	98.89
28	4	**Oil shale processing**	4.9	0.22	99.11
29	5	**Heavy-oil fired engines**	4.3	0.19	99.30
30	8	**Smoke houses**	3.5	0.16	99.46
31	5	**Diesel engines**	3.0	0.14	99.60
32	4	**Asphalt Mixing**	2.4	0.11	99.70
33	3	**Fossil fuel power plants**	2.1	0.09	99.80
34	4	**Ceramics production**	1.3	0.06	99.86

Table 12 – General Classification of Total Releases according to the inventory in 2008 (continued)

Rank	Toolkit Category	Source	Total	%	% Cumulative
35	2	**Shredders**	0.9	0.04	99.90
36	5	**4-stroke engines (gasoline)**	0.7	0.03	99.93
37	3	**Heating and cooking**	0.5	0.02	99.95
38	4	**Glass production**	0.4	0.02	99.97
39	5	**2-stroke engines (gasoline)**	0.3	0.01	99.98
40	8	**Crematoria**	0.1	0.01	99.99
41	2	**Magnesium production**	0.1	0.003	99.99
42	2	**Hot-dip galvanizing plants**	0.1	0.003	100.00
43	3	**Landfill/biogas combustion**	0.04	0.002	100.00
44	7	**Petroleum refineries**	0.03	0.001	100.00
45	8	**Tobacco smoking**	0.01	0.0005	100.00

Source: Action Plan to Progressively Reduce Formation POPs Releases. MMA, 2015.

5.2 Detailed Distribution of Releases by Group of Sources

5.2.1 Releases to Air

Iron ore sintering showed the greatest individual contribution, 33.4% of all releases to air. In addition to this subcategory, another four are worth mentioning, as they form the group of five largest emitters: open biomass burning (25.7%), waste burning and accidental fires (11.1%), medical waste incineration (5.8 %) and iron and steel production (5.0%).

These five subcategories contribute with 81% of releases to air.

5.2.2 Release in Residues

Iron and steel plants provided the largest releases in residues, with 23.8%. Another four subcategories are also important: aluminium production (22.6%), sewage treatment disposal (18.8%), landfill leachate (12.0%) and hazardous solid wastes incineration (3.8%), making up an 81.0% participation altogether.

5.2.3 Release in Products

The largest contributor of releases in product is the leather industry, with 60.6%, followed by composting with 12.7%, textile industry with 12.4% and paper and pulp with 8.8%. In fifth place is the chemical industry with 3.3% and brick production in sixth with 2.1% and lastly shale oil processing.

5.2.4 Releases to Water

Releases to water come predominantly from paper and pulp, with 43.9% share and from dumping of untreated effluents into open water, with 43.2%. In third place is the treatment and disposal of treated liquid effluents with an 8.0 % share. Together these three subcategories are responsible for 95.4% of releases to water.

5.2.5 Releases to Land

Releases to land come from two sources: the greatest share is from fires and open burning of wastes, accidental or otherwise, with 54%, followed by open biomass burning with 46%, making up a total of 100% of releases to this environment.

15 of the 45 inventoried sources are the main contributors to releases for all environments, as shown in Table 13, amounting to 90% of releases.

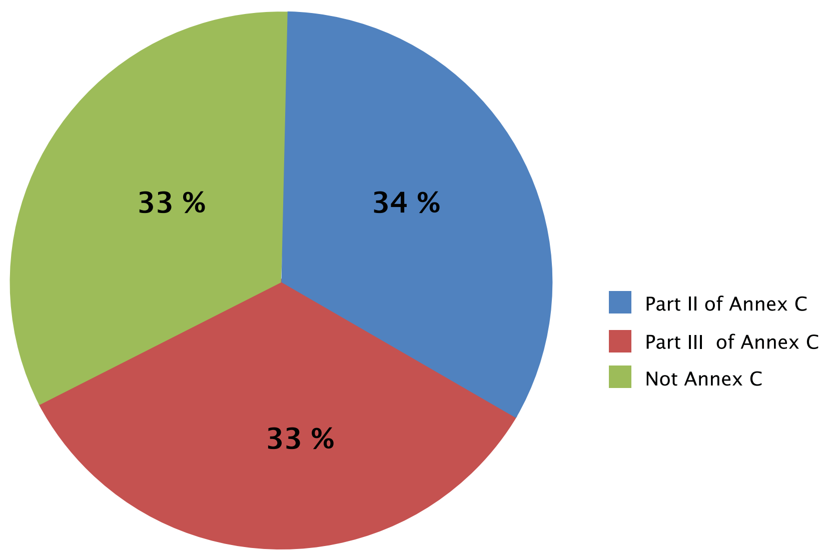
Table 13 – Main Contributors to Air, Water, Land, Residues and Product Releases

Order	Category (group)	Source or Process	Total Releases (g TEQ/year)	%	% Cumulative
1	2	Iron ore sintering	406.2	18.17	18.17
2	6	Open burning - biomass	336.5	15.06	33.23
3	7	Leather refining	253.5	11.34	44.57
4	2	Iron/Steel Plants	187.7	8.40	52.97
5	6	Fires and open burning of wastes, accidental or otherwise	172.5	7.72	60.69
6	2	Aluminum production (mainly secondary)	151.8	6.79	67.48
7	9	Sewage and sewage treatment	104.5	4.68	72.15
8	1	Medical waste incineration	76.3	3.41	75.56
9	9	Landfill leachate	65.7	2.94	78.50
10	7	Pulp and paper production	63.8	2.85	**81.35**
11	9	Composting	53.1	2.38	**83.73**
12	7	Textile industry	52.1	2.33	**86.06**
13	4	Lime production	37.4	1.67	**87.73**
14	3	Biomass power plants	33.3	1.49	**89.22**
15	2	Copper production (mainly secondary)	25.3	1.13	**90.36**

Source: Action Plan to Progressively Reduce Formation POPs Releases. MMA, 2015.

The figure below shows the relative share of each of the priority sources listed in Annex C of the Convention and of the sources that are not listed in this Annex but were inventoried according to the National Inventory of Sources and Estimates of Releases of Dioxins and Furans, in 2008 (MMA, 2013).The share is almost the same in each of the group of sources (Part II and Parte III of Annex C and non-Annex C).

Figure 18 – Distribution of Releases (Annex C)



Source: Action Plan to Progressively Reduce Releases of Persistent Organic Pollutants. MMA, 2015.

5.3 Strategy for Emissions Reduction and use of BAT/BEP

The reduction strategy was developed taking into account the information contained in the inventory, the situation of sources in Brazil, and the national conditions for meeting BAT/BEP.

Concern about the conditions of the industries to meet higher standards (BAT) was expressed during the meetings. This showed that there is need for government-industry joint efforts in order to analyze the SC/UNEP BAT-BEP Guide (2008) and verify the difficulties to meet its proposals in the short term in face of national conditions.

The definition of BAT/BEP for national conditions shall be part of the Action Planand shall take into account the size of the companies and whether they are new or not. It should be noted that for it is necessary to create national data on Emission Factors for the matter to be analyzed within a solid basis.

The country's infrastructure and capability for monitoring these substances were analyzed and some shortcomings were found. Imrovement measures were proposed. Item 11.3 presents the survey of the country's analytical capacity for dioxins and furans in more detail.

Current legislation should be complemented and/or updated in order to meet the proposed measures.

In this context, preliminary reduction measures were proposed for discussion at the GTI meeting in Brasilia. Other discussions took place with representatives of various industrial sectors, who questioned some data used for the inventory. Important information was obtained in these meetings. The need to build national emission factors was also reinforced.

The cornerstone of the strategy is to:

1. Consider different conditions for new and existing sources. BAT/BEP should be emphasized for new sources;
2. Consider national conditions when analyzing BAT/BEP measures;
3. Focus, first, on releases to air and water because their reduction will be more effective than that of releases to residues;
4. Take into account the participation in the Brazilian Inventory when making decisions on the cut values of sources that will be considered; and
5. Consider national deficiencies in terms of laboratory infrastructure and costs of sample collection and analysis for the establishment of the monitoring frequency, as well as consider indirect monitoring as a possibility to indicate compliance or non-compliance to reduction measures that will be established.

Thus, the strategy focuses on:

1) The eight sources that most contributed with releases to air are: sintering of iron ore; open biomass burning; fires and open burning of waste (accidental or otherwise); incineration of medical wastes; iron/steel mills; whitewash production; aluminum production; and thermal recovery of electrical wires and cables. The implementation of the strategy in these 8 priority sources of releases to air will result in an estimated decrease of emissions of 576g TEQ during the Action Plan period, corresponding to a 49.3% reduction in releases to air; and
2) The two sources that contributed most to releases to water are: production of pulp and paper and disposal of untreated effluents into surface waters.

Hereafter, the strategies for the three sources that contributed most to the releases to air will be presented.

5.3.1 Iron Ore Sintering

There are 7 large steel mills with large-sized sintering units in Brazil in addition to several other smaller ones.

The total estimated releases for this source in 2008 represent the largest share of total emissions. The current average emission in Brazil, based on the 2012 Toolkit (UNEP 2013) should be somewhere between 20 µg TEQ/t and 5 µg TEQ/t, with a resulting concentration at the output of the electrostatic precipitator from 2.5 ng TEQ/Nm^3 to 10 ng TEQ/Nm^3. However, the data was questioned by the sector that understands that an assessment based on national emission factors would lead to a more favourable result for this source.

The use of the best available techniques and best environmental practices, in an iron ore sintering plant, would result in a release to air of less than 0.2 ng TEQ/Nm^3. This emission figure is only obtained by changing the process technology and by operational alterations, in addition to using multi-phase scrubbers and the proper treatment of the generated liquid effluent. The best dry systems used in Brazil to treat particulate matter from sintering (bagfilters and electrostatic precipitators) do not remove the gaseous phase of dioxins and furans and, thus, cannot achieve the low aforementioned emission levels in the sintering primary treatment system.

The strategy for the sector was established as follows:

1. Continued adoption of best environmental practices (BEP) in existing units. Implementation of BEP in new units;
2. Adoption of the best practical technology available for emissions treatment in existing units, with setting of a limit of releases to be determined by a study of national conditions for best applicable technologies and a survey of national emissions in a 5 year deadline;
3. Adoption of the best practical technology available for treatment of emissions in new units, with setting of a limit of releases to be determined by a study of national conditions for best applicable technologies and a survey of national emissions;
4. Adoption of systematic monitoring of emissions with a standardized method, setting a minimum frequency after the aforementioned studies on emissions are carried out. In new units the systematic monitoring should be implemented as soon as the unit starts operating.

Expected reduction in sintering emissions: With the measures above in place and considering the information received from the industry that their emissions are already lower than those of the Emission Factors Toolkit used in the inventory, all of the Class 2 of the Toolkit emissions were taken into account. Therefore, the expected reduction in relation to the 2008 inventory for this source is 60%, which corresponds to the reduction of emissions to air from sintering of 234.3g TEQ during the action plan and of 218.8g TEQ during the action plan for all sintering (53.9% reduction in total sintering).

5.3.2 Open Biomass Burning

Open biomass burning is the second largest source of releases to air and of total releases. In this category, the most important are class 1 – forest fires and class 2 – burning of sugar cane.

As for forest fires, they may be natural events or man-made, where the latter is the most frequent in Brazil and result from illegal activities.

Given the relevance of this issue, the National Centre for Prevention and Combat of Forest Fires (Prevfogo) was created in 1989. It promotes, supports, coordinates and carries out educational activities, research, monitoring, burning control, prevention and combat of forest fires throughout the entire country.

Monitoring uses satellite images supplied by Inpe (National Institute for Space Research). Ibama and ICMBio have been working together with state environment agencies of crucial areas, particularly the Amazon Region and the Cerrado, together with the Federal Police, intensifying campaigns, providing guidance to the population in fire prevention and decrease in the use of fire in productive systems.

Intelligence and surveillance actions aim at restraining illegal practices and preventing deforestation.

The problem is also addressed in the National Climate Change Plan, which includes several programmes and projects designed to achieve CO_2 emissions reduction targets by 2020. The National Climate Change Plan is an important ally of the Plan of Action to reduce emissions of unintentional POPs. It establishes, among other targets, a reduction of the annual deforestation rate of the Amazon (reduction of 80% by 2020, according to Decree Nº 7390/2010).

As to burning of sugar cane crops, the sugar cane industry makes use of this practice, which facilitates cutting the sugar cane, eliminates attacks of venomous animals and increases worker productivity and, thus, the productivity of manual harvest.

However, the practice has been condemned because of the ensuing environmental impacts. In the three main sugar cane producing states, São Paulo, Goiás and Minas Gerais, agro-environmental protocols were signed by the environment agencies and the sugar cane industry to begin to eradicate this practice, replacing it by mechanised harvesting. The practice, however, still persists in other sugar cane producing states.

The new Forest Code, published in 2012, requires rural landowners to request the state environment agency a prior authorisation for the use of fire on vegetation in sites or regions whose characteristics justify their use in agropasture or forest practices. It also stated that the Federal Government should develop a National Policy for Management and Control of Burnings, which, among other objectives, promotes institutional coordination with a view to replacing the use of fire in rural areas. This policy is currently under development and will allow for the practice to be progressively eliminated in the states where it is still used.

Expected reduction in open fire emissions: The efficiency of these measures is difficult to determine because it depends on several factors and because they occur in vast areas. A reduction target may be fixed and measures can be taken to achieve it. Thus, the proposed target is to achieve a minimum reduction of 50% in emissions in relation to 2008 by the end of the implementation plan period, since actions for this have already been structured. Emission reductions would, therefore be 150g TEQ for the Action Plan period.

5.3.3 Fire and Open Burning of Waste, accidental or otherwise

Estimated total releases from this source were 172.5g TEQ/year and the overall share was 7.72%, with 75.4% of release to air and 24.6% to soil. It is the fifth largest emitter category.

This category includes class 1: landfill fires; class 2: accidental household and factory fires; class 3: uncontrolled household wastes burning; class 4: fires in vehicles; and finally class 5: open burning of construction/demolition timber.

It is important to note that the low reliability of the amounts (source activity) used for the inventory allied to the problem of low reliability of the emission factors for this category provide an estimate with low reliability. The system for collecting fire data must be standardized and important information — from an environmental viewpoint — could be included, which would make it easier and afford greater reliability to the statistics in future inventories.

This source is directly linked to the existence of dumps, which, according to a survey conducted in 2002 by IBGE, are 2,906, distributed in 2,810 municipalities. This situation is mostly seen in the rural areas where garbage collection is deficient and the common practice is to burn, bury or throw the waste in vacant lots, rivers, lakes, streams and dams (MMA, 2012).

As a rule, open burning of wastes or other materials should be eliminated. National legislation already prohibits this practice and indicates landfilling as the adequate method to dispose of solid wastes. The National Solid Wastes Policy and its National Solid Wastes Plan established targets that will contribute to the elimination of landfills and the implementation of a system to capture and treat gases as well as to use them as energy sources.

In the landfills, an efficient system should be adopted for collecting biogas and giving it a useful destination or at least ensure that it is properly burned. In addition, during the combustion process, the usual measures to ensure an efficient combustion should be taken.

The production of guidance material on best environmental practices for the burning of wastes and other material, particularly in the rural zones is recommendable. Thus, an awareness raising programme and training would be appropriate for this sector.

The National Solid Wastes Plan is closely related to other plans such as the National Plan on Climate Chante (PNMC), the National Plan on Water Resources (PNRH), the National Sanitation Plan (Plansab), the National Plan for Sustainable Production and Consumption (PPCS) and with the National Environmental Education Policy.

Expected reduction in emissions from fires and open burning of waste, accidental or otherwise: the effectiveness of these measures is difficult to quantify because it depends on several factors and, in several cases, occur accidentally. It is possible to set a reduction target and act to achieve it. The proposal is to achieve a minimum reduction of 30% in emissions compared to the base-year of 2008, to be achieved by end of the implementation period of this Action Plan. This reduction corresponds to not releasing 38.9g TEQ during the Action Plan.

5.4 Summary of the Stragety to Reduce/Eliminate the Release of PCDD/PCDF

The proposed strategy is based on an expected reduction of 1,018g TEQ during the5-year period of implementation of the Action Plan, corresponding to a 45.5% reduction in relation to total estimated release for the base-year of 2008.

The strategy adopted to reduce or, where possible, eliminate the release of PCDD/PCDF consists basically of the following points:

a) Acting on the sources detected by the National Inventory of Sources and Estimates of Dioxin and Furan Emissions, base-year 2008 (Brasil/MMA sd), according to their significance and growth potential in relation to releases to air and water and releases in product;

b) Use of Best Environmental Practices (BEP) and/or Best Available Techniques (BAT) as defined by the Convention,[5] adapted to national conditions, with classification of requirements according to size, relevance of the source and if it is existing or new, with establishment of levels for the presence of PCDD/PCDF in the gaseous and liquid effluents;

c) Sound management of residues and waste;

d) Monitoring of PCDD/PCDF in gasous and liquid effluents in the environment;

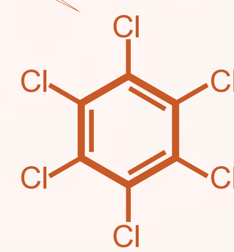
e) Awareness raising activities in general (institutions, undertakings, population) and promotion of joint participation of institutions, bodies and organizations that may aid in PCDD/PCDF reduction actions or in information collection to improve measurements of national emissions of PCDD/PCDF;

5 Included in the BAT/BEP Guides produced by UNEP and published by the Stockholm Convention's Secretariat.

f) Infrastructure improvement and national capacity building, both on the government and private levels, for monitoring of PCDD/PCDF; and

g) Updating and complementation of national legislation on the subject.

The adoption of the measures of the Action Plan to reduce the releases of dioxins and furans contributes to reduce the emissions of the other unintentional POPs.



6 Pollutants Release and Transfer Register (PRTR)

Direct measurement of emissions of POPs in activities and processes is not routinely done under the Brazilian environmental licensing of potentially polluting undertakings and activities, thus, analytical data based on source are scarce. Hence, the importance of the PRTR whose system provides the correlations between activities (such as generating sources of pollution), produced pollutants and their allocation to the environmental compartments (air, water and soil) or shipment of waste for several purposes.

In Brazil, the list of pollutants was produced based on analysis of the lists adopted in other countries and, after review it consisted of 194 pollutants.It reflected the country's reality, considering factors such as production, imports and exports and the use of raw materials.

The PRTR is not yet fully implemented, with the MMA and IBAMA adjusting specific fields of the Federal Technical Cadastre of Activities that are Potentially Polluting or Use Environmental Resources (CTF) in which should PRTR information shall be declared.

Guiding manuals were produced and training was carried out to help companies fill in the system's forms.

The PRTR annual reports shall be evaluated by comparing them with international data, and, among other benefits, they may serve as support for the formulation of government actions and also business decisions in social and environmental responsibility initiatives, such as the improvement of production processes by using Best Environmental Practices and Best Available Techniques.

7 Contaminated sites

Convention Requirements

> **Article 6, paragraph 1, item "e":**
>
> Each Party shall endeavour to develop appropriate strategies for identifying sites contaminated by chemicals listed in Annex A, B or C; if remediation of those sites is undertaken it shall be performed in an environmentally sound manner.

The federal legislation that determines the identification of contaminated sites in Brazil and provides methodology for this purpose Conama Resolution nº 420 of 30 December 2009 - is recent, this being the reason why Brazil still doesn`t have an official survey of POP contaminated sites in the entire country.

Some states, in accordance with their legislative mandate, enacted state laws that established the management and remediation of contaminated sites in their territories and have made more progress in this area, already having registers of contaminated sites.

The initiative brought about by Conama Resolution nº 420/2009, which determines that all state environment agencies should prepare reports with information on identified contaminated sites to submit to Ibama, aims at having a single database, with information on contaminated sites of the entire country.

Thus, official reports are incomplete and it was necessary to carry out an inventory from 2012 to 2013 to verify the state of the art in Brazil on these sites, in order to provide inputs for the NIP Action Plan.

To carry out the survey, the Ministry of the Environment consulted the state environment agencies and collected information in papers published by academia, or others, resulting in the first National Inventory of Sites Contaminated with Persistent Organic Pollutants (POPs) listed in the Stockholm Convention.

The inventories of contaminated sites or the information systems on contaminated sites are essential tools for managing these areas and are sources of information for the community. The inventory of contaminated sites in Brazil will likely increase, in response to the new legislation; to improved licensing and control processes in general; to increased attention paid to industrial accidents; and to improved registers and documentation.

States like São Paulo, Rio de Janeiro and Minas Gerais already have consolidated information on contaminated sites. In São Paulo, the adoption of measures to control and remediate these areas is more evident, as it is the state that has the largest survey of areas contaminated with chemicals, including POP-contaminated sites. In the states of Amapá, Tocantins and Rio Grande do Sul, initiatives were identified to implement management of POP-contaminated sites.

At the municipal level, particularly noteworthy is an initiative in the city of Natal, RN, where a programme to manage contaminated sites has been implemented and it identified areas suspected of POP-contamination.

At the federal level, the Ministry of Health has an important initiative the aforementioned Remediar Project through which it surveys storage sites for chemicals used to control endemic diseases in the country, evaluating their condition and the environmental liability they represent. Forty one sites were considered a priority for action by the Ministry of Health because they were identified as possibly having pesticides, household cleaning products, wood preservatives, veterinary products and medicine to combat disease vectors stored or buried on their grounds, among which DDT and BHC.

As a result of the inventory, 117 POP-contaminated sites were identified. Nine of them have already been recovered and two are being reused, showing a 9% rate of decontamination. There are still 106 POP-contaminated areas in Brazil that have been identified.

In 26 states, nine have recorded POP-contaminated sites, eight have said they have no knowledge of the existence of these sites and the remaining nine did not provide sufficient information to identify such sites.

Around 85% of these areas are located in the Southeast Region, with 81 of them found in the state of São Paulo and 31 in the city of São Paulo.

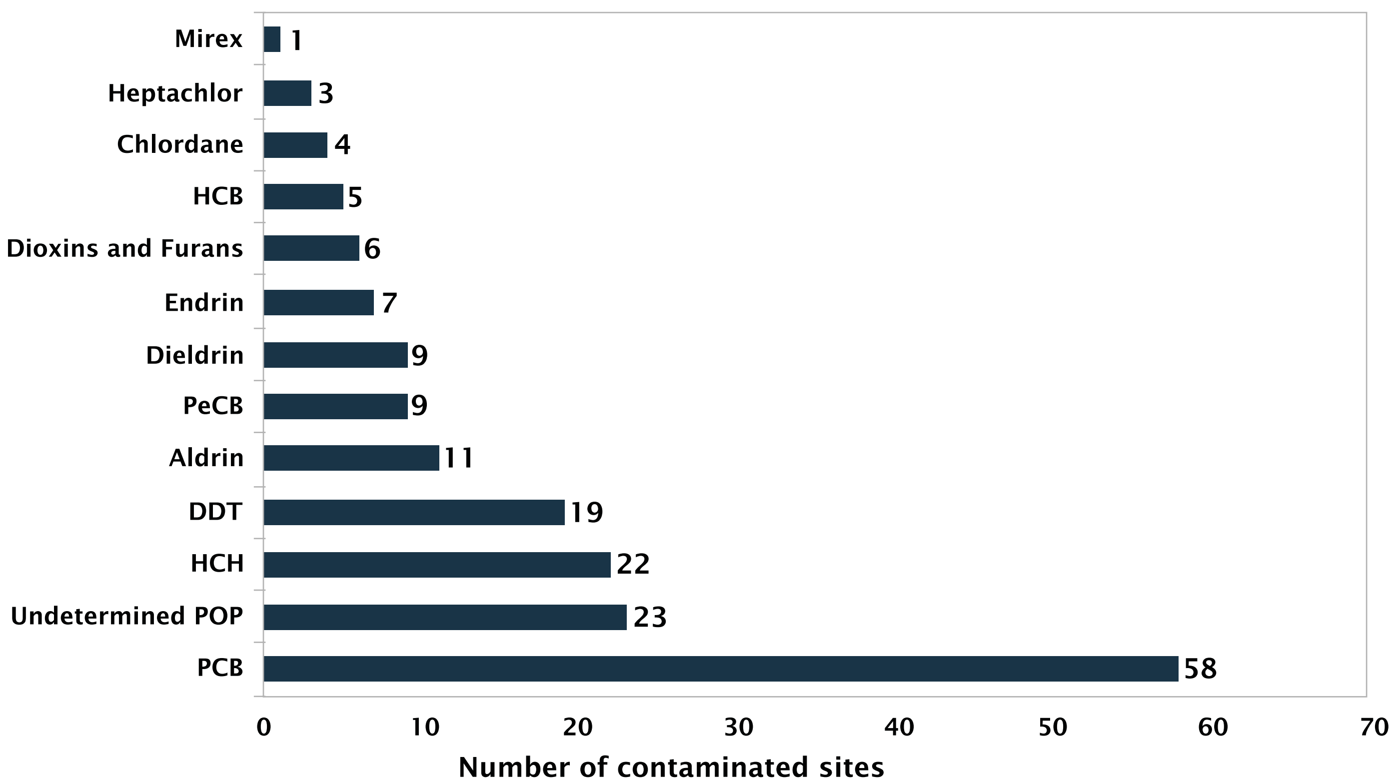
The areas identified in the state of São Paulo are at an advanced stage of investigation, decontamination and monitoring. Nevertheless, a considerable share of the identified contaminated sites is still undergoing assessment and initial surveys or has yet to undergo the first steps. The ten areas contaminated with DDT and BCH for which Funasa is responsible are already part of a decontamination programme to be executed by the Ministry of Health.

According to the survey, industrial activities contributed to the contamination of 52% of the sites. As to the sources of contamination, chemicals storage and waste discard and disposal were responsible for contaminating 41% and 37%, respectively, of these sites, proving that the poor management of products and wastes was the most significant cause of POP-contamination. Groundwaters (90 sites) and subsoil (73 sites) were the environmental compartments most affected by POP-contamination.

The presence of PCBs was seen in 50% of the sites, while HCH and DDT were present in, respectively, 19% and 15% of the sites contaminated with POPs. Most sites are contaminated with two or more POPs, but the sites contaminated with PCBs do not usually have other POP contaminants.

Among the POP-contaminated sites identified in this inventory, 12 indicate the presence of POPs under analysis in the Stockholm Convention's POP Review Committee (POPRC-9). In 92 areas the presence of contaminants other than POPs listed in the Convention were found, of which 32 indicated metal contamination.

Figure 19 – Number of POPs contaminated areas



Source: National Inventory of POPs contaminated sites. MMA, 2015.

Although the information obtained is representative, there are still unidentified POPs contaminated in Brazil. They are associated to inadequate storage of obsolete POPs pesticide stockpiles or disabled power substations containing abandoned PCB contaminated equipment.

Some states did not send information about POPs contaminated sites. On this, the inventory showed that Brazilian states are at different levels of progress regarding identification of such sites, especially with regards to the implementation of the Conama Resolution 420/2009.

Most states have not yet established their guiding values for soil, as determined by Conama Resolution 420/2009, nor defined the instruments, strategies and procedures they will use to conduct the task of identifying and managing their contaminated sites.

The MMA has been active in promoting training courses for technicians of state environmental agencies, including through demonstration/practical projects, which will be expanded and continued. Workshops and distance learning courses were held, and more training activities are planned, both on determining the guiding values for soil in compliance with Conama Resolution 420/09, and on methods for the identification and remediation of PCB contaminated sites.

Manuals for guiding the identification and management of contaminated sites as well asbooklets about existing experiences in the country on the subject will be published.

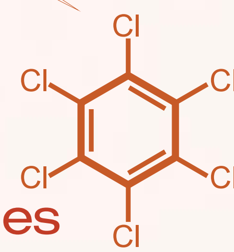
7.1 Main Challenges and Priorities for Action

For the Acion Plan, priorities are:

1) Promote capacity building and guidance for state environment agencies for managing POP-contaminated sites;

2) Develop booklets and reference documents for managing of contaminated sites;

3) Support the implementation of a demonstration project for remediation of PCB-contaminated sites.



8 Measures to improve the legal framework and the country's institutional capacity to perform activities in compliance with the Stockholm Convention

An analysis of national legislation found that there is considerable legal basis for controls of production, foreign trade, transport, chemical use and disposal of hazardous waste. Some gaps, however, have been identified, and will be synthesized below.

According to their mandates, States will also need to develop their specific legislation and develop programmess for implementation of the NIP's actions.Some states have legislation, but in others, there is a lack of knowledge about national legislation and/or established responsibilities.In addition, it is possible to identify cases of conscious resistance to compliance with legal obligations, consolidating situations of environmental violations.

Efforts for the enforcement of existing legislation include the qualifying staff, increasing the number of surveillance officers and intensifying surveillance.

Below are listed the main conclusions outlined in the study of the legal gaps and required revision.

1) **Pesticide Registration, Household Products, Wood Preservatives and others:** although these products were analyzed and classified according to the criteria of toxicity, ecotoxicity, persistence, bioaccumulation and transport, there are no objective criteria for verifying the conditions that would hinder the registration of the active ingredient based on the characteristics set forth in Annex D of the Convention.

Regarding the legal status of POPs pesticides, they are all already prohibited by specific normative acts in line with the provisions of the Convention, so there is no need for additional legislation.

2) **Industrial Chemicals:** there are regulations establishing restrictions or prohibitions for some specific industrial chemicals, such as benzene, asbestos, chlorine, mercury, PCBs and ozone layer depleting substances, but there is no general legislation covering all chemicals for industrial use in a comprehensive and systematic way.

3) **PCBs:** with respect to legislation regarding PCBs, although some regulations have been published in order to prohibit the use of POPs in new equipment and to discipline their maintenance, it is not enough to ensure the environmentally sound management of POPs due to gaps that were identified.

4) **New POPs of industrial use:** in parallel to the construction of a comprehensive legislation that covers all industrial chemicals, specific legislation for new POPsof industrial use should

be published, establishing prohibitions and restrictions in line with the Convention. And, for those chemicals whose uses permitted, publish legislation to guide the licensing process of the activities that use these POPs, their waste and articles that contain them, on Best Available Techniques and Best Environmental Practices (BAT/BEP). This legislation will also facilitate access to information on the situation of these substances and their uses in the country.

With regards to sulfluramid, its monograph needed to be altered so that its authorized uses complied with the Convention's provisions.

5) **Labeling of POPs:** the study noted the lack of harmonization of national legislation on the classification and labeling of chemicals and suggested the implementation of the GHS in the country. Similarly, Brazil should follow the international debate on labeling strategies and identification of products and articles containing POPs and implement them in the country.

6) **Customs Codes - Imports and Exports:** most new POPs of industrial use do not have individual customs codes, using codes that identify large groups of substances. This makes it difficult to obtain data on foreign trade of these POPs and the quantities traded. Thus, it is necessary to discuss the establishment of specific codes for new POPs of industrial use to enable their proper identification and monitoring of international trade.

7) **Waste management containing POPs:** publication of additional legislation may be required to govern the recycling of electrical and electronic waste, and the implementation of a strategy for the dismantling of vehicles.

8) **Water and soil quality controls:** regarding the legislation for monitoring POPs in water and soil, it does not cover all POPs listed in the Convention. The detection standards of POPs established by these regulations have proven insufficient to quantify their concentrations.

9) **Emissions of unintentional POPs:** the limits of dioxins and furans set for waste incineration are significantly milder than those suggested in the Convention's BAT/BEP Guide, and should be updated. In addition to the priority sources identified in the National Inventory Sources and Estimates of Dioxins and Furans Emissions, it is necessary to publish legislation establishing emission limits to determine reduction targets for companies/emission sources and serve as a legal basis and guide to surveillance and sanctioning actions of state agencies under the monitoring and licensing activities.

Institutional capacity: an assessment of the capacity of institutions to conduct the activities of the Action Plan for the Implementation of the Stockholm Convention was not carried out. However, from the MMA's routine contact with the institutions, including for the development of NIP activities and seminars, it was possible to point out the following management gaps:

- Government agencies with small teams to conduct certain activities by law. Insufficient supervision;
- Little dissemination of management technical support, requiring the production of guides on technology and procedure manuals to guide the activities;
- Lack of specialized training and qualification;

- Lack of IT systems for data registry, which hinders the rapid gathering of information and recording the history of activities;
- Frequent changes of staff and managers that can lead to discontinuity of some actions;
- Difficulty of the technical staff in articulating joint actions with their institutions decision makers;
- Difficulties in performing coordinated, articulated and integrated activities between various agencies; and
- Responsibilites are not clearly set, overlapping tasks with other government bodies.

This reality, however, varies to some extent between the states. Some states are better able to structure their institutions and develop their actions more easily than others and are more successful inhandling difficulties.

To guide state and local authorities on their responsibilities in the excecution of the Stockholm Convention implementation activities and the management of POPs, some actions have been suggested:

- Consolidate a standard document containing the activities to be conducted by agencies in the states and the content of their obligations in accordance with their established legal mandates;
- Prepare model-documents, terms of reference and activity guides;
- Appoint technical focal points in the states to form a national network of contacts to exchange experiences and implement the NIP; and
- Conduct periodic workshops with focal points.

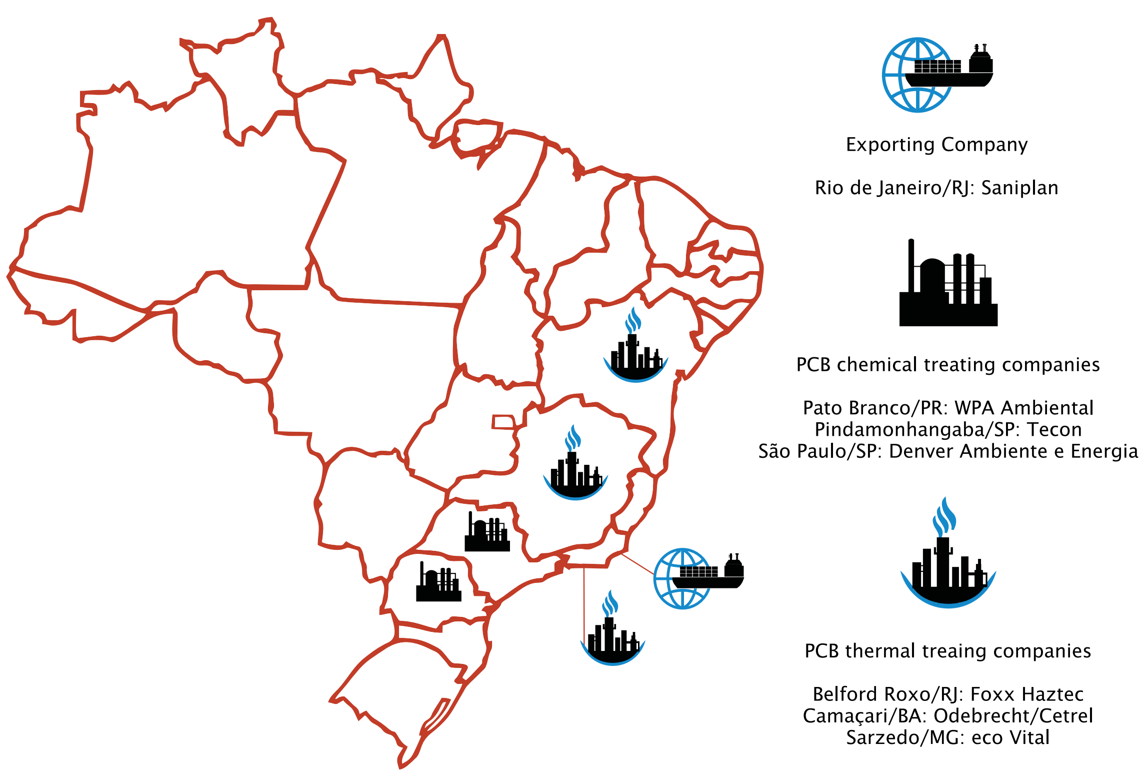
These measures will help form an institutional organization around the Convention and implementation of the NIP activities.

9 Available technologies for final destination of POPs and treatment of POPs contaminated sites

In Brazil, there is no survey of available technologies and national capacity to provide adequate dispose of all the Convention's POPs. A study commissioned by the MMA in 2011 identified the technologies nationally used for the disposal of PCBs only.

The study found that there are 3 incinerators and 3 chemical treatment plants in Brazil available for this purpose. Technologies available in Brazil are of the 70s and 80s. Many of them are no longer used by the developers themselves who currently apply more up to date technologies, such is the case of incinerators. Overall, companies headquartered in Brazil have shortcomings, either in licensing the technology itself or in tracking and controlling the process. Although the summed nominal capacities are close to the expected demand, it is noteworthy that this capacity in the case of incinerators, will not be fully available for PCBs. A new incinerator of hazardous industrial waste was recently insatlled in Minas Gerais, with 4th generation equipment.

Figure 20 – Location of companies treating PCBs



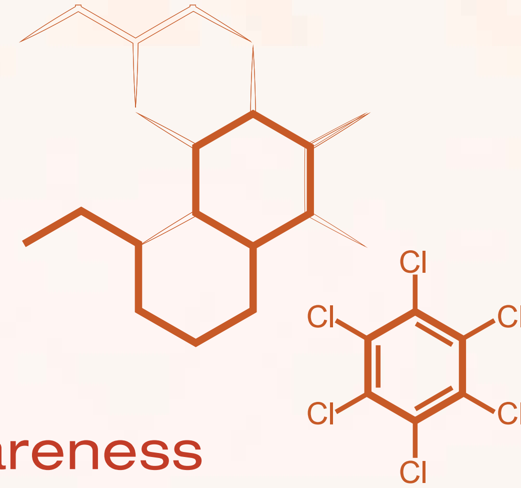
It also found that the new plasma pyrolysis, pressure oxidation and hydrogen reduction technologies are able to eliminate or significantly reduce the problems of unintentional dioxins and furans emissions in the treatment of PCB wastes. None of them, however, is available in Brazil, either to treat PCB or other wastes.

It is not a common practice, but Brazil has sent PCBs abroad for thermal treatment disposal as provided by the Basel Convention.

It is worth mentioning that in the campaigns to collect POPs stockpiles carried out in the states of SP and PR – presented in item 4.1.4 –, incineration was used as a means of disposal.

In order to fully verify the national capacity for the disposal of POPs, the NIP Brazil will include a study on the subject. A strategy to encourage the implementation of technologies that are more modern and have greater environmental benefits shall also be discussed. Civil society has severely criticized the use of incineration as a method of destruction of POPs stockpiles, due to emissions of dioxins and furans and the development of alternative technologies to the use/emission of POPs is still incipient in the country.

Similarly, there is no systematic survey of the techniques for remediation of POPs contaminated sites available in Brazil, which should also be studied in the implementation phase of the NIP.



10 Information dissemination, awareness raising and social participation

Article 10 of the Convention addresses the component Public Information, Awareness and Education that determines that signatory countries undertake activities to promote and facilitate access to information by the public; participation of society in the implementation of the Convention; and training of technical personnel to meet the obligations under the Convention.

The right to information is consolidated in the Brazilian legal system and it is ensured by the Federal Constitution.

The National Environment Policy defines as one of its objectives to disseminate environmental data and information and to raise public awareness of the need to preserve environmental quality and ecological balance. It is also mandatory that all requests for environmental licensing, its renewal and concession be made public.

It is important to note the National Environmental Education Policy Law No. 9795/99, which stresses that environmental education is an essential and permanent component of national education with the aim of, among others, developing an integrated understanding of the environment with its multiple and complex relations, ensure democratization of environmental information; encourage and strengthen critical thinking on environmental and social issues; and encourage permanent and responsible individual and community participation in preserving the equilibrium of the environment, by understanding that protection of environmental quality is an inseparable part of being a citizen.

However, the Brazilian population's knowledge on POPs is very incipient and social participation in chemicals management is very shy.

Even in the environmental agencies, the need to improve knowledge on POPs and on chemicals in general is felt.

The NIP elaboration process, through several seminars and GTI meetings, contributed substantially to expanding knowledge on POPs among environmental government technicians and allowed for a wide dissemination of the Stockholm Convention among companies involved with the use and production of POPs.

In order to promote the wide dissemination of the Convention and the POPs, Cetesb, as the Regional Centre for the Stockholm Convention for Latin America and the Caribbean, signed an agreement to minister a distance-learning course (EaD) on the Stockholm Convention POPs and their management. The course is directed at state environmental and health agencies, NGOs and the private sector.

For the first version of the course, which will be held in February 2015, the expected results are the broad dissemination of concepts and necessary measures to comply with the Stockholm Convention among key stakeholders of the Brazilian public administration and civil society.

Cetesb, as the Regional Centre for the Stockholm Convention has held the “International Programme for Intensive Training on Chemicals and Waste Environmental Management, in particular, Persistent Organic Pollutants and Mercury”, in cooperation with Jica (Japan International Cooperation Agency) every year since 2012. These are classroom environmental management programmes that address all POPs issues and management techniques, and aim at strengthening countries and states to comply with obligations from the Stockholm Convention in face of the harmful impacts of POPs and other chemicals included in the Conventions. These training programmes allowed the capacity building of technical personnel from several Brazilian states, as well as from other countries: not only from Latin America and the Caribbean but also from Africa.

The technical capacity building programme provides transfer of knowledge on environmental management of chemicals, focusing on POPs and mercury (Hg). It addresses the following topics: environmental toxicology; environmental management of urban solid wastes, medical wastes, obsolete pesticides, PCB-containing wastes, mercury-containing wastes and wastes containing new POPs; measures for the prevention and control of sources that generate unintentional POPs (such as dioxins and furans); proper monitoring of emissions to air using best available techniques and best environmental practices (BAT/BEP), protection of the quality of soil and of groundwaters and sediments; management of contaminated sites; addressing chemical emergencies and risk assessment; support for drafting legislation, rules and standards.

The distance education initiative will increase the number of people who are prepared to act in the area of chemical management, particularly the Stockholm Convention POPs, throughout the entire country, and will increase the number of people who can be trained.

The courses first edition will have a general and introductory character about the Convention and POPs. Expectation is to have further editions with a more technical focus, directed to orientation on the implementation of the NIP actions.

In relation to the group of actions regarding dissemination and training, specific technical seminars will be held for different interest groups under the Action Plans that make up the NIP as already mentioned throughout this document.

A specific Plan of Communication for PCBs is being developed and will provide different strategies for dialogue with civil society, PCB holding companies, laboratories and government.

As to dissemination of information on POPs and the Stockholm Convention, the NIP project includes the development of the National Information System for the National Stockholm Convention Plan (SNIP), which will provide all Inventories, Action Plans and other relevant information on POPs and national implementation of the Convention to the public. The SNIP will be an important and centered platform for national information on the Convention.

In this information dissemination process, social engagement, organized by NGOs is a relevant political and social stakeholder, performing an important role as diffuser of information and proposer of actions.

The National Environment Council (Conama), the consultative and decision-making body of Sisnama, is composed of different government sectors — from the three levels of government — and civil society, and it approves resolutions that establish environmental rules and standards, among other responsibilities. There are 22 representatives of worker entities and civil society in its Plenary, in addition to 8 representatives of business entities.

Civil society, the private sector and workers also have a seat in Conasq and are part of the National Coordinating Group for the Brazil NIP, as stated in item 1.2. Its representatives and partners were invited to all the meetings of the Interinstitutional Technical Groups for the inventories/studies and the action plans, always collaborating to improve documents and define actions.

Conasq will be undergoing reformulation soon and, among the projected changes to be implemented will be the expansion of representation of civil society in the commission.

In Brazil there are many NGOs addressing environmental issues, but there aren't many that specifically address toxic chemicals or POPs. We highlight the following:

Association Against Pollutants (ACPO), Association of Workers Exposed to Chemicals (Atesq), Action Network on Pesticides and their Alternatives in Latin America (Rapal-Brasil), Cianorte rural producers association (Apromaq) and Toxisphera (Environmental Health Association).

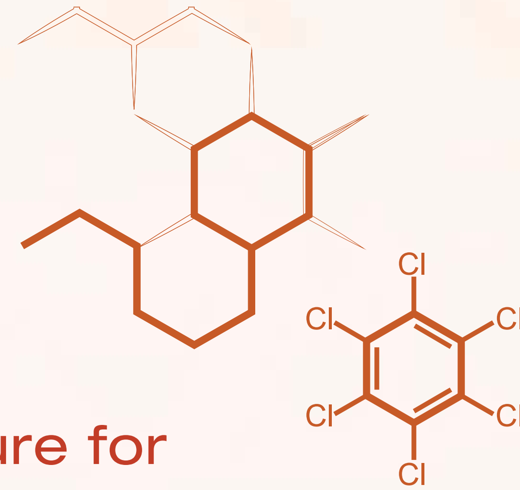
A preparatory meeting with NGOs was held to discuss the organization of a National Seminar to engage, promote and educate on POPs. This Seminar, to be held in 2015, will aim at building the capacity of a group of these entities to take part in a process to raise awareness, disseminate, and create several civil society groups to ensure community participation in the NIP implementation process.

At the end of the Seminar, a plan to raise awareness, disseminate and educate on POPs will be developed for selected interest groups, such as: teachers, university students and school teachers and students; women and children; groups of workers that handle pesticides, PCBs and other POPs; and recyclers of electrical and electronic equipment. The Plan will include development of support materials for awareness raising, dissemination and education on POPs and seminars for awareness raising of selected groups on the different aspects of the life cycle of POPs, as well as associated risks and opportunities for mitigation.

In addition to the NGOs mentioned above, others are being identified that have the potential to collaborate with NIP implementation.

The goal is to promote engagement of the public, workers that handle POPs, private sector and related government bodies in the implementation of the Convention's actions and in the search for solutions to the problems brought about by POPs in Brazil in addition to encouraging and motivating these stakeholders.

In this context of engagement, it is importante to mention the significant role played by industry representative organizations, which place themselves as intermediaries in the dialogue between the government and the companies they represent, in addition to developing training programmes to promote the implementation of responsible processes and clean technologies.



11 National laboratory infrastructure for POP analyses and monitoring

11.1 Pesticides

The laboratory infrastructure in Brazil directly or indirectly involved in the management of chemicals is composed of government and private institutions, which act mainly on two instances:

- Conducting bioassays and physical-chemical analyses as service providers; and
- Carrying out research and providing technical and scientific support for decision-making or knowledge accumulation.

In Brazil, technical infrastructure related mainly to services has advanced greatly after the regulation of the use, production, import and export of several chemicals, in particular pesticides, in the late 1980s.

Laboratories that provide services for physical-chemical analysis of these products and ecotoxicological bioassays that serve as a support for the registration with the government bodies responsible for health, environment and agriculture are submitted to accrediting processes with the bodies responsible for the registration of these substances in the country.

MAPA has accredited laboratories to perform analysis of: Pesticides and related substances, physical-chemical analyses of food of animal origin and water, physical-chemical of products of plant origin for classification purposes, physical-chemical analysis of beverages and vinegars, physical-chemical analysis of feed, fertilizers, soil correction substances, substrates and related substances, genetic identification and animal reproduction material, biotechnology and genetically modified organisms, animal diagnostics, plant health diagnostics, drugs and contaminants for animal nutrition and veterinary medicines, food and water microbiology, biological products of agronomic use, residues and contaminants in food, seeds and quality of milk.

There are 11 private accredited laboratories for pesticide analysis, their components and related substances, and pesticide residues in food, including POPs.

In addition to these, MAPA has its own official laboratories, the National Agricultural Laboratories (Lanagro) that also perform analysis for the National Plan to Control Residues and Contaminants (PNCRC).

The 6 Lanagros are located in the 5 regions of Brazil, with 2 in the Southeast (Pedro Leopoldo/MG and Campinas/SP), 1 in the South (Porto Alegre/RS), 1 in the Midwest (Goiânia/GO), 1 in the Northeast region (Recife/PE) and 1 in the North (Belém/PA). Each Lanagro focuses in a certain segment based on its location and regional production profile, thus developing specific scopes, which, in sum, cover the list of substances and mixes monitored in the PNCRC, including POP pesticides.

The Ministry of Science, Technology and Innovation acts in cooperation with the MAPA through the Network of Laboratories with respect to accreditation methodologies and R,D&I actions within the monitoring of residues and contaminants. Currently, in addition to monitoring residues and contaminants, MCTI and MAPA have agreed to expand the scope of the Network of Laboratories with a view to meet the demands of the National Policy for Agroecology and Organic Production (PNAPO-2010) and of the National Plan for Agroecology and Organic Production (Planapo–2013). This initiative prioritizes the establishment of reference specifications and specifications for toxicological and ecotoxicological tests for the industrial production of alternatives to animal health products for the organic and agroecological production systems.

As to laboratories accredited by the Ministry of Health, there is a Brazilian Network of Analytical Laboratories in Health (Reblas), which gathers organizations in different states. This network was established to provide laboratory services related to prior analysis, control and guidance for products subject to the Health Survaillance system.

Reblas is made up of official and private laboratories authorized by the National Health Surveillance Agency (Anvisa) and/or accredited by Inmetro.

There are 15 accredited laboratories in Reblas, which perform analysis of pesticide residues in food.

Anvisa coordinates actions in toxicology in the National Health Surveillance System with a view to regulate, analyze, control and monitor products and services involving risks to health – pesticides, components and related substances and other chemicals of toxicological interest.

The agency coordinates the Pesticide Residues in Food Analysis Programme (PARA) and the National Network of Information Centres and Toxicological Assistance (Renaciat).

The National Network of Health Surveillance Laboratories (RNLVISA) is made up of 27 Central Public Health Laboratories, the National Institute of Quality Control in Health – Fiocruz, the Adolfo Lutz Institute and 6 municipal laboratories that are also part of RNLVISA and perform tests on products of interest to health such as cosmetics, sanitizing products, medical drugs, water, food, health products and services. Laboratories connected to the network perform analysis of pesticide residues in food that include Persistent Organic Pollutants.

This is the laboratory infrastructure related to pesticide analysis in Brazil.

11.2 PCBs

As to PCBs analysis, the country has several public and private laboratories capable of performing analysis to determine the content of PCB in several substrates. However, there is a need for standardization of analytical methods, adoption of Good Laboratory Practices and training of laboratories that carry out analysis of PCBs in oil, so that the quality of the analysis is guaranteed. Accreditation would be a way to level the laboratories and improve analytical capacity for PCB analysis.

Another necessary step is the adoption of a single method for the determination of PCBs in insulating oils, with the adoption of the Brazilian standard for PCBs analysis in oil (NBR 13882 rev. 2008, revised in 2013).

The requirement of accreditation is being discussed in the drafting of legislation in process within Conama, which provides for the environmentally sound management of polychlorinated biphenyls (PCB) and their residues. According to the proposed new legislation, laboratory analysis to determine the concentration of PCBs, for inventory purposes, operation, maintenance, marketing and disposal, when performed by quantitative methods should be performed by accredited laboratories for conducting this test by the National Institute of Metrology, Quality and Technology (Inmetro) or by foreign laboratories accredited by accreditation bodies, signatories of a mutual recognition agreement of which Inmetro is a Party. For inventory purposes, validated semiquantitative method for false negative lower than 1% may be accepted.

11.3 Dioxins and Furans

The laboratory and sampling infrastructure for performing analysis of dioxins and furans in the environment was verified through research carried out with the companies using questionnaires.

In addition to the survey of companies in Brazil that provide analysis services and services of collection of samples of dioxins and furans in environmental and biological mixes, an assessment was carried out to evaluate the existing laboratory infrastructure and the need to expand it in order to support the amount of sampling and analysis necessary to the implementation of the Action Plan to reduce releases of these pollutants.

Fourteen companies were found that provide sampling or analysis services for the 17 dioxins and furans 2,3,7,8 – TCDD. Of the 14 companies, 9 carry out analyses, but two aren't operating commercially yet. One of the companies does not provide commercial services (Cetesb). Therefore, in practice only six laboratories currently provide analysis of dioxins and furans with specification of the 17 congeners 2,3,7,8 – TCDD. Six companies provide sampling services (collection) in stationary atmospheric emission sources, but one of them is Cetesb, which does not operate commercially.

The Cetesb laboratory is the only public laboratory for dioxins and furans in Brazil and carries out analysis of these pollutants, but does not yet provide commercial services.

Two companies working in Brazil provide analysis of PCDD/PCDF, but they have laboratories abroad, in Germany and Belgium.

The seven laboratories in Brazil have high-resolution gas chromatographs and high resolution mass spectrometers (HRGC/HRMS), 3 of which have ISO 17025 accreditation with Inmetro.

As to the analytical capacity, evaluation results show a monthly capacity for analysing 9,173 samples, totaling a capacity of analysing approximately 110,000 samples a year. However, most of this capacity refers to the company, whose analyses are carried out in Germany.

With respect to sampling in stationary sources (sampling in stacks), the number of companies is small (5 companies). There is no information on the capacity of these companies.

As to cost of analysis, they are high due to the need to use ultrasensitive analytical techniques, as well as to have modern facilities with special filtering incoming and outgoing air in the laboratory.

Collection of solid and liquid samples is not a problem. However, sampling of atmospheric emissions in stationary sources (stacks) is more complex and will be more expensive. In Brazil, US Environmental Protection Agency method 23A is used. The measuring protocol requires a special sampling train, regular calibration of equipment and trained personnel.

In conclusion, the scenario of the national analytical capacity for monitoring unintentionally produced POPs shows that we have a good capacity for analysing samples, even if not in the country, it is possible to carry out analyses abroad, with the intermediation of companies that have been in Brazil for a long time.

Furthermore, equipment and instruments, both for collecting and analysis are imported, as are the laboratory standards used in the analyses, and all this contributes to the high cost. Technical personnel must also be trained and have experience in order for the sample collections and analyses to be reliable.

With respect to laboratories, the possibility of expanding the number of public laboratories should be examined. Based on the inventory, we see that the largest shares in emissions were in the states of São Paulo, Minas Gerais, Rio de Janeiro and Espírito Santo, in this order (Brasil/MMA 2013, Figure 36, p. 133). Thus, there could be new laboratories in the state environment agencies of these states, like Cetesb. Its current laboratory has been used constantly and the existence of another one would be very important for more routine work. Partnerships with academia and external entities with experience in this type of laboratory would be interesting for exchange of experiences and knowledge.

It will also be necessary to equip and assemble teams for stack sampling in the states to monitor systems. São Paulo already has equipment and an assembled team that has been trained, thus, new teams would be more useful in other states with a large share in stationary source emissions, like Minas Gerais, Rio de Janeiro, Espírito Santo, Paraná, Rio Grande do Sul and Bahia.

Industry must also undergo capacity building and training to use the best environmental practices and technologies for treating emissions as well as monitoring emissions. Thus, an awareness raising programme and training should also involve technical staff of this sector.

Nevertheless, we must think of alternative ways and methods of monitoring to decrease costs and increase surveillance, such as indicative parameters for monitoring to reduce the frequency of sampling. For example, part of dioxins and furans is found in particulate matter and reducing the emissions of this pollutant will lead to the reduction of PCDD/PCDF emissions. Thus, if the emissions treatment system and the good environmental practice measures are in tune with the strategy for emissions reduction, the company could benefit from the reduction of PCDD/PCDF monitoring by monitoring the fine particulate, which is cheaper. However, this possibility should be studied and tested, and begun on a case-by-case basis and later, if appropriate, expand its use.

11.4 New POPs

As to the analytical capacity to perform analysis of New Industrial POPs (PFOS/PFOSF, POP-PBDEs and HBCD), today, Brazil does not have qualified laboratories for this purpose. Usually the research related to New POPs are conducted in cooperation with international institutions, and the samples are sent to reference laboratories abroad.

Cetesb has sought to acquire equipment, methods, procedures and standards to conduct PFOS and PBDE analysis in water and ambient air samples. One of the plan’s activities is to support this type of initiative, to build analytical capacity for new POPs in Brazil.

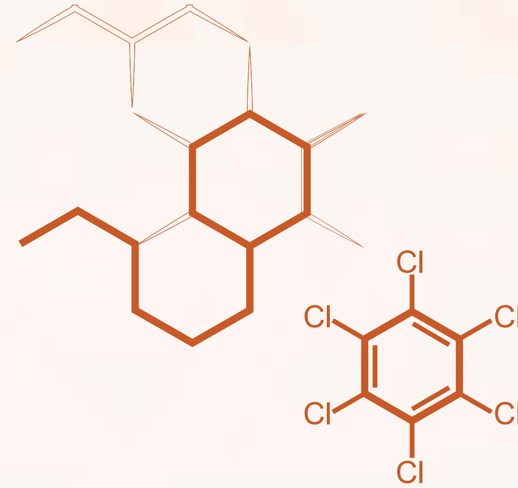
The establishment of quality standards for air, soil and water for new POPs of industrial use is also part of the strategy for controlling the emission of these pollutants. The current legislation does not include them in the list of pollutants that should have their presence determined.

In fact, the establishment of quality standards for New POPs is still a challenge because their acceptable levels in the environment are unknown. Some international environment agencies have ongoing studies to establish quality standards for water, soil and/or other environments for new POPs.

For example the Canadian environmental agency (Environment Canada 2013, in UNEP, 2007) established a monitoring programme for PFOS in air, surface water, sediments, aquatic biota and wild animals, and also a proposed Guide to Federal Environmental Quality for PFOS in water, fish tissue, wild animal nutrition and bird's eggs. This provisional guide was based on studies that correlate animal exposure in laboratories to adverse effects that were observed. In the USA, several states adopt limits based on the risk to human health of the presence of PFOS and PFOA (perfluorooctanoic acid) in water for human consumption and household water (US EPA, 2012b). The 2012 edition of the Quality Standard for Water for Human Consumption of the American environmental agency (US EPA, 2012a), established a provisional value for PFOA and PFOS quality.

Therefore, it is necessary to carry out a comprehensive study on standards adopted by international environmental agencies, evaluate the presence of these POPs in the environment in Brazil and, then, propose the adoption of standards for relevant matrices for each chemical. This study could be carried out by the Monitoring Group but could also include the Ministry of the Environment and Conama as debates advance.

An initial activity should include analysis to check emissions/releases of these pollutants in sulfluramid production activities, electroplating and EPS/XPS production or WEEE recycling activities that contain POP-PBDEs. This should be a requirement for licensing activities that use new POPs or for licensing renewal.



12 Capacity for environmental monitoring of POPs

An important component of the evaluation of the effectiveness of the Stockholm Convention is the Global Monitoring Plan (GMP), which provides a harmonized organizational framework for the collection of comparable monitoring data or information on the presence of persistent organic pollutants in all regions, in order to identify changes in levels of POPs over time as well as provide information on regional and global environmental transport (UNEP, 2013).

Brazil appointed a representative in the regional Latin American organization group for the GMP. The main objectives of the regional organization groups (ROG) are the definition and implementation of a regional strategy for information gathering, including capacity building and strategic partnerships in order to fill the identified data gaps, and prepare the regional monitoring report.

The first overview of the global geographic distribution of POPs presented information on baseline of the 12 initial POPs, the priority matrices of the Convention, air, breastmilk and human blood.

The second campaign for global data collection, which will disclose its results during the 7th meeting of the Conference of the Parties, in 2015, will include baseline information on new POPs and data on concentration changes of chemicals initially included in the Convention, that have more than one priority matrix, water (GMP, 2014).

Preliminary results of the second regional report indicate that relevant progress was made in technical training in sampling and POPs analysis and in harmonizing analytical methodologies for the obtainment of comparable data through on the spot training in Latin American and Caribbean countries (GMP, 2014).

However, the report concludes that the region is far from having a regional continuous monitoring system that provides comparable and reliable tools and data. Training activities are essential to the process of developing national or regional monitoring networks as well as the participation of laboratories in intercalibration programmes that provide tools for comparing the quality of regional data with that of the rest of the world and for identifying strong and weak points in laboratories.

Country-Parties must strive to develop local or regional monitoring programmes to produce high quality information for the Global Monitoring Plan (GMP) that can be used to evaluate the Convention's efficiency.

12.1 Establishment of a National Monitoring Network

A group of Brazilian laboratories that include universities and public research institutions related to POPs have been holding meetings to debate the creation of a national POPs monitoring network.

The group took part in the "International Course of Intensive Training in Environmental Management of Persistent Organic Pollutants – COPs", held in march 2013 by Cetesb as the Regional Centre for the Stockholm Convention, approved by the Third Country Training Programme (TCTP) – a trilateral cooperation mode in the scope of the Japan-Brazil Partnership Programme (JBPP), operated by the Brazilian Cooperation Agency (ABC) and by the Japan International Cooperation Agency (JICA).

The group participated with other Latin American countries in the *module III "Monitoring and Determining Persistent Organic Pollutants (POPs) in Environmental Samples",* developed with the objective to train national and Grulac laboratories to determine POPs (particularly organochlorines, PCBs and dl-POPs), including sample preparation techniques (soil, sediments, ambient air, water, etc), instrumental analytical methods (gas chromatography with diverse detectors) and an overview of the laboratorial structure needed to determine and monitor POPs in several environmental and biological matrices (breastmilk and human blood and aquatic organisms).

National and Grulac participants expressed interest in structuring a POPs monitoring network in samples of air and breastmilk in the region. Other topics such as sample selection points, amount of sample points, indication of laboratories with capacity and/or interest to carry out analysis and structuring of an interlaboratorial programme for the region were also discussed. Regarding new POPs, the group considered the debate to be premature since most of the participants had not yet begun addressing the subject.

In the end, it was decided that it was important to, first, discuss with participating laboratories the analysis methods and sampling and, then, develop a sampling network or an interlaboratorial programme. Participants in the meeting also concluded that it is necessary to continue discussions initiated during the workshop and add other participants in order to begin the monitoring of POPs in Brazil and the Grulac region.

Therefore, this Action Plan will include activities to strengthen the Discussion Group and continue debate related to the creation of a national or regional monitoring network, including the issue related to the monitoring of new POPs of industrial use. This activity should be supported by the Regional Training and Technology Transference Centres in the region, coordinated by Cetesb.

Laboratories listed in Table 14 expressed disposition to participate in the effort and the present challenge. The list may be extended.

Table 14 – Available Laboratories for analyses of POPs in ambient air

Laboratory	Current analysis capacity	Equipment*	Sampler
CENA-USP	PCB/OCPs	CG-μECD/CG-MS	Doesn't have
CETESB	dl-PCBs/PCBs indicators/ OCPs/Dioxins and furans/	CG-ECD/CG-MS/HRMS-HRMS/	8 PUF Samplers
FURG	OCPs/PCBs-45 congeners/ BFRs/Others**	CG-MS/CG-ECD	XAD-2/80-90 locals (180 samplers)
IBCCF/UFRJ	OCPs/PCBs-48 congeners/ BFRs	CG-ECD/CG-MS(EI and NCI)	2-3 PUFs

Table 14 – Available Laboratories for analyses of POPs in ambient air (continued)

Laboratory	Current analysis capacity	Equipment*	Sampler
IPT	OCPs/PCB indicators/ Dioxins and furans*	CG-ECD/CG-ECD-HRMS	Doesn't have
UNESP/ Araraquara	OCPs/PCBs	CG-ECD/CG-MS	Active Sampler
INEA***	Organoclorineand PCBs	CG-ECD	AR = Must contact management
FSP/USP	Dioxins and furans (sampling)	CG-MS	PM-10/3 PUFs/ Hi-Vol
UFSM	Organochlorine	CG-MS	Doesn't have (QuEChERS SPE – Solid Phase Extraction)

*Available Equipment

** Intends to perform training in the short term.

*** INEA = Water, sediments and soil.

Source: São Paulo State Environmental Protection Agency (2014).

12.2 Monitoring of POPs in Brazil

Brazil currently participates in some international monitoring programs of POPs sampling such as the Global Atmospheric Passive Sampling (GAPS) Network, Latin American (POPs) Passive Atmospheric Sampling Network (Lapan), and Global Fund Projects for the Environment (GEF/SAICM), and has eleven ambient air sampling points in several regions, as shown in Table 15 (GMP, 2014).

Table 15 – Location of passive samplers to analyze POPs in the air

Location	Type of location	Latitude	Longitude	Type of passive sampler	Monitoring Programme
Indaiatuba, São Paulo	Rural	-23.16	-47.17	PUF	GAPS
Porto Velho	Urban	-8.84	-63.94	PUF	GAPS
St. Peter y St. Paul Rocks	Remote	0.92	-29.35	PUF	GAPS
São Luis	Urban	-2.35	-44.12	PUF	GEF/SAICM
São Paulo	Urban	-23.55	-46.72	PUF	GEF/SAICM
Atol das Rocas	Remote	-3.86	-33.82	XAD	LAPAN

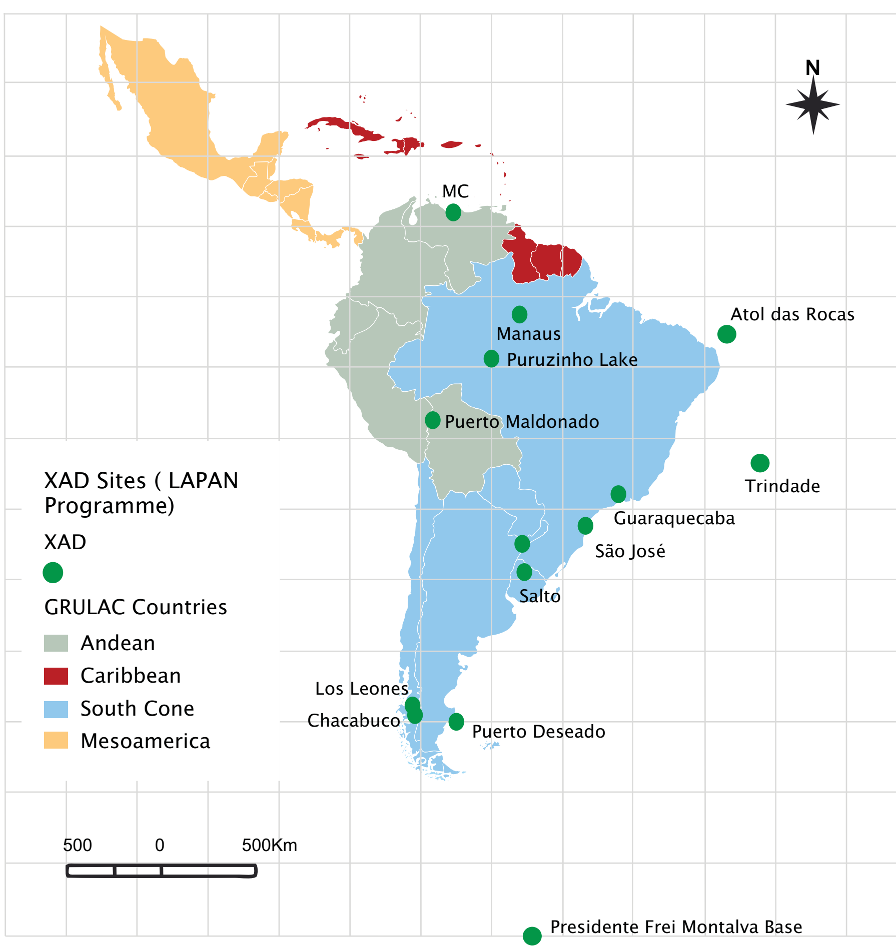
Table 15 – Location of passive samplers to analyze POPs in the air (continued)

Location	Type of location	Latitude	Longitude	Type of passive sampler	Monitoring Programme
Guaraquecaba	Remote	-25.29	-48.32	XAD	LAPAN
Manaus	Remote	-2.59	-60.21	XAD	LAPAN
Puruzinho Lake	Remote	-7.37	-63.06	XAD	LAPAN
São Jose	Remote	-28.59	-49.82	XAD	LAPAN
Trindade	Remote	-20.51	-29.31	XAD	LAPAN

Source: World Surveillance Plan Persistent Organic Pollutants – Second Report – Latin America and the Caribbean region.

The map below (Figure 21) presents the distribution of passive samplers of the different programmes in which Brazil participates.

Figure 21 – Map of passive samplers geographical distribution



Source: World Surveillance Plan Persistent Organic Pollutants – Second Report – Latin America and the Caribbean region.

To improve the capacity of POPs analysis, Brazil participated in the UNEP/GEF project "Supporting the Implementation of the POP Global Monitoring Plan in the Latin American and Caribbean Countries" that aimed at training laboratories of participating countries in conducting sampling and POPs analysis in two selected matrices, air and breastmilk.

The project's national coordinator was the Ministry of the Environment (MMA) and participating institutions (laboratories) were: Cetesb, Oswaldo Cruz Foundation (Fiocruz), who are responsible for analysis of air and breastmilk, respectively. The project's next stage will include training in sampling and analysis of new POPs.

Besides Brazil, other participating countries are: Antigua and Barbuda, Chile, Ecuador, Jamaica, Mexico, Peru and Uruguay. SAICM also supported the participation of Barbados, Bahamas and Haiti in the GMP project.

12.2.1 Ambient Air Study

For Cetesb, the main purpose of participating in the project was to improve laboratory capacity for sampling/analysis of dioxins, furans and dl-PCBs in air through High Mass Resolution Spectrometry (HRMS), but the project also included sampling and analysis of POPs pesticides (UNEP, 2012).

The agency chose an urban area in the city of São Paulo near Cetesb to install passive samplers to facilitate PUF collection and analysis and for being a place where POPs concentration is high (UNEP, 2012).

Sampling was conducted according to procedures sent by the Regional Centre in Uruguay: *"Procedimiento para el montaje y desmontaje de captadores pasivos de aire (PAS)";"Instructivo para el uso de los captadores pasivos (PAS) según el cronograma establecido"* and *"Guideline for the passive air samplers (PAS) management"*. Samplers were exposed for three-month periods during a year (July 1, 2010 to July 1, 2011). A total of 4 PUF samplers for each group of components were used (UNEP, 2012).

In addition to the Interlaboratorial Programme for POPs Analysis in Ambient Air, the project received mirror samples. Brazil chose sediments and fish as mirror samples. Sediment samples were used as indicators of organochlorine pesticide (OCP) and PCB because these are routine analysis for the laboratory responsible for the mirror samples. In regard to the requestes biological sample, there was no time to collect the sample and send it in the time frame established by the project. Thus, a fish sample used to analyze PCDD/Fs was used (UNEP, 2012).

The study's results are presented below.

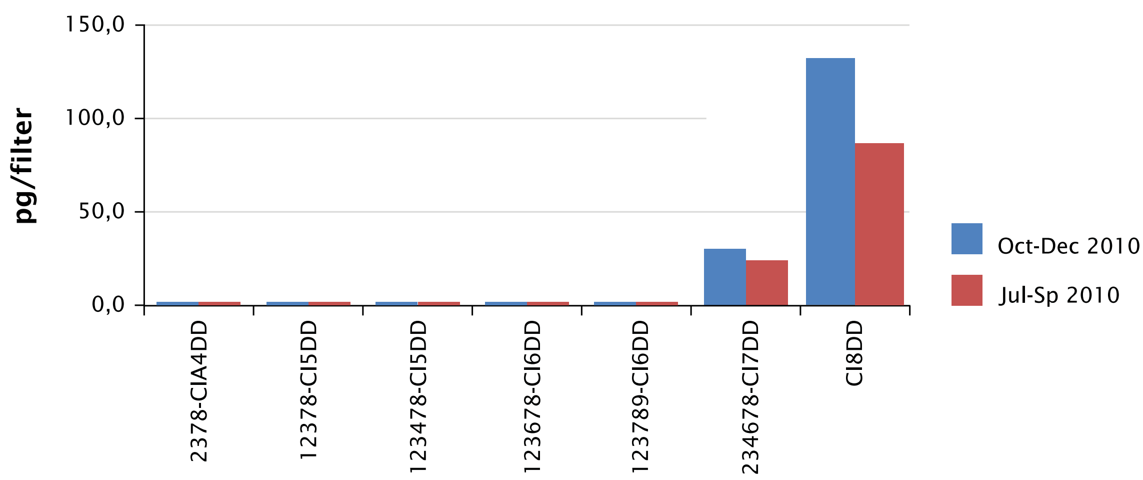
12.2.2 Dioxins and Furans

National results for dioxins and furans (PCDD and PCDF) in PUF samples are available only for the first and second sampling periods. Results of the third and fourth periods could not be considered because of a loss of$^{13}C_{12}$-PCDD/F added to the sample before extraction (UNEP, 2012).

Figure 22 shows the PCDD results. In both sampling periods, extracts are predominantly CL8-DD, 1234678Cl7-DD, 1234678Cl7-DF and CL8-DF. For dioxins (PCDD) only congeners 1234678-Cl7DD and Cl8DD were quantified. The concentration of other congeners was lower that the quantification limit (UNEP, 2012). Considering TEQ values, furans (PCDF) were present in higher concentration than dioxins (PCDD) (Figure 23) and it was possible to see that almost all PCDF congeners were quantified. This PCDD/Fs pattern is very similar to the one presented by a previous study carried out in São Paulo using an active sampler (Assunção et al., 2005).

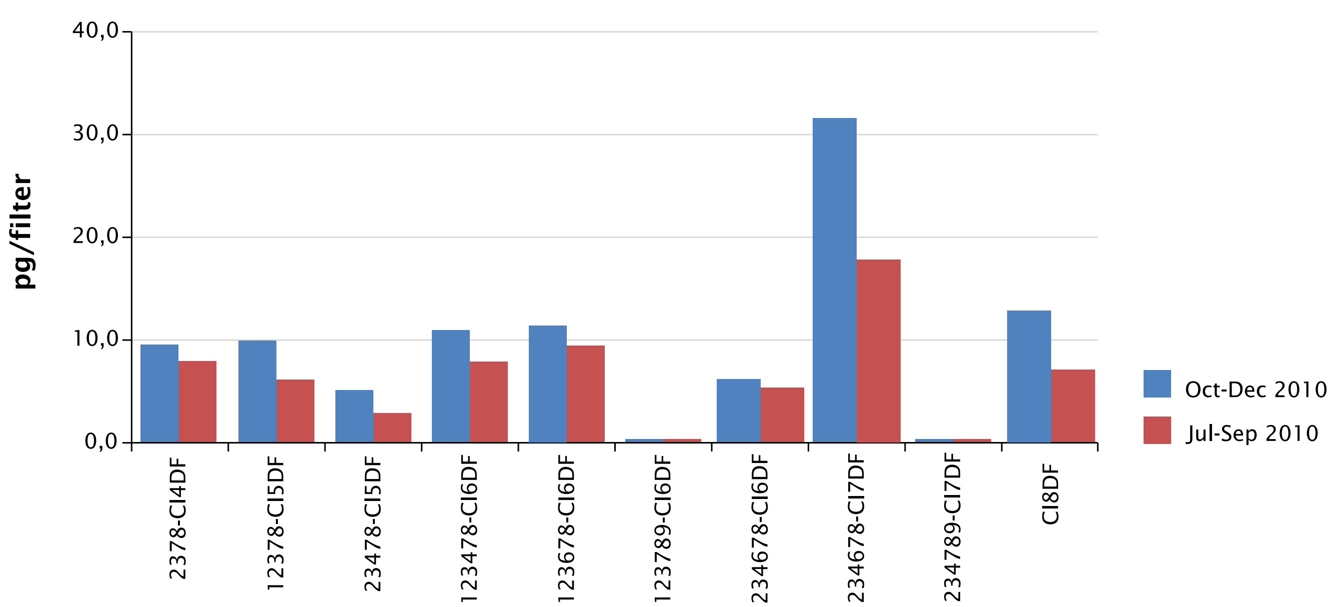
The place of sampling presents heavy traffic of cars running on gasoline or ethanol and buses that run on diesel. Thus, the main source of dioxins and furans is, probably vehicular emissions. Total PCDD/F results (min/max was 6.5-23 pg TEQ/filter) are similar to those from urban areas in Ghana, Sudan and Tunisia (UNEP, 2009 in UNEP, 2012).

Figure 22 – Dioxin concentration in PUF samplers from July to December 2010



Source: Supporting the Implementation of the GMP in GRULAC Region – Brazil Report, 2012.

Figure 23 – Furan Concentration in PUF samplers from July to December 2010

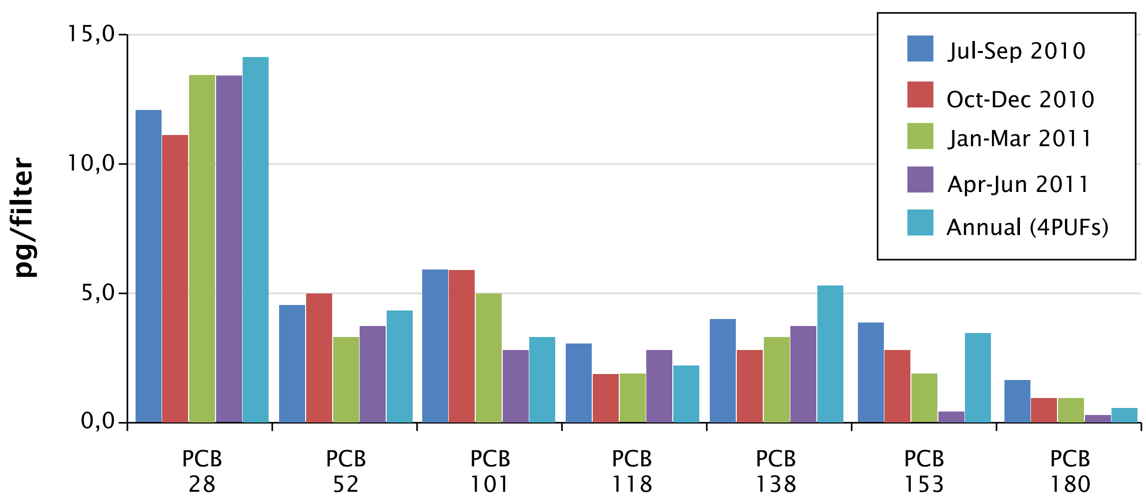


Source: Supporting the Implementation of the GMP in GRULAC Region – Brazil Report, 2012.

12.2.3 PCBs

PCBs indicators results are presented in Figure 24. The less chlorinated PCB, **PCB 28**, was the most abundant branch and the most chlorinated PCB, **PCB 180**, was the less abundant. Maximum levels of PCB (7 indicators) in the city of São Paulo were lower than maximum levels in industrial and urban sites in Africa, Southern, Central and Western Europe, but higher than samples of rural areas, remote rural areas and mountains of those regions (UNEP, 2009). In the Grulac region, detection frequency of PCBs in PUF samples from the GAPS (Global Atmospheric Passive Sampling) programme in 2005 was 42% (UNEP, 2009 in UNEP, 2012).

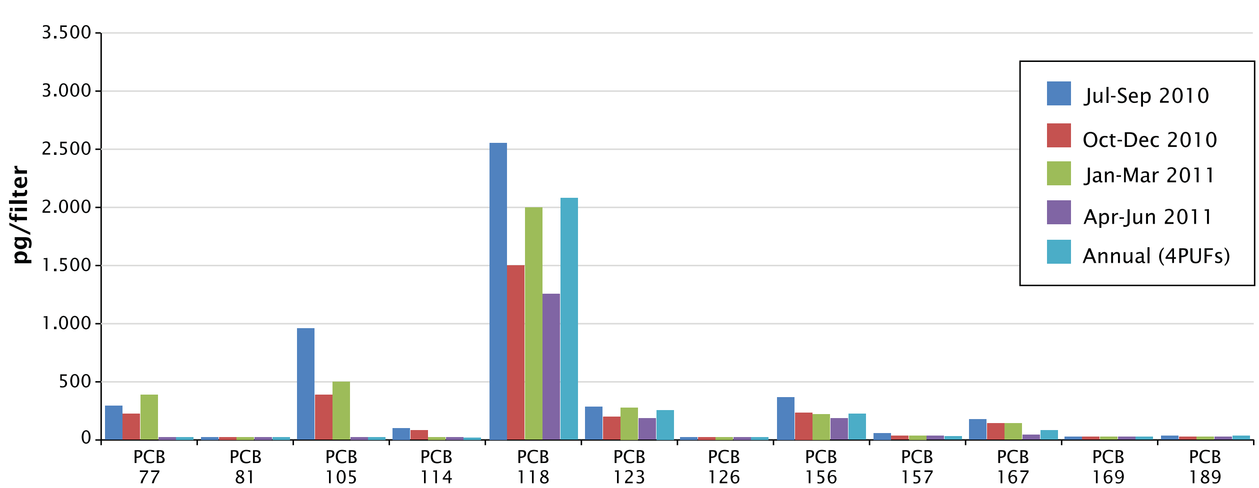
Figure 24 – Concentration of PCBs indicators in PUF samplers during the study period



Source: Supporting the Implementation of the GMP in GRULAC Region – Brazil Report, 2012.

Figure 25 presents dl-PCBs results. The most abundant congener was PCB 118 and dl-PCB contribution to total TEQ (PCDD/PCDF/ PCB) was 17.2-32.2% (lower-upper limit).

Figure 25 – Concentration of dl-PCBs in PUF samplers during the study period



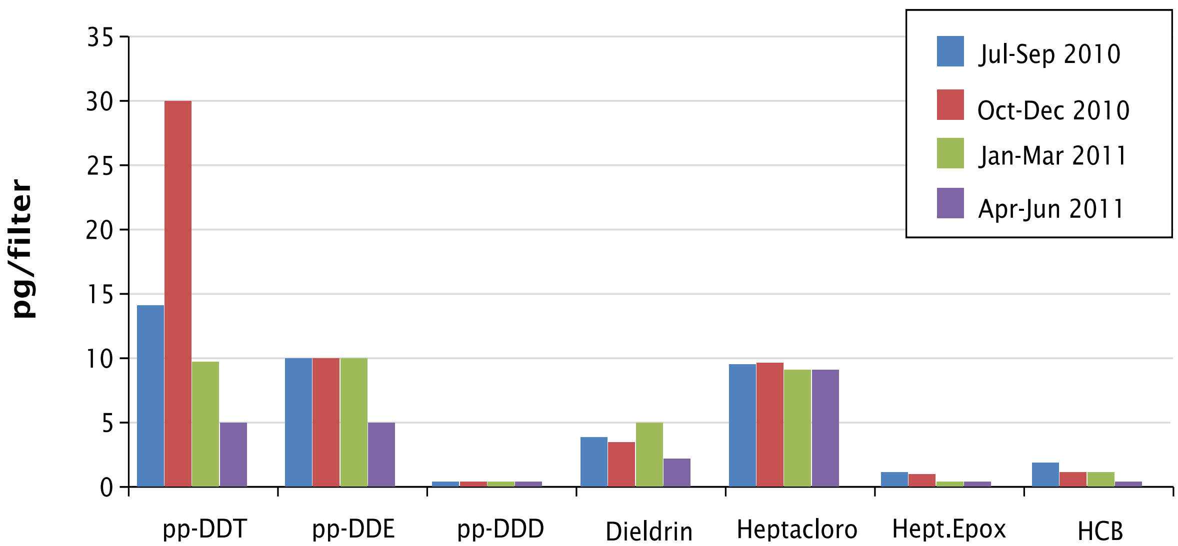
Source: Supporting the Implementation of the GMP in GRULAC Region – Brazil Report, 2012.

Considering the past use of PCBs in Brazil, their presence in air samples may be related to stored used equipment, old equipment still in use, wastes and contaminated sites. But it is necessary to evaluate more samples/sites in order to understand the possible sources of contamination (UNEP, 2012).

12.2.4 Organochlorine Pesticides (OCPs)

Results for PUF sampler quantified OCPs are presented in Figure 26.

Figure 26 – Concentration of POPs in PUF samplers during the study period



Source: Supporting the Implementation of the GMP in GRULAC Region – Brazil Report, 2012.

Pesticides identified in the study were pp'-DDT and DDE-pp', dieldrin, heptachlor and hexachlorobenzene (HCB).

The presence of pp'-DDT and DDE-pp' may be related to the production and use of these compounds in the country in the past (UNEP, 2012). DDT has been detected although in low frequency or concentration, in drinking water monitoring programmes in Brazil (Bergamasco et al., 2011 in UNEP, 2012), sediment samples in the state of São Paulo (Tominaga et al., 2011), soil samples in the state of São Paulo (Cetesb, 2008; Lemos et al., 2009 in UNEP, 2012), fish samples in Brazil and breastmilk samples (Krauss, 2004) (Torres et al., 2010 in UNEP, 2012).

DDT (op'-DDT + pp'-DDE) was detected in ambient air samples, Meire et al. (2010) of two national parks in the concentration range of ND to 57pg/m^3. In the Grulac region, the detection frequency of pp'-DDE in PUF samples of the GAPS programme, in 2005, was 25% (UNEP, 2009).

The presence of dieldrin in PUF samples confirms the information found in literature and may be related to the use and production of these compounds (aldrin, dieldrin and endrin) in the past in São Paulo (UNEP, 2012). Meire et al. (2010) identified dieldrin in ambient air samples of two national parks in a concentration range of ND a 19 pg/m^3. Aldrin and dieldrin were detected in drinking water monitoring programmes in Brazil (Bergamasco et al., 2011) and in soil samples in the state of São Paulo (Cetesb, 2008; Lemos et al., 2009). According to Torres et al. (2010), among the cyclodienes compounds, dieldrin is the most present in fish samples in the state of São Paulo when compared to other states in Brazil. Dieldrin was detected in milk samples in the state of São Paulo (Krauss et al., 2004). In the

Grulac region, the frequency of detection of dieldrin in PUF samples of the GAPS programme, in 2005, was 33% (UNEP, 2009).

The detection of heptachlor and heptachlor epoxide in PUF samples confirms national data found in the literature (UNEP, 2012). Heptachlor Epoxide was detected in air samples of two national parks in Brazil in the concentration range of ND a 14 pg/m^3 (Meire et al., 2010). Heptachlor and Heptachlor Epoxide were detected in drinking water monitoring programmes in Brazil (Bergamasco, 2011) and in surface water samples and sediments (Almeida et al., 2007; Fernicola; Oliveira, 2002). In the Grulac region, detection frequency of heptachlor epoxide in PUF samples of the GAPS programme, in 2005, was 19% e for heptachlor the rate was 4% (UNEP, 2009 in UNEP, 2012).

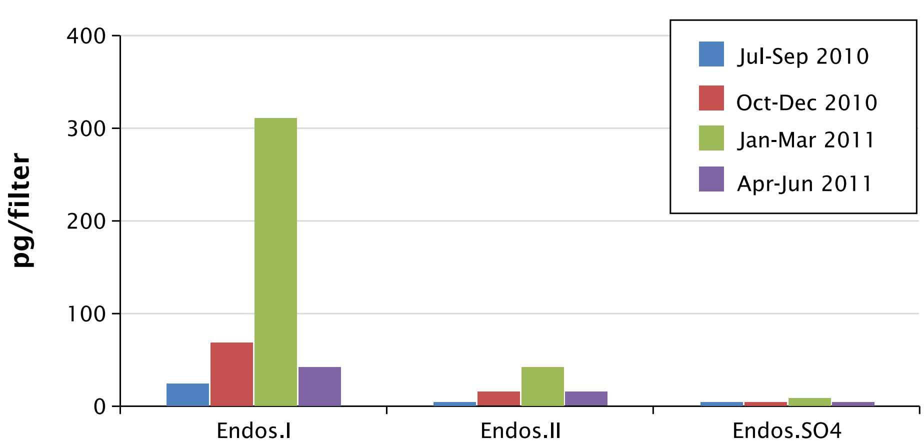
The main sources of HCB releases to the environment are a byproduct of industrial production of chlorinated solvents as well as pesticides such as pentachlorophenol. In Cubatão (São Paulo) there are sites heavily contaminated by this substance and HCB stockpiles that are a potential source of pollution in the region (Cetesb, 2001; UNEP, 2002 in UNEP, 2012).

HCB detection in PUF samples confirms data found in the literature (UNEP, 2012). HCB has been detected in drinking water monitoring programmes in Brazil (Bergamasco, 2011) and in surface water samples, soil samples and sediments in the state of São Paulo (Cetesb, 2008; Del Grande et al., 2003; Lemos et al, 2009; Tominaga et al., 2011; Almeida eta l., 2007; Bicego, 2006), in fish samples (Almeida et al., 2007) and breastmilk samples (Krauss et al., 2004).

12.2.5 Endosulfan (New POP)

Endosulfan was present in all PUF samples in higher concentrations than other POPs (Figure 27) because endosulfan was only recently banned in Brazil. Endosulfan I was the predominant isomer, responsible for over 68% of the total (UNEP, 2012).

Figure 27 – Concentration of Endosulfan in PUF samplers during the study period



Source: Supporting the Implementation of the GMP in GRULAC Region – Brazil Report, 2012.

Meire et al. (2010) detected endosulfan in two national parks in Brazil. (ND - 57 pg/m^3) and Pozo et al. (2009) reported the detection of endosulfan in all sampling sites of the GAPS Programme. Both studies presented high concentrations and variance in all four seasons of the year.

12.2.6 Mirror Sample Results

1) Sediment samples:

Dioxins and Furans (PCDD/Fs)

Total concentration of PCDD/F was14,7-14,8 pgTEQ/g dw (upper/lower limit), higher than some values for sediments in rivers in remote regions (0.42-7.73 pgTEQ/g dw) or coastal sediments (3.79-8.01pg TEQ/g dw) in Spain (ELJARRAT et al., 2001 in UNEP, 2012), but lower than the Probable Effect Level (PEL) adopted by Environment Canada to protect aquatic life (CCME, 2002 in UNEP, 2012). The PCDD standard was Cl8-DD> CL7-DD> Cl6 -DD> Cl5-DD> Cl4-DD and the PCDF standard was CL8-DF> CL7 -DF> Cl6-DF> Cl5-DF> Cl4-DF. These standards are similar to PUF air samples except for CL7-DF, which was higher than that for CL8-DF. Total PCDD/F concentration was lower than that of soil samples from an industrial area (Cubatão) but higher than the value found in a rural area (Araraquara), both in the state of São Paulo, Brazil (Assunção, 1999, in UNEP, 2012).

Organochlorine Pesticides (OCPs)

In sediment samples only the pp'-DDE (0.57ng/g dw) and the hexaclorobenzen (0,58 ng/g dw were quantified. The other compounds were, either not detected or were below the quantification limit (UNEP, 2012). DDT was frequently detected in Santos Estuary (site of sampling) in the past, but hasn't been detected recently (Cetesb, 1978; Cetesb, 2001 in UNEP, 2012). DDE concentration is below the limit established in Brazilian regulation for quality of sediments/dredged material (Brasil, 2004). There is no regulation for hexachlorobenzen in sediment samples, but results show that concentration is low and is decreasing, considering the region's latest results (Cetesb, 2001 in UNEP, 2012).

2) Fish samples

Total PCDD/F concentrations were 5,2-6,6 pg TEQ/g of fat (upper/lower limit), total concentrations of PCB indicators in fish samples were 69.8ng/g of fat and total concentrations of dl-PCB were 8,6 pg TEQ/g of fat. The fish sample was sent to a German reference laboratory and, therefore, could not be considered a national sample, consequently, results were not evaluated. The information was considered a laboratory training analysis and could only be considered for the purpose of comparing analysis of mirror samples.

Conclusions

Analysis results for PCB indicators, dl-PCB, dioxins and furans can be considered successful since the main goal for Cetesb's POPs in ambient air laboratory – develop analysis capabilities for dl-POPs – was achieved. With regards to organochlorine pesticides (OCPs), it is necessary to further debate the discrepancies between results obtained in the reference laboratory and those of the national laboratory (UNEP, 2012).

Results in ambient air represent only one sampling point in the city of São Paulo. In a future project, other sampling points, including remote, rural, urban and industrial areas will be assessed in order to have a better idea of POPs concentration in different sites and also to be able to assess POPs concentration progress in time in Brazil. It is also important to include at least one active sampler parallel to passive sampler, in a remote site, for comparison effects (UNEP, 2012).

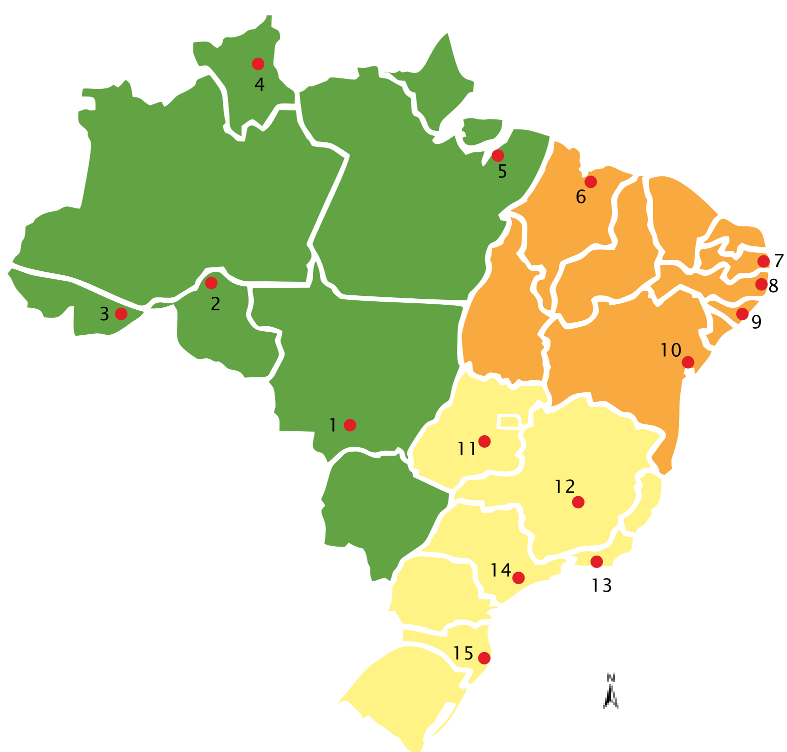
12.2.7 Breast Milk Studies

As to monitoring POPs in milk, Brazil was the only Latin American country to participate in the WHO third global round of studies of exposure to POPs in human milk, which took place in 2002. The study only included information on the first 12 POPs. Low levels of dioxins and furans in human milk were detected in this study with an average of 4,07 pg/g WHO-TEQ1995, 1,78 pg/g in fat of PCBs (dioxin like) and 16,2 pg/g in fat for PCB indicators. Concentrations were among the lowest found in the third round of the WHO research (Fiocruz, 2014).

After that, the Oswaldo Cruz Foundation (Fiocruz), together with the Ministry of the Environment (MMA) developed a study carried out from 2011 to 2013 to determine POPs concentrations in human milk considering the World Health Organization (WHO) protocols and the national study protocol of 2002 (Braga et al., 2002 in Fiocruz, 2014).

Sampling was done in human milk banks pertaining to the Brazilian Network of Breast Milk Banks (RBLH), coordinated by the Oswaldo Cruz Foundation (Fiocruz). Fifteen locations were selected thus ensuring a broader distribution among the country's different regions. RBLH banks located in the capital cities were contacted and, after clarifications on the purposes of the study, those who expressed interest were selected to partake in the study (Fiocruz, 2014).

Figure 28 – Breastmilk collection sites in Brazil, 2012



Human milk sampling sites:

- **Big Region 1**
  Cuiabá/MT (1), Porto Velho/RO (2), Rio Branco/AC (3), Boa Vista/RR (4), Belém/PA (5);
- **Big Region 2**
  São Luís/MA (6), João Pessoa/PB (7), Recife/PE (8), Maceió/AL (9), Salvador/BA (10);
- **Big Region 3**
  Goias/GO (11), Belo Horizonte/MG (12), Rio de Janeiro/RJ (13), São Paulo/SP (14), Florianópolis/SC (15).

Source: Oswaldo Cruz Foundatin – Final Report of the POPs Study in breastmilk, 2014.

All composite samples (regional and local) were analyzed in the State Institute for Chemical and Veterinary Analysis (CVUA – acronym in German), in Freiburg/Germany except the PFOS and other

PFC analyses that were conducted in the Man-Technology-Environment Research Centre (MTM) of the University of Orebro/Sweden (Fiocruz, 2014).

Analyses of 160 individual samples were conducted in the POPs sector of the Laboratory of Toxicology in Food of the National Institute for Quality Control in Health (INCQS/Fiocruz) where an instrumental analysis was conducted. Results may compose the database on individual exposure to selected POPs and a national monitoring programme of POPs in human milk, generating comparable data due to the use of the same sampling and analysis methodology (Fiocruz, 2014).

12.2.7.1 Summary of study results

The study showed that, in general, levels of POPs in human milk in Brazil can be considered low when compared to other countries. Therefore, it is possible to assume that exposure of Brazilian population in general to these chemicals and food contamination – main source of exposure to POPs – must be low (Fiocruz, 2014).

Among initial POPs, DDT levels represented by its metabolite pp-DDE and Mirex are worth noting. Among new POPs and to-be-listed POPs, PFOS levels are noteworthy for having ranked among the highest in developing countries (Fiocruz, 2014). The study's main results are presented hereafter.

12.2.7.2 Dioxins, furans and dl-PCBs

The table below presents the levels obtained in composite samples in the country's three regions in the study carried out in 2012. Results for the three regions present small differences. A slightly higher content can be observed in Great Region 3 for PCDDs/PCDFs and for dl-PCBs in Great Region 1. Average values found were 2.38 pg WHO-TEQ2005/g of fat (2.73 pg WHO-TEQ1998/g of fat) for PCDDs/PCDFs, 0.82 pg WHO-TEQ2005/g of fat (1.14 pg WHO-TEQ1998/g of fat) for dl-PCBs e 3.20 pg WHO-TEQ2005/g of (3.87 pg WHO-TEQ1998/g of fat) for the sum of the two.

Table 16 – Concentration of PCDDs, PCDFs and dl-PCBs in regional composite samples of breastmilk in Brazil, 2012

	Great Region 1 (GR1)*	Great Region 2 (GR2)*	Great Region 3 (GR3)*
PCDDs + PCDFs / $WHO\text{-}TEQ_{2005}$	2.15	2.28	2.71
PCDDs + PCDFs / $WHO\text{-}TEQ_{1998}$	2.52	2.59	3.07
dl-PCBs / $WHO\text{-}TEQ_{2005}$	1.01	0.72	0.72
dl-PCBs / $WHO\text{-}TEQS_{1998}$	1.57	0.92	0.95
Sum / $WHO\text{-}TEQ_{2005}$	**3.16**	**3.00**	**3.43**
Sum / $WHO\text{-}TEQ_{1998}$	**4.09**	**3.51**	**4.02**

*pg/g fat

Source: Oswaldo Cruz Foundation – Final Report of the POPs Study in breastmilk, 2014.

Comparisons between these average values and the average levels of PCDDs/PCDFs and dl-PCBs obtained in human milk in 2008/2009 and related to studies of POPs expousure coordinated by WHO/UNEP (Malisch et al., 2010 in Fiocruz, 2014) show that concentrations found in Brazil in 2012 are among the lowest. PCDDs/PCDFs and dl-PCBs values ranged from 1.43 (Uganda) to 24.3 (India) pg WHO-TEQ1998/g of fat and 0.92 (Kenya) to 12.1 (Moldova) pg WHO-TEQ1998/g of fat respectively (Fiocruz, 2014).A study carried out in a rural area of Turky by Çok et al., 2012 showed an average value of dl-PCBs in human milk, which was slightly lower than that for Brazil. Average levels of PCDDs/PCDFs reported in Sweden in 2011 (FÅNG et al., 2013 in Fiocruz, 2014) and in rural areas in China (Schen et al., 2012 in Fiocruz, 2014) and in Vietnam (Nishijo et al., 2012 in Fiocruz, 2014) are slightly higher than those found in Brazil. All other PCDDs/PCDFs and dl-PCBs values are a lot higher than those found in the 2012 study of Brazil.

The comparison of average levels of the 2002study (10 local composite samples) (Braga et al., 2002) and the 2012 study (15 local composite samples) indicates that there was a decrease of exposure in this 10-year period. However, it must be noted that sampling sites, which may present additional exposure, as Cubatão in São Paulo, were included in the 2002 study, and the mean value may not necessarily represent the exposure of the general population. However, the comparison of the levels found in local composite samples in 2002 and 2012 (Belém/PA, Recife/PE, Rio de Janeiro/RJ, Belo Horizonte/MG and Sao Paulo/SP) confirm this decrease (Fiocruz, 2014).

The average level of PCDDs/PCDFs decreased by 35.5%, and the reduction of concentrations in local composite samples ranged from 9.6% in Recife to 46.0% in Belo Horizonte (Figure 30).

12.2.7.3 PCBs Indicators

The results reported below represent the sum of six specific PCBs indicators, which are generally the most abundant congeners in environmental and biological samples and thus the best tool in the evaluation of contamination by or exposure to PCBs. The indicators are PCBs congeners # 28, # 52, # 101, # 138, # 153 and # 180.

Table 17 – PCBs indicator in breastmilk in Brazil – regional samples, Brazil, 2012

	Great Region 1 (GR1)*	Great Region 2 (GR2)*	Great Region 3 (GR3)*
PCB 28	0.27	0.28	0.37
PCB 52	0.067	0.063	0.11
PCB 101	0.10	0.083	0.12
PCB 138	4.6	1.4	1.6
PCB 153	7.9	2.1	2.6
PCB 180	5.5	1.0	1.4
Sum of PCB indicators	**18.3**	**4.9**	**6.2**

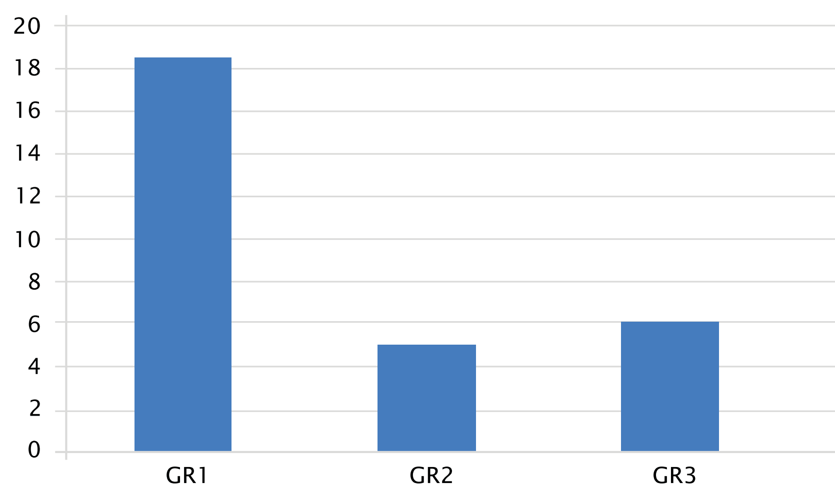
*ng/g fat

Source: Oswaldo Cruz Foundation – Final Report of the POPs Study in breastmilk, 2014.

The sum of the concentrations of PCBs indicators in the three regional composite samples result in an overall average of 9.80 ng/g of fat.

The sum of the six indicator PCBs in region 1 (GR1) was 18 ng/g of fat, three times higher than the values of the other two regions, and almost a third of the total amount recorded in Brazil in 2002 (50 ng/g fat). This difference between the concentrations of the regions has been observed in dl-PCB analysis, but in this case, the level of GR1 was only about 1.5 times higher. The analysis of PCBs indicators standard profile also reveals a slight difference between great region 1 and the other two, where PCBs 21, 52 and 101 show lower abundance and the PCB 180 shows greater abundance than in the other two regions (Fiocruz, 2014).

Figure 29 – 6 PCB indicators (ng/gfat)



Source: Oswaldo Cruz Foundation – Final Report of the POPs Study in breastmilk, 2014.

The analysis of PCBs indicators in local composite samples shows that the highest value of area 1 is caused by the local contribution of Porto Velho/RO, which is about 10 to 20 times higher than the levels found in other sites in that region. The variation in levels of local composite samples without inclusion of Porto Velho was 3.41 ng/g fat in Cuiabá/MT to 9.86 ng/g fat in Florianopolis. In general, the average values calculated on the five local levels of each region are in tune with the values found in the regional composite samples, although the difference in GR1 is higher than in the other regions (Fiocruz, 2014).

The comparison of the average level of Brazil for PCBs indicators with the various levels of other countries in the world was carried out with the mean value of 5.03 ng recalculated/g of fat, but it is worth noting that the application of the non-corrected figure of 9.80 ng/g of fat also identifies the average level in Brazil as one of the lowest (Fiocruz, 2014).

The comparison between average levels of PCBs indicators obtained in human milk in 2008/2009 and related to exposure to POPs studies coordinated by WHO/UNEP (UNEP, 2011 in Fiocruz, 2014) shows that the average concentration found in Brazil in 2012 is among the lowest. Values for PCBs indicators ranged from 4.3 ng/g of fat (Uganda) to 78.4 ng/g of fat (Switzerland).

The comparison with levels of PCBs indicators found in human milk from other studies published in the last seven years also confirms that the concentration obtained in Brazil is among the lowest. A study conducted in a rural area of Turkey by Çok et al. (2012) showed the average value of PCBs indicators slightly lower than the average obtained in Brazil. All other values of PCBs indicators are higher than those found in Brazil in the 2012 study.

12.2.7.4 PBDEs

For the first time, PBDE levels in human milk were assessed in Brazil. The results of the local and regional composite samples are shown in Table 18 and represent the sum of only seven congeners of PBDEs (# 28, # 47, # 99, # 100, # 153, # 154 and # 183) due to the comparison with the values reported in the literature references, which mostly include the sum of these congeners (Fiocruz, 2014).

The 11 samples analyzed had concentrations equal to or lower than 0.52 ng/g of fat. Three samples (Salvador/BA, Belo Horizonte/MG and Cuiabá/MT) had levels between 0.78 and 1.60 ng/g of fat. The highest concentration was found in São Paulo/SP with 4.36 ng/g fat. The levels obtained in regional composite samples ranged from 0.54 to 1.32 ng/g of fat. The average calculated from five locations in every region was in tune with the values determined in their respective regional composite samples. The average PBDE for Brazil was 0.86 ng/g of fat.

Table 18 – PBDE levels in breastmilk in Brazil – regional composite samples, Brazil, 2012

	Great Region 1 (GR1)*	Great Region 2 (GR2)*	Great Region 3 (GR3)*
BDE 17	3.9	< 1	5.0
BDE 28	24.3	14.1	52.6
BDE 47	329.2	227.1	816.1
BDE 66	< 3	< 3	< 4
BDE 99	60.8	63.4	116.5
BDE 100	111.8	44.5	178.9
BDE 138	< 7	< 8	< 10
BDE 153	163.7	142.3	150.4
BDE 154	< 6	< 6	< 8
BDE 183	< 26	39.6	< 29
Sum PBDE (lower bound)	**693.7**	**531.0**	**1319.4**

*pg/g fat

Source: Oswaldo Cruz Foundatin – Final Report of the POPs Study in breastmilk, 2014.

The comparison between the average value of Brazil for the sum of PBDEs and the average levels found in other countries, in the past six years, identifies the Brazilian average as one of the lowest The mean values found in Vietnam were 0.42 ng/g of fat (Haraguchi et al., 2009 in Fiocruz, 2014) and 0.57 ng/g of fat in Slovakia, lower than the average in Brazil, but these values are within the range found in most local composite samples. The mean values of 0.91 ng/g of fat found in India (Devanathan et al. 2012 in Fiocruz, 2014) and 0.96 ng/g of fat obtained in Russia (Tsydenova et al., 2007 in Fiocruz, 2014) are slightly higher than the average value of Brazil.

12.2.7.5 PFOS e outros PFCs

The results presented below relate only to levels of PFHxS, PFOS and PFOA, since all other PFCs showed concentration levels below the limit of quantification.

The concentrations of PFHxS, PFOA and PFOS obtained in local and regional composite samples are reported in Table 19. The local levels of PFHxS ranged from <6.0 to 6.3 pg/ml in region 1, from <6.0 to 9.7 pg/ml in region 2 and from <6.0 to 8.0 pg/ml in region 3.

Table 19 – PFOS and other PFC levels in breastmilk in Brazil – composite regional samples, Brazil, 2012

	Great Region 1 (GR1)*	Great Region 2 (GR2)*	Great Region 3 (GR3)*
PFBuS	<15	<15	17
PFPeA	<32	<32	<32
PFHxA	<25	<25	<25
PFHxS	7,6	8,5	7,7
PFHpA	<17	<17	<17
PFOA	52	55	66
PFOS	20	45	51
PFNA	<28	<28	<28
PFDA	<19	<19	<19
PFDS	<9	<9	<9
PFUnDA	<32	<32	<32

*pg/ml

Source: Oswaldo Cruz Foundatin – Final Report of the POPs Study in breastmilk, 2014.

Variations in local concentrations of PFOA were <52-61 pg/ml in region 1, from <52-80 pg/ml in region 2 and 54-64 pg/ml in region 3. Local levels of PFOS ranged 20-103 pg/ml in region 1, 28-97 pg/ml in region 2 and 31-88 pg/ml in region 3. A high value of PFOS was found in Porto Velho/RO, which cannot be explained at the moment, and may have some connection with the current activity in the electricity sector (hydropower plants) in the region (Fiocruz, 2014).

In general, the concentrations of the three determined substances in regional composite samples are in tune with the respective averages calculated through the local levels of each region. The regional levels PFHxS, PFOS and PFOA ranged from 7.6 to 8.5 pg/ml, 52-66 pg/ml and 20 to 51 pg/ml, respectively. The mean values for Brazil PFHxS, PFOA and PFOS were calculated at 7.9 pg/ml, 58 pg/ml and 39 pg/ml, respectively (Fiocruz, 2014).

The reference laboratory (MTM), in collaboration with the CVUA and UNEP, analyzed PFCs in 19 composite samples of human milk collected in developing countries over 2008-2010 (Käarman et al., 2011). Comparing the values of PFOS and the mean value obtained in Brazil reveals that Brazilian human milk has the third highest value among the countries under evaluation. The highest values were Uruguay (50 pg/ml) and Moldova (65 pg/ml) (Fiocruz, 2014).

Most PFHxS and PFOA values reported by Kärrman et al. (2011) were below the limit of quantification which, at the time, was greater than the limit of quantification for informed analysis of samples from Brazil. However, the few PFHxS and PFOA values that were above the limit of quantification are around two to four times greater than the average of Brazil.

The comparison of mean values between Brazil and the average levels of PFOS and PFOA found in human milk studies published in several countries over the past six years shows that Brazil has the lowest average (PFOA - 58 pg/ml, PFOS - 39 pg/ml). The average PFHxS (7.9 pg/ml) is equal to or slightly lower than the average found in other countries.

12.2.7.6 HBCDs

The HBCD levels in human milk were evaluated for the first time in Brazil. The HBCDs were determined only in regional composite samples. The results of HBCDs analysis are shown in Table 20. The concentrations of the three isomers of the 3 regions were below the quantification limit. The average was of the summed HBCDs was calculated at 0.44 ng/g of fat based on the concentrations of Iregions 1 and 2 (Fiocruz, 2014).

Table 20 – HBCD levels in breastmilk in Brazil – regional composite samples, Brazil 2012

	Great Region 1 (GR1)*	Great Region 2 (GR2)*	Great Region 3 (GR3)*
alpha-HBCD	0.33	0.27	< 0.05
beta-HBCD	< 0.05	< 0.05	< 0.05
gamma-HBCD	< 0.05	0.27	< 0.05
SumHBCDs	**0.33**	**0.54**	**< 0.05**

*ng/g fat

Source: Oswaldo Cruz Foundation – Final Report of the POPs Study in breastmilk, 2014.

The comparison of the average value of Brazil with average levels obtained in other countries shows that the average concentration of Brazil is among the lowest. Only the average value of 0.23 ng/g of fat obtained in the Philippines is lower than that of Brazil.

12.2.7.7 POPs Pesticides

The results obtained in POPs pesticides regional composite samples are presented in Table 21.

Table 21 – POP pesticides and Hexabromobiphenyl levels in breastmilk in Brazil – Regional composite samples, Brazil, 2012

	Great Region 1 (GR1)	Great Region 2 (GR2)	Great Region 3 (GR3)	Mean*	Median*	Min*	Max*
Hexachlorbenzene	1.1	1.4	1.5	1.3	1.4	1.1	1.5
Aldrin	< 0.5	< 0.5	< 0.5	0.5	0.5	0.5	0.5
Dieldrin	< 0.5	< 0.5	< 0.5	0.5	0.5	0.5	0.5
Endrin	< 0.5	< 0.5	< 0.5	0.5	0.5	0.5	0.5
Endrin ketone	< 0.5	< 0.5	< 0.5	0.5	0.5	0.5	0.5
Heptachlor	< 0.5	< 0.5	< 0.5	0.5	0.5	0.5	0.5
Heptachlor-epoxide cis	< 0.5	< 0.5	0.5	0.5	0.5	0.5	0.5
Heptachlor-epoxide trans	< 0.5	< 0.5	< 0.5	0.5	0.5	0.5	0.5
α – Chlordane	< 0.5	< 0.5	< 0.5	0.5	0.5	0.5	0.5
γ – Chlordane	< 0.5	< 0.5	< 0.5	0.5	0.5	0.5	0.5
Oxy-chlordane	0.6	0.5	0.6	0.6	0.6	0.5	0.6
trans – Nonachlor	< 0.5	< 0.5	< 0.5	0.5	0.5	0.5	0.5
Toxaphene Parlar 26	< 0.5	< 0.5	< 0.5	0.5	0.5	0.5	0.5
Toxaphene Parlar 50	< 0.5	< 0.5	< 0.5	0.5	0.5	0.5	0.5
Toxaphene Parlar 62	< 0.5	< 0.5	< 0.5	0.5	0.5	0.5	0.5

Table 21 – POP pesticides and Hexabromobiphenyl levels in breastmilk in Brazil – Regional composite samples, Brazil, 2012 (continued)

	Great Region 1 (GR1)	Great Region 2 (GR2)	Great Region 3 (GR3)	Mean*	Median*	Min*	Max*
Mirex	3.3	3.4	4.1	3.6	3.4	3.3	4.1
pp-DDT	47.3	15.8	7.3	23.5	15.8	7.3	47.3
op-DDT	0.9	0.5	< 0.5	0.6	0.5	0.5	0.9
pp-DDD	1	1	< 0.5	0.8	1.0	0.5	1
op-DDD	< 0.5	< 0.5	< 0.5	0.5	0.5	0.5	0.5
pp-DDE	1614	435	254	768	435	254	1614
op-DDE	< 0.5	< 0.5	< 0.5	0.5	0.5	0.5	0.5
α – HCH	< 0.5	< 0.5	< 0.5	0.5	0.5	0.5	0.5
β – HCH	2.5	2.9	5.3	3.6	2.9	2.5	5.3
γ - HCH (Lindane)	< 0.5	< 0.5	< 0.5	0.5	0.5	0.5	0.5
α – Endosulfan	< 0.5	< 0.5	< 0.5	0.5	0.5	0.5	0.5
β – Endosulfan	< 0.5	< 0.5	< 0.5	0.5	0.5	0.5	0.5
Endosulfan sulfate	< 0.5	< 0.5	< 0.5	0.5	0.5	0.5	0.5
Clordecone	< 0.5	< 0.5	< 0.5	0.5	0.5	0.5	0.5
Pentachlorobenzene	< 0.5	< 0.5	< 0.5	0.5	0.5	0.5	0.5
Hexabromobiphenyl	< 0.5	< 0.5	< 0.5	0.5	0.5	0.5	0.5

* measured with upper limit values

Source: Oswaldo Cruz Foundation – Final Report of the POPs Study in breastmilk, 2014.

Most pesticides analyzed (21 of 26) had concentrations below the quantification limit (<0.5 ng/g of fat). Only HCB, oxychlordane, beta-HCH and Mirex had values above the limit of quantification.

The average values from Brazil are 1.3 ng/g of fat for HCB, 0.6 ng/g of fat for oxychlordane, 3.6 ng/g of fat for beta-HCH and 3.6 ng/g of fat for Mirex. Chlordecone was analyzed only in regional composite samples.

Values for HCB, beta HCH, Mirex and oxychlordane ranged from 1.0 to 2,1ng/g of fat, 0.6 to 6.8 ng/g of fat, <0,5 to 0,8 ng/g of fat and 1.0 to 9.1 ng/g of fat, respectively. The highest concentration of HCB was found in Porto Velho/RO, beta-HCH in Goiânia/GO and Florianópolis/SC and Mirex in Belo Horizonte/MG. Dieldrin values were below detection limit in the regional composite samples, but some local composite samples were slightly above the limit of quantification (Fiocruz, 2014).

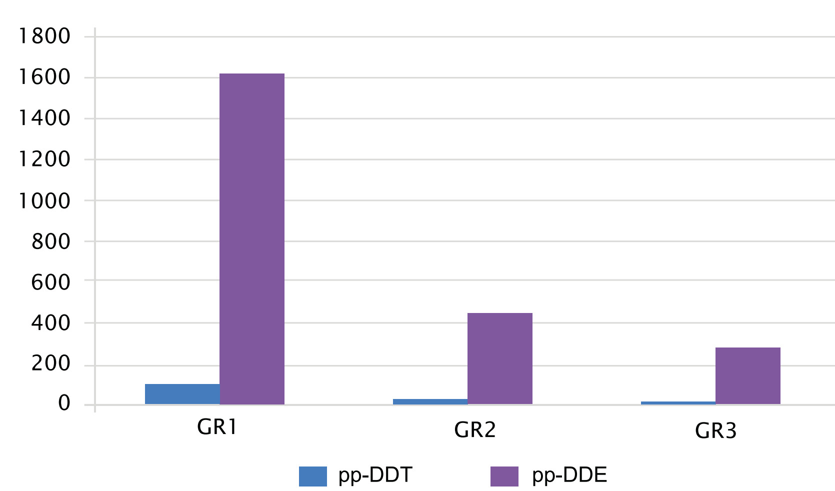
Compared to the average levels of HCB and beta-HCH obtained in other countries, the average values of Brazil are the lowest. As to oxychlordane, only the averages of Vietnam and China (Haraguchi et al., 2009 in Fiocruz, 2014) were lower than the Brazilian average. Although there are few studies on POPs pesticides that inform concentrations of Mirex, the average concentration of Mirex in Brazil is around 3-50 times higher than the averages in other countries. Only the Mirex average found in Hong Kong (Hedley et al., 2010 in Fiocruz, 2014) is 200 times higher than the Brazilian average.

In addition to PCDDs, PCDFs and PCBs, POPs pesticides were analyzed in two composite samples of Belo Horizonte and São Paulo, in the study of 2002 (Krauss et al., 2004). The comparison of these levels with the 2012 study indicates that there was also a decrease in exposure in this 10-year period at these two sites. Just as in the 2012 study, most pesticides analyzed in 2002 had concentrations below the limit of quantification, only HCB, beta-HCH, dieldrin and oxychlordane had levels above the quantification limit. Mirex was not analyzed at that time. The average decrease was 69.2% for HCB, 79.7% for beta-HCH, 45% for dieldrin and 63.3% for oxychlordane. However, only future studies or a continuous monitoring can confirm if the levels of these pollutants are indeed falling (Fiocruz, 2014).

12.2.7.8 DDT

The results of DDT and its metabolites obtained in regional and local composite samples are shown in the chart below.

Figure 30 – pp-DDT and pp-DDE (ng/gfat), (Breasmilk) Brazil, 2012



Source: Oswaldo Cruz Foundation – Final Report of the POPs Study in breastmilk, 2014.

The op-DDT and metabolites p-DDE, DDD and p-pp-DDD levels were mostly below the limit of quantification or slightly above. Thus, the levels of DDT and its metabolites are studied considering only the pp-DDT and the metabolite p-DDE. Average levels of pp-DDT and pp-DDE calculated through the local levels are in tune with the levels obtained in their respective regional composite samples. There was a decrease in these levels from the inner region to the coastal region and from north to south of the country (GR1 GR2 >>> GR3). In region 2, composed of five northeastern coastal states, we highlight the levels found in São Luís/Maranhão that are around ten times higher than the levels found in the capitals of the four other states of this region. The levels obtained in Goiânia/Goiás are five times higher than the levels found in the capitals of the other four states in region 3. In large region 3, the highest concentrations were obtained in Rio Branco/Acre, in Boa Vista/Roraima and in Porto Velho/Rondônia.

Thus, high concentrations of pp-DDT and pp-DDE in human milk are probably related to places were malaria is endemic, where the substance was widely used in the past. Only the high value found in Goiânia/GO does not fall within this explanation because it is located outside the risk area of malaria (Fiocruz, 2014).

The average level of pp-DDT in Brazil was 23.5 ng/g of fat and p-DDE was 768 ng/g of fat. Average levels of pp-DDT obtained in other countries vary from 4.3 to 8967 ng/g fat and of p-DDE vary from 44.8 to 3953 ng/g of fat. Thus, the average levels of Brazil are in middle range. However, local levels of pp-DDE in some states of Brazil can be found at the top (Fiocruz, 2014).

Exposure reduction can also be observed for pp-DDT and pp-DDE when comparing 2012 concentrations with those measured in the 2002 study (Krauss et al., 2004). The decrease in concentration was 28,9% for pp-DDT and 34.2% for pp-DDE in Belo Horizonte/MG. In São Paulo/SP the level fell by 41% for pp-DDT and 60.9% for pp-DDE. But, as already mentioned, only future studies, or a continuous monitoring can confirm that the levels of these pollutants are in fact falling (Fiocruz, 2014).

12.2.7.9 Conclusion

POPs with the highest levels in Brazil were DDT, Mirex and PFOS, as well as PCBs in some locations. To assess the source of exposure to these pollutants, it is recommended in addition to the continuous monitoring of POPs in human milk, required by the Stockholm Convention, the monitoring of POPs in food and environmental samples (Fiocruz, 2014).

The monitoring of DDT and its metabolites in human milk should be expanded to all Brazilian states especially in endemic areas of Malaria (Fiocruz, 2014).

As to PFOS, monitoring of this substance in drinking water and surface water is recommended due to its high solubility in water (Fiocruz, 2014).

12.2.8 Compilation of data on POPs monitoring available in several projects

As observed, monitoring of POPs by environmental agencies that control water, soil and air quality is not common. The capability of institutions varies widely in the country. A survey is being conducted to map out exactly which States are already carrying out monitoring of POPs, what are the difficulties for conducting such activities, and, from that scenario, develop measures to expand the monitoring of these pollutants.

There are, however, institutions in the country that already perform this monitoring through various programs, including providing training and education to other countries. In addition to them, there are other institutions that do not yet perform monitoring, but have some capacity and willingness to do so.

In this context, it is important to mention the participation of public and private universities in gathering information on the presence of POPs in environmental and biological matrices.

The work carried out by researchers and academics in Brazil is of great importance and, in many cases, it is complementary to actions carried out by public institutions, producing important information about the environment and the effects of POPs on human health.

Hereafter is a compilation of some of the results of monitoring already carried out in several projects.

Chart 1 – Results of POPs monitoring in ambient air, in Brazil, in several projects

Location	Results	Project
SP Pinheiros Urban area – passive sampling (PUF): 01/07/10 a 30/09/10; 01/10/10 a 30/12/10.	Dioxins/Furans – LB*: 6,47 - 10,6 pg-TEQ/PUF Dioxins/Furans - UB*: 15,7 a 23pg-TEQ/PUF	GMP project
São Paulo, Pinheiros – SP Urban area Passive sampling (PUF): 01/07/10 a 30/09/10; 01/10/10 a 30/12/10; 30/12/10 a 31/03/11; 31/03/11 a 01/07/11	dl-PCBs-LB*: 3,1 a 4,9 pg-TEQ/PUF; dl-PCBs-UB*: 3,2 a 4,9 pg-TEQ/PUF; PCBs indicators (Σ28, 52, 101, 118,138, 153,180): 25,4 a 37,1 ng/PUF; organochlorine pesticides:pp-DDT: 6,8 – 33,1 ng/PUF; pp´- DDE: 7,2 – 14,8 ng/PUF; pp´- DDD: ND – 0,72 ng/PUF; Dieldrin: 3,67 – 9,0 ng/PUF;Endosulfan (ΣI, II e sulfate): 31,5 – 424,5 ng/PUF ; HCB: ND – 4,60 ng/PUF ; Heptachlor: 10,3 a 13,8 pg/PUF; Heptachlor-Epoxide: ND – 2,48 ng/PUF.	GMP project
São Paulo Passive sampling (PUF): 2010-2011	PBDEs-UB*:; BDE-17: 0,84 ng/PUF; BDE-28: 0,91 ng/PUF; BDE-47: 6,45 ng/PUF BDE-99: 2,94 ng/PUF; BDE-100: 0,67 ng/PUF; BDE-153: 0,48 ng/PUF; BDE-154: 0,29 ng/PUF; BDE-183: (0,61 ng/PUF; BDE-66: 0,44 ng/PUF; BDE-85: 0,11 ng/PUF; ΣBDEs(total 10): 3,7ng/PUF.	Martrat et al., 2012
P. N. Serra dos Órgãos (RJ) – urban areas, suburbs and remote areas –passive sampling (PUF)	PCBs (Σ30): 68 a 620 pg/m³	Meire et al., 2012
São Joaquim National Park (SC)– rural and remote areas-passive sampling (PUF)	PCBs(Σ30): 25 a 230 pg/m³	Meire et al. 2012

Chart 1 – Results of POPs monitoring in ambient air, in Brazil, in several projects (continued)

Location	Results	Project
Serra dos Órgãos National Park (RJ) Passive Sampling (PUF)	Winter: HCH: 17,4-36 pg/m^3; DDT: ND-57pg/m^3; Dieldrin: ND-3pg/m^3; Heptachlor: ND-10pg/m^3; Endosulfan: 50,3-241pg/m^3; Summer: HCH: 8,3-30 pg/m^3; DDT: ND-33pg/m^3; Dieldrin: ND-19pg/m^3; Heptachlor: ND-14pg/ m^3; Endosulfan: 384-5592pg/m^3	Meire et al., 2010
São Joaquim National Park (SC) Passive sampling (PUF)	Winter: HCH: 9,9-26 pg/m^3; DDT: ND-16pg/ m^3;Dieldrin: ND-10pg/m^3; Heptachlor: ND; Endosulfan: 42,6-226pg/m^3. Summer: HCH: 3,5-11 pg/m^3; DDT: ND-12pg/m^3; Dieldrin: ND-3pg/m^3; Heptachlor: ND-1,9pg/m^3; Endosulfan: 244-1354pg/m^3.	Meire et al., 2010
São Paulo (Carvoaria)- Active sampling	Dioxins and furans: 137,9 fg-TEQ/m^3	De Assunção, 2013
Indaiatuba – SP (23º09'S, 47º10'W) – 03/2005 – 06/2005 Passive sampling (PUF)	α-HCH: 11pg/m^3; γ-HCH: 30pg/m^3; trans-chlordane: 4 pg/m^3; cis-chlordane: 1 pg/ m^3;trans-nonachlor: 1 pg/m^3; Endosulfan I: 1907 pg/m^3; Endosulfan II: 783 pg/m^3; Endosulfan sulfato: 132 pg/m^3; Dieldrin: 44 pg/ m^3; pp´-DDE:<LDPCBs: (∑48congêneres): 145 pg/m^3 ; PBDEs <LD	GAPS programme Pozo et al., 2009 (sup information)
Indaiatuba – SP (23º09'S, 47º10'W) – 06/2005 – 09/2005 Passive sampling (PUF)	α-HCH: 34pg/m^3; γ-HCH: 26pg/m^3; trans-clordano: 2 pg/m3; cis-clordano: 5 pg/m^3; trans-nonachlor: 1,2 pg/m^3; Endosulfan I: 163 pg/m^3; Endosulfan II: <LD;Endosulfan sulfate: <LD; Dieldrin: <LD; pp´-DDE: <LDPCBs (∑48congêneres): 113 pg/m^3 PBDEs: <LD	PGAPS programme Pozo et al., 2009 (sup information)
Indaiatuba – SP (23º09'S, 47º10'W) – 09/2005 – 12/2005 Passive Sampling (PUF)	α-HCH: 26pg/m^3; γ-HCH: 24pg/m^3; trans-chlordane: 3 pg/ m^3; cis-chlordane: 3 pg/m^3; trans-nonachlor: 1 pg/m^3; Endosulfan I: 458 pg/m^3; Endosulfan II: 108 pg/m^3; Endosulfan sulfate: 46pg/m^3;Dieldrin: <LD; pp´-DDE: <LDPCBs (∑48congêneres): 146 pg/ m^3PBDEs: <LD	GAPS programme Pozo et al., 2009 (sup information)
SP (Congonhas,Lapa e Centro) Active sampling	Dioxins and furans: 19 – 225 fg-TEQ/m^3	De Assunção et al., 2008

Chart 1 – Results of POPs monitoring in ambient air, in Brazil, in several projects (continued)

Location	Results	Project
SP (urban area and urban/ industrial area) Active sampling	Dioxins and furans: 39-751 fg-TEQ/m^3	De Assunção et al., 2005
SP (urban area) Active sampling	Dioxins and furans: 86-169 fg-TEQ/m^3	CETESB, 2002
Araraquara (near sugar cane burning) Active sampling	Dioxins and furans: 42-267 fg-TEQ/m^3	CETESB, 2002
Araraquara (urban area) Active sampling	Dioxins and furans: 13-215 fg-TEQ/m^3	CETESB, 2002
Cubatão – Active sampling	Dioxins and furans: 19-72 fg-TEQ/m^3	CETESB, 2002

ND: not detected; LD: Limit of Detection; LQ = Limit of Quantification.

(*) LB: lower bound, measurementof TEQ considering values <LQ as zero; UB: upper bound, measurement of TEQ considering values<LQ, equal to LQ.

Source: Cetesb (2014).

Chart 2 – Results of POPs monitoring in breast milk, in Brazil, in several projects

Location	Results	Project
Several States of Brazil	Not available yet	GMP project
Several States of Brazil (in 2001)	PCDD/F: 2,73 – 5,34 pg TEQ/g fat;dl-PCBs: 1,30 – 12,30 pg TEQ/g fat	Braga et al., 2002
São Paulo (2001)	Organochlorine pest.:HCB: 0,006 µg/g fat; pp´-DDE: 0,596 µg/g fat; pp´-DDT: 0,01 µg/g fat; dieldrin: 0,001 µg/g fat; cis-heptachlor epoxide: 0,001 µg/g fat; oxichlordane: 0,003 µg/g fat;trans-nonachlor: 0,002 µg/g fat;β-HCH: 0,027 µg/g fat; others: <LD/LQ	Krauss et al., 2004
Belo Horizonte (2001)	Organochlorine pest: HCB: 0,003 µg/g fat; pp´-DDE: 0,155 µg/g fat; pp´-DDT: 0,009 µg/g fat; dieldrin: 0,001 µg/g fat; cis-heptachlor epoxide: 0,001 µg/g fat; oxichlordane: 0,001 µg/g fat; trans-nonachlor: 0,002 µg/g fat; β-HCH: 0,022 µg/g fat; others: <LD/LQ	Krauss et al., 2004

Chart 2 – Results of POPs monitoring in breast milk, in Brazil, in several projects (continued)

Location	Results	Project
Rio de Janeiro (1992 and 2000*) * 2000 (average, n=50)	Organochlorine pest: HCB: 0,012-0,026 µg/g fat; ΣDDT: 1,706-0,618 µg/g fat; Dieldrin: 0,023 - 0,048 µg/g fat; Endrin: NA – 0,013 µg/g fat; cis-heptachlor epoxide: NA - 0,008 µg/g fat.; γ-chlordan: NA – 0,078 µg/g fat; trans-nonachlor: NA – 0,016 µg/g fata; α-HCH: 0,001– NA µg/g fat; β-HCH: 0,270–0,253 µg/g fat; γ-HCH: 0,005-0,073 µg/g fat; Σendosulfan: NA - 0,176 µg/g fat.	Krauss et al., 2004

NA: not analyzed

Source: Cetesb (2014).

Chart 3 – Results of new POPs (PBDEs and PFOS) in biological samples, in Brazil, in several projects

Location	Results	Project
Southeaster regione – Industrial and urban area (liverof 51 cetaceans, 10 species)	PBDEs: 3 – 5960ng/g fat	Dorneles et al., 2010
Guanabara Bay – RJ – Liver of 23 sea dolphins (Sotalia guianensis)	PFOS: 43 – 2431 ng/g m.s.	Dorneles et al., 2008
Rio de Janeiro – Liver of 32 cetaceans stranded on beaches	PFOS: <1,5 – 592 ng/g m.s.	Dorneles et al., 2008

m.s.: dry mass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13 Action Plans

This section comprehends the strategies and actions of the National Implementation Plan of Brazil to meet the Convention's commitments, based on the country's situation verified in the Inventories and the intervention priorities that were determined.

The tables bring information about the status of the planned activities, deadlines and those responsible for implementing this Plan, which will be reviewed and updated every 5 years, and its progress will be evaluated.

NIP contains the following Measures and Action Plans:

1) Measures to strengthen the national institutional capacity and the legal framework for POPs management;
2) Action Plan for managing wastes and stockpiles of Pesticides POPs;
3) Action Plan for managing polychlorinated biphenyls (PCB);
4) Action Plan for new POPs of industrial use;
5) Action Plan for managing contaminated sites with POPs;
6) Action Plan for the progressive reduction of unintentional POPs releases;
7) Measures to disseminate information, raise public awareness and education; and
8) Measures to improve the national analytical capacity, POPs monitoring, research, development and innovation.

The need for technical and financial assistance for the implementation of actions was noted in the action plans, identifying potential sources of those resources.

1 Measures to strengthen and expand the legal framework and the national institutional capacity to manage POPs

Objective	Activity	Situation	Responsible	Period
Adopt and implement an adequate legal framework to perform obligations.	***Article 3: Measures to reduce or eliminate releases from intentional production and use***			
	Article 3, Paragraph 4 – Debate on the revision of regulation for registration of pesticides, cleaning products and other chemicals to comply with the criteria of Annex D of the Convention.	Started	IBAMA, ANVISA and MAPA	2014-2017
	Article 3, Paragraph 1 (New POPs): 1) Develop legislation establishing bans and restrictions and directives for environmental licensing of activities that use POPs in the scope of specific exemptions and acceptable purposes; 2) Include BAT/BEP recommendations in legislation for licensing of companies that produce and use new POPs.	Not started	MMA, CONAMA and Sectors	2015-2019
	Article 3, Paragraph 1 (Import and Export control) – Develop specific customs codes for new POPs and develop strategies to control import and export operations.	Not started	MMA, Ibama, Receita Federal e MDIC	2015-2016
	Article 6: Legal measures to reduce or eliminate releases of stockpiles and wastes			
	Article 6 and Part II of Annex A (PCB) – Develop legislation creating the cadaster/inventory of PCB-containing equipment and establishing technical procedures for management and sound disposal of PCBs.	Started	MMA, CONAMA, OEMAs and sectors	2013-2015
	Article 5: Legal measures to reduce or eliminate non intentional releases to air			

1 Measures to strengthen and expand the legal framework and the national institutional capacity to manage POPs

Objective	Activity	Situation	Responsible	Period
	Discuss a revision of Conama Resolutions that discipline thermal treatment of wastes and stationary sources on the emission limits of dioxins and furans.	Not started	MMA, CONAMA	2015-2017
	Article 11: Legal measures to improve monitoring			
	Discuss a revision of Conama Resolutions that address water and soil quality to include POPs in environmental quality parameters.	Not started	MMA, CONAMA	2015-2017
Establish a national innplementation network for the Convention	Develop a standard document for activities to be performed by state government bodies, contents and responsibilities according to their legal mandates.	Not started	MMA	2015-2016
	Appoint technical focal points in the states to form a national network to exchange experiences and implementation of the NIP.	Not started	OEMAS	2015
	Carry out seminars with focal points periodically.	Not started	MMA	2015-2020

2 Action Plan for the management of stockpiles and wastes of pesticides POPs

Objective	Activity	Situation	Responsible	Period
Promote the elimination of stockpiles and wastes of remaining obsolete products indentified in the National Inventory.	Final disposal of identified obsolete products in the states of Bahia, Paraná and São Paulo.	Not started	State Governments of Bahia, Paraná and São Paulo / Agricultural, industry sector / Sectoral representative bodies and rural extension and technical assistance institutions	2015-2017
	Partnership agreements with the Ministry of Agriculture, Funasa, private sector and other government bodies to dispose of these stockpiles.	Not started	MMA and involved bodies	2015-2016
Promote technical training in state environmental and agricultural agencies.	Develop and publish procedures manuals to identify obsolete POPs stockpiles and good practices for POPs pesticides management.	Not started	Ministry of the Environment	2015-2016
	Carry out seminars in the states to disseminate collection guides and train technicians from the institutions involved in these actions as well as the appointed disseminators.	Not started	Ministry of the Environment and States	2015-2022
	Technical partnership with FAO to support implementation of actions.	Not started	Ministry of the Environment	2015-2016
Promote engagement of farmers.	Develop informative material in simple language, highlighting risks to health and the environment posed by POPs and the benefits of contributing to final disposal of these products.	Not started	Ministry of the Environment and States	2015-2016

2 Action Plan for the management of stockpiles and wastes of pesticides POPs

Objective	Activity	Situation	Responsible	Period
	Workshops to disseminate actions being executed and to guide farmers on how to collaborate.	Not started	States	2015-2022
Promote the reduction and elimination of Stockpiles and Wastes of POPs pesticides nationwide.	Carry out seminars in the states to offer guidance on the Stockholm Convention's obligations and the promotion of campaigns to identify and dispose of stockpiles and wastes of POPs used as pesticides.	Not started	Ministry of the Environment	2015-2017
	Working Groups to discuss and design programmes/strategies to identify and final dispose of obsolete pesticides.	Not started	State governments, Agricultural, industry sector / Sectoral representative bodies and rural extension and technical assistance institutions	2015-2019
	Local campaigns to identify and dispose of obsolete pesticides.	Not started	State governments, Agricultural, industry sector / Sectoral representative bodies and rural extension and technical assistance institutions	2015-2022
Measure results of the Action Plan.	Develop biennial follow-up reports on the elimination of POPs pesticides.	Not started	Ministry of the Environment	2016-2018

3 Action Plan for the sound management of polychlorinated biphenyls (PCB)

Objective	Activity	Situation	Responsible	Period
Strengthening of the administrative procedures structure to manage and dispose of PCBs	Create a database for the Mandatory Registration of Equipment for the National Inventory on PCB – adjust fields of the CTF/Ibama.	Ongoing	MMA and Ibama	2015-2016
	Develop guides, technical rules and approval mechanisms for sound environmental management and disposal of PCBs – Guide to PCB-containing Equipment Inventory.	Prepared (revision)	MMA, Conama, Sectors of interest, OEMAs	2015
Build national capacity to dispose of PCBs in an environmentally sound manner	Develop a PCB Wastes and Equipment Management Manual.	Prepared (revision)	MMA, Setores Interessados	2015
	Technical training on management and disposal of PCB wastes.	Started	MMA	2015
	Implement 4 demonstration projects: 3 on inventory and development of management plans in the electricity sector and 1 on PCB contaminated sites investigation.	Started	MMA and Sectors	2014-2015
	Evaluation of PCB wastes treatment systems in Brazil and verification of best available technologies for PCB waste treatment.	Completed	MMA	
Promote awareness of PCB holders, public administration and society	Develop a Plan of Communication to draw up a national strategy to disseminate Project results among sectors involved.	Ongoing	MMA	2015-2016
	Development of communication material: booklets, videos, etc.	Not started	MMA	2015
Develop a strategy for other PCB holding sectors	Inventory of priority sectors (hospital, schools, government bodies).	Not started	MMA and sectors	2015-2020
	Adoption of specific strategies in representative areas of diffuse sectors (such as dialogue with the fire department about the inclusion of PCB criteria in their survey report [AVCB] and dialogue with license issuers for transport of hazardous wastes to speed up procedures).	Not started	MMA, Ibama and Sectors	2015-2016

Objective	Activity	Situation	Responsible	Period
Adopt measures to reduce and eliminate the use of PFOS, its salts and PFOSF – unintentional production and use POP included in Annex B (restricted)	Sufluramid – Carry out studies to identify alternatives to sulfluramid, chemical and otherwise and verify contamination by PFOSF in areas of application.	Started	Embrapa, Cetesb, MAPA, private sector	2014-2020
	Sulfluramid – Development of booklets indicating the Best Available Techniques (BAT) to sulfluramid producers and Best Practices to users, and carry out seminars and workshops for dissemination of and training on BAT/BEP.	Not started	MMA, MAPA, Industry sector	2015-2016
	Electroplating – Evaluation of the use of PFOS in decorative chromium plating to see if it is possible to replace Chromium-VI for Chromium-III electrolytes.	Not started	MMA, Industry Sector	2015
	Electroplating – Development of booklet with guidance on best available techniques and best environmental practices including those related to the use of PFOS and seminars for dissemination of and training on BAT/BEP.	Not started	MMA, industry sector	2015-2016
	Electroplating – studies and tests to examine substitutes to PFOS, particularly non-fluorinated and biodegradable.	Not started	Industry Sector	2015-2017
	Other uses – Development of inventory and action plan to manage stockpiles and wastes of PFOS/PFOSF for uses identified as suspicious and uses in which there is more risk to human exposure. The proposed Conama Resolution will aim at creating a mandatory registration of companies that produce, import, export, market or use controlled substances according to the Stockholm Convention and will help in this indentification.	Not started	MMA	2015-2016
Adopt measures to reduce and eliminate the use of unintentional HBCD-POP included in Annex A (elimination)	Improvement of information on uses of HBCD in Brazil, requesting registration of specific exemptions for use of EPS and XPS and elimination of uses for which there is no possibility of requesting a specific exemption.	Not started	MMA, Abiplast, Industry sector	2015

4 Action Plan for new POPs of industrial use

Objective	Activity	Situation	Responsible	Period
	Improvement of information on uses of HBCD in Brazil, requesting registration of specific exemptions for use of EPS and XPS and elimination of uses for which there is no possibility of requesting a specific exemption.	Not started	MMA, Abiplast, industry sector	2015-2016
	Development of a booklet to promote the use of BAT/BEP and measures to reduce HBCD exposure risks, carry out seminars for dissemination of and training on BAT/BEP.	Not started	MMA, Abiplast, Industry, Recycling companies	2016-2017
	Carry out studies and develop programmes to adequately manage wastes of EPS and XPS that contain HBCD banning recycling of material containing.	Not started	Abiplast, Industry sector	2017-2020
Adopt measures to ensure that recycling and disposal of articles containing POP-PBDEs is carried out in an environmentally sound manner	WEEE – Assessment of practices and techniques used by plastic recycling companies to verify the actual situation and needed improvements.	Not started	MMA, Abiplast, plastic recycling companies	2015
	WEEE – Development of a booklet to promote the adoption of best available techniques and best environmental practices to recycle WEEE and disseminate the BAT/BEP guide among recycling companies, and carry out workshops and seminars on BAT/BEP for the sector. The booklet should include a negative list of applications in which recycled materials cannot be used and a positive list specifying application where these WEEE recycled materials may be used.	Not started	MMA, Abiplast, Plastic recycling companies	2015-2016
	WEEE – Development of a project to support the acquisition of screening tests to detect PBDEs and equipments that reduce releases of these substances and reduce occupational exposure.	Not started	Plastic Recycling companies	2016-2017

4 Action Plan for new POPs of industrial use

Objective	Activity	Situation	Responsible	Period
	WEEE – Development of a schedule to eliminate recycling of articles containing POP-PBDEs within the deadline of the specific exemption, i.e., 2030.	Not started	Plastic Recycling companies	2017-2025
	Vehicles – adoption of best environmental practices through enactment of Law 12,977 of May 20, 2014 that regulates and disciplines dismantlement activities of automotive vehicles in Brazil.	Started	State governments/ Detran/ Dismantling companies	2015-2016
	Vehicles – support initiatives that promote recycling of vehicles by the states.	Started	State governments/ Detran	2015-2017
	Vehicles – Support the approval of the Bill 67/2013 that alters Law 12,305 of August 2, 2010 that establishes the National Solid Wastes Policy to provide for reverse logistics for automotive vehicles.	Started	Congress	2016-2017
Promote measures to identify and manage in an environmentally sound manner articles containing POPs.	Create a group in Conasq to evaluate existing classification and labeling systems and develop an adequate system to improve the exchange of information on articles containing POPs by the gupply chains.	Not started	MMA, CONASQ	2015-2017
	Create a discussion group to include issues related to production and consumption of articles containing POPs in the Action Plan for sustainable production and consumption.	Not started	MMA, Industry sector	2015-2016

5 Action Plan to Progressively Reduce Releases of Unintentional Formation Persistent Organic Pollutants from Anthropogenic Sources

Objective	Activity	Situation	Responsible	Period
Eliminate/Reduce emissions of U-POPs in existing sources	Implement the appropriate measures to reduce the emission of U-POPs according to deadlines and targets agreed upon with the following priority sectors: iron ore sintering, open biomass burning, fires and open burning of wastes (accidental and otherwise), incineration of medical wastes, metallurgy and steel mills, whitewash production, aluminum production, thermal recovery of electrical wires and cables, paper and pulp and disposal of untreated effluents in surface waters.	Started	Sectors	2014-2020
	Establish, together with the states and the federal district, articulate actions to effectively implement strategy and measures to reduce and/or eliminate PCDD/PCDF releases regarding licensing, control and monitoring.	Not started	MMA and OEMAS	2015-2017
Prevent the release of U-POPs in new sources	Establish actions for licensing of new sources listed in parts I and III of Annex C.	Not started	OEMAs	2016-2019

5 Action Plan to Progressively Reduce Releases of Unintentional Formation Persistent Organic Pollutants from Anthropogenic Sources

Objective	Activity	Situation	Responsible	Period
Improve the populations, companies and supervising agencies knowledge on U-POPs impacts on health and the environment, sources of U-POPs releases and general measures for their reduction/ elimination in order to engage them in the process.	Develop dissemination material in adapted language for the several sectors involved.	Not started	MMA, OEMAs, private sector	2015-2017
	Carry out training courses to implement reduction/elimination actions and surveillance as well as monitoring of sources and the environment and also in articles.	Not started	MMA, Cetesb	2015-2020
Evaluate the efficiency of the adopted strategy	Monitor and report efficiency of these actions and the need to change them according to difficulties faced by government supervising agencies and undertakings.	Not started	MMA, Sectors and OEMAS	2015-2020
	Update the inventory with possible revision of emission factors.	Not started	MMA and sectors.	2017-2018

6 Action Plan to manage sites contaminated with Persistent Organic Pollutants (POPs) listed in the Stockholm Convention

Objective	Activity	Situation	Responsible	Period
Promote technical training for management of POPs contaminated sites	Carry out courses and seminars on management and recovery of contaminated sites.	Not started	MMA, OEMAS	2015-2020
	Development of a guide on good practices and experiences for management of POPs contaminated sites.	Not started	MMA	2015-2019
	Development of a document containing the systematization of experiences in RJ, MG and SP on management of contaminated sites.	Not started	MMA e OEMAs	2015-2017
Adopt strategies and procedures to identify and manage POPs contaminated sites	Conduct Demonstration Projects: 1) sites contaminated by PCB; 2) sites contaminated by DDT.	Started	MMA, Funasa	2015-2018
	Identification of sites contaminated by POPs pesticides and PCBs.	Started	OEMAS	2015-2020

7 Measures to disseminate information, raise public awareness and education

Objective	Activity	Situation	Responsible	Period
Promote training courses on the Stockholm Convention and POPs management	Carry out intensive training programme on chemical management focusin on POPs and Mercury.	Started	Cetesb (Regional Centre)	2012-2020
	Carry out distance learning course – introduction to the Stockholm Convention and POPs management.	Started	MMA - Cetesb (Regional Centre)	2015
	Carry out seminars, training courses and demonstration projects in the scope of specific Action Plans.	Started	MMA	2015-2020
Promote awareness of the public and interest groups	Hold preparatory meeting with NGOs to design social participation strategies.	Completed	MMA	2014
	Carry out a National Engagement Seminar with NGOs.	Not started	MMA	2015
	Prepare an engagement, dissemination and education plan on POPs.	Not started	MMA	2015-2017
Disclose information on POPs	Develop the National Information System on the NIP Brazil.	Started	MMA	2013-2015
	Disclose inventories, studies and NIP action plans.	Started	MMA	2014-2015

8 Measures to improve POPs monitoring and analytical capacity and Research, Development and Innovation

Objective	Activity	Situation	Responsible	Period
Promote measures to improve analytical and POPs monitoring capacity	Stregthen working groups to discuss the creation of a monitoring network in Brazil and measurement protocols.	Not started	Cetesb (Regional Centre), MMA e MS	2015-2020
	Study to develop protocols on sampling and analysis for new POPs in the relevant matrices for these substances.	Not started	Cetesb (Regional Centre), Monotoring Group	2016-2018
	Support building analytical capacity in national laboratories for analysis of new POPs.	Not started	(MMA and Conama at a second stage)	2015-2020
	Include mandatory analysis/monitoring of new POPs by companies that use them in their industrial processes or that recycle articles that contain, in the licensing process.	Not started	FINEP, CNPQ, Fapest, MMA, MCT	2016-2017
	Support public reference laboratories for monitoring POPs, particularly U-POPs.	Not started	MMA/CONAMA/ OEMAS	2015-2019
	Training on quality system and analysis methods for PCB in insulating oil to standardize methodologies and implement a quality system.	Not started	MMA, MCTI, MAPA,	2014-2015
	Establish strategy and methodology for monitoring U-POPs in products and articles.	Not started	Inmetro e MMA	2018-2019
	Support the establishment of credit lines to promote the improvement of private structure for sampling and analyses of U-POPs.	Not started	MMA, MDIC, Inmetro	2017-2018

8 Measures to improve POPs monitoring and analytical capacity and Research, Development and Innovation

Objective	Activity	Situation	Responsible	Period
	Participate in the Global Monitoring Plan (GMP) of POPs of the UNEP, in order to obtain information on trends and other countries, in particular, from Latin America.	Started	MMA, Academia, Teaching and Research Institutions, OEMAs	Continuous
	Implement the PRTR – data and information registration system on national sources of pollutants with a view to obtaining local information to complement national inventories and quantify emissions.	Started / Ongoing	MMA, IBAMA, Private Sector	2015-2016
Promote research, development and innovation	Development of study on existing technologies to dispose of POPs.	Not Started	MMA	2015-2016
	Promote support/incentives for cleaner technologies and POP-free technologies.	Started	MMA, MCTI	2015-2020

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