# NATIONAL IMPLEMENTATION PLAN – NIP

## COLOMBIA STOCKHOLM CONVENTION ON PERSISTENT ORGANIC POLLUTANTS - POPs

## 2017

**MINISTRY OF ENVIRONMENT AND SUSTAINABLE DEVELOPMENT**

MINAMBIENTE

TODOS POR UN NUEVO PAÍS
PAZ EQUIDAD EDUCACIÓN

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## 2017

**MINISTRY OF ENVIRONMENT AND SUSTAINABLE DEVELOPMENT**

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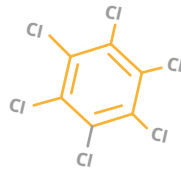

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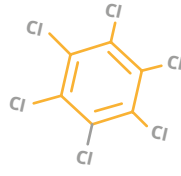

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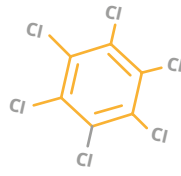
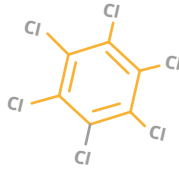


# ABBREVATIONS AND ACRONYMS

| | |
|---|---|
| **ANDI** | National Business Association of Colombia |
| **ANLA** | National Authority for Environmental Licensing |
| **ASINFAR** | Colombian Pharmaceutical Industries Association |
| **Bacex** | Foreign Trade Database |
| **Cancillería** | Ministry of Foreign Affairs |
| **COLCIENCIAS** | Administrative Department of Science, Technology and Innovation |
| **CONASA** | National Inter-Sectoral Technical Commission for Environmental Health |
| **DANE** | National Administrative Department of Statistics |
| **DIAN** | National Directorate of Taxes and Customs |
| **DNP** | National Planning Department |
| **EPSA** | Pacific Energy Company |
| **FAO** | Food and Agricultural Organisation |
| **FINDETER** | Territorial Development Finance Agency |
| **GEF** | Global Environment Facility |
| **ICA** | Colombian Agricultural Institute |
| **IDEAM** | Institute for Hydrology, Meteorology and Environmental Studies |
| **IGAC** | Agustín Codazzi Geographic Institute |
| **INS** | National Health Institute |
| **INVEMAR** | José Benito Vives de Andréis Marine and Coastal Research Institute |
| **INVIMA** | National Institute for Drug and Food Surveillance |

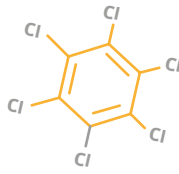
| | |
|---|---|
| **IPSE** | Institute for Planning and Promotion of Energy Solutions for Non-Interconnected Areas |
| **MinAgricultura** | Ministry of Agricultural and Rural Development |
| **MinAmbiente** | Ministry of Environment and Sustainable Development |
| **MinCIT** | Ministry of Industry, Commerce and Tourism |
| **MinEducación** | Ministry of National Education |
| **MinMinas** | Ministry of Mines and Energy |
| **MinTrabajo** | Ministry of Labour |
| **MinTransporte** | Ministry of Transport |
| **MinSalud** | Ministry of Health and Social Protection |
| **OECD** | Organisation for Economic Cooperation and Development |
| **ONAC** | National Accreditation Agency of Colombia |
| **PNN** | National Natural Parks |
| **POLFA** | Directorate of Fiscal and Customs Police Management |
| **SENA** | National Training Service |
| **SINA** | National Environmental System |
| **SUISA** | Unified System of Environmental Health Information |
| **UNDP** | United Nations Development Program |
| **UNEP** | United Nations Environmental Program |
| **UNIDO** | United Nations Industrial Development Organisation |
| **UNITAR** | United Nations Institute for Training and Research |
| **WHO** | World Health Organisation |



# SYMBOLS

| | |
|---|---|
| **α-BHC** | Alpha-Hexachlorocyclohexane |
| **ABS** | Acrylonitrile Butadiene Styrene |
| **BAT** | Best Available Techniques |
| **BDE** | Brominated Diphenyl Ether |
| **BEP** | Best Environmental Practices |
| **β-BHC** | Beta--Hexachlorocyclohexane |
| **c-octaBDE** | C-Octa-Brominated Diphenyl Ether |
| **COL** | Colombian Peso |
| **c-pentaBDE** | C-Penta-Brominated Diphenyl Ether |
| **CRT** | Cathode Ray Tube |
| **DDE** | Dichlorodiphenyldichloroethylene |
| **DDT** | Dichlorodiphenyltrichloroethane |
| **dl-PCBs** | Dioxin Like PCB |
| **F** | Regional Multiplication Factor |
| **FE** | Emission Factor |
| **GAP** | Good Agricultural Practice |
| **GDP** | Gross Domestic Product |
| **HBB** | Hexabromobiphenyl |
| **HBCD** | Hexabromocyclododecane |
| **HCB** | Hexachlorobenzene |
| **hepta-BDE** | Hepta-Brominated Diphenyl Ether |
| **hexa-BDE** | Hexa-Brominated Diphenyl Ether |
| **ISC** | Inspection, Surveillance and Control |
| **ISO** | Isomers |
| **kg** | Kilograms |
| **KPEG** | Potassium In *Polyethylene Glycol* |
| **L** | Litres |

| | |
|---|---|
| **L1** | Strategic Direction 1 |
| **L2** | Strategic Direction 2 |
| **L3** | Strategic Direction 3 |
| **L4** | Strategic Direction 4 |
| **L5** | Strategic Direction 5 |
| **m2** | Square Meter(s) |
| **MSF** | Phytosanitary Measurements |
| **Ni** | Nickel |
| **NIP** | National Implementation Plan |
| **NTC** | Colombian Technical Standard |
| **OE** | Specific Objective |
| **PBDE** | Polybrominated Diphenyl Ether |
| **PCB** | Polychlorinated Biphenyls |
| **PCDD** | Polychlorinated Dibenzodioxins |
| **PCDF** | Polychlorinated Dibenzofurans |
| **PeCB** | Pentachlorobenzene |
| **PFOS** | Perfluorooctane Sulfonic Acid |
| **PFOSF** | Perfluorooctane Sulfonyl Fluoride |
| **PNA** | National Application Plan (Equivalent To NIP) |
| **POP** | Persistent Organic Pollutant |
| **ppm** | Parts Per Million |
| **Respel** | Hazardous Waste |
| **t** | Metric Tons |
| **TEQ/y** | Toxic Equivalency Factor Per Year |
| **µg** | Micrograms |
| **USD** | United States Dollars |
| **VUCE** | Single Foreign Trade Window |
| **WEEE** | Waste Electrical and Electronical Equipment |
| **ZNI** | Zone Not Interconnected |



# INTRODUCTION

Colombia signed the Stockholm Convention on Persistent Organic Pollutants (POPs) in May 2001, and it was ratified through Law 1196/2008. Since the signing of the Stockholm Convention, Colombia has been making substantial progress towards achieving the objectives set out by the Convention, that is, identifying, preventing, reducing and eliminating persistent organic pollutants and their wastes. Since 2003, the country has published a number of studies, documents, and implemented actions that have contributed to the understanding and analysis of the country's POPs situation, as well as how to guide the different partnership actions concerned with their comprehensive management.

Article 7 of the Convention states that *"Each Party shall review and update, as appropriate, its implementation plan on a periodic basis and in a manner to be specified by a decision of the Conference of the Parties"*. Therefore during 2007, the former Ministry of Environment, Housing and Territorial Development (nowadays the Ministry of Environment and Sustainable Development) initiated the formulation of the first National Implementation Plan (NIP) for the Stockholm Convention[1], and, during 2008 and 2009, a NIP dissemination and negotiation process was carried out within the sectors and with the partners to facilitate its implementation; such NIP was finally approved and submitted to the Convention's Secretariat in July of 2010.

Since Colombia needed to update the NIP submitted in 2010 to the Stockholm Convention[2], in order to comply with the activities, set out in the original NIP, it was revised. POP inventories initially documented were updated, compounds included in the Convention's fourth, fifth, and sixth Conference of the Parties reports were incorporated into the inventories, and the required consultations were held with the country's appropriate

**1.** In Spanish language was called National Application Plan (Plan Nacional de Aplicación)

**2.** In order to update the Stockholm Convention NIP, the Colombian government submitted a project to the Global Environmental Facility (GEF) so that the NIP update approved in November 2014 and started in March, 2015 would be financed through resources from enabling activities.

government agencies and stakeholders in order to update the specific action plans for the comprehensive management of POPs.

The organisation of this process was based on four components:

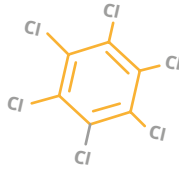
Component 1: Definition of the work plan and scope for the NIP update and the assignment of responsibilities to the stakeholders. Also, the compliance activities established in the initial national plan were reviewed together with the organisation and awareness of the stakeholders involved (July-December 2015).

Component 2: Development of POP inventories and assessment of the national capacity and infrastructure. For which, the initial inventories of the POPs were updated and compounds included in the annexes to the Convention and published following the last Conferences of the Parties were also added. Likewise, the institutional, regulatory and policy framework was updated, as well as the evaluation of the national capacity for monitoring and POPs management (November 2015 - May 2016).

Component 3: Develop action plans for the new POPs and update the action plan for the initial POPs. In this sense, the required consultations were carried out at the governmental level and with the various stakeholders with interests in the country, for the review and agreement of the specific objectives, strategies and action plans for the comprehensive management of POPs. Likewise, the financial cost estimates and the socioeconomic analysis for the implementation of the new version of the NIP were updated (May 2016 - April 2017).

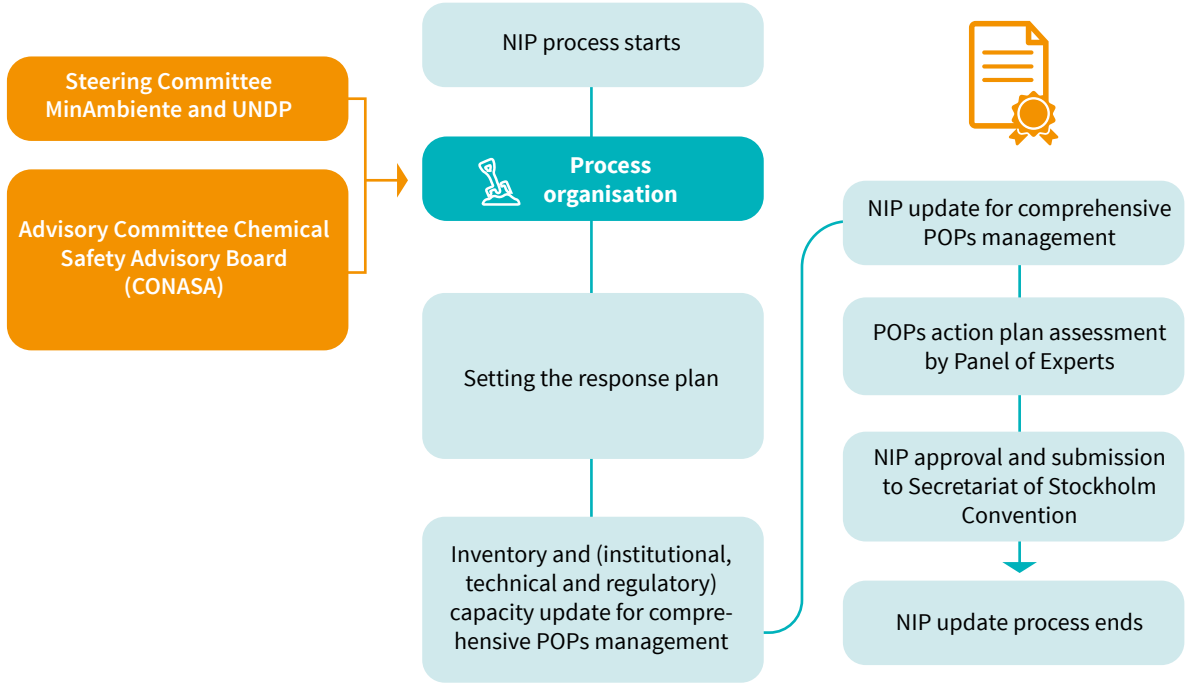
Component 4: Update the national implementation plan, resulting in the publication of the present document (December 2016 – June 2017).

The document herein is submitted as an update of the Stockholm Convention NIP developed by Colombia to be submitted before the Convention's Secretariat based on the results and inputs obtained up to this date; and the Convention's NIP updated guidelines[3]. The main stages of such an update are summarized in the following chart.




**3.** Guidance for developing, a National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants – Draft UNEP, UNIDO, UNITAR (2014).

**Figure 0.1. Stages of the NIP Update Process**




This process, even though it has been led by the Ministry of Environment and Sustainable Development (MinAmbiente) with the support of the UNDP, it also had the active participation of various partners and stakeholders, from both the public and private sectors. Also inputs from entities and organisations belonging to the Chemical Safety Advisory Board (CONASA) were used, as well contributions from collective construction and feedback workshops held during the whole process.

This NIP version updates the present information contained in the initial version of the national plan (2010) and corresponds to the current situation in Colombia in terms of POPs; similarly, this plan includes the recent POPs added to the Convention's annexes during the last Conferences of the Parties (COPs). This plan is structured to comply with the most recent guidelines given by the Stockholm Convention in its guidance documents.

The first chapter of the NIP describes the Colombian approach through a short profile that updates the principal socioeconomic and environmental data, to provide information in a general context.

Furthermore, it contains information related to updating the institutional, regulatory and policy framework applied to the comprehensive management of POPs. In this chapter, the current organisation of public part-

nerships by the administrative sectors (health, work, agriculture, environment, among others) is outlined, as well as their interactions with the principal private partnerships. In addition, it complements the normative framework and the applied policies with those issued after 2010.

In the third chapter can be found the principal achievements obtained up and until the present by Colombia in terms of the comprehensive management of POPs since the implementation of its first national plan in conjunction with the different partnerships involved. In the same way, the results from the POPs pesticides and PCBs inventories updates are presented, a preliminary inventory for POPs used for industrial purposes, and a recalculation of the Unintentional POPs following the most updated methodology guidelines available.

Presented in the fourth chapter are the results of the updated capacity assessment for the monitoring of POPs (sample collection and analytical determination), inspection, surveillance and control by the environmental authorities and the environmentally sound management of POPs in Colombia.

The information compiled and presented in the previous chapters was used as essential input for the formulation and collective construction of the action plans for each POPs group, together with their revisions and adjustments of their objectives and strategies. They are presented in the fifth chapter.

In the sixth chapter, the financial cost estimates for the implementation of the new NIP version are presented together with the updated socioeconomic analysis, and the cost-benefit relationship for the country as a result of the implementation of the national plan.

Finally, in the last chapter, the remarks and recommendations for the implementation of this national plan are presented.

# 1. NATIONAL **CONTEXT**

This chapter features the country's general profile, physical, demographic, political and economic features to facilitate an understanding of the following chapters within the framework of Colombian characteristics.

## 1.1. Overview

The Republic of Colombia is a unitary, democratic, participatory and pluralistic state with separate powers. The President is elected by popular vote for a four-year administration period. According to the Bank of the Republic, in Latin-American countries during 2016, Colombia together with Chile and Mexico, had a growth rate below of their historical average, but better than other countries in the region, such as, Argentina, Brazil, Ecuador and Venezuela, who have negative growth rates. The GDP increased 2.0%, 1.1 points below the one registered in 2015, due principally to the internal demand adjustment and the low dynamism in real exports (Bank of the Republic, 2017)

## 1.2. Political-administrative division

The political-administrative division of the national territory has been organized in different ways, depending on the nation's historical evolution. Colombia currently has 32 provinces, 1,101 municipalities, *San Andrés* Island, 5 districts[4], including the Capital District of Bogotá, which is a municipality subject to a special regime, 20 Departmental Small Towns and 8,059 populated centres, classified as small municipal towns, police stations and village settlements (DANE, 2016a).

## 1.3. Location and surface

Colombia is located to the Northeast of South America, approximately latitude 16°10' north and 4°13' south, and 66°50' to 84°46' longitude to the east of the Greenwich Meridian, including its maritime area. Its total surface area is 2,070,408 km$^2$, where 55.1% is a continental area and 44.9% a maritime area. (IGAC, 2008). Colombia's location affords coasts on both the Atlantic and Pacific oceans and has borders with 11 countries. Its land borders include Venezuela (2,219 km), Brazil (1,645 km), Peru (1,626 km), Ecuador (586 km) and Panama (266 km); its maritime borders are Ecuador, Costa Rica, Panama, Nicaragua, Honduras, Jamaica, Haiti and the Dominican Republic (Chancellor's Office, 2016).

**4.** Its 5 districts are: Bogota D.C., Cartagena de Indias Cultural and Touristic District, Santa Marta Historic, Cultural and Touristic District; Barranquilla Special Port and Industrial District, and Buenaventura Special Eco-touristic, Biodiverse, Port and Industrial District.

## 1.4. Geographical regions[5]

Six geographic regions have been identified based on similar topography, weather, geological, geomorphological and soil features, as well as, socio-cultural activities carried out in a visible landscape: Caribbean, Insular, Pacific, Andean, Orinoquia and Amazon (IGAC, 2008 as reported by IDEAM, UNDP, MADS, DNP, Cancillería, 2015).

- *Insular Region*: comprises the Caribbean Sea and Pacific Ocean waters, as well as the continental and oceanic islands where the population's main activities are fishing, trading and tourism.
- *Andean Region:* covers the Western, Central and Eastern watersheds of the mountain range, the longitudinal valleys of Cauca and Magdalena rivers, and the Nariño, Cauca, Huila, Antioquia, Quindío, Tolima, Cundinamarca, Boyacá and the Santanders up to the Venezuelan border. It comprises of very dry areas, such as Chicamocha and the Patía Canyons, and the very wet areas such as the eastern mountain chain's watershed. Most of the country's economic activities are focused in this region that holds two thirds of the country's population, especially livestock, agriculture (coffee, sugar cane, rice and cotton crops are the most common), and mining, particularly gold, silver, platinum, iron, coal, salt, mercury and oil. The country's main industries are also centralized in this area such as fabrics, shoes, chemical products, food and drinks.
- *Caribe Region*: comprises the coast plains from La Guajira to the Urabá Gulf, passing through Sierra Nevada de Santa Marta. There are flood plain areas such as Depresión Momposina and the Atrato River's estuary. The region's climate is arid and semi-arid; there are even desert areas. Some economic activities standout such as livestock, banana and palm oil plantations, coal and nickel mining. This region has the second largest population.
- *Pacific Region:* runs from the Panama border to Ecuador from north to south and crosses the Pacific Ocean's littoral, Serranía del Baudó and the western mountain chain's watershed. Its population is mostly Afro-Colombian, and there are some indigenous ethnic groups and settlers who work in diverse activities, mainly forestry and mining.
- *Orinoquia Region*: also known as Altillanura; it comprises the savanna plains covered by gramineae (grasses) and gallery forests (corridors) that go from the foothills of the eastern mountain range's external watershed - including the Orinico River basin- to the Venezuelan border, including Serranía de la Macarena. The climate is warm, wet and rainy. The most important activities are large-scale livestock, oil exploration, rice, plantain and palm oil crops.
- *Amazon Region:* tributary of the great Amazon River. It covers and area from the Los Llanos border to the jungle bordering Brazil, Peru and Ecuador. It is a large region with mountains and plains formed by tropical rainforest with great diversity, mountain ranges and rocky outcrops. Livestock, subsistence agriculture and forestry activities are carried out at the foothills.

**5.** This section was developed based on the Circunstancias nacionales chapter of the document titled "Primer Informe Bienal de Actualización de Colombia", published by IDEAM, UNDP, MADS, DNP and the Chancellor's Office in August, 2015.

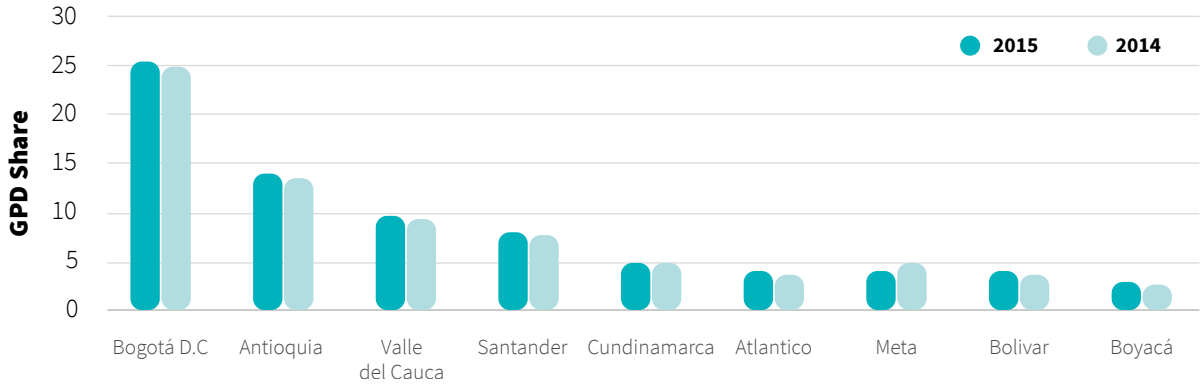
## 1.5. Population

The estimate for the Colombian population for 2017 is 49,291,609, where 50.62% are women and 49.38% are men. The estimated population for 2020 is 50,911,747 total inhabitants based on DANE's forecasts obtained from the 2005 census. The population rate is 40.7 inhabitants per square kilometre, and the Andean region holds the greatest density with almost 76% out of the nation's total (DANE, 2010). The country's ethnic group population based on the numbers from the last census (2005) was as follows: 0.01% belongs to ROM, 0.02% are Palenqueros de San Basilio, 0.08% are Raizales from San Andrés, Providencia and Santa Catalina archipelago, 3.43% are indigenous groups, 10.52% are black, multi-ethnic or Afro-Colombian, and 85.94% do not belong to any specific ethnic group. (DANE, s.f).

## 1.6. Economy

The GDP grew 3.1% in 2015[6] compared to 2014. The provinces with the greatest share in the country's GDP were: Bogotá D.C. (25.2%); Antioquia (13.7%), Valle del Cauca (9.5%), Santander (8.1%), Cundinamarca (5.1%) y Meta (4.1%). These six economies represent 65.7% of the national aggregated GDP. Those with the smallest GDP share were Guainía and Vaupés with 0.0% each. Most variations occurred in the provinces of Santander (9.3%); Antioquia (6.9%) and Atlántico (6.6%); while Arauca (-7.6%); Meta (-2.9%) and Chocó (-2.1%) experienced a greater downturn (DANE, 2016).

**Graph 1.1. GDP of the fifteen Colombian provinces with the greatest share of GDP.**




**Source: DANE, 2016b**

According to DANE, during 2015 the provinces with higher growth using 2005 constant prices by chaining were: Cauca (5.7%); Arauca y Atlantico (5.3%); Quindio (4.8%) and Nariño (4.7%). For those provinces, except Atlantico, the results are due principally to construction, mining and quarrying exploration activities; in the case of the Atlantico Province the growth was due to building and manufacturing industries.

The country's foreign trade has experienced a growing trend, except for 2014 and 2015, when the economy was significantly hindered by a negative business balance at the end of 2015.

**6.** This is a temporary number that may be adjusted slightly based on DANE's methodologies.

**Graph 1 2. Percentage variation of growth rates in Colombian imports and exports from 2000 to 2014.**


| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014p |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Exports | - | 2,8 | -2,4 | 7,4 | 9,8 | 5,7 | 8,6 | 6,9 | 4,5 | -2,8 | 1,3 | 11,8 | 6,0 | 5,2 | -1,3 |
| Imports | - | 8,7 | 0,3 | 8,2 | 10,3 | 11,9 | 20,0 | 14,0 | 10,5 | -9,1 | 10,8 | 21,5 | 9,1 | 6,0 | 7,8 |

### 1.6.1. Mining and Energy Sectors

This sector is characterized by the production of oil, natural gas, electrical power and minerals, mainly coal. According to DANE, during 2016 the value of this sector decreased by 6.5% compared to 2015, due mainly to the decrease in the added value of crude oil and natural gas extraction activities, despite the increase in the extraction of coal, and metallic and non-metallic minerals (DANE, 2017).

**Table 1.1 Annual Oil Production and Export Volumes (thousand barrels of oil per calendar day)**

| Indicator | 2012 | 2013 | 2014 | 2015 | 2016* |
|---|---|---|---|---|---|
| Annual Production | 944 | 1028 | 990 | 1005 | 461 |
| Exports Volume | 613 | 703 | 462 | 473 | 415 |

*Data to the first semester of 2016

**Source: UPME (2016)**

Colombia is the principal coal producer in Latin America, and it is among the top 10 exporters worldwide, as shown in Table 1.2. The production of this resource in 2015 fell by 3.42% compared to the previous year without reaching the goal of the national government, even though exports increased by 2.87% during this period (UPME, 2016).

**Table 1.2 Annual Coal Production and Exports (kilo tons)**

| Indicator | 2012 | 2013 | 2014 | 2015 | 2016* |
|---|---|---|---|---|---|
| Annual Production | 89,024 | 85,496 | 88,578 | 85,548 | 44,629 |
| Exports Volume | 83,295 | 80,587 | 80,143 | 82,444 | 43,905 |

*Data to the first semester of 2016

**Source: UPME (2016)**

Moreover, during the 2012-2015 period, Colombia increased the installed capacity for electric energy generation. In 2016 hydro-electric energy accounted for 70% of the total energy in the National Grid. Followed by the Others category (12%) which includes biogas, fuel oil, diesel oil, among others; the gas generation (10%), the coal generation (8%) and renewable energy (like wind energy, less than 1%) (UPME, 2016).

**Table 1.3 Annual Generation of Electrical Energy (gigawatts per hour – GWh)**

| Source | 2012 | 2013 | 2014 | 2015 | 2016* |
|---|---|---|---|---|---|
| Hydro | 47,581 | 44,362 | 44,741 | 44,681 | 25,863 |
| Gas | 9,231 | 820 | 7,839 | 9,511 | 7,891 |
| Coal | 2,478 | 5,764 | 5,935 | 6,522 | 3,854 |
| Wind | 54 | 57 | 70 | 68 | 40 |
| Others | 640 | 3.187 | 5,737 | 5,762 | 2,366 |
| Total | 59,988 | 62,196 | 64,327 | 66,548 | 40,018 |

*Data to the first semester of 2016

**Source: UPME (2016)**

Referring to the natural gas reserves, since 2012 there has been a percentage decrease, from 5,726 $Gft^3$ (giga cubic foot) to 4,361 $Gft^3$ in 2015. In the same way a decrease has been observed in the gas production from 34,325 MPCDC (millions of cubic feet by day calendar) in 2013 to 28,798 MPCDC in 2015 (UPME, 2016).

The exported products from this sector are oil and its derivates and related products, hard coal, coke, and briquettes. During the years 2016 and 2017, the exports have increased by 55.6% (DANE, 2017)

### 1.6.2. Agricultural Sector

This sector is characterized by coffee production, permanent crops (fruits, drinkable plants, seeds, oilseeds, fruits, sugarcane, flowers and live plants), transitory crops (cereals, legumes, roots, tubers, vegetables, raw tobacco products), livestock (beef cattle, poultry, and pigs), animal products (raw milk and eggs, forestry, wood extraction, fishing, production of fish from hatcheries, and fish farms. During 2016, it was observed that there was a decrease in the GDP of the percentage volume, principally due to the fall in production from forestry, hunting and fishing, and coffee, which is one of the more important products for the Colombian economy (DANE, 2017).

**Table 1.4 Percentage growth rates for the agricultural sector**

| Sector | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|
| Agricultural | 2.5 | 5.2 | 2.3 | 3.3 | 0.5 |

**Source: Prepared with the information from DANE (2017)**

The products exported from this sector are raw coffee (decaffeinated or not), coffee husks, fresh or dried bananas, palm oil, flowers and cut foliage, bakery products and confectionery products (DANE, 2017). It has seen an increase in exports of 12.7% between 2016 and 2017 (DANE, 2017).

### 1.6.3. Manufacturing and Building Sectors

The manufacturing sector includes a wide variety of articles or products produced labour in the country; the following tabulation presents the output taken into account for this sector in the value of the GDP (DANE, 2017):

**Table 1.5 Manufacturing Sector, Articles taking into account the GDP**

| Processed goods in manufacturing sector | |
|---|---|
| Meat and fish | Paper and cardboard products |
| Oil, edible fats and cocoa | Printing and publishing paper |
| Dairy products | Oil refining products |
| Milling products | Chemical substances and products |
| Coffee and hulling products | Plastic and rubber products |
| Sugar and panela (kind of brown sugar) | Non-ferrous mineral products |
| Beverages | Basic metallurgic products |
| Threads and yarn | Machinery and equipment |

| | |
|---|---|
| Textile articles | Other machinery and electricity supply |
| Clothing | Transport equipment |
| Leather tanning | Furniture |
| Wood products | Other manufactured goods n.p.c.* |

* n.p.c: not previously classified.

**Source: Prepared with the information from DANE (2017)**

The GDP in the manufacturing sector has shown a recovery since 2014, with significant increases during 2015 and 2016, evidence of an intense contribution from the main regions of the country such as Bogotá, Antioquia, Valle del Cauca, Cundinamarca, Atlántico and Santander (IDEAM, 2015). The exported products from this sector are machinery, transport equipment, and various manufactured articles classified according to the materials and the chemical products; they showed a fall between the years 2016 and 2017 of 0.7% (DANE, 2017).

The building sector in Colombia has shown significant growth due to the increase in residential buildings, non-residential buildings, maintenance work and building repairs (DANE, 2017)

**Table 1.6 Manufacturing and Building Sectors percentage growth rates**

| Sector | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|
| Manufacturing industry | -1.1 | -1.2 | 0.2 | 1.2 | 3 |
| Building | 6 | 9.8 | 9.9 | 3.9 | 4.1 |

**Source: Prepared with the information from DANE (2017)**

### 1.6.4. Transport Sector

The transport sector is constituted by urban terrestrial, intercity, air, complementary, pluvial, maritime and rail transport. The GDP has shown during 2016 a decrease of 0.1%, principally due to the fall in mailing and telecommunication services, although there was an increase in the levels in the air, complementary and terrestrial transport (DANE, 2017). In 2015, the country had 206,727 kilometres of infrastructure in terrestrial roads, which 9.3% are primary roads, 21.8% are secondary roads, and 68.8% are tertiary roads. In 2014, the country had 1,008 kilometres of railways in operation, 18,225 kilometres in navigable waterways and 543 airstrips (MinTransporte, 2015).

**Table 1.7 Transport Sector percentage growth rates**

| Transport sector | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|
| Terrestrial services | 2.6 | 10.8 | 5.9 | 2.1 | 0.3 |
| Airline services | -1.4 | 5.8 | 5 | 9.1 | 5.1 |
| Complementary services | 5.6 | 4.4 | 4.2 | 5.4 | 2.5 |
| Mail and telecommunication services | 6.9 | 1.1 | 3.6 | -1.3 | -1.9 |

**Source: Prepared with the information from DANE (2017)**

## 1.7. Biodiversity

Colombia is a country with one of the greater biodiversities in the world with about 56,343 species, and the best country in the world for bird and orchid biodiversity; the second for plants, amphibians, butterflies and fresh-water fish; the third for palms and reptiles; and the fourth in mammal biodiversity (SiB Colombia, 2016). Such diversity is to be found in 59 natural areas that belong to the Natural National Park System, which comprises 14,268,224 (142,682 km2) (marine and land) hectares of the country, where 11.27% is in the continental area and 1.5% the marine area. 26 of these areas hold indigenous and Afro-Colombian communities (PNN, 2016). Being a tropical country located in the Ecuador area, Colombia contains many fauna and flora taxonomic groups, common to the area, which hosts several fauna migrations from different parts of the world due to its varied ecosystems. Colombia contains 44.25% of the South American moorland. It is therefore one of the countries containing the largest wetlands with high river flows throughout the country compared to other nations worldwide. Colombia has moorland biomes, Amazon rainforests, bushy herbaceous vegetation in Amazonian mountains, lowland forests and Amazon “catingales” (bushy vegetation areas), plain savannas, xerophytic shrubland and deserts, alluvial forests, tropical humid forests, mangrove forests, swamp forests and vegetation, Caribbean savannas, Andean forests, and tropical dry or sub-humid forests. This variety places Colombia as one of the 19 megadiverse countries worldwide (PNN, 2016).

## 1.8. Hydrographic and climatic zoning

The country’s local hydrographic zoning is formed by 5 hydrographic areas (Magdalena - Cauca, Caribbean, Orinoco, Amazon and Pacific), 41 zones and 316 subzones, and underground water is located in 16 hydrogeological provinces and 61 aquiferous systems (IDEAM, 2015).

On the other hand, climatic zoning shows that a large portion of the country has hot seasons (79%) and rainfall ranges from 2,000 to 7,000 mm, with predominantly wet (40%) and very wet (36.5%) areas, thus generating diverse landscape types from deserts to rainforests, and even glaciers. The Intertropical Convergence Zone - ITCZ, which generally governs the annual cycle of climate variations in Colombia, produces two rainy seasons and two dry seasons in a year, except for some local variations with monomodal patterns (IDEAM, 2016).

# 2. INSTITUTIONAL, REGULATORY **AND POLICY FRAMEWORK**

This chapter first presents an update of the institutional framework which somehow impacts comprehensive POPs management in the country. It also introduces some other non-institutional stakeholders that are essential to fulfil the proposed national plan. Then, the chapter briefly outlines the legal instruments currently available in Colombia for comprehensive POPs management. Such instruments basically comprise of the appropriate policies, main regulatory and normative frameworks, and multi-lateral treaties, conventions or agreements that contribute to this subject to a certain extent.

## 2.1. INSTITUTIONALITY AND OTHER INVOLVED STAKEHOLDERS

Ever since the Political Constitution was enacted in 1991 and given the changing circumstances in public administration, the institutional framework has been reformed in order to guarantee harmony, coherence and articulation among the activities performed by each institution based on their assigned duties. The reform also seeks to develop, execute and evaluate policies, plans and programs that allow such institutions to perform their duties, avoid duplicate duties among public institutions of any kind, and allow direct participation and communication between the administration and the administered party.

The last reform was undertaken in 2011 through Law 1444, whereby the Congress of the Republic divided some ministries and modified the public administration structure. The most notable topics in this matter are especially those related to health, labour and the environmental sectors.

On the one hand, the Health Administration Sector was integrated with the Social Protection Sector and the objectives and structure of the Ministry of Health and Social Protection[7] as a health governing institution were set out. This Ministry is now responsible for developing, adopting, directing, coordinating, executing and evaluating policy on health, public health and social health promotion. The Ministry is also involved in the development of policies on pensions, periodic economic benefits and occupational hazards. The main institutional stakeholders that are part of this management sector, and somehow related to the country's POPs management, include, in addition to the Ministry of Health and Social Protection as the sector leader, ascribed institutions such as the National Institute of Health, INS[8], and the National Institute for Food and Drug Monitoring - INVIMA.

**7.** Through Decree 4107/2011

**8.** The INS legal nature was changed through Decree 4109/2011, and its structure and purpose were set forth.

Similarly, the objectives of the Ministry of Labour and its structure were modified and the Labour Management Sector was integrated[9]. It also comprises the National Training Service - SENA as an important actor in this process. The Ministry of Labour's main duty as a sector leader is to develop and adopt policies, general plans, programs and projects for the observance of fundamental labour rights, worker guarantees, strengthening, promotion and protection of supportive economic activities and decent labour relations. This is achieved by means of an effective surveillance, information, registration, inspection and control system, as well as, social dialogue and an understanding of how to develop proper labour relations. The reform performed on this sector aims at improving the protection of the fundamental right to work by strengthening the labour inspection, surveillance and control system.

On the other hand, the Environment and Sustainable Development Management Sector was integrated into the structure of the Ministry of Environment and Sustainable Development[10] with the same objectives, and established in order to appoint this Ministry as the institution in charge of developing the national policy on the environment and renewable natural resources. It believes that it is the right of every person to enjoy a healthy environment and this should be guaranteed and that the nation's natural heritage and sovereignty should be protected. The Ministry is also in charge of directing the National Environmental System, SINA, to ensure the adoption and execution of relevant policies, plans, programs and it is there to project and guarantee the fulfilment of the State's and persons' rights and duties concerning the nation's environment and natural heritage.

Other institutional stakeholders of special interest in this Environment and Sustainable Development management sector are the Institute of Hydrology, Meteorology and Environmental Studies (IDEAM), the José Benito Vives de Andréis Marine and Coastal Research Institute (INVEMAR), and the National Authority for Environmental Licensing (ANLA)[11].

Among other aspects, the foregoing leads to fulfil the different commitments acquired by the country, such as multilateral environmental agreements, including the Stockholm Convention, where Colombia has stood out among the international community because of its commitment to the safe and sustainable management of chemical substances and hazardous waste.

Although the health, labour and environmental sectors have been the ones mainly covered so far, these are not the only sectors with stakeholders involved in Colombia's comprehensive POPs management framework.

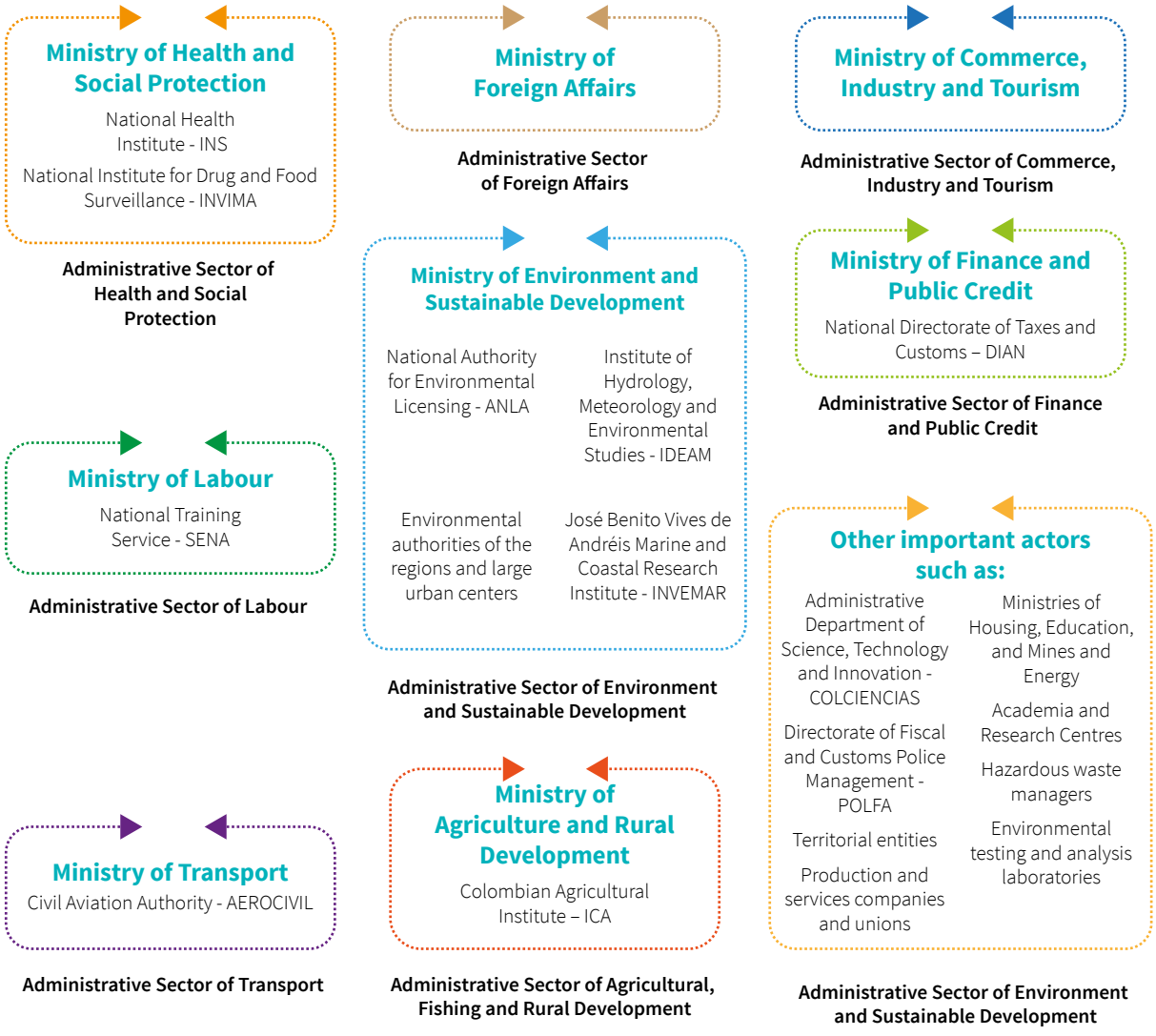
Similarly, the work and contributions made by other public and private stakeholders are also worth highlighting. They play a key role in the implementation of many comprehensive POP management actions and strategies in Colombia. Some of these stakeholders include academia, the Fiscal and Customs Police (POLFA), the Administrative Department of Science, Technology and Innovation (COLCIENCIAS), production and service

**9.** Pursuant to Decree 4108/2011

**10.** Through Decree 3570/2011

**11.** Through Decree 3573/2011

**Figure 2.1. Main stakeholders involved in comprehensive POP management in Colombia**




companies and Trades unions, hazardous waste managers, environmental testing and analysis laboratories, amongst others.

It is also worth highlighted the cross-cutting coordination entity called the National Cross-cutting Technical Commission for the Environmental Health –CONASA (the Spanish name)- and the environmental health territorial councils in the national territories, established as instruments of public polices as the CONPES document 3550 of 2008, where the guidelines for the formulation of the Environmental Health Comprehensive Policy –PISA- and the Decree 2972 of 2010, which create and regulate the CONASA were all conceived.

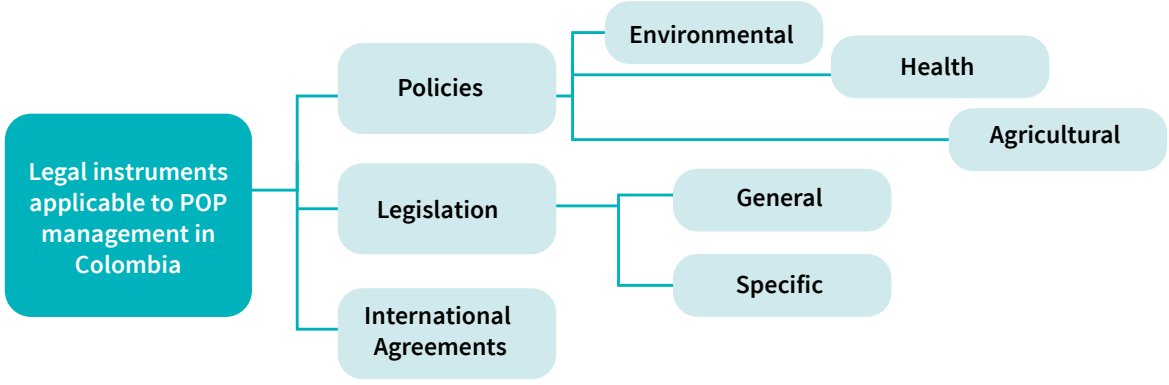
According to the objective of this cross-cutting commission, and established in article nine of Law 1196 of 2008 and article nine of the Stockholm Convention, Colombia is revising this cross-cutting commission framework to include, the effective addition of mechanisms in the CONASA action plan, which allow the operation to act as a national focal point for the exchange of information about POPs, through the Chemical Safety Advisory Board of this Commission.

Figure 2.1 shows a relationship between the public entities, who have assigned responsibilities related to the hazardous chemical substances and wastes, which could contribute to POP management. This Figure also stipulates that the Ministries are the central part of the national public administration.

## 2.2. NATIONAL LEGAL INSTRUMENTS

This section contains the general review of current standards relevant for proper POP management in Colombia and it includes the analysis of the following instruments:

**Figure 2.2. Main legal instruments applicable to POP management**



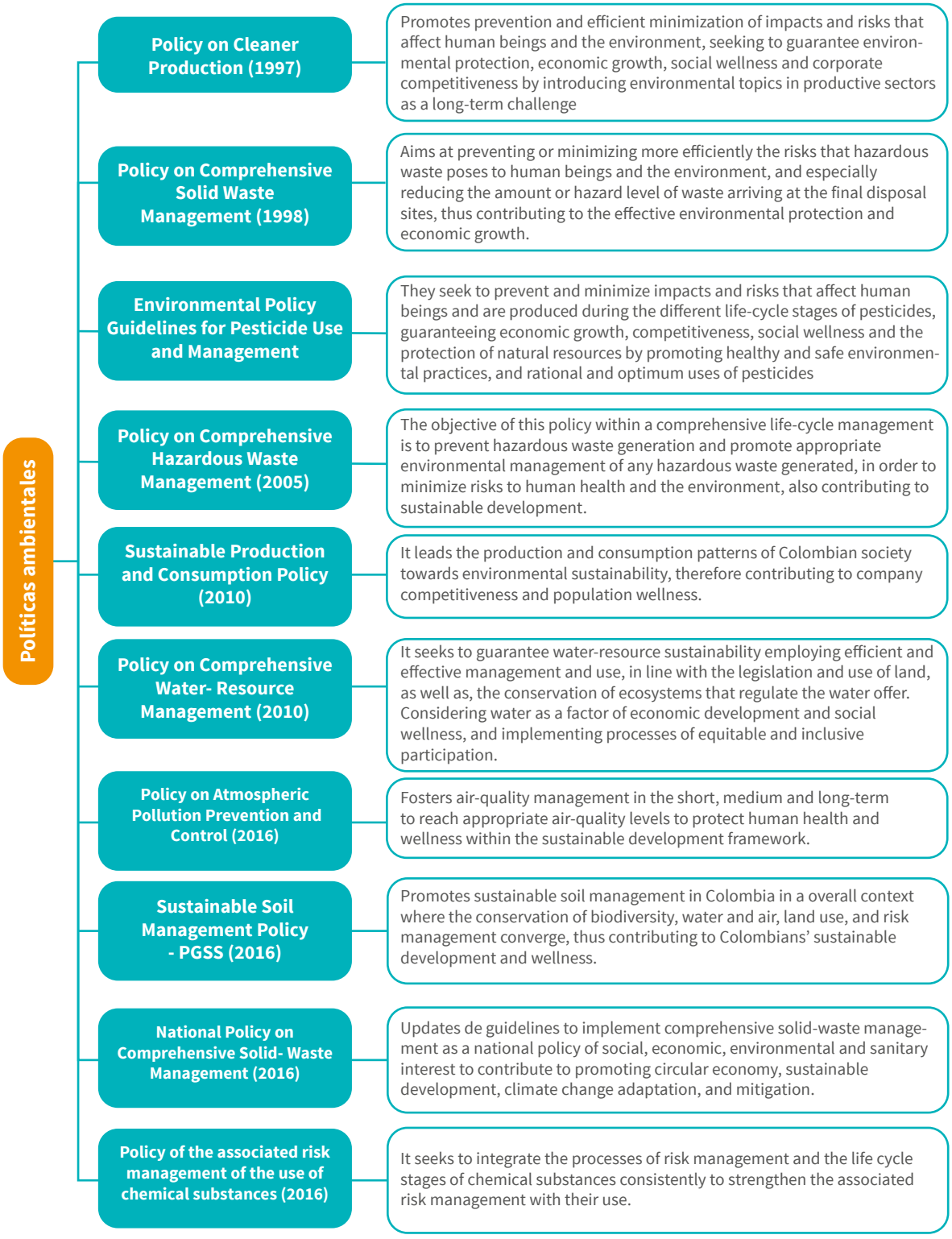

### 2.2.1. National public policies related to the Management of Persistent Organic Pollutants (POPs)

Public policies are a set of actions and decisions intended to solve community problems. The civil society, private institutions and government organisations can intervene in the design and implementation of public policies at their various levels[12].

Public polices seek to solve different types of problems or needs such as economic, social, health, educational, housing, infrastructure, and environmental issues. The following are the main current environmental, health and agricultural policies in Colombia that are directly or indirectly related to POP management.

12. http://escuelaUNDP.org/biblioteca/pmb/opac_css/doc_num.php?explmun id=390

Figure 2.3. Main environmental public policies related to POP management



## Figure 2.4. Main health public policies related to POP management


## Figure 2.5. Principal Agricultural Public Policies related to POP management

### 2.2.2. International conventions entered into by Colombia for the Management of Persistent Organic Pollutants (POPs)

The Congress of the Republic of Colombia approved the *"Stockholm Convention on Persistent Organic Pollutants" issued in Stockholm on May 22, 2001, the 'Correction to article 1° of the original text in Spanish' issued on February 21, 2003, and 'Annex G to the Stockholm Convention' issued on May 6, 2005* through Law 1196 issued on June 5, 2008[13].

This convention became effective in Colombia on January 20, 2009, under the provisions of Article 26, Number 2[14], provided Colombia submitted the relevant Ratification Instrument to the UN General Secretariat on October 23, 2008.

The objective of the Convention[15] is to protect human health and the environment against these pollutants; this issue must be addressed under the relevant environmental legislation and regulations. It sets forth that the countries must suggest strategies to reduce or eliminate releases from intentional production and use of Persistent Organic Pollutants –POPs- (Article three of the Convention), as to determine the POP stocks and their wastes (Article sixth of the Convention), which must be managed in environmentally-sound manner under all circumstances. POPs comprise a series of substances with toxic, persistent, bio-accumulative features that travel large distances in the environment.

Similarly, it suggests that unintentionally-produced POPs, such as dioxins and furans, should be reduced to a minimum and eliminated whenever possible by adopting the concepts of *best environmental practices and best available techniques* in activities that may potentially generate such emissions (Article five of the Convention).

The Stockholm Convention, until 2017 has included in the lists of 28 regulated substances (annexes A, B and C) classified as POPs, but it is also recognised that year on year there are new studies that could keep these lists growing. Following are presented the regulated substances covered by the Convention and its year of inclusion, according to the POPs groups to be managed in Colombia and the annexes where they belonged:

**13.** Published in Official Gazette number 47.011 issued on June 5, 2008 and declared enforceable through ruling C-944 by the Constitutional Court issued on October 1, 2008, since they considered it conforming to the 1991 Political Constitution.

**14.** Effective Date. (…) 2. 2. Concerning each state or organisation for regional economic integration that ratifies, accepts or approves this Convention or adheres to it after submitting the fiftieth ratification, acceptance, approval or adherence instrument, the Convention shall be effective on the ninetieth day after the date when such State or organisation for regional economic integration has submitted its ratification, acceptance, approval or adherence instrument.

**15.** Considering the precautionary approach stated in Principle 15 of the Rio Declaration on Environment and Development. This approach implies that in case of suspicion of an activity generates an irreparable damage, although there is not a scientific certainty, should be created measures to reduce the risk; meaning, upon suspicion of adverse and irreversible effects of these substances to the environment and human health, should be established measures to regulate them.

**Table 2.1 POPs regulated by Stockholm Convention**

| Group | Annex | POP substance | Year of inclusion |
|---|---|---|---|
| POP pesticides | A | Aldrin | 2001 |
| | | Dieldrin | 2001 |
| | | Endrin | 2001 |
| | | Chlordane | 2001 |
| | | Heptachlor | 2001 |
| | | Hexachlorobenzene (HCB) | 2001 |
| | | Mirex | 2001 |
| | | Toxaphene | 2001 |
| | | Chlordecone | 2009 |
| | | Pentachlorobenzene (PeCB) | 2009 |
| | | Lindane | 2009 |
| | | Alpha-hexachlorocyclohexane | 2009 |
| | | Beta- hexachlorocyclohexane | 2009 |
| | | Endosulfan | 2011 |
| | | Pentachlorophenol and its salts and esters | 2015 |
| | B | Dichlorodipheniltrichloroethane (DDT) | 2001 |
| | | Perfluorooctane sulfonic acid (PFOS) (e.g.: sulfluramid), its salts and perfluorooctane sulfonyl fluoride (PFOSF). | 2009 |
| PCB | A | Polychlorinated biphenyls (PCB) | 2001 |
| Unintentional POPs | C | Polychlorinated dibenzo-p-dioxins (PCDD) | 2001 |
| | | Polychlorinated dibenzo-p-furans (PCDF) | 2001 |
| | | Polychlorinated biphenyls - PCB (dioxin-like PCBs) | 2001 |
| | | Pentachlorobenzene (PeCB) | 2009 |
| | | Hexachlorobenzene (HCB) | 2001 |
| | | Polychlorinated naphthalenes | |
| POP used for industrial purposes | A | Hexabromobiphenyl | 2009 |
| | A | Tetrabromodiphenyl ether and pentabromodiphenyl ether (c-penta-BDE) | 2009 |
| | A | Hexabromodiphenyl ether and Heptabromodiphenyl ether (c-octa-BDE) | 2009 |
| | A | Decabromodiphenyl ether (c-deca-BDE) | 2017 |
| | A | Pentachlorobenzene (PeCB) | 2009 |
| | A | Hexabromocyclododecane (HBCD) | 2013 |
| | A | Hexachlorobutadiene | 2015 |
| | A | Hexachlorobenzene (HCB) | 2001 |
| | A | Polychlorinated naphthalenes | 2015 |
| | A | Short-chain chlorinated paraffins (SCCPs) | 2017 |
| | B | Perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOSF). | 2009 |

**Note: take into account that some POPs could belong to different groups and Annexes of the Convention (A, B, and C)**

After the Stockholm Convention was signed, the current Ministry of Environment and Sustainable Development, supported by other Ministries and the private sector, has progressed towards achieving the objectives of identification, prevention, reduction and phase-out of these substances and their wastes. Consequently, a series of activities have been carried out since 2003 that facilitated an understanding and analysis of the national POPs status at the first stage.

During 2007, the National Implementation Plan (NIP) for the Stockholm Convention was developed (Article seven of the Convention), and from late 2008 to part way into 2009, the NIP underwent a dissemination and consultation process with the related sectors in order to facilitate its implementation. In the first instance, this first national plan included actions for the initial twelve (12) POPs established by the Stockholm Convention, as well as some preliminary measures for the POPs added in 2009 (since there was not inventory for the POP substances added in 2009).

Since 2015, the Ministry of Environment and Sustainable Development has led the review and updated the processes included in the National Implementation Plan for the Stockholm Convention on POPs[16], and as a result this document was produced, which includes the actions proposed for all twenty-eight substances.

The Stockholm Convention is the main multilateral agreement that gathers the commitments of different world countries to the protection of health and the environment against POPs. However, there are also other multilateral treaties or agreements, such as the Basel Convention[17] and the Rotterdam Convention[18] that have other measures to control and manage hazardous chemical substances and they also permit partnerships to be established based on the efforts made by the parties or participant countries for the regulation of those substances.

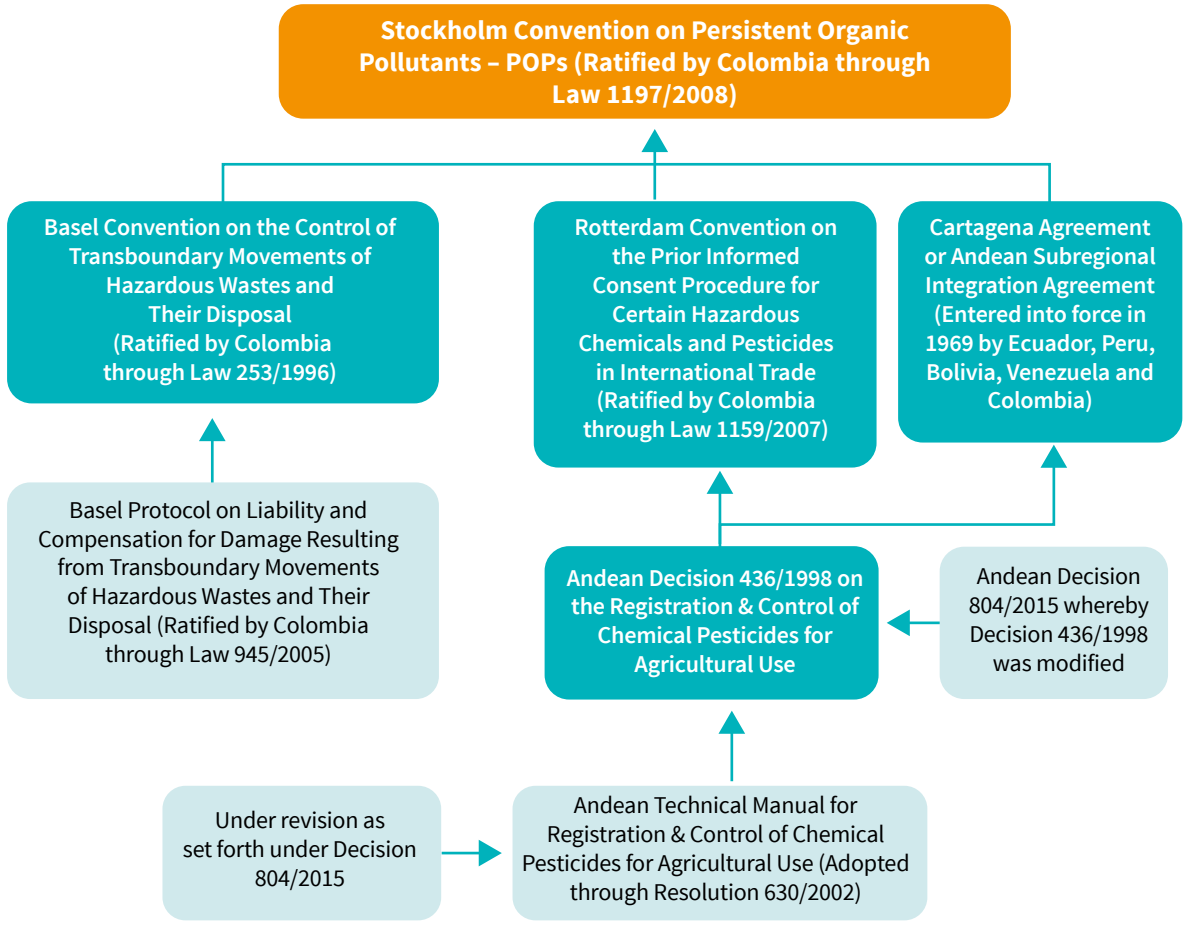
In the case of Colombia, the Figure 2.8 shows the main treaties or agreements entered into by the Government; their agreed joint efforts may contribute in some way to fulfil the commitments acquired in relation to POPs.

**16.** With resources of Global Environment Facility – GEF and support by the United Nations Development Program – UNDP.

**17.** Basel Convention on the Control of Transboundary Movements of Hazardous Waste

**18.** Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade

Figure 2.6. International conventions entered into by Colombia on POP management




For more details about the scope of each multilateral agreement entered into by Colombia, please see the *"Actualización del marco institucional, regulatorio y de políticas relativas a la gestión de COP - 2016"* document, available at www.minambiente.gov.co.

### 2.2.3. Legislation or regulatory framework related to the Management of Persistent Organic Pollutants (POPs)

Colombian legislation emerges in line with the Political Constitution, which is the supreme constitutional legal standard that governs a State's organisation, establishes people's rights and duties, and entails that every person has the right to life, health, security, and to enjoy a healthy environment. Consequently, if these rights are to be protected and acknowledged, the Colombian State, attention must focus on providing the optimum quality of life, which requires channelling policies so that they protect human health, physical integrity, and the environment from polluting agents.

The 1991 Constitution placed great significance to environmental issues. The constitutional precepts include, among others:

(I ) The State and everybody's obligation to protect the Nation's cultural and natural wealth (Article 8°);
(II ) The characterization of environmental health and sanitation as public services managed by the State (Article 49);
(III ) The right of every individual to enjoy a healthy environment, exert community engagement in decisions that may affect them; and it is the State's duty to protect environmental diversity and integrity (Article 79);
(IV ) The State's obligation to plan the management and exploitation of natural resources to guarantee their sustainable development, preservation, restoration or substitution, as well as, prevent environmental deterioration factors (Article 80);
(V ) The existing prohibition on bringing nuclear waste and toxic waste into the country (Article 81);
(VI ) People's and citizens' duty to protect the country's cultural and natural resources and look after the preservation of a healthy environment (Article 95, number 8);
(VII ) The State's duty to promote the internationalization of public, economic, social and ecological relations based on equity, reciprocity and national co-existence (Article 226);
(VIII ) The possibility to limit the scope of economic freedom by means of laws, whenever required by social interest, the environment and/or the Nation's cultural heritage (Article 333);
(IX ) The need to include environmental policies as one of the essential elements of the National Development Plan to be issued every four years (Articles 339 and 340); and
(X ) The inclusion of environmental sanitation as one of the essential objectives of the State's activity (Article 366).

From this viewpoint, Colombia has developed regulatory instruments in line with these constitutional precepts during the last decades by issuing different laws, decrees and resolutions. In this particular case, the following summary chart presents the main general and specific regulations that to a certain extent contribute to the comprehensive POPs management system in the country.

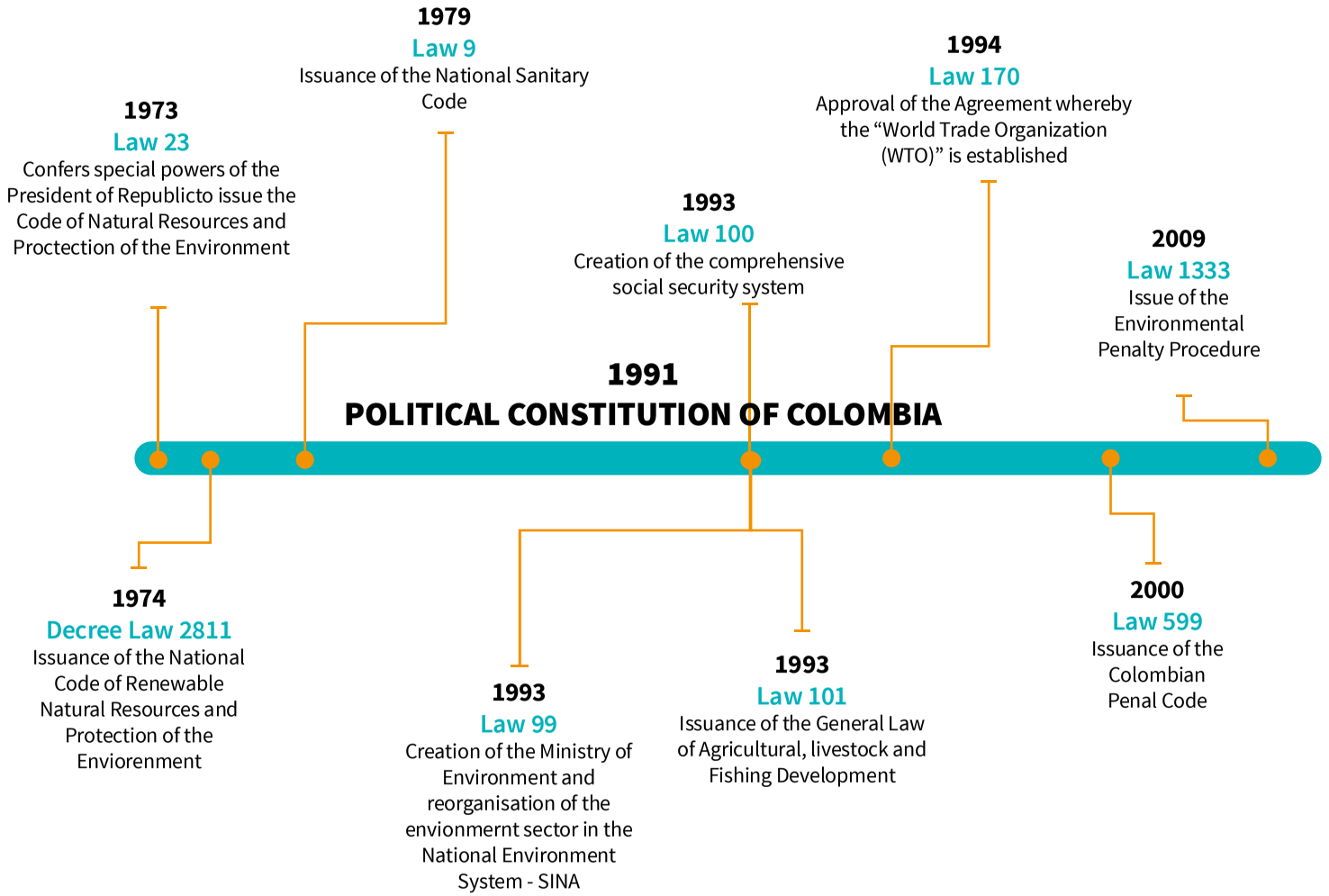
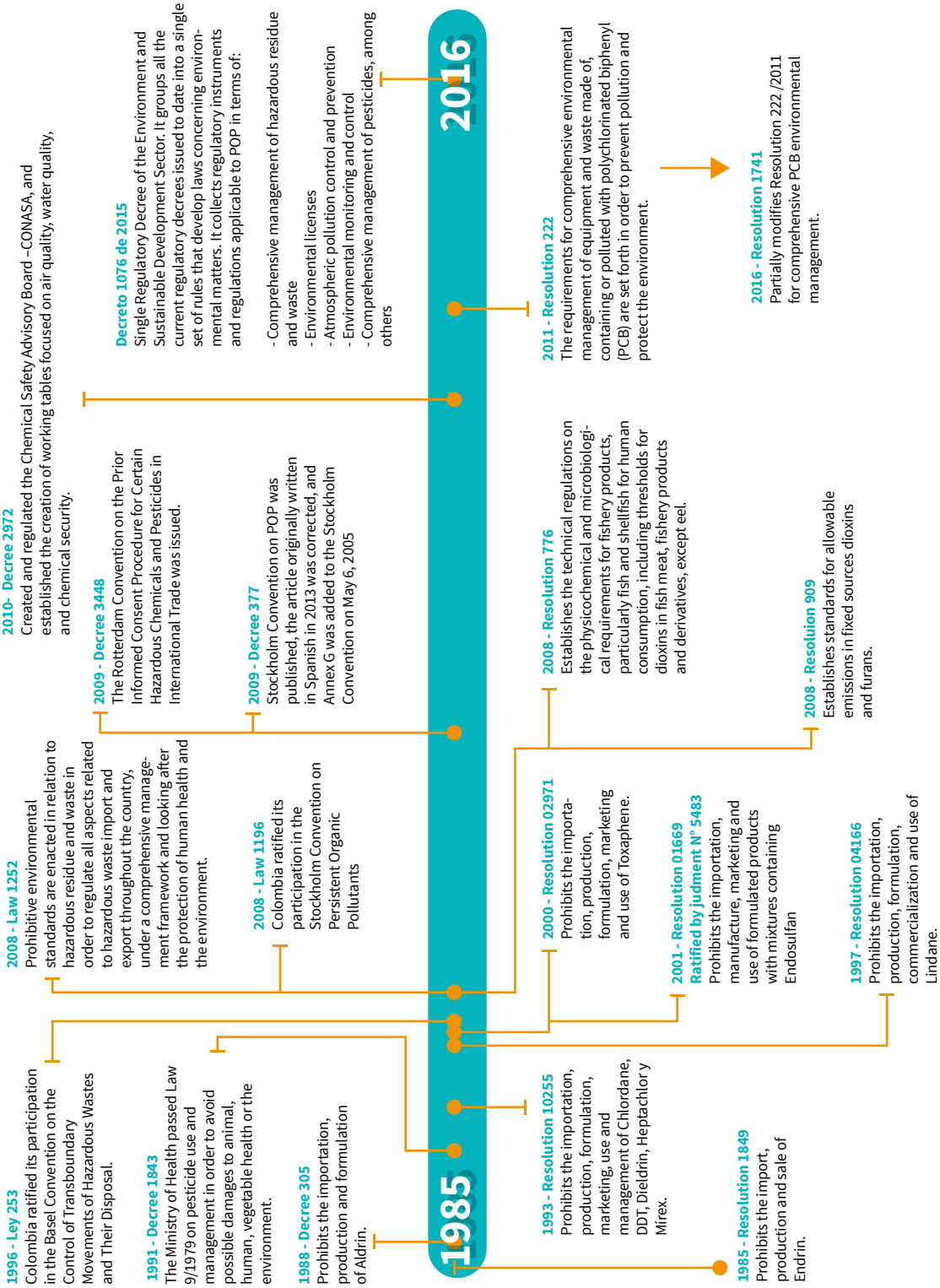



Figure 2.7. General regulations that contribute to comprehensive POP management

**Figure 2 8. Specific regulations that contribute to comprehensive POP management**



Following, and presented in Table 2.2 are shown the legal and administrative measures adopted for Colombia for some of the substances classified as POPs, which allow to fulfil the restrictions in terms of a ban, use, import and export. Also included are the measures to reduce the releases derived from anthropogenic sources of some of the unintentional POPs (dioxins and furans), according to Articles Three and Five of Law 1196 of 2008 where it approved the Stockholm Convention for POPs in Colombia, in this way, complying with Articles three and five (section g) of the Stockholm Convention.

**Table 2.2 Regulatory synthesis of definitive POP Pesticide prohibitions in Colombia**

| Substance | Definitive prohibition | Institution that issued the standard | Summary |
|---|---|---|---|
| Endrin | Resolution 1849/1985 | Colombian Agricultural Institute - ICA | It bans its import, production, and sale. |
| Aldrin | Decree 305/1988 | Ministry of Health [1] and Ministry of Agriculture [2] | It bans its import, production, and formulation. |
| Chlordane | Resolution 10255/1993 | Ministry of Health [1] | It bans its import, production, formulation, distribution, use, and handling. |
| DDT | Resolution 10255/1993 | Ministry of Health [1] | It bans its import, production, formulation, distribution, use, and handling. |
| Dieldrin | Resolution 10255/1993 | Ministry of Health [1] | It bans its import, production, formulation, distribution, use, and handling. |
| Heptachlor | Resolution 10255/1993 | Ministry of Health [1] | It bans its import, production, formulation, distribution, use, and handling. |
| Mirex | Resolution 10255/1993 | Ministry of Health [1] | It bans its import, production, formulation, distribution, use, and handling. |
| Lindane | Resolution 04166/1997 | Ministry of Health [1] | It bans its import, production, formulation, distribution, and use. |
| Toxaphene or Camphechlor | Resolution 02971/2000 | Ministry of Health [1] | It bans its import, production, formulation, distribution, and use. |
| Endosulfan | Resolution 01669/1997 ratified by Ruling N°5483/2001 | Ministry of Health [1] and Council of State, | It bans its import, production, distribution, and use of products formulated with mixes that contain this active ingredient. |

| | | | |
|---|---|---|---|
| PCBs | Resolutions 222/2011 and 1741/2016 | Ministry of Environment, Housing and Territorial Development [3] | It bans the production, use, import of PCB equipment or wastes containing PCBs for purposes other than their environmentally sound management[19]. |
| | Resolution 776/2008 | Ministry of Social Protection [1] | It establishes the technical regulation for the physicochemical and microbiological requirements that should meet the fishery products standards, especially fish, molluscs and crustaceans destined for human consumption, including the threshold for dioxin-like PCB (dl-PCB) in fish meat, fishery products, and derivatives, except for eels. |
| Dioxins | Resolution 909/2008 | Ministry of Environment, Housing and Territorial Development [3] | It establishes the acceptable dioxin emission standard for fixed sources. |
| | Resolution 776/2008 | Ministry of Social Protection [1] | It establishes the technical regulation for the physicochemical and microbiological requirements that required for fishery products, especially fishes, molluscs and crustaceans destined for human consumption, including the threshold for dioxin in fish meat, fishery products, and derivatives, except for eels. |
| Furans | Resolution 909/2008 | Ministry of Environment, Housing and Territorial Development [3] | It establishes the acceptable furan emission standard for fixed sources. |
| | Resolution 776/2008 | Ministry of Social Protection [1] | It establishes the technical regulation for the physicochemical and microbiological requirements necessary to meet the fishery products destined for human consumption, especially fishes, molluscs and crustaceans, including the threshold for dioxin in fish meat, fishery products, and derivatives, except for eels. |

[1] Currently called the Ministry of Health and Social Protection
[2] Currently called the Ministry of Agriculture and Rural Development
[3] Currently called the Ministry of Environment and Sustainable Development

**Source: Information published by the ICA and the Council**

**19.** PCB environmental sound management: an integrated system of technical, financial, administrative, educative and planning actions. The actions are related to the buying, identification, manipulation, storing and transport, surveillance, and monitoring, including the use and disposal stages of the equipment and wastes containing PCBs, framed in the principles of prevention, warning, and minimization of risks, as well as technical and economic efficiency.

In the same way, in the next list are presented the POPs substances which do not have specific regulations in Colombia. Although the management of these substances are under Law 1196 of 2008:

a. Hexachlorobenzene
b. Alpha-hexachlorocyclohexane
c. Beta-hexachlorocyclohexane
d. Chlordecone
e. Pentachlorobenzene
f. PFOS and its salts, PFOSF and its derivatives
g. Hexabromobiphenyl
h. Tetrabromodiphenyl ether and pentabromodiphenyl ether
i. Hexabromodiphenyl ether and heptabromodiphenyl ether
j. Hexabromocyclododecane (HBCD).
k. Hexachlorobutadiene (HCBD)
l. Pentachlorophenol and its salts and esters
m. Polychlorinated naphthalenes

Moreover, in Article five of Law 1196, 2008 and of the Stockholm Convention, it is established that there is a need to adopt measures for the UPOPs releases reduction. Colombia has, along with Resolution 909 (2008) described in Table 2.2, the Environmental Decree 1076 (2015). Title five (chapter 1, section 3) bans the open incineration practices (which is the principal source of UPOPs releases according to the inventory presented in Chapter 3) within the urban perimeter of cities, towns and human settlements, and in the surrounding areas fixed by the competent authority. Similarly, it bans open incineration in rural areas, except from controlled burning necessary to prepare soil in farming activities, to prepare land for mining activities, harvesting crops or stubble disposal and the open fires required to control the effects of frost. These open burning and incineration activities are controlled and subject to the rules established by the Ministry of Agriculture and Rural Development, the Ministry of Health and Social Protection and the Ministry of Environment and Sustainable Development[20]. The aim of the regulation is to reduce open burning and incineration, control atmospheric pollution, prevent fires, avoid adverse health, preserve ecosystems, and protect water sources and infrastructure.

In addition, in accordance with Article six of Law 1196 (2008) and the Stockholm Convention related to the measures to reduce or eliminate releases from inventory and wastes, Colombia incorporates in Environmental Decree 1076 of 2015, its sixth title about the comprehensive management of waste and hazardous waste. It has some key points to guarantee the environmentally sound management of these kind of wastes, including those related to POP inventory and wastes. In Table 2.3 is shown the principal measures in this context.

**20.** It was issue the Resolution 532 (2005). It established the requirements, terms, conditions and obligations for the controlled open burning in rural areas for farming and mining activities.

**Table 2.3 Main measures adopted by Colombia for the environmentally sound management of hazardous waste or residues (including POPs)**

| Subject | Overview |
|---|---|
| **Environmental License for the sound management of hazardous waste (article 2.2.2.3.2.3)** | It gives the jurisdiction to the regional and urban environmental authorities to grant or refuse the environmental licenses for the construction and operation of facilities for the storage, treatment, utilization, recovery and/or final disposal of hazardous wastes. |
| **Framework Purpose and Scope (articles 2.2.6.1.1.1 and 2.2.6.1.1.2)** | In the comprehensive management framework, the intention is to avoid hazardous waste generation and to regulate the management of any such waste to protect human health and the environment. These provisions apply to the national territory and anyone that either generates or manages hazardous waste. |
| **Obligations of the hazardous waste generator (article 2.2.6.1.3.1, points a and b)** | Among the duties are: to ensure the comprehensive management of the hazardous wastes generated and to develop a comprehensive management plan including generation prevention, minimization at source, and to reduce the quantity and hazard characteristics. Also, the generator has a duty to declare any hazardous waste generated in the Hazardous Wastes Generators Register regulated by Resolution 1362 (2007). |
| **Responsibilities of hazardous waste generator and waste manager (articles 2.2.6.1.3.2 and 2.2.6.1.3.8)** | The generator is the responsible person for the hazardous wastes generated. This responsibility includes effluent, emissions, products and by-products, and the adverse impacts to human health and the environment. This responsibility goes on to ensure the environmentally sound management of those wastes.<br>Similarly, the waste manager becomes responsible for the hazardous waste management once the wastes are delivered from a transporter and until achieving the environmentally sound management of those wastes. |
| **Obligations of the hazardous waste transporter (article 2.2.6.1.3.6 points a and b)** | Among other duties, they are the comprehensive management of the hazardous wastes received for their transportation, and to comply with the regulation for hazardous goods transportation. |
| **Obligations of the hazardous waste manager (article 2.2.6.1.3.7, points a, c and d)** | Among the duties are: process and obtain the appropriate environmental licenses, permits, and authorizations needed; process through environmentally sound management procedures the received wastes for one or several stages of their management according to the regulatory framework. Also, provide certification to the generator confirming that the activity has been concluded following the agreement between the generator and the waste manager. |

| Subject | Overview |
|---|---|
| **Responsibility concerns for site contamination and remediation. (article 2.2.6.1.3.9)** | Those people responsible for site contamination due to the inappropriate management of the hazardous wastes are obliged to diagnose, remediate and repair the damage caused to human health and the environment, according to the current legal framework. |
| **Hazardous Waste Transboundary Movement (article 2.2.6.2.1.1)** | All transboundary movements of hazardous wastes are subject to Law 253 (1996) that ratified the Basel Convention for the Control of the Transboundary Movement of Hazardous Wastes and their Disposal.<br>The exporter should take measures according to the current legislation to ensure that the hazardous wastes are transported and disposed of in a sound manner, protecting population health and the environment from adverse effects resulting from these activities.<br>The import and traffic of hazardous wastes within the national territory is banned by any person or legal entity, private or public. Similarly, it is forbidden to disposal of or receive hazardous wastes at in landfill sites that do not meet with the physical and technical conditions required for their safe disposal.<br>Whoever brings a cargo containing hazardous wastes to the national territory or illegally brought it should return it immediately to its source, according to the customs legislation and under the strict control of the environmental authorities. In case of an emergency, risks to the health and environment, due to the hazardous wastes illegally transported within the national territory, the penalty should be according to an impact assessment.<br>Only hazardous wastes that cannot not be treated in a sound manner in Colombia, due to their complexity, within the national territory can be exported. In that case, the generator, transporter and waste manager should accomplish what is established in the Basel Convention and other current related regulation. |
| **Transport and authorization for the transboundary movement. (articles 2.2.6.2.1.2 and 2.2.6.2.1.3)** | The materials that are going to be subjected to transboundary movement should be packaged, labelled and transported according to the international regulations and standards, and have obtained the authorization of the ANLA as well as the consent of the involved countries. |
| **Bans (article 2.2.6.2.2.1)** | a) Introduce or import into the national territory waste or hazardous waste;<br>b) Import waste or waste containing or consisting of Persistent Organic Pollutants (aldrin, chlordane, dieldrin, endrin, heptachlor, hexachlorobenzene, mirex, toxaphene, polychlorinated biphenyls, DDT) following the provisions of the Stockholm Convention.<br>c) Import equipment or substances containing polychlorinated biphenyls (PCB), in a concentration equal to or greater than 50 mg/kg.<br>d) Open incineration of waste or hazardous waste.<br>e) Disposal of waste or hazardous waste in landfills, unless there are security cells within it, authorized for the final disposal of this type of waste.<br>f) Transfer disused electrical equipment, containing or containing dielectric fluids, through auctions, waste bags, auctions or public or private donations, to persons or companies that do not have the corresponding environmental licenses. And without previously informing the competent environmental authority of the results of the physicochemical characterizations carried out to determine the content of PCB polychlorinated biphenyls. |

| Subject | Overview |
|---|---|
| | g) The disposal or burial of hazardous waste or residues in sites not authorized for this purpose by the competent environmental authority;<br>h) The abandonment of waste or hazardous waste on roads, soils, wetlands, parks, bodies of water or anywhere else. |

For more details about the relationship between these tools and the POPs management, and the regulation for each of the sectoral entities, please see the "Actualización del marco institucional, regulatorio y de políticas relativas a la gestión de COP - 2016" document, available in www.minambiente.gov.co.


# 3. CURRENT SITUATION FOR **POPs MANAGEMENT** IN COLOMBIA

## 3.1. Background

Colombia has produced some reports, studies, documents and implementation actions as a contribution to understand and analyse the country's POPs situation based on substantial progress made by the government since 2003[21] through the initial project for enabling activities.

As part of the activities realized for the first version of the NIP (2010), an inventory of POP pesticide stocks (2006) was developed, the preliminary PCB inventory (2007), and the 2002 baseline inventory of dioxin and furan sources and releases (2005). Similarly, the evaluation of available infrastructure and institutional capacity and assessment of Colombia's POP management regulatory framework (2005) was also developed, along with the evaluation of economic and social impacts of using and reducing POPs, including the needs of improving the national capacity (2006), the POP risk management and evaluation manual (2007), and initial dissemination material to meet the needs at the time.

The aforementioned inputs put Colombia in a position ready not only to ratify its participation in the Stockholm Convention in 2008[22], but also to have the necessary elements to create its first National Implementation (or Application) Plan in 2010. This first plan structured its strategies under the concept of risk administration by applying a two-stage process: the analysis or diagnosis and the risk management, including three strategic directions (prevention, elimination, and reduction). Although these strategic directions were considered appropriated for the needs at that time, and in the updated NIP has likewise continued the concept of risk management, but reformulated the actions in five strategic directions as set out in the chemical substances risk management policy[23], and these will be addressed in chapter five of this document.

The different actors in charge of implementing the original NIP were asked about progress made in the first five years of its execution in order to understand the current status of the actions proposed in the 2010 NIP framework. The following presents each one of the four POP groups with the main developments or progress

**21.** Specially, under the financed projects framework with GEF resources corresponding to the activities developed in Colombia in the periods 2003 - 2009 and 2015 - 2017, as well as the specific projects for the capacity building in the PCB sound management (2013 - 2018)

**22.** By means of issuing Law 1196/2008

**23.** CONPES document 3868 of fifth October of 2016

in the implementation of the initial plan (2010 – 2016), as well as the updates or developments in respect of their corresponding inventories for each group in the framework of the NIP review and the updated project (2015-2017).

Furthermore, and to strengthen understanding of the current situation with regard to POPs in the country, the results of the following actions carried out during 2016 regarding the POP inventories are presented as a key input for updating the NIP:

- Updating of POP pesticide inventory
- Update of PCB inventory
- Recalculation of baseline inventory of dioxins and furans (2002) with the 2013 toolkit, given that the update of the same is scheduled to begin in 2018
- Preparation of an initial inventory for POPs for industrial use as a first approximation to their status in Colombia.

It is expected that, in the medium term, it will provide an essential input for updating POPs inventories and the consolidation of the instruments and mechanisms of environmental management, especially the management of chemical substances and their associated information systems, which have been strengthened in recent years in the field.

In 2016, the document CONPES 3868[24] was developed and approved for the risk management policy associated with the use of chemical substances, based on the guidelines and recommendations of the OECD Chemistry Committee, which contributed to the country's accession process to this international organisation. There are different actions proposed to reduce the adverse effects on population health and the environment, through the implementation of management programs for chemical substances for industrial use and the prevention of significant accidents associated with these substances, promoted by several ministries and entities with the necessary competence in the subject.

As part of these programs, it is envisaged that a pollutant release and transfer register will be designed and implemented. The register has been advanced with inter-institutional and inter-sectoral participation in line with the OECD guidelines[25]. This register has information on the nature and quantity of emissions and transfers of pollutants to the environment released by different productive activities in the national territory. It will be available to the public in a manner that the information provided by the tool to the public on polluting sources will facilitate the promotion of environmental improvements in industrial processes and guarantee citizens their rights to information.

## 3.2. POP Pesticides[26]

According to a study conducted by the Superintendence of Industry and Commerce - SIC[27], Colombia stands out as one of five countries with the highest average use of pesticides worldwide to improve agricultural production (including some POP pesticides). In 2013, 1,573 products belonged to 5 types of pesticides[28] were under surveillance; they were mostly herbicides (40.8%), fungicides (35.6%) and insecticides (23.3%) (SIC, 2013). Given this highly-significant consumption pattern, concerted efforts have been made to strengthen the institutions involved in the pesticide registration process under the Andean Decision for POP pesticides assessment.

Since in Colombia had already identified damaging effects, especially in health, associated with the use of many of these substances, Colombia has been progressively regulating their prohibition for many of them since the 1980's, through institutions such as the Ministry of Health and the Ministry of Agriculture, or ICA. As part of these regulations there are specific bans for some pesticides the pre-dated the introduction of the Stockholm Convention, which nowadays are considered POP pesticides.

**24.** Document CONPES 3868, approved on October 5th (2016). National Economic and Social Policy Council, Republic of Colombia. Policy on Management of the Risk associated to Chemical Substances Use.

**25.** Organisation for Economic Cooperation and Development (OECD). Recommendation C (96) 41 for the implementation of a pollutants releases and transfers register system

**26.** The substances addressed in this group of POPs, which have applications as pesticides, are 17 in total. From Annex A: Aldrin, dieldrin, endrin, chlordane, heptachlor, mirex, toxaphene, alpha-hexachlorocyclohexane, beta-hexachlorocyclohexane, lindane, chlordecone, endosulfan, pentachlorophenol and its salts and esters; from Annexes A and C: hexachlorobenzene (HCB), pentachlorobenzene (PeCB); and from Annex B: DDT and PFOS as sulfluramid.

**27.** Pesticides in Colombia study. Superintendence of Industry and Commerce – Economical studies group, 2013.

**28.** Herbicides, fungicides, insecticides, acaricide-insecticides and fungicide-insecticides.

Although Colombia has currently specific regulations for the prohibition of production, use or commercialization for ten (10) of the POP substances used as POP pesticides[29], as shown in Table 2.2, there is still no specific legislation for the other seven (7) POP pesticides[30]. In this way, the agencies for sanitary and environmental control institutions are the resources under Law 1196/2008, which ratifies the country's participation in the Stockholm Convention on POPs, and directs parties to avoid the production and commercialization of POP pesticides, that is, within the framework of the pesticides registration process in the national territories. However, it is advisable to develop a technical and legal analysis to determine the needs of issuing specific prohibition regulations for these seven (7) substances, and this particular action plan for this POP group is presented in Chapter 5.

Colombia, due to its agricultural disposition, has for some decades, used some pesticides before they were classified as POP substances. Indeed, this is not only the case for agricultural use, but also for vector control in public health, and they are as follows:

- Aldrin
- Dieldrin
- Endrin
- Chlordane
- Heptachlor
- Hexachlorobenzene - HCB
- Mirex
- Toxaphene
- Lindane
- Endosulfan
- Pentachlorophenol and its salts and esters
- DDT
- PFOS-(e.g. sulfluramid), its salts and PFOSF.

Although there is specific legislation for some of them, it is assumed that from this list there is illegal use of endosulfan and lindane in certain circumstances and these instances should be identified by the competent authorities.

**29.** 1) Aldrin, 2) Endrin, 3) Dieldrin, 4) Chlordane, 5) DDT, 6) Heptachlor, 7) Mirex, 8) Lindane, 9) Toxaphene, and 10) Endosulfan.

**30.** 1) Hexachlorobenzene, 2) alpha-hexachlorocyclohexane, 3) beta-hexachlorocyclohexane, 4) chlordecone, 5) pentachlorobenzene, 6) sulfluramid (PFOS) and 7) pentachlorophenol.

### 3.2.1. Progress on the implementation of the action plan

As part of the specific 2010 NIP pesticide action plan and the continuity given by an updated plan presented in Chapter 5 of this document, strategies were proposed with a preventive approach and risk related management of these substances and inventory elimination.

Among the reported actions planned in the 2010 prevention strategy plan, was a regime to maintain and update the production and marketing registration of chemical pesticides for farming use, including POP pesticides. It was found that Colombia is continuing to make important strides towards improving and updating the registrations, which are held by the Colombian Agriculture Institute (ICA). The registrations are pursuant to the procedures outlined in the Andean Community of Nations (CAN) regulations and prior evaluations of toxicology, environmental risk and effectiveness carried out by the National Institute of Health (INS), the National Authority for Environmental Licensing (ANLA) and the ICA.

Accordingly, a re-evaluation of molecule formulations was carried out from 2010 to 2015 to apply the Andean standard to uses or permits previously granted[31] and the Andean Technical Manual is currently being updated in accordance with the Andean Decision 804/2015 (Minsalud, 2016).

Furthermore, the environmental sector continues to strengthen its technical-legal evaluation processes and the corresponding annual monitoring, not only for the aforementioned pesticides for agricultural use (including POP pesticides), but also for other (public health, industrial, veterinarian and domestic uses) chemical pesticides within the framework of environmental rulings and environmental licensing on production, creation or repacking plants of the associated chemical pesticides. Similarly, there is a continuous ongoing revision about the (favourable or unfavourable) environmental opinion on the issue of the import of pesticides through the Single Window for Foreign Trade-VUCE (ANLA, 2016), which implies the revision of the restrictions applied to those substances (including POPs).

The results of the environmental and health assessments for different substances used as pesticides could be an essential information source. With this information, it is possible to participate as a Party in various discussions related to the inclusion of new formulations to the list of POP substances, according to the establishment in number 4 article 3 of the Law 1196 (2008) and the Stockholm Convention.

There has been significant progress related to strengthening the phytosanitary and sanitary measurement system – MSF. This system is designed to guarantee the agricultural and livestock sanitation and food safety. It was found that evaluation by the MSF policy enforced by the DNP and Fedesarrollo (2012)[32] showed important

**31.** Pursuant to Resolution 3497/2014, whereby the procedure for revaluation of chemical pesticides for agricultural use recorded before CAN Decision 436 was made effective, and other dispositions are established.

**32.** Institutional and result evaluation of the national policy on agricultural and livestock sanitation and food safety. DNP & Fedesarrollo (2012). Pags. 13, 26, 296 and 299.


progress by managing to introduce the concept of the System as an integral part of this MSF policy, changing from an uncoordinated scheme operated by sanitation and health authorities with little mutual communication to a more cross-cutting approach among agriculture, health, environment and trading sectors, thus facilitating the achievement of the results expected by the institutions operating under a unified MSF System approach.

Some of the institutions running the system such as the ICA, INVIMA and INS have significantly strengthened their staff, physical infrastructure (laboratories, branches, etc.), information systems and operating capacity, thus enabling normative and technical strengthening. However, the study concludes that the MSF system is in a consolidation process and must continue to be strengthened by the MSF Commission and its participating institutions in order to achieve the objectives proposed in the corresponding policy, as well as strengthening the interest in monitoring pollutants (including POPs) in food.

Since 2010, the INVIMA has started to develop national plans to oversee and control pesticides (including POP) and chemical pollutants in chemical animal or vegetable products; the plan results have been officially communicated to the ICA as a primary production component to manage the corresponding risks.

The Ministry of Agriculture and Rural Development and the Ministry of Health and Social Protection issued specific regulations[33] in order to establish an order of sanitary authorities that allows them to work jointly in the development, execution, monitoring and evaluation of national sub-sector plans to monitor and control wastes in food, as well as, implement the inspection, surveillance and control systems - IVC for pesticide residue, including POP in food.

In addition, and in line not only with national agricultural and livestock, health and environmental policies, but also with Andean Decision 804/2015, the proper use and management of pesticides is guided within the framework of good agricultural practices – GAP, to prevent and minimize risks to human health and the environment. From 2010 to 2015, 1,929 properties obtained a GAP certification to produce avocado, blackberry, citrus fruits, onions, plums, spinach, mangos, cashews, pomegranates, pitahayas, pineapples, plantains, tomatoes, lettuce and cabbage; training workshops were attended by more than 1,000 GAP external technical instructors; field sessions were developed in different regions for the benefit of a total of 4,612 producers; and the GAP regulations were explained to more than 11,000 people including producers, marketers, and stakeholders related to the vegetable and fruit supply chain throughout the country (ICA, 2015). It is hoped that with the GAP implementation and the awareness developed among farmers in terms of the responsible use of agrochemicals, the use of POP pesticides will be reduced, minimised or prevented.

Important synergies have been achieved in customs control among the Directorate of National Taxes and Customs - DIAN, Fiscal and Customs Police - POLFA and the Colombian Agriculture and Livestock Institute – ICA. However, as shown by the POP pesticide inventory outcomes below, it is necessary to continue to strengthen them to avoid the illegal entry and use of forbidden substances in Colombia, including POP pesticides.

The POP pesticides stocks that has been identified in the past five (5) years (after the ones identified and reported in the 2010 NIP[34]) are related to the seizures achieved with the DIAN, POLFA and ICA during the years 2010, 2011 and 2014, where 110, 250 and 43 litres respectively were recovered, corresponding to pesticides where the active component was endosulfan, intended for illegal entry and commercialized in the country. These stocks were eliminated in an environmentally sound manner through licensed waste managers (DIAN, 2016), as well as other stocks of obsolete pesticides such as lindane.

However, it is considered that the available statistics are still generic for the seizures since they are not divided by active components (except some specific exceptions as the described for endosulfan), but by functional

**33.** Resolution 770/2014, whereby the guidelines to develop, execute, monitor and evaluate National Subsector Plans for Surveillance and Control of Wastes in Food, and other regulations are set forth.

**34.** In 2009, the country, through the Ministry of Social Protection (today Ministry of Health and Social Protection), eliminated stocks of 167.46 tons of DDT. Which 149.57 tons (principally DDT in high concentrations) were exported to Finland and 17.89 tons (wastes containing low DDT concentrations) were eliminated in the country, as it was reported in the NIP 2010.

subgroups[35] and that is why is difficult to determine which are POP pesticides[36]. The customs authorities still do not have the technical capacity and operative experience to comprehend the technical description of all the seized smuggled goods. They do not have a way to systemize the product information in their database, identify the active ingredients and the commercial names of several pesticides.

Besides, it must be borne in mind that these arrests are not always due to prohibitions of substances in the national territory, but may also be other types of substances that despite being allowed entry, do not comply with the legal procedure for the import of these products.

Similarly, the customs authorities state that they have storage contracts for goods apprehended in most of the country's Sectional Directorates. However, due to the information provided in their databases, it cannot be established if this storage is taking place in an environmentally sound manner, which could imply potential environmental and health risks in some regions of the country. This generates the need to establish support mechanisms for the customs and trade authorities and strengthening the technical and operational capacities, so that goods with dangerous characteristics that are confiscated are identified and managed until their final disposal according to the current environmental regulations. Likewise, strengthening the capacities of inter-institutional management of the pesticides listed in the annexes of the Stockholm Convention is also essential.

In the year 2015, it was enacted the Law 1762 of 2015 or the Anti-Smuggling Law was enacted. This law authorised formal operations, where they could be identified to facilitate the dismantling of organisations or gangs dedicated to this menace, in the framework of the inter-institutional and inter-associations, where the private sector has combined efforts to protect the national industry and its jobs. In this way, there are important efforts by some of the industry production associations through their participation in associated programs for combating smuggling, and a project against counterfeiting of products and brands. (ANDI, 2016)

Efforts have been made by the control agencies, such as the Tax and Customs Police, the Directorate of National Taxes and Customs (DIAN) and the Colombian Agricultural Institute (ICA), as well as their counterparts in some unions in the agricultural sector. But, they have still not been able to consolidate the numbers or estimates that enables the National Government to evaluate the magnitude of the problem of the illegal trade or smuggling of POP pesticides into Colombia.

However, the instances of illegal trade have been corroborated through the emergence and reports of recent cases of poisoning, mainly associated with the illicit use of endosulfan. Likewise, these occurrences and oth-

**35.** Fungicides, tickcide, herbicides, insecticides, fly-insecticides, pesticides, rodenticide, larvicides.

**36.** According to the operational results bulletins about the fight against chemical smuggling and illegal commerce in Colombia during the last years by POLFA (2016), it was realized seizures of 141.1 tons of pesticides in 2013, 57.4 tons in 2014 and 54.4 tons in 2015.

er cases involving organochlorine pesticides in the studies carried out by the National Health Institute (INS) (presented in table 3.2) and the environmental monitoring carried out mainly in marine waters and sediments undertaken by INVEMAR[37], they corroborate its presence and persistence in part of the population and ecosystems of Colombia.

Concerning the environmentally safe handling of stocks, under the Basel Convention, the following transboundary movements of POP pesticides were carried out between 2010 and 2015 for their destruction (ANLA, 2017):

**Table 3.1 POP Pesticides transboundary movement under Basel Convention**

| Exported POP pesticide | Quantity (kg) year 2011 exported to Finland | Quantity (kg) year 2013 exported to Finland | Quantity (kg) year 2015 exported to Sweden |
|---|---|---|---|
| Endosulfan | 1,324 | 1,737 | - |
| Lindane | 322 | - | 1,471 |

**Source: Prepared according to the information given by ANLA, 2017**

In the other hand, DDT substitution in Colombia, after it was prohibited was achieved by means of a comprehensive vector management strategy, which took into account comprehensive and integrated control measures directed to the vector, including basic environmental sanitation, personal protection and the use of chemical insecticides employed in public health rationally and carefully. Chemical control as a component of comprehensive vector control is advisable in emergency situations caused by outbreaks in order to eliminate or reduce the density of disease-transmitting insects, by using insecticides classified as larvicides and adulticides. The selection and supervision of inputs and equipment is in line with the 2012-2021 Ten-Year Public Health Plan and guidelines and regulations recommended by the World Health Organisation Pesticide Evaluation Scheme (WHOPES), among others.

Moreover, it has been identified there is a  need to establish an interinstitutional roundtable (public and pri-

**37.** The quality of marine waters is an excellent indicator that allows having evidence of the runoff of pesticides from continental activities. The Institute of Marine and Coastal Research "José Benito Vives de Andréis" - INVEMAR published a report newspaper titled "Diagnosis and evaluation of the quality of marine and coastal waters of the Colombian Caribbean and Pacific". This report presents the results of the monitoring carried out for the following POP pesticides: total hexachlorocyclohexane, aldrin, heptachlor, total organochlorines, the summation of DDT and its metabolites. In general, the values found in the last monitoring report of marine and coastal waters (2015) showed that there are some POP pesticides. The concentrations found do not exceed the reference values set by the Environmental Protection Agency - US EPA or the Canadian Council of Ministers of the Environment - CCME. Except for the case of DDT in sediments in the Ciénaga La Caimanera, department of Sucre during the dry season in 2014, where the concentration was 6.0 ng / L, exceeding the limit proposed by the CCME (1999) of 4.77 ng / L.  In general terms, it can be said that the concentrations found for most cases do not represent a risk of acute effects to living beings (INVEMAR, 2016).

vate) where technical and scientific issues are discussed related to the inclusion in the Convention of new POPs, to the POP exemptions process application and restrictive measures that the Parties should take.

Referring to POP pesticides contaminated sites; in 2009, the Ministry of Environment, Housing, and Territorial Development, in partnership with National University of Colombia, conducted three studies in El Copey (Cesar), Codazzi (Cesar) and Barranquilla (Atlántico). These studies conducted research about soil contamination and risk assessment analysis for contaminated sites with POP pesticides in those municipalities. They found that soil and groundwater remediation was required in Barranquilla[38], while El Copey was experiencing a particular circumstance that did not generate any significant risk to public health, but limited the use of the property. In the case of Codazzi, it was considered that the concentrations were low and it is not a contaminated site. Therefore, this issue should be addressed in the country, that is, in efforts directed towards the policy framework for contaminated sites and remote environmental management.

Related to studies and research on exposure to POP pesticides, the National Institute of Health -through the Occupational Health and Environment Group- has participated in publishing different scientific papers related to organochloride pesticides that include several POPs and are briefly presented in the following chart:

**Table 3.2 Research on POP pesticides with INS participation**

| Title | Description |
|---|---|
| Exposure to pesticides experienced by Bogota River riverbank (Suesca) inhabitants and in the fish Eremophilus mutisii (2012) | Its results showed the presence of organochloride pesticides in the river, fish tissue and biological human samples. 101 workers directly exposed to pesticides, who handle highly-toxic products, participated in the study; errors in hygiene and industrial safety measures were evidenced, so they were advised to implement and/or strengthen programs intended to minimize occupational exposure. 88% had any or some of the following 11 pesticides to an extent: α-BHC, β-BHC, HCB, heptachlor, oxychloride, α-chlordane, γ-chlordane, α-endosulfan, β-endosulfan, endosulfan, and 4,4-DDE. They presented an average of 1.087 µg / L, a range between 4.1255 and 0.1929 µg / L, and the latter was reported more frequently. 1.2514 µg/L was the mean obtained by determining these pesticides in 105 serum samples. |

**38.** The countries that adhere to the Stockholm Convention are required to identify the POP-contaminated sites; however, the decision to initiate remediation activities is autonomous for each country, according to their financial resources. In the case of sanitation of those sites, this should be done in an environmentally sound manner.

| | |
|---|---|
| Organochlorine pesticide exposure among agricultural workers in Colombian regions with illegal crops: an exploration in a hidden and dangerous world (2010) | A sample of 99 individuals was collected from 2005 to 2006 for this study. Organochlorine pesticides were quantified by chromatography in serum samples and heptachlor (72.73%), 4,4-DDE (19.19%), aldrin (15.15%), g-chlordane (12.12%), dieldrin (10.10%),α-endosulfan (8.08%), endosulfan (6.06%), β-endosulfan (5.05%), oxychlordane (3.03%), and DDT (2.02%) were detected. No association between exposure level variables was identified, but data suggested that organochlorine pesticides forbidden in Colombia had been used. |
| Exposure to pesticides and genotoxic effects on rice agricultural workers (2013) | All blood samples reported positive values for organochlorine pesticides a-HCH, hexachlorobenzene, heptachlor, oxychloride, 4,4-DDE, β-endosulfan, 2,4-DDT, and endosulfan sulfate. Evaluated individuals who work with rice crops in Guamo municipality showed greater DNA damage than individuals from Espinal and Purificación Municipalities. These values may be related to occupational and environmental exposure to pesticides and their management such as using personal protection equipment (PPE) for their handling and storage. |

**Source: Prepared according to the information given by INS, 2016**

### 3.2.2. POP pesticide inventory update

*Overview*

The POP inventory-update incorporated information related to substances added by the Stockholm Convention to the convention annexes in the past few years[39] amounting to a total of 17 substances used as pesticides.

It was based on the inventory made in 2006 and the complementary information obtained by the Ministry of Environment and Sustainable Development from 2014 to 2016 by means of specific inquiries with the environmental authorities, ICA branches, DIAN and unions concerning pesticide production or commercialization in the country, and by verifying information with the main stakeholders involved.

Considering that a large percentage of POPs have been explicitly banned for many years by the sanitation and health authorities in Colombia, Colombia's official statistics on the production, import and export of these substances were analysed to verify compliance with the regulations. For this purpose, the statistics on POP

**39.** The substances addressed in the updated inventory and used as POP pesticides were: From Annex A: Aldrin, Dieldrin, Endrin, Chlordane, Heptachlor, Mirex, Toxaphene or Camphechlor, Alpha-hexachlorocyclohexane, Beta-hexachlorocyclohexane, Lindane, Chlordecone, Endosulfan, Pentachlorophenol and its salts and esters; From Annexes A and C: Hexachlorobenzene-HCB, Pentachlorobenzene-PeCB; From Annex B: DDT and PFOS as Sulfluramid.

pesticide production and commercialization reported in the 2006 inventory were collated for the 1970-2014 series[40] concerning the 9 initial substances[41] and for the 2000-2014 series 8 new substances used as pesticides were added, and these were included in the Convention annexes from 2009 to 2015[42].

*Results*

The characteristics of POP-pesticide production, import, and export statistics is presented in brief in Graph 3.1. The red line represents the year of prohibition for each substance in Colombia (when applicable) and according to the established format outlined in Article 3 (numeral 1) of Law 1196 (2008) and the Stockholm Convention[43], the green line represents the effective year, based on their incorporation into the Stockholm Convention Annexes.

The official numbers demonstrate that prohibitions made in Colombia from 1985 to 2000 and shown in table 2.2, stopped the formal production and commercialization of some POP pesticides such as Aldrin, Endrin, Dieldrin, Toxaphene or Camphechlor, Heptachlor, DDT, Mirex and Chlordane, which is also in line with Article 3 of Law 1196 (2008) and Article 3 of the Stockholm Convention. From the initial list of POP pesticides that became enforceable in 2004, only Hexachlorobenzene had no specific prohibition regulation in Colombia; however, only a few exports were reported from 1976 to 1977.

In turn, lindane and endosulfan, which were officially and internationally acknowledged as POPs in 2009 and 2011, were already included in a prohibition for production, use and commercialization in Colombia from 1997 to 2001.

Although lindane exports were recorded in 1998 (1.83 tons), 2005 (2.33 tons) and 2007 (2.02 tons), official numbers show that its formal commercialization stopped a couple of years before its international regulation became effective in 2009.

Similarly, endosulfan imports of 238.6 tons and exports of approximately 1,136.81 tons were recorded in 2002. Therefore the official numbers mean that Colombia ceased legal production and commercialization of this substance in 2002, and it was subsequently regulated within the Stockholm Convention framework starting on 2011.

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**40.** Information as of 2014, pursuant to the last technical journal of statistics published by the ICA in 2015.

**41.** Aldrin, eldrin, dieldrin, toxaphene, hexachlorobenzene, heptachlor, DDT, mirex and chlordane.

**42.** Alpha-hexachlorocyclohexane, beta-hexachlorocyclohexane, lindane, chlordecone, pentachlorobenzene, endosulfan, sulfluramid- derived from PFOS and pentachlorophenol.

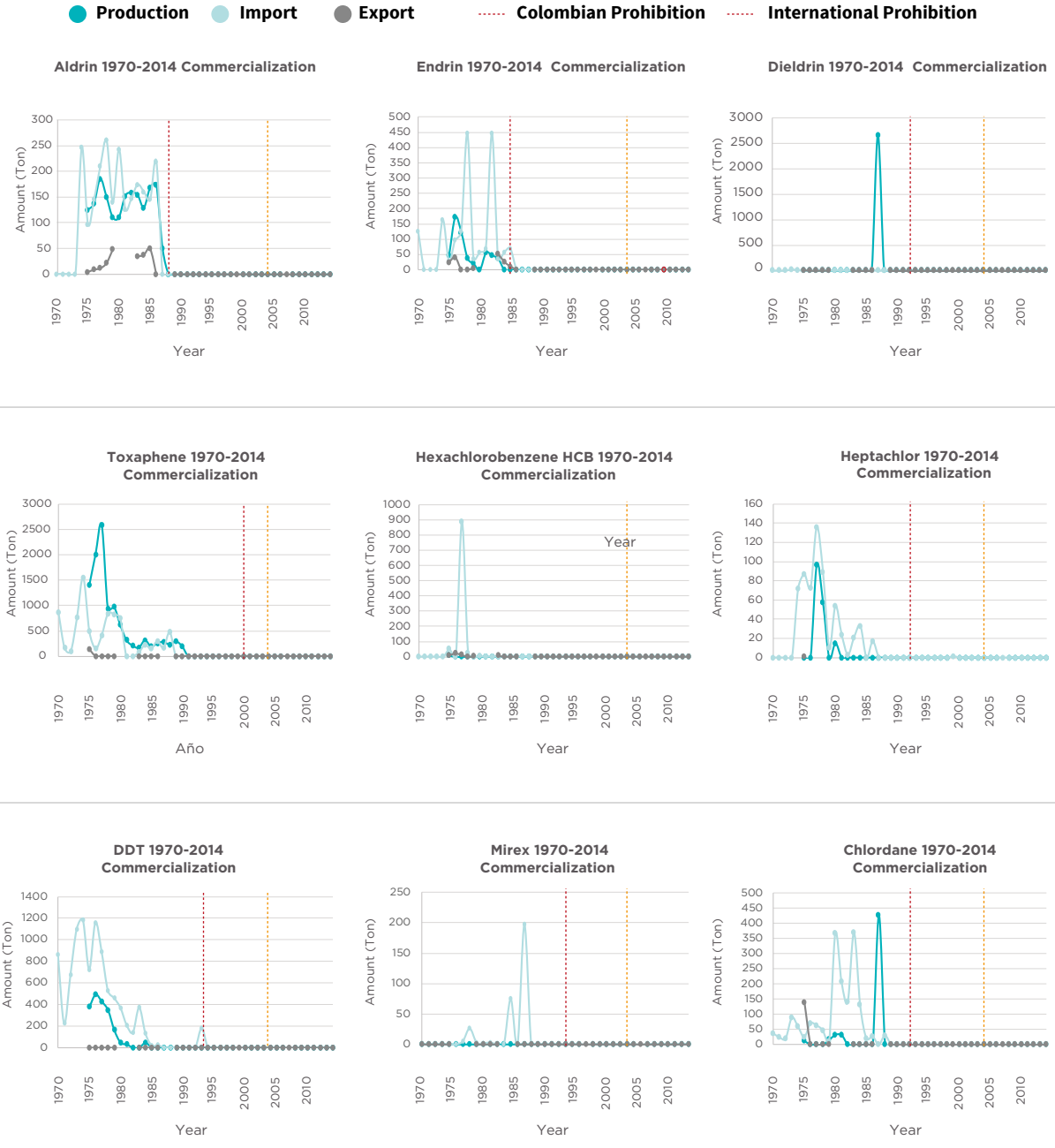
**43.** Each Party shall (a) prohibit and/or take the legal and administrative measures necessary to eliminate: (i) Its production and use of the chemicals listed in Annex A subject to the provisions of that Annex< and (ii) Its import and export of the chemical listed in Annex A in accordance with the provisions of paragraph 2, and (b) Restrict its production and use of the chemicals listed in Annex B in accordance with the provisions of that Annex.

The official numbers for other substances shown such as alpha-hexachlorocyclohexane, beta-hexachlorocyclohexane, chlordecone and pentachlorobenzene, provides evidence that no production or commercialization of these POPs has been performed in Colombia since the year 2000 and to this date. On the other hand, minor imports of Pentachlorophenol were reported from 2009 to 2010; however, they were officially acknowledged as POPs only from 2015.

In the analysis of Sulfluramid (PFOS), it is possible to identify initially some imports of this substance into the country from 12 to 25 tons between 2001 and 2003; more significant imports of 54 annual tons were recorded from 2008 to 2011, except for 2010 when there were none recorded. These last imports attract attention because the substances were added to Annex B (with some restrictions) of the Stockholm Convention in 2009, but the conclusion is that the imports occurred within a transition process when there was misinformation among the involved stakeholders on whether Colombia had been or had not been granted an exception for its use; an exception that was not required by Colombia.

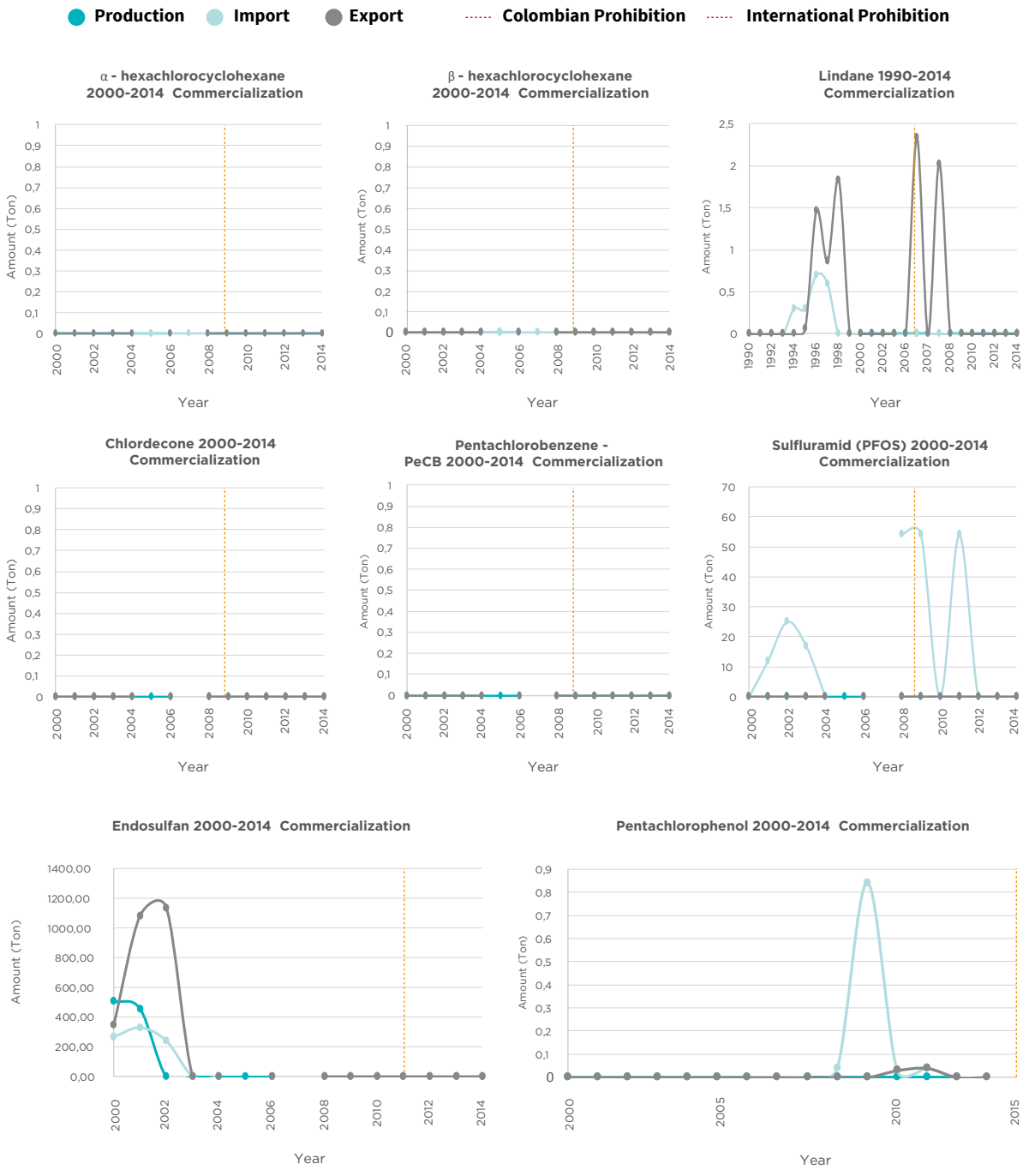
Additionally, when verifying the available statistics on production, imports or exports of POP pesticides, it was found that there was no activity of any sort for sulfluramid for these years. There were sales of this substance reported for the years 2014 and 2015 (2,843 kg and 1,879 kg respectively), which when cross referenced against the information reported by the Stockholm Convention through document POPRC.12 / INF / 15Rev.1, indicates that this substance came from Brazil, following the information published by that country. However, it must be verified with the ICA because the imports reported by Brazil to Colombia are not reflected in the statistics, only the corresponding sales.

## Graph 3.1. Statistics on POP pesticide production and commercialization in Colombia until 2014, part 1 (tons of active ingredient)[44]




**44.** Data obtained from the ICA's annual technical journals on production and commercialization of agricultural inputs. Data in the 1970-2000 series on some of the pesticides shown have already been reported by the former Ministry of Environment, Housing and Territorial Development and the 2006 pesticide inventory.

**Graph 3.2. Statistics on POP pesticide production and commercialization in Colombia until 2014, part 2**




**Source: Minambiente (2016a)**

Despite the general encouraging panorama reflected by the official numbers, the results of some studies and the perception of many stakeholders involved is that, an illegal trade of these substances, especially endosulfan and to a lesser extend other pesticides forbidden in Colombia, continues to occur in some regions of the country, where they allegedly enter the nation through some border areas of neighbouring countries where these pesticides are still being produced.

The Ministry of Environment and Sustainable Development has been raising a variety of questions about the existence of POP pesticides in Colombia since 2014[45] among the stakeholders involved in order to update the information available on the matter, focusing especially on determining endosulfan, lindane, sulfluramid and chlordecone stocks. This data base was complemented in 2016 through additional inquiries.

This project was supported by different government and pesticide-industry institutions, so it was possible to obtain recent data through technical meetings and surveys[46] intended to collect information on site to identify existing amounts, localization, storage, comprehensive management actions, analysis of current regulations in Colombia and the extent and existence of records.

According to Zárate (2014) and enquiries realized during 2016, the main findings of the POP pesticides inventories identified in the country are:

- Company's data gathered by Cámara Procultivos of the ANDI and ASINFAR, that represent approximately 95% of the pesticide industry in Colombia, reported that none of the companies surveyed has POP stocks and these companies state they have not acquired, imported or traded any pesticide classified as a POP in the past years.
- The environmental authorities that provided a response stated they do not have endosulfan, lindane, sulfluramid and chlordecone inventory of any of such POP Pesticides. Similarly, they communicated their unmitigated commitment to disseminate related information in their jurisdiction, as well as, report to the Ministry of Environment and Sustainable Development of any case of any type of finding that arises on this matter.
- In turn, the ICA reported through its Branch Manager's Office in Putumayo that although there are no current POP stocks in institutions, 14 litres of Endopac and 29 litres of Palmarol insecticide with endosulfan as the active ingredient were seized in 2014 during the activities of the inter-institutional support group with the DIAN's Puerto Asís (Putumayo) Office; such products entered that region

**45.** Information in this section related to Endosulfan, Lindane, Sulfluramide and Chlordecone POP pesticides was obtained from the results of the consultancy developed with Eng. Yonny Zárate Amaya by means of contract number 118/2014 and updated in 2016 by the Ministry of Environment.

**46.** After performing 74 queries addressed to the relevant governmental and pesticide-industry institutions in the country, 26 of the queried parties provided a response, that is, 53%.


of the country through illegal activities such as counterfeiting, but timely action by the relevant authorities led to a successful seizure. Following on in a similar manner, the DIAN's Puerto Asís Office (Putumayo) stated that in addition to the seizures from 2014, they had already seized 20 litres of endosulfan, 90 litres of palmarol in 2010 and 230 litres of palmarol, and 20 litres of endopac in 2011. Similarly, they reported that the disposal of the entire stock seized was performed by means of an authorized manager from Valle del Cauca, so they had no POP pesticide stocks at their facilities by the time of query.

- On the other hand, when the ICA's databases were queried, they found that there were not current records of endosulfan, lindane and chlordecone as of 2014. Nevertheless, there is evidence of a sale with a Sale Registration Number of 3276 issued in January 14, 1999, granted to the Agrocorp S.A. company, and corresponding to the insecticide product Atta-Kill, whose active ingredient is 3% sulfluramid, in toxicological category III, in a special form as Granular Bait (GB).

*Conclusions*

According to the official statistics, currently Colombia no longer produces, imports or exports formally any of the 17 POP substances used as pesticides, except for some sales registered in 2015 for sulfluramid (PFOS), and these sales authorisations should be reviewed and stopped as part of the Action Plan.

Although Colombia has not currently identified any stocks of POP pesticides because those identified in the past have been disposed of in environmentally sound manner, some outstanding issues must be resolved such as those related to strengthening the different stakeholders involved, special control stakeholders, in order to guarantee that these substances do not continue to enter Colombia illegally and are no longer used in some regions of the country. Similarly, their identification and management must be strengthened in the confiscation processes in order to be able to perform the environmentally sound disposal of the seized goods depending on their characteristics.

## 3.3. Polychlorinated Biphenyl – PCB

### 3.3.1. Progress on the implementation of the action plan

One of the greatest POPs management improvements in Colombia is related to the comprehensive environmental management of PCB, which has been leveraged in the last years by implementing the *"Desarrollo de la capacidad para la gestión y eliminación ambientalmente adecuada de los bifenilos policlorados (PCB)"*[47] *project.* This project was developed in line with the provisions of the particular action plan created for these substances within the 2010 National Implementation Plan for the implementation of the Stockholm Convention, and it has continued to be executed since 2013. The following is a summary of the main areas of progress achieved to date.

#### a. Strengthening the legal, administrative and regulatory framework for proper PCB management.

Colombia developed a specific regulation in 2011 to establish the requirements for comprehensive environmental management of equipment and wastes containing PCB[48], and given that aspects requiring clarification or improvement were evidenced in its first five years of implementation, joint work was carried out with all the stakeholders within a sector framework of collective construction called the "National PCB Board", which was formed in 2010 with participation from different public and private organisations with the objective of updating this regulation[49].

This regulatory update led to some clarifications related to aspects such as: identification and labelling re-

**47.** Project financed with GEF resources and the UNDP support.

**48.** Resolution 0222/2011 "*Whereby the requirements for comprehensive environmental management of equipment and wastes containing, formed by or contaminated with PCB are set forth*".

**49.** Resolution 1741/2016 "Whereby Resolution 22/2011 is modified, and other provisions are adopted"

sponsibilities, PCB identification procedures, PCB analysis and sampling protocols, classification into groups for the inventory, labelling goals for equipment under inventory, information to be filled in on the PCB form, cross-contamination in maintenance of electric equipment and dielectric oil, and PCB management plans intended to reduce risks and enact prohibitions.

Diverse educational sessions were carried out with different stakeholders involved from 2013 to 2016 in order to disseminate the published regulations, study in detail the PCB-associated risks and management, as well as, promote the activities stated in the 2010 action plan, which were as follows:

**Table 3.3 Training sessions to strengthen the regulatory and administrative framework for comprehensive PCB management from 2013 to 2016**

| Involved stakeholders | N. workshops | N. of people trained | Description |
|---|---|---|---|
| Environmental authorities. | 14 | 205 | PCB overview and basic concepts, regulations on PCB management and how to fill in and manage data from the national PCB inventory. |
| Customs control and foreign trade authorities | 3 | 118 | Illegal traffic of hazardous wastes focusing on PCB and instruments to control imports and exports of equipment and wastes contaminated with PCB. |
| Environmental authorities. | 1 | 40 | Discussion on the criteria for the action plan for contaminated-site remediation, as well as, the future creation of regulation to this regard. |
| **Total** | **18** | **363** | |

## b. Developing the national capacity for environmentally sound PCB management.

- ***Education and training to strengthen technical capacity***

Diverse technical education and training sessions were developed from 2013 to 2016 with different stakeholders involved in the PCB management chain to facilitate their environmentally sound management and these are shown in Table 3.4.

**Table 3.4 Training sessions to strengthen the technical capacity for safe PCB management carried out from 2013 to 2016**

| Stakeholders Involved | N° of workshops | N° of participants | Description |
|---|---|---|---|
| Sanitary authorities and other stakeholders of the health and labour sector | 5 | 26 | Toxicological aspects of PCBs and their effects on health, strategies for epidemiologic surveillance of the population under occupational risk of exposure, alternatives to prevent population under risk from being environmentally exposed to PCB |
| Environmental analysis laboratories | 1 | 20 | Training on dielectric oil sampling in stored equipment and oils and PCB identification in dielectric oils, solid surfaces and soils. |
| Companies that own equipment and wastes containing PCB, maintenance companies, and environmental authorities | 1 | 153[50] | Virtual course on comprehensive management of polychlorinated biphenyl - PCB: 100 course hours in a virtual environment and 20 in-person hours. The following topics will be addressed:<br>1. Overview and basic concepts on polychlorinated Biphenyl.<br>2. Identification, classification, and labelling of materials contaminated with PCB.<br>3. Considerations to implement the National PCB inventory.<br>4. Maintenance of equipment using dielectric oils.<br>5. Rational environmental management of equipment contaminated with PCB.<br>6. Managing risks related to PCB management. |
| Companies from non-interconnected areas - ZNI | 3 | 17 (companies) | Technical support to fulfil the environmental PCB regulation among companies from the Non-Interconnected Area. |
| Companies with electric equipment maintenance services. | 3 | 70 | Training on Good Environmental Practices during electric equipment maintenance, intended for 36 companies located in 12 cities of the country. |
| **Total** | **13** | **286** | |

**50.** The Ministry of Environment and Sustainable Development, in partnership with Universidad Central, certified 85 of the participants who completed the evaluation criteria established in the course design.

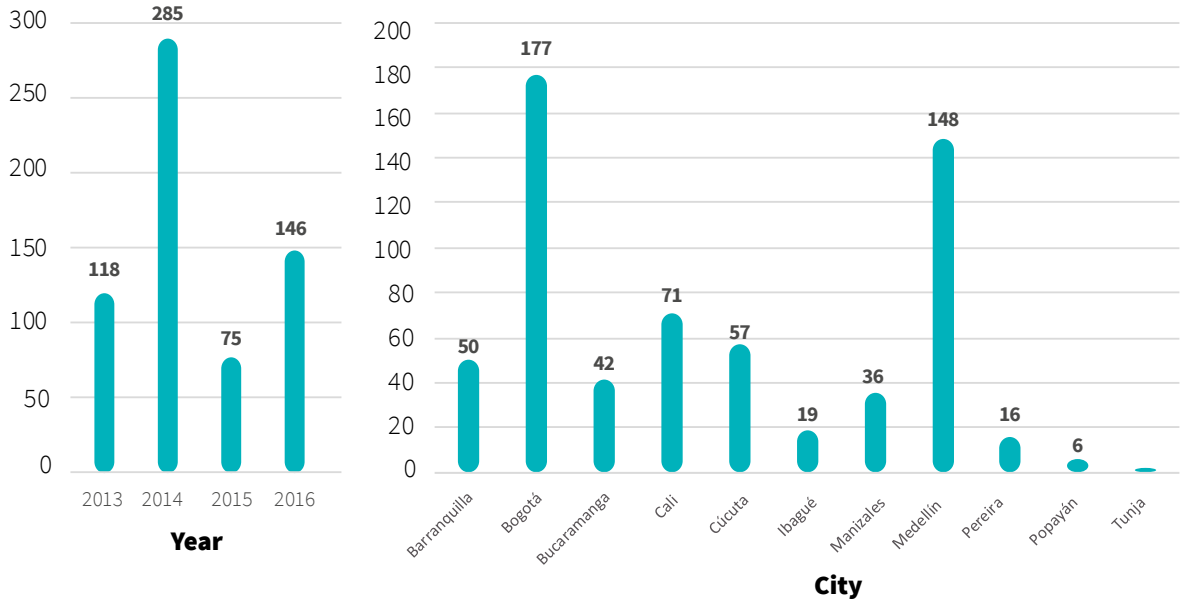
- ***Collecting samples and analysing them to determine PCB***

One of the strengthening fronts for the environmentally sound PCB management has been the front related to improving the national capacity to collect samples and perform analysis to determine PCB.

Colombia has made significant progress since 2010 in the framework of strengthening the sample-collection capacity, by designing and issuing, first, the labour competency standard[51] for sample collection in isolating fluids and solid surfaces in contact with such fluids; this standard restricted this work to personnel certified in such labour competency since 2013, in line with the existing Colombian environmental PCB standards, in order to minimize the PCB contamination risks of exposed staff and areas where these activities are carried out.

During 2013 to 2016, 624 people were certified in sample collection of dielectric oils and solid surfaces in contact with such oils in 11 cities of Colombia with the SENA's support, in order to facilitate the subsequent determination of PCB concentration.

**Graph 3.3. Number of people certified in labour competencies for the collection of samples of dielectric oils and solid surfaces from 2013 to 2016**




**Source:Minambiente(2017)**

**51.** NCL 220201030 intended to "Perform sampling of isolating fluids and solid surfaces to detect hazardous substances following the established procedures" issued by the National Training Service - SENA.

On the other hand, concerning the analytical capacity to determine PCB, a guide was developed from 2013 to 2016 to validate analytical methods in PCB analysis and it was possible to increase the number of testing laboratories with methodologies implemented on PCB analysis in environmental matrices with 12 new laboratories, resulting in an accrued total of 18 laboratories with current capacity for PCB analysis in dielectric oils, water, soil, sediments and solid surfaces, and of which, 16 of such laboratories are currently accredited[52].

Similarly, an inter-calibration exercise for PCB analysis was developed in 2015 with the participation of 20 laboratories; 18 of those laboratories obtained a highly-satisfactory level to measure PCB in dielectric oils.

Furthermore, official sampling and analysis protocols[53] were established in the country to determine PCB contents in the following matrices of environmental interest: dielectric oils, water, soils and sediments. Similarly, methodologies have been developed, implemented and validated to determine PCB concentration in bovine milk[54]; human blood and breast milk[55], as well as, a sampling and analysis protocol to determine PCB in fish[56].

The implementation of these methodologies in the country has progressed so far in the analysis and determination of PCB concentration in 50 samples of raw bovine milk from various country provinces; undetectable PCB levels were found in 100% of the samples under analysis. In turn, 50 fish samples from different regions have been analysed so far; no values exceeding the levels established by the CODEX Alimentarius have been found.

In addition, a program was implemented to monitor PCB in human blood and breast milk[57] from 2015 to 2016. A cross-disciplinary descriptive study was conducted to determine PCB levels in 15 blood samples to establish a general level of exposure among staff exposed at work while handling dielectric oils. Participants distributions were 71% men and 29% women. 63% of the men and 36% of the women showed PCB levels in their blood[58], but only one person showed levels exceeding the threshold of hazardous toxicity (7 µg / L). As for the PCB in breast milk, the samples were analysed according to the "Guidelines for Developing a National Protocol, Fourth WHO (World Health Organisation) - Coordinated Survey of

**52.** Based on the latest list published by IDEAM at http://www.ideam.gov.co/web/contaminacion-y-calidad- ambiental/acreditacion, institution in charge of carrying out the process of environmental testing laboratories in Colombia; it is regulated by Resolution 0268/2015 and the criteria established in the ISO/IEC 17025, standard whereby testing laboratories demonstrate their suitability and skill.

**53.** Official recognition made by the Institute of Hydrology, Meteorology and Environmental Studies – IDEAM by issuing Resolution No. 0792 of May, 2013.

**54.** Partnership between Universidad Nacional de Colombia and the Ministry of Environment and Sustainable Development.

**55.** By the National Institute of Health - INS.

**56.** By the National Institute of Food and Drug Monitoring - INVIMA that used protocols of the Association of Official Analytical Chemists – AOAC as a basis.

**57.** Tests were developed to determine PCB in blood plasma in partnership with the National Institute of Health – INS and the Ministry of Environment and Sustainable development, and they were analyzed using gas chromatography with mass selective detector.

**58.** With a 0,04 mg / L limit of detection (LOD) and a reference concentration of 3,5 mg / L.

Human Milk for Persistent Organic Pollutants in Cooperation with UNEP". The analytical method for PCB determination in blood and breast milk was validated by gas chromatography with a Selective Mass Spectrometer during 2016.

Furthermore, as part of the development to build capacity to identify PCB, a pilot plan was implemented to label equipment containing dielectric oils and owned by electric sector companies located in the Non-Interconnected Area (ZNI), under the guidelines provided by the Comprehensive PCB Management Manual. A total of 561 items of equipment owned by 12 electric sector companies located at non-interconnected areas were identified and labelled (including sample collection and analysis to determine PCB). Only one sample (0.2%) out of 561 equipment samples analysed showed a result with a PCB concentration over 50 ppm and the remaining 99.8% of equipment was marked as "NO PCB"; the only contaminated equipment device in this pilot was eliminated in an environmentally sound and safe manner (Minambiente, 2017).

The development of a demonstration project was carried out in 2015 together with the Pacific Energy Company (EPSA) in order to establish a methodology to allow owners of equipment containing dielectric oils, other than electrical sector companies, to become aware of the regulatory obligations related to the environmentally appropriate management and elimination of PCB in the municipality of Buenaventura – Valle del Cauca.

An information leaflet was designed during this project containing a summary of PCB obligations and was distributed by EPSA among typical owners who had items of equipment linked to EPSA's distribution network. Similarly, these owners were visited to endorse the provisions set out in the national PCB regulations, and a total of 44 owners were informed by means of such visits.

- **Tools to facilitate environmentally sound PCB management**

Different support tools were designed and developed as part of the strategies to strengthen the capacity for environmentally sound PCB management, to promote and study in depth the key aspects of comprehensive PCB management such as the following:

**Table 3.5. Tools developed from 2013 to 2016 to promote the environmentally sound management of PCB**

| Developed tool | Description |
|---|---|
| *Web tool to complete and manage the "National PCB Inventory" (IDEAM)* | Online tool where all the owners of equipment that contains or has contained dielectric oils can report their inventory and update their progress towards the identification, removal from service and elimination of equipment contaminated with PCB. In 2015, the inventory has registered 454,487 items of equipment[59] owned by 613 companies from a variety of different production sectors. |
| *Risk analysis tool for the management of PCB in companies with PCB inventory (Ministry of Environment and Sustainable Development supported by Universidad de los Andes)* | Qualitative tool to identify security breaches in the operation of companies that own materials containing PCB or companies that provide environmentally sound PCB management services. It was used in three (3) facilities during 2015 and at six (6) companies during 2016, providing technical support through a consultant that specializes in its use and implementation; this allowed making improvements to the Tool so that it becomes available for users, promoting its use as a self-management alternative to improve their operations. Four (4) facilities started the process to obtain or extend their environmentally-safe PCB management license in the period from 2013 to 2016. |
| *Comprehensive PCB Management Manual (Ministry of Environment and Sustainable Development)* | Technical document that contains the guidelines and standards for environmentally sound PCB management; it is formed by 6 topic areas, namely:<br>1. PCB overview and basic concepts.<br>2. Considerations to implement the National PCB Inventory.<br>3. Sampling, sample collection, analysis and identification of equipment and wastes included in the PCB environmental standard.<br>4. Labelling electric equipment that are made of, contain or may contain PCB and wastes contaminated with PCB.<br>5. Maintenance of equipment using dielectric oils.<br>6. Rational environmental management of equipment and wastes contaminated with PCB. |
| *Occupational surveillance protocol on exposure to polychlorinated biphenyl for companies (National Institute of Health)* | This document shows the basic guidelines to be applied by companies in their occupational surveillance protocols in order to optimize or introduce preventive and control activities related to occupational exposure to Polychlorinated Biphenyl - PCB. Moreover, this document applies to any company whose activities are related to handling dielectric oils and equipment potentially contaminated with PCB. |

**59.** Numbers as of February 10, 2017 and thus slightly higher than those reported by IDEAM in its report issued as of October 15, 2016.

| | |
|---|---|
| *Safe PCB management draft guidelines for foreign trade authorities. (Ministry of Environment and Sustainable Development supported by DIAN)* | It includes the conceptual basis on PCB, PCB effects on health and the environment, inspection safety, multilateral environmental conventions and collects the inspection experiences and good practices of trade authorities. |
| *Guidelines for the environmental authorities to identify and characterize sites contaminated with PCB (Ministry of Environment and Sustainable Development)* | This guide is being validated through the identification and remediation process of a previously-identified site contaminated with PCB, and it is expected to be completed in the future using the results from a convention entered into by Colombia, the Ministry of Environment of Peru and the Secretary of Environment and Natural Resources of Mexico - SERMANAT in order to implement standards and identification of sites contaminated with PCB. |
| *Preliminary assessment of economic, financial and market tools that may promote environmentally appropriate PCB management in Colombia. (Ministry of Environment and Sustainable Development supported by the Center for the Innovation and Development of Education and Technology - CIDET)* | The results of this preliminary evaluation achieved the following results:<br>1. Electric Sector Cost Structure and Market Analysis.<br>2. Analysis of possible measures of economic, financial or market instruments that may be considered in the country for PCB management.<br>3. Proposal of financial mechanisms.<br>4. Validation tool for the proposal for financial mechanisms for PCB management in Colombia.<br>Activities to be developed by each actor involved in the application of tax incentives related to investment in comprehensive PCB management are currently being set up. |
| *Informational videos on Comprehensive PCB Management (Ministry of Environment and Sustainable Development)* | The videos were created as an awareness-raising and fun social educational alternative for the PCB issue and environmental management actions developed in Colombia in this regard. Their production involved different stakeholders of the PCB management chain, such as environmental authorities, electrical sector companies, PCB management service providers, as well as, national and international experts in matters related to this topic. The topics addressed are:<br>Video 1: PCB problems and solutions.<br>Video 2: Labelling, sampling, and identification of equipment and wastes included in the PCB environmental regulations.<br>Video 3: Maintenance of equipment using dielectric oils.<br>Video 4: Decontamination and elimination alternatives for equipment and wastes contaminated with PCB. |

### c. Environmentally sound management and elimination of PCB through a demonstration pilot project

The country has made significant progress in the last 5 years by improving its capacity to safely manage PCB through (internal or external) PCB transport, storage (internal and external)[60], decontamination, and disposal operations. In this context, diagnostic, technical support and monitoring activities have been developed for companies that perform storage, treatment, packaging and transport activities.

Related to the packaging, transport and storage operations, a total of six (6) companies have participated in this process: two (2) PCB management companies (with 4 security warehouses in different regions of the country) three (3) electrical sector companies and one (1) industrial sector company, with each one owning a security warehouse that was in service.

In the late 2016, Colombia had the following number of items of equipment contaminated with PCB (PCB concentrations greater than 50 ppm) stored at facilities that fulfil the provisions of the national regulations and the country's technical manual for comprehensive PCB management:

**Table 3.6. Equipment contaminated with PCB stored up to 2016.**

| Type of element | Internal storage | | External storage | |
|---|---|---|---|---|
| | Units | Metric Tons | Units | Metric Tons |
| Unused equipment | 301 | 595.9 | 13 | 0.7 |
| Disposed equipment | 97 | 64.3 | 226 | 152.6 |
| Total | 398 | 660.2 | 239 | 153.3 |

**Source: Minambiente (2017)**

In recognition of this issue, a pilot project was developed in 2014 with support from a hazardous waste management company in order to build and commission a plant to clean metal surfaces contaminated with PCB; this plan was used to treat 47 tons of recyclable materials from 9 transformers contaminated with PCB. The cleaning plant obtained an extension of its environmental license for the provision of decontamination services for equipment disposed of with PCB contamination (non-porous surfaces) in 2015, and it is currently working through the PCB management company.

**60.** Internal storage is provided in the same facilities of owners of equipment or elements contaminated with PCB during no longer than 12 months (except when environmental license is obtained for this purpose, in which case the storage period may be longer), while external storage is kept at facilities of hazardous waste managers with an environmental license to provide this storage service.

Additionally, a plant to de-chlorinate dielectric oil contaminated with PCB was installed as part of the investment made by an electrical sector company that owns the greatest number of such equipment in the country. Its environmental license was obtained in 2016 and it is currently operating. Furthermore, the import and commissioning of a de-chlorination plant for dielectric oils with potassium in polyethylene-glycol or KPEG technology is being developed with support from a hazardous waste management company.

Similarly, a pilot project for the chemical treatment of PCB by means of supercritical water oxidation[61] (SCWO) was developed in 2015 with support from the academy; the base scale laboratory tests of this pilot project have been completed and the construction and commissioning of a pilot-scale plant that uses this alternative is currently under development

An evaluation process of technical capacity was carried out from 2014 to 2015 in four facilities in order to prepare and implement pilot tests for the thermal treatment of PCB. The initial incineration tests were completed, including the detailed scientific design, the security protocol and the strategy for the communication to stakeholders; however, further tests had to be cancelled in April 2016 due to a disagreement with the regional authorities.

The Ministry of Environment and Sustainable Development has managed directly the elimination of 43 items of equipment contaminated with PCB (31.2 tons), located in Amazonas, Antioquia, Boyacá, Cauca, Huila, La Guajira and Sucre, and they fulfilled the following features: equipment and wastes located at the non-interconnected area (ZNI), equipment located at high-risk areas, such as drinking water treatment plant facilities, animal production facilities, marketplaces, hospitals or clinics and educational institutions, equipment owned by national, regional or local public institutions that provide services in areas with Indigenous, Afro-Colombian population, or other vulnerable populations in Cauca, Caquetá, La Guajira and Huila, owned by third parties linked to the network of electrical energy distribution companies that have an equipment substitution program for these users located in urban areas of socio-economic levels 1, 2 and 3 or rural areas dedicated to domestic use.

As previously stated, the only items of equipment identified as contaminated in the pilot project developed in the non-interconnected area was eliminated. Among equipment located in high-risk areas, a total of 131 (in-use and unused) items of equipment had been identified as contaminated with PCB in 2015; 6 of these items of equipment have been eliminated in total, 5 at drinking water treatment plants and 1 at an educational institution.

**61.** Patented by Universidad del Valle.

**Table 3.7. Items of equipment contaminated with PCB identified at high-risk areas in 2015.**

| Equipment | Drinking water treatment | Food industry | Educational institutions | Hospitals | Restaurants and food courts | Total |
|---|---|---|---|---|---|---|
| In-Use | 49 | 33 | 32 | 4 | 1 | **119** |
| Unused | 1 | 6 | 2 | 3 | 0 | **12** |
| **Total** | **50** | **39** | **34** | **7** | **1** | **131** |

**Source: Minambiente (2017)**

Concerning sites contaminated with PCB, the information collection process from studies conducted at the site was developed in 2016 with the support of an electrical sector company, and a procurement process started in order to characterize the site and implement a pilot project for its remediation.

822 tons of PCB were eliminated from 2013 to 2016, 92% through exports in compliance with the Basel Convention[62] and the remaining 8% through decontamination alternatives implemented in the country such as de-chlorination and the cleaning of solid surfaces.

### 3.3.2. Updating the national Polychlorinated Biphenyl – PCB inventory

*Overview*

Efforts made in Colombia regarding comprehensive PCB management have focused mainly on closed applications, that is to say, items of equipment[63] and their associated wastes[64] that are made of, or contain or are contaminated with PCB. Within this line of thought, the owners of equipment or wastes contaminated with PCB must submit and update annually the total inventory of the equipment they own, as well as, the wastes contaminated with PCB, in order to quantify and control the progress made in the identification and elimination of these substances in the country, by means of an information system and database populated in a Website[65].

Regulated users declare all the items of equipment that contain or have contained isolation fluids, as well as the wastes that have come into contact with the isolation fluids of such items of equipment based on four groups depending on their PCB content, in order to facilitate reporting to the PCB inventory.

**62.** Sent to Spain, where they were eliminated in an environmentally-safe manner.

**63.** The term "equipment device" comprises those that contain or have contained isolating fluids in liquid state such as electrical transformers, electrical condensers, switches, regulators, reclosers or other devices.

**64.** "Waste contaminated with PCB" refers to all the elements, substances, fluids, materials and items of equipment discarded, rejected or returned, among others, in any condition and containing PCB in a concentration greater than or equal to 50 ppm, as well as, any other material or element that comes into contact with them directly in any activity, including workwear.

**65.** Resolutions 222 / 2011 and 1741 / 2016, which regulate comprehensive PCB management in Colombia, include an IT tool that feeds the Colombian Environmental Information System and is managed by the IDEAM.

**Table 3.8. Element classification groups based on their PCB content.**

| Group | Description | Concentration |
|---|---|---|
| 1. Equipment manufactured with PCB fluids and wastes contaminated with PCB. | Those containing PCB because they have been manufactured by equipping them since the beginning with dielectric oils or fluids containing PCB, or subsequently filled with PCB during maintenance or remanufacturing, as well as, the wastes that have come into contact with the oil of such equipment. Semi-quantitative or quantitative analysis may be used to classify equipment or waste in this group. | Concentration equal to or greater than 10% PCB (greater than 100,000 ppm in weight). |
| 2. Equipment and waste that contain or may contain PCB. | Those that contain or may have been contaminated with PCB in their manufacturing, use, or maintenance, as well as wastes that have come into contact with the oil of such equipment. The results of semi-quantitative or quantitative analysis may be used to classify equipment or waste in this group. | Concentration equal to or greater than 0.05% and lower than 10% PCB (equal to or greater than 500 ppm and lower than 100,000 ppm in weight). |
| 3. Equipment and waste contaminated with PCB. | Those that were manufactured with fluids that originally did not contain PCB, but became contaminated with PCB throughout their life cycle in some components in a concentration equal to or greater than 50 ppm and lower than 500 ppm, as well as, wastes that have come into contact with the oil of such equipment. Semi-quantitative or quantitative analysis may be used to classify equipment or waste in this group. | Concentration equal to or greater than 0.005% and lower than 0.05% PCB (equal to or greater than 50 ppm and lower than 500 ppm in weight). |
| 4. Equipment and waste with NO PCB. | Those with a certified PCB concentration lower than 0.005% or 50ppm, by means of quantitative analysis, or items of equipment with a PCB-free certificate showing that have not been contaminated. Items of equipment that undergo decontamination processes may only be classified in this group depending on a 6-month analysis after the decontamination process. | Concentration lower than 0.005% PCB (lower than 50 ppm by weight). |

**Source: Minambiente (2015)**

*Results*

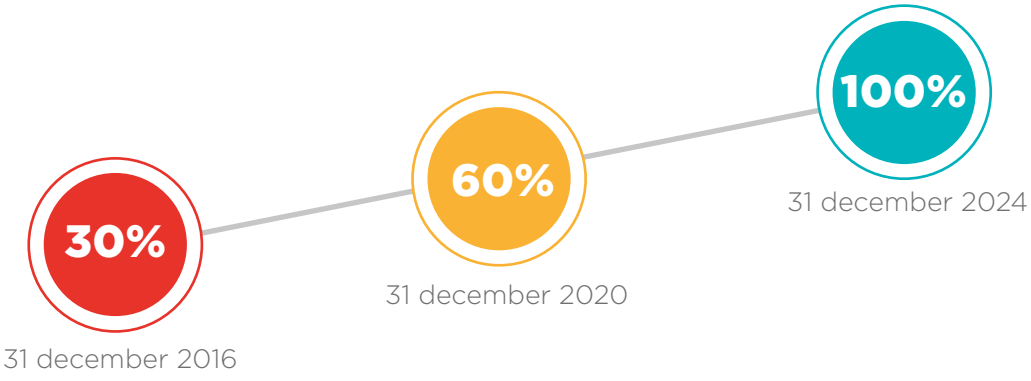
The 2015 PCB inventory had 1,097 records (that belonged to 613 companies), which were used by the environmental authorities from different regions of the country to report the existence of 430,729[66] items of equipment, based on the information provided by regulated users (IDEAM, 2016).

The results obtained so far for indicators related to progress made in labelling, removal from use and elimination of PCB are presented below. The development and progress made in the fulfilment of indicators in Colombia is based on the information provided by the owners of equipment and/or wastes that are made of, contain or are contaminated with Polychlorinated Biphenyl (PCB), and information communicated by environmental authorities through the information system that feeds the national PCB inventory.

## Labelling

This indicator shows progress made in the fulfilment of the four-year goals (2016, 2020 and 2024) for equipment labelling[67].

**Graph 3.4. Equipment labelling and identification goals**




**Source: Minambiente & U. Central (2015)**

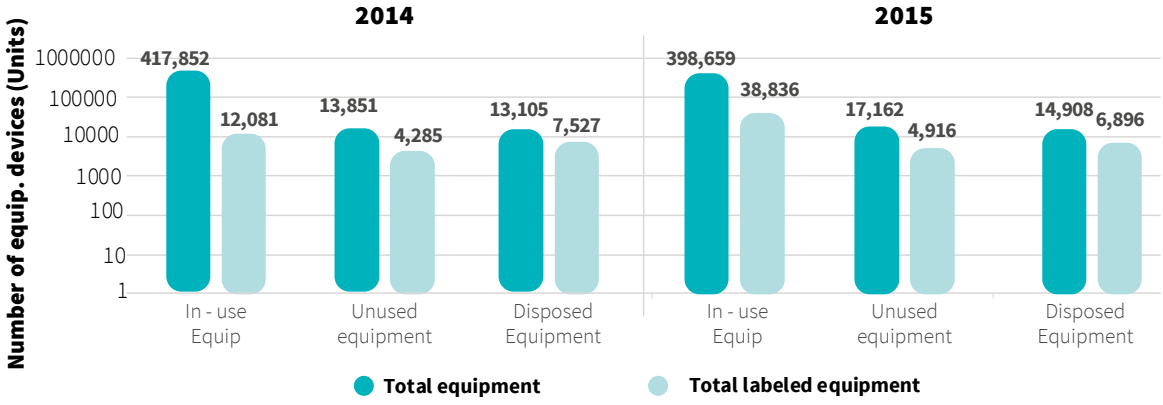
50,648 equipment units had been labelled by the end of 2015, 11.77% of the reported items of equipment, based on the information submitted by equipment owners and communicated by the country's environmental authorities. The following graph shows the total items of equipment compared to equipment labelled nationwide based on their

**66.** They correspond to the information communicated by the country's environmental authorities as of October 15, 2016, which is equivalent to 96% of reported equipment (448,600 units).

**67.** The indicator is calculated by means of the expression: Labelling percentage of equipment recorded in the PCB inventory = (Amount of labelled items of equipment / Total amount of items of equipment recorded in the PCB inventory)*100. It includes in-use, unused and disposed items of equipment.

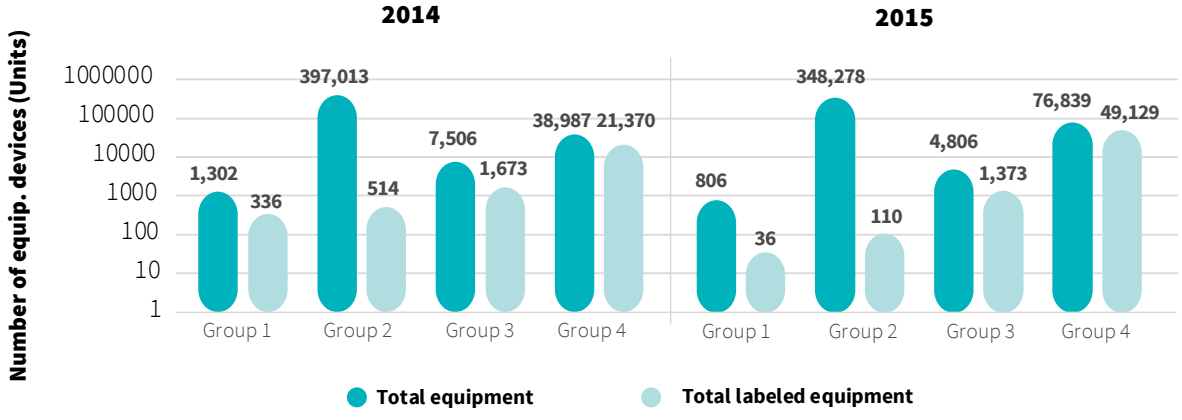
condition (in-use, unused and disposed equipment)[68], as well as, the total quantity of equipment reported, and the quantity of equipment labelled according to the four classification groups depending on the PCB content.

**Graph 3.5. Total amount of items of equipment vs. equipment devices labelled based on their condition for 2014 and 2015[69]**




**Source: IDEAM 2016**

**Graph 3.6. Total amount of items of equipment vs. equipment devices labelled based on their PCB classification group for 2014 and 2015[70].**




**Source: IDEAM (2016)**

**68.** For the purposes of the PCB inventory "in-use equipment" refers to items of equipment connected to an electric network and/or fully operational; "unused equipment" refers to items of equipment that have been used but are currently not connected to any electric network and/or are not operational (they may be under maintenance or in storage), but that will be used in the future; and "disposed or removed equipment" refers to items of equipment that cannot be used again for the purpose they were manufactured for, since their technical features no longer allow use, or a decision has been made to discard them, reject them or return them.

**69.** Graph in base-10 logarithmic scale.

**70.** Graph in base-10 logarithmic scale.

The information for year 2015 shows that items of equipment classified in Confirmed Group 4 (76,839 units) have the greatest labelling percentage, namely, 63.94% (49,129 units), followed by items of equipment classified in Group 3 (both confirmed and suspected) with 28.57% (1,373 units).

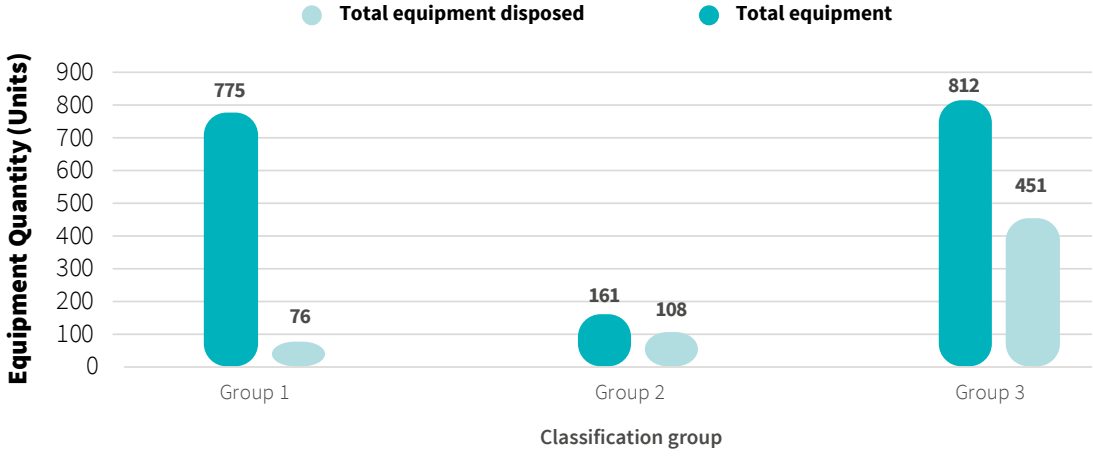
### Removal from Use

This indicator shows the progress made in the fulfilment of the removal-from-use goal for equipment contaminated with PCB[71]. The removal deadline is 2025, which is closely related to the labelling goals. The removal-from-use goal refers to the total items of equipment classified in Groups 1, 2 and 3 (confirmed), since they are the contaminated items of equipment.

In 2015, it was reported that there were 1,748 items of equipment in the groups 1,2, and 3 (confirmed), of which 635 units are items of equipment that have been disposed of (36.3%).

The following are the numbers for decommissioned items of equipment for groups 1, 2 and 3 confirmed at 31st of December 2015.

**Graph 3.7. Number of items of equipment and disposed items of equipment per PCB classification group for 2014 and 2015.[72]**




**Source: IDEAM (2016)**

**71.** The indicator is calculated by means of the expression: Removal-from-use percentage of contaminated equipment = (Amount of items of equipment removed from use / Total amount of items of equipment recorded in the PCB inventory and belonging to groups 1, 2 and 3)*100.

**72.** Graph in base-10 logarithmic scale.

### Elimination

This indicator shows the progress made in the fulfilment of the elimination goals for equipment and wastes contaminated with PCB. After the labelling goals are fulfilled, the equipment or wastes contaminated with PCB must be eliminated progressively in 2017, 2022 and 2028[73].

The elimination goal refers to all the items of equipment, contained liquids disposed of and other residues and/or wastes that have been eliminated in and out of the country, except for those classified into confirmed group 4, that is, those classified as not-contaminated with PCB.

**Graph 3.8. Elimination goals for equipment and wastes contaminated with PCB.**

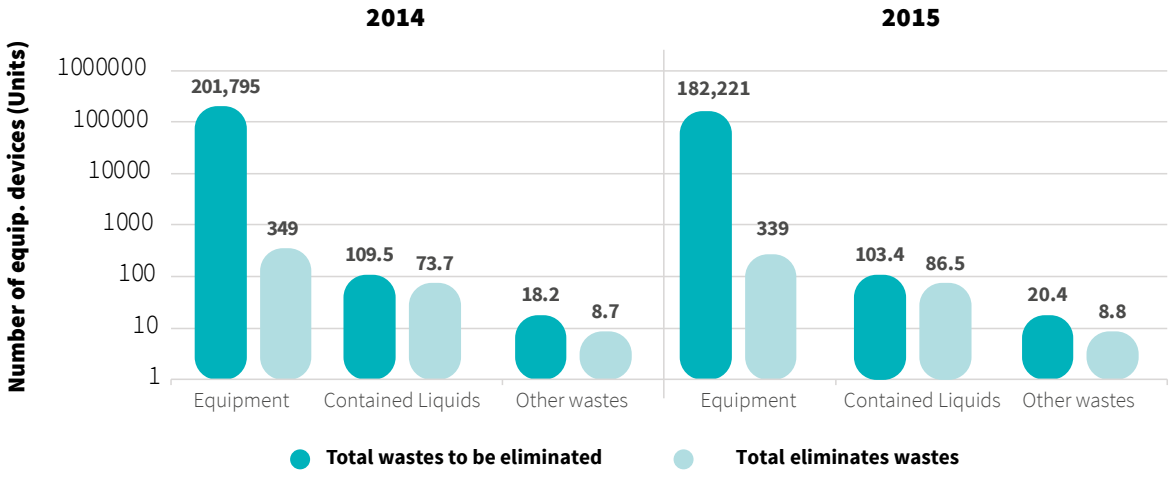

**Source: Minambiente & U. Central (2015)**

The owners of materials contaminated with PCB must eliminate them in environmentally sound manner during the year immediately following the fulfilment of partial identification and the labelling goals, with a deadline that expires in 2028.

182,221.7 tons equivalent to in-use, unused and disposed of items of equipment were reported in 2015; they have a PCB concentration equal to or greater than 50 ppm (confirmed and suspected), and must be eliminated. A total of 339.5 tons had been eliminated by December 2015, equivalent to 0.2% of the total tons of items of equipment to be eliminated or decommissioned.

**73.** The indicator is calculated by means of the expression: Elimination percentage of contaminated wastes = (Amount of eliminated items of equipment / Total amount of items of equipment recorded in the PCB inventory)*100.

**Graph 3.9. Number of items of equipment and wastes eliminated based on their classification in 2014 and 2015[74].**




**Source: IDEAM (2016)**

Subsequently, it transpired that the identified inventory containing liquid waste, that is, mostly dielectric oils contaminated with PCB (confirmed and suspected), had already been eliminated up to 83.7% by the end of 2015, based on the information reported by the national PCB inventory.

Similarly, 43.0% of the identified stocks of wastes contaminated with PCB (confirmed and suspected) consisting of materials that were discarded, rejected or returned, including workwear, had been eliminated by December 31, 2015.

For more detailed information of each of the indicators presented above, it is suggested to consult the document *"Inventario nacional de bifenilos policlorados – PCB 2014 – 2015"* IDEAM (2016) in www.ideam.gov.co[75]

*Conclusions*

In line with the foregoing, it is observed that the efforts made, and actions implemented during the past few years in the country that is seeking to strengthen the comprehensive environmental management of PCB, Colombia has made significant progress, not only in the improvement of their PCB inventories, but in the overall management performance by the different stakeholders involved, showing their appreciation of the subject matter.

**74.** Graph in base-10 logarithmic scale.

**75.** http://www.ideam.gov.co/web/atencion-y-participacion-ciudadana/publicaciones-ideam

A total of 430,729 items of equipment belonging to 613 companies were reported in the PCB national inventory. At the end of 2015 50,648 units were labelled, that is 11.77% of the total reported equipment. 353,890 items of equipment were reported in 2015, where 3,636 units have been disposed of (1.02%). It was reported that 182,221.7 tons equivalent to used, disused and disposed equipment, which presented a PCB concentration equal or superior to 50 ppm (confirmed and suspected), should be eliminated. In December 2015 339.5 tons were eliminated (0.2% of the total equipment). The identified stocks of waste liquid contaminated by PCB (principally dielectric oil) has been eliminated in 83.7% and 40% respectively.

It is necessary to continue to improve and strengthen the processes of identification, labelling, removal from use and elimination of the items of equipment contaminated with PCB, as well as, their wastes, in order to fulfil the goals established locally in the specific domestic regulation and internationally with regard to Colombia's commitments to the Stockholm Convention.

## 3.4. Unintentional POPs[76]

### 3.4.1. Progress on the implementation of the action plan

Consideration will now be given to the difficulties encountered trying to fulfil the actions planned for unintentional POPs. In 2016 Colombia obtained approval for a new project financed with GEF resources and supported by the UNDP. This project was called *"Reducción de las liberaciones de los COP no intencionales y mercurio provenientes de la gestión de residuos hospitalarios, RAEE, procesamiento de chatarra metálica y quemas de biomasa" (Project for reducing unintentional POPs and mercury releases from healthcare waste management, Waste Electrical and Electronical Equipment - WEEE treatment, scrap processing, and biomass incineration)*. This project is planned to start updating the unintentional POPs inventory during 2018. The first step towards this goal was to recalculate the current baseline for dioxins and furans using information from 2002, but based on the 2013 toolkit version to make any methodology corrections required and thereby render the data comparable to the results obtained from the inventory update.

Based on the premise that the specific action plan for unintentional POPs formulated in the framework of the 2010 NIP has not been implemented, it is presumed that the categories or sources of more significant releases of these substances still prevail in Colombia. However, it should be borne in mind that releases may have increased in recent years due to the increase in the population, consumption patterns and growth in the generation of waste and the development of new industrial activities. Despite these factors, it is considered reasonable to direct the strategies currently formulated to prioritize the sources of unintentional POP releases from the estimates of the re-calculation of the inventory.

**76.** Unintentional POPs listed in Annex C of the Stockholm Convention are Polychlorinated Dibenzodioxins– PCDD, Polychlorinated Dibenzofurans - PCDF, Polychlorinated Biphenyls – PCB, Hexachlorobenzene - HCB, Pentachlorobenzene – PeCB and Polychlorinated Naphthalene.

It should also be noted that in Chapter 2 the regulation[77] that sets out the permissible dioxin and furan emission standards for industrial activities was issued, as well as, the equivalence factors required to calculate the corresponding risk factors. Similarly, permissible emission standards were established for hazardous and non-hazardous waste or residue incineration facilities and existing cement furnaces that perform co-processing of hazardous wastes or residues. Also, there is regulation[78] for the control of open burning (according to the estimations in the UPOPs inventory are the main source of UPOPs releases) carried out for soil preparation in farming activities, stripping of topsoil for mining activities, crops harvesting or stubble disposal, and open fires for controlling effects of the frosts. This regulation seeks to reduce open incineration, control air pollution, prevent fires, reduce health risks, preserve ecosystems and water protected areas and associated infrastructure.

A list of the scientific research on dioxins and furans performed in Colombia in the past few years is presented in Table 3.9 (contributed by the Colombian academy):

**77.** Resolución 909 de 2008 del Ministerio de Ambiente, Vivienda y Desarrollo Territorial (hoy Ministerio de Ambiente y Desarrollo Sostenible).

**78.** Resolution 532/2005 establishes the requirements, terms, conditions and obligations for controlled open burning in rural areas for farming and mining activities.

**Table 3.9 Dioxin and furan research developed in Colombia**

| Published articles | |
|---|---|
| 1. Pemberthy D, Quintero A, Martrat MG, Parera J, Ábalos M, Abad E, Villa AL. "Polychlorinated dibenzo-p-dioxins, dibenzofurans and dioxin-like PCBs in commercialized food products from Colombia". STOTEN (2016 - 568:1185-1191). | 16. Aristizábal B, Quintero A, Suarez N, Montes de Correa C, Abad E, Rivera J, "internal validation method of PCDD/Fs by HRGC/LRMS/MS", Organohalogen Compounds, 2008, 70, 1101-1104. |
| 2. Pemberthy D., Quintero A., Martrat M.G., Parera J., Abad E., Villa A., "Levels of polychlorinated dibenzo-p-dioxins, polychlorinated dibenzofurans and dioxin-like PCBs in oils commercialized in Colombia", Organohalogen Compounds, 2015, 77, 736-739. | 17. B. H. Aristizábal, M. I. Cobo, C. Montes de C., K. Martínez, E. Abad, J. Rivera, "Dioxin emissions from thermal waste management in Medellin, Colombia: present regulation status and preliminary results", Waste Management, 2007, 27, 1603-1610. |
| 3. Pemberthy D., Quintero A., Martrat M.G., Ábalos M., Abad E., Villa A., "Levels of PCDD/PCDFs and dl-PCBs in food commercial samples quantified by HRGC-HRMS", Organohalogen Compounds, 2014, 76, 1525-1528. | 18. Cobo M, López A, Aristizábal B, Montes de Correa C, Avalos M, Abad E, Rivera J, "Dl-PCBs and PCDD/Fs analysis by HRGC/QITMS/MS", Organohalogen Compounds, 2007, 69, 1098-1101. |
| 4. Silvana Arias Arias, Aída Luz Villa. "Hidrodecloración de dioxinas y furanos en cenizas de incineración con catalizadores de Ni, Pd, y Mo soportados en carbón activado". Revista de Investigaciones Universidad del Quindío, 2013, 24 (1), 5 - 9. | 19. Aristizábal B, Quintero A, Cobo M, Suarez N, Hoyos E, Montes de Correa C, Avalos M, Abad E, Rivera J, "PCDD/Fs method detection limit by HRGC/LRMS/MS", Organohalogen Compounds, 2007,1269-1271. |
| 5. Diana Pemberthy, Juan David Ripoll, Aída Luz Villa. "Estudio de la relación estructura-actividad y visualización (2D y 3D) de interacciones Dioxinas - Aminoácidos". Revista de Investigaciones Universidad del Quindío, 2013, 24(1), 25 - 29. | 20. B. H. Aristizábal, M. I. Cobo, N. Orozco, C. Montes de Correa, E. Abad, J. Rivera, "Comparison of DB-5MS and Cp-Sil 8CB low bleed/MS gas chromatography columns for assignment of 2,3,7,8-substituted PCDDs/PCDFs in emission samples from Colombian incinerators", Organohalogen compounds, 2006, 68, 2388-2391. |
| 6. Diana Pemberthy, Jairo Alexander Quintero, Silvana Arias Arias, Julián Andrés Cardona, Aída Luz Villa. "Efecto de la cantidad de agua y del número de extracciones en el análisis de dioxinas y furanos en muestras de aceite vegetal". Revista de Investigaciones Universidad del Quindío, 2013, 24(1), 30 - 34. | 21. A. E. Hoyos, B. H. Aristizábal, M. I. Cobo, Luis F. Córdoba, C. Montes de Correa, "Dioxins and incineration in Antioquia-Colombia", Organohalogen compounds, 2005, 67, 1116 – 1118. |
| 7. Diana Pemberthy, Jairo Alexander Quintero, Silvana Arias, Aida Luz Villa. "Análisis de dioxinas y furanos en aceites comercializados en Colombia". The Journal of the Argentine Chemical Society, 2012, 99 (1-2), 18 - 22. | 22. B. H. Aristizábal, A. E. Hoyos, E. Abad, J. Rivera, C. Montes de Correa, "Survey program on PCDD/F emissions from combustion waste management in Colombia". Organohalogen compounds, 2005, 67, 2156 – 2158. |

## Published articles


8. Martha Isabel Cobo Ángel, Andrés Orrego, Juan Conesa. "Washcoated Pd/$Al_2O_3$ monoliths for the liquid phase hydrodeclorination of dioxins". Applied Catalysis A: General, 2012, 445, 83 - 91.

9. Pemberthy D, Quintero A, Martrat MG, Parera J, Ábalos M, Abad E, Montes de Correa C, "Dioxins and furans in vegetable oils sold in Colombia", Organohalogen Compounds, 2011, 73, 813-816.

10. Martha Cobo, Araceli Gálvez, Juan A. Conesa and Consuelo Montes de Correa. "Characterization of fly ash from a hazardous waste incinerator in Medellín, Colombia", Journal of Hazardous Materials, 2009, 168, 1223 – 1232.

11. Martha Cobo, Juan A. Conesa, Consuelo Montes de Correa. "Effect of the reducing agent on the hydrodechlorination of dioxins over 2 wt. % Pd/ γ-$Al_2O_3$". Applied Catalysis B: Environmental, 2009, 92, 367 – 376.

12. M. I. Cobo, J. A. Conesa, C. Montes de Correa "The Effect of NaOH on the Liquid-Phase Hydrodechlorination of Dioxins over Pd/ γ-$Al_2O_3$", Journal of Physical Chemistry A, 2008, 112 (37), 8715 – 8722.

13. B. H. Aristizábal, M. I.Cobo, A. Hoyos, C. Montes de C, M. Avalos, K. Martínez, E. Abad, J. Rivera "Baseline levels of dioxin and furan emissions from waste thermal treament in Colombia", Chemosphere, 2008, 73, S171 – S175.

14. A. E. Hoyos, B. H. Aristizábal, M. Cobo, F. Córdoba, C. Montes de C. "Total suspended particulate (TSP), polychlorinated dibenzodioxins (PCDD) and polychlorinated dibenzofurans (PCDF) emissions from medical waste incinerators in Antioquia – Colombia", Chemosphere, 2008, 73, S137 – S142.

23. M. I. Cobo Angel, A. E. Hoyos, B. H. Aristizábal, C. Montes de Correa, "Dioxinas y furanos en cenizas de incineración. Revista Facultad de Ingeniería Universidad de Antioquia, 2004, 32, 26 - 38.

24. B. H. Aristizábal, E. Abad, J. Rivera, C. Montes, "A comparative study of PCDD/F emissions from medical and industrial waste incinerators in Medellín-Colombia" (South America)". Organohalogen compounds, 2004, 66, 951 – 354.

25. B. H. Aristizábal, J. González, C. Montes de Correa, "Retos en la aplicabilidad de la norma colombiana de dioxinas y furanos en incineradores", Revista Facultad de Ingeniería, Universidad de Antioquia, 2003, 28, 17-36.

26. C.A. García Ubaque, A. Gonzales Hässig, C. Acosta Mendoza, "Stack emissions tests in a brick manufacturing Hoffmann kiln: firing of municipal solid waste", Waste Management & Research 2010: 28: 596–608, DOI: 10.1177/0734242X09357222

27. César Augusto García Ubaque, Juan Carlos García Ubaque, Martha Lucía Vaca Bohórquez, "Emisión de dioxinas y furanos (PCDD/PCDF) en Colombia: evaluación y diagnóstico", Tecnura. Vol. 16, Edición Especial, pp 194 – 206, Octubre 2012

28. J. Cortés, M. Cobo, C.M. González, C.D. Gómez, M. Abalos, B.H. Aristizábal, "Environmental variation of PCDD/Fs and dl-PCBs in two tropical Andean Colombian cities using passive samplers", Science of the Total Environment (2016 - 568, 614–623)

29. Jasmin K. Schuster, Tom Harner, Gilberto Fillmann, Lutz Ahrens, Jorgelina C. Altamirano, Beatriz Aristizábal, Wanderley Bastos, Luisa Eugenia Castillo, Johana Cortés, Oscar Fentanes, Alexey Gusev, Maricruz Hernandez, Martín Villa Ibarra, Nerina B. Lana, Sum Chi Lee, Ana Patricia Martínez, Karina S. B. Miglioranza, Andrea Padilla Puerta, Federico Segovia, May Siu, and Maria Yumiko Tominaga "Assessing Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans in Air across Latin American Countries Using Polyurethane Foam Disk Passive Air Samplers", Environ. Sci. Technol. 2015, 49, 3680−3686, DOI: 10.1021/es506071n

| Published articles | |
|---|---|
| 15. M. Cobo, A. Quintero, C. Montes de C., "Liquid phase dioxin hydrodechlorination over Pd/γ–$Al_2O_3$", Catalysis Today, 2008, 133-135, 509-519. | 30. D. Pemberthy, A. Quintero, M.G. Martrat, J. Parera, M. Ábalos, E. Abad b , A.L. Villa a "Polychlorinated dibenzo-p-dioxins, dibenzofurans and dioxin-like PCBs in commercialized food products from Colombia", Science of the Total Environment (2016) DOI 10.1016/j.scitotenv.2016.04.113, disponible online 9 May 2016 |

Currently, Colombia has two locations for passive monitoring[79] as part of the Global Monitoring Plan project. This project has results for PCDD/PCDFs, dl-PCBs, and PFOS. However, it is essential to implement new locations for monitoring in other places. During passive monitoring, the air passes through the monitor by diffusion and the sampling operation could be 3, 6 or 10 months. Another kind of monitoring is active, where the operation last 24 to 48 hours with the air passes through the monitor by the use of a pump.

### 3.4.2. Recalculating the dioxin and furan inventory[80]

*Overview*

The update of the unintentional-POP inventory is expected to start during 2018. However, the existing baseline inventory for dioxins and furans was recalculated in the NIP update process using information from 2002[81], but based on the 2013 toolkit version in order to perform the methodology corrections required and thus make data comparable to the results eventually obtained from the inventory update.

It is necessary to consider that although the estimation was calculated for dioxins and furans (PCDD/PCDF) based on the aforementioned toolkit, these estimations identified the release sources and the NIP implementing actions designed to minimize the use of these substances, but the estimates also indicated the presence of indirect and simultaneous actions on all unintentional POPs (UNEP, 2013)[82]. Additionally, these kinds of inventories provide a meaningful approach to identifying release sources not only for UPOPs, but also for potential sources of greenhouse gases and mercury. This information is therefore an essential input for other projects that the country is currently undertaking related to those issues, and where they are required to strength in their information systems and databases.

**79.** The passive monitoring in the air is an economic control technique. It complements another type of monitoring and allows the impact assessment of air sources. Stockholm Convention and UNEP endorse it.

**80.** Identification and quantification toolkit for dioxins and furans releases and other UPOPs. UNEP, 2013.

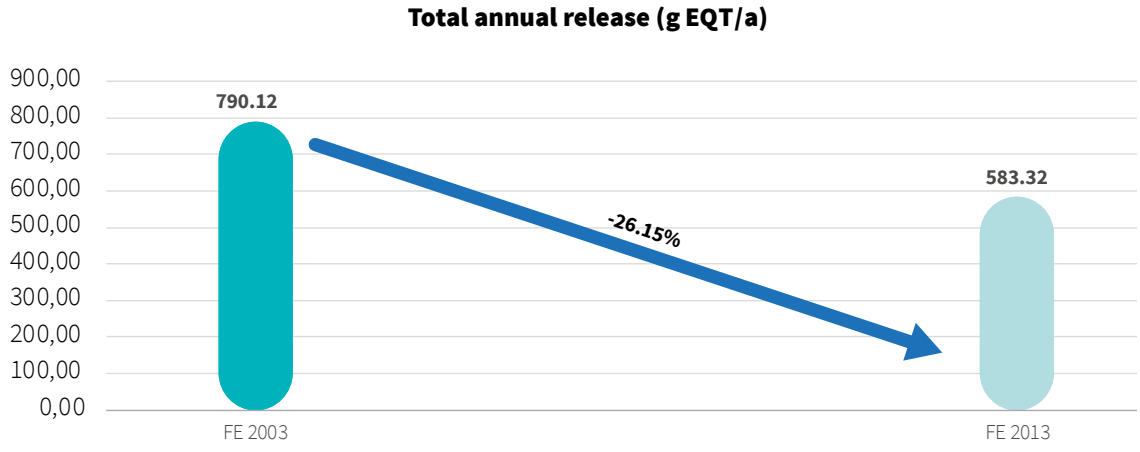
**81.** Colombian dioxins and furans sources and releases national inventory – baseline year 2002. MADS, 2005.

**82.** "PCDD/PCDF releases are accompanied by releases of other unintentional POPs that may be minimized or eliminated by using the same measures applied to address PCDD/PCDF emissions. Making an exhaustive PCDD/PCDF inventory allows identifying priority sources, establishing measures and developing action plans to minimize emissions of all unintentional POPs. It is thus advisable to focus the inventory activities on PCDD/PCDF for practical reasons, since these substances indicate the presence of other unintentional POPs. They are deemed to be a sufficient basis to identify and prioritize the sources of all those substances, as well as, develop control measures applicable to all POPs of Annex C, and evaluate their effectiveness. Analyzing the emissions of all unintentional POPs included in Annex C is only advisable in a research context or in other projects, in order to generate useful information to derive emission factors". The unintentional POPs listed in Annex C of the Stockholm Convention are: Polychlorinated Dibenzodioxins– PCDD, Polychlorinated Dibenzofurans - PCDF, Polychlorinated Biphenyls – PCB, Hexachlorobenzene - HCB, Pentachlorobenzene – PeCB and Polychlorinated Naphthalene.

*Results*

The comparative results obtained for annual dioxin and furan releases using emission factors (EF) established using the 2013 toolkit compared to the 2003 toolkit, and based on the information obtained for reference year 2002, shows a reduction in total releases of 26.15%, down from 790.12 g EQT/a to 583.32 g EQT/a (Graph 3.9), taking into account the fact that some release group sources increased, and others decreased their contribution.

**Graph 3.10. Comparison of total annual releases**

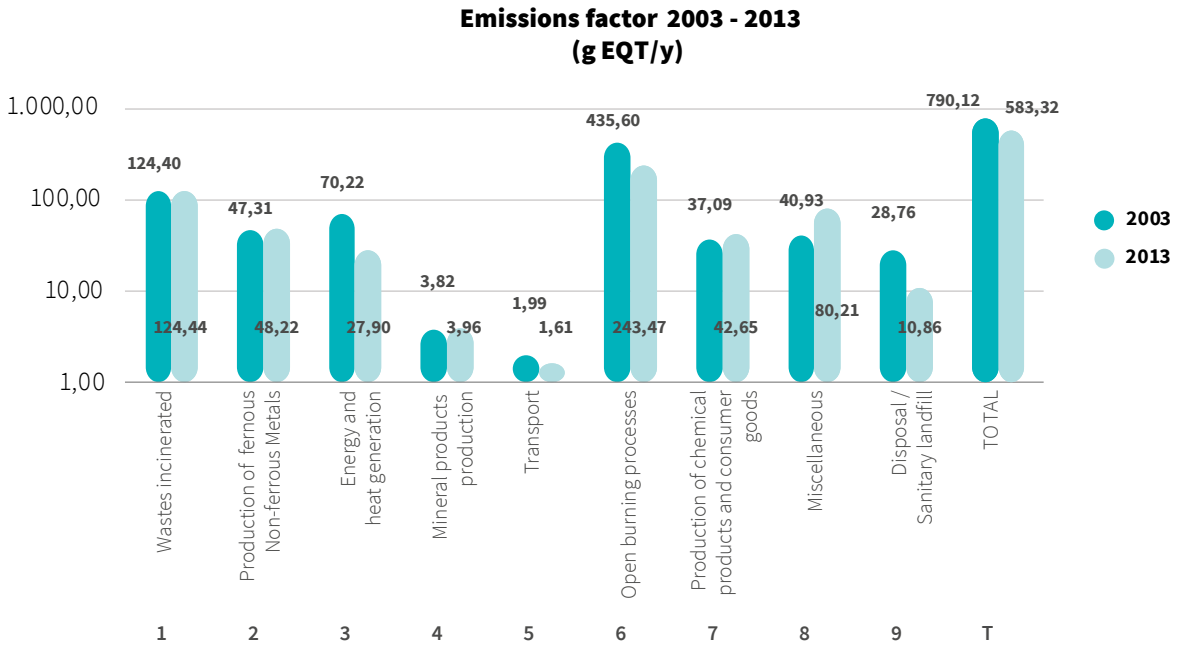



**Source: Minambiente (2016b)**

The comparison for each group of sources shown in Graph 3.1 shows that, according to the methodology adjustments from the 2013 toolkit, the group that recorded the highest increase in releases was group 8 *"Miscellaneous"*[83], with 95.97%. Group 4, *"Mineral product production",* and group 7, *"Production of chemical products and consumer goods",* increased their releases by 3.63% and 15.50% respectively, and group 2, *"Production of ferrous Non-Ferrous Metals"*, showed a slight increase in releases of 1,93%. Group 1, *"Waste incineration",* did not vary, since there was no change in classes, subclasses or emission factors. In turn, groups 3. *"Energy and heat generation"*, 5 *"Transport"*, 6, *"Open burning or incineration processes",* and 9, *"Disposal of sanitary landfills",* recorded a reduction in their releases at 60.26%, 19.26%, 44.11% and 62.22%, respectively.

**83.** The categories of biomass drying, crematoria, smokery, dry cleaning and tobacco consumption belong to this group. A significantly-high emission factor was added to the biomass drying category in the residue item (formerly 0, now 79,36 g EQT/a), which almost doubles the contribution of this group.

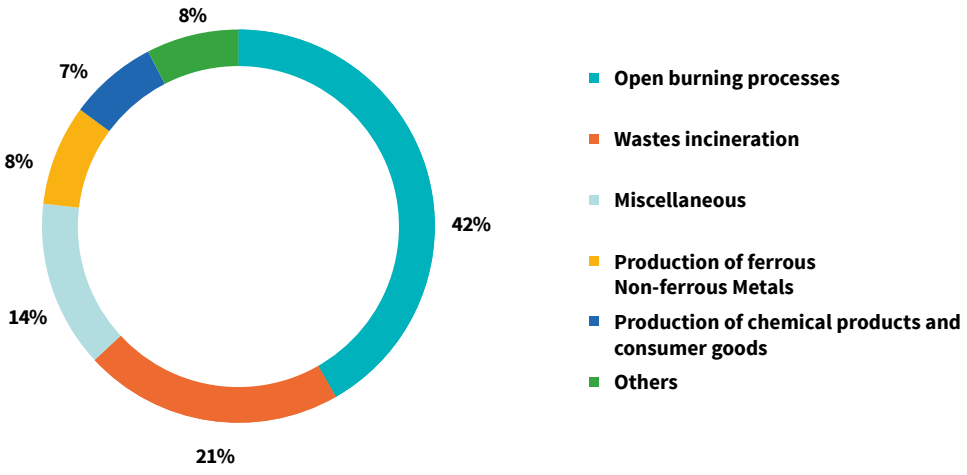
**Graph 3.11. Comparison of total annual releases per group[84]**




**Source: Minambiente (2016b)**

According to the recalculation performed based on the 2013 emission factors, the contribution from each group of release sources is distributed as shown in Graphs 3.11 and 3.12, and Table 3.10.

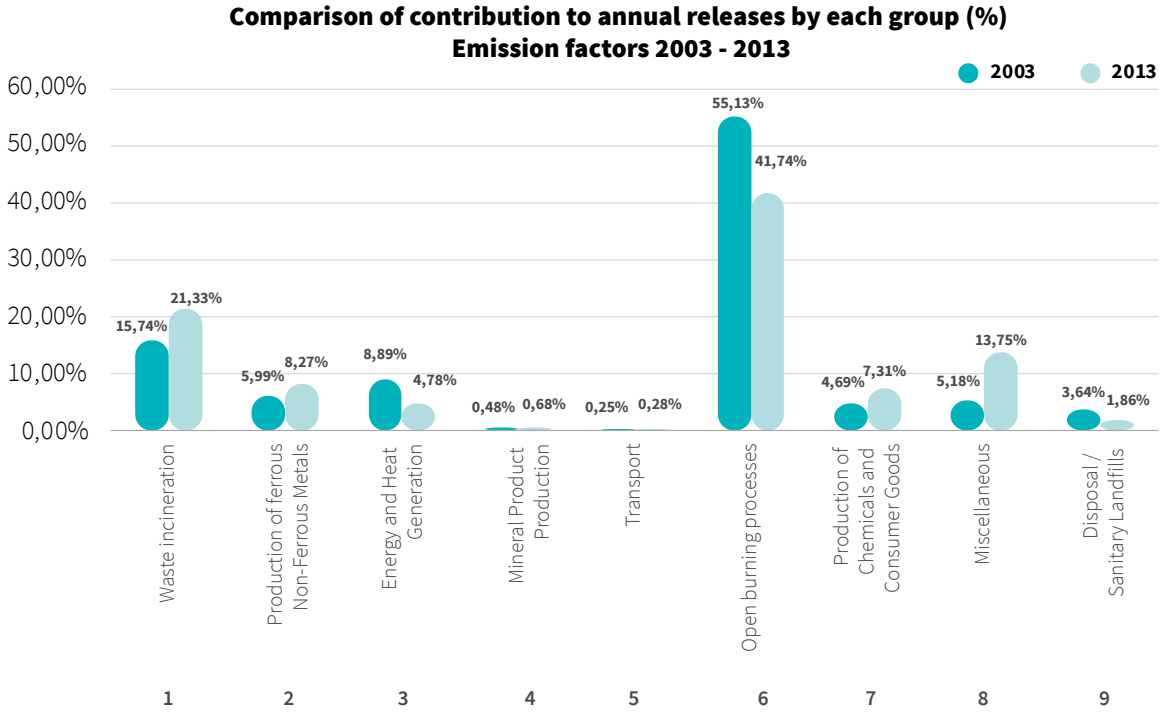
**Graph 3.12. Contribution of each group of release sources to the total**




**Source: Realized based on information reported by Minambiente (2016b)**

**84.** Graph in base-10 logarithmic scale.

**Graph 3.13. Comparison of the contribution of each group in the total release based on FE 2003-2013**




**Source: Minambiente (2016b)**

The group of release sources making a greater contribution, compared to the total, is group 6, "*Open burning or incineration processes"* with a 41.74% contribution (243.5 g TEQ/y, where 194.61 g TEQ/y are accidental waste incineration and fires and 48.85 g TEQ/y are biomass incineration); followed by group 1, *"Waste incineration"* with 21.33% (124.4 g TEQ/y where 89.02 g TEQ/y are associated with medical wastes, 28.23 g TEQ/y to hazardous waste and 6.45 g TEQ/y to municipal wastes). The third place is for group 8, "*Miscellaneous",* with 13.75% (80.2 g TEQ/y are drying biomasses with 80.17 g TEQ/y). These three groups represent 76.82% of the country's total releases (448.1 g TEQ/y), while the remaining six groups included in the inventory amount to 23.18% (135.2 g TEQ/y) in total.

These six group release sources contribute in the following order: group 2, *"Production of ferrous Non-Ferrous Metals",* with 8.27% (48.22 g TEQ/y), group 7, *"Production of chemical products and consumer goods",* with 7.31% (42.65 g TEQ/y), group 3, *"Energy and heat generation",* with 4.78% (27.9 g TEQ/y), group 9, *"Final disposal of wastes",* with 1.86 (10.86 g TEQ/y), group 4, *"Mineral product production",* with 0.68% (3.96 g TEQ/y) and group 5, *"Transport",* with 0.28 (1.61 g TEQ/y). Although the toolkit establishes ten groups, the last group being, *"Contaminated hot-spots and sites",* this group was not included in the baseline and the

re-calculation, since the initial inventory did not have information about this group, but it is expected that it will be included in the inventory update planned for 2018.

The Table 3.8 shows the results of the corresponding categories that are part of each stated group.

Concerning the so-called release "vectors", the trend for greater releases associated with atmospheric emissions and disposed waste continues, but its contribution falls at some points with 53% and 21% approximately (compared to 61% and 30% according to FE 2003) and the soil vector appears to be stronger with almost 15% (compared to 2% in the prior inventory).

*Conclusions*

According to the last re-calculation for 2002, Colombia released 583.32 g TEQ/y. The priority action concerning UPOPs is the inventory update, since although it is clear that the estimations for the year 2002 are not suitable for decision making. However, those figures a national approximation to the problematic and once the inventory is updated, the action plan will be revised and adjusted.

The two groups with the most significant contribution of dioxin and furan releases in the country, according to the 2003 and 2013 methodology, continue to be open incineration processes (41.74% - 243.5 g TEQ/y) where is included the accidental wastes incineration and fires, and biomass incineration. In second place is the waste incineration (21.33% - 124.4 g TEQ/y) where is included the medical wastes, hazardous wastes, and municipal wastes. The third place of contribution is the group 8 "miscellaneous" (13.75% - 80.2 g TEQ/y) associated with biomass drying. This information allows prioritizing the actions with these sectors in the country, for the identification and quantification of current UPOPs releases, as well as to implement policies, normative and measures for these releases reduction.

In turn, emissions into the atmosphere and disposed wastes continue to be the vectors with highest contributions, but the soil vector becomes important in the third place by increasing its contribution significantly, based on the latest emission factors.

For more information on each group and category, please see the *"Re-cálculo del inventario de línea base 2002 para fuentes y liberaciones de dioxinas y furanos"* document by Minambiente (2016b) available at the Ministry of Environment and Sustainable Development www.minambiente.gov.co

**Table 3.10. Summary results for the recalculation of the 2002 baseline for dioxin and furan releases based on their contribution.**

| Group | Categories that comprise the group | Annual release (g TEQ/y) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Air | Water | Soil | Product | Residue or Ashes (*) | Total based on FE 2013 g TEQ/y | % Share |
| Open incineration processes | Biomass incineration<br>Waste incineration and accidental fires | 156,8 | 0.0 | 86.7 | 0.0 | 0.0 | 243.47 | 41.74% |
| Waste incineration | Incineration of solid municipal waste<br>Incineration of hazardous waste<br>Incineration of medical waste<br>Incineration of the light fraction of fragmentation wastes<br>Incineration of sewage sludge<br>Incineration of wood wastes and biomass wastes<br>Combustion of animal carcasses | 103,1 | 0.0 | 0.0 | 0.0 | 21.3 | 124.44 | 21.33% |
| Miscellaneous | Biomass drying<br>Crematorium Smokery<br>Dry cleaning<br>Tobacco consumption | 0,4 | 0.0 | 0.0 | 0.4 | 79.4 | 80.21 | 13.75% |
| Production of ferrous Non-Ferrous Metals | Sintering iron mineral<br>Coke production<br>Iron, steel and casting production plants<br>Copper Production<br>Aluminum Production<br>Lead Production<br>Zinc Production<br>Bronze and Brass Production<br>Magnesium Production<br>Heat production of non-ferrous metals (e.g. Ni) Waste disposal units<br>Heat recovery of wires and recycling of electrical and electronic wastes | 18,8 | 18.0 | 0.0 | 0.0 | 11.5 | 48.22 | 8.27% |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Production of chemical products and consumer goods | Pulp and paper factories<br>Inorganic Chlorinated Chemicals<br>Aliphatic Chlorinated Chemicals<br>Chlorinated Aromatic Chemicals<br>Other Chlorinated and Non-Chlorinated Chemicals<br>Oil refineries<br>Textile plants<br>Leather processing plants | 0,3 | 0.4 | 0.0 | 41.4 | 0.6 | 42.65 | 7.31% |
| Energy and Heat Generation | Fossil fuel plants<br>Biomass stations<br>Combustion of landfill biogas<br>Combustion of biomass for heating and domestic cooking<br>Domestic heating with fossil fuels | 24,6 | 0.0 | 0.0 | 0.0 | 3.3 | 27.90 | 4.78% |
| Final disposal of wastes | Sanitary fillings, landfills and sanitary landfill<br>removal<br>Sewage drainage and treatment<br>Direct discharges to water<br>Compost<br>Disposal of oil waste | 0,0 | 3.2 | 0.0 | 2.5 | 5.2 | 10.86 | 1.86% |
| Mineral Product Production | Cement kilns<br>Cal<br>Bricks<br>Glass<br>Ceramics<br>Asphalt mixtures<br>Processing of bituminous shales | 3,8 | 0.0 | 0.0 | 0.1 | 0.0 | 3.96 | 0.68% |
| Transport | 4-stroke engines<br>2-stroke engines<br>Diesel engines<br>Heavy-fuel engines | 1,6 | 0.0 | 0.0 | 0.0 | 0.0 | 1.61 | 0.28% |
| | Total | 309.3 | 21.6 | 86.7 | 44.4 | 121.3 | 583.32 | 100.00% |

Source: Made based on information reported by Minambiente (2016b)

## 3.5. POPs used for industrial purposes (except PCB)[85]

### 3.5.1. Progress on the implementation of the action plan

The country has not made any significant progress on addressing and identifying the situation of POP used for industrial purposes (except PCB) in the last years (except for PCB). Consequently, Colombia developed an initial inventory of POP used for industrial purposes (except PCB) in the NIP update during 2016[86]; this inventory will be briefly shown in the sections following this chapter as a first approach to this problem.

This first approach allowed identifying some productive sectors that would potentially use them or have used them, as well as, developing a review of national statics on production and import of suspicious items, and its results are presented in the following sections.

Research studies been conducted on the presence of PFOS and other perfluorinated compounds in different biological matrices (blood, serum, tissue) of fish, birds and human blood have from the country's north coast (Table 3.11), and they have shown high levels of these type of compounds, for example, 29 ng/ml in blood. These results suggest for the first time that perfluorinated compounds are present in the wildlife of Latin American countries.

**Table 3.11 Research on POP used for industrial purposes (except PCB)**

| Published Articles |
|---|
| Johnson, Boris. (2004). Perfluorinated Compounds In Fish, Birds, And Humans From Colombia. Abstract Book Setac North America Annual Meeting, 25(1), 45. |
| Verbel, O., Johnson, B., Fernández, G., Avila, B., Hoyos, O., & Kannan, K. (2006). Perfluorooctanesulfonate and related fluorochemicals in biological samples from the north coast of Colombia. Environmental Pollution, 142(2), 367-72. |
| Rauert, C., Harner, et al (2016). Towards a regional passive air sampling network and strategy for new POPs in the GRULAC region: Perspectives from the GAPS Network and first results for organophosphorus flame retardants. Science of the Total Environment, 573, 1294-1302. |
| Hernández, F., et ál. (2012). Use of time-of-flight mass spectrometry for large screening of organic pollutants in surface waters and soils from a rice production area in Colombia. Science of the Total Environment, 439, 249-259 |

**85.** The POPs used for industrial purposes are eight. In the Annex A are included 1) Hexabromobiphenyl (HBB), 2) Tetrabromodiphenyl ether (tetraBDE) y pentabromodiphenyl ether (pentaBDE) (c-pentaBDE), 3) Hexabromodiphenyl ether (hexaBDE) and heptabromodiphenyl ether (heptaBDE) (c-octaBDE), 4) Hexabromocyclododecane (HBCD), 5) polychlorinated naphthalenes, 6) Hexachlorobutadiene (HCBD), pentachlorobenzene (PeCB) and 8) Hexachlorobenzene (HCB). In the Annex B: 1) Perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctanesulfonyl fluoride (PFOSF).

**86.** Based on the methodological guidelines issued by the Stockholm Convention.

It is worth mentioning that the Ministry of Labour is currently developing actions in cross-cutting manner for different POP groups in order to substitute the current Occupational Health Program in Colombia by the Occupational Safety and Health Management System (SG-SST)[87], which is expected to provide better guarantees to workers facing occupational risks they are exposed to, including risks related to POP substances.

### 3.5.2. Preparation of the initial inventory of the POPs used for industrial purposes

*Overview*

Colombia is not and has not been a manufacturer of POP substances[88] used for industrial purposes. However, as an importer, Colombia might have allowed the entry of products with this type of substances and they may even be present in industrial products and everyday use goods that require proper management.

Despite the significant progress made in managing other types of POP -e.g. PCB and some pesticides-, there are still gaps and unknown aspects in relation to the new brominated, perfluorinated and chlorinated POPs for industrial use, so the NIP update project took a first step towards the creation of an initial inventory of these substances[89], as a first approach to know the general situation of these compounds in a local context and identify significant gaps and deficiencies that allow the country to direct future actions for their proper management.

*Results*

The results obtained for Hexabromobiphenyl-HBB, polybromodiphenyl ethers - PBDE, Hexabromocyclododecane-HBCD, pentachlorobenzene, PFOS and their salts and, PFOSF and their derivatives are presented below.

#### a. Pentachlorobenzene

Pentachlorobenzene – PeCB stopped being manufactured in the world over two decades ago and its most representative intentional use was as a pesticide. It was used in the industry as a viscosity reducer for several heat transfer products, paint accelerator and flame retardant.

**87.** In Decree 1072 /2015 (chapter 2, section 4), single regulatory decree of the labor sector.

**88.** POP substances with industrial applications are: Hexabromodiphenyl, Tetrabromodiphenyl ether (tetraBDE) and pentabromodiphenyl ether (pentaBDE), hexabromodiphenyl ether (hexaBDE) and heptabromodiphenyl ether (heptaBDE)> Pentachlorobenzene (PeCB), Hexabromocyclododecane (HBCD), perfluorooctanosulfonic acid (PFOS), its salts and Perfluorooctane sulfonyl fluoride (PFOSF), polychlorinated naphthalenes and Hexachlorobutadiene.

**89.** Made based on the methodology of a Level 1 or initial inventory following the UNEP, UNITAR and UNIDO guidelines, mostly using secondary available information. "*Guidance for the inventory of polybrominated diphenyl ethers (PBDEs) listed under the Stockholm Convention on Persistent Organic Pollutants*", draft, March, 2014 and "*Orientaciones para el inventario de ácido sulfónico de perfluorooctano (PFOS) y sustancias químicas afines enunciados en el Convenio de Estocolmo sobre contaminantes orgánicos persistentes*", draft, July, 2012.

According to the information queried in the official databases[90], PeCB was not manufactured in Colombia or used extensively[91]. However, an entry of **0.16 kg** of this substance into the country in 2014 is a matter of interest; considering its low quantity, it is assumed that it was imported for some laboratory application, but no matter how little, it should not have occurred taking into account that this POP has been regulated in the Stockholm Convention since 2009, so controls must be strengthened in this regard.

### b. Hexabromobiphenyl (HBB)

The HBB has been used as flame retardant in polyurethane foam for car upholstery, and in thermoplastics based on acrylonitrile butadiene styrene (ABS) for casing in office equipment, motor casing, electric and electronic equipment and coating of electrical wirings.

There is no evidence of HBB manufacturing in the country, and after the query of import figures for this compound through the "Bacex" foreign trade database, specifically tariff sub-heading 2903.99.31.00 corresponding to *"Brominated derivatives: Hexabromobiphenyl (ISO)",* no import records were found in the last ten years.

Consequently, and considering that HBB is no longer manufactured around the world, it is estimated that this substance is not used in Colombia, and thus there are no stocks or manufactured items containing such substance in the country. However, an inquiry in a more detailed inventory may show the presence of imported materials or items containing the substance, either while in use or at the end of their life cycle.

### c. Hexabromocyclododecane-HBCD

Considering that the current Colombian tariff system does not have a detailed tariff sub-heading for hexabromocyclododecane[92], it was not possible to determine the import figures of these substances based on the country's official databases[93]. It was possible to identify the trade of products such as CD-75P™ and SP-75™ produced by HBCD Great Lakes Solutions from the United States, but the traceability of import figures for this specific substance could not be identified.

According to the information available in the Stockholm Convention documents, it is known that hexabromocyclododecane - HBCD was used in the textile sector and continues to be used as a flame retardant in construction and plastic vehicle parts. This POP was included in Annex A of the Stockholm Convention in 2013, with restriction of use in expanded polystyrene and extruded polystyrene in buildings.

Additionally, based on the information available and collected for this initial inventory, it was not possible to

**90.** DANE and Bacex

**91.** It appears in the national tariff under tariff sub-heading 2903991100 "Other chlorinated derivatives: Pentachlorobenzene (ISO)".

**92.** The HBCD's tariff sub-heading is 2903.59.02; however, it is only possible to query from chapter "Organic chemical products" to sub-heading 29 03 "Halogenated derivatives of hydrocarbons" in the Colombian tariff system.

**93.** Especially Colombia's foreign trade database - Bacex in weight (kg).


identify the use and amount of HBCD-based flame retardant products related to the polystyrene foam industry for construction or textile applications in Colombia.

### d. Polybromodiphenyl ethers – PBDE

The inventory of PBDE, mainly used in the industry as flame retardants, focused on the following sectors in this stage: Electrical and Electronic Equipment (EEE), Waste Electrical and Electronic Equipment (WEEE) and transport (by the end of their useful life), since these sectors are considered to have gathered most of the PBDE applications: rug and textile manufacturing, oil industry products, among others.

### e. Octabromodiphenyl ether (c-octa-BDE)

It is formed by a mixture of PBDE ethers. Its main components are: hexabromodiphenyl ethers (11%), heptabromodiphenyl ethers (43%), octabromodiphenyl ethers (35%), nonabromodiphenyl ethers (10%) and decabromodiphenyl ethers (1%). This commercial mix will be hereinafter referred to as c-octa-BDE.

The main categories of EEE / WEEE were considered to estimate the possible c-octa-BDE content in electric and electronic devices. Based on international experiences of these categories, it is estimated that this product may appear in relevant concentrations, especially in ABS covers of CRT (Cathode ray tube or cathode screen) televisions and computer monitors; reason why the initial EEE c - octaBDE inventory focused particularly on the categories listed in the following table:

**Table 3.12 Main EEE/WEEE categories with c-octaBDE content**

| EEE Category No. | | HS* Codes | c-octa-BDE content |
|---|---|---|---|
| 3 | Information technology and telecommunications equipment | 8471, 8443, 8470, 8517, 8528 | Average concentrations in monitor CRTs greater than 0,1 % in weight and in other products around or below 0,1 % in weight[94] |
| 4 | Electronic consumption devices | 8527, 8528, 8540, 8519, 8521, 8525 | Average concentrations in TV CRTs possibly greater than 0,1 % in weight, and other products with concentrations around or below 0,1 % in weight |

The inventory for items under EEE categories 3 and 4 imported to Colombia from 2002 to 2015 was estimated based on the EEE import numbers[95], as well as the calculation factors and expressions[96] for c-octa-BDE provided in the UNEP, UNITAR and UNIDO[97] guidelines.

The estimated amounts must be construed considering the following premises:

**94.** 0,1% (in weight) = Value of maximum concentration pursuant to EU Directive 2002/95/EC by the European Parliament and the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS Directive). Several countries (such as China and India) have adopted the cut-off values of RoHS standards for EEE. Currently the Basel Convention has not defined low limits for POP.

**95.** Numbers taken from Colombia's foreign trade database - Bacex in weight (kg).

**96.** The calculation expression based on the methodological guideline is: c-octa-BDE (kg) content = EEE Stocks (t) x Polymer fraction (mean) x c-octa-BDE content in the polymer (mean).

**97.** Guidance for the inventory of polybrominated diphenyl ethers (PBDEs) listed under the Stockholm Convention on Persistent Organic Pollutants - Draft. UNEP, UNITAR and UNIDO (2014).

- Average percentages of the polymer fraction are taken for the different EEE categories based on the literature.
- Estimated c-octa-BDE values are assigned to the polymer fractions in the different EEE categories based on the relevant technical literature.
- It is assumed that the total imported EEE would contain c-octa-BDE, in the worst-case scenario, considering that this substance has no longer been manufactured around the world for several years.
- The numbers taken from "Bacex" only correspond to imported EEE.
- There were no available consolidated numbers for making estimates on the manufacturing of this type of items nationwide.
- EEE are not considered to have entered the country illegally.

**Table 3.13. c-octaBDE estimates in EEE categories 3 and 4 for the 2002-2015 series**

| YEAR | Total imports (*) (t) | Estimated c-octa-BDE content (kg) |
|---|---|---|
| 2002 | 46,650,879 | 6,484 |
| 2003 | 54,169,628 | 7,440 |
| 2004 | 66,148,689 | 9,789 |
| 2005 | 85,431,074 | 12,534 |
| 2006 | 96,942,724 | 15,019 |
| 2007 | 102,996,831 | 16,086 |
| 2008 | 64,424,166 | 5,352 |
| 2009 | 46,187,304 | 4,162 |
| 2010 | 57,290,423 | 4,900 |
| 2011 | 64,103,922 | 5,587 |
| 2012 | 61,746,996 | 5,248 |
| 2013 | 60,703,249 | 5,258 |
| 2014 | 64,744,802 | 5,504 |
| 2015 | 46,971,872 | 4,180 |
| **TOTALS** | **918,512,559** | **107,541** |

(*) Based on the tariff sub-headings of EEE categories 3 and 4

**Source: Minambiente (2016c)**

However, it is necessary to consider that many of these EEE are already out of service, so an approximate EEE useful life from 7 to 15 years was taken as the basis to calculate an estimate of the amount of c-octa-BDE present in imported EEE in use in the country by the end of 2015. Based on this calculation, it is estimated that the probable c-octa-BDE content in the EEE fraction in use in the country by the end of 2015 was around **57,804 kg**.

On the other hand, an estimate was made on the c-octaBDE content in some consumer household EEE items based on 13,427,281 households in Colombia in 2013 (DANE, 2014)[98], estimating **601.9 kg** as shown in the following table:

**Table 3.14. c-octaBDE content in consumer EEE in households in 2013**

| TYPE OF EEE | % of households With EEE (2013) | Amount of c-octaBDE (kg) (*) |
|---|---|---|
| Conventional color TV | 0.78 | 544.5 |
| LCD, plasma or LED TV | 0.28 | 22.0 |
| Stereo | 0.47 | 6.9 |
| Desktop computer | 0.26 | 25.2 |
| Laptop computer | 0.23 | 2.8 |
| Digital photo or video camera | 0.21 | 0.5 |
| **Total** | **---** | **601.9** |

**Source: Minambiente (2016c)**

This estimate indicates that there are EEE in Colombian households that may contain nearly 0.6 tons of c-octa-BDE, which in the next years would become part of the waste currents.

Additionally, some EEE were seized during 2013 pursuant to national reports by the Fiscal and Customs Police - POLFA, for example: 22 TVs, 82 DVDs, 14 micro components, 16 home theatres, 179 computers and 11 laptops (POLFA, 2016). Consequently, it is estimated that the merchandise seized in that year may contain **1.9 kg** of c-octa-BDE.

An estimate was made on wastes contaminated with c-octa-BDE, based on the EEE import numbers of categories 3 and 4 from the 2004-2015 period, using the expected years of useful life for the different items (from 7 to 15 years depending on the item); the result was **43,952 kg** of c-octa-BDE that may have entered the country's waste current by 2015 from such EEE fraction. The particular estimate for 2013 was **6,913.3** kg of c-octa- BDE contained in waste potentially generated in that year.

**98.** Based on the data provided by the National Quality of Life Survey in 2013 (DANE, 2014).

On the other hand, based on the numbers for environmentally sound WEEE management performed by eight of the main hazardous waste managers authorized in Colombia (Stavro, 2015) from 2013 to 2014, it is estimated that such wastes contained **152.9 kg** and **163.1 kg** of c-octa-BDE, respectively.

Additionally, the information from the table above was used as reference in 2013 in order to calculate the congeners comprising commercial octa-BDE based on the foregoing estimates. In this line of thought, the estimates for hexa-BDE, hepta-BDE, octa-BDE, nona-BDE and deca-BDE are presented below.

**Table 3.15. Estimates on c-octaBDE congener for 2013**

| Congener | % in c-octa-BDE | POP-BDE in net EEE imports (kg) | POP-BDE present in consumer EEE (kg) | POP-BDE entering WEEE wastes flow (kg) |
|---|---|---|---|---|
| Hexabromobiphenyl ethers | 11% | 578.4 | 66.2 | 760.5 |
| Heptabromodiphenyl ethers | 43% | 2,260.9 | 258.8 | 2,972.7 |
| Octabromodiphenyl ethers | 35% | 1,840.3 | 210.7 | 2,419.7 |
| Nonabromodiphenyl ethers | 10% | 525.8 | 60.2 | 691.3 |
| Decabromodiphenyl ethers | 1% | 52.6 | 6.0 | 69.1 |
| **c-octa-BDE total** | | **5,257.9** | **601.9** | **6,913.3** |

**Source: Minambiente (2016c)**

In summary, the estimates made for c-octa-BDE based on the available information as of 2015 are:

**Table 3.16. Summary of c-octaBDE estimates in Colombia**

| Type of estimate | Amount of c-octa- BDE (kg) |
|---|---|
| (1) c-octa-BDE content estimated based on EEE imported from 2002 to 2015 | 107,541 |
| (1.1) Feasible c-octa-BDE content in the EEE fraction in use by the end of 2015 in the country | 57,804 |
| (1.2) Estimated c-octa-BDE content in EEE for domestic use in 2013 | 601.9 |
| (2) Feasible c-octa-BDE content in the EEE seized during 2013 | 1.9 |
| (3) Feasible c-octa-BDE content in the WEEE possibly generated until 2015[99] | 43,952 |
| (3.1) Estimated c-octa-BDE content in the WEEE possibly generated specifically in 2013 | 6,913.3 |
| (3.2) Feasible c-octa-BDE content in the EEE managed during 2013 | 152.9 |
| (3.3) Feasible c-octa-BDE content in the WEEE managed during 2014 | 163.1 |
| (4) Minimum feasible amount of c-octa-BDE that the country must eliminate in environmentally soundmanner in the next years according to this inventory [(4) = (1.1) + (2) + (3) ] | **101,758** |

The minimum feasible amount of c-octa-BDE estimated to be part of the waste currents in the next years and subject to environmentally sound management is approximately **102 tons**, based on Table 3.16. However, it is necessary to consider that -for the purposes of waste management- this figure will increase significantly because c-octa-BDE will not be available as a pure isolated substance, but it will be applied to parts or pieces of disposed items or materials.

### f. Pentabromobiphenyl ether (c-penta-BDE)

The commercial version of this substance consists of tribromodiphenyl ethers (0.5%), tetrabromodiphenyl ethers (33%), pentabromodiphenyl ethers (58%), hexabromodiphenyl ethers (8%) and heptabromodiphenyl ethers (0.5%). This commercial mix will hereinafter be referred to as c-penta-BDE.

**99.** The calculation expression based on the methodological guideline is: octa-BDE (kg) content = Amount of WEEE (t) x Polymer fraction (mean) x octa-BDE content in the polymer (mean).

The c-penta-BDE inventory focused basically on the estimates of this commercial substance in the transport sector, since it was broadly used in the treatment of flexible polyurethane foams (for vehicle seats, head rests, automobile roofs, etc.) and the inner cover of fabrics used in automobile seats. Considering the date when this substance was discovered and its subsequent manufacturing prohibition in 2004, it is estimated that only vehicles manufactured from 1975 to 2004 may contain c-Penta-BDE.

Land transport vehicles such as automobiles, trucks and buses represent the fraction of vehicles from the transport sector with the highest feasible content of commercial c-penta-BDE given their consumption volumes, for this reason they are used for inventory estimates. This inventory is an initial stage, so it did not include vehicles for means of transport other than land transport, based on the available information.

Table 3.17 details the amounts of c-penta-BDE estimated internationally in the polyurethane foam fraction in specific vehicle categories, considering a c-penta-BDE average use of 1% weight of the polyurethane foam used in the transport sector.

**Table 3.17. Estimated amounts of c-pentaBDE in the vehicle polyurethane foam fraction.**

| Vehicle Category | Estimated c-PentaBDE content |
|---|---|
| Automobiles | It is estimated that the average of polyurethane foam with c-penta-BDE used in automobiles was around 16 kg. With an average content of 1% c-PentaBDE, an automobile may have approximately 160 g of c-PentaBDE. |
| Trucks | It is estimated that the amount of polyurethane foam in trucks is similar to that of a passenger automobile, and thus 160 g of c-penta-BDE are calculated for each truck. |
| Buses | It is estimated that the average of polyurethane foam with c-penta-BDE used in buses was around 100 kg. With an average content of 1% c-PentaBDE, a bus may have approximately 1,000 g of c-PentaBDE. |

**Source: Reported by Minambiente (2016c) based on information from UNEP, UNITAR, UNIDO (2014)**

The inventory for vehicles made from 1975 to 2004 was estimated based on the vehicle fleet numbers available in 2012[100], as well as the calculation factors and expressions[101] for c-penta-BDE provided in the UNEP, UNITAR and UNIDO[102] guidelines.

**100.** Numbers retrieved from the Ministry of Transport of Colombia. MinTransporte (2013).

**101.** The calculation expression based on the methodological guideline is: Amount of POP-PBDE based on the vehicle category (kg)= Number of vehicles per category x amount of c-penta-BDE per vehicle x Regional factor.

**102.** Guidance for the inventory of polybrominated diphenyl ethers (PBDEs) listed under the Stockholm Convention on Persistent Organic Pollutants - Draft. UNEP, UNITAR and UNIDO (2014).

The following assumptions were considered for the estimates:

- Only vehicles manufactured from 1975 to 2004 would contain c-PentaBDE.
- The regional factor of 0,05[103] is applied to vehicles manufactured in Latin America and the Caribbean region.
- A regional factor of 0,5 is assigned to vehicles manufactured in the United States as it is known that approximately 90% of this substance was used in North America.

The estimated values of c-penta-BDE in the different types of vehicles manufactured in the country from 1975 to 2004 with a valid license (vehicle fleet) in 2012 (MinTransporte, 2013) are listed in the following table, they comprise **10,937.8 kg** of c-penta-BDE in total.

**Table 3.18. Amount of c-pentaBDE per type of locally-manufactured vehicle in the 2012 vehicle fleet in Colombia**

| Vehicle Manufactured locally (model 1975 - 2004) * | Number of vehicles | Amount of c-penta-BDE per vehicle (kg) | Regional F | Amount of c- penta-BDE per type of vehicle (kg) |
|---|---|---|---|---|
| Automobile / all-terrain/SUV | 1,094,501 | 0.16 | 0.05 | 8,756.0 |
| Bus | 13,952 | 1.00 | 0.05 | 697.6 |
| Small bus/ minibus | 27,841 | 1.00 | 0.05 | 1,392.0 |
| Truck | 11,519 | 0.16 | 0.05 | 92.1 |
| Tractor truck | 3,788 | 0.16 | 0.05 | 30.3 |
| **TOTAL** | | | | **10,937.8** |

(*) In the vehicle fleet as of 2012 according to MinTransporte (2013)

**Source: Minambiente (2016c)**

The estimated values of c-penta-BDE in the different types of imported vehicles model 1975 to 2014 (United Nations, 2014) with a valid license (vehicle fleet) in 2012 (MinTransporte, 2013) comprise **9,045.8 kg** of c-penta-BDE in total and are listed in the following table.

**103.** "*There are no available data on the POP-PBDE contents in transport for vehicles manufactured in Latin America, the Caribbean and African regions. Since POP-PBDE is mainly used in North America, we suggest applying the low-impact factor of 0,05 as a regional factor until there are any available data*" (UNEP, UNITAR, UNIDO, 2012).

**Table 3.19. Estimates of c-pentaBDE congeners for 1975-2004 model vehicles in 2012**

| Type of Vehicle | Number vehicles of imported (model 1975 - 2004) * | Origin | Amount of c-penta-BDE per vehicle (kg) | Regional F | Amount of c-penta-BDE per vehicle (kg) |
|---|---|---|---|---|---|
| Automobile/ all-terrain/SUV | 38,283 | USA | 0.16 | 0.5 | 3,062.6 |
| | 570,178 | Rest | | 0.05 | 306.3 |
| Bus | 3,386 | USA | 1.00 | 0.5 | 1,693.0 |
| | 35,641 | Rest | | 0.05 | 169.3 |
| Small bus/ minibus | 5,804 | USA | 1.00 | 0.5 | 2,902.0 |
| | 60,364 | Rest | | 0.05 | 290.2 |
| Truck | 6,178 | USA | 0.16 | 0.5 | 494.2 |
| | 61,062 | Rest | | 0.05 | 49.4 |
| Tractor truck | 984 | USA | 0.16 | 0.5 | 78.7 |
| | 9035 | Rest | | 0.05 | 7.9 |
| **TOTAL** | | | | | **9,045.8** |

(*) In the vehicle fleet as of 2012 according to MinTransporte (2013) Source: Minambiente (2016c)

Considering the number of 1975-2004 model vehicles identified in use as of 2012 and based on the years of useful life suggested for different vehicle types, namely, 20 years for private vehicles[104], 20 years for passenger transport vehicles (Congreso de la República, 1993) and 25 years for cargo vehicles (MinTransporte, 2012), an estimate of **4,082.9 kg** of c-penta-BDE was made in the fraction of vehicles that were at the end of their useful life in 2012 and would become part of the waste currents; their numbers are detailed below.

**104.** Artículo El Tiempo. Mayo 10 de 2013. Primer paso para la chatarrización de autos particulares en el país http://www.eltiempo.com/archivo/documento/CMS-12791346. Retrieved on: February 22, 2016.

**Table 3.20. Amounts of c-pentaBDE in vehicles by the end of their useful life in 2012**

| Type of Vehile | Final | Origin | Number of Vehicle per year of useful life and older(model 1975 - 2004) * | Amount of c-penta-BDE per Vehicle (kg) | Regional F | Amount of c-penta-BDE per type of vehicle (kg) |
|---|---|---|---|---|---|---|
| Automobile All-terrain SUV | 1992 | USA | 22,550 | 0.16 | 0.5 | 1,804.0 |
| | | Other | 270,589 | | 0.05 | 180.4 |
| | | National | 379,244 | | 0.05 | 0.0 |
| Bus Small bus Minibus | 1992 | USA | 3,341 | 1.00 | 0.5 | 1,670.5 |
| | | Other | 34,460 | | 0.05 | 167.1 |
| | | National | 12,896 | | 0.05 | 0.0 |
| Truck Tractor-truck | 1987 | USA | 2,965 | 0.16 | 0.5 | 237.2 |
| | | Other | 30,448 | | 0.05 | 23.7 |
| | | National | 3,722 | | 0.05 | 0.0 |
| **TOTAL** | | | | | | **4,082.9** |

(*) In the vehicle fleet as of 2012 according to MinTransporte (2013) Source: Minambiente (2016c)

On the other hand, table 3.21 shows the calculated amounts for the congeners of tri-BDE, tetra-BDE, penta-BDE, hexa-BDE and hepta-BDE, based on the prior estimated volumes of c-penta-BDE and using year 2012 for reference.

**Table 3.21. Estimates of c-pentaBDE congeners for 1975-2004 model vehicles in 2012**

| Congener | % in c- penta-BDE | POP-PBDE in vehicles locally manufactured and in use to 2012 | POP-PBDE in imported vehicles in use to 2012 | POP-PBDE in polyurethane foams of vehicles at the end of their useful life to 2012 |
|---|---|---|---|---|
| Tribromodiphenyl ethers | 0.5% | 54.7 | 45.2 | 20.4 |
| Tetrabromodiphenyl ethers | 33% | 3,609.5 | 2,985.1 | 1,347.4 |
| Pentabromodiphenyl ethers | 58% | 6,343.9 | 5,246.6 | 2,368.1 |
| Hexabromobiphenyl ethers | 8% | 875.0 | 723.7 | 326.6 |
| Heptabromodiphenyl ethers | 0.5% | 54.7 | 45.2 | 20.4 |
| **total c-penta-BDE** | | **10,937.8** | **9,045.8** | **4,082.9** |

**Source: Minambiente (2016c)**

In summary, the estimates made for c-penta-BDE based on the available information as of 2012 are:

**Table 3.22. Summary of c-pentaBDE estimates in Colombia**

| Type of estimate | Amount of c-penta-BDE (kg) |
|---|---|
| (1) Amount of c-penta-BDE per type of locally-manufactured vehicle in the 2012 vehicle fleet in Colombia | 10,937.8 |
| (2) Amount of estimated c-penta-BDE in imported vehicles of models 1975 to 2004 from the 2012 vehicle fleet in Colombia | 9,045.8 |
| (3) Feasible amounts of c-penta-BDE in vehicles reaching the end of their useful life in 2012 | 4,082.9 |
| (4) Minimum feasible amount of c-penta-BDE that the country must eliminate in environmentally sound manner in the next years according to this inventory [ (4) = (1) + (2) + (3) ] | 24,067 |

**Source: Minambiente (2016c)**

The minimum feasible amount of c-penta-BDE estimated to be part of the waste currents in the next years and to be subject to environmentally sound management is approximately **24 tons**, based on the table above. However, similarly as in c-octa-BDE, it is necessary to consider that -for the purposes of waste management- this number will increase significantly because c-penta-BDE will not be available as a pure isolated substance, but it will be applied to parts or pieces of disposed vehicles.

### g. PFOS and its salts and PFOSF and its derivatives

There is no reference of local manufacturing of perfluorooctane sulfonic acid - PFOS and its salts or perfluorooctane sulfonyl fluoride - PFOSF and its derivatives; there are not specific import data because -similarly as in HBCD- the current tariff sub-headings do not detail in particular the perfluorinated PFOS and PFOSF compounds.

Some chemical products with PFOS content are used in industrial photography, semiconductor and electronics sectors worldwide, as shown in table 3.23:

**Table 3.23. Chemical products with PFOS content used for different industrial applications.**

| Management Process | Chemical product | Guiding value |
|---|---|---|
| **Photography Industry** | Surfactant for electrostatic charge control agent; friction control agent; dirt repellent agent; adhesion control agent | 0.01 % |
| **Semiconductor Industry** | Engraving agent; photoresistor substance; photoacid generator; surfactant; anti-reflective coating agent. | 0.02-0.1 % |
| **Electronics Industry** | Engraving agent; dispersing agent; surface treatment agent; photoresistor substance; photoacid generator; surfactant for anti-reflective coating agent; welding; adhesive; painting. | 0.02-0.1% |
| **Metal plating** | Smoke suppressants, wetting agents | 5-10% |

**Source: UNEP, UNITAR, UNIDO, 2012**

The Stockholm Convention classifies the uses of PFOS, its salts and PFOSF and its derivates as:

| Acceptable Uses | Specific Exemptions | Expired Exemptions |
|---|---|---|
| • Photo imaging<br>• Photo resist and anti-reflective coatings for semi-conductors<br>• Etching agent for compound semi-conductors and ceramic filters<br>• Aviation hydraulic fluids<br>• Metal plating (hard metal plating) only in closed-loop systems<br>• Certain medical devices<br>• Fire-fighting foam<br>• Insect baits for control of leaf-cutting ants from Atta spp. and Acromyrmex spp. | • Photo masks in the semiconductor and liquid crystal display (LCD) industries<br>• Metal plating (hard metal plating)<br>• Electric and electronic parts for some colour printers and colour copy machines<br>• Insecticides for control of red imported fire ants and termites<br>• Chemically driven oil production | • Carpets<br>• Leather and apparel<br>• Textiles and upholstery<br>• Paper and packaging<br>• Coatings and coating additives<br>• Rubber and plastics |

Many of these products are manufactured internationally by companies such as Clariant, Dupont, South Florida Imaging Supply, Honeywell, Katun Corporation, Ricoh, Transene Company Inc., Canon USA Inc, Kyzen USA, Agfa Gevaert do Brasil Ltda, Tomoegawa USA Inc., Fujifilm Hunt Chemicals USA Inc., Kodak Alaris México SA de CV, Eastman Kodak SARL, among others. For example, in the case of products classified in tariff sub-heading 3707900000 *"Other products and chemical preparations for use in photography, except for varnishes, glues, adhesives and similar preparations; unmixed products to be used in photography in doses or in packaging suitable for retail sale"*, 813,840 kg were supplied to Colombia in 2015. However, some of the aforementioned manufacturers do not currently use PFOS substances in their products, based on the statements and information they have published.

Another application of PFOS and its related substances is flame retardant for firefighting foams; after European standards were issued to restrict the use of PFOS and the manufacturers adhered to programs such as USEPA to substitute the use of C-8 perfluorinated compounds (such as PFOS and PFOA) in these products, the main world manufacturers started to migrate to using products based on C-6 and fluorotelomer compounds.

The main manufacturers of firefighting foams that provide products to Colombia include Ansul Incorporated, Clariant, Chemguard Inc, Angus Fire and Tyco, among others, who provided the country with 72.1 tons of preparations and charges for fire extinguishing devices made of halogenated derivatives from 2007 to 2008 under tariff sub-heading 3813001100. Since many manufacturers migrated to use substances other than PFOS precisely in that period, it can be inferred that some firefighting foams imported before 2007, which have not been used yet, may contain PFOS compounds.

Another industrial application of PFOS substances is hard metal plating, where PFOS work as wetting agents for chromium electroplating and smoke suppressants; however, no specific information about this type of substances was found in the import records.

Concerning consumer products, it was not possible to identify or access statistical information on items that may contain PFOS and were imported into the country within categories such as kitchenware with non-stick layer, textiles, and clothes with firefighting fabrics and items with decorative plating, among others. There was not information about the electronic sector inputs that may contain these substances, that is to say, the entry of items containing PFOS or PFOSF into the country could not be established in figures, although they are suspected to be circulating in the national market.

National production of 15,439,975 m2 (DANE, 2016) was identified from 2002 to 2007 in the local manufacture of synthetic rugs and mats, which is another category of consumer products which may have contained PFOS substances in the past.

Assuming that products with POP substances were used in their manufacture, it is estimated that they contained **4,442.1** kg of PFOS that would have entered the country's waste currents almost completely in 2015, considering a 10-year useful life for this type of products.

**Table 3.24. Estimates of PFOS substances in artificial or synthetic fabric rugs and mats manufactured locally.**

| Year | PRODUCTION (m2) | Average fiber weight* (kg/m2) | PRODUCTION (Tons) | Feasible PFOS concentration applied to the material (Guiding value**) | Value Estimated in the PFOS annual production (kg) |
|---|---|---|---|---|---|
| 2002 | 2,039,540 | 0.959 | 1,956 | 0.03% of the fibre weight | 586.8 |
| 2003 | 2,356,756 | | 2,260 | | 678.0 |
| 2004 | 2,419,238 | | 2,320 | | 696.0 |
| 2005 | 2,678,832 | | 2,569 | | 770.7 |
| 2006 | 2,237,866 | | 2,146 | | 643.8 |
| 2007 | 3,707,743 | | 3,556 | | 1066.7 |
| **TOTAL** | **15,439,975** | | | | **4,442.1** |

**(*) Source: (Cuperz S.A., 2016) / (**) Source (UNEP, UNITAR, UNIDO)**

Concerning manufacture products exported by Colombia to European Union countries within the Free Trade Agreement entered into with the European Union in 2012 such as textile industry items, apparels, leather products, shoes and plastics, among others, exporters' products must comply with a minimum PFOS value set forth (OSEC & ProExport Colombia, 2016).

The foregoing gains relevance if we consider that items, products, parts or materials that may contain PFOS or PFOSF substances in their components have not been identified in Colombia. It is thus necessary to take actions that allow identifying the contents of these perfluorinated substances in export items.

*Conclusions*

The initial inventory of POP substances for industrial use in Colombia allowed collecting some statistical information about substances and products that may have contained them. These data were useful to make the feasible preliminary estimates. However, in most cases the available information was not detailed enough to identify substances of interest or information was incomplete, scattered or out of date. The national tariff system does not discriminate specific headings for PBDE, HBCD, PFOS or PFOSF, to allow traceability of the entry of this type of substances into the country.

Although the presented estimates have deficiencies that need to be corrected in a new inventory in the following phase, they allow evidencing a problem concerning the possible presence of contaminating substances such as PBDE (102 tons of c-octa-BDE and 24 tons of c-penta-BDE), PFOS and PBDE-associated substances (4.5 tons) in fractions of items widely distributed throughout the country. The estimated amounts show that substances deserve to be evaluated, all the more considering that they will reach the waste currents in the short and medium term.

On the other hand, since c-octa-BDE in EEE is mainly found in the oldest home appliances and specially in CRT monitors and televisions, the fraction of these items currently in Colombian households becomes important because the useful life of these appliances for home use tends to extend much longer and they also enter the second-hand market despite having been manufactured many years ago.

Additionally, the country's vehicle disintegration and scrapping programs do not consider vehicle polyurethane foams as hazardous wastes. This aspect must be analyzed because foam wastes containing c-penta-BDE must be identified and separated from others in order to be properly managed as hazardous wastes.

In turn, it was not possible to identify the country's applications in the information queried in the inventory or create a list of products and items containing PFOS, PFOSF and related substances in the consumption market. Although their applications are known worldwide, its local use is not clear yet. It was not possible either to make a preliminary list of suppliers of products containing PFOS, PFOSF and related substances in the country, or industries and particular consumers of such substances.

Similarly, some of the national EEE manufacturers queried stated that they do not know whether the imported inputs they employ to manufacture their products such as microcomponents, boards and other electronic parts -mainly imported from Asia- contain PFOS, PFOSF or related substances. International companies that provide these inputs do not certify this condition and importers do not require this information either.

A record of chemical substances for industrial use in the country that provides figures on their uses in different industrial processes would be essential to obtain accurate information on whether POP substances for industrial use are being utilized in the country.

The country does not require imported products to have a minimum content of POP substances for industrial use. It is important to develop this aspect considering that Colombia is not a manufacturer of POP industrial substances, but a consumer of products containing such substances.

The identification of items that contain PFOS and PFOSF substances is a great challenge for the country and other countries in the region due to the wide variety of this kind of compounds that have been identified in the world market. Consequently, it will be critical to strengthen customs control on these substances and items containing such substances.

Given the constrains of the queried information and considering that the reported figures are estimates based on the established factors and some assumptions, these data must be considered strictly as a guide, not as exact information. Similarly, the recommendations provided in the inventory of POPs for industrial use must be considered for the implementation of a Level II or preliminary inventory, which will essentially require working with EEE and vehicle manufacturers and importers, as well as, WEEE managers, and other items, products and wastes of interest, in order to conduct a more effective data survey. It will also allow verifying fractions or percentages of different materials to make estimates on this type of inventories.

For further information about the calculation detailed in this inventory, please see the "Inventario inicial de contaminantes orgánicos persistentes de uso industrial" document Minambiente (2016c), available at the Ministry of Environment and Sustainable Development www.minambiente.gov.co.

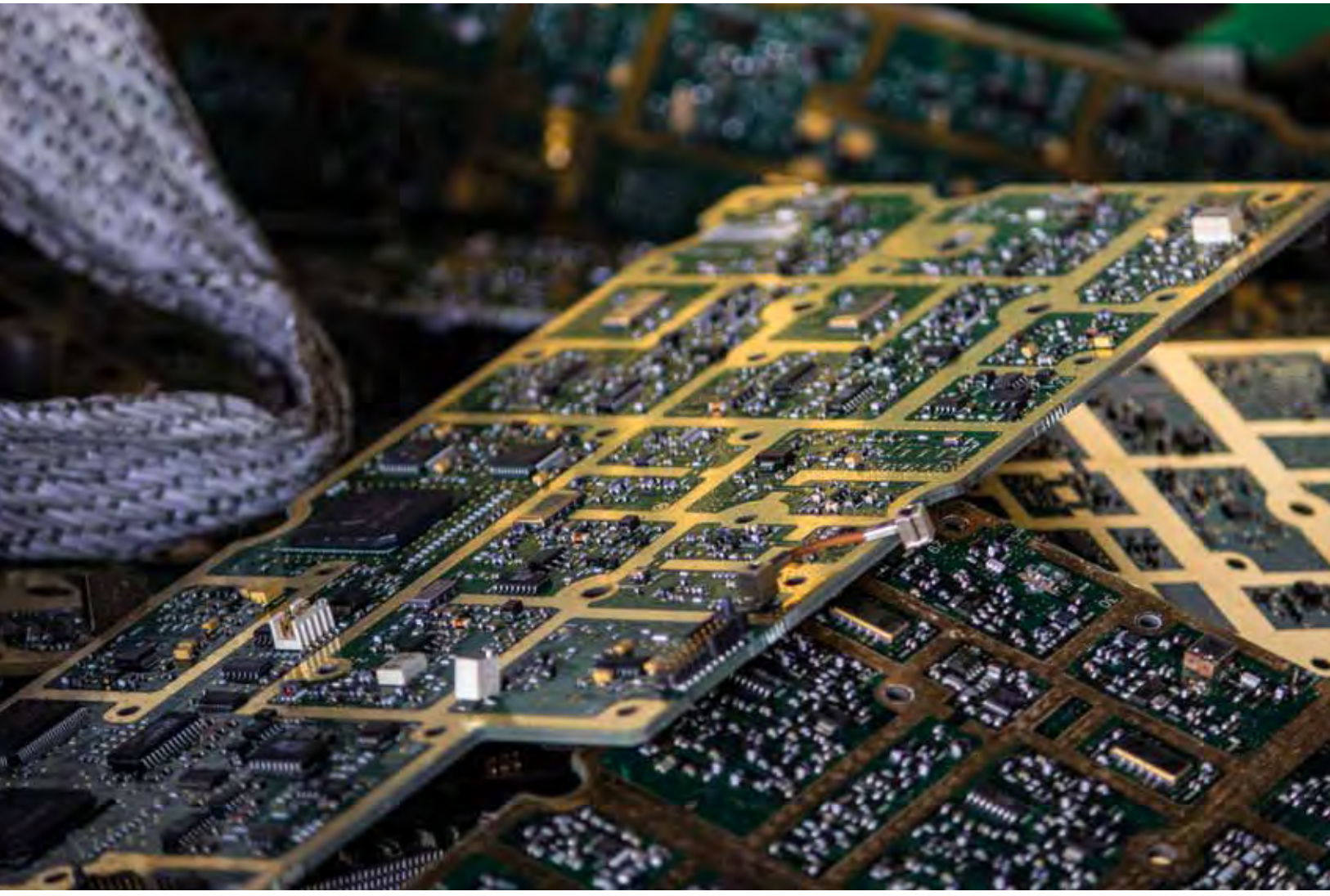
## 3.6. Aspects to be strengthened in Colombia to improve compliance with the Stockholm Convention

Colombia has taken significant actions to comply with the provisions of Law 1196 of 2008 and the Stockholm Convention, as it has been presented throughout this chapter. But, it must be clear that there are aspects that still should be established explicitly, complement or sometimes even regulate, to improve the provisions to protect human health and the environment against POPs.

***Article 3. Measures to reduce or eliminate the releases from production and intentional use***

The POP substances that still do not have regulation on ban in Colombia but are under the Law 1196 (2008) and should be attended according to the regulative actions included in the action plans at Chapter 5, are:

a. Hexachlorobenzene
b. Alpha-hexachlorocyclohexane
c. Beta-hexachlorocyclohexane
d. Chlordecone
e. Pentachlorobenzene
f. PFOS and its salts and PFOSF
g. Hexabromobiphenyl
h. Tetrabromodiphenyl ether and pentabromodiphenyl ether
i. Hexabromodiphenyl ether and heptabromodiphenyl ether
j. Hexabromocyclododecane
k. Hexachlorobutadiene
l. Pentachlorophenol and its salts and esters
m. Polychlorinated naphthalenes



Additionally, the updates and normative developments that are currently taking place in the country should be harmonized in the framework of the adjustment to the Andean technical manual for the registration of new pesticides. As well as, the regulation of industrial chemical products and efforts made by Colombia for its entry to the OECD, to include the criteria for the evaluation of molecules arranged by the Stockholm Convention for Persistent Organic Pollutants, following numeral 4 of Article 3 of both Law 1196 of 2008 and this Agreement.

***Article 4. Specific Exemptions Register***

Although Colombia did not find the need to access to the specific exemption mechanism, it is essential to clarify that the actors involved in the NIP implementation, which is the procedure to follow in case that it is required to apply for this register, considering other substances to be added to the Convention in the future.

***Article 5. Measures to reduce or eliminate the releases from unintentional production***

The country should strengthen the use of the best available techniques and best environmental practices according to the Stockholm Convention general guidelines on UPOPs releases prevention and reduction measures.

***Article 6. Measures to reduce or eliminate the releases from stocks and wastes***

The tariff subheadings must be discriminated to facilitate the identification of stocks, products, and articles in use, which may contain POPs substances. The substances that do not yet possess them in this way make difficult the updating of the corresponding inventories.

On the other hand, the strategies for the identification of contaminated sites with POPs and the mechanisms to be applied should be strengthened in case the country decides to make an environmentally sound management of them.

***Article 9. Information exchange***

Colombia so far, has not ruled on paragraph 3 of Article 9 of Law 1196 of 2008 and the Stockholm Convention. This paragraph indicates that the country should designate a national coordination centre for the exchange of information related to the reduction or elimination of the production, use, and release of persistent organic pollutants and alternatives to persistent organic pollutants, including information about their hazards and their economic and social costs.

In this regard, the country has reviewed and identified that this designation could occur in the National Inter-sectoral Commission for Environmental Health - CONASA through its chemical safety table. Since, the problems associated with persistent organic pollutants - POPS, is one of those addressed in this conceptual framework[105], as well as that within the functions established in its regulatory framework, are among others:

- Coordinate the development of environmental health actions, plans, programs and projects from a comprehensive approach that considers, individually and / or in combination, the social, economic, political, environmental, health, technological and biological determinants that have the potential to affect the human health.
- Promote the dissemination and publication of environmental health information.
- Support the creation of the Unified Environmental Health Information System - SUISA.

Taking into account the above, it is considered pertinent to designate in the CONASA the national coordination centre for the exchange of information for the Stockholm Convention.

**105.** Article 3, Decree 2972 (2010), where is created the National Inter-sectoral Commission for Environmental Health – CONASA and is described other provisions.

# 4. EVALUATING POP **MONITORING & MANAGEMENT** CAPACITY IN COLOMBIA

This chapter features updated information about the[106] evaluation of the country's capacity to monitor POP through sample taking, analytical tests for POP determination, surveillance, supervision and control, as well as, environmentally sound management of these substances in the country.

It should be considered that although several measurements and analytical determinations of POPs have been made in Colombia, only two permanent monitoring programs that include some of the POPs substances. These two programs are the evaluation of the quality of marine waters in the Colombian Caribbean and Pacific coastal areas led by INVEMAR, and the INVIMA's food contaminant monitoring program within the framework of sub-sectoral food waste plans. The plans operate with public resources and with the installed capacity of the entities in mention[107] , whose main advances were mentioned in chapter 3. Likewise, Colombia participates in the project: "Global Monitoring Plan" with 2 points of passive monitoring for pollutants such as PCDD, PCDF, dl-PCB, and PFOS. In this sense, the scope of the monitoring prioritized so far by Colombia, is focused on these programs (food, marine waters and sediments), as well as continuing to strengthen passive monitoring.

Different actors involved were queried about their current capacity or the actual activities developed in each POP (including sample collection and analytic determination), monitoring and POP management.

## 4.1. Analytical capacity for POP monitoring (sample collection and analytic determination)

Laboratories and companies that provide sample collection services and analysis to determine substances of environmental interest[108] were queried during this information update in order to find out whether the scope of their service portfolio currently includes any POP substances or plans to include them eventually.

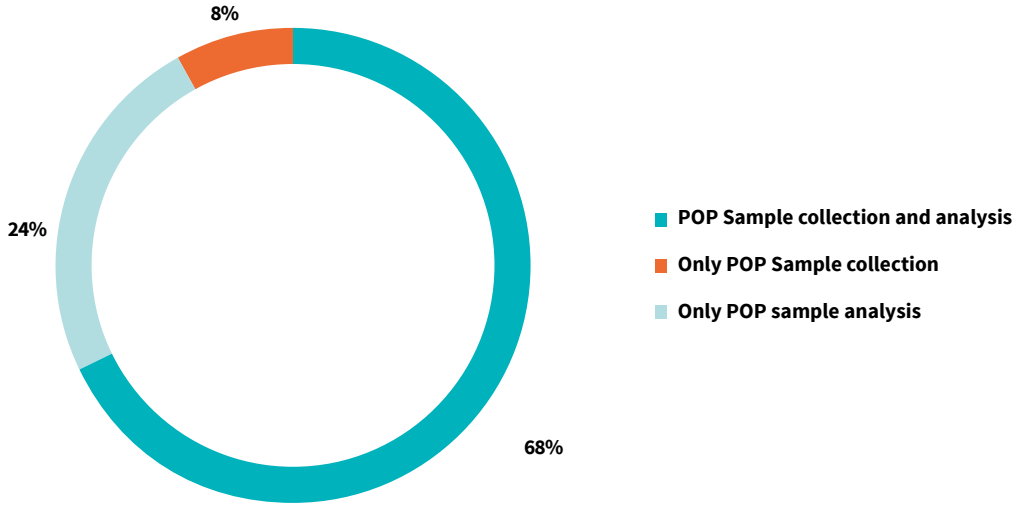
**106.** As of the first semester 2016

**107.** The environmental capacity is complemented by the capacity of some environmental authorities who have analytic determination laboratories.

**108.** The directories of accredited environmental laboratories or laboratories participating in the performance tests administered by the IDEAM (2016) were used; according to these tests there are potentially 218 laboratories that provide some type of environmental service in the country. However, considering that many laboratories focus their service on basic sanitation and exclude specialized analysis, the actual participation of laboratories in the survey was 34.4% (75 laboratories).

Currently in Colombia approximately 68% of organisations (51 laboratories or companies) offer services for both sample-collection and analysis to determine certain POPs, while 24% (18) currently offer services only for analysis of certain POP substances and 8% (6) offer services only for collection of samples of some of these POP, as shown in Graph 4.1.

**Graph 4.1. Scope of services currently offered for POP monitoring**




**Source: Minambiente (2016d)**

As it was mentioned before, a survey was realized among the entities who have services in environmental matrices for the information update about the POP sample collection and analytical determination. In the Graph 4.2, it is presented the answers including the intentions to increase capacity as the case of IDEAM`s credited services. However, according to environmental legislation[109], the entities which generate official information required by environmental authorities should be credited by IDEAM, therefore the capacity presented in this section is limited to credited entities[110].

The most significant current capacity for POP sample collection focuses on PCB (9 entities), also endrin, DDT, endosulfan, heptachlor, dieldrin, aldrin, lindane and chlordane with seven laboratories for each substance. There are six credited entities for the sample collection of heptachlor, dieldrin and dioxin and furans. There

**109.** Specially the established in Article 5, Decree 1600 (1994), added through Decree 2570 (2006) issued by Ministry of Environment and Sustainable Development.

**110.** In Colombia, the credited process for environmental laboratories is done by IDEAM according to the Resolution 0268 (6th march, 2015) and under ISO/IEC 17025 criteria, where the laboratories show their suitability and competence

are four entities for alpha and beta hexachlorocyclohexane, and three entities for hexachlorobenzene – HCB. For the other POP substances: pentachlorobenzene, toxaphene, mirex, chlordecone, PFOS, their salts and PFOSF, hexabromocyclododecane - HBCD, tetra, penta, hexa and hepta BDE or PBDE and hexabromobiphenyl – HBB, there are two credit entities for sample collection for each POP.

Additionally, the current greatest capacity for POP analysis or determination is available for PCB with 16 laboratories, followed by endrin, endosulfan, DDT, lindane, heptachlor and aldrin with 6 laboratories; dieldrin with 5 and chlordane with 4. Alpha-hexachlorocyclohexane with 3 laboratories, and beta-hexachlorocyclohexane and hexachlorobenzene - HCB with 2 for each substance. There are not credited laboratories for analytic determination for toxaphene, mirex, pentachlorobenzene, chlordecone, PFOS, its salts and PFOSF, dioxins and furans, hexabromocyclododecane, PBDEs and hexabromobiphenyl.

Related to the brominated POPs used for industrial purposes, it is believed that the lack of capacity is related to the unawareness in the country about this substances group and the absence of an inventory[111], the interest about this POP group is limited to the academy studies.

In summary, some installed capacity for POP sample collection was found nationwide. This capacity ranges from a minimum of 2 to a maximum of 9 laboratories or entities that currently offer this service for 23 POPs[112], and from 3 to a maximum of 16 laboratories that offer analysis services for 12 POPs. These quantities should be compared with an assessment study about these services provided nationwide (planned to be done in the next years). It is important to consider about these substances their demand, the regulation framework or their monitoring implementation programs.

Furthermore, it is worth mentioning that, given the dynamics experienced by the specific regulation on comprehensive environmental management of PCB in the country[113], a labour competency certification scheme has been implemented for staff in charge of collecting PCB samples, in order to guarantee compliance not only with technical, but also environmental and occupational health standards[114].

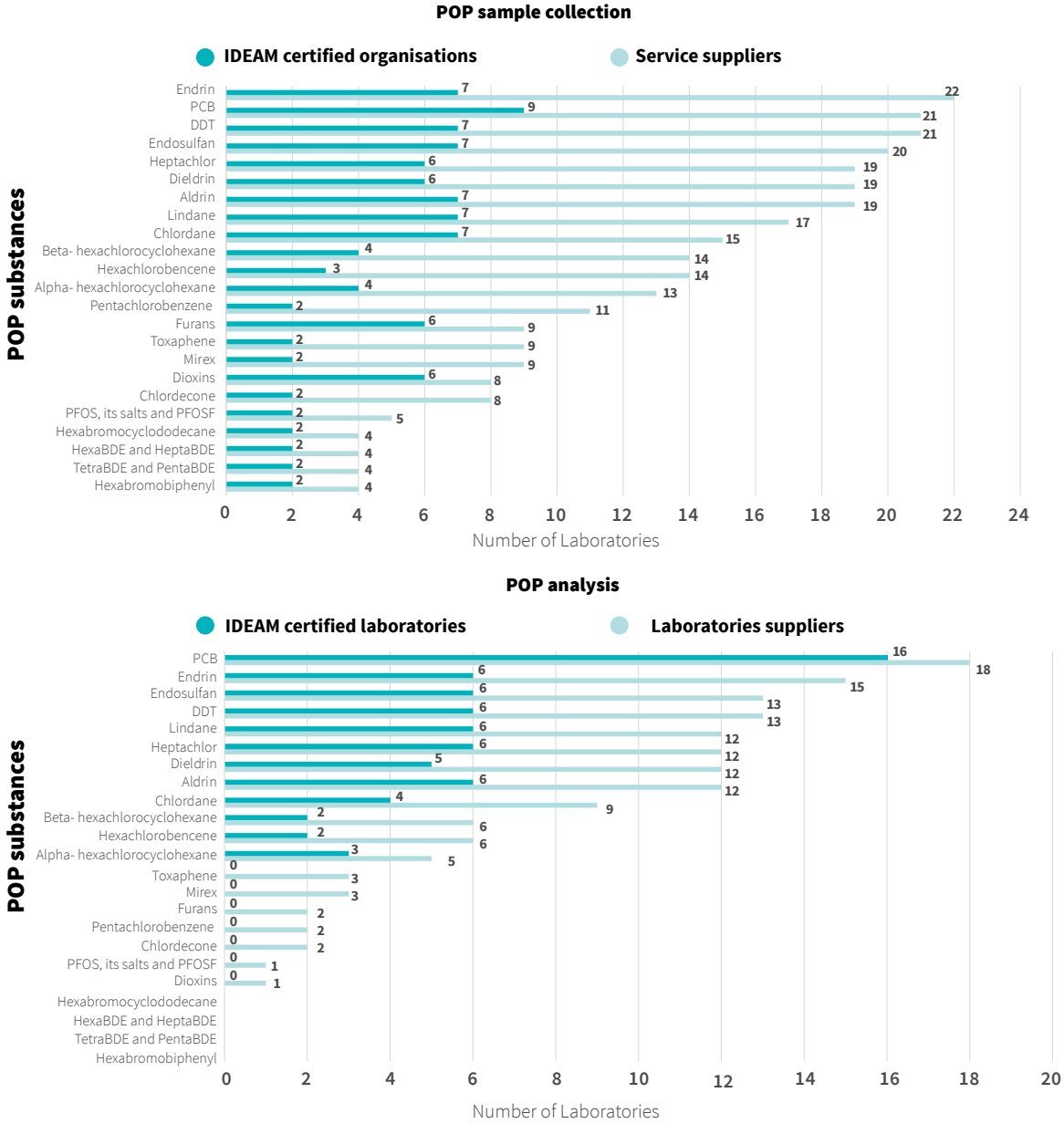
**111.** Until 2016 it was realized the initial inventory with a quantity approximation about the POPs used for industrial purposes

**112.** Except for polychlorinated naphthalenes, hexachlorobutadiene and pentachlorophenol, their salts and esters, since they were added to the Convention by the end of 2015 and thus could not be included in this survey.

**113.** Resolutions 222/2011 and 1741/2016 by the Ministry of Environment and Sustainable Development.

**114.** This activity is carried out by the National Training Service – SENA under Occupational Competency Standard -NCL 220201030, which aims at "Performing the sampling of isolating fluids and/or solid surfaces to detect hazardous substances based on the established procedures", a requirement that, in turn, becomes one of the accreditation criteria for PCB sample collection before the IDEAM.

## Graph 4.2. Services of POP sample-collection and analysis currently offered in Colombia




**Source: Minambiente (2016d)**

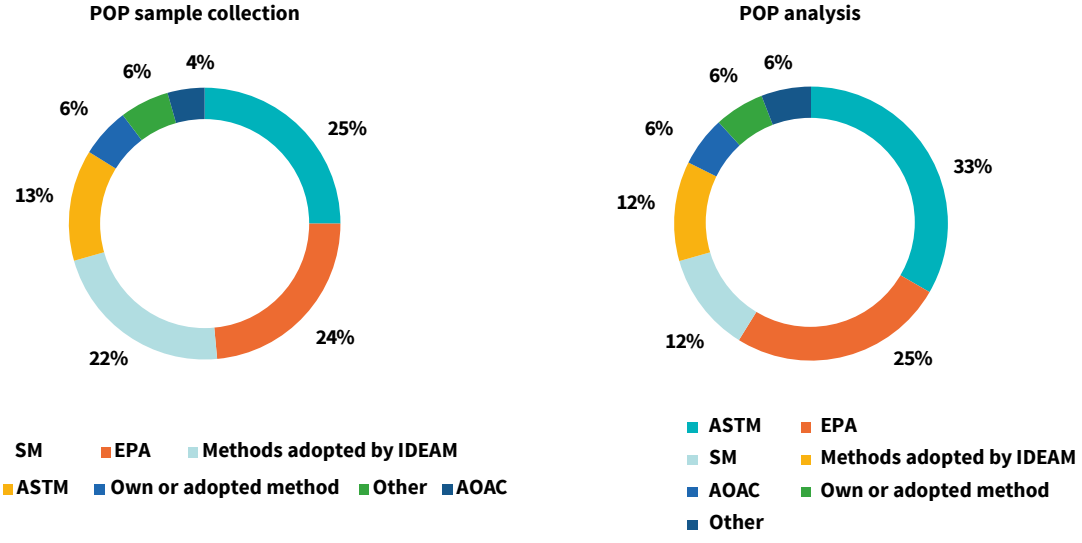
Concerning the environmental matrixes[115] where organisations provide their services, most organisations report capacity for collecting samples in water. Such capacity represents 44% of the total reported services, followed by soils and sediments with 20.7% and 13.2%, respectively, hazardous waste with 10.5%, air with 5.7%, oils with 4.3% and muds with 1.7% of the total services reported for POP sample collection.

**115.** Water, soil, air, sediments, hazardous wastes, oils or muds.

On the other hand, they reported POP analysis or determination services in waters represented 33.4% of the total reported services, followed by soils and sediments with 23.9% and 12.9%, respectively, hazardous waste with 11.3%, and oils with 10.3%, air with 5.5% and sludge with 2.6%.

Similarly, the methodologies currently used in the country for POP sample collection and analysis were investigated, and the results are shown in the following graph:

**Graph 4.3. Methodologies most commonly used in Colombia for POP sample collection and analysis**




- SM - Standard Methods
- EPA - Environmental Protection Agency
- IDEAM – Institute of Hydrology, Meteorology and Environmental Studies
- ASTM - American Society for Testing Materials
- AOAC - Association of Analytical Communities

It is considered that the critical issues that will influence in the needed capacity of the POP services for the next years are: the demand, the regulation development and the economic resources availability.

## 4.2. Capacity of POP surveillance, monitoring and control by environmental authorities

A second focus of this evaluation relates to the capacity of the country's environmental authorities to monitor POP through surveillance, supervision and control in their jurisdictions or regions where they have any service area. Such capacity greatly depends on the fieldwork performed by these institutions and the interpretation and use of information provided by their regulated stakeholders, testing laboratories, waste managers and other actors involved in POP management regionally or locally.

These institutions were inquired about their current monitoring programs and future[116] forecasts for program implementation in order to evaluate the current capacity of the country's regional and local environmental authorities to perform surveillance, monitoring and control actions.

According to the answers obtained from the different authorities consulted, it was found that although there are currently no permanent monitoring programs for POPs by these entities, there are important actions taken about monitoring and control in the framework of the existing regulations. Also, an essential participation by some of these authorities, in support of the program led by INVEMAR in marine and coastal waters, as well as sediments.

According to what is presented in graph 4.4, the monitoring and control reported and implemented by the environmental authorities is currently focused on 9 of the POPs: PCBs, dioxins, furans, aldrin, dieldrin, endrin, DDT, lindane, and endosulfan. For the other POPs, there were no permanent control actions implemented by the environmental authorities, except for concrete activities (once a year) for the transmission of information regarding the national PCB inventory. However, there is interest in the future implementation of actions that allow for the extension of this monitoring to other substances classified as POPs, following the regulatory updates that are given in this regard.

On the other hand, environmental authorities were inquired about the main application or environmental matrix where they were implementing these POP monitoring programs, and the result is that most of the reported programs will take place in the water matrix and are mainly the result of monitoring performed in the REDCAM program[117] for marine, coastal and estuarine waters. However, some atmospheric monitoring programs were also reported in evaluation, monitoring and control programs for licenses of incineration plants, mainly related to dioxins and furans, among others.

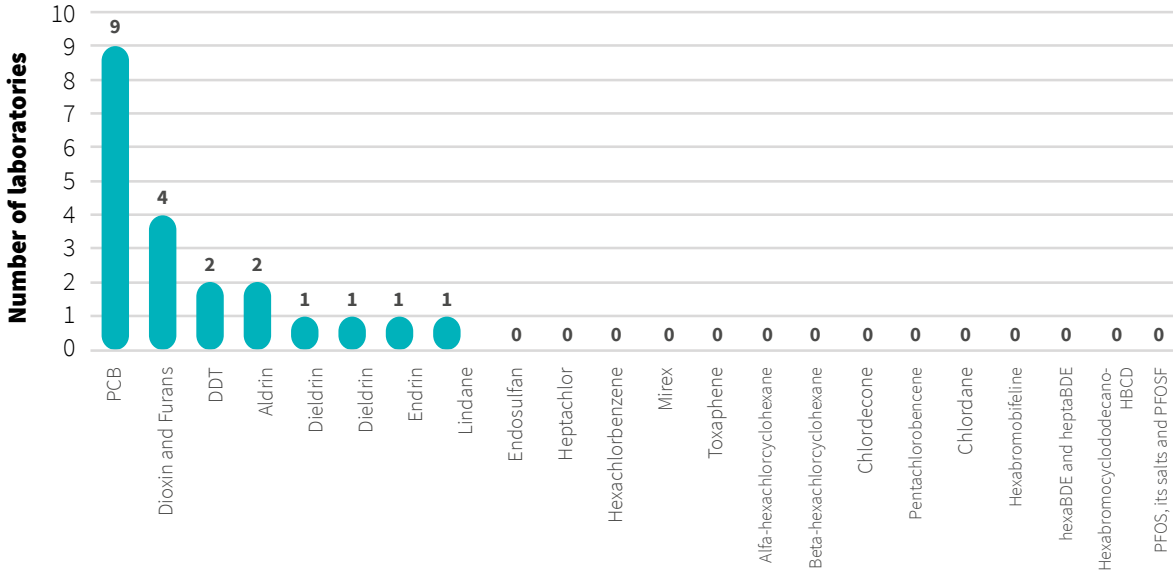
However, some atmospheric control actions are also reported, aimed at the processes used for evaluation, monitoring, and control of environmental licenses at incineration plants, and mainly related to dioxins and furans and other atmospheric pollutants. This type of monitoring is required by the environmental authorities for the regulated sectors where and when it is considered necessary to monitor and control to ensure compliance with the emission standards from the activities and the fixed sources subject to the corresponding regulations[118].

**116.** 30 responses out of 40 possible responses were obtained, achieving 75% coverage in this survey.

**117.** Colombian Marine and Coast waters Quality Monitoring Network.

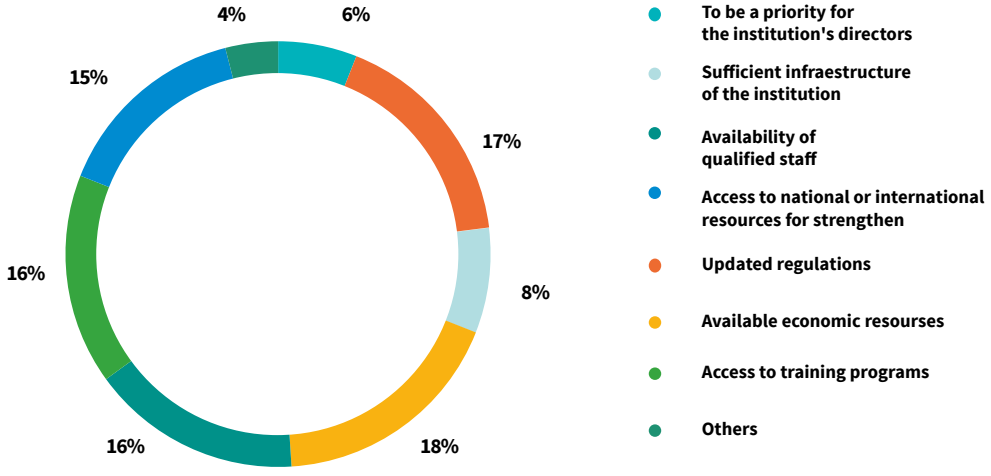
**118.** Resolution 909 (2008) issued by Ministry of Environment, Household and Territorial Development (today Ministry of Environment and Sustainable Development) where is established the admissible limits for dioxins and furans.

**Graph 4.4. Most used methodologies in Colombia for POP sample collection and analysis**




**source: Minambiente (2016d)**

**Graph 4.5. Factors that affect the monitoring, surveillance and control by environmental authorities**




**Source: Minambiente (2016d)**

The key factors or aspects that will impact the increase or reduction of POPs monitoring and control programs or campaigns for a 4-year period are generally considered to be economic resource availability and current

and up-to-date regulations (18% and 17% respectively), followed by qualified staff (16%), access to training programs (16%) and access to national and international strengthening resources (15%).

## 4.3. Capacity of environmentally sound POPs management

This update focused mainly on identifying the capacity of existing hazardous waste managers and receivers[119] to perform POPs storage, transport, decontamination, elimination and transboundary movement operations[120] in the country.

Regarding the POPs environmentally sound management, the quantities of those substances to be eliminated are identified in the inventories presented in Chapter 3 (approximately 130 tons of POPs used for industrial purposes and 182,350 tons of PCB) and must be taken into account, as well as, the regulatory considerations established by Colombia and set out in chapter 2 (table 2.3), which have facilitated the sound management of the POPs wastes and stocks identified so far. However, as the country advances in the evaluation and adjustment of its regulatory framework for the comprehensive management of POPs, it is considered pertinent to reinforce these measures for each group of POPs, following the provisions of article 6 of Law 1196 of 2008 and the Stockholm Convention.

As mentioned in chapter 3, in Colombia POPs management has been mainly focused on the elimination of stocks of pesticides POPs and PCBs, through transboundary movements within the framework of the provisions of the Basel Convention. However, there have been some remarkable achievements in the pilot projects implemented for capacity development that will facilitate the environmentally sound management of a good part of this waste within the country in the coming years.

### POP pesticides

From the information available in the ANLA dossiers, over the past six years it has been established that for POP pesticides, the capacity of the country rests with four (4) companies. They carry out with packaging, transport and temporary storage operations and the transboundary movement for the environmentally sound disposal in other countries.

### Polychlorinated biphenyls (PCB)

Meanwhile, for the environmentally sound management of PCB, six companies are currently operating providing packaging, transport, and temporary storage services. Two of these correspond to management companies or PCB receivers (with four security warehouses in different regions of the country), three companies in the electricity supply sector and one company in the industrial area, each of these companies has storage

**119.** The identification of 54 managers authorized by their environmental licenses for environmentally-safe management of pesticides, WEEE, PCB or other related POP was performed based on the country's directory of hazardous waste managers. 31 responses were received from these managers; they are equivalent to 57,4% response.

**120.** In the framework of the Basel Convention guidelines, ratified by Colombia through Law 253 / 1996.

capacity with a total of eight safe warehouses for PCB equipment currently in operation.

Likewise, the country currently has four organisations that carry out PCB decontamination or elimination operations, as follows:

1. A patent is held in the PCB treatment technique by oxidation with supercritical water. A public university in Valle del Cauca department and MinAmbiente have advanced a project that provides the necessary design and construction of a pilot scale plant that uses this alternative disposal process. MinAmbiente currently is working with this university within the framework of the PCB capacity building project. Currently, the project is completing the construction process and after commissioning, the plant will have the capacity to treat PCB-containing oils up to 20,000 ppm of PCB.

2. Through a PCB management and receiving company located in the Valle del Cauca, a PCB-containing waste washing plant was installed, within the framework of the capacity building project for PCB led by the MinAmbiente. The company has an environmental license issued by the competent environmental authority for the treatment and decontamination of non-porous materials that can be used once washed, taking them to a PCB concentration on the surface of less than 1 mg / $dm^2$.

3. One of the public companies in the electricity supply in the country, installed with its own resources the first de-chlorination plant for PCB-containing oils, through a chemical treatment technology with sodium metal dispersion in mineral oil. This plant currently has an environmental license issued by the competent environmental authority.

4. Also, another PCB management and receiving company is in the process of importing and putting into operation a dielectric oil de-chlorination plant that uses KPEG technology (potassium hydroxide in polyethylene glycol) to dechlorinate oils contaminating PCB, within the framework of the capacity building project for PCB.

Some of the surveyed companies that currently offer services for other types of hazardous waste consider that with their current infrastructure they could carry out this kind of operation in the short term. But, these companies cannot operate until an evaluation is carried out by the environmental authorities for the extension of their environmental license, to guarantee that their infrastructure and operating conditions will process the POP in an environmentally sound manner. Therefore, the figures are limited by this consideration.

According to the information presented in figure 4.6, the capacity for the POPs management in the country is: eight managers or receivers of PCB hazardous waste with transport capacity, six with temporary storage, three with capacity to eliminate PCB, one with the capacity to decontaminate PCB, and two with the capacity to carry out transboundary movements of these substances. The four companies that have current capacity for transport, temporary storage and transboundary movement of some of the POP pesticides are shown in the following graph.

**Graph 4.6. Current installed capacity for the POP environmental sound management**


**Minambiente (2016d)**

## 4.4. Conclusions on the POP monitoring and management capacities

Based on the results presented, it can be stated that currently Colombia has the basic capacities for POP sample collection and analysis, as well as, the environmentally sound management of these substances (storage, transport, decontamination, elimination and transboundary movement). However, whether the capacity for these services can become stronger depending on the promotion of strategies and programs that allow the country to study in detail the understanding and management of risks associated to POPs, as well as, the specific regulatory updates for these substances.

These factors will then leverage economic resources, infrastructure and the strengthening of POP management staff by generating interesting market niches for organisations that provide these services, leading to an eventual extension of their portfolio for POP monitoring and management services, according to the demand in the country.

Although the capacity of the environmental authorities to implement POP monitoring programs in the country providing some monitoring and control programs specifically focused on PCB, dioxins, furans and some POP pesticides (DDT, aldrin, dieldrin, endrin, endosulfan and lindane), these programs are only implemented among a small fraction of the country's environmental authorities. It is therefore necessary to strengthen the

capacities of these authorities to implement this type of monitoring, in line with their stated interest in increasing POP controls in different environmental matrixes, according to the declared will of these agencies to increase the control in different environmental matrixes, depending greatly of course, on the available resources and relevant regulatory updates.

In the other hand, it is estimated that once the specific regulation for other POP substances that are currently not regulated, but included in various action plans, they are going to be included in the services offered for sample collection and analysis, inventory and the environmentally sound management of the wastes according to the actual demand for these services.

Also of note and as mentioned in section 3.1, it is expected that by the mid-term the emissions register and pollutants transfer record system will be commissioned. This project has been advanced through the inter-institutional and inter-sectoral participation in line with the OECD Guidelines[121], as a system with information on the nature and quantity of emissions and transfers of pollutants to the environment released by different production activities in the national territory. It will be accessible to the public, giving information on pollution sources that promote and instigate environmental improvements in industrial processes, and it guarantees a citizen's right to information. It also explains the capacity the country has regarding sample collection and analysis, and control systems for the environmentally sound management of POPs should circumstances change with more timely and accurate information.

**121.** Organisation for Economic Cooperation and Development (OECD). Recommendation C (96) 41 about the implementation of emissions register and pollutants transfer.

# 5. PLANNED STRATEGIES **AND ACTIONS**

Four action plans for the different POP groups comprising the national plan were structured and arranged with the stakeholders involved through collective development discussions and based on the results obtained in the POP-inventory update or development processes. The evaluations of POPs based on the following categories, institutional, regulatory, political, monitoring and environmentally sound capacity were also taken into account.

## 5.1. GOVERNING PRINCIPLES FOR POP ACTION PLANS

Governing principles are classified into two categories. Those governing general matters of POP management and those governing the implementation of each action plan.

### 5.1.1. General Principles

Managing risks related to POP and POP-waste management: Waste management facilitates protecting population health and the environment by identifying and acknowledging the cause-effect relationships associated with POP and POP-waste management, as well as, assessing, treating, monitoring and communicating such factors, thus allowing all the stakeholders involved to make better decisions in this regard.

Comprehensive POP and POP-waste management: Considering that POP substances and materials in contact with these substances requires environmentally sound and rational management, actions performed towards this goal must be carried out under the principle of comprehensive management. Comprehensive management provides prioritizing actions that initially promote prevention and minimization of the use of these substances or their unintentional release by substituting such substances by less harmful alternatives, as well as, minimizing the generation of waste containing such substances. Similarly, comprehensive management promotes priorities such as environmentally sound management measures for POP and waste generated in POP management, so that they are treated, disposed of or finally eliminated.

Sustainable production and consumption: The promotion of changes in the production and consumption patterns of Colombian society regarding POP and materials that may contain POP also allows the fostering of environmental sustainability, population wellness and competitiveness of the productive sectors.

Environmental cost internalization: This principle invites the different participating stakeholders to internalize the costs associated with pollution prevention and control, as well as, comprehensive management of environmental and population health risks derived from POP and POP-waste management.

### 5.1.2. Implementation Principles

Comprehensive responsibility for POP: This principle invites all stakeholders, such as manufacturers, importers, distributors, marketers, consumers, managers, associated-service companies, regulatory and control institutions, and any other player working in the POP or POP-waste management chain, to work jointly and expressly within the framework of their responsibilities to guarantee the comprehensive management of these substances.

Shared responsibility: Since this is a National Plan, responsibility for its execution is shared across the sectors and promotes co-responsibility. The detailed planning of activities and its successful execution, monitoring, adjustment and financing depends on the commitment to the assumed joint responsibility.

Awareness and internalization: It is worth highlighting that growth and promotion of responsible and connected awareness of human beings with their environment and themselves facilitates and boosts the internalization of new conscious habits free from persistent organic pollutants in Colombia. This includes the strengthening of comprehensive POP management capacities.

Progressive implementation: The planned actions will be implemented progressively, considering impacts, results and goals based on the set schedules. Their execution will be performed consciously and will be a guideline for collaborative monitoring of such actions.

Collaborative monitoring: Supervision and evaluation of the level of compliance and success of the achieved goals. In other words, the monitoring plan depends on the collaboration among all the involved stakeholders appointed as co-responsible entities.

Cross-sectoriality: The actions provided require cross-sector implementation, coordination and collaboration so that the intended objectives may be achieved.

Prioritized territoriality: The planned actions must be carried out in prioritized regions that leverage the rest of the country.

## 5.2. Specific action plans and strategic direction

The strategies and actions developed for comprehensive POP management in the country have been divided into four specific action plans, which are part of the National Implementation Plan (NIP) for the Stockholm Convention. They gather the POP substances (see annex) that have been classified as POPs so far in the update of this national plan, and grouped according to their main uses in Colombia[122], as follows:

1. POP Pesticides
2. Unintentional POPs
3. POP used for industrial purposes (except PCB)
4. PCB

It is necessary to consider that the classification of POP substances in Colombia in the four groups mentioned above does not correspond exactly to the classification of these substances in the annexes of the Stockholm Convention. The three annex lists contained in the Stockholm Convention are: Annex A covering compounds that require elimination mechanisms to be produced, used and marketed (locally-manufactured, imported and exported products); Annex B covering the compounds with production and use restrictions; and Annex C covering the compounds derived from unintentional production or by-products.

Additionally, it is worth mentioning that although the Stockholm Convention allows the member countries to state their willingness to be included in the registry of specific exemptions for using some of the substances included in Annexes A and B, by providing solid justifications that evidence the reasons for this exemption, Colombia has not identified sufficient grounds to make statements on any POP substance in this regard before the Convention's Secretariat.

On the other hand, considering the risk management approach stated in the Colombian Technical Standard NTC-ISO 31000:2011[123], as well as, the guidelines and structure addressed in the *Policy on risk management associated to the use of chemical substances*, the action plans submitted for the different POP groups suggest

**122.** The NIP update considered the 26 substances classified as POP as of December, 2015.

**123.** Icontec – NTC ISO 31000:2011 "Gestión del riesgo. Principios y directrices". Bogotá, diciembre de 2014.

actions to manage these substances so that the country may identify, evaluate and manage them properly, thereby minimizing the impacts they may have on population health and the environment.

An adaptation of the guidelines provided by the technical and political standard mentioned above was made to structure the action plans of the four POP groups, based on risk management principles and directives (Icontec, 2014), as well as, other principles considered in the National Implementation Plan (NIP) update and the country's experience in POP management so far. The following strategic directions were defined:

- L1 - Information collection and dissemination
- L2 - Risk evaluation
- L3 - Risk management (prevention, reduction and elimination) and promotion of alternatives
- L4 - Monitoring - Inspection, Surveillance and Control
- L5 - Cross-cutting instruments to generate and strengthen capacities

The starting point for effective and comprehensive POP management is to have sufficient information of the right quality, that is relevant and timely about the amount, types, uses and any other data that allows identifying and restricting the problems related to POP substances, as well as, the stakeholders involved and how they are impacted. Similarly, it is essential to plan awareness-raising, dissemination and communication activities addressing the different stakeholders to raise awareness on identified problems, and foster information exchange and knowledge generation about POP substances among the stakeholders.

Furthermore, the evaluation of health and environmental risks associated with these substances allow the establishment of a framework to define the needs and type of measures needed for their management through POP prevention, reduction or elimination mechanisms, as well as, alternatives for POP substitution.

Similarly, the corresponding monitoring must be performed on actions defined in each action plan and in legal and regulatory matters.

On the other hand, the cross-cutting instruments to generate and strengthen capacities such as regulatory development, inter-institutional and inter-sector synergies, among others, will allow the country to improve its capacity for comprehensive POP management and comply with the planned objectives and actions.

Consequently, the strategic and comprehensive focus proposed for action plans for different POP groups aims at promoting organized and articulated work among the different stakeholders from both the public and private sectors, including the national, regional and local domains, in order to achieve the necessary synergies that allow strengthening the capacities required in the country to manage chemical substances classified as POP in a comprehensive and efficient manner.

### 5.2.1. Action plan POP pesticides

Some pesticides classified as POPs[124] were used in Colombia decades ago, but they began to be banned in the 1980's given their particular harmful effect on human health, even before they had been internationally regulated in the Stockholm Convention. They were mostly used in Colombia in the agricultural sector on crops such as cotton, corn, rice, potato and coffee, and DDT was used extensively in the health sector to control malaria; however, the stocks identified for this last year in the 2006 pesticide inventory allowed the Ministry of Social Protection to perform the relevant procedures to eliminate such stocks in a sound manner.

In accordance with the latest POP pesticide inventory update, the stakeholders involved from diverse public and private sectors stated that they do not have, and are not aware of current POP pesticide stocks; however, a problem related to illegal use and trade of some of these substances was evidenced.

This plan of action features the necessary measures to address the POP pesticide problem, prevent and minimize their effects on human health and the environment, as well as fulfil the international commitments undertaken by Colombia as a Party to the Stockholm Convention.

#### *5.2.1.1. Main objective*

To prevent the use of POP pesticides in Colombia by developing a prevention culture, and the guarantees sound elimination of seized or obsolete POP pesticides.

#### *5.2.1.2. Specific objectives*

- To foster measures that users adopt to undertake preventive actions, apply good practices and promote the use of alternative substances to POPs in priority crops.
- To eliminate the stocks of POP pesticides seized or associated with polluted sites in an environmentally sound manner, following a comprehensive management plan.
- To strengthen the Inspection, Surveillance and Control (IVC) System by improving identification and monitoring to prevent "POP Pesticides" from entering the country's through key ports and border crossings.

**124.** The POPs regulated by the Stockholm Convention that have applications as pesticides to this date are: endrin, aldrin, dieldrin, chlordane, heptachlor, hexachlorobenzene, mirex, lindane, Alpha and Beta -hexachlorocyclohexane, toxaphene or camphechlor, DDT, endosulfan, chlordecone, pentachlorobenzene, PFOS and pentachlorophenol.

### 5.2.1.3. Stakeholders involved

| | |
|---|---|
| Ministry of Agriculture and Rural Development – MinAgricultura | Ministry of Commerce, Industry and Tourism - MinCIT |
| Ministry of Transport - MinTransporte | Ministry of Health and Social Protection - MinSalud |
| Ministry of Labour - MinTrabajo | Ministry of Foreign Affairs - Cancillería |
| Ministry of Environment and Sustainable Development - MinAmbiente | National Authority for Environmental Licensing - ANLA |
| Regional and Urban Environmental Authorities | National Institute of Health – INS |
| Colombian Agriculture and Livestock Institute – ICA | National Institute of Food and Drug Monitoring - INVIMA |
| Institute of Hydrology, Meteorology and Environmental Studies – IDEAM | Marine and Coastal Research Institute - INVEMAR |
| Directorate of National Taxes and Customs - DIAN | Fiscal and Customs Police - POLFA |
| Unions and associations from the agriculture and livestock sector | National Training Service - SENA |
| Administrative Department of Science, Technology and Innovation (COLCIENCIAS) | Academy |
| Financiera de Desarrollo Territorial S.A. - FINDETER | National Accreditation Body of Colombia – ONAC |
| Colombian Family Welfare Institute - ICBF | Mayor's Offices and Governor's Offices |
| Corpoica | Civil Aviation Authority |
| Hazardous waste managers | Testing laboratories |

### 5.2.1.4. Actions outlined in the POP pesticide action plan

Although official records on pesticides indicate there is no formal production, use or commercialization of POP pesticides and most POP pesticides have been banned in the country due to their harmful effects that were identified several decades ago, the fact that there are illegal trade problems with some of these substances and the existence of some sites polluted or potentially polluted with these POPs makes it necessary to establish an action plan that addresses these issues.

The following are the actions outlined in different strategies that comprise the POP pesticide action plan. The planning table or matrix is shown in a logical sequence starting with the general objective, as well as, its usage indicator and overall goal to be fulfilled, followed by its specific objectives, use indicators and relevant goals, which are eventually achieved by the relevant activities. The specific objectives and activities include an analysis of the weight or prioritization and relevance to the actions outlined required to achieve the general objective and compliance percentages[125].

**125.** The degree of compliance with activities has an impact on the degree of compliance with the corresponding specific objective, and thus the degree of compliance with the general objective.

## POP PESTICIDE ACTION PLAN

**GENERAL OBJECTIVE (GO):** To prevent the use of POP pesticides in Colombia by developing a prevention culture, and a guarantee of sound elimination of seized or obsolete POP pesticides.
**GO INDICATORS:** Percentage of users that do not use pesticides containing POP substances.
GO GOAL: In 2027 100% of pesticide users will no longer use products containing POP.

**SPECIFIC OBJECTIVE 1 (SO1):** To foster users to take preventive actions, apply good practices and promote the use of alternative substances to POP in priority crops. Weight: 30%.
**SO1 INDICATOR:** Number of prioritized crops where users see the risk associated to POP pesticides, apply good practices and use alternative substances.
**SO1 GOAL:** In 2027 there will be at least 4 priority crops where good practices are fostered and the use of alternative substances to POP pesticides is promoted.

| Activity | Strategic Direction | Weight | Goal | Main person in charge | Stakeholders involved |
|---|---|---|---|---|---|
| 1.1. To inform and raise awareness about the risks associated with POP pesticides -and those suggested to be included as POPs- among stakeholders involved, thoroughly and using a preventive approach. | L1. Information collection and dissemination | 30% | At least 5 dissemination mechanisms will be implemented by the end of 2027 | MinAmbiente | MinSalud<br>MinTrabajo<br>MinAgricultura |
| 1.2. To implement the Good Agricultural Practices (GAP) program for priority crops in the country. | L3. Risk management* and promotion of alternatives | 25% | At least 4 crops will implement the GAP certification program by 2027 | MinAgricultura | ICA |
| 1.3. To identify and implement mechanisms so that farmers that still consider using some POP substances stop using them, by means of implementing Good Agricultural Practices or substituting such POPs with alternative products. | | 25% | Mechanisms to substitute at least 3 POP pesticides currently used illegally will be implemented by the end of 2027 | MinAgricultura | ICA |
| 1.4. To strengthen the cross-sector coordination and collaboration capacity among the stakeholders involved. | L5. Cross-cutting instruments | 20% | At least 5 cross-sector coordination activities will be evidenced in the sector, together with inter-ministerial, and similar agendas by the end of 2027. | MinAmbiente | MinSalud<br>MinTrabajo<br>MinComercio<br>MinAgricultura |

**SPECIFIC OBJECTIVE 2 (SO2)**: To eliminate the stocks of POP pesticide seized or associated with polluted sites in an environmentally sound manner, following a comprehensive management plan. Weight: 30%.
**SO2 INDICATOR:** Percentage of POP pesticide stocks that are eliminated in an environmentally sound manner following a comprehensive management plan.
**SO2 GOAL:** By the end of 2027, 100% of POP pesticides seized and associated with polluted sites that may have been contaminated at that time will be eliminated in an environmentally sound manner.

| | | | | | |
|---|---|---|---|---|---|
| 2.1. To promote the environmentally sound management of POP pesticide stocks identified or seized in compliance with national and international standards. | L3. Risk management* and promotion of alternatives | 70% | By the end of 2027, comprehensive management of 100% of the POP pesticides seized at the time will be achieved. | DIAN | ICA<br>POLFA<br>MinAgricultura |

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|---|---|---|---|---|---|
| 2.2. To promote the guidelines and mechanisms For the comprehensive management of sites polluted with POP pesticides in the country. | | 30% | The procedure to remediate the polluted sites identified will be totally completed by the end of 2027. | MinAmbiente | MinAgricultura<br>Environmental Authorities |
| **SPECIFIC OBJECTIVES 3 (SO3):** To strengthen the Inspection, Surveillance and Control (IVC) System by improving identification and monitoring to prevent "POP Pesticides" from entering the country through the key ports and border crossings. Weight: 40%.<br>**SO3 INDICATOR:** Number of ports and border crossings where the entry of POP pesticides is prevented after the IVC System is applied.<br>**SO3 GOAL:** Control on POP pesticide entry will be applied to at least 3 ports and 3 priority border crossings by 2027. | | | | | |
| 3.1. To identify and quantify the seized or obsolete POP pesticides, as well as, entry routes, country regions and crops where they are used. | L1. Information collection and dissemination | 10% | By 2027 there will be capacity to identify and quantify 100% of the seized pesticides. | DIAN | ICA<br>POLFA<br>MinAgricultura |
| 3.2. To update periodically the POP monitoring system in the Colombian Caribbean and Pacific marine and coastal waters. | | 5% | There will be at least 5 updates of monitoring reports on marine waters by 2027. | INVEMAR | MinAmbiente |
| 3.3. To continue to strengthen programs to identify residual POP pesticides in food. | | 5% | The residue identification programs for at least 10 types of food will be stronger by the end of 2027. | INVIMA | MinSalud |
| 3.4. To develop activities in chemical risk prevention associated with POP pesticides in primary production | | 5% | By 2017, there are activities developed for the assessment of the safety of POP pesticides in the primary production of at least 5 foodstuffs | ICA | MinAgricultura |
| 3.5. To include in the pesticides assessment processes in the country, the Stockholm Convention established criteria related to identification, persistence, bioaccumulation, transport potential and adverse effects. | | 5% | By 2022, the country will include in the pesticides assessment processes, the Stockholm Convention criteria for the identification, persistence, bioaccumulation, transport potential and adverse effects. | MinAmbiente | ANLA |
| 3.6. To design the epidemiological environmental surveillance scheme in country areas or zones where POP pesticides are stocked or used and identify their human health effects based on monitoring or available environmental studies. | L2. Risk assessment | 5% | By 2022 an epidemiological environmental surveillance scheme will be implemented with at least one pilot project for POP pesticides. | MinSalud | INS<br>MinAmbiente<br>Environmental and sanitary authorities |

| | | | | | |
|---|---|---|---|---|---|
| 3.7. To strengthen the Inspection, Surveillance and Control (IVC) programs to identify and reduce unauthorized uses, applications or trading of POP pesticides performed by farmers and marketers. | L4. Monitoring - Inspection, Surveillance and Control | 15% | By the end of 2027, IVC actions will be carried out in at least 4 prioritized crops to identify and reduce the unauthorized use, applications or trades of POP pesticides. | ICA | Environmental authorities |
| 3.8. The strengthening of customs control systems in ports and border crossings to be prioritized, to prevent POP pesticides from entering the country. | | 20% | Controls on POP pesticide entry will be stronger in at least 3 border crossings and 3 prioritized ports by the end of 2027. | DIAN | ICA<br>POLFA<br>MinAgricultura<br>MinComercio<br>Environmental Authorities |
| 3.9. To strengthen the infrastructure of accredited laboratories that support the characterization of POP pesticides in the country. | L5. Information exchange instruments to generate and strengthen capacities | 5% | By 2027. The number of laboratories accredited for POP pesticides will double. Base line = 6 accredited laboratories as of 2016. | IDEAM | MinAmbiente |
| 3.10. To develop the required standards for POP pesticides that are not yet regularized | | 10% | By 2022 100% of the regulation considered a priority will be in place. | MinSalud | MinAgricultura<br>MinTrabajo<br>MinComercio<br>MinAmbiente |
| 3.11. To develop the capacities of the staff in charge of the Inspection, Surveillance and Control, or monitoring and control of the competent authorities, in the framework of the POP pesticides comprehensive management plan | | 15% | By 2027 at least 5 training sessions for the competent authorities, about the IVC System and the POP pesticides comprehensive management plan will be developed. | MinAmbiente | MinSalud<br>MinTrabajo<br>MinComercio<br>MinAgricultura |

*L3 includes prevention, reduction and elimination of risk

### 5.2.2. Action plan for Polychlorinated Biphenyls - PCB

The PCBs targeted by this action plan were widely used worldwide, especially in the electricity generation and distribution sectors, as well as, being used as dielectric oil in electrical transformers, condensers, ballast, etc. They were also used in industrial sectors such as paint, coating and plastic production, and they were used as hydraulic fluid at different facilities. As time went by their harmful effects on human health and the environment were identified and they were classified as persistent organic pollutants, thus boosting international interest in starting a process leading to eliminate and restrict their use.

This action plan outlines the actions that are considered necessary to continue developing proper PCB management in the country, as well as, prevent and minimize their effects on human health and the environment and comply with the national and international commitments.

#### *5.2.2.1. Main objective*

To eliminate Polychlorinated Biphenyls (PCB) existing in the country through environmentally sound and rational management.

#### *5.2.2.2. Specific objectives*

- To identify, label and eliminate equipment, oils and wastes polluted with PCB existing in Colombia.
- To strengthen the capacity of stakeholders involved in the comprehensive environmentally sound management of PCB to guarantee their elimination.

#### *5.2.2.3. Stakeholders involved*

| | |
|---|---|
| Ministry of Mines and Energy - MinMinas | Ministry of Commerce, Industry and Tourism - MinCIT |
| Ministry of Transport - MinTransporte | Ministry of Health and Social Protection - MinSalud |
| Ministry of Labour - MinTrabajo | Ministry of Foreign Affairs - Cancillería |
| Ministry of Environment and Sustainable Development - MinAmbiente | National Authority for Environmental Licensing - ANLA |
| Regional and Urban Environmental Authorities | National Institute of Health – INS |
| Planning and Promotion Institute for Energy Solutions to non-interconnected zones - IPSE | National Institute of Food and Drug Monitoring - INVIMA |

| | |
|---|---|
| Institute of Hydrology, Meteorology and Environmental Studies - IDEAM | Directorate of National Taxes and Customs - DIAN |
| Fiscal and Customs Police - POLFA | Mayor's Offices and Governor's Offices |
| National Training Service - SENA | Administrative Department of Science, Technology and Innovation - (COLCIENCIAS) |
| Hazardous waste managers | Testing laboratories |
| Academy | Financiera de Desarrollo Territorial S.A. - FINDETER |
| National Accreditation Body of Colombia – ONAC | Comprehensive Responsibility Colombia |
| Industrial unions and companies that own elements containing PCB | |

#### *5.2.2.4. Actions outlined in the PCB action plan*

Although the results of the national PCB inventory and the progress made on the issues already discussed demonstrate important achievements by Colombia in comprehensive PCB management, not only as an improvement in its PCB inventories, but as a general success story in the actions that have been developed by the different stakeholders involved, reflecting their commitment thereto, it is still necessary to continue progressing and strengthening the processes to identify, label, remove from use and eliminate equipment contaminated with PCB, as well as, their wastes, in order to fulfil the goals set out in the specific national regulations and the international commitments of Colombia in compliance with the Stockholm Convention.

The following are the actions outlined in different strategies comprising the PCB action plan. The planning table or matrix is shown in a logical sequence starting with the general objective, as well as, its usage indicator and the overall goal to be fulfilled, followed by its specific objectives, use indicator and relevant goals, which are or will eventually be achieved by the relevant activities. The specific objectives and activities include an analysis of the weight and an outline of the relevant actions required to achieve the general objective and compliance percentages[126].

**126.** The degree of compliance with activities has an impact on the degree of compliance with the corresponding specific objective, and thus the degree of compliance with the general objective.

## PCB ACTION PLAN

**GENERAL OBJECTIVE (GO):** To eliminate Polychlorinated Biphenyls - PCB existing in the country through environmentally sound and rational management.
**GO INDICATORS:** Percentage of PCB eliminated through environmentally sound and rational management of equipment, oils and wastes.
**GO GOAL:** By the end of 2028, 100% of the PCBs will be eliminated through comprehensive management of equipment, oils and wastes contaminated with this substance.

**SPECIFIC OBJECTIVE 1 (SO1):** To identify, label and eliminate equipment, oils and wastes polluted with PCB existing in Colombia. Weight: 60%.
**SO1 INDICATOR:** Elimination percentage for equipment, oils and wastes contaminated with PCB.
**SO1 GOAL:** By 2028, 100% of equipment, oils and wastes polluted with PCB existing in Colombia will be eliminated.

| Activity | Strategic Direction | Weight | Goal | Main person in charge | Stakeholders involved |
|---|---|---|---|---|---|
| 1.1. To update and disseminate the PCB National Inventory periodically, this facilitates monitoring and reporting to the Stockholm Convention of the progress towards achieving the labelling goals and PCB elimination | L1. Information collection and dissemination | 10% | By 2028, at least 12 annual reports on the National PCB Inventory will be completed and disseminated, including the results for the labelling goals accomplishment to 2024 and the elimination to 2028. | IDEAM | Environmental Authorities<br>MinAmbiente |
| 1.2. To design of the epidemiological environmental surveillance scheme in country areas or zones with PCB stocks or contaminated sites and identification of their health effects based on monitoring or available environmental studies. | L2. Risk assessment | 10% | By 2022, there will be an epidemiological environmental surveillance scheme with at least one pilot project on PCB. | MinSalud | INS<br>MinAmbiente<br>Regional and local environmental and sanitary authorities |
| 1.3. To promote equipment labelling alternatives that guarantee PCB equipment management. | L3. Risk management* and promotion of alternatives | 15% | By 2024, at least 2 promotional campaigns on labelling alternatives will be performed, to guarantee the identification and labelling of 100% of the equipment and wastes contaminated with PCB. | MinAmbiente | MinMinas<br>IPSE |
| 1.4. To eliminate in an environmental sound manner (in the country and through transboundary movements) the stocks of oils, equipment and wastes contaminated with PCB and identified through the National PCB Inventory. | | 20% | By 2028, 100% of the oils, equipment and wastes contaminated with PCB will be eliminated in an environmentally sound manner. | MinAmbiente | MinMinas<br>IPSE |
| 1.5. To have the environmental authorities perform monitoring and control in compliance with the current PCB regulations. | L4. Monitoring - Inspection, Surveillance and Control | 10% | By 2028, at least 10 monitoring exerciseswill be made by environmental authorities about the current PCB normative fulfilment | Environmental Authorities | MinAmbiente |

| | | | | | |
|---|---|---|---|---|---|
| 1.6. To perform monitoring and control activities on facilities authorized for environmentally sound PCB management. | L4. Monitoring - Inspection, Surveillance and Control | 15% | By 2020, the competent authorities will have made at least 1 control and monitoring visit to a PCB management facility (with environmental license). | Environmental Authorities | MinAmbiente |
| 1.7. To implement customs control mechanisms to prevent materials contaminated with PCB from entering the country and control the transboundary movements of wastes contaminated with PCB. | | 5% | By 2018, there will be a guidance document published to strengthen the customs control. By 2020, at least three pilot projects for the implementation of customs control guidelines. | DIAN | POLFA<br>MinComercio<br>ANLA<br>MinAmbiente |
| 1.8. To perform control and monitoring actions to identify and register PCB owners that have not been reported in the National PCB Inventory. | | 10% | By 2018, there will be an owners list for the dielectric oil equipment belonging to a third party or those that have not been registered to date in the National Inventory.<br><br>By 2020, 100% of the owners of identified equipment will be included in the permanent monitoring and control activities actioned by the environmental authorities that submit the information to the PCB National Inventory. | Environmental Authorities | MinMinas<br>IPSE<br>MinAmbiente |
| 1.9. To strengthen the trade and customs authorities, as well as, the authorities in charge of environmental monitoring and control at facilities with equipment, oils and wastes contaminated with PCB, by means of training. | L5. Information exchange instruments to generate and strengthen capacities | 5% | By 2020, at least four training sessions on monitoring and control will be implemented. | MinAmbiente | DIAN<br>POLFA<br>MinComercio<br>Environmental Authorities |
| **SPECIFIC OBJECTIVE 2 (SO2):** To strengthen the capacity of stakeholders involved in the comprehensive and environmentally sound PCB management to guarantee their elimination.<br>**Weight:** 40%.<br>**SO2 INDICATOR:** Percentage of actions carried out to strengthen the stakeholders' capacities in the comprehensive management and environmentally sound management of PCB.<br>**SO2 GOAL:** By 2028, 100% of the priority strengthening actions will be executed to strengthen the stakeholders involved in the comprehensive and safe management of PCB. | | | | | |
| 2.1. To disseminate information on how to prevent risks associated with PCB in order to raise awareness about PCB management among the stakeholders. | L1. Information collection and dissemination | 20% | By 2020, there will be at least three available means of dissemination about risks and how to educate 100% of the PCB equipment owners listed in the Inventory and available to the general public. | MinAmbiente | Environmental Authorities |

| | | | | | |
|---|---|---|---|---|---|
| 2.2. To verify that the installed capacities in the country meet the criteria established in the Manual for Comprehensive PCB management to handle polluted equipment, oils and wastes, in line with the guidelines of the Stockholm and Basel Conventions. | L3. Risk management* and promotion of alternatives | 20% | By 2020, at least 5 facilities will meet the criteria established in the Manual for Comprehensive PCB management to handle polluted equipment, oils and wastes within the country. | Environmental Authorities | MinAmbiente |
| 2.3. To promote the guidelines and mechanisms for PCB contaminated sites through comprehensive management in the country, including the identification and evaluation of the associated risks. | | 10% | By 2022, there will be guidelines and a mechanism for the identification and assessment of contaminated sites with PCB, including the PCB contaminated sites list, the remediation alternatives, and the sites prioritization according to the associated risk reduction within the policies framework. | Environmental Authorities | MinAmbiente |
| 2.4. To identify and promote use cases with alternatives focused on substitution and environmentally sound management of items of equipment contaminated with PCB owned by stakeholders that are not part of the electricity sector. | | 10% | By 2020, there will be a study of successful cases on substitution and the environmentally sound management of items of equipment contaminated with PCB specifically for owners that are not part of the electricity supply sector. | MinAmbiente | MinMinas<br>IPSE<br>Environmental Authorities |
| 2.5. To boost and facilitate articulation among different stakeholders through discussion sessions, work groups and other initiatives that address topics related to comprehensive PCB management. | L5. Information exchange instru-ments to generate and strengthen capacities | 20% | By 2028, at least 10 meetings or discussions will be held. | MinAmbiente | MinMinas<br>IPSE<br>Environmental Authorities |
| 2.6. To promote good practices and the prevention of cross-contamination at facilities that perform equipment maintenance and repair activities using dielectric oil. | | 10% | By 2020, at least 4 sessions on promotion and dissemination of good practices and ways to prevent cross-contamination will be performed. | MinAmbiente | MinMinas<br>IPSE<br>Environmental Authorities |
| 2.7. To train owners of equipment and wastes contaminated with PCB on the current technical criteria and regulations for comprehensive PCB management. | | 10% | By 2020, at least two training sessions on technical criteria and regulations for PCB management will be held. | MinAmbiente | Environmental Authorities |

*L3 includes prevention, reduction and elimination of risk

### 5.2.3. Action plan for unintentional POPs

Unintentional POP substances targeted by this action plan are the listed in Annex C of the Stockholm Convention (polychlorinated dibenzo-p-dioxins (PCDD), polychlorinated dibenzo-p-furans (PCDF) and others that are used for industrial purposes, and those that could also release unintentional substances such as hexachlorobenzene (HCB), pentachlorobenzene, polychlorinated biphenyl (PCB) and polychlorinated naphthalenes). They are formed and released unintentionally as a result of incomplete combustion or chemical reactions in thermal processes that comprise organic matter and chlorine, as well as processes in the chlorine industry and organochloride compounds.

This action plan suggests the necessary activities for the country to address the problems associated with such substance, to reduce their generation and releases to the environment and to ensure the fulfilment of the Colombian objectives in this regard. Some of the unintentional POPs are also used as pesticides or employed in the industry, and they appear as POP substances listed simultaneously in Annex A.

Based on the results from recalculating the inventory of the unintentional POPs dioxins and furans, it is estimated that the total release for the reference year (2002) is 583.32 g EQT. The following are the processes that contribute the most based on the estimations made and they run from highest to lowest:

1. Open burning and/or incineration contributes 41.74 % of the total releases (243.5 g TEQ/y), where 194.61 g TEQ/y are accidental waste burning and fires and 48.85 g TEQ/y are biomass incineration.

2. Waste incineration contributes 21.33 % (124.4 g TEQ/y) where 89.02 g TEQ/y are associated with medical wastes, 28.23 g TEQ/y to hazardous waste and 6.45 g TEQ/y to municipal wastes.

3. Miscellaneous contributes 13.75% (80.2 g TEQ/y) through drying biomass with 80.17 g TEQ/y.

4. Production of ferrous and non-ferrous metals contributes 8.27% (48.22 g TEQ/y), related principally to iron and steel foundries, as well as magnesium, copper and zinc production.

5. Production of chemicals and consumer goods contributes 7.31% (42.65 g TEQ/y), related principally to chloride aromatic chemical production plants, leather processing plants, textile plants and paper production.

6. Heat and energy generation contributes 4.78% (27.9 g TEQ/y), associated principally to domestic heating with fossil fuel, domestic biomass combustion, and biomass central heating.

7. Disposal in sanitary landfills contributes 1.86% (10.86 g TEQ/y), related principally to practices at the landfills.

8. Mineral product production contributes 0.68% (3.96 g TEQ/y), especially for cement and lime.

9. Transport contributes 0.28% (1.61 g TEQ/y), especially related to two-strokes engines.

It is worth clarifying that, although Colombia's current inventory has focused on estimating two unintentional POP substances, namely, polychlorinated dibenzo-p-dioxins - PCDD and polychlorinated dibenzo-furans – PCDF, the UNEP toolkit 2013[127] showed that these estimations permit the identification of releases sources and facilitate plans to implement action for the reduction of those substances, it also shows the presence and indirect and simultaneous actions for all unintentional POPs (UNEP, 2013)[128], and it is a valid Tool to develop an action plan for all unintentional POPs.

Conversely, although is clear that the 2002 estimates are not suitable for decision making and so the priority action is to update the inventory[129], these figures are used as an approximation for the action plan formulation, which is going to be revised and adjusted once the new inventory is completed.

#### *5.2.3.1. Main objective*

To prevent, control and reduce unintentional POP emissions in the country through the development and introduction of a policy and a regulatory framework according to the needs identified, as well as adopting the Best Environmental Practices (BEP) and the Best Available Technology (BAT) improve the wastes comprehensive management plan, and the awareness through education of all the stakeholders.

#### *5.2.3.2. Specific objectives*

- To develop the regulatory framework and policies required for the adoption of Best Environmental Practices (BEP) and Best Available Technology (BAT), improvement of the wastes comprehensive management plan, and the awareness through education of all the stakeholders.
- To perform monitoring of control measures for the prevention and reduction of unintentional POP emissions, according to the policies and the regulatory framework.

**127.** Toolkit to identify and quantify dioxins, furans and other UPOPs under Article 5 of the Stockholm Convention, 2013 issue.

**128.** "PCDD / PCDF releases are accompanied by releases of other unintentional POPs, which can be minimized or eliminated with the same measures that are used to address PCDD / PCDF emissions. The elaboration of a comprehensive PCDD / PCDF inventory allows the identification of priority sources, the establishment of measures and the development of action plans to minimize the emissions of all unintentional POPs. Therefore, it is recommended, for practical reasons, to concentrate the inventory activities in the PCDD / PCDF, since these substances indicate the presence of other unintentional POPs. It is considered that they constitute a sufficient basis to identify and prioritize the sources of all these substances, as well as to develop control measures applicable to all Annex C POPs and to evaluate their effectiveness. Only in the context of an investigation or other projects, it is advisable to analyze the emissions of all unintentional POPs listed in Annex C to generate useful information to derive the emission factors. "

**129.** The inventory is planned to start in 2018, therefore the results are not presented in this NIP.

### 5.2.3.3. Stakeholders involved

| | |
|---|---|
| Ministry of Commerce, Industry and Tourism - MinCIT | Ministry of Transport - MinTransporte |
| Ministry of Health and Social Protection - MinSalud | Ministry of Labour - MinTrabajo |
| Ministry of Foreign Affairs – Cancillería | Ministry of Agriculture and Rural Development – MinAgricultura |
| Ministry of Environment and Sustainable Development - MinAmbiente | Ministry of Mines and Energy - MinMinas |
| Ministry of Housing, City and Territory | Ministry of Education - MinEducación |
| National Authority for Environmental Licensing - ANLA | Regional and Urban Environmental Authorities |
| National Institute of Health - INS | National Institute of Food and Drug Monitoring - INVIMA |
| Institute of Hydrology, Meteorology and Environmental - IDEAM | Directorate of National Taxes and Customs - DIAN |
| Fiscal and Customs Police - POLFA | Industrial unions and companies |
| National Training Service - SENA | Administrative Department of Science, Technology and Innovation - COLCIENCIAS |
| Academy | Financiera de Desarrollo Territorial S.A. - FINDETER |
| National Accreditation Body of Colombia – ONAC | Mayor's Offices and Governor's Offices |
| Unintentional pollution generators | Comprehensive Responsibility Colombia |

### 5.2.3.4. Actions outlined in the action plan for unintentional POPs

Given the diverse potential sources of unintentional POPs regulated since the Stockholm Convention came into effect, as well as, the provisions of amendments made in 2009 and 2015, it is necessary to take actions to identify, quantify and assess risks, as well as, treat unintentional POPs focusing on prevention, reduction or elimination of associated risks. Likewise, information sharing activities for institutional strengthening, regulatory development and communication, among others, must be considered.

The following are the actions outlined in different strategies comprising of the action plan for unintentional POPs. The planning table or matrix is shown in a logical sequence starting with the general objective, as well as, its usage indicator and overall goal to be fulfilled, followed by its specific objectives, uses indicator and relevant goals, which will eventually be achieved by the relevant activities. The specific objectives and activities include an analysis of the weight and relevance of the actions outlined and necessary to achieve the general objective and compliance percentages[130].

**130.** The degree of compliance with activities has an impact on the degree of compliance with the corresponding specific objective, and the degree of compliance with the general objective.

## ACTION PLAN FOR UNINTENTIONAL POPS

**GENERAL OBJECTIVE (GO):** To prevent, control and reduce unintentional POP emissions in the country by the development of a policy and regulatory framework, and adopting Best Environmental Practices (BEP) and the Best Available Technology (BAT), an improvement of the wastes comprehensive management and the awareness and education of the involved stakeholders.
**GO INDICATORS:** Percentage of emissions reduced through BEP and BAT, as well as, monitoring and control actions.
**GO GOAL:** At least 20% of unintentional POP emissions will be reduced and verified by 2027.

**SPECIFIC OBJECTIVE 1 (SO1):** To develop a regulatory framework and policy required for the adoption of best environmental practices and best available technology, an improvement in the comprehensive management of waste, and the awareness and education of all stakeholders. Weight: 60%.
**SO1 INDICATOR:** Number of BAT and BEP implementation pilot projects for the UPOPs emissions reduction in prioritized sectors.
**SO1 GOAL:** By 2022, in at least four sectors pilot projects adopting BAT and BEP will be on stream, according to sources generating the most UPOS and identified releases in the dioxin and furan inventory, together with the applicable regulation and wastes comprehensive management policies.

| Activity | Strategic Direction | Weight | Goal | Main person in charge | Stakeholders involved |
|---|---|---|---|---|---|
| 1.1. To promote through education, training and awareness-raising of all stakeholders (involved, interested and the general population) in different country regions on the risks of unintentional POPs and the actions to be taken to prevent, reduce and control the release of unintentional POPs. | L1. Information collection and dissemination | 10% | By 2022, 2 awareness-raising annual programs for the stakeholders, and the general population will be developed. | MinAmbiente | Environmental Authorities |
| 1.2. To design and disseminate guidance material about Best Available Technology - BAT and Best Environmental Practices (BEP) promoted in the country to prevent, reduce and control unintentional POPs in priority sectors. | | 25% | By 2022, guidance material will be designed and disseminated in at least 4 prioritized sectors. | MinAmbiente | Environmental Authorities |
| 1.3. To implement the Best Available Technology - BAT and Best Environmental Practices - BEP that facilitates the realization of the reduction goal for UPOPs in the prioritized sectors that release the greatest percentage of these substances. | L3. Risk management* and promotion of alternatives | 30% | By 2022, demonstration projects with BAT and BEP will be implemented at least in 4 prioritized sectors that have together reduced by at least 20% of the emissions estimated in the baseline. | MinAmbiente | MinComercio MinAgricultura Environmental Authorities |
| 1.4. To promote the use of Best Available Technology - BAT and Best Environmental Practices - BEP in all sectors that may potentially generate unintentional POPs in the country and promote the introduction of successful projects that do reduce the emissions of unintentional POPs, as well as the improve the comprehensive management of wastes according to the national policies. | | 25% | By 2027, BAT and BEP will be promoted in at least 50% of the sectors that may generate unintentional POPs and the process will be documented. | MinAmbiente | MinComercio MinAgricultura Environmental Authorities |
| 1.5. To evaluate, harmonize and complement the regulatory framework intended to control and reduce the emission of unintentional POPs, including among other issues, the required guidelines for the BAT and BEP implementation, and the improvement of the comprehensive management of wastes according to the national policies. | L5. Information sharing instruments to generate and strengthen capacities | 10% | By 2019, there will be a first evaluation on the need to harmonize and complement the regulatory framework related to the reduction of unintentional POPs.<br>By 2022, there will be a published evaluation of the need to harmonize and complement the regulatory framework related to the reduction of unintentional POPs. | MinAmbiente | Environmental Authorities |

**SPECIFIC OBJECTIVE 2 (SO2):** To realize the control and monitoring to the UPOPs emissions prevention and reduction, according to the policies and the regulatory framework. Weight: 40%.
**SO2 INDICATOR:** Number of control and monitoring actions that will verify the UPOPs emissions reduction.
**SO2 GOAL:** By 2027, 100% of the control and monitoring actions has been realized.

| | | | | | |
|---|---|---|---|---|---|
| 2.1. To update the inventory of unintentional POP sources and releases periodically, as well as to identify other transversal information systems that provide data for this inventory. | L1. Information collection and dissemination | 25% | By 2027, the inventory of unintentional POP sources and emissions will be updated at least every five years. | MinAmbiente | Environmental Authorities |
| 2.2. To design the environmental epidemiological surveillance scheme in country areas or zones with the highest releases of unintentional POPs and identify their human health effects based on monitoring or available environmental studies. | L2. Risk assessment | 15% | By 2022, the environmental epidemiological surveillance scheme will be designed and at least one pilot project on unintentional POPs will be implemented. | MinSalud | INS<br>MinAmbiente<br>Environmental and Sanitary Authorities |
| 2.3. To implement the monitoring and control program for unintentional POP, to verify compliance with the Colombian regulations by generating sources in accordance with the national established guidelines. | L4. Monitoring - Inspection, Surveillance and Control | 15% | By 2027, Monitoring and control activities on unintentional POPs will be carried out at least in 20 environmental authorities in the country according to the national established guidelines. | Environmental Authorities | MinAmbiente |
| 2.4. To design and develop a program for periodical verification (at least each 5 years) of the results on the UPOPs emissions reduction, to determine the adopted measures efficiency. | | 15% | By 2027, there will be two five-year verifications of the results achieved in the reduction of unintentional POPs in the country. | MinAmbiente | Environmental Authorities |
| 2.5. To strengthen the country's capacity to monitor unintentional POPs, including food monitoring, as well as the identification and characterization of contaminated sites. | | 15% | By 2020, there will be a capacity and needs assessment to determine the strength of the UPOPs monitoring (including passive monitoring). | MinAmbiente | Environmental Authorities<br>INVIMA<br>ICA |
| 2.6 To develop the skills of environmental and sanitary authorities, unintentional-POP generating companies and the productive sector to estimate emissions and features of unintentional-POP generation sources. | | 15% | By 2027, at least 10 training sessions will be developed for the stakeholders involved in the emission of unintentional POPs. | MinAmbiente | MinSalud |

*L3 includes prevention, reduction and elimination of risk

### 5.2.4. 5.2.4 Action Plan for POPs used for industrial purposes (except PCB)

The POP substances for industrial use[131] under this action plan were widely used in the industries of developed countries, ever since the early 1960's they were widely used in various industrial applications. Over time, the adverse effects on human health and the environment were established and these substances were identified as persistent organic pollutants, which boosted the world's interest in initiating the process leading to the elimination and restriction of the use of these chemicals.

According to the results of the initial inventory of the POPs used for industrial purposes, they can be found in the electrical and electronic consumer appliances sectors as well as in vehicle foams. They can also be found in other sectors either as part of a chemical formulation or a material, therefore there should be robust control measures for the recycling of goods or materials that could contain POPs, as well as the mechanism for their labelling and environmentally sound management according to the BAT and BEP. At present in Colombia there is no regulation banning the import and use of these POP substances, nor is there full identification of the chemicals imported, or the manufactured and marketed goods in the country that could contain such compounds.

This action plan sets out the necessary activities for the country to address the problem associated with these substances and thereby comply with the related objectives of the Convention. These activities and goals are developed from the perspective of sustainable production and consumption.

#### *5.2.4.1. General Objective*

To promote the integrated management of POPs for industrial use through the identification of the materials containing such substances in their life cycle, and ensure the environmental sound management of such materials.

#### *5.2.4.2. Specific Objectives*

- To identify materials (products, articles and wastes) containing POP substances for industrial use in Colombia.
- To promote appropriate environmental management of POPs used for industrial purposes and the materials containing them (products, articles and waste).

**131.** Hexabromobiphenyl - HBB, commercial grade pentabromodiphenylether, commercial quality octabromodiphenylether, hexabromocyclododecane - HBCD, PFOS, its salts and PFOSF and Pentachlorobenzene -PeCB.

### 5.2.4.3. Stakeholders

| | |
|---|---|
| Ministry of Commerce, Industry and Tourism - MinCIT | Ministry of Transport - MinTransporte |
| Ministry of Health and Social - Protection MinSalud | Ministry of Labour - MinTrabajo |
| Ministry of Foreign Affairs - Cancillería | Ministry of Environment and Sustainable Development - MinAmbiente |
| National Authority for Environmental Licensing - ANLA | Regional and Urban Environmental Authorities |
| National Institute of Health - INS | National Institute of Drug Oversight and Food - INVIMA |
| Institute of Hydrology, Meteorology and Environmental Studies - IDEAM<br>IDEAM | National Tax and Customs - DIAN |
| Tax and Customs Police - POLFA | Industrial associations and corporations |
| Education and Training National Service - SENA | Administrative Department of Science, Technology and Innovation - COLCIENCIAS |
| Hazardous Waste Managers and WEEE | Testing laboratories |
| Academy | Territorial Development Financial Institution- FINDETER |
| Accreditation National Agency - ONAC | Ministry of Commerce |
| International Telecommunication Union - ITU | |

### 5.2.4.4. Activities included in the POP used for industrial purposes (except PCB) action plan

Given the multiple applications of new industrial POPs listed in the 2009, 2011, 2013 and 2015 amendments to the Stockholm Convention, these substances are widely distributed in the world in a great variety of products, both industrial and retail. This clearly indicates they must be identified, quantified and assessed for risks, in order to take the proper measures to address these risks, or those related with prevention, reduction or elimination. The above steps must be accompanied by institutional strengthening and communication activities.

These are the actions proposed in the framework of the different strategic directions presented for POPs used for industrial purposes (except PCB) in the action plan. The planning table or matrix is presented in a logical sequence starting with the general objective, as well as its usage indicator and overall goal, followed by its specific objectives; uses indicator and related goals, which then follows with a list the subsequent relevant activities. Both, the specific objectives and activities are weighted showing the relevance to achieving the overall objective and the percentages for compliance[132].

**132.** The compliance rate of the activities affects the compliance rate of the respective specific objectives and therefore the compliance rate of the overall objective.

## POP USED FOR INDUSTRIAL PURPOSES (EXCEPT PCB) ACTION PLAN

**GENERAL OBJECTIVE (GO):** To promote the integrated management of POPs used for industrial purposes through the identification of the materials containing such substances in their life cycle, and ensure the appropriate environmental management.
**GO INDICATOR:** Percentage of identified materials (products, articles and wastes) containing POPs used for industrial purposes in the country and which are managed in an environmental sound manner
**GO GOALS:** By 2027, there will be comprehensive management of 100% the identified materials (products, articles and wastes) containing POPs used for industrial purposes.

**SPECIFIC OBJECTIVES 1 (SO1):** To identify the main materials (products, articles and wastes) containing POP used for industrial purposes (except PCB) substances in Colombia. Weight: 60%.
**SO1 INDICATOR:** Percentage of POP used for industrial purposes (except PCB) identified in prioritized materials (products, articles and re residues) which may contain them.
**SO1 GOAL:** By 2027, 100% of the POPs for industrial use will be incorporated in the inventories of prioritized materials (products, articles and wastes) which may contain them.

| Activity | Strategic Direction | Weight | Goal | Main Responsible | Stakeholders Individuals involved |
|---|---|---|---|---|---|
| 1.1. To develop and maintain the national inventory of POP used for industrial purposes (except PCB) (types and quantities of substances, materials and wastes) also including manufacturers (if any) and importers and marketers of products or materials which may contain them, taking into account the stages of their life cycle, as well as preliminary considerations for those which are proposed and are undergoing evaluation to be included as POP. | L1. Information collection and dissemination | 40% | By 2022, 1 (one) POP used for industrial purposes (except PCB) preliminary inventory has been developed.<br>By 2027, the POP used for industrial purposes (except PCB) inventory has been updated. | MinAmbiente | MinComercio<br>Environmental Authorities |
| 1.2. To maintain tariff sub-headings at the level of detail required to conduct inventories and studies on POP used for industrial purposes (except PCB), and to establish the required control measures. | | 20% | By the end of 2022, the tariff headings have been updated in detail. | DIAN | MinComercio |
| 1.3. To strengthen personnel capacity at the approved laboratories to aid the characterization of POPs used for industrial purposes in the country. | L5. Information exchange instruments to generate and strengthen capacities | 20% | By year 2020, 2 laboratory personnel trainings have been conducted to analyze at least PBDE and PFOS. | MinAmbiente | IDEAM |
| 1.4. To evaluate, harmonize and complement the existing regulations and to develop more rules accordingly to regulate POPs used for industrial purposes in the country, including among other issues, the required guidelines for the BAT and BEP adoption, and improvement of the comprehensive management plan for wastes in accordance with the national policies. | | 20% | By 2019, there will be a first evaluation on the need to harmonize and complement the regulatory framework related to the POPs used for industrial purposes.<br>By 2022, there will be a complete evaluation on the need to harmonize and complement the regulatory framework related to the POPs used for industrial purposes. | MinAmbiente | MinComercio |

**SPECIFIC OBJECTIVES 2 (SO2):** To promote the appropriate environmental management of POPs used for industrial purposes and the materials containing them (products, articles and waste), as well as the BAT and BEP adoption, according to the policies and national regulations. Weight: 40%.
**SO2 INDICATOR:** Percentage of available national guidelines for the sound management of POPs used for industrial purposes and the materials containing them.
**SO2 GOAL:** By year 2027, 100% of the national guidelines required so far for the appropriate environmental management of POPs used for industrial purposes and the materials that contain them have been disseminated and implemented.

| | | | | | |
|---|---|---|---|---|---|
| 2.1. To develop tools for effective communication and awareness on the risks associated with the management of materials or waste containing POPs used for industrial purposes within the sustainable production and consumption framework. Such communication is intended for workers, consumers and other stakeholders. | L1. Information collection and dissemination | 10% | By 2027, at least 3 tools for effective communication of risks associated with POPs for industrial use will be developed. | MinTrabajo | MinSalud<br>MinAmbiente |
| 2.2. To design a epidemiological environmental surveillance scheme for the areas or zones of the country with stocks or applications of POP used for industrial purposes (except PCB) and their effect on human health identified from the available studies or environmental data. | L2. Risk assessment | 10% | By 2022, there is an epidemiological environmental surveillance scheme implemented with at least one pilot project on POP used for industrial purposes (except PCB). | MinSalud | INS<br>MinAmbiente<br>Environmental and Sanitary Authorities |
| 2.3. To establish the guidelines for the sound environmental management of wastes containing or contaminated with POPs used for industrial purposes in order to reduce related risks. | L3. *Risk management and promotion of alternatives | 15% | By 2022, an orientation guide for the environmentally sound management of waste containing POPs for industrial use waste has been developed and published. | MinAmbiente | Environmental Authorities |
| 2.4. To develop and assess demonstration projects for the replacement of chemical products (formulated from POPs and applied in imported or manufactured goods and sold in the country) based on the available alternatives identified in international studies. | | 15% | By the year 2022, at least 4 cases of POP used for industrial purposes (except PCB) substitution have been evaluated, as well as sound recycling of materials containing them. | MinAmbiente | MinComercio<br>Environmental Authorities |
| 2.5. To eliminate the waste stocks associated with materials that may contain POPs used for industrial purposes identified through the initial inventory of these substances. | | 10% | By 2027, 100% of the waste confirmed as contaminated with POPs for industrial use has been disposed. | MinAmbiente | MinComercio<br>Environmental Authorities |
| 2.6. To develop demonstration studies, including BAT and BEP promotion and implementation, for the identification and substitution of POPs used for industrial purposes and sound management of the wastes containing them. | | 10% | By 2022, at least 2 demonstration projects for the BAT and BEP implementation for, POPs used for industrial purposes substitution and the sound management of the wastes have been developed. | MinAmbiente | Environmental Authorities |
| 2.7. To establish inspection, surveillance and control mechanisms to be performed by the competent authorities for the comprehensive management of POPs used for industrial purposes. | L4. Monitoring - Inspection, Oversight and Control | 10% | By the end of 2022, a protocol defines inspection, surveillance and control activities for POPs used for industrial purposes. | MinAmbiente | Environmental Authorities |
| 2.8. To build the capacities of staff responsible for the Inspection, Surveillance and Control at the competent authorities and within the framework of the comprehensive management of POPs used for industrial purposes. | L5. Information exchange instruments to generate and strengthen capacities | 10% | By 2027, at least 10 training sessions will have been completed for personnel from those authorities on the IVC system and comprehensive management of POPs used for industrial purposes. | MinAmbiente | MinSalud<br>MinComercio<br>MinAgricultura |
| 2.9. To identify and implement incentives and mechanisms for the financing of the substitution of POP substances with alternative substances. | | 10% | By year 2027, there will be one assessment on incentives and other mechanisms to finance the substitution of POPs used for industrial purposes. | MinAmbiente | MinComercio |

*L3 Includes prevention, reduction and elimination of risks

# 6. SOCIO-ECONOMIC AND COST ANALYSIS OF THE NATIONAL IMPLEMENTATION PLAN - **NIP FOR THE COMPREHENSIVE MANAGEMENT OF POPs IN COLOMBIA**

The implementation of a national plan implies not only environmental, social and economic benefits, but also the need for investments associated with the implementation of action plans. It is therefore necessary to estimate the implementation costs and to conduct an assessment of the socio-economic impact of the actions taken in order to determine whether the cost - benefit relationship is favourable for the country, otherwise it will be necessary to rethink and reorient the national implementation plan and its specific action plans towards alternative strategies.

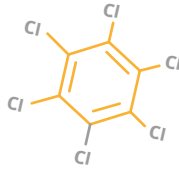
Once the action plans specific to the different groups of POPs were agreed, an analysis to estimate the implementation costs was carried out together with the socioeconomic assessment of the National Implementation Plan in Colombia for the period 2017-2027 (except for PCB because that was to run to 2028). This plan includes both the global and itemized evaluation for the four groups of persistent organic pollutants that have been identified in this NIP so far[133].

## 6.1. COST ANALYSIS

The costing of the four groups of POPs within the framework of the five (5) strategic guidelines established for the update of the National Implementation Plan under the Stockholm Convention, facilitates a methodology for estimating the amount of the necessary investment to ensure compliance with the commitments Colombia has for the integrated management of POPs.

The structure of the budget or cost estimate for the action plans followed the guidelines established by the Convention.[134] The information used in estimating financial costs associated with the execution of the four action plans are in accordance with the objectives, activities, goals and deadlines provided therein.

Investments or financial costs of the NIP are estimated in 2017 Colombian pesos, but presented in US dollars[135]. After quantification and analysis of unitary financial costs in each POP specific action plan in their different objectives and strategies, the total costs of the Stockholm Convention National Implementation Plan are established. They are listed in Table 6.1:




**133.** POP Pesticides, PCB, Unintentional POP and industrial use POPs

**134.** According to guidelines *"Guidance on Calculation of Action Plan Costs for Specific Persistent Organic Pollutants"*, which proposes the methodological approach for developing an updated cost structure for a specific period of time, taking into account secondary information on unitary costs and levels of activities scheduled for each year in line with the implementation objectives of each plan.

**135.** Considering the exchange rate on January 12, 2017 equivalent to COL $ 3,275 per US dollar (USD).

**Table 6.1. National Implementation Plan Total Financial Costs**

| NIP TOTAL COSTS | | |
|---|---|---|
| **POP group** | **Strategic Direction** | **Direction total cost (USD *)** |
| **PESTICIDES** | 1 | $ 3,915,267 |
| | 2 | $ 91,603 |
| | 3 | $ 1,164,098 |
| | 4 | $ 623,740 |
| | 5 | $ 555,725 |
| **PESTICIDES TOTAL COST** | | $ 6,350,434 |
| **PCB** | 1 | $ 412,214 |
| | 2 | $ 152,672 |
| | 3 | $ 65,488,761 |
| | 4 | $ 1,775,137 |
| | 5 | $ 427,481 |
| **PCB TOTAL COST** | | $ 68,256,264 |
| **Unintentional POP** | 1 | $ 427,481 |
| | 2 | $ 152,672 |
| | 3 | $ 1,618,321 |
| | 4 | $ 793,893 |
| | 5 | $ 442,748 |
| **Unintentional POP TOTAL COST** | | $ 3,435,115 |
| **POP used for industrial purposes (except PCB)** | 1 | $ 181,679 |
| | 2 | $ 152,672 |
| | 3 | $ 3,716,788 |
| | 4 | $ 91,603 |
| | 5 | $ 464,828 |
| **Industrial POP TOTAL COST** | | **$ 4,607,570** |
| **NIP TOTAL COST** | | **$ 82,649,382** |

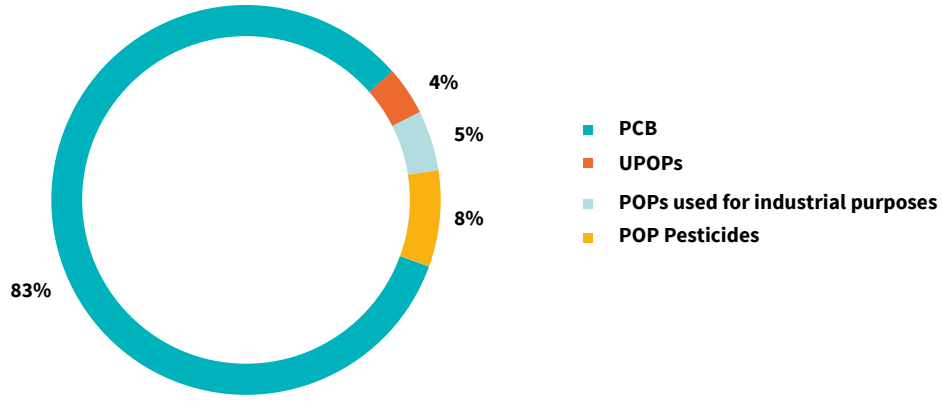
*** Applying a COL $ 3,275 per USD exchange rate**

**Source: Minambiente (2017b)**

For the POP pesticide group, the total financial cost amounts to USD $ 6,350,434, approximately equivalent to 2017 COL $ 20,797,669,770. The PCB group corresponds to USD $ 68,256,264, equivalent to COL $223,539,266,062. The total financial cost for unintentional POPs is USD $ 3,435,115, equivalent to approximately COL $ 11,250,000,000 and for POPs used for industrial purposes (except PCB), the total financial cost is USD $ 4,607,570, equivalent to $ COL 15,089,790,884 approximately.

The above figures are estimates of the total financial investment or costs of the Stockholm Convention National Implementation Plan and amounts to eighty two million six hundred forty nine thousand three hundred eighty two dollars (USD $ 82,649,382), equivalent to two hundred and seventy thousand six hundred and seventy six million 2017 Colombian pesos (COL $ 270,676,726,716) approximately[136].

**Graph 6.1 NIP implementation costs, participation of each POP groups**




These financial costs, besides helping to understand the dimension of the financial resources necessary to meet the updated NIP, are essential data for the preparation of the socio-economic analysis report of the Stockholm Convention NIP, which are presented below.

## 6.2. SOCIO-ECONOMIC ANALYSIS

The socio-economic analysis of POPs management in Colombia based its results on secondary information and estimated costs associated with the implementation of the POP action plans presented in the previous section[137]. The analysis was prepared by identifying and quantifying the economic benefits produced by the National Implementation Plan, as well as updating the investments for each group of POPs and by specifying and estimating cash flows using the "cost - benefit analysis" technique to estimate the net present value of the benefits and the cost - benefit relation - RBC.

**136.** There are 224.2 billion Colombian pesos according to MinHacienda Bulletin N.176, 19th October, 2016, available www.minhacienda.gov.co

**137.** Following the methodological guidelines of the "Draft Guidance on Socio-Economic Assessment for National Implementation Plan Development and Implementation under the Stockholm Convention" and "Guidance on Calculation of Action Plan Costs for Specific Persistent Organic Pollutants"

This analysis is an update of the first study conducted and published in Colombia in 2006[138], which developed a socioeconomic analysis of the first NIP 2010 considering a period between 2007 and 2016. This study compared the implementation economic costs of the plan based on investments in eight strategic directions. It included the socio-economic benefits derived from the adverse impact reduction on public health and diseases associated with POPs contamination in different regions of the country, as well as the benefits for complying with the Convention in foreign trade with the EU, via a reduction in entry tariffs.

Ten years later, the update of the socio-economic analysis has been made taking into account two major changes: first, the update of the initial intervention strategic direction for the 2010 plan (4 directions), to the strategic directions established for updating the NIP 2017-2027 (5 directions) and; secondly, the non-inclusion of the foreign trade benefits, since there are no current tariff schemes under free trade agreements with the EU.

This study updated the socio-economic benefits by reducing human health impacts caused by POPs pesticides, PCBs, industrial POP and unintentional POP, which are measured considering the positive impacts of a reduction in morbidity and mortality indexes for 6 types of diseases related to the four types of POPs (Chloracne, Neuropathy, and Non-Hodgkin lymphoma, Cirrhosis, Porphyria and Hypothyroidism).

**138.** Study called: "Evaluation of Economic and Social Implications of the Use and Reduction of Persistent Organic Pollutants POPs including the needs for improve of the national capacity" conducted in 2006 as part of a collaborative partnership betweeren Universidad Javeriana and the Ministry of Environment, Housing and Territorial Development (now Ministry of Environment and Sustainable Development).

Four categories of costs were quantified: patient treatment costs, productivity loss costs, the costs of deaths and the costs for soil degradation. The economic benefits were calculated as the difference between Convention non-compliant health costs and Convention compliant health costs, and an update of the economic benefits in both Colombian pesos and US dollars was calculated for 2017.

The cash flows use a social discount rate[139] of 10% as a reference, and the simulation analysis is presented with rates of 8% and 12%. Likewise, for the NIP socioeconomic evaluation, the financial costs of the plan presented in the previous section were adjusted by applying the price account relation (PAR), which is weighted according to Castro's Study (2016), *"Price Accounts Relations for Colombia"* by a factor of 1.1, thereby becoming the values presented hereinafter as "economic costs of implementing the NIP update" for each group of POPs.

### 6.2.1. POP Pesticides

Considering the above information, the Table 6.2 presents the flow of economic benefits and costs for the group of POP Pesticides:

**Table 6.2. Cost-benefit analysis for the group of POPs pesticides**

| Cash flow results for POPs Pesticides | Economic Net Present Value (US Dollar 2017) |
|---|---|
| Economic costs in Human Health WITHOUT the convention | 177,251,810 |
| Economic costs in human health WITH the convention | 119,985,375 |
| Total economic benefit | 57,266,435 |
| Implementation Economic Costs for the NIP update | 9,904,943 |
| Net economic benefits | 50,311,492 |
| Benefit cost relation (CBR) | 8.23 |

Source: MinAmbiente (2017b)

As shown in the above table, net economic benefits for POP pesticide pollutants amounts to fifty million three hundred eleven thousand four hundred and ninety-two dollars in 2017 (US $ 50,311,492), with a CBR of 8.23, indicating that for every dollar invested in NIP activities to meet the provisions of the Stockholm Convention, in the case of POPs pesticides, there is a socio-economic return of $ 8.23 dollars. This shows the high socio-economic return the country will receive from investments in this component to comply with the convention

**139.** The discount rate is the index that compares economic flows during different periods. From the individual consumption point of view, the discount rate is the cost that the individual is willing to pay to consume any goods over a given period instead of consuming it in the next period (or benefit they demand to stop consuming a good in the current period and to consume it in the following). From the investor's point of view, the discount rate of return expected in a sector of similar risk.

The above results are a lower limit of the true net benefit in net present value derived from the implementation of the NIP strategic direction for this group of POP. Especially considering that the elimination of these substances avoids public health costs in the future, that is, for at least for an additional 30-year period from the last year the new NIP investments are implemented, according to the average life span reported for some of these pollutants (e.g. DDT whose average life span is 15 years).

### 6.2.2. Polychlorinated biphenyls - PCB

In the same way, the following are the results of the socio-economic analysis for the group of PCB pollutants.

**Table 6.3. Cost-benefit analysis for PCB pollutants group.**

| Cash flow results for PCB | Economic Net Present Value (US Dollar 2017) |
|---|---|
| Economic costs in Human Health WITHOUT the convention | 237,136,010 |
| Economic costs in health WITH the convention | 81,144,157 |
| Total economic benefit | 155,991,853 |
| Implementation Economic Costs of the NIP update | 75,081,891 |
| Net economic benefits | 80,909,962 |
| Benefit cost relation (CBR) | 2.08 |

**Source: MinAmbiente (2017b)**

The Table 6.3, shows that the net economic benefits for the PCB pollutant component amounts to approximately eighty million nine hundred nine thousand nine hundred and sixty-two dollars (US $ 80,909,962) in 2017, with a CBR of 2.08. This indicates that for every dollar invested in NIP activities to meet the provisions of the Stockholm Convention, in the case of PCBs, there is a socio-economic return of $ 2.08 dollars. This shows the positive socio-economic return in terms in socio-economic profitability the country will receive from investments in this component. As for POPs pesticides, the above results are a lower limit of the true net benefit in net present value produced by the implementation of the strategic direction of the NIP for this group of POP, given that the elimination of these substances reduces the costs for public health in the future, that is, for at least for a period of up to 15 additional years from the last year of new NIP investment implementation, according to the average life span of the PCB (7.5 years approx.).

### 6.2.3. Unintentional POPs

Likewise, the table below shows the results of the socio-economic analysis for the Unintentional POPs group.

**Table 6.4. Cost-benefit analysis for the group of Unintentional POPs.**

| Cash flow results for Unintentional POP | Economic Net Present Value (US Dollar 2017) |
|---|---|
| Economic costs in human Health WITHOUT the convention | 203,741,323 |
| Economic costs in human health WITH the convention | 184,610,345 |
| Total economic benefit | 19,130,978 |
| Economic costs of NIP update implementation | 3,778,626 |
| Net economic benefits | 15,352,352 |
| Benefit cost relation (CBR) | 4.06 |

Source: MinAmbiente (2017b)

As shown in Table 6.4, the net economic benefits for the Unintentional POP component amount to approximately fifteen million three hundred fifty-two thousand three hundred fifty-two US dollars in 2017 (US $ 15,352,352), with a CBR of 4.06. This indicates that for every dollar invested in NIP activities to meet the provisions of the Stockholm Convention, in the case of Non-intentional POP, there is a socio-economic return of $ 4.06 dollars. This shows the high socio-economic return the country will receive from investments in this component.

As per the above, these results are a lower limit of the true net benefit in the net present value derived from the implementation of the NIP strategic directions for this group of POP. This also reduces public health costs in the future for at least 14 to 22 additional years from the last year the new NIP investment is implemented, according to the average life span reported for some of these pollutants (between 7 and 11 years).

### 6.2.4. POPs used for industrial purposes (except PCB)

The results of the socio-economic analysis for the group of pollutants POP used for industrial purposes (except PCB) are as follows.

**Table 6.5 Cost-benefit analysis for the group POPs used for industrial purposes.**

| Cash flow results for Industrial use POP | Net Present Economic Value (US Dollar 2017) |
|---|---|
| Economic costs in human Health WITHOUT the convention | 203,741,323 |
| Economic costs in human health WITH the convention | 188,768,015 |
| Total economic benefit | 14,973,308 |
| Economic costs of NIP update implementation | 5,068,327 |
| Net economic benefits | 9,904,981 |
| Benefit cost relation (CBR) | 1.95 |

**Source: MinAmbiente (2017b)**

The Table 6.5 shows that the net economic benefits for POPs used for the industrial purposes component amounts to approximately fourteen million nine hundred seventy-three thousand three hundred and eight US dollars for 2017 (US $ 14,973,308), with a 1.95 RBC. This indicates that for every dollar invested in the NIP activities to meet the provisions of the Stockholm Convention, in the case of Industrial POP, there is a socio-economic return of $ 1.95. This shows the positive return in terms in socio-economic profitability the country will receive from investments in this component.

In a similar manner to the other three POP groups, these results represent a lower limit of the true net benefit in net present value derived from the implementation of the NIP strategic directions for this group. This indicates that the elimination of these substances avoids public health costs in the future for at least 18 additional years from the last year the new NIP investment is implemented, according to the average life span reported for some of these pollutants (e.g. 9 years for PFOS).

### 6.2.5. Global Implementation of NIP

Here are the overall results for all NIP components. Here is a summary of all the economic benefits and costs of the four action plans, for which there is a positive net present value in benefits equivalent to one hundred and fifty-six million four hundred and seventy-eight thousand seven hundred eighty-seven US dollars (**US $ 156,478,787**). This means that from an ex ante evaluation (anticipated outcomes) perspective, the NIP for the period 2017 to 2028 is favourable in terms of social welfare and quality of life for Colombian society.

Similarly, the socio-economic evaluation reports a **2.72 CBR**, which confirms the cost effectiveness of the investments set out in the NIP because a CBR greater than 1 implies that social returns are higher than the costs borne by society. In this evaluation, a 2.72 CBR means that for every dollar invested in the NIP from 2017 - 2028, there is a positive return in social welfare of $ 2.72 dollars.

**Table 6.6. Results for the socio-economic analysis of the Stockholm Convention National Implementation Plan.**

| POP Group total economic (USD in 2017) | Benefits | Costs economic total | Benefits net economic (USD in 2017) |
|---|---|---|---|
| POPs pesticides | $ 57,266,435 | $ 6,954,943 | $ 50,311,492 |
| PCB | $ 155,991,853 | $ 75,081,891 | $ 80,909,962 |
| Non intentional POPs | $ 19,130,979 | $ 3,778,626 | $ 15,352,352 |
| POP for industrial Use | $ 14,973,308 | $ 5,068,327 | $ 6,954,981 |
| Benefit Net Present Value | | | $ 156,478,787 |
| Benefit cost relation (CBR) | | | 2.72 |

**Source: MinAmbiente (2017b)**

Considering the results of the socioeconomic analysis, it can be stated that updating the NIP strategic direction will lead to a model of cost effectiveness that will ensure the country might achieve a net positive economic impact that largely benefits the Colombian communities at risk of being affected by persistent organic pollutants. The inclusion of additional positive impacts on the socio-economic analysis would increase the net economic benefits in terms of the net present value and the CBR indicator, which reaffirms this result even further.

Based on the results found in the socioeconomic analysis, it is important to note that the estimated socio-economic feasibility relies on an impact that directly improves the quality of life, that is, an individual's health condition. This is further reinforced if one considers that the economic feasibility found in the socioeconomic study conducted in 2006 for the 2010 NIP, depended in part on obtaining economic benefits from the reduction of tariffs by the Union European, but today, these tariff benefits do not exist because they were removed from the free trade agreement with the European Union.

Still, the benefits reported in this socio-economic analysis update conclude that investments scheduled for the NIP 2017 - 2028 follow a model of cost efficiency. Also, that the economic benefits of reducing negative impacts on human health, by reducing, managing and disposing of POPs, remains a significant impact in terms of reducing social costs caused by persistent organic pollutants (POPs) in Colombia.

In addition, these results were subject to a sensitivity analysis to verify the robustness of the results. The benefit cost relations under the simulation scenarios also reported values greater than 1, thus confirming the positive impact on welfare produced by the implementation of the new NIP to meet the Stockholm Convention provisions in Colombia.

**Table 6.7. Results of the comparative socio-economic analysis of the National Implementation Plan of the Stockholm Convention**

| SENSITIVITY ANALYSIS | |
|---|---|
| **Social discount rate** | **CBR** |
| **8%** | **2.52** |
| **10%** | **2.72** |
| **12%** | **2.43** |

**Source: MinAmbiente (2017b)**

In general terms, it is concluded that for each dollar invested by Colombia in the implementation of the NIP, the country will receive, under an average scenario, 2.72 times the value of this investment in socio-economic benefits. This value represents the reduction in cases of illness and death due to exposure to POPs, the reduction of workdays lost due to the adverse effects of POPs, the savings in medical care costs due to the adverse effects of POPs, the savings in costs associated with deaths averted, prevention or minimization of POP pollution in soil, air, water and biota, the cost savings for managing POP contamination of soil, air, water and biota, as well as increasing the eligibility of Colombian POPs-free products in international markets.

For more information on the details of each of these cost and socio-economic estimates, go to "*Actualización del análisis socioeconómico y de costos financieros de la gestión de COP en Colombia"* available at Minambiente *www.minambiente.gov.co*

# 7. COMMENTS AND RECOMMENDATIONS

During the process of updating the National Implementation Plan for the Stockholm Convention, the progress, limitations, inventory results, strategies and actions to be addressed in the coming years for the four groups of POPs, presented in the previous chapters, were identified. However, it is considered pertinent to finalize this document by referring to some transversal aspects, as well as different critical factors and recommendations to facilitate the compliance and implementation of this national plan.

### General Recommendations

- To advance a broad socialization of the results of the inventories and evaluations carried out in the framework of the NIP update, as well as its action plans for each of the groups of POPs, to all the stakeholders and interested parties at in the various social groups.
- Implement the actions foreseen in the four specific action plans that are part of the NIP.
- Carry out a briefing (at least initial) for the Ministry of Environment and Sustainable Development, and to the agencies that will lead the implementation of the actions foreseen in each of the specific plans for the different groups of POPs.
- Continuously follow-up the action plans to check on the achievement of the goals and objectives proposed in the framework of the NIP, and to identify early on in the implementation phase any difficulties that may arise, as well as taking appropriate measures for the fulfilment of the plan.
- Report periodically (at least every five years) to the Secretariat of the Stockholm Convention, the progress made by Colombia on the implementation of the NIP and the commitments established within the framework of the Convention.
- Identify the sources of financing and appropriation of financial, human, technological and other resources that are required by those responsible for the implementation of the action plans.
- Generate or maintain inter-institutional and inter-sectoral channels for dialogue and collective construction, for the correct implementation of the planned actions, as well as the follow-up to them.
- Incorporate into the Inter-Sectoral National Technical Commission for Environmental Health - CONASA action plan, and especially its chemical safety table, the actions that are necessary for the implementation and designation as a national coordination centre for the exchange of information. The information is related to the reduction or elimination of the production, use, and release of persistent organic pollutants and the alternatives to these substances, including information pertaining to their hazards and their economic and social costs.
- Advance the planned evaluations concerning the needs for updating, development and normative harmonization, especially for those POPs that do not yet have specific regulations, but currently, are covered by Law 1196 of 2008.

- Incorporate as part of the regulation, instruments of agricultural and industrial chemicals that the country has or are in development, the criteria for the evaluation of formulation established by the Stockholm Convention for persistent organic pollutants.
- Evaluate with the stakeholders involved in the implementation of the NIP what will be the procedure to be followed in Colombia, in case there is a need to apply the registry of exemptions for substances that will be added in the future to the Agreement.
- Strengthen the application of the best available techniques and best environmental practices, to take into account the general guidelines on preventative measures and the reduction of unintentional POPs releases, as well as some existing cases for POPs used for industrial purposes listed in the Stockholm Convention.
- Segregate the tariff subheadings of those POP substances that have yet to be categorised to facilitate the identification of stocks, products, and articles in use that may contain them, as well as updating the corresponding inventories.
- Strengthen strategies for the identification of POPs contaminated sites and the mechanisms to be applied in case the country decides to remediate them in an environmentally sound manner.
- Involve academia effectively in the processes of POPs evaluation and analysis when they are carried out in the country.

### Recommendations for the improvement of POPs inventories and evaluations

In general terms, it is recommended to incorporate the recommendations made by the different stakeholders and experts involved in the process for the improvement of POP inventories and evaluations, which are summarized below:

### POP pesticides

It is suggested to incorporate some measures on the application of the FAO Pesticide Stock Management System.

### Polychlorinated biphenyls - PCB

It is recommended to strengthen the strategies to advance the goals to action the withdrawal of the use of contaminated equipment and to speed up the procedures for the quantitative analyses that will help to reduce the numbers of suspect equipment, taking into account that at this moment they represent more than 80% of the equipment in use.

Additionally, it is suggested to evaluate a community education strategy in association with the competent authorities. This strategy will permit the various stakeholders to take actions to reduce their exposure to disused equipment and waste contaminated with PCBs, facilitating in turn, the training processes with informal recyclers and scrap yards that could possibly market equipment or oils contaminated with PCBs.

### Unintentional POPs

Sources that were not included in the first version of the inventory should be included in the update, such as the subcategories of chemicals (group 7), thermal recovery of cables (group 2), contaminated sites, and in general the group called hot spots (group 10).

Likewise, it is suggested that the guidelines developed by UNIDO and the directives of the European Union for the implementation of the best available techniques and best environmental practices should be evaluated and incorporated in a manner that ensures they are consistent with the comprehensive waste management policies in Colombia.

Similarly, it is suggested that the procedures for periodically updating the national information systems and the inventories should be strengthened.

### POPs used for industrial purposes

It is suggested in the next inventory phase for this group of POPs to undertake a detailed identification exercise of the imported products and articles that could contain some of these substances in case they have been applied to their internal components.

Likewise, it is suggested to review the building codes applicable in Colombia regarding the requirements for the use of flame retardant insulation materials and the main channels of distribution and marketing of flame retardants in the country.

It is suggested that once the Stockholm Convention defines the permissible limits for POPs for industrial use, they are taken into account for the commercialization and environmentally sound management of materials or residues that could potentially contain them.

# 8. REFERENCES


- Colombia. Banco de la República. (2017). Informe de la junta directiva al Congreso de la República. ISSN - 1657 - 799X. Consultado el 02 de octubre de 2017. Disponible en: http://www.banrep.gov.co/sites/default/files/publicaciones/archivos/ijd_mar_2017.pdf
- Colombia. DANE (2016a). Codificación de la División Político Administrativa de Colombia (Divipola) sección "Sobre Divipola". Consultado el 15 de noviembre de 2016. Disponible en: http://geoportal.dane.gov.co:8084/Divipola/
- Colombia. DANE (2016b). Informe de coyuntura económica regional 2015. Consultado el 15 de noviembre de 2016. Disponible en: http://www.dane.gov.co/files/icer/2015/ICER_informe_15.pdf
- Colombia. DANE (2010). Estudios postcensales N° 7. Proyecciones nacionales y departamentales de población 2005 – 2020. Bogotá D. C. Colombia.
- Colombia. DANE (s.f.). La visibilización estadística de los grupos étnicos colombianos. Bogotá D. C. Colombia.
- Colombia. IDEAM. Instituto de Hidrología, Meteorología y Estudios Ambientales. (2015). Estudio Nacional del Agua 2014. Bogotá, D.C.
- Colombia. IDEAM (2016), Informe Nacional de avance en las metas de identificación, marcado, retiro de uso y eliminación de PCB en Colombia - Años 2014 – 2015 - Convenio de Estocolmo. Bogotá, D.C., disponible en www.ideam.gov.co.
- Colombia. IDEAM, PNUD, MINAMBIENTE, DNP, CANCILLERÍA (2015). Primer Informe Bienal de Actualización de Colombia. Bogotá D.C., Colombia.
- Colombia. IDEAM, PNUD, MINAMBIENTE, DNP, CANCILLERÍA (2016). "Conocer: El primer paso para adaptarse. Guía básica de conceptos sobre el cambio climático". Bogotá D.C., Colombia.
- Colombia. Instituto Geográfico Agustín Codazzi - IGAC. (2008). Atlas básico de Colombia. Imprenta Nacional de Colombia. Bogotá, D. C.
- Colombia. Ministerio de Ambiente, Vivienda y Desarrollo Territorial – MAVDT (2005). Inventario nacional de fuentes y liberaciones de dioxinas y furanos de Colombia – Línea base año 2002.
- Colombia. Ministerio de Ambiente, Vivienda y Desarrollo Territorial – MAVDT (2006). Inventario nacional de existencias de plaguicidas COP Colombia 2006. Bogotá.
- Colombia. Ministerio de Ambiente, Vivienda y Desarrollo Territorial – MAVDT (2010). Plan Nacional de Aplicación del Convenio de Estocolmo sobre COP Colombia 2010. Bogotá.
- Colombia. Ministerio de Ambiente y Desarrollo Sostenible - Minambiente. (2015). Manual para la Gestión Integral de Bifenilos Policlorados - PCB N°2. Consideraciones para la implementación del Inventario nacional de PCB. Bogotá, Colombia.
- Colombia. Ministerio de Ambiente y Desarrollo Sostenible - Minambiente & U. Central. Ministerio de Ambiente y Desarrollo Sostenible y Universidad Central. (2015). Material del curso virtual de Gestión ambiental integral de PCB. Bogotá, Colombia.
- Colombia. Ministerio de Relaciones Exteriores. (2016). Consultado el 15 de noviembre de 2016. Disponible en: http://www.cancilleria.gov.co/colombia/nuestro-pais/informacion-inversion y http://www.cancilleria.gov.co/en/informacion-inversionistas
- Colombia. Ministerio de Ambiente y Desarrollo Sostenible – Minambiente (2016). Actualización del marco institucional, regulatorio y de políticas relativas a la gestión de COP. Bogotá D.C., Colombia. Disponible en www.minambiente.gov.co.
- Colombia. Ministerio de Ambiente y Desarrollo Sostenible - Minambiente. (2016a). Actualización del inventario de plaguicidas COP. Bogotá, Colombia. Disponible en www.minambiente.gov.co.

- Colombia. Ministerio de Ambiente y Desarrollo Sostenible - Minambiente. (2016b). Re-cálculo del inventario de línea base 2002 para fuentes y liberaciones de dioxinas y furanos. Bogotá, Colombia. Disponible en www.minambiente.gov.co.
- Colombia. Ministerio de Ambiente y Desarrollo Sostenible - Minambiente. (2016c). Inventario inicial de contaminantes orgánicos persistentes de uso industrial. Bogotá, Colombia. Disponible en www.minambiente.gov.co.
- Colombia. Ministerio de Ambiente y Desarrollo Sostenible - Minambiente (2017b). Actualización del análisis socioeconómico y de costos financieros de la gestión de COP en Colombia. Producto de consultoría adelantada por Juan Carlos Mendieta, disponible en archivo del Minambiente. Bogotá D.C., Colombia. Disponible en www.minambiente.gov.co.
- Colombia. PNN. (2016). Parques Nacionales Naturales de Colombia. Sistema de Parques Nacionales Naturales. Consultado el 19 de julio de 2016. Disponible en: http://www.parquesnacionales.gov.co/portal/es/sistema-de-parques-nacionales-naturales/
- Colombia. Procolombia. (2016). El Clima en Colombia. Consultado el 19 de julio de 2016. Disponible en: http://www.colombia.travel/es
- Instituto Colombiano Agropecuario – ICA (2014). Boletines Técnicos de Comercialización de plaguicidas químicos de uso agrícola 2002 a 2014. Bogotá.
- Instituto de Investigaciones Marinas y Costeras "José Benito Vives de Andréis" – INVEMAR (2016). *Diagnóstico y evaluación de la calidad de las aguas marinas y costeras del Caribe y Pacífico colombianos. Serie de Publicaciones Periódicas del INVEMAR No. 4. Red de vigilancia para la conservación y protección de las aguas marinas y costeras de Colombia (REDCAM). Informe técnico 2015. INVEMAR, MINAMBIENTE y CAR costeras. Santa Marta, Colombia,* disponible en www.invemar.gov.co.
- Ministerio de Ambiente y Desarrollo Sostenible (2017a). Informe de gestión 2016 del proyecto PNUD COL 84851-71268 Desarrollo de la capacidad para la gestión y eliminación ambientalmente adecuada de PCB, disponible en archivo del Minambiente. Bogotá D.C., Colombia.
- PNUMA, UNITAR, ONUDI. (2012). Orientaciones para el inventario de éteres de bifenilos polibromados (PBDE) enunciados en el Convenio de Estocolmo sobre contaminantes orgánicos persistentes. Borrador.
- PNUMA, UNITAR, ONUDI. (2012). *Orientacionesparael inventario de ácido sulfónico de perfluorooctano (PFOS) y sustancias químicas afines enunciados en el Convenio de Estocolmo sobre contaminantes orgánicos persistentes.*
- SiB Colombia. Sistema de información sobre biodiversidad de Colombia. (2016). Biodiversidad en cifras. Consultado el 19 de julio de 2016. Disponible en: http://www.sibcolombia.net/biodiversidad-en-cifras/
- SIC. (2013). *Estudios Económicos Sectoriales.* Obtenido de Estudio sobre Plaguicidas en Colombia: http://www.sic.gov.co/recursos_user/documentos/Estudios-Academicos/Documentos-Elaborados-Grupo-Estudios-Economicos/7_Estudio_Sobre_Sector_Plaguicidas_Colombia_Diciembre_2013.pdf
- UNEP (2013). Kit de herramientas para la identificación y cuantificación de vertidos de dioxinas, furanos y otros COP no intencionales.
- UNEP, UNITAR, UNIDO. (2014). *Guidance for the inventory of polybrominated diphenyl ethers (PBDEs) listed under the Stockholm Convention on Persistent Organic Pollutants.*

# 9. ANNEX

| N° | POP substance | Year of inclusion | Some commercial products that contain it | Main uses and applications |
|---|---|---|---|---|
| 1 | Aldrin (Annex A) | 2001 | Aldocit, Aldrec, Aldrex, Aldrite, Aldrosol, Altox, Bangald, Drinox, HHDN, Octalene, Rasayaldrin, Seedrin, Arrierafin, hormonal healing, Hormitoz or Mata Arriera Almagricola. | Pesticide applied to soils to protect corn and potatoes to control:<br>• Termites<br>• Grasshopper,<br>• Corn Rootworm<br>• Other insect pests |
| 2 | Dieldrin (Annex A) | | Dieldrex, Dielmoth, Exo-Dieldrin, HEOD, Illoxol, Octalox, Panoram D-31, Quintox, Red shield, Termitox | Pesticide used mainly to control:<br>• Termites<br>• Moths<br>It has also been used to control insect-borne diseases residing in agricultural soils |
| 3 | Endrin (Annex A) | | Enpar, Envel, Endrimetil Proficol, Endotion, Endrition, Endrex, Endricol, Hexadrine, Mendrin, Nendrin, Oktanex. | Pesticide applied on the leaves of crops such as cotton and grains.<br>It is also used to control:<br>• Rodents |
| 4 | Chlordane (Annex A) | | Aspon-chlordane, Belt, Chlor Kil, Chlortox, Comejenol, Corodane, Cortilan-Neu, Dowchlo, Gold Kypchlor, Niran, Prentox, Penticklor, Synklor, ToCFPlor or Toxichlor, | Broad-spectrum pesticide used in agricultural crops of vegetables, grain, corn, potatoes, sugar cane, beets, fruits, nuts and cotton mainly to control:<br>• Termites<br>• Other insect pests |
| 5 | Heptachlor (Annex A) | | Aahepta, Agroceres, Basaklor, Drinox Clorahep, Ciclodrin, Cutvel, Drinox, Goldcrest H-60, Heptagran, H-34 Heptamul, Heptox, Rhodiachlor | Pesticide used in cotton and seed production, mainly for controlling:<br>• Termites<br>• Grasshoppers<br>• Ants<br>It has also been used to control vectors carrying mosquitos bearing malaria |

| N° | POP substance | Year of inclusion | Some commercial products that contain it | Main uses and applications |
|---|---|---|---|---|
| 6 | Hexachlorobencene-HCB (Annexes A y C) | 2001 | Anti-Carie, Bent-cure, Bent-no-more, Ceku C.B., HCB, No Bunt, Agronexit, Nexa gorgoricida, Lexane insecticida, Gorgoricida Agricense, Cotton Dust, Supercon 3-10-40, Lexane L. | Pesticide mainly was used to control fungus in crops of foods like wheat<br>Used in the industry to manufacture fireworks, ammunition and synthetic rubber |
| 7 | Mirex (Annex A) | | Attamex, Dechlorane, Declorano, Dodecacloro, Ferriamicide, Fire Ant Bait, Formuquin, Mart drim cebo, Paramex, Perchlodecone, Super Isca, Zomcoop, Zompex | Used as a pesticide to control termites and ants<br>It has been used as fire retardant in plastics, rubber and electrical items. |
| 8 | Toxaphene or Camphechlor (Annex A) | | Agricide maggot kille, Alltex, Altox, Attac2-4-6-8, Canfecloro, Clorocanfeno, Crestoxo, Cristoxo, Estonox, Fasco-Terpene, Genifeno, Hercules Toxaphene, Huilex, Kanfocloro, Melipax, Motox, octaclorocanfeno, Phenatox, polychlorocamphene, Strobane-T, Toxadust, Toxakil, Vertac | Pesticide used on crops such as cotton, cereals, fruits, nuts and vegetables.<br>It has also been used to control ticks and mites on livestock. |
| 9 | DDT (Annex B) | | Agritan, Anofex, Dicorhane, Dinocide, Ixodex, Neocid, Zerdane, Guesapon, Gyron, Corafex, Gesarol | Pesticide used primarily in public health for vector control of diseases such as typhus malaria among others.<br>Also used in a variety of agricultural crops especially cotton. |
| 10 | Polychlorinated biphenyls – PCB (Annex A and C) | | Aroclor, Therminol FR Series, PYRANOL, INERTEEN, ASKAREL, PYDRUL | Its main use was as dielectric oil in the field of generation and transmission of<br>electricity, especially in transformers, capacitors and some Ballasts<br>Hydraulic pumps, gas condensers, flame retardant in paints and plastic |
| 11 | Dibenzoparadioxines Polychlorinated - PCDD (Annex C) | | Does not contain | Does not contain |
| 12 | Dibenzofurans Polychlorinated - PCDF (Annex C) | | Does not contain | Does not contain |

| N° | POP substance | Year of inclusion | Some commercial products that contain it | Main uses and applications |
|---|---|---|---|---|
| 13 | Chlordecone (Annex A) | 2009 | Compound 1869, Decacloroketone, ENT-16391, GC 1189, Kepone, Merex, NCI- C00191. | Pesticide used extensively in the tropics for banana crops, potatoes,<br>tobacco, citrus among others to control:<br>• Root borer<br>• Insects cutters<br>• Fly larvicide<br>• Fungicide<br>• Beetles<br>• Acaricide<br>• Wireworm<br>It has also been used in household products such as ant and roach traps |
| 14 | pentachlorobenzene - PeCB (Annexes A and C) | | Quintochlorobencene, PeCB | As a pesticide, it was used as an intermediate in the production of various products.<br>Used as viscosity reducer in several heat-transmitting products, paint accelerator and fire retardant. |
| 15 | Lindane (Annex A) | | Acitox, Chimac, Etan 3G, Forlin, Gamaphex, Gamma Mean seed, Gamma Up, Lidax, Lindagam, Gammex, Germate Plus, Hammer, Isotox, Ec Lintox, Novigan, Silvanol, Sulbenz | Broad-spectrum pesticide used in fruit farming, horticulture, agriculture and<br>forestry to control:<br>• Sucking insects<br>• Biting insects<br>Also used to control ectoparasites in both animals and humans |
| 16 | Alpha-hexachlorocyclohexane (Annex A) | | Bencide, Hexiclan, Trivex T | Used to control insects that appear in the production of lindane. |
| 17 | Beta- hexachlorocyclohexane (Anex A) | | Bencide, Hexiclan, Trivex T | Used to control insects that appear in the production of lindane. |

| N° | POP substance | Year of inclusion | Some commercial products that contain it | Main uses and applications |
|---|---|---|---|---|
| 18 | Hexabromobiphenyl (Annex A) | 2009 | Hexabromo-HBB, FireMaster (R) BP-6, FireMaster(R) FF-1 | It has been industrially used as:<br>• Fire retardant in thermoplastics based on Acrylonitrile-Butadiene-Styrene (ABS) for:<br>  • Office machinery housings<br>  • Industrial products (e.g. motor housings)<br>  • Electrical (eg radio and TV parts)<br>• Fire retardant in cable linings and lacquers<br>• Fire retardant in polyurethane foam for automobile upholstery |
| 19 | Ether Hexabromodiphenyl and ether heptabromodiphenyl (Annex A) | | Octabromobiphenyl oxide; oxide of octabromodiphenyl; octabromo phenoxybenzene and benzene; 1,1' oxybis-, octabromo derivative, benzene, 1,1'-OXYBIS- derived hexabromado; hexaBDE derived heptabromo; heptaBDE | It has been used in industry as a flame retardant in:<br>• Acrylonitrile-butadiene styrene (ABS).<br>• High impact polystyrene (HIPS),<br>• Polybutylene terephthalate (PBT)<br>• Polyamide polymers.<br>• As a fire retardant in office equipment covers and commercial machines.<br>• Nylon and low-density polyethylene, polycarbonate, phenol formaldehyde resins and unsaturated polyesters, adhesives and coatings |
| 20 | Ether Tetrabromodiphenyl and ether pentabromodiphenyl (Annex A) | | PentaBDE, HexaBDE, HeptaBDE | It has been used in industry as a flame retardant in:<br>• Construction insulation products<br>• Refrigerators and freezers<br>• Furniture and bed linings<br>• Footwear<br>• Automobiles<br>• Coatings and adhesives |

| N° | POP substance | Year of inclusion | Some commercial products that contain it | Main uses and applications |
|---|---|---|---|---|
| 21 | Perfluorooctane acid sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (Annex B) | 2009 | PFOS, FC-95, foam agents 3M ™ Light Water ™ - AFFF or AFFF-ATC, Fluorotenside-248, Sulfluramid, SurTec 960, 248-248m FC and FC-80. | It has been mainly used in industry as a small scale pesticide, here the different uses according to the Stockholm Convention:<br>*Acceptable uses*<br>• Optical imaging<br>• Photo resistant coatings and semiconductor antireflections.<br>• Etchant for semiconductor compounds and ceramic filters<br>• Hydraulic fluids for aviation<br>• Metal plating (hard metal plating) only in closed systems<br>• Certain medical devices<br>• Fire-resistant foams<br>*Specific exemptions*<br>• Photomasks in the semiconductor and liquid crystal displays industries<br>• (LCD)<br>• Metal plating (hard metal plating)<br>• Electrical and electronic parts for some colour printers andcolour photocopiers<br>• Insecticides for red ant and termite control<br>• Chemically conducted oil production<br>*Expired exemptions*<br>• Carpets<br>• Leather / apparel<br>• Textiles / upholstery<br>• Paper and packaging<br>• Coatings and coating additives<br>• Rubber and plastic |

| N° | POP substance | Year of inclusion | Some commercial products that contain it | Main uses and applications |
|---|---|---|---|---|
| 22 | Endosulfan (Annex A) | 2011 | Agrofan, Agrosulfan Benzoepin; Beosit; Chlorthiepin; Crisulfan; Cyclodan; Devisulphan; Endosol; Ensure; Hildan; Thiodan; Insectophene; Malix; Thifor, Thimul; Thiodan; Thionex; Thiosulfan; Thiosulfan tionel; Thiotox; Tionex; Tiovel, Palmarol, Endopac | Broad-spectrum pesticide used on soybeans, cotton, rice and tea, vegetables,<br>Fruits, nuts, berries, grapes, cereals, pulses, corn, oilseeds, potatoes, coffee, mushrooms, olives, hops, sorghum, tobacco and cocoa. To control:<br>• Chewing insects<br>• Sucking insects<br>• Boring insects |
| 23 | hexabromocyclododecane - HBCD (Annex A) | 2013 | Bromkal 73-6CD; Nikkafainon CG 1; Pyroguard; Pyrovatex 3887; Great Lakes CD 75P ™; Great Lakes CD; Great Lakes, Dead Sea Bromine Group Standard FR 1206 I-LM; Dead Sea Bromine Group Compacted FR 1206 I-CM. | It has been used in industry as a flame retardant in:<br>• Expanded and extruded polystyrene foam<br>• In construction and isolation (over 90% using this substance HBCD),<br>• In textiles and electrical and electronic devices (high impact polystyrene) in a smaller scale |
| 24 | Hexachlorobutadiene (Annex A) | 2015 | C-46, Dolen-pur, GP40-66: 120 | It has been mainly used in industry as an intermediary in the production of chemicals in transformer fluids, hydraulics or for heat transfer.<br><br>It has also been used as a pesticide in viticulture |
| 25 | Pentachlorophenol and its salts and esters (Annex A) | | Block Penta, Chem-Tol, Cryptogil oil, Dowicide 7 Antimicrobial, Dirotox, Treet Dura II, Forpen 50 Wood Preservative, Fungifen, Grundier Arbezol, Lautor A, Liroprem, Penta-Kil, Permacide, Permagard, Permasan, Permatox, Permite, Priltox, Santobrite, Santophen, Sautox, Sinituho, Term-i-Trol, Thompson's Wood Fix, Weed and Brush Killer, Weedone, Woodtreat | It has had multiple applications including:<br>• Timber Preservation Treatments<br>• Masonry surface biocide<br>• Conservation of textiles (wool, cotton, linen fabrics and yarn and jute used in roofs, tarps, awnings, tents, belts and net, as well as in sisal and manila ropes).<br>• Oil paints preservatives<br>• Glues<br>• Adhesives<br>• As an intermediate material in the synthesis of pharmaceuticals and dyes |
| 26 | Naphthalenes Polychlorinated (Annexes A and C) | | PCN, polychlorinated naphthalene, naphthalenes Chlorinated, chlorinated naphthalenes derivatives, Halowa | Its use has been mainly in industry, however, applications have relied on the amount of chlorine in the congeners *Lower chlorinated congeners (monochlorinated and* chlorinated and monochlorinated mixtures)<br>• They have been used for chemical resistant fluid gauges |

| | | | | |
|---|---|---|---|---|
| | | | | • Instrument sealants, heat exchange fluids, specialitysolvents<br>• with a high boiling point<br>• Colour dispersants such as Crankcase additives<br>• Motor tuning compound ingredients.<br>• Raw material for tinctures<br>• Wood preservative with fungicidal and insecticidal properties.<br>*More chlorinated congeners*<br>• The most important uses in terms of volume has been in:<br>• Cable Insulation<br>• Flameproofing<br>• Wood preservatives<br>• Engine lubricant additives<br>• Gears<br>• Masking electroplating compounds<br>• Raw material for the production of tinctures<br>• Dyestuff carriers,<br>• Dielectric impregnators for capacitors / condensers and<br>• Refractive index test oils. |

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