HEALTH AND POLLUTION ACTION PLAN

COLOMBIA

May 2019

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Colombia

Completed as part of the UNIDO global project entitled

Mitigating Toxic Health Exposures in Low- and Middle-Income Countries

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Disclaimer

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Acknowledgement

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The Colombia Health and Pollution Action Plan was created through a collaborative, inter-ministerial process that included significant leadership and technical inputs from the following agencies and organizations:

- Ministry of Health and Social Protection.
- Ministry of Environment and Sustainable Development.
- Ministry of Agriculture and Rural Development.
- Ministry of Mines and Energy.
- National Planning Department.
- National Authority of Environmental Licences.
- National Institute of Health.
- Institute of Hydrology, Meteorology and Environmental Studies.
- National Institute of Food and Drugs Surveillance.
- Colombian Agricultural Institute.

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Abbreviations

ANLA	National Authority of Enviromental Licences (Spanish: Autoridad Nacional de Licencias Ambientales)
ANH	National Agency of Hidrocarbons (Spanish: Agencia Nacional de Hidrocarburos)
APC	Presidential Cooperation Agency (Spanish: Agencia Presidencial de Cooperación)
CAR	Regional Autonomous Corporations (Spanish: Corporaciones Autónomas Regionales)
CIMSF	Inter-sectoral Commission on Sanitary and Phytosanitary Measures (Spanish: Comisión Nacional de Medidas Sanitarias y Fitosanitarias
CONAIRE	National Intersectoral Technical Commission for the Prevention and Control of Air Pollution (Spanish: Comisión Técnica Nacional Interesectorial para el Control y Prevención de la Contaminación Atmosférica)
CONASA	Inter-sectoral Commission of Environmental Health (Spanish: Comisión Técnica Nacional Intersectorial de Salud Ambiental)
CONPES	National Council on Economic and Social Policy (Spanish: Consejo Nacional de Políitica Económica y Social)
DALY	Disability-Adjusted Life Year
DNP	National Planning Department (Spanish: Departamento Nacional de Planeación)
GAHP	Global Alliance for Health and Pollution
GBD	Global Burden of Disease
GDP	Gross Domestic Product
GNI	Gross National Income
ICA	Colombian Agricultural Institute (Spanish: Instituto Colombiano Agropecuario)
ICONTEC	Colombian Institute of Technical Standards and Certification (Spanish: Instituto Colombiano de Estándares Técnicos y Certificación)
IDEAM	Institute of Hydrology, Meteorology and Environmental Studies (Spanish: Instituto de Hidrología, Meteorología y Estudios Ambientales)
INM	National Institute of Metrology (Spanish: Instituto Nacional de Metrología)
INS	National Institute of Health (Spanish: Instituto Nacional de Salud)
INVIMA	National Institute of Food and Drug surveillance (Spanish: Instituto Nacional de Vigilancia de Medicamento)
MADS	Ministry of Environment and Sustainable development (Spanish: Ministerio de Ambiente y Desarrollo Sostenible)

MARD	Ministry of Agriculture and Rural Development (Spanish: Ministerio de Agricultura y Desarrollo Rural)
MEN	Ministry of National Education (Spanish: Ministry of National Education)
MINCIT	Ministry of Commerce, Industry and Tourism (Spanish: Ministerio de Comercio, Industria y Turismo)
MME	Ministry of Mines and Energy (Spanish: Ministry of Mines and Energy)
MSPS	Ministry of Health and Social Protection (Spanish: Ministerio de Salud y Protección Social)
OCL	Organochlorine Pesticide Residues
OECD	Organisation for Economic Co-operation and Development
PAHO/WHO	Pan American Health Organization/ World Health Organization
REACH	Registration, Evaluation, Authorization and Restriction of Chemicals
SIAC	Environmental Information System of Colombia (Spanish: Sistema de Información Ambiental de Colombia)
SISAIRE	Subsystem of Information on Air Quality (Spanish: Sub-sistema de Información de Calidad del Aire)
SIVIGILA	National Public Health Surveillance System (Spanish: Sistema Nacional de Vigilancia en Salud Pública)
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization

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Introduction

The Health and Pollution Action Plan of Colombia (HPAP) has three central elements: 1) a description of the process used to prioritize pollution challenges and create a national plan; 2) descriptions of pollution challenges identified as priorities through the consultative and analytical process; and 3) recommendations and project proposals aimed at creating actions, policies, programs and projects that would reduce public health impacts resulting from the priority pollution challenges.

The HPAP process prioritizes pollution challenges based on their impacts on public health or because they are under-studied and significant gaps exist in the current national responses to them. It should be mentioned that the scope of the HPAP does not cover all pollution challenges in Colombia, but is limited to those causing significant and direct impacts to public health.

This HPAP document includes project proposals that can be used to guide development assistance to address priority pollution issues. These project proposals are intended to serve as foundations for further consideration and the eventual development of full proposals for national or international funding.

Finally, the HPAP document contains important data on the types, severity and sources of pollution that can and should be used to raise pollution awareness among the general population, within government decision-making processes and externally in discussions with development partners.

International experience shows that national pollution challenges are unlikely to be addressed at a scale without senior political leadership recognizing the issues as priorities and incorporating them into national and international planning processes.

Information about the origin of the HPAP process can be found in Annex 2.

1.1. Health and Pollution

While the impacts of pollution on health are increasingly well-recognized, the scale of these impacts is regularly underestimated. Recently, the Lancet Commission on Pollution and Health provided new data on the magnitude of health impacts globally and at the national level. The Commission showed that pollution is now one of the largest drivers of deaths and diseases in the world, causing 16% of all deaths worldwide. The overwhelming majority of the burden of pollution-induced morbidity (92%) falls on people in low- and middle-income countries. Within these countries, the impacts of pollution are greatest in poorer communities that lack resources and capacities to address the problem and recover from its impacts. Pollution has serious implications for sustainable development, exacerbates intergenerational poverty cycles, harms the environment and biodiversity and discourages economic growth.

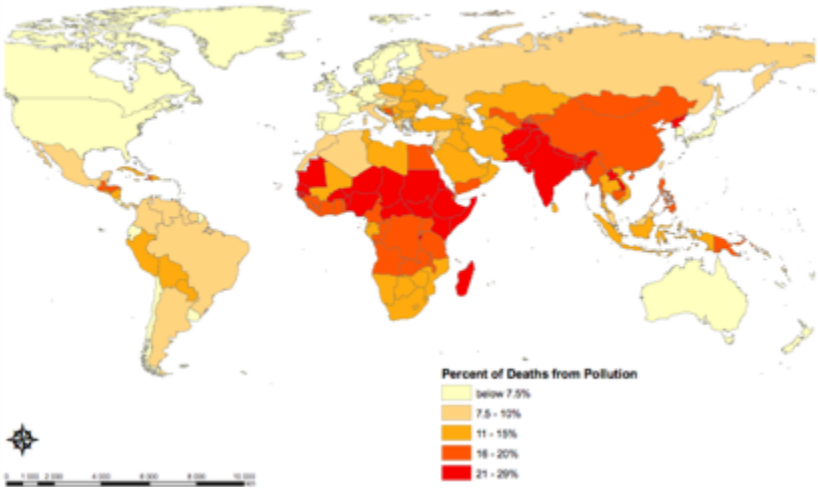


Figure 1

Percentage of all deaths caused by pollution in 2015

Source: The Lancet Commission, 2017

[1] The Lancet Commission on Pollution and Health, 2017. https://www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736(17)32345-0.pdf?code=lancet-site - free account registration required.

1.2. International Regulatory Context

Links between pollution and health has been known for decades. This is why the 1992 Rio Declaration on Environment and Development recognized three pillars of sustainable development (economic, social and environmental) stating that "human beings have the right to a healthy and productive life in harmony with nature" and that "to achieve sustainable development and a better quality of life for all people, states should reduce and eliminate patterns of unsustainable production and consumption and promote appropriate demographic policies"

Subsequently, in the Assembly of 2012 where the document "The Future We Want" was adopted, commitments to sustainable human development and links to human health were ratified, expanded and made more explicit .

More recently, in 2015, the 2030 Agenda for Sustainable Development and the 17 Sustainable Development Goals (ODS by its Spanish acronym), were launched, which include targets directly related to the impact of pollution on health. The goals include the following relevant sections:

- Objective 3 "Ensure healthy lives and promote well-being for all at all ages".
  - » Goal 3.9 aims to "substantially reduce the number of deaths and illnesses caused by hazardous chemicals and air, water, and soil pollution and contamination" by year 2030.
- Objective 6 "Ensure availability and sustainable management of water and sanitation for all"
  - » Goal 6.3 "By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally."
- Objective 7 "Ensure access to affordable, reliable, sustainable and modern energy for all"
- Objective 11 "Make cities and human settlements inclusive, safe, resilient and sustainable"
  - » By 2030, reduce the negative environmental impact of the cities, paying special attention to the quality of air and management of municipal and other wastes.

In addition, other international agreements have been created to address specific pollution issues that impact human health, such as the Minamata Convention on Mercury that was adopted at the Plenipotentiary Conference in 2013 in Kumamoto, Japan. The aim of this global treaty is to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds. It includes provisions on public information, environmental education, participation-building and capacity-building. The Convention entered into force in 2017 and included banning new mercury mines, gradual elimination of existing mercury mines, reduction of mercury uses in a number of products and processes, promoting measures to control emissions to the atmosphere and emissions to land and water, as well as regulation of the artisanal and small-scale mining sector. The Convention also deals with interim storage of mercury and its disposal once it becomes waste, mercury-contaminated sites and related health issues. In Colombia, the Convention was approved on May 11th, 2018, under Law 1892.

[2] General Assembly United Nations, 1992. Rio Declaration on Environment and Development.

[3] General Assembly United Nations, 2012. Resolution 66/88 The future we want. https://www.un.org/en/development/desa/population/migration/generalassembly/docs/globalcompact/A_RES_66_288.pdf

The Stockholm Convention on Persistent Organic Pollutants, in force since May 17th, 2004, has as its central objective to restrict and definitively eliminate the production, utilization, emission and storage of persistent organic pollutants (POPs). In Colombia, it came into force January 20th, 2009, when Law 1196 of 2008 was declared constitutional by Judgement C-044/08 of the Colombian Constitutional Court.

As for other chemicals and pesticides, the Rotterdam Convention aims to:

- Promote the shared responsibility and joint efforts of the parties in the field of international trade in certain hazardous chemicals in order to protect human health and the environment from possible harm; and
- Contribute to its environmentally sound use, facilitating the exchange of information about its characteristics, establishing a national decision-making process on its import and export and disseminating those decisions to the parties.

In Colombia, according to the Chancellery, the Rotterdam Convention was approved by Law 1159 of September 20th, 2007, and declared constitutional by Judgement C-538/08 of the Colombian Constitutional Court. Colombia has provided information on decisions regarding the importation of chemical products subject to prior informed consent. The follow-up and implementation of the agreement is the responsibility of the Ministry of Environment and Sustainable Development (MADS by its Spanish acronym), the Ministry of Health and Social Protection (MSPS by its Spanish acronym) and the Colombian Agricultural Institute (ICA by its Spanish acronym).

1.3. Health and Environment Framework in Colombia

Colombia has extensive legislation on environmental issues and specifically in relation to pollution of environmental media. Law 23 of 1973 formulated the fundamental principles of pollution prevention and control, and the improvement, conservation and restoration of renewable natural resources to protect the health and well-being of all inhabitants of the national territory.

Additionally, Law 9 of 1979, the Sanitary Code, established general rules that serve as a basis for the necessary provisions and regulations to preserve, restore or improve conditions related to human health, and the procedures and measures to be taken for the regulation, legalization and control of discharges of residues and materials that affect or may affect the sanitary conditions of the environment. In this regard, it addresses topics such as wastewater, atmospheric emissions, solid waste and water supply.

Subsequently, with the reform to the Constitution in 1991, it was established in article 79 that “all people have the right to enjoy a healthy environment”. The law ensures community participation in decisions that may affect the enjoyment of a healthy environment. It is the duty of the

State to protect the diversity and integrity of the environment, to preserve areas of special ecological importance and to promote education for the achievement of these purposes.

In subsequent years, specific elements were regulated regarding permissible limits of pollution in environmental media, as well as environmental licensing processes for the development of industrial activities. Table 1 describes the current and most relevant regulations and policies regarding pollution control and environmental health.

Table 1:

Current regulatory instruments related to pollution

Normative instrument	Media	Object	Remarks
Resolution 2254 of 2017. Ministry of Environment and Sustainable Development	Air	Establishes air quality standards and emission levels and adopts provisions for the management of air resources in the national territory in order to ensure a healthy environment and minimize risks to human health caused by exposure to contaminants in the atmosphere.	This standard defines more restrictive values for year 2030 regarding PM_{10} annual, $PM_{2.5}$ annual, SO_2 24h and NO_2 annual.
Resolution 2115 of 2007. Ministry of Health and Social Protection, Ministry of Environment and Sustainable Development	Water	Establishes characteristics, basic instruments and frequencies for the control and monitoring of water quality for human consumption	
Decree 1575 of 2007. Ministry of Health and Social Protection	Water	Establishes a system for the protection and control of water quality for human consumption.	
Decree 1594 of 1984, Ministry of Agriculture	Water	Establishes water quality criteria according to the destination of surface waters.	
Decree 4741 of 2005, Ministry of Environment and Sustainable Development	Hazardous Residues	Partially regulates prevention and handling of hazardous waste.	
Resolution 631 of 2015, Ministry of Environment and Sustainable Development	Dumping – Water	Establishes parameters and maximum permissible limit values on point source dumping to surface water bodies and public sewers.	
Resolution 883 of 2018, Ministry of Environment and Sustainable Development	Dumping – Seawater	Establishes parameters and maximum permissible limit values on point source dumping to marine water bodies.	

Normative instrument	Media	Object	Remarks
Decree 050 of 2018, Ministry of Environment and Sustainable Development	Dumping – Soils	Modifies and issues additional provisions to Decree 1076 of 2015—the Single Regulatory Decree of the Environmental and Sustainable Development Sector related to the Regional Environmental Councils of the basins (CARMAC).	
Resolution 719 of 2015, Ministry of Health and Social Protection.	Food	Establishes the classification of food for human consumption in accordance with the public health risk.	
Law 994 of 2005, Presidency of the Republic.		Adoption of the Stockholm Convention on Volatile Organic Compounds (VOC).	
Law 1159 of 2007, Presidency of the Republic.	Pesticides	Approval of the Rotterdam Convention.	
Decree 1843 of 1991	Pesticides	Establishes regulations on the use and management of Pesticide.	

The Ten-Year Plan for Public Health 2012-2021 published by the MSPS in 2012, established environmental health as a priority for the country and defines relevant objectives and specific strategies. In terms of pollution and health, it states that “by 2017, a prioritization will be carried out regarding the territorial entities in accordance to environmental health problems related to chemical substances, mining, exposure to mercury, agribusiness, livestock industry, technological developments and other processes, and the follow-up to their implementation, with comprehensive care of the environmental determinants to health".

In the same vein, the country has other policy instruments in which issues of pollution and health are addressed, such as the CONPES 3550 published by the National Council on Economic and Social Policy (CONPES by its Spanish acronym) in 2008 the purpose of which is to "define the general guidelines for strengthening the comprehensive management of environmental health aimed at the prevention, management and control of adverse health effects resulting from environmental factors, as a basis for the formulation of a comprehensive policy on environmental health”. Considering the magnitude of the deterioration of the environment and the impact on the health

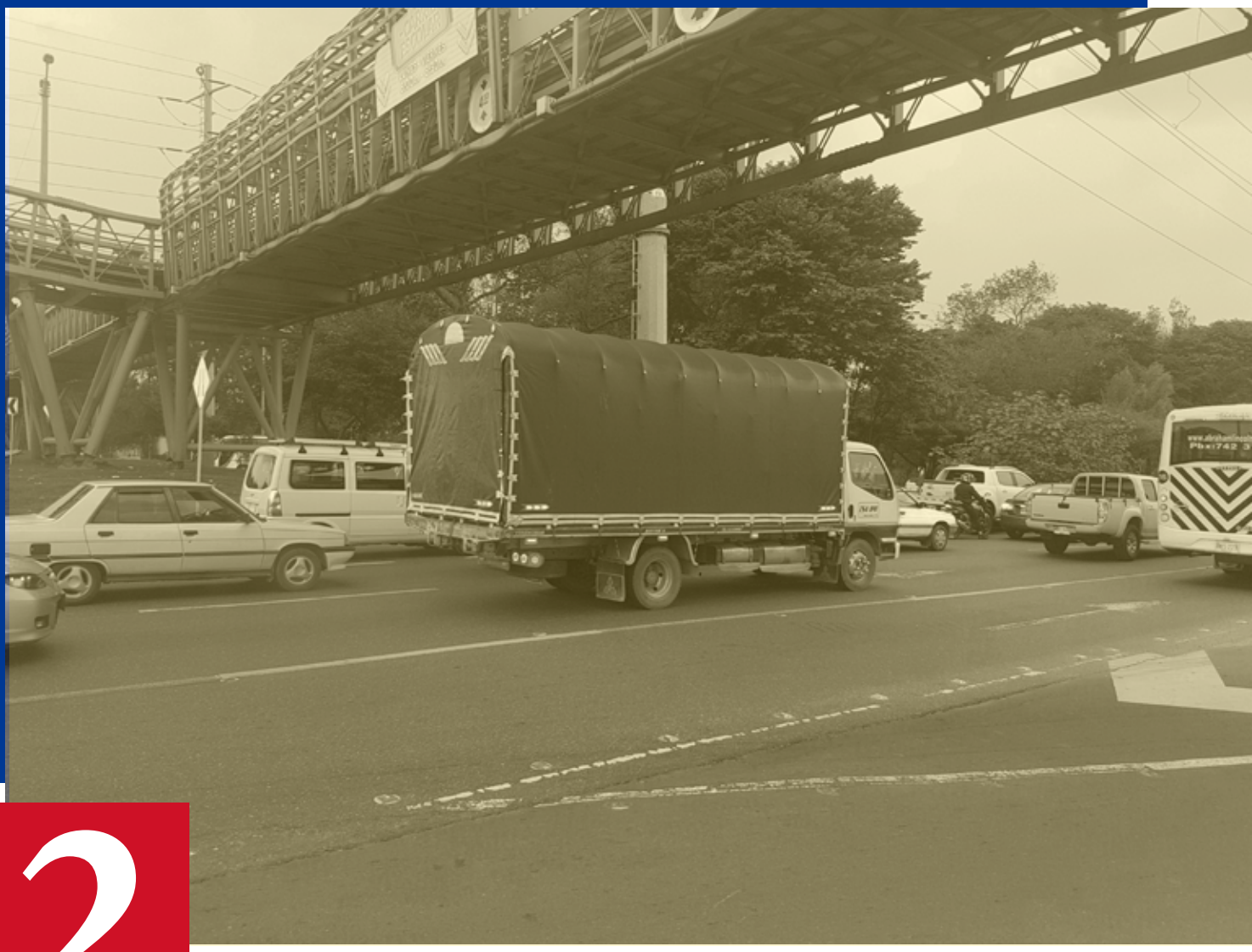
of the population, mainly vulnerable groups (children, pregnant women, older adults and populations in extreme poverty), in this document the priority areas of intervention are the low quality of air and water for human consumption and the inadequate management of chemicals.

Within the framework of CONPES 3550, the National Inter-Sectoral Technical Commission for Environmental Health (CONASA by its Spanish acronym) was created, and in Decree 2972 of 2010, its objective is established: "Coordinate and guide the design, formulation, monitoring and verification of the implementation of the Comprehensive Policy on Environmental Health (PISA by its Spanish acronym)".

CONASA is comprised of the MSPS, MADS, Ministry of Agriculture and Rural Development (MARD by its Spanish acronym); Ministry of Mines and Energy (MME by its Spanish acronym); Ministry of Trade, Industry and Tourism (MINCIT by its Spanish acronym); Ministry of National Education (MEN by its Spanish acronym); and the Ministry of Transport; as well as the National Planning Department (DNP by its Spanish acronym); Administrative Department of Science, Technology and Innovation (COLCIENCIAS by its Spanish acronym); Institute of Hydrology, Meteorology and Environmental Studies (IDEAM by its Spanish acronym); National Institute of Food and Drug Surveillance (INVIMA by its Spanish acronym); National Institute of Health (INS by its Spanish acronym) ; and the ICA.

According to mandate of the Presidency of Colombia, the following functions have been assigned to CONASA in addition:

- To coordinate the development of environmental health actions, plans, programs and projects from a comprehensive approach that considers in an individual and/or combined way the social, economic, political, environmental, sanitary, technological and biological determinants that have the potential to affect human health.
- To formulate recommendations that allow the articulation, harmonization and integrality of the sectoral rules of the health sector in the environmental context and those of the environment sector, within the framework of the Political Constitution and the principles and provisions of Law 99 of 1993 or the standards that amend or replace it.
- To recommend mechanisms of technical cooperation between national and international entities in matters related to environmental health.
- CONASA and its technical work groups are considered as the relevant institutional and government medium for the elaboration of the HPAP and the definition of priorities.



2

Health and Pollution Action Plan in Colombia: Activities and Timeline

The Health and Pollution Action Plan was facilitated by UNIDO and Pure Earth (acting as the Secretariat of the Global Alliance on Health and Pollution), and was funded by the European Commission and the United States Agency for International Development. The development of the Action Plan builds on substantial national progress in the field of environmental health as a basis to ensure that the institutions of the Colombian Government take ownership of the process as part of their management of environmental health issues.

During an Inception Meeting in October 2017, representatives of the National Government expressed the value of the HPAP process and their support for this international cooperation initiative. The advisory team of the Health and Pollution Action Plan in Colombia had substantial consultations with the main members of CONASA and members of other relevant institutions throughout the process, initiating collaborative work with the MADS and MSPS.

Additionally, the HPAP process was presented and adopted in a session of CONASA, where government representatives approved the government's involvement in the construction of the HPAP and agreed to the participation of CONASA technical working groups related to chemical safety and water and air pollution.

CONASA technical working groups reviewed the findings of a literature review of relevant studies conducted during the HPAP research process and provided input into the pollution prioritization methodology that was implemented in a Workshop for the development of the HPAP in Colombia that took place on June 14th, 2018.

During the HPAP process, Colombia was in the process of creating of a new development plan for 2018-2022. The governmental institutions that participated in the construction of the HPAP emphasize the importance of the HPAP findings, results and project initiatives to the creation of the new development plan and other upcoming actions.

Table 2 describes the activities that took place in the development of the HPAP in Colombia, beginning with Inception Meetings in the fall of 2017.

Table 2:

Timeline – Health and Pollution Action Plan for Colombia

Date	Activity	Assistants	External entities	Agreements
October 18, 2017	HPAP Technical Meeting	Delegates of Government Entities (see Attendance lists – Annex)	General Comptroller of the Republic National Environmental Licensing Agency (ANLA by its Spanish acronym) MME Secretary of Health of Cundinamarca District; Secretariat of Environment MADS; District Health Secretary of Bogotá; Chancellery IDEAM MSPS Cundinamarca Governorate; Regional Autonomous Corporation of Cundinamarca (CAR by its Spanish acronym) UNIDO Pure Earth	N/A
October 20, 2017	High Level HPAP Inception Meeting	Delegates of Government Entities (see Attendance lists Annex)	MSPS MADS; Secretary of Health of Cundinamarca; IDEAM CAR UNIDO Pure Earth	The HPAP process will be implemented according to the description in the program Handbook (5 phases) and to the needs and priorities defined by the Government of Colombia.
April 3, 2018	First CONASA meeting	Viviana Ceron	MADS UNIDO Pure Earth	To socialize the HPAP within the Directorate of Environmental and Urban Affairs of the MADS Manage the inclusion of the HPAP at the next session of the CONASA.

Date	Activity	Assistants	External entities	Agreements
April 16 April 20, 2018	HPAP presentation	Delegates of the government agencies and entities (see Attendance lists Annex)	United Nations agencies (UNICEF, UN environment, UNDP, PAHO and FAO); Presidential Cooperation Agency (APC by its Spanish acronym); MADS MSPS UNIDO Pure Earth	To socialize the objectives and activities of the HPAP within each institution. Feedback to UNIDO and Pure Earth on programs and projects that could contribute to the HPAP.
May 15, 2018	Inclusion of the HPAP in CONASA's agenda	CONASA Support List	CONASA Support List UNIDO Pure Earth	Participation in the construction of the HPAP, through the linkage of the technical working groups to the process was approved.
June 3, 2018	Socialization and methodology validation of the prioritization workshop.	Andrea Soler David Combariza	MSPS UNIDO	Participation of the delegates of the MSPS in the prioritization workshop. Methodology approval.
June 8, 2018	Socialization and methodology validation of the prioritization workshop.	Mauricio Blanco Rodolfo Alarcon Carolina Cruz Andrés Palacio Sergio Hernández	MADS UNIDO	Participation of the delegates of the MADS in the prioritization workshop. Methodology approval.
June 14, 2018	Workshop for the development of the Health and Pollution Action Plan in Colombia	Delegates of Government Entities and PAHO (see Attendance lists Annex)	MME DNP INS IDEAM ANLA National Hydrocarbons Agency (ANH by its Spanish acronym) PAHO UNIDO Pure Earth	Socialization of results of the HPAP prioritization exercise.

Date	Activity	Assistants	External entities	Agreements
October 30, 2018	PASC Validation Workshop	Delegates of Government Entities	MSPS MADS MADR MME DNP INS IDEAM ICA INVIMA ANLA ANH OPS ONUDI Pure Earth	N/A
December 10, 2018	Final Presentation and HPAP Validation	Government entities representatives	MSPS MADS MADR MME DNP INS IDEAM ICA INVIMA ANLA ANH PAH UNIDO Pure Earth	N/A

A basic goal of the HPAP process is to help achieve concrete action and measurable results related to high-priority pollution challenges. Therefore, in addition to describing the process used to prioritize pollution challenges and the health impacts from priority issues, this Action Plan includes project proposals for actions that will reduce the mortality and morbidity associated with the priority pollution issues.

3

Health Impacts of the Main Pollution Challenges

The Colombia HPAP is based on the contributions of national agencies, on national and international data on pollution sources and health impacts and on an analysis of existing national studies and reports. Together, these describe the pollution challenges in Colombia and the resulting burden of disease. A description of the available national data is provided in Annex 3.

3.1. Global Burden of Disease Study of the Institute for Health Metrics and Evaluation

The assessment of health impacts from pollution in Colombia is based in part on data on deaths and disability-adjusted life years (DALYs) from the global disease burden studies conducted by the Institute of Health Metrics and Evaluation (IHME) and the World Health Organization (WHO) (Annex 4).

An analysis of the types of diseases that cause mortality in Colombia shows that there is an increasing trend in the percentage of annual deaths attributable to non-communicable diseases and a decrease in those from communicable diseases (Figure 2).

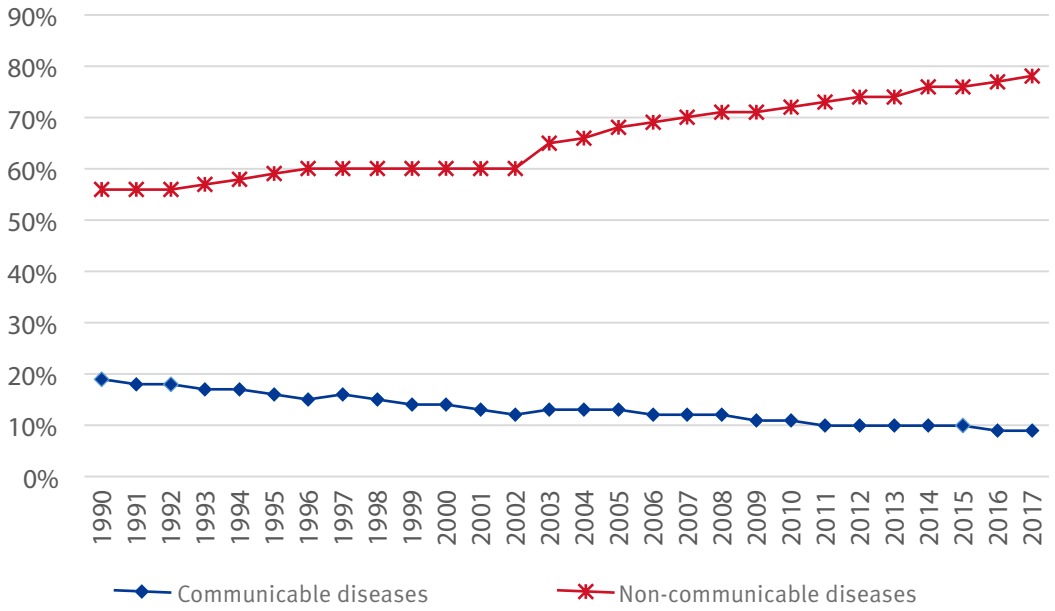


Figure 2

Percentage of annual deaths attributable to communicable and non-communicable diseases

Source: GBD2017

This trend is repeated in the percentages of disability-adjusted annual life years (DALY) attributable to communicable and non-communicable diseases (Figure 3).

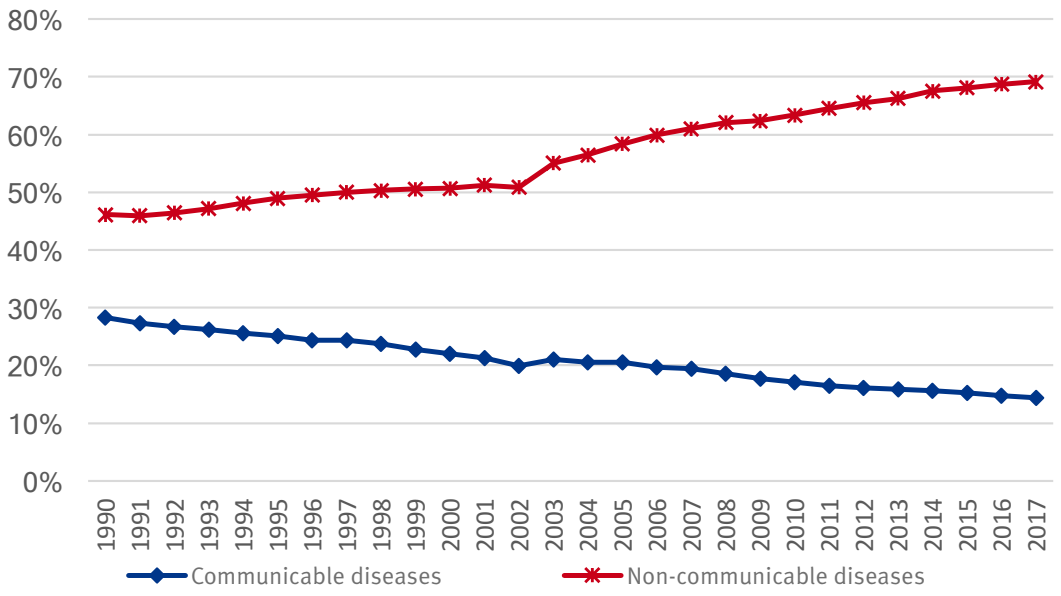


Figure 3

Percentage of the total annual DALYs attributable to communicable and non-communicable diseases

Source: GBD2017

Pollution exposures significantly contribute to death and disability from non-communicable diseases. Environmental hazards (not including occupational hazards) were responsible for 7% of deaths in Colombia in 2017, making it the third highest risk factor, only two percentage points below deaths caused by tobacco (Figure 4).

In evaluating the percentage of DALYs by risk factors over time, there is a substantial decrease in those associated with children's malnutrition. However, environmental and occupational risk factors decrease in the first decade (1990-2000) then remain almost constant, making public and occupational exposures to pollution the third highest risk factor for DALY losses in 2017—causing 6.2% of all DALY losses (Figure 5).

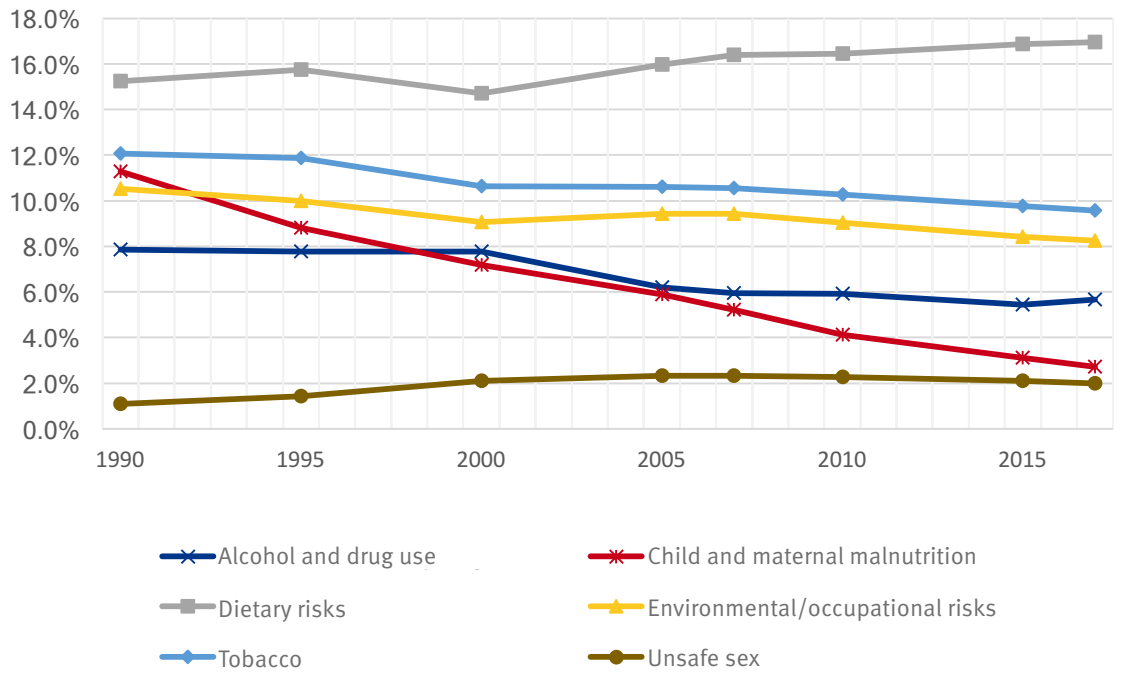


Figure 4

Percentage of Total Deaths in Colombia caused by Major Risk Factors

Source: GBD2017

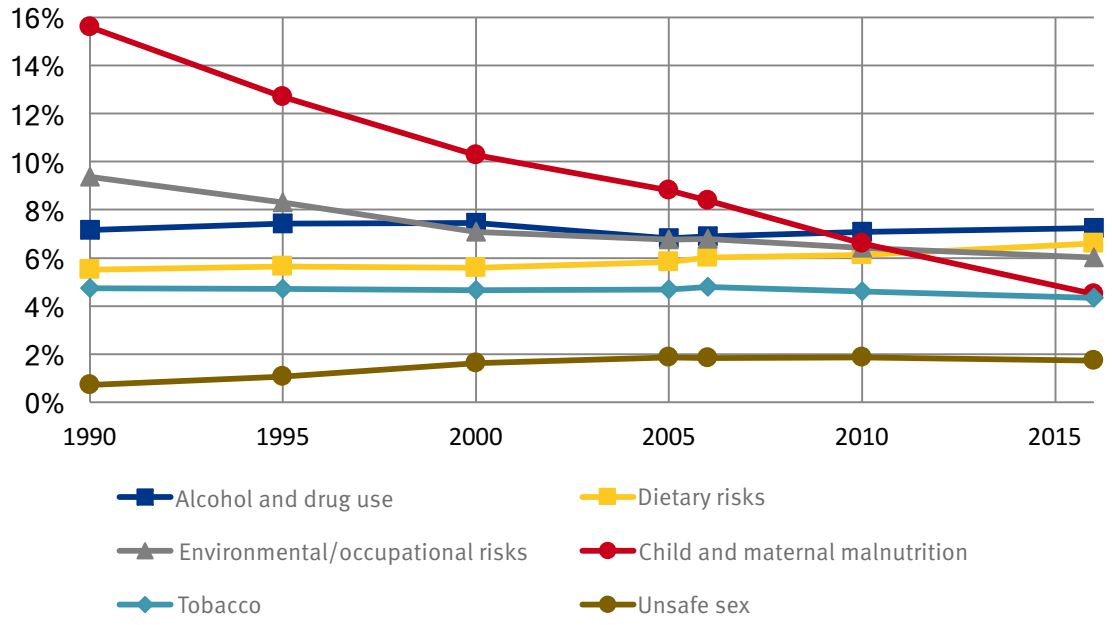


Figure 5

DALYs by Risk Factors

Source: GBD2017

When deaths attributable to contamination exposure are compared with the combined deaths of high-profile communicable diseases such as HIV/AIDS, malaria, and tuberculosis, the impacts of pollution appear to be almost 6 times greater than these diseases combined. (Figure 6).

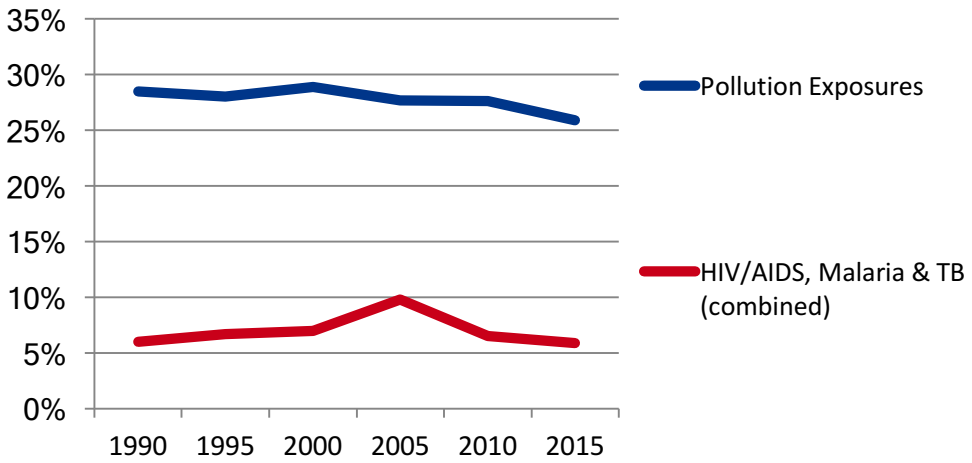


Figure 6

Annual percentage of deaths attributable to pollution vs HIV/AIDS, malaria and tuberculosis (combined)

Source: GBD2016

Table 3 summarizes the annual deaths in Colombia from several sources of pollution in total and as a percentage of all deaths, as estimated in the IHME 2017 Global Burden of Disease Study.

Table 3:

Summary of annual deaths by pollution in Colombia 2017*

Source: GBD2017

* Excluding occupational hazards

Type of pollution	Annual deaths	Percentage of total deaths (%)
Air		
Indoor Air	2.382	1,02
Outdoor air	9.031	3,85
Total Air (includes Ambient ozone pollution)	**11,962**	**5,11**
Water		
Unsafe sanitation	116	0,05
Unsafe water source	520	0,22
Total Water (includes No access to handwashing facility)	**870**	**0,37**
Chemical		
Lead	4,052	1,73
Total Chemicals	**4,390**	**1,87**
Total	**19,337**	**8.25**

For air quality specifically, the mortality rate increases from 1990 to 2017 (Figure 7). When the data is disaggregated to separate ambient air pollution from indoor (or "household") air pollution related to the burning of solid fuels, there is a decrease in the latter, reflecting that the overall increase in mortality from air pollution is driven by ambient air pollution.

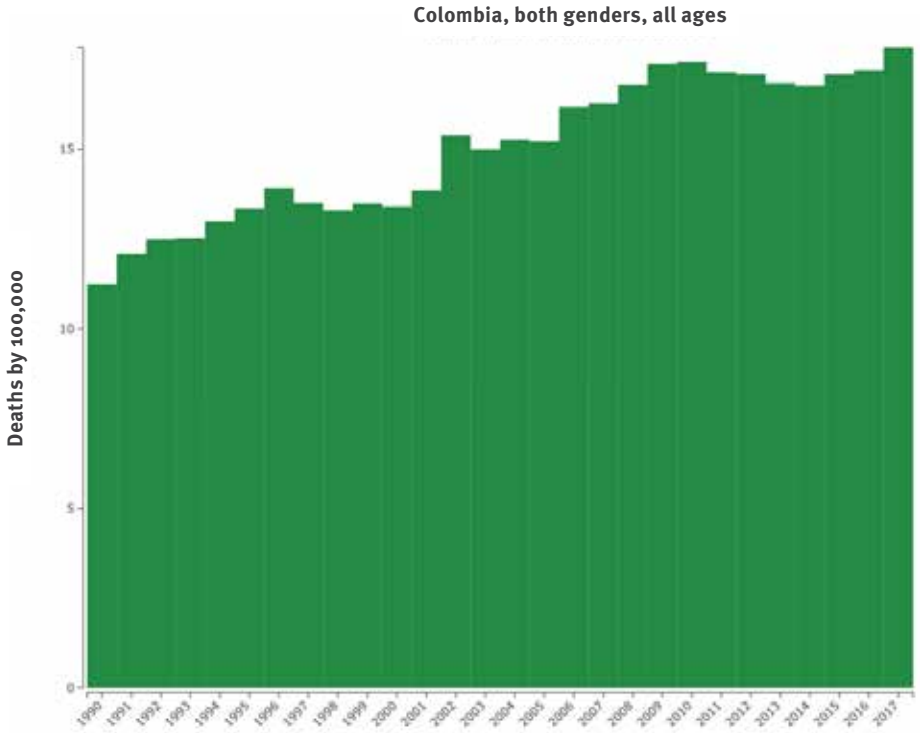


Figure 7

Death rate per 100,000 from ambient air pollution exposures

Source: GBD2017

3.2. National and regional data on pollution impacts

For many years, government, private and academic institutions in Colombia have generated relevant information regarding environmental pollution problems and associated health impacts. However, much of the information on pollution and health is not integrated into common databases or easily accessible formats, which hinders an analysis of the direct relationship and the current state of environmental health in the country.

To overcome this situation, available information was compiled for a preliminary analysis of the country's progress and challenges. This strategy called for a review of published scientific articles regarding the integrated aspects of health and pollution, followed by a review of other available reports.

3.2.1. Available information from scientific articles

A review across Science Direct, Scopus, PubMed, and Springerlink provided 138 relevant studies indicating 219 total contaminants for analysis (the review was conducted up to May 2018). This information was grouped and quantified by type of pollutant and by environmental media. It is important to highlight that the same article could include more than one contaminant or one media. Available data can be seen in Table 4 and Figure 8.

Table 4:

Information available from scientific articles

Pollutant	# Records	Pollutant	# Record
Aluminio	1	Mercurio	42
Arsénico	5	Níquel	9
Cadmio	15	HPA	1
Calcio	2	Perclorato	1
Carbón	4	Pesticidas	3
Carbonatos	1	Plata	1
Cobre	11	Plomo	23
COT	1	PM_{10}	17
Cromo	9	Piretroides	1
Dioxinas	3	Residuos	3
Furanos	2	Siloxanos	1
Glifosato	2	Surfactantes	1
HAP	3	Tetrabromobisphenol A	1
Hierro	1	HTP	1
Magnesio	1	Estudios que no aplican *	40
Manganeso	1	Zinc	12
Total studies 138			
Total records 219			

"Studies that do not apply" includes research on environmental media or fauna and flora without an impact on human health, as well as research on social aspects associated with pollution. 42.92% of relevant studies include major heavy metals (mercury, cadmium, arsenic, chromium, lead) as pollutants of concern.

In descending order, the most studied pollutants in the performed review are: mercury, lead, PM_{10}, cadmium and zinc.

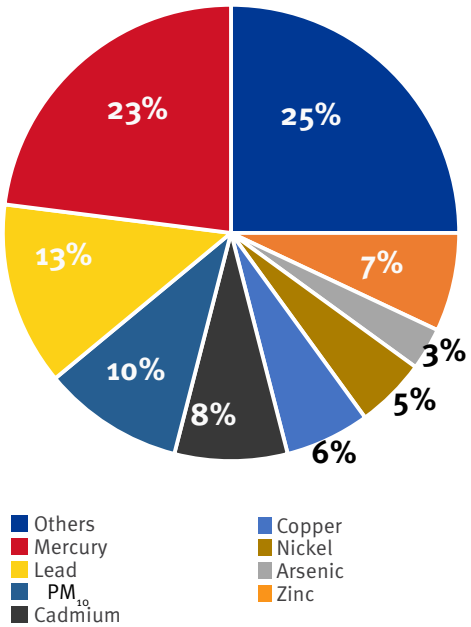


Figure 8

Studies distribution by pollutant

According to the results included in Table 5, the most studied environmental media in the review was soil. For air, the most-included pollutant was particulate matter PM_{10}, followed by mercury. For soil, the most-included pollutants in the studies were mercury and lead alike, followed by zinc. For water, the most-included contaminant was mercury, followed by lead. For food, it was mercury followed by lead.

Table 5:

Number of studies by pollutant and environmental matrix

Pollutant	Air	Soil	Water	Food	Health Impact
Aluminum		1			
Arsenic	2	2	2	2	1
Cadmium	2	6	3	5	5
Calcium		1			
Carbon	2				2
Carbonates		1			
Copper	2	8	1	1	2
COT		1			
Chrome		5	2	2	2
Dioxins	3				1
Furans	2				1
Glyphosate	2				2
HAP	2	1	1		2
Iron		1			
Magnesium		1			
Manganese		1			
Mercury	7	11	9	19	12
Nickel	1	7	1	1	1
HPAs		1			
Perchlorate	1				
Pesticides		1	1	1	1
Silver		1			
Lead	2	11	5	5	5
PM_{10}	16				12
Pyrethroid				1	
Waste	3				3
Siloxanes		1			
Surfactants				1	1
Tetrabromobisphenol A		1			
HPT				1	1
Zinc	2	9	1	1	2
Total	**53**	**73**	**27**	**40**	**64**

The health impacts reported in Table 5 refer to the mention of health effects by the pollutant being studied but does not imply that a health impact study was carried out. Included health effects correspond to those regularly associated with pollutants.

3.2.2. Information available from other sources

Within the literature review on health and contamination in the country, it was possible to find relevant information generated by several institutions with specific purposes. The consolidated information is presented below.

ENVIRONMENTAL LIABILITIES

In 2015, the MADS performed a study titled "Comprehensive Strategy Design for the Management of Environmental Liabilities" in which more than 1,400 potentially polluted sites were identified by consulting with several sources and classified by the associated economic sector (Figure 9). 82% of sites correspond to the hydrocarbon and mining sectors.

The study also identified the possible sources of pollution (Figure 10), finding that in 68% of the events, the generation of potential environmental liabilities was spilled hydrocarbons caused by pipeline explosion by terrorist attacks and mining extraction. However, the study does not include evidence of associated health impacts[4].

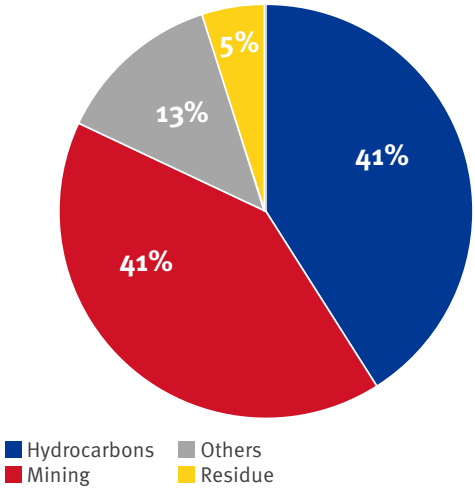


Figure 9

Distribution of Potential Environmental Liability by Economic Sectors

Source: MADS – INNOVACION AMBIENTAL SAS ESP Consulting

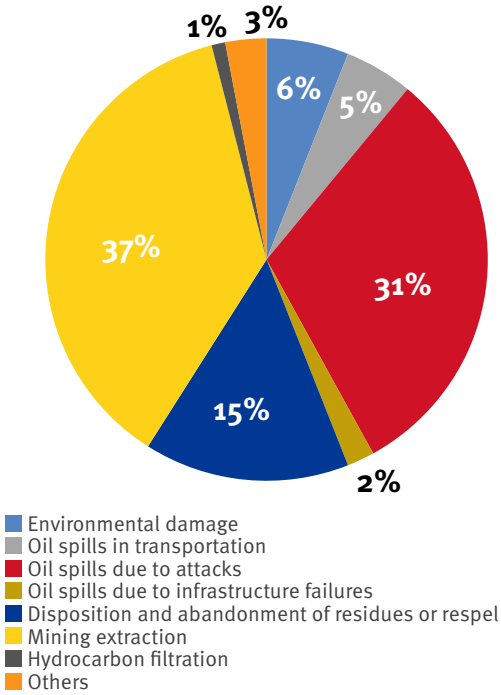


Figure 10

Causes of generation of possible environmental liabilities

Source: MADS – INNOVACION AMBIENTAL SAS ESP Consulting

[4] MADS, 2015. Innova Ambiental Consulting. Design of a strategy for the management of environmental liabilities in Colombia. http://www.innovaambiental.com.co/descargas/taller5.pdfhttp://www.innovaambiental.com.co/descargas/taller5.pdf

The summary of potentially contaminated sites by department in the country is shown in Table 6. Nariño is the department of the country with the most reported contaminated sites.

Table 6:

Locations reported as environmental liabilities or contaminated sites

Source: MADS – INNOVACION AMBIENTAL SAS ESP Consulting

Department and sector	Quantity per department
Nariño	247
Santander y Norte de Santander	167
Putumayo	113
Choco	106
Cundinamarca	92

SITES IDENTIFIED THROUGH THE TOXIC SITES IDENTIFICATION PROGRAM OF PURE EARTH

In 2017, the non-profit organization Pure Earth completed 42 investigations of sites suspected of chemical contamination under the Toxic Sites Identification Program (TSIP). The geographic distribution of these sites is shown in Table 7. This program was funded by the United States Agency for International Development (USAID).

Table 7:

TSIP Program in Colombia Studies - Distribution by Departments

Source: Pure Earth, 2019, TSIP Colombia country report

Department	Number of Investigations	Percentage
Atlántico	6	14%
Cundinamarca	20	48%
Valle del Cauca	7	16%
Bolívar	1	2%
Cauca	6	14%
Magdalena	2	5%

The largest number of site investigations was concentrated in the Department of Cundinamarca because of information provided by the Autonomous Regional Corporation (CAR) and the Secretariat of Health of Cundinamarca, which have been very active actors in the TSIP process.

The distribution of sites by type of contaminant is shown in Figure 11.

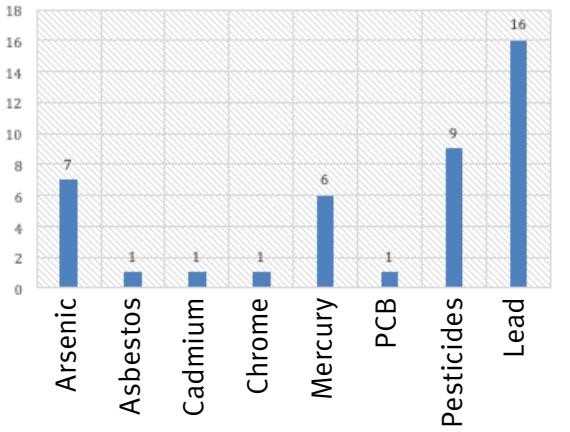


Figure 11

TSIP Investigations – Distribution by Contaminant

Source: Pure Earth, 2019, TSIP Colombia country report

Lead was the most prevalent contaminant with a total of 16 lead-contaminated sites (Cundinamarca 6, Atlántico 4, Valle del Cauca 4, Bolívar 1 and Magdalena 1). Detailed results of each site investigation are recorded in the database of the TSIP program.

NATIONAL ACTION PLAN FOR THE MANAGEMENT OF CHEMICALS IN COLOMBIA

In the framework of the project "National Profile of Chemicals in Colombia", which was developed by the MADS, a total of 772 substances were analyzed, capturing formulations, pure substances, mixtures, pesticides, manures and fertilizers.

The substances were classified into seven groups: organic chemicals; inorganic chemicals; paints, varnishes, inks, dyes and pigments; pesticides; fertilizers; oil, gas and its derivatives; and other chemicals. To determine the priority level, the substances were assessed by the number of dangerous features present, total quantity consumed, number of regions in which it is consumed, number of industrial classes (or crops) in which it is used, and the number of emergency events in which it is involved. Data in the document for the most highly ranked substances, based on the prioritization criteria and the final assessments, was reviewed during the HPAP process.

Among the substances analyzed, pesticides were highlighted as a chemical of particular importance because of their potential toxicity and the number of emergency events in which they are involved.

NATIONAL ENVIRONMENTAL HEALTH DIAGNOSIS

The objective of this study was "to develop a diagnostic for environmental health based on secondary information available on the environmental conditions that influence the morbidity and mortality profile of the Colombian population, as a basis for the formulation of the National Environmental Health Policy according to CONPES DOCUMENT 3550".

With regard to chemicals, the study placed emphasis on the most studied substances according to the results of a literature review and on those that "present special conditions (asbestos and organochlorine pesticides) or require special future attention given their possible adverse effects on human health". In this regard, lead, cadmium, chromium, arsenic, fluorine, pesticides (organochlorides, pyrethroids, organophosphorus, glyphosate), and asbestos were included[5].

3.3. Economic impacts of pollution in Colombia

According to the results of the study carried out by The Lancet Commission on Pollution and Health[6], productivity losses are greater for air pollution (ambient and household), then for unsafe water and sanitation and lead exposure. The total of productivity loss from pollution was equal to a .07% loss in GDP in 2015 (Table 8).

[5] MADS, 2012. National Environmental Health Diagnosis, https://www.minsalud.gov.co/sites/rid/Lists/BibliotecaDigital/RIDE/INEC/IGUB/Diagnostico%20de%20salud%20Ambiental%20compilado.pdf

[6] The Lancet Commission on pollution and health, 2017, The Lancet 2017: Supplementary appendix, https://www.thelancet.com/journals/lancet/article/PIIS0140-67361732345-0/fulltext?code=lancet-site#sec1 - , free account registration required

Table 8:

Loss of productivity as a percentage of GDP per pollutant

Source: The Lancet Commission on Pollution and Health 2017 - Supplementary Appendix

Country	World Bank-Income Group	3% discount rate			
		Combined AAP and HAP	Combined UW and US	Lead exposure	Total
Colombia	Upper-middle	0.052%	0.0166%	0.002%	0.071%
		1.5% discount rate			
		0.062%	0.024%	0.002%	0.089%

AAP: Ambient Air Pollution (environmental pollution) HAP: Household Air Pollution, UW: Unsafe Water, US: Unsafe Sanitation

Table 9:

Gross Domestic Product

Source: World Bankl

Year	2015 (Billion dollars)	2016 (Billion dollars)
Colombia	291.519,60	282.462,55

Table 10:

Damage to social assistance in Billions of dollars as a percentage of NGI per contaminant

Source: The Lancet Commission on Pollution and Health 2017 - Supplementary Appendix

Country	Income Group World Bank	Billions of Dollars			
		Combined AAP and HAP	Combined UW and US	Lead exposure	Total
Colombia	Upper-middle	10.22	1.17	1.15	12.54
		Porcentaje			
		AAP y HAP Combinados	UW y US Combinados	Exposición a plomo	Total
		0.03%	0.003%	0.003%	0.04%

AAP: Ambient air Pollution, HAP: Household Air Pollution, UW: Unsafe Water, U.S.: Unsafe Sanitation

The DNP of Colombia conducted a study of the economic valuation of environmental degradation in 2015, specifically related to urban air pollution, indoor air pollution, and deficiencies in water and sewage coverage[7]. This study reported that the economic cost of the country's environmental degradation for the three analyzed components amounts to 5.2 billion dollars (2.08% of GDP of 2015).

According to both analyses, contaminated urban air has the greatest economic impact, resulting in a loss of 3.8 billion dollars according to the DNP (1.5% of GDP in 2015). Indoor air pollution represented a cost of approximately 970 million dollars (0.39% of GDP in 2015), and lack of clean drinking water and basic sanitation access represents a cost of approximately 344 million dollars (0.15% of GDP). In this estimate, the majority of the costs are attributable to premature deaths (83.8%, i.e. 4.3 billion dollars) and the remaining 16.2%, is due to morbidity (approximately 800 million dollars). Major contributors to mortality are the quality of urban and household air, in that order. Deficiencies in drinking water access and basic sanitation coverage represent a more significant component of morbidity.

[7] DNP, 2017. Valoración económica de la contaminación del aire urbano, la contaminación del aire interior y la deficiencia en la cobertura de acueducto y el alcantarillado.

4

Priority Pollution Challenges and Health Impacts

In order to prioritize pollution challenges by health impacts, an in-country technical workshop was carried out with delegates of governmental entities in charge of the management of environmental health.

A literature review was carried out to identify and compile available information related to environmental pollution and its impacts on the health of the people in Colombia. Criteria and qualification parameters for the evaluation of identified contaminants (Annex 5) were determined, and a multi-criteria assessment (EMC by its Spanish acronym) was applied by experts to assess the comparative weight of each criterion. Lastly, experts qualified each pollutant media according to the parameters defined for each criterion.

Table 11:

Pollutant rating and matrix

Pollutant	Media	Rating
Lead	Soil	3.77
Mercury	Water and food	3.75
Lead	Food	
Pesticides	Soil and food	3.64
Mercury	Soil	3.60
HAP	Soil	3.55

4.1. Issues not selected as priorities

Based on seven criteria, the top five contaminants were identified (Table 11). The calculations by which the results were obtained are presented in Annex 6.

Lead was excluded as a priority because government experts consider the impacts from lead contamination to be localized and not necessarily an issue of national concern. In the case of mercury, government experts stated that there are already many interventions in the field, so it is more strategic to focus other challenges.

Table 12 lists additional contaminants with identified information gaps, as well as the reasons why these contaminants are of note.

Table 12:

Identificación de brechas

Contaminant	Matrix	Observations
Benzene and toluene	Air	Number of exposed inhabitants
Radon	Air	There are no national investigations despite the existence of international evidence of emissions
Asbestos	Air	Use in non-paved road construction materials
Fracking by-products		Production of unconventional hydrocarbons
Neonicotinoids Pesticides	Air and water	Persistence of formulations with these active ingredients and their effects on pollinators
$PM_{2.5}$	Air	Pollution mortality. There are no studies that support taking action on this issue
Polymers	Water	Employees in water purification
Domestic and industrial waters	Water	Dumping

Contaminant	Matrix	Observations
Detergents and cleaners		Source of pollution
Cyanide	Water and soil	Replacement of mercury in gold production
Endocrine disruptors		Pesticides in food production
Microbiological	Water, soil and food	Communicable diseases
NOx, SOx and CO	Air	Through constant exposure
Nanomaterials	Consumer products such as cosmetics, paints, etc.	Their health effects are not well-understood
Total petroleum hydrocarbons	Water	The proposed table does not include studies in water from this pollutant

Of all of the contaminants in Table 12, benzene and toluene in air, asbestos in air, and cyanide in water and soil were included in the prioritization process.

Contaminants such as radon, fracking by-products, polymers and nanomaterials were excluded from the prioritization due to the lack of specific information that would allow the application of the defined parameters. The HPAP recommends increasing the available information of these contaminants in the country.

Neonicotinoid pesticides were considered in the prioritization process as part of the general category of pesticides. Particulate matter of a size smaller than 2,5 microns ($PM_{2,5}$) was considered within PM_{10}, with the clarification that all particulate matter less than this fraction was evaluated within this pollutant.

Industrial and domestic wastewaters, detergents and cleaners and microbiological contaminants were considered outside the scope of the HPAP, so they were excluded from the prioritization process.

Pollutants NOx, SOx and CO are part of atmospheric emissions from both fixed and mobile sources. Because these pollutants would be best addressed through macro-level government policies, they were not selected to be the subject of project proposals.

4.2. Priority contaminants

Through discussions of the results in the prioritization workshop, it was agreed to focus the project proposal resulting from the HPAP on the following topics:

- $PM_{2.5}$: Development of the country's strategy for the reduction of $PM_{2.5}$ emissions and strengthening of the technical capacities for its monitoring and follow-up in areas with industrial zones but without adequate monitoring data.
- Endocrine disruptors: Establish baseline exposure data. Identify, evaluate and strengthen capacities in order to define national objectives, strategies and priorities.
- Pesticides in food: Strengthening of food monitoring and pesticide control.
- Assessment of contaminated sites: further improve and expand efforts to identify and assess sites contaminated with a broad range of chemical contaminants to be stored in a national database.

4.2.1. Ambient Air Particulates ($PM_{2.5}$)

A. SOURCES AND FEATURES

Particulate contamination comprises a mixture of microscopic solids and liquid droplets including acids (such as nitrates and sulphates), ammonia, sodium chloride, organic chemicals, metals, soil or dust particles, allergens (such as fragments of pollen spores or mold), and water suspended in air. The exact composition depends on the source of emissions.

Particles have a wide range of sizes and are classified according to their diameter into PM_{10} (particles with a diameter of less than 10 microns) or $PM_{2.5}$ (diameter of less than 2.5 microns). The latter are considered more dangerous because, when inhaled, they can reach the peripheral areas of the bronchioles and alter the pulmonary exchange of gases. These particles are so small that they can only be detected with an electron microscope.

Among these particulates, "black carbon" is of particular concern to the government of Colombia. Black carbon is a class of particulates that is highly absorbent of the sun's radiation and contributes to regional and global climate change in the short term (in the time span of months to a few decades). The definition of black carbon (CN by its Spanish acronym) can vary depending on the study and how it is being measured.

Most of the black carbon emissions in Colombia, especially in large cities, result from incomplete combustion of fuels from vehicles. According to the report on the state of air quality published by IDEAM in 2016, air pollution is elevated where population density is high and industrial activities are present. In Bogotá and Medellín, for example, the main emission sources of PM_{10} are mobile, with a contribution exceeding 60%, especially from heavy-duty vehicles using diesel fuel. Fixed industrial sources contribute approximately 40%.

The CONPES 3344 document from 2005 "Guidelines for the Formulation of the Policy of Prevention and Control of Air Pollution" reports that air pollution in the country is mainly caused by the use of fossil fuels and 41% of total emissions were generated in eight cities. The high emissions of PM_{10}, NOx and CO are associated with mobile sources, while total suspended particles (PST by its Spanish acronym) and sulphur oxides (SOx) are generated by fixed sources. Levels of PM_{10} frequently exceed the maximum permissible levels under current regulations[8].

Although there is monitoring of $PM_{2.5}$, there is no detailed characterization to correlate particles with the sources of emission, nor is there a baseline of black carbon emissions for the country. Existing measurements are being developed mainly in large cities such as Bogota, Medellín and Cali among others, but the lack of progress in increasing monitoring in small and medium-sized cities represents an urgent need.

Aunque existen monitoreos correspondientes a partículas $PM_{2.5}$, no existe una caracterización detallada de este tipo de emisiones con el fin de correlacionarlas con fuentes de emisión en forma específica y mucho menos existe una línea base en relación a la emisión de Carbono Negro para el país. Las mediciones existentes se están desarrollando principalmente en grandes ciudades como Bogota, Medellín y Cali entre otras, pero la falta de fortalecimiento en incrementar los monitoreos en ciudades pequeñas y medianas es urgente.

[8] CONPES 3344, 2005. Guidelines for the formulation of the policy of prevention and control of air pollution. http://www.minambiente.gov.co/images/normativa/conpes/2005/Conpes_3344_2005.pdf

B. DISEASE BURDEN FROM $PM_{2.5}$

De acuerdo con el informe del Banco According to the World Bank's 2007 report "Environmental Priorities and Poverty Reduction – An Environmental Analysis for Colombia", it is estimated that particulate contamination in urban air causes about 6,000 premature deaths and approximately 7,400 new cases of chronic bronchitis each year. Annual hospitalizations as a result of the contamination are estimated to be about 13,000, and visits to the emergency room and ambulatory hospitalizations to be 255,000 per year. In terms of annual DALYs, mortality accounts for approximately 51%, chronic bronchitis for around 18%, restricted activity days for 14%, and respiratory symptoms for 11%.

More than a third of the health impacts from $PM_{2.5}$ take place in Bogota. This proportion is significantly higher than the relative population of Bogotá to the rest of the country. Bogotá presents the highest urban levels of particulate matter compared to most other cities. More than 20% of the estimated health effects are found in cities with populations of less than half a million. However, the proportion of estimated health impacts in smaller cities is significantly lower than the proportional population in these cities, due to the low levels of pollution.

Data from the 2017 IHME Global Burden of Disease Study suggests a total of 6,323 deaths derived attributable to exposure to particulates in air.

Table 13:

Health impacts attributable to air pollution

Source: Global Burden of Disease, 2017

Health Category	% deaths	% attribution to risk Factor
Ischemic heart disease	17.56	8.64
Chronic obstructive pulmonary disease	5.78	7.61
Stroke	5.34	7.5
Trachea, bronchi, and lung cancer	2.16	7.92
Low respiratory infection	2.68	10.31

In Colombia, there is a growing interest in air pollution issues and in the environmental degradation from atmospheric pollution. This concern has taken hold in recent years because of the increase in awareness of health and environmental effects, and furthered by the knowledge that local air pollution results a loss of 5.7 trillion pesos to the economy annually.

According to the 2015 "Economic Valuation of Environmental Degradation" report of the National Planning Department, about 5,000 premature deaths and almost 65,000 lost disability adjusted life years (DALY) are attributable to air pollution in Colombian cities. Bogotá and the Metropolitan Area of the Valle de

Aburrá (AMVA by its Spanish acronym) represent more than 75 percent of the attributable mortality. Every year, about 4,700 new cases of chronic bronchitis are attributable to urban air pollution in Colombia. Mortality represents about half of the burden of disease attributable to air pollution, and morbidity (i.e., diseases) accounts for the other half[9].

C. ROLES AND RESPONSIBILITIES IN $PM_{2.5}$ MANAGAMENT

Main roles and responsibilities are given in Table 14.

Table 14:

Roles y responsabilidades $PM_{2.5}$

Government entity	Roles and Responsibilities
MADS	To provide policy and regulatory guidelines on the issue of emissions and to determine permissible limit values for pollutants in the air and in emissions
MSPS	To provide policy and normative guidelines on the topic of health care
Environmental Authorities	To control and monitor mobile and fixed emission sources and establish air quality monitoring stations
Health Secretaries	Control and surveillance of health care centers
IDEAM	Collection and analysis of environmental data

[9] Golub, E., Klytchnikova, I., SanchezMartinez, G., & Belausteguigoitia, J. C., 2015. Environmental health costs in Colombia: The changes from 2002 to 2010. World Bank.

D. ACTIONS TAKEN TO DATE ON $PM_{2.5}$ MANAGEMENT

The central government has developed efforts to control atmospheric emissions over many years, as summarized below:

- In 1973, Law 23 was issued, the purpose of which is "to prevent and control environmental pollution and to seek the improvement, conservation and restoration of renewable natural resources, to defend the health and well-being of all the inhabitants of the national territory".
- Decree-Law 2811 of 1974, National Code of Renewable Natural Resources and Environmental Protection.
- In 1979, Congress approved Law 9, which issued the National Health Code by which standards, programs and measures for the protection of the environment were defined, and which empowered the MSPS to declare rules for air pollution control.
- The standard that regulated the emission and concentration of pollutants to the atmosphere was published in 1982, the year in which standards of air quality and emission by fixed sources were adopted by Decree 02 (which was partially repealed in 1995 with some articles remaining temporarily in force until 2008).
- In 2001, a specific standard was issued for the Capital District by which stricter standards were established and contaminants that had not been considered in national regulation were included.
- In March 2005, the National Council for Economic and Social Policy approved CONPES 3344, which contains guidelines for the formulation of the policy of prevention and control of air pollution.
- On 2006, with Decree 244, the "National Intersectoral Technical Commission for the Prevention and Control of Air Pollution" (CONAIRE by its Spanish acronym) was created. It was formed by: MADS; MME; Ministry of Transport; MSPS; DNP and IDEAM. Resolution 601 of 2006 was published the same year "by which the standard of air quality or emission level is established for all the national territory under reference conditions".
- In 2008, Resolution 909 was issued "laying down the permissible emission standards and standards for pollutants into the atmosphere by fixed sources and other provisions".
- In 2010, the "Policy of Prevention and Control of Air Pollution in Colombia" was issued.
- In 2010, Resolutions 650 and 2154 were issued, which adopted and adjusted the "air quality follow-up and monitoring protocol". Resolution 610 was also passed, which modified Resolution 601 of 2006 and Resolution 651 of 2010 by which the Subsystem of Information on Air Quality was created (SISAIRE by its Spanish acronym).
- In 2017, Resolution 2254 was adopted, establishing the Ambient Air Quality Standard, and other provisions were established to adjust previous technical documents. Within this resolution, the following permissible limit values of $PM_{2.5}$ in air were set.

Table 15:

$PM_{2.5}$ allowable limits

Source: MADS, 2017

Exposure time	Current values since July 1, 2018 (ug/m³)	Value starting 2030 (ug/m³)
Anual	25	15
24-hour average	37	37

- Resolution 2254 opened the door to studies related to black carbon in the country. It is the only existing normative reference on the subject.
- In 2018, the National Government approved the CONPES 3943 document of "Policy for the Improvement of Air Quality" that aims to guarantee the prevention and control of air pollution with strategies to improve the management of this resource.

Colombia has had significant growth in data collection to determine air quality, which can be seen in the Air Quality Status in Colombia 2017 report, developed by IDEAM. Of the available information with reference to the monitoring of the fraction of breathable $PM_{2.5}$ particles, there are the following relevant points:

- All of the information on air quality coming from Air Quality Monitoring Systems operated by environmental authorities at the national level, or by legal entities, must be held on the SISAIRE, administered by IDEAM, which is the official source of environmental information of the country. This information subsystem belongs to the Environmental Information System of Colombia (SIAC by its Spanish acronym), which is in the process of modernization and allows interoperability with other information subsystems that the entity currently has, such as water and hazardous waste databases, among others.
- There is a total of 204 monitoring stations in the country as of December 2017, of which 89 measure $PM_{2.5}$. These monitors increased by 48 % compared to those available in 2016.

From the CONPES 3344 document of 2005, it was initially mentioned that in Colombia, the pollutant monitored with greatest interest was particulate matter (PST and PM_{10}), given its proven adverse effects on human health and that concentrations of this pollutant often exceeded current regulatory standards. However, monitoring of particulate matter of less than 2.5 microns ($PM_{2.5}$), a pollutant that significantly affects people's health, is not mandated under Colombian law.

The need to establish a coordinated action plan with the aim of building the national policy for the prevention and control of air pollution was identified, and such an action plan was issued by the MADS (Ministry of Environment, Housing and Territorial Development by 2010). This policy articulates mechanisms by which environmental, health, transport, and energy authorities should coordinate, using a cooperative approach for management of issues such as epidemiological surveillance, renewal of vehicle fleets, fuel quality, cleaner production and sustainable consumption, best practices and available technologies, corporate social responsibility, territorial planning and shared project management. The objectives of this policy are:

- To regulate pollutants in the atmosphere that can affect human health and the well-being of the population and set adequate standards to protect public health.
- To identify the main sources of emissions of pollutants that affect human health and the well-being of

the population.

- To establish, promote and strengthen strategies to prevent and minimize the generation of pollutant emissions and noise to the atmosphere.
- To strengthen coordination, participation and training spaces that involve the different actors related to the prevention and control of air pollution.
- To continue the implementation of international commitments by the country and increase the use of the opportunities offered by multilateral environmental agreements related to pollution prevention and atmospheric control.

Considering all of the above, the MADS issued the "Guide to the Elaboration of Atmospheric Emissions Inventories" in 2017 to meet the objectives set out in the aforementioned policy. With this guide, it is expected that environmental authorities, municipalities, territorial entities, academic institutions, emission generators and the general public can find information on the existing procedures and methodologies for the elaboration of emissions inventories that meet criteria on quality, coherence, integrity, comparability, representativeness and transparency.

E. FUTURE ACTIONS PROPOSED FOR THE MANAGEMENT OF $PM_{2.5}$

Through the framework of the CONPES 3344 of 2005, a general plan of action was established for the management of air quality. However, this plan does not set specific actions for $PM_{2.5}$ particulate emission control. The Health and Pollution Action Plan proposes the following action to improve the management of air pollution:

- Institutional strengthening aimed at all relevant institution to improve air pollution prevention, control and monitoring capacities.
- Strengthening of the air monitoring

and follow-up program at the national, regional and municipal level through the development of a monitoring and follow-up protocol.

- Establishment of policies, strategies, standards and regulations to prevent and control air pollution and preserve air quality and environmental health.
- Development of strategies to facilitate access to clean technologies for micro- and small-scale companies of all industrial and transport sectors.
- Review of vehicle import regulations and of technologies for emissions control.
- Creation of incentives for the use of clean technologies to reduce emissions.
- Identification of information needs, weaknesses and technical requirements for strengthening of epidemiological surveillance associated with air pollution.
- Establishing protocols to follow-up on health impacts from air pollution that can be scalable at a national level.

Likewise, future actions concerning air quality should be focused on the identification of potentially dangerous chemicals or pollutants emitted into the air that can contribute to the information system of Pollutant Release and Transfer Register (RETC by its Spanish acronym).

F. REQUIRED RESOURCES AND POSSIBLE SOURCES OF SUPPORT

Although there is a budget for maintaining the air quality information system handled by the IDEAM, this budget does not include a specific allocation for $PM_{2.5}$ particulate matter characterization or an expansion of air quality monitoring to areas with industrial development but little information available. For this reason, the proposed initiative, which is annexed to this document, aims to address the lack of budget necessary for these specific developments.

G. ACTION PLAN

The framework of the CONPES 3344 document of 2005 established a comprehensive plan of action for the management of air quality. However, this plan does not establish specific functions or timely actions for the characterization of $PM_{2.5}$ particulate matter (including the identification of black carbon), the extension of monitoring to areas with no information, or the correlation of this information with health impacts. These gaps are addressed in the project proposal on outdoor air particulates attached as an annex.

4.2.2. Endocrine disruptors

A. SOURCES AND FEATURES

Although the discussion about potential health effect of endocrine disrupting chemicals began in the 1990s, it was not until 2002 that the World Health Organization issued an assessment of this subject. In 2012, it ratified the definition of endocrine disruptors (EDs), adopted in 2002, as "an exogenous substance or mixture that alters function(s) of the endocrine system and consequently causes adverse health effects in an intact organism, or its progeny, or (sub)populations. A potential ED is an exogenous substance or mixture that possesses properties that might be expected to lead to endocrine disruption in an intact organism, or its progeny, or (sub)populations[10]".

A 2017 UN Environment/UNEP report identified 45 endocrine disrupting or potentially endocrine disrupting substances .However, there is uncertainty around this number due to the lack of evidence regarding the impacts of many other chemicals. Some countries have initiated the process to regulate these chemicals. In most cases, the initial process began with the collection of evidence to identify substances as being potentially endocrine disrupting, before proceeding to the establishment of a regulatory framework. Such was the case in the United States[12], the European Union[13] and Canada[14]

This same UN Environment report identifies worldwide initiatives

[10] WHO/UNEP, 2013, State of the science of endocrine disrupting chemicals – 2012: An assessment of the state of the science of endocrine disruptors prepared by a group of experts for the United Nations Environment Programme (UNEP) and WHO, https://www.who.int/ceh/publications/endocrine/en/

[11] UN Environment (UNEP),2017. Overview Report I: Worldwide initiatives to identify endocrine disrupting chemicals (EDCs) and potential EDCs. https://wedocs.unep.org/bitstream/handle/20.500.11822/25633/EDC_report1.pdf?sequence=1&isAllowed=y

[12] EPA, 2014. Endocrine Disruptor Screening Program Comprehensive Management Plan.

[13] European Commission, 2016. Communication from the Commission to the European Parliament and the Council on endocrine disruptors and the draft Commission acts setting out scientific criteria for their determination in the context of the EU legislation on plant protection products.

[14] Office of the Auditor General of Canada, 2018. Federal research on hormone disrupting substances as required under the Canadian Environmental Protection Act, 1999. Reports and petitions - Environmental Petitions - Petiions Catalogue http://www.oag-bvg.gc.ca/internet/English/pet_340_e_37607.html

(government, industry, civil society and academia) for the identification of potential EDs. In total, 28 initiatives were identified. They were qualitatively analyzed and grouped according to their scope, selection criteria, selection processes and the chemical information.

B. BURDEN OF DISEASES FROM ENDOCRINE DISRUPTORS

Although the possible actions to control EDs are described, epidemiological studies to determine the health impacts of EDs poses a challenge due to the characteristics of these substances, according to the WHO[15].

Data on the disease burden attributable to specific EDs is still under development. In the WHO report "State of the Science of Endocrine Disrupting Chemicals-2012" of 2013[16], a review of available information on health impacts included:

- Female reproductive system (puberty, low fertility, infertility), polycystic syndrome, uterine fibrosis, endometriosis
- Male reproductive system (germ cell testicular cancer, congenital cryptorchidism, hypospadias, semen quality, testicular dysgenesis syndrome)
- Sex ratio
- Thyroid-related diseases and disorders (hypothyroidism, congenital hypothyroidism)
- Neurodevelopment in children
- Hormone-related cancer (breast, endometrial, ovary, prostate, testicular, thyroid)
- Adrenal disorders
- Bone diseases
- Metabolic diseases (obesity, type 2 diabetes, type 1 diabetes)
- Immune functions, diseases and events related to the immune system (allergies endometriosis, autoimmune diseases of the thyroid)
- Population declines

This document generally identified that there is a probability that EDs have a role as causal factors of disease, and that experimental and epidemiological evidence to support the hypothesis is limited and insufficient.

Other more recent studies have included among the potential impacts for ED obesity, diabetes, male reproductive health, neuro-behavioral deficits, and women's reproductive conditions. Recently, studies have been published with the objective of estimating the costs of diseases attributable to EDs. These studies use an adaptation of the Intergovernmental Panel on Climate Change to assess the probability of causation, based on epidemiologic and toxicological evidence, for the contribution of one or more substances to a disease through the mechanism of endocrine disruption.

To evaluate the epidemiological evidence, the GRADE (Grading of Recommendations Assessment, Development and Evaluation) methodology was used; to evaluate the toxicological evidence of laboratory and animal experiments, the recommendations of the Danish Environmental Protection Agency were used.

[15] WHO, 2014. Identification of risks of endocrine-disrupting chemicals: overview of existing practices and steps ahead. Report of a meeting in Bonn. Germany

[16] WHO/UNEP, 2013. State of the Science of Endocrine Disrupting Chemicals. https://www.who.int/ceh/publications/endocrine/en/

The main results obtained can be observed in Table 16:

Table 16:

Evidence Assessment Studies

Source: Bond Gregory G, 2017[17]

Exposure	Result	Epidemiological evidence strength	Toxicological evidence strength	Probability causality (%)
PBDEs	Loss of I.Q. and intellectual disability	Moderate to high	Strong	70-100
Organophosphorus Pesticides	Loss of I.Q. and intellectual disability	Moderate to high	Strong	70-100
DDE	Childhood obesity	Moderate	Moderate	40-69
DDE	Adult diabetes	Low	Moderate	20-39
Di-2-Ethilhexil-phthalate	Adult obesity	Low	Strong	40-69
Di-2-Ethilhexil-phthalate	Adult diabetes	Low	Strong	40-69
BPA	Childhood obesity	Very low to low	Strong	20-69
PDBEs	Testicular cancer	Very low to low	Weak	0-19
PDBEs	Cryptorchidism	Low	Strong	40-69
Benzyl and Butyl Phthalates	Male infertility	Low	Strong	40-69
Phthalates	Low T	Low	Strong	40-69
DDE	Fibroids	Low-moderate	Moderate	20-39
Phthalates	Endometriosis	Low-moderate	Moderate	20-39
Multiple exposures	ADHD	Low-moderate	Strong	20-69
Multiple exposures	Autism	Low	Moderate	20-39

[17] Bond Gregory G., Dietrich Daniel R, 2017. Human cost burden of exposure to endocrine disrupting chemicals. A critical review. Springer-Verlag Berlin Heidelberg.Bond Gregory G., Dietrich Daniel R, 2017. Human cost burden of exposure to endocrine disrupting chemicals. A critical review. Springer-Verlag Berlin Heidelberg.

C. ROLES AND RESPONSIBILITIES IN THE MANAGEMENT OF ENDOCRINE DISRUPTORS

Although there are currently no standards or regulation related to EDs in Colombia, the health risks associated with them are beginning to be addressed by the MSPS and INS.

However, considering the legal framework in Colombia on pollution issues that affect health, it would be expected that this issue would be addressed by the national health authority in terms of health protection and by the environmental authority in terms of the regulation of environmental media. In addition, authorities responsible for regulating trade must assume the corresponding market regulation of ED-containing products.

D. ACTIONS TAKEN TO DATE FOR THE MANAGEMENT OF ENDOCRINE DISRUPTORS

To date, the country has not taken concrete actions to address health risks from endocrine disruptors. However, projects have been developed that, although not primarily concerned with identifying the health risks of EDs, can provide information to establish a baseline for further study. Such is the case for PCBs.

E. PROPOSED FUTURE ACTIONS FOR THE MANAGEMENT OF ENDOCRINE DISRUPTORS

Considering that the country has not started working on the health risks associated with EDs, the need to identify such risks was identified as a first step. This will be the baseline for the following steps.

F. POSSIBLE STEPS TO FOLLOW FOR THE MANAGEMENT OF ENDOCRINE DISRUPTORS

Once the characterization of health risks from EDs has been carried out, a health risk management program for EDs should be established. In addition, the normative instruments and institutional arrangements necessary for the implementation of the program must be established.

G. REQUIRED RESOURCES AND POSSIBLE SOURCES OF SUPPORT

In general terms, the resources envisaged for the development of the aforementioned activities, which are included as components of the project's initiative (as detailed in the corresponding project proposal), are: national personnel and international consultants, expert national staff in each required area, software, printed materials, office supplies, and laboratory certification consultancy, among others.

The estimated overall budget of the intervention, considering the time requirements for each component and activity, amounts to USD426,000

H. ACTION PLAN

The country does not currently have an action plan to address health risks posed by endocrine disruptors. In this sense, the project's initiative within the framework of the HPAP, would be the initial plan of action for Colombia.

Table 17:

Action Plan – Endocrine disruptors

Output	Activity	Location	Time	Partners
Capacity building in national authorities for the identification and prevention of health risks from EDs	Enlistment	Bogota, Colombia	Q1/Y1	UNIDO
	Identify the capacities needed to develop a strategy to reduce the health risks from EDs	Bogota, Colombia	Q1/Y1	Ministry of Health and Social Protection; UNIDO; UNDP; PAHO;
	Assess capabilities to develop a health risk reduction strategy for EDs	Bogota, Colombia	Q2/Y1	Ministry of Health and Social Protection; UNIDO; UNDP; PAHO
	Develop a capacity building plan	Bogota, Colombia	Q2/Y1	Ministry of Health and Social Protection; Ministry of Environment and Sustainable Development; Ministry of Industry and Commerce; Ministry of Agriculture; INS; INVIMA; UNIDO; UNDP; PAHO

Output	Activity	Location	Time	Partners
(Cont.) Capacity building in national authorities for the identification and prevention of health risks from EDs	Implement capacity building plan	Bogota, Colombia	Q3-Q4/Y1 Q1-Q2/Y2	Ministry of Health and Social protection; Ministry of Environment and Sustainable Development; Ministry of Industry and Commerce; Ministry of Agriculture; INS; INVIMA; UNIDO; PAHO
Identification of exposure conditions regarding endocrine disruptors	Danger identification	Bogota, Colombia	Q4/Y1	Ministry of Health and Social Protection; INS; UNIDO; PAHO
	Exposure assessment	Bogota, Colombia	Q4/Y2	Ministry of Health and Social Protection; INS; UNIDO; PAHO
	Evaluation of the dose-response ratio		Q1/Y2	Ministry of Health and Social Protection; INS; UNIDO; PAHO;
	Risk characterization	Bogota, Colombia	Q1/Y2	Ministry of Health and Social Protection; INS; UNIDO; PAHO

Output	Activity	Location	Time	Partners
Identification of efficient actions to prevent exposure to endocrine disruptors	Identification of possible actions	Bogota, Colombia	Q2/Y2	Ministry of Health and Social Protection; Ministry of Environment and Sustainable Development; Ministry of Industry and Commerce; Ministry of Agriculture; INS; INVIMA; UNIDO; PAHO
	Identification of managers according to competences	Bogota, Colombia	Q2/Y2	Ministry of Health and Social Protection; Ministry of Environment and Sustainable Development; Ministry of Industry and Commerce; Ministry of Agriculture; INS; INVIMA; UNIDO; PAHO

Output	Activity	Location	Time	Partners
(Cont.) Identification of efficient actions to prevent exposure to endocrine disruptors	Valuation of efficiency and feasibility of actions	Bogota, Colombia	Q3/Y2	Ministry of Health and Social Protection; Ministry of Environment and Sustainable Development; Ministry of Industry and Commerce; Ministry of Agriculture; INS; INVIMA; UNIDO; PAHO
	Definition of political actions and mechanisms for their implementation	Bogota, Colombia	Q3/Y2	Ministry of Health and Social Protection; Ministry of Environment and Sustainable Development; Ministry of Industry and Commerce; Ministry of Agriculture; INS; INVIMA; UNIDO; PAHO

4.2.3. Pesticides

A. SOURCES AND FEATURES

A study of pesticides in Colombia conducted by the Economic Studies Group of the Superintendent of Industry and Commerce in 2013 determined that Colombia was among the top five countries in the world in terms of highest average pesticide use in agricultural. In that year, 1,573 products were monitored, representing five types of pesticides, most of them herbicides (40,8%), fungicides (35,6%) and insecticides (23.3%)[18].

According to the National Profile of Chemicals in Colombia and information provided by the ICA from the AGRONET database, pesticides that are used in the greatest number of crops, using the 70 most representative and important crops in Colombia agricultural production as reference, are: Mancozeb (42), Carbaryl and Dimethoate (22), Captan and Propineb (16)[19].

Despite laws and regulations prohibiting the use of certain pesticides, including Law 1196 of 2008 regulating POPs pesticides, there is evidence that Endosulfan and Lindane are still being illegally used. The status of illegal trade has been corroborated through cases of poisoning by restricted pesticides[20].

B. BURDEN OF DISEASE FROM PESTICIDE RESIDUES IN FOOD

The IHME in its Global Burden of Disease Study does not report disaggregated information for pesticide exposure as a risk factor. However, it is important to mention that according to the recorded information of the Chemicals Intoxications Protocol of the INS, there were 212,039 cases of chemical poisoning reported in Colombia between 2008 and 2016. For the first five years of analysis, pesticides caused a plurality of the registered cases, representing on average 36% of annual poisonings in the country[21].

It is notable that, in the specific case of organochlorine pesticides (OCL), the population groups most susceptible to exposure via consumption of residues in meat and milk are: minors, due to the higher consumption of milk with respect to their weight; pregnant women, because OCL compounds can cross the placental barrier; and older adults, who would be in a position of greater susceptibility because their lifespan presents a longer period of potential exposure[22].

C. ROLES AND RESPONSIBILITIES IN THE MANAGEMENT OF PESTICIDES

In the framework of the Health and Pollution Action Plan for Colombia, the issue of the health effects by pesticides focused on exposures from contaminated food. Therefore, the most appropriate government agency to lead interventions in this matter is the Inter-sectoral Commission on Sanitary and Phytosanitary Measures (CIMSF by its Spanish acronym). CIMSF is comprised by the following entities:

A. MADR

B. MSPS

C. MINCIT

D. MADS

E. DNP

[18] MADS, 2017. Plan Nacional de Implementación del Convenio de Estocolmo sobre Contaminantes Orgánicos Persistentes.

[19] MADS/ONUDI, 2012. Perfil Nacional de Sustancias Químicas en Colombia.

[20] MADS, 2017. Plan de Implementación del Convenio de Estocolmo sobre Contaminantes Orgánicos Persistentes.

[21] INS, 2017. Protocolo de Vigilancia en Salud Pública - Intoxicaciones por Sustancias Químicas (Cod. 365)

[22] INS, 2015. Evaluación de Riesgos en Inocuidad de Alimentos - Residuos de plaguicidas organoclorados en matrices de carne y leche de origen bovino.

In accordance with Decree 2833 of 2006, by which the CIMSF was created, the main duties of the CIMSF, with regard to the monitoring and control of pesticide residues in food, are as follows:

1. Harmonize the policies of the various ministries and other entities that are part of the sanitary and phytosanitary measures system.
2. Guide the formulation of national policies and plans on sanitary and phytosanitary measures through to the finalization of guidelines of common interest for different ministries and national entities.
3. Coordination the development and implementation of sanitary and phytosanitary measures.
4. Promote strategies to strengthen the National System of Sanitary and Phytosanitary Measures and their entities.
5. Finalize the country's participation strategies in the different regional and multilateral forums related to sanitary and phytosanitary measures and in international reference agencies.

The particular mission of each of the entities that make up the CIMSF can be found in the project proposal 3 presenting the intervention to strengthen the monitoring and control of pesticide residues in food.

However, it is hoped that the CIMSF itself will adopt the envisaged interventions within its action plans to mitigate this problem.

D. ACTIONS TAKEN TO DATE IN THE MANAGEMENT OF PESTICIDES

In Colombia, pesticide management is governed by Decree 1843 of 1991, which established the mandate and mechanisms for epidemiological control and surveillance of their use and handling. Resolution 2906 established the Maximum Limits of Pesticide Residues (MLPR's) in food for human consumption, feed, and fodder. Resolution 4506 of 2013 established the maximum levels of other pollutants intended for human consumption.

Technical guidelines for the monitoring of food residues are laid out in Resolution 770 of 2014, which established guidelines for the formulation, implementation, monitoring, and evaluation of National Sub-sectoral Plans for Monitoring and Control of Residues in Food.

Since 2010, INVIMA has developed plans for the monitoring and control of pesticides (including some POPs) and chemical contaminants in food products of animal and vegetable origin. These results are communicated to the ICA to inform risk management strategies.

Two of the selection criteria for what products are included each year in the Sample Plan are the level of consumption of the product, according to the National Survey of Nutritional Status, (ENSIN by its Spanish acronym), and its exporting potential. By the year 2013, approximately 22 matrices were monitored including fruits, vegetables, and legumes.

Through Decree 2833 of 2006, the Intersectoral Commission of Sanitary and Phytosanitary Measures was created in Colombia in order to coordinate and guide this policy and transform the system into a cross-sectoral framework that includes agriculture, health, environment and trade.

E. PROPOSED FUTURE ACTIONS FOR THE MANAGEMENT OF PESTICIDES

Within the framework of the National Implementation Plan for the Stockholm Convention[23] the government plans to implement programs on Good Agricultural Practices (BPA by its Spanish acronym), information and risk awareness campaigns

[23] MADS, 2017.Plan Nacional de Implementación del Convenio de Estocolmo sobre Contaminantes Orgánicos Persistentes.

associated with the use of pesticides, mechanisms for the safe management of seized pesticide pesticides, as well as actions to strengthen the inspection, monitoring and control system. These actions are designed to prevent the entry of POP pesticides into the country, discontinue their use, and eliminate seized products.

Regarding the monitoring and control of pesticide residues in food, government entities must make an articulated and effective effort. Implementation can be supported by updating the corresponding regulatory framework, identifying public policy tools that allow action after a violation of the maximum permissible limits has been identified, and improving the availability and quality of laboratory services needed to identify these events.

With Decree 931 of 2018, which creates the National Plant Traceability System, the government laid the groundwork to identify the tools, managers, and resources needed to assist the entities in charge of implementing product tracing. This system allows the identification of the origin of the product or its associated consumables, and thus makes implementation of the sampling and monitoring plans more effective. The implementation of this system will be the backbone for interventions related to pesticide residues in food.

In order to identify the sources of pollution in the country and their relationship with the development of economic activities, the national government is advancing efforts for the implementation of the Registry of Emissions and Transfer of Pollutants (RETC by its Spanish acronym).

This information system contains an inventory or database, periodically updated with environmental information at a national or regional level, of potentially dangerous chemicals or pollutants emitted into the air, water, and soil or transferred for treatment or disposal. This includes residues[24].

In accordance with the Organisation for Economic Co-operation and Development (OECD) recommendation, in addition to substances or contaminants, the system must generate a comprehensive notification of emissions and transfers, include information on sources and their nature (point and non-point sources), provide mechanisms of periodic reporting (preferably annually), and do so in a format that allows public access to registration information[25].

F. REQUIRED RESOURCES AND POSSIBLE SOURCES OF SUPPORT

To date, the government does not have a defined or allocated budget to increase its capacity in the risk analysis for the inspection, surveillance and control of pesticide residues in food.

G. ACTION PLAN

Within the framework of the National Plan for the Implementation of the Stockholm Convention[26], the government plans to implement actions to strengthen the inspection, monitoring and control system in order to avoid the entry of POPs pesticides into the country, discontinue their use, and eliminate the existence of seized products.

[24] MADS, 2018. Registro de Emisión y Transferencia de Contaminantes. Obtenido de http://quimicos.minambiente.gov.co/index.php/gestion-de-sustancias-quimicas/ocde/registro-de-emisiones-y-transferencia-de-contaminantes-retc

[25] Ibid 24.

[26] MADS,2017. Plan Nacional de Implementación del Convenio de Estocolmo sobre Contaminantes Orgánicos Persistentes.

5

Monitoring of interventions and measurement of impacts

The project's results will be monitored annually, and the project's implementation will be periodically assessed to ensure that objectives are being effectively achieved.

Project-level monitoring and evaluation will be carried out in accordance with UNIDO requirements as a proposed implementing agency, under its Independent Evaluation Division. While UNIDO requirements are not described in this document, the Country Office will work with relevant stakeholders of the project to ensure that monitoring and evaluation requirements are met in a timely manner and with high quality standards.

Additional mandatory monitoring and evaluation requirements will be met in accordance with the policies and requirements established by donors and funding sources acquired for the implementation of the project.

In addition to the mandatory requirements of the implementing agency, the national government and the donors, other monitoring and evaluation activities will be agreed upon during the project start-up meeting and will be detailed in the initial report. The activities will include the exact role of those involved in the project and other stakeholders, including the focal points of international cooperation of the government and the national/regional institutes assigned to carry out the project's monitoring.

The Project Manager will be responsible for the daily administration of the project and regular monitoring of the results and risks. S/he will ensure that all project staff maintains an elevated level of transparency and responsibility for monitoring and evaluation activities, to be reflected in the respective reports. S/he shall inform the Board of the Project, UNIDO's Country Office, the government counterpart, and the respective donors of any delay or difficulty arising during implementation so that adequate support and corrective action can be taken.

S/he will also develop annual work plans based on the project's overall work plan, including annual objectives to support the efficient implementation of the project. This includes, but is not limited to, ensuring that project indicators are monitored annually and in a timely manner for reporting purposes.

The Board of the Project will take the corrective measures necessary to ensure

that the project achieves the proposed results. It will conduct periodic reviews to evaluate performance and evaluate the annual work plan for the following year. In the last year, it will conduct a final review to capture and disseminate lessons learned and discuss opportunities to broaden and highlight the project outcomes, the findings described in the final project evaluation report, and the response of the administration.

National counterparts shall be responsible for providing all information and data necessary for timely, complete and evidence-based reporting, including results and financial data. They will strive to ensure that project-level monitoring and evaluation is carried out by the national institutes and is aligned with national schemes, so that the data used and generated by the project support them.

UNIDO's office in Colombia will support the Project Manager as needed, including annual monitoring missions. UNIDO's Country Office will initiate and organize the key monitoring and evaluation activities of the respective donor, the independent mid-term review, and the independent

end evaluation. UNIDO's Country Office and the Project Manager must address any quality concerns identified during the monitoring and evaluation activities and retain all records up to seven years after financial closure of the project to support ex-post evaluations.

Possible support from the Secretariat and members of GAHP

After completing the HPAP document, GAHP facilitators will continue to work with relevant government agencies and development partners to identify possible technical or financial assistance mechanisms that can advance the recommendations and programs designed in the HPAP.

While the final success of the goals of the HPAP is based on the political will and the actions of the government, GAHP members are available to help with the development of full funding proposals, based on the project proposals of HPAP, as well as identify calls that coincide with the proposals, provide technical advice on the design of funded activities at the national level, and facilitate communications with development partners that can provide financial support to the programs described in the HPAP.

The specific role of the members of the GAHP after the HPAP development process will depend on government requests and the interest and capabilities of relevant development partners.

6

Project Proposals

Based on the results of the prioritization process and on consultations with government experts, four project proposals were developed under the HPAP. The project proposal selection and development process considered the national relevance of the project, the available capacity and the potential impacts on public health.

The four project proposals include:

- Strengthening of the inventory and characterization of $PM_{2.5}$ particulate matter emissions and black carbon emissions in medium and small cities in Colombia.
- Identification of actions to prevent risks from EDs in populations of greatest vulnerability in Colombia.
- Strengthening of the country's institutional management for the monitoring and control of pesticide residues in food.
- Identifying and assessing sites contaminated by chemical pollutants to increase the available information about the scope, severity, number and location of contaminated sites and potential impacts to public health.

Detailed information of each initiative is presented in the corresponding project proposal, which is an integral part of this document.

Project Proposal 1:
Air Quality ($PM_{2.5}$)

Project title:	Developing the country's roadmap for the reduction of $PM_{2.5}$ emissions and building technical capacities for monitoring and follow-up.
Location:	Areas in the country with industrial development zones that lack information.
Duration:	3 Years
Government coordinating agency and cooperating /executor agency/:	MADS IDEAM MSPS INS UNIDO, Pure Earth
Budget (in USD):	$ 1,557,000

1. Project Summary

This project seeks to build a country strategy (roadmap) for reducing $PM_{2.5}$ emissions and building technical capacities for follow up and monitoring in Colombia's priority areas. The main objective is to increase the data available to the national information system managed by IDEAM to support analysis and decision-making regarding specific actions to improve air quality and thus reduce health impacts for the exposed population. The project would focus on areas of the country that have exposed communities and the presence of industrial development zones, but lack sufficient data.

2. Background

Emissions inventories are useful tools as they facilitate researchers and policymakers (government) in evaluating the magnitude of emissions of atmospheric pollutants, the contribution of different source categories, and the most promising mitigation strategies. Likewise, knowing the physical and chemical composition of particulate matter provides scientific information that helps direct mitigation efforts to reduce emissions. $PM_{2.5}$ (particles with a diameter less than 2.5 microns) can enter the lungs and the bloodstream, interrupting the exchange of oxygen in the blood and causing inflammation and

premature death. Additionally, black carbon, a large component of $PM_{2.5}$, has gained greater attention in recent times due to its effects on health and its contribution to global warming[27]. $PM_{2.5}$ was recently classified as carcinogenic in humans[28].

In recent years, Colombia has significantly advanced in the collection of information on air quality with monitoring of total suspended particles, PM_{10}, SO_2, CO, O_3 and $PM_{2.5}$, especially in major cities like Bogota, Medellin and Cali, among others. However, there is an interest from the central government and several environmental authorities to know more precisely the current state of air quality in the country and the main $PM_{2.5}$ emission sources, which have a direct impact on the health of people and the environment. Likewise, there is a concern about the lack of information regarding black carbon, as it is one of the contributors to climate change.

From regulatory point of view, the central government has for many years been developing mechanisms to control atmospheric emissions, which are summarized below:

- In 1973, Law 23 was issued, the purpose of which is "to prevent and control environmental pollution and to seek the improvement, conservation and restoration of renewable natural resources, to defend the health and well-being of all the inhabitants of the national territory".
- Decree-Law 2811 of 1974, National Code of Renewable Natural Resources and Environmental Protection.
- In 1979, Congress approved Law 9, which issued the National Health Code. Standards, programs and measures for the protection of the environment were defined, and the MSPS was empowered to declare rules for air pollution control.

- The standard that regulated the emission and concentration of pollutants in the atmosphere was put forth in 1982.The standards of air quality and emissions by fixed sources were adopted by Decree 02, which was partially repealed in 1995; some articles were temporarily in force until 2008.
- In 2001, a specific standard was issued for the Capital District by which stricter standards were established and included additional contaminants in the national regulation.
- In March 2005, the National Council for Economic and Social Policy approved CONPES 3344 document, which contains guidelines for the formulation of the policy on the prevention and control of air pollution.
- On 2006, with Decree 244, CONAIRE was created; formed by: MADS, MME, Ministry of Transport, MSPS, DNP and IDEAM. Resolution 601 of 2006 was published the same year "by which the standard of air quality or emission level is established for all the national territory under reference conditions".

[27] WHO, 2016. Air quality and health. http://origin.who.int/mediacentre/factsheets/fs313/es/

[28] International Agency of Research on Cancer (IARC), 2016. Air pollution and cancer. Publication Nro 161. https://www.iarc.fr/wp-content/uploads/2018/07/AirPollutionandCancer161.pdf

- In 2008, Resolution 909 was issued "laying down the permissible emission standards and standards for pollutants into the atmosphere by fixed sources and other provisions".
- In 2010, the "Policy of Prevention and Control of Air Pollution in Colombia" was issued.
- In the same year, Resolutions 650 and 2154 were issued, which adopted and adjusted the "air quality follow up and monitoring protocol". Resolution 610 was also published, modifying Resolution 601 of 2006 and Resolution 651 of 2010 "by which the SISAIRE is created".
- In 2017, Resolution 2254 was issued, through which the Ambient Air Quality Standard was adopted and other provisions were established to adjust previous technical documents. In this resolution, the permissible limit values of $PM_{2.5}$ in air were set in the following ways.

Exposure time	Current values since July 1, 2018 ug/m³	Values starting 2030 ug/m³
Annual	25	15
24-hour average	37	37

- Resolution 2254 also opened the door to studies related to black carbon in the country. It is the only existing reference in the standards to black carbon.
- In 2018, the National Government approved CONPES 3943, Policy for the improvement of air quality", that aims to guarantee the prevention and control of air pollution with strategies to improve the management of this resource.

The country has also had significant growth in data collection on air quality, which can be seen in the 2017 report "Air Quality Status in Colombia" developed by IDEAM. The report included the following information on the monitoring of the breathable fraction $PM_{2.5}$ particles:

- All information on air quality coming from Air Quality Monitoring Systems operated by environmental authorities at the national level, or by legal entities, must be included in the SISAIRE, administered by IDEAM, the official source of information of the country. This information subsystem belongs to the SIAC, which is in the process of modernization and will allow interoperability with other information subsystems, such as water and hazardous waste, among others.
- The country's Air Quality Monitoring Systems are not under IDEAM's control; their operation depends directly on Regional Autonomous Corporations and Urban Environmental Authorities.
- There was a significant increase of 26% in 2017 (compared to 2016) of the number of monitor logs installed. A total of 3,385,860 records were reported, with temporary representativeness (valid data vs. ideal data) of 31 %.
- There was a total of 204 monitoring stations in the country as of December 2017, of which 89 measure the breathable fraction $PM_{2.5}$. These monitors increased by 48% in reference to those available in 2016.
- Based on available data for 2017, stations that do not comply with established limits in the current legislation are mainly located in major cities such as Bogota, Medellin and Cali, as shown in the following figure.

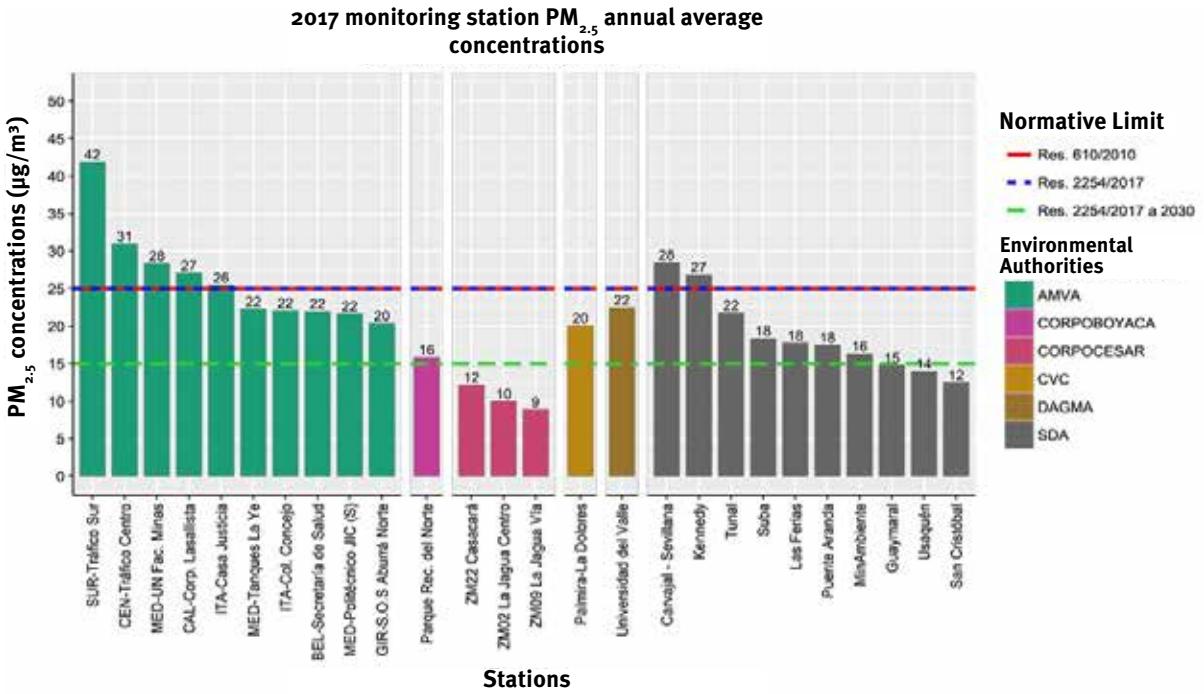


Figure 12

Average annual concentration of $PM_{2.5}$ in stations in the country, 2017

Source: Report on air quality status in Colombia – IDEAM, 2018

- Data from the stations reported levels up to 64% above the maximum permitted limit laid out in the current legislation (25 µg/m3). This is the case for a monitoring station called Trafico Sur, located in the municipality of Sabaneta.

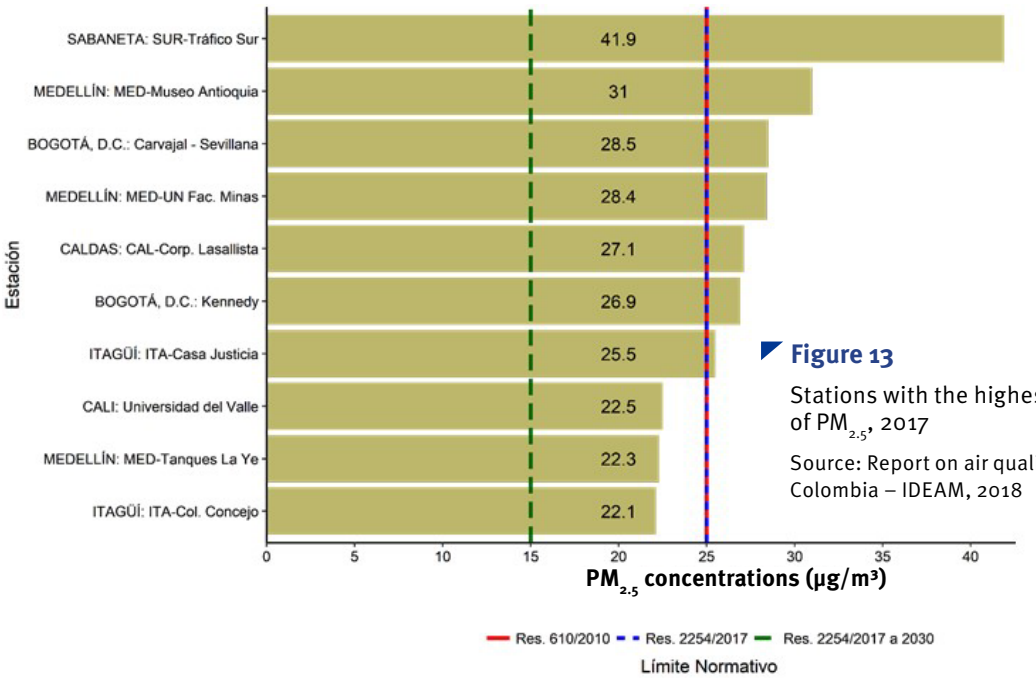


Figure 13

Stations with the highest concentration of $PM_{2.5}$, 2017

Source: Report on air quality status in Colombia – IDEAM, 2018

- On the other hand, only 5 of the 89 stations that monitor $PM_{2.}$ would comply with the maximum permissible limit established for 2030.
- When compared with other air pollutants monitored in Colombia, the recorded concentrations of $PM_{2.}$ were found to be the least in compliance with current legislation.

Figure 14

Stations with the highest concentration of $PM_{2.5}$, 2017

Source: Report on air quality status in Colombia – IDEAM, 2018

3. Project Description

Beneficiaries

The main beneficiaries of this project are the populations in the study areas, in addition to national government entities involved in the capture of information and analysis of air quality data in Colombia. This includes MADS, IDEAM and all the environmental authorities such as the Regional Autonomous Corporations of the departments that are selected for the project. Another entity that will directly benefit from the project is the MSPS, whose information will be of vital importance in relating the data obtained to the diseases derived from exposure to this class of particles. Indirectly, the beneficiaries include the different private and public organizations involved in this subject, such as research institutes and accredited laboratories in the country.

General Objective

To build a country strategy (roadmap) for reducing $PM_{2.}$ emissions and strengthen the technical capacities for monitoring and follow-up.

Intervention Strategy

The strengthening of institutional capacity has been defined as the process by which people, organizations and societies obtain, strengthen and maintain the necessary skills to establish and achieve their own development objectives over time. The elements of the implementation strategy of this initiative were based on the principles of air quality assessment given by the World Bank[29]. These principles include an emissions inventory, monitoring network, and spot measurements of particulates, as well as information management aspects, dispersion models, and contaminant distribution.

[29] World Bank, 2015. Clean air and healthy lungs : enhancing the World Bank's approach to air quality management. http://documents.worldbank.org/curated/en/610191468166143435/Clean-air-and-healthy-lungs-enhancing-the-World-Banks-approach-to-air-quality-management

The strategy designed to achieve the proposed objective would be a joint effort among the relevant government agencies, headed by the MADS and IDEAM. The participation of the MSPS and INS is fundamental to developing the strategy. As part of the strategy, the following steps will be carried out – identifying gaps, defining parameters and variables to study (including determining the areas to be monitored), and characterizing the type of particles (physicochemical composition) of the breathable fraction $PM_{2.}$.

The above will serve to standardize the implementation and evaluation protocols that can be replicated by any environmental authority in the country, in order to strengthen their technical capacity and support the generation of valid scientific information. It will also provide tools for the authorities to formulate plans for the prevention, control and reduction of particulate matter emissions.

As part of the development of the strategy, it is essential to include other important participants such as the national laboratories accredited for the analysis of the collected samples, as well as international laboratories, if necessary. As an integral part of the strategy, all the available local studies that have information on air quality that complements the data generated will be considered.

National Counterparts and Donors

As main partners of the project, the MADS and IDEAM will have the responsibility to accompany the project at all stages, establish the scope of each of the proposed objectives, and facilitate access to existing information. They will also support the sampling and laboratory analysis process to characterize the $PM_{2.}$ particles. MSPS and INS will be important partners in the project, which will utilize and analyze information to determine health impacts.

Results of the Project

The project's expected results will focus on:

- To include in the air quality information system areas which currently lack information but have industrial development zones.
- To characterize the breathable fraction particles $PM_{2.}$ (e.g. determine the physicochemical composition) in the zones selected for the study. This includes sampling, transport and analysis methodologies, as defined by national or international accredited laboratories. This characterization must include at least the identification of elemental carbon (black carbon), organic carbon, soluble ions (sulfate, nitrate, ammonium, Cl- and K+), earth-crust metals and trace elements(Na, Hg, Al, S, K, Ca, Ni, Cu, V, Mn, As, Pb, Cr, Sb, Cd, Fe, Zn, Ti), as well as polycyclic aromatic hydrocarbons, among others.
- To strengthen the monitoring program and current inventory of $PM_{2.}$ emissions of the air at national, regional and local levels through the development of protocols for monitoring and follow up.
- To develop a profile of the health impacts among the exposed populations of the areas selected for the study.
- To link the results of the physicochemical characterization of the $PM_{2.}$ with attributable health effects in the selected populations.
- To design a methodology for identifying emission sources based on the results obtained in the characterization of the $PM_{2.}$.
- To map $PM_{2.}$ emissions projections up to 2050, displaying different possible emission reduction scenarios, including a scenario with no action.

- To identify scenarios and cost-effective actions for reducing emissions of $PM_{2.}$ (environmental, economic and technological components), and analyze the benefits, investments and implementation barriers.
- To strengthen the technical knowledge of government officials through training on: air quality monitoring techniques, the development of inventories of atmospheric emissions, characterization and laboratory analysis techniques of air contaminants, as well as the definition and analysis of pollution and emission reduction scenarios.
- To strengthen the participating institutions through the development of a handbook and national implementation protocol so this type of study can be replicated by other environmental authorities or by other entities engaged in this issue.

Activities

Output	Activities	Ubicación	Tiempo	Socio
Inclusion of zones with no information and the presence of industrial development zones in the air quality information system.	Review of existing information on emissions, air quality, health and industrial development zones	Bogota Colombia	Q1/Y1	Implementer MADS IDEAM
	Prioritize areas of Colombia considering the problems of air quality, lack of information and industrial development zones.	Bogota, Colombia	Q1/Y1	Implementer MADS IDEAM
	Qualitatively characterize sources of pollution in priority areas	Prioritized areas	Q2/Y1	Implementer MADS IDEAM

Output	Activities	Ubicación	Tiempo	Socio
Protocol to measure and characterize (determine the physicochemical composition) the breathable fraction $PM_{2.5}$ in air quality	To determine the most efficient technical system (device) for the determination of concentrations in air quality $PM_{2.5}$	Bogota, Colombia	Q2/Y1	Implementer MADS IDEAM
	Selection of the monitoring points where the measurements will be done or selection of the stations where the samples will be obtained for the characterization of $PM_{2.5}$.	Prioritized areas	Q3-Q4/Y1	Implementer MADS IDEAM CAR's
	Definition of the physicochemical parameters to be analyzed by the selected laboratory (national or international)	Bogota, Colombia	Q3-Q4/Y1	Implementer MADS IDEAM
	Design of sampling strategy (sample quantity, times and transport) of each one of the selected stations.	Bogota, olombia	Q3-Q4/Y1	Implementer MADS IDEAM
	Selection of laboratories that will conduct the characterization of filters.	Bogota, Colombia	Q3-Q4/Y1	Implementer MADS IDEAM
	$PM_{2.5}$. measurement and sampling	Prioritized areas	Y2	Implementer MADS IDEAM CARs Accredited Laboratories
	$PM_{2.5}$particles physicochemical characterization. Identification of black carbon, organic carbon, soluble ions (sulfate, nitrate, ammonium, Cl- and K+) and components of Na, Hg, Al, S, K, Ca, Ni, Cu, V, Mn, As, Pb, Cr, Sb, Cd, Fe, Zn, Ti, as well as polycyclic aromatic hydrocarbons among others.	Prioritized areas	Y2	Implementer Accredited Laboratories

Output	Activities	Ubicación	Tiempo	Socio
Strengthening inventory of emission sources in prioritized areas	Integrating collected information on $PM_{2.5}$ emissions to the existing inventory, including the characterization.	Bogota, Colombia	Q1/ Y3	Implementer MADS IDEAM CAR's
	Development of the emission inventory in the prioritized areas	Bogota, Colombia	Q1/ Y3	Implementer MADS IDEAM CAR's
Study to identify the attributable fraction and health effects of $PM_{2.5}$	Characterization survey (socio demographic, mobility, social capital, use of free time, physical activity, quality of life, respiratory health, anthropometry, current habits)	Prioritized areas	Y2	Implementer MSPS INS
	Develop a systematic review or analysis of goals for the characterized pollutants and their effects on the population's health.	Prioritized areas	Y3	MSPS INS IDEAM MADS CAR's
	To develop an exploratory study on the relationship between characterized contaminants and the health effects in three populations.	Prioritized areas	Y3	MSPS INS IDEAM MADS, CAR's
Evaluation studies on the $PM_{2.5}$ reduction scenarios.	Design the correlation methodology to identify emission sources, based on the characterization results obtained for the samples of $PM_{2.5}$	Bogota, Colombia	Q1/Y3	Implementer MADS IDEAM
	Identify the emission sources by applying the designed correlation methodology.	Bogota, Colombia	Q1-Q2/Y3	Implementer MADS IDEAM
	Map $PM_{2.5}$ emissions for different scenarios into 2050	Bogota, Colombia	Q2/Y3	Implementer MADS IDEAM
	Identify cost-effective actions for the reduction of $PM_{2.5}$ emissions	Bogota, Colombia	Q2/Y3	Implementer MADS IDEAM
	Perform analysis of different emission reduction scenarios and identify the actions with the most impact.	Bogota, Colombia	Q3/Y3	Implementer MADS IDEAM

Output	Activities	Ubicación	Tiempo	Socio
Institutional strengthening	Workshop 1. Training government officials in the development of the inventory and environmental projections of $PM_{2.5}$.	Bogota, Colombia	Q2/Y1	Implementer MADS IDEAM CAR's MSPS INS
	Workshop 2. Training government officials in analytical techniques for particulate samples (physicochemical composition).	Bogota, Colombia	Q1/Y3	Implementer MADS IDEAM CAR's MSPS INS
	Workshop 3. Training government officials in the development of the emission inventories.	Bogota, Colombia	Q2/Y3	Implementer MADS IDEAM CAR's MSPS INS
National-level $PM_{2.5}$ Emissions Reduction Roadmap	Written document to compile the protocols developed as part of the Strategy (roadmap) for the implementation of $PM_{2.5}$ reduction actions	Bogota, Colombia	Q3-Q4/ Y3	Implementer MADS IDEAM
	Closing event. Development and socialization of roadmap.	Bogota, Colombia	Q4/Y3	Implementer MADS IDEAM CAR's MSPS INS

Gender mainstreaming

The incorporation of a gender mainstreaming is defined by the United Nations Economic and Social Council as "The process of evaluating the consequences for women and men of any planned activity, including laws, policies or programs, in all sectors and at all levels. It is a strategy aimed at making the concerns and experiences of women, as well as men, an integral part of the development, implementation, monitoring and evaluation of policies and programs in all political, economic and social areas, so that women and men equally benefit and to prevent inequality to perpetuate. The ultimate goal is to achieve equality [substantive] between genders[30]".

There is growing evidence of different associations between air pollution and respiratory health for men and women. International and local studies report stronger effects among women (including pregnant women) and girls than among men and boys, although the literature is far from consistent. It is important to note that it is unclear whether these observed changes are attributable to biological differences between men and women, exposure differences (for example, work-related exposures), or some combination of the two. Gender analysis, such as disaggregating social and biological differences between men and women (e.g. hormonal status), can help elucidate this difference, identify key mechanisms, and design more effective interventions[31].

Elements of the incorporation of the gender mainstreaming in the context of air quality management are:

- Raising awareness of the links between exposure to harmful air pollution and the effects on human and environmental health, and gender differences in risk and impact.
- Promoting a participatory approach to ensure the inclusion of vulnerable women and populations in the development of policy and decision-making processes.

The project will include a detailed evaluation of the exposed population in the areas associated with each of the selected air quality monitors. In this way, men, women and children will be identified, and they will be the main focus for decision-making and policies following the characterization of the $PM_{2.5}$ (breathable fraction).

[30] UN WOMEN, 2018. Incorporación de la perspectiva de género. http://www.unwomen.org/es/how-we-work/un-system-coordination/gender-mainstreaming

[31] Clougherty, J.E., 2010. A growing role for gender analysis in air pollution epidemiology. DOI: 10.1289/ehp.0900994. Environmental Health Perspectives, 118(2):167-76

Project's Funding and Estimated Budget

Budget Line	Total in USD	Year 1 in USD	Year 2 in USD	Year 3 in USD
Staff:				
- National	250,000	82,500	82,500	85,000
Consultants:				
- International	60,000	20,000	20,000	20,000
- National	135,000	45,000	45,000	45,000
National travel	50,000	10,000	30,000	10,000
International travel	25,000	10,000	10,000	5,000
Meetings. workshops and other	27,000	9,000	9,000	9,000
Other direct costs				
Laboratory tests	285,000	20,000	180,000	85,000
Equipment ($PM_{2.}$ monitors)	305,000	305,000		
Financial Costs and others	420,000	220,000	100,000	100,000
Total	**1,557,000**	**721,500**	**476,500**	**359,000**

The budget for the development of the project is estimated at USD 1,557,000.

Sustainability of Project Results

Methodologies and protocols generated by this project may be applicable on all scales by any of the country's environmental authorities, which ensure that the project is sustainable over time. Furthermore, the country has a continuous and urgent need to have air quality information to support decision-making for around surveillance and control policies and actions.

This project initiative is fully aligned with the need to update and strengthen the SIAC and its several subsystems, especially SISAIRE, which were implemented in 2007. Therefore, the sustainability of the results and the protocols to be developed is strongly guaranteed.

Project implementation risks

Assumptions	Risks	Acciones de mitigación
Lack of interest of the central government in project's development	Low. There is a strong need for detailed information (specifically in $PM_{2.5}$ characterization) by the MADS and IDEAM.	Maintain permanent contact with the involved government entities.
Lack of access to air quality monitoring stations in selected cities.	Medium. Access to monitoring stations does not depend on IDEAM. This corresponds to local environmental authorities or private contractors.	Ensure access to the station directly with the owner of the monitor and request the permissions that are relevant for the sampling. Support access to the monitors with MADS and IDEAM.
Failure in selection of method for determining the physicochemical characterization of the $PM_{2.5}$.	Medium. Non-existence of methods for physicochemical analysis of $PM_{2.5}$ particles.	Look for existing methods in the physicochemical analysis of $PM_{2.5}$ samples.
Public order in the area of influence of the air quality monitoring stations.	Medium. The location of many of the monitoring stations is in a vulnerable area.	Request the support and accompaniment of the local police. Carry out work in groups.
Availability of sample analysis by national accredited laboratories.	Medium. There is no certainty of the availability of accredited laboratories to conduct the analysis of the $PM_{2.5}$ samples.	Assess laboratories at national and international level. The IDEAM will support the laboratory selection under current accreditations.

Monitoring, Reporting and Evaluation

All of the information (documents and data) obtained in the development of the project will be permanently verified by a consultative project verification committee, which will be convened by MADS and which will involve all public and private institutions that have relevant activities in the topic of air quality. Because the generated data is expected to form part of the Colombian Environmental Information System, the data validation must be directly carried out by IDEAM.

All reports and protocols must be reviewed and approved by the MADS development prior to disclosure or official publication.

Communication and Visibility

Donor support will be highlighted and emphasized during all relevant project activities. The project anticipates the following communication and visibility activities: issuing press releases, distributing data sheets/leaflets and newsletters, publishing project activities

on websites, making presentations in workshops, conferences and/or other events, and education/awareness campaigns.

All communication and visibility activities will be carried out in accordance with the Handbook of Communications and Visibility of Donors (if applicable). For example, awareness of the project will be promoted at various levels (national, local, etc.).

In all workshops and training courses, participants will be informed of donor funding. Their logos, along with those of the main partners, will be visible in all printed materials and presentations. Reports will prominently highlight all logos.

Press releases or other media products will refer to the names and logos of the project partners, including the source and the amount of funds.

National Counterparts

Organization's Name	Organization's Profile	Capacity	Related experiences
MADS	Public entity in charge of defining national environmental policy and promoting the recovery, conservation, protection, ordering, management, use and utilization of renewable natural resources, in order to ensure sustainable development and guarantee the right of all citizens to enjoy and inherit a healthy environment.	National level	Issuance of regulations on Air Quality and Permissible Limit Values of emissions in the environment.
IDEAM	IDEAM is a public institution for technical and scientific support to the National Environmental System, which generates knowledge, produces reliable, consistent and timely information about the state and dynamics of natural resources and the environment, which facilitates the definition and adjustment of environmental policies and decision-making by the public and private sectors.	National level	Development of the national environmental Information system
MSPS	The ministry is in charge of managing the health and social protection system, through health promotion policies, prevention, treatment and rehabilitation of diseases, as well as intersectoral coordination for policy development on health determinants; under the principles of efficiency, universality, solidarity, equity, sustainability and quality, in order to contribute to the improvement of the health of the inhabitants of Colombia.	National level	Development of studies on impacts and health information systems.

Organization's Name	Organization's Profile	Capacity	Related experiences
INS	National Health Institute has the objective of (i) development and management of scientific knowledge in health and biomedicine to help improve people's health conditions; (ii) conduct basic and applied scientific research on health and biomedicine; (iii) promotion of scientific research, innovation and the formulation of studies in accordance with the Institute's knowledge of public health priorities; (iv) health surveillance and safety in the subjects of its competence; production of biological supplies; and (v) act as a national reference laboratory and coordinator of special networks, in the General System of Social Security in Health and the Technology and Innovation System framework.	National level	Development of studies on impacts and health information systems.

Project Proposal 2:

Health Risk from Endocrine Disruptors

Project Title:	Elaboration of a strategy for the prevention/mitigation of health risks associated with Endocrine Disruptors among vulnerable populations in Colombia.
Location:	National Level
Duration:	2 years
Government Coordinating Agency and Cooperating/Executor Agency:	MSPS UNIDO
Budget (USD):	$ 828,000

1. Project Summary

Endocrine disruptors (EDs) and their associated health risks are relatively new topics in the world of environmental health. Recently, there have been advances in the identification of substances that act as EDs and strategies to prevent or mitigate risks associated with exposure. However, Colombia has yet to develop ED risk identification and mitigation programs. Within the framework of the HPAP, EDs were identified as a priority by the government, which identified the need to establish a baseline assessment of the health risk from EDs in vulnerable populations. Based on the results of the risk assessment, a strategy will be developed for the prevention or mitigation of the health risks associated with prioritized EDs in vulnerable populations of Colombia. This process will require strengthening capacities to perform the risk evaluation and for the implementation of the risk mitigation strategy.

2. Background

Although the discussion about the potential effects of endocrine disruptors began in the 90s, it was not until 2002 that the World Health Organization issued a report on this subject. In 2012, it ratified the definition of endocrine disruptors adopted in 2002 as "an exogenous substance or mixture that alters function(s) of the endocrine system and consequently causes adverse health effects in an intact organism, or its progeny, or (sub)populations. A potential endocrine disruptor is an exogenous substance or mixture that possesses properties that might be expected to lead to endocrine disruption in an intact organism, or its progeny, or (sub) populations[32]."

Although the possible mechanisms of EDs are described, according to the WHO, epidemiological studies to determine the characteristics of these substances

[32] WHO/UNEP, 2013, State of the science of endocrine disrupting chemicals – 2012: An assessment of the state of the science of endocrine disruptors prepared by a group of experts for the United Nations Environment Programme (UNEP) and WHO, https://www.who.int/ceh/publications/endocrine/en/

and the expected health outcomes from exposure pose a challenge[33]. The evidence of specific DE's associated burden of disease is still under development. WHO/UNEP's report "State of the science of endocrine disrupting chemicals - 2012"[34], lists the following potential impacts from exposure:

- female reproductive system (puberty, low fertility, infertility), polycystic syndrome, uterine fibrosis, endometriosis;
- male reproductive system (germ cell testicular cancer, congenital cryptorchidism, hypospadias, semen quality, testicular dysgenesis syndrome);
- sex ratio;
- thyroid-related diseases and disorders (hypothyroidism, congenital hypothyroidism);
- neurodevelopment in children;
- hormone-related cancer (breast, endometrial, ovary, prostate, testicular, thyroid);
- adrenal disorders;
- bone diseases;
- metabolic diseases (obesity, type 2 diabetes, type 1 diabetes); and
- immune functions, diseases and events related to the immune system (allergies endometriosis, autoimmune diseases of the thyroid).

This report notes that EDs likely play a causal role in a variety of diseases, but that experimental and epidemiological evidence is limited and insufficient in many cases.

Other more recent studies have included connections with obesity and diabetes, male reproductive health, neuro-behavioral deficits, and women's reproductive conditions. Recently, studies have been published with the objective of estimating the costs of disease associated with EDs. Those studies use an adaptation of the Intergovernmental Panel on Climate Change to assess the available evidence on the causal probability, based on the levels of epidemiologic and toxicological evidence for the contribution of one or more substances to a disease. To evaluate the epidemiological evidence the GRADE (Grading of Recommendations Assessment, Development and Evaluation) methodology was used to evaluate the toxicological evidence from laboratory and animal experimentation the recommendations of the Danish Environmental Protection Agency. The main results from this assessment can be observed in Table 1:

[33] WHO, 2014. Identification of risks of endocrine-disrupting chemicals: overview of existing practices and steps ahead. Report of a meeting in Bonn. Germany

[34] WHO/UNEP, 2013, State of the science of endocrine disrupting chemicals – 2012: An assessment of the state of the science of endocrine disruptors prepared by a group of experts for the United Nations Environment Programme (UNEP) and WHO, https://www.who.int/ceh/publications/endocrine/en/

Exposure	Result	Epidemiological evidence's strength	Toxicological evidence's strength	Probability causality (%)
PBDEs	Loss of I.Q. and intellectual disability	Moderate to high	Strong	70-100
Organophosphorus Pesticides	Loss of I.Q. and intellectual disability	Moderate to high	Strong	70-100
DDE	Childhood obesity	Moderate	Moderate	40-69
DDE	Adult diabetes	Low	Moderate	20-39
Di-2-Ethilhexil-phthalate	Adult obesity	Low	Strong	40-69
Di-2-Ethilhexil-phthalate	Adult diabetes	Low	Strong	40-69
BPA	Childhood obesity	Very low to low	Strong	20-69
PDBEs	Testicular cancer	Very low to low	Weak	0-19
PDBEs	Cryptorchidism	Low	Strong	40-69
Benzyl and Butyl Phthalates	Male infertility	Low	Strong	40-69
Phthalates	Low T	Low	Strong	40-69
DDE	Fibroids	Low-moderate	Moderate	20-39
Phthalates	Endometriosis	Low-moderate	Moderate	20-39
Multiple exposures	ADHD	Low-moderate	Strong	20-69
Multiple exposures	Autism	Low	Moderate	20-39

Source: Bond Gregory G., 2017[35]

A 2017 UN Environment/UNEP report identified 45 endocrine disrupting or potentially endocrine disrupting substances[36].However, there is uncertainty around this number due to the lack of evidence regarding the impacts of many other chemicals. Some countries have initiated the process to regulate these chemicals. In most cases, the initial process began with the collection of evidence to identify substances as being potentially endocrine disrupting, before proceeding to the establishment of a regulatory framework. Such was the case in the United States[37], the European Union[38] and Canada[39].

During the First International Conference on Chemicals Management (ICCM 1), organized under the Strategic Approach to International Chemicals Management (SAICM), the parties agreed that it is a function of the ICCM to identify emerging chemicals management policy issues that must be addressed. In that context,

[35] Bond Gregory G., Dietrich Daniel R, 2017. Human cost burden of exposure to endocrine disrupting chemicals. A critical review. Archives Toxicology, 91(8):2745-2762. DOI: 10.1007/s00204-017-1985-y

[36] UN Environment (UNEP),2017. Overview Report I: Worldwide initiatives to identify endocrine disrupting chemicals (EDCs) and potential EDCs. https://wedocs.unep.org/bitstream/handle/20.500.11822/25633/EDC_report1.pdf?sequence=1&isAllowed=y

[37] EPA, 2014. Endocrine Disruptor Screening Program Comprehensive Management Plan.

[38] European Commission, 2016.COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL on endocrine disruptors and the draft Commission acts setting out scientific criteria for their determination in the context of the EU legislation on plant protection products.

[39] Office of the Auditor General of Canada, 2018. Federal research on hormone disrupting substances as required under the Canadian Environmental Protection Act, 1999. Reports and petitions - Environmental Petitions - Petiions Catalogue http://www.oag-bvg.gc.ca/internet/English/pet_340_e_37607.html

the Third International Conference on Chemicals Management (ICCM 3) identified endocrine disruptors as an emerging issue that should be included in the scope of SAICM. During ICCM 4, the interested parties adopted a resolution inviting UN Environment/UNEP to generate and disseminate information about ED. In this context, UNEP has developed three reports:

Report 1: world-wide initiatives (government, industry, civil society and academia) for the identification of EDs and potential EDs. In total, 28 initiatives were identified. They were qualitatively analyzed and grouped according to their scope, selection criteria, selection processes and chemical information included. Additionally, 45 chemicals that were classified as EDs or potential EDs were identified. This report makes 5 general observations as a result of this analysis:

- Substantial resources have been and are being invested to identify EDs, as reflected in the number and diversity of the encountered initiatives.
- The intended purpose of individual initiatives, as well as the criteria used to identify (or include) chemicals as EDs or potential EDs, vary considerably.
- Some initiatives have already been developed and advertised, while others are planned or are in various stages of development.
- Within the identified initiatives, there is a lack of information and representation from developing countries and countries with economies in transition.
- Widely accepted criteria for the identification of EDs is not available yet, however, the European Commission on its Regulation 2018/605 recently accepted criteria for the identification of EDs in phytosanitary products (European Commission Regulation 2018/605).

Report 2: A review of current scientific knowledge regarding the life cycle, environmental exposure and health effects of 45 suspected EDs and potential EDs. The report makes four primary observations:

- There is a lack of data identifying the physical and chemical properties, as well as degradation processes and rates in environmental contamination.
- There are significant gaps in publicly available data describing the current and historical state of production, uses, and releases of EDs, in particular with regard to quantitative information. Some of this information may have been generated, but it has not been made public.
- A substantial amount of knowledge has been generated with regard to the sources of emission of some chemicals, but substantial gaps still exist for many others. Chemicals included are very diverse and only some common elements can be identified. One commonality is that the effluent from wastewater treatment plants is a major source of emissions of EDs to the environment. Information on emissions during manufacturing is very limited and is available only for some of these chemicals.
- Most environmental sampling was carried out after the year 2000. Field measurements of contamination are limited or non-existent in many lower income countries, especially in the southern hemisphere.

Report 3: Existence of national, regional and global regulatory frameworks related to EDs. The main observations made in this report were:

- Some explicit regulatory frameworks have been developed and are being implemented to address EDs; most of them in developed countries. Public information about existing frameworks (for example, documents and websites) is often scattered,

complex and/or inconsistently linked or referenced. Terminology and characteristics (e.g., scope, focus, and processes) may differ considerably between existing regulatory frameworks.

- A number of political initiatives are working towards the creation of future regulatory frameworks; some of them in countries with economies in transition.
- In addition to the emerging regulatory frameworks described in the document, many existing frameworks can implicitly address some EDs without a further understanding of the causes of such adverse effects. Compared to explicit regulatory frameworks, implicit frameworks have advantages and disadvantages.

In 2014, the World Health Organization[40] carried out a meeting to:

- Review current knowledge, experience, and practices in evaluating human exposure to EDs, analysing health outcomes, conducting epidemiological studies, prioritizing research, building capacity, mobilizing resources, and raising awareness.
- Discuss approaches to facilitate an exchange of scientific information and the creation of ED networks.
- Compile expert advice on facilitating ED-related activities at a national, regional and international level

The conclusions drawn from the event included:

- In the EDs program planning stage, an initial assessment, based on an inventory of existing data, would be useful for: defining the purposes and tasks of the program; identification of priority chemicals (based on chemical properties, potential to cause adverse effects, level of consumption, volume of production and use); deciding the exposure windows to evaluate (early life, puberty, etc.); choosing the appropriate methodology and analytical methods; and creating a biobank and a database.
- There is an urgent need to build capacity (including analytical capacity) in all relevant professional groups, especially in developing countries and countries with economies in transition, to facilitate EDs-related activities at the national and international levels.
- Developing the capacity of relevant professional groups and NGOs would significantly contribute to the collection of information and

[40] WHO, 2014. Identification of risks of endocrine-disrupting chemicals: overview of existing practices and steps ahead. Report of a meeting in Bonn. Germany. Bonn: World Health Organization.

the dissemination of knowledge about EDs. It would raise awareness in the public, those responsible for decision-making, and health professionals, and would facilitate identifying information, needs of stakeholders, and vulnerable population groups (women of childbearing age, pregnant women, new-borns, children).

- Existing resources should be used to develop ED-related capacities and actions.
- EDs and potential EDs should be included in existing national programs for monitoring environmental pollutants in various media.
- A step-by-step approach to the development and implementation of ED monitoring programs is recommended.
- In the planning stage, an initial assessment, based on an inventory of existing data, would be useful to: define the purposes and tasks of the program; identify priority chemicals (based on chemical properties, potential to cause adverse effects, level of consumption, volume of production, and use); determine the exposure windows to evaluate (early life, puberty, etc.); choose the appropriate methodology and analytical methods; and create a biobank and a database.

Colombia has not yet initiated specific actions to address health risks associated with ED. The INS, recently began raising the issue, specifically with respect to pesticides, mainly because of the potential economic impacts to Colombia's food export market. On the other hand, some scientific and clinical events have begun disseminating knowledge about EDs. Additionally, MSPS and the MADS have raised the issues in the context of the process of the country's entry to the OECD.

Despite growing awareness of EDs as a significant environmental health issue, Colombia has not yet designed a program to assess the health risks associated with EDs in the country, and there is no instrument or guidelines to address the risks posed by EDs. According to the WHO's recommendations, these should be the first steps to designing an ED assessment and risk-reduction program.

Therefore, it is necessary for Colombia to begin with the identification of the health risk, starting from the strengthening of technical capacities in all relevant institutions in order to identify and develop an ED work plan aimed at defining a regulatory framework in the short, medium and long term.

3. Project Description

Beneficiaries

The project will benefit the participating institutions by generating capacities for the identification of the health risks from EDs. The development of the strategy to prevent the health risk will generally benefit the population exposed to endocrine disruptors and specifically the most vulnerable population groups.

General Objective

To develop a strategy for the prevention and mitigation of health risks associated with prioritized endocrine disruptors in vulnerable populations of Colombia.

Intervention Strategies

Three main program actions:

1. Strengthen the institutional capacities to perform assessments of the health risks from EDs and for the implementation of the strategy for the prevention and mitigation of associated health risk among vulnerable populations of Colombia.
2. Assess actual current and emerging health risks.
3. Develop a strategy and efficient actions to prevent or decrease health risks posed by EDs

Although the actions are sequential, the final stage of capacity building is conducted in parallel with the start of the health risk assessment.

1. Capacity building: The United Nations Development Programme (UNDP) has defined the strengthening of institutional capacities as the process by which individuals, organizations and societies, obtain, strengthen and maintain the necessary skills to establish and achieve their own development goals over time

   Capacity building will start with the identification of the capacities to be developed, and based on this, the capacity building plan is defined.

   In accordance with the UNDP framework for capacity assessment, three dimensions will be included[42].

   - **Entry points.** This methodology recognizes three levels of capacities: creating a favorable environment, organizational capacities, and individual capacities. Each one of these will be an entry point for capacity diagnostics.
   - **Core problems.** Four capacity problems will be included: institutional arrangements; leadership; knowledge; and accountability.
   - **Technical and functional capacities.** Improved functional capacities may be necessary to create and manage the different policies, laws, strategies and programs. The following key capabilities will be included in this process: actors commitment; diagnosis; program formulation; response implementation; and evaluation.

4. Capacity building will be carried out to advance two development goals:
   - **Assessment of health risks from EDs.** The strategy for preventing or reducing health risk associated with ED requires a strengthening of the initial capacities in the risk assessment process.
   - **Implementation of the program to prevent or reduce health risks associated with prioritized EDs in vulnerable populations of Colombia.** It will be necessary for the relevant institutions to have the capabilities to implement the agreed risk prevention or reduction program. As a result, a capacity strengthening plan for the implementation of the program will be carried out.

2. Assessment of health risks associated with EDs: The design of a strategy to prevent or reduce health risks associated with EDs will start with a health risk assessment process. This assessment will be carried out using secondary sources, according to progress made in other countries, and based on a systematic review of those sources. No field assessments or laboratory tests will be carried out.

   Bearing in mind that the issue of ED risks is just emerging in Colombia, an initial review of the available evidence on chemicals identified as EDs will be performed in order to prioritize and define which chemicals will be included in the risk assessment. In that sense, the starting point will be the 45 chemicals listed as EDs or potential

[41] UNDP, 2008. Capacity Assessment Practice Note. UND, New York.

[42] Ibid 41.

EDs by UN Environment/UNEP. Criteria will be defined to identify which of these substances are relevant to Colombia and should be included in the risk evaluation. These criteria may include:

- consumption levels;
- volume of production and use;
- availability of information; and
- identification of hot spots.

Obtaining data on these criteria will require a process of consultation and communication with other sectors of the government involved in resource extraction, energy production, trade and agriculture, among other sectors.

The risk assessment activities will include available evidence of chemicals' properties, such as Registration, Evaluation, Authorization and Restriction of Chemicals (REACH), which includes the typical characteristics of chemicals. Subsequently, an exposure assessment will draw from information such as:

- The Endocrine Disruptor Knowledge Base (EDKB) of the FDA
- Endocrine Disruption Screening Program for the 21st century (EDSP21) EPA Dashboard
- Endocrine Active Substances Information of the European Commission DG Joint Research Centre

Other sources of information that will be consulted may include:

- Global Monitoring Plan (GMP) of the Stockholm Convention on Persistent Organic Pollutants
- Global Environmental Assessment Information System (GENASIS),
- Global Earth Observation System of Systems (GEOSS)
- WHO Data Browser containing WHO-UNEP POPs content survey data in breast milk.

7. Simultaneously with the exposure evaluation, an assessment of dose-response ratios will be carried out using the same aforementioned sources, as well as a systematic review of available evidence regarding dose responses. In this process, an analysis will be carried out to determine the factors that must be adjusted to the Colombian context.
8. Following the hazard identification, exposure assessment, and response dose analysis, a risk evaluation will be performed.
9. Professionals from the INS and MSPS, supported by a group of consultants, will carry out the risk evaluation. It will require consultation of national and international databases, stakeholder meetings, workshops, and a national and international review and validation process.

3. Finally, with the characterization of the health risk by EDs completed, the program leaders will identify strategies and actions to prevent or mitigate ED-related risks. These actions will cover the following areas:
   - Communication of the health risks posed by EDs
   - Detailed identification of sources of exposure to EDs
   - Substitutes for products containing EDs or replacement of ED use
   - Government policy development
   - Development of local and inter-sectoral capacities to reduce the health risk from EDs

Subsequently, a cost-efficiency and feasibility assessment of the actions will be carried out to determine the most relevant and cost-effective, as well as the political mechanisms necessary for their implementation. This will include a study of the cost associated with the burden of disease posed by EDs.

This work will be led by the MSPS, based on the results obtained in the risk assessment and with the support of a consulting team. The process will require significant stakeholder consultation within the government, as well as with business associations, chambers of commerce and consumers associations.

National Partners and Donors

Management of the project should include the following national authorities with competence in the production, use and regulation of substances that may contain EDs:

- MSPS: it will lead the project as the highest health authority in charge of policy, standards and regulation. It will convene the other institutions and drive the development of project activities to maintain a focus on protecting human health.
- MADS as a governmental entity responsible for environmental policy, regulation, and standards, it should participate and give technical support and, if necessary, initiate relevant environmental regulations.
- MINCIT being the entity in charge of trade policy, it should provide technical support for regulatory process as necessary. It could also provide required information regarding trade for the health risk assessment. The ministry may also choose to participate in the cost-benefit evaluation.
- MADR: being the entity in charge of formulating agricultural, fishing, and rural development policies, the ministry's participation will be necessary in the risk assessment and in identifying the strategies and actions to prevent exposure to EDs, including cost-benefit studies.
- INS: Considering its mandate to guide public health research, policies and innovations, the INS will coordinate the health risk assessment activities and assist with the implementation of other activities as appropriate.
- INVIMA: with the strategic goal of strengthening coordination of inspection, surveillance, and sanitary control to protect public, it will be part of the health risk assessment team. It will also implement require actions to prevent public exposures to EDs.
- ICA: due to its mandate to implement strategies to prevent, control, and reduce health, biological, and chemical risks for animal and plant species, ICA will be part of the risk assessment team and will implement exposure reduction actions.
- Colombian Association of Endocrinology (Asociación Colombiana de Endocrinología): considering its objectives to advise on aspects related to this discipline to public or private entities, it can be a strategic partner for analysing endocrinology studies and serving in an advisory capacity on related matters.
- Local health authorities: activities will involve actions at the local level that must be developed or monitored by local health authorities. In this sense it is necessary for them to be involved throughout the strategy development and implementation process.
- UNIDO: will lead the project in cooperation with the appropriate government agencies.
- UNDP: adviser on the methodology for capacity building.
- PAHO/WHO: As a United Nations

cooperation agency on health issues, its participation is essential in order to gain access to the networks of international experts, as well as the latest developments in this area.

Results of the Project

- Capacity building in the national authorities to develop health risk assessments and to implement a strategy to prevent and reduce health risks associated with EDs
- Characterization of health risks from EDs:
  - » Identification of main EDs of Interest in the country according to the health risk;
  - » Identification of exposures to EDs in vulnerable populations in the country; and
  - » Study on the burden of disease from EDs and the associated costs.
- Identification of cost-effective and feasible actions to prevent or mitigate health risk from EDs.

Activities

Most activities will take place in Bogota, with the exception of regional workshops required for consultation and validation.

Output	Actividades	Tiempo	Contrapartes
Capacity building to develop health risks from ED assessment	Identifying capabilities to perform risk assessment	Q1/Y1	MSPS UNIDO UNDP PAHO
	Capacity assessment	Q1/Y1	MSPS UNIDO UNDP PAHO
	Capacity building plan	Q2/Y1	MSPS INS UNIDO UNDP PAHO
	Implement Capacity Building Plan	Q2/Y1- Q1/Y2	MSPS INS ONUDI ONU Ambiente OPS

Output	Actividades	Tiempo	Contrapartes
Health risk by ED Assessment	Hazard identification	Q3-Q4/Y1	MSPS MADS MINCITR MADR INS INVIMA ICA UNIDO PAHO
	Exposure assessment	Q4/Y1	MSPS INS UNIDO UNDP PAHO
	Dose Response Assessment	Q4/Y1	MSPS INS UNIDO UNDP PAHO
	Risk characterization	Q1/Y2	MSPS INS UNIDO UNDP PAHO
Development of a strategy for	Identification of possible actions	Q1/Y2	MSPS MADS MINCITR MADR INS INVIMA UNIDO PAHO
	Identification of managers according to competencies	Q1/Y2	
	Evaluation of efficiency and feasibility of actions	Q2-Q3/Y2	
	Definition of actions and political mechanisms for its implementation	Q2-Q3/Y2	
Capacity Building to Implement the strategy for Prevention/ mitigation of health risks from	Capacity identification	Q3/Y2	MSPS MADS MINCITR MADR INS INVIMA UNIDO PAHO
	Capacity assessment	Q4/Y2	
	Capacity Building Plan	Q4/Y2	
	Implement Capacity Building Plan	Q4/Y2	

Gender mainstreaming

The incorporation of a gender mainstreaming is defined by the United Nations Economic and Social Council as "the process of evaluating the consequences for women and men of any planned activity, including laws, policies or programs, in all sectors and at all levels. It is a strategy aimed at making the concerns and experiences of women, as well as men, an integral part of the development, implementation, monitoring and evaluation of policies and programs in all political, economic and social areas, so that women and men equally benefit and to prevent inequality to perpetuate. The ultimate goal is to achieve equality [substantive] between genders[43]."

In this sense the project will include a detailed assessment of the specific exposure situations for men, women and children considering their involvement in specific activities and by age ranges. Likewise, the evaluation of the dose response ratio will consider the specific physiological conditions of men, women and children.

Financing and Estimated Budget

Category	Total (USD)	Year 1 (USD)	Year 2 (USD)
International 1	$100,000.00	$50,000.00	$50,000.00
International 2	$40,000.00		$40,000.00
National 1	$88,000.00	$44,000.00	$44,000.00
National 2	$76,000.00	$38,000.00	$38,000.00
National 3	$76,000.00	$38,000.00	$38,000.00
National 4	$40,000.00		$40,000.00
Subcontract 1	$100,000.00	$100,000.00	
Subcontract 2	$115,000.00		$115,000.00
Subcontract 3	$100,000.00		$100,000.00
Training, education & meetings	$30,000.00	$10,000.00	$20,000.00
Printed material	$12,000.00	$3,000.00	$9,000.00
Travel	$18,000.00	$8,000.00	$10,000.00
Office supplies	$10,000.00	$5,000.00	$5,000.00
Insurance, bank and contingency costs	$23,000.00	$8,000.00	$15,000.00
Total	**$828,000.00**	**$304,000.00**	**$524,000.00**

Financial, technical and logistical support is expected of the MSPS, INS, MADS and MINCIT.

[43] UN WOMEN,2018. Incorporación de la perspectiva de género. http://www.unwomen.org/es/how-we-work/un-system-coordination/gender-mainstreaming

Sustainability of the project's results

This proposal directly reflects the interests of government, as it is the result of a prioritization process carried out in collaboration with relevant government agencies. In that sense, it is guaranteed that it is within the priorities of government entities that have jurisdiction over exposure to endocrine disrupters. The Government of Colombia's potential entry into the OECD creates an additional incentive for action on endocrine disruptors.

In addition, prior to the implementation of the program plan, a capacity development process will be carried out, which will give the authorities the technical and functional capacities for the detailed design and implementation of the program.

Finally, the design of the program will be led by the national authorities and this will ensure that it is in line with its competencies, functions, resources and schedules.

Risks for the project's implementation

Assumptions	Riesgo	Acciones de mitigación
Access to information on ED sources	Medium	Involve the entities that have the data from the beginning of the project in order to achieve their commitment and interest and identify collateral benefits to the achievement of the project's goal.
International experts can be identified to advise on the program's design and activities	Medium Considering that the health risk by EDs is a relatively recent subject and the subject of ongoing research, it may not be easy to get an international expert with the time availability to advise the project	Use existing networks of participating cooperation agencies (including UN agencies) and GAHP partners.
The industrial sector participates in a proactive way in the discussion of the strategy	Medium Considering that some of the actions of the strategy could adversely affect a variety of industries, there may be resistance from the private sector	Identification of costs of inaction and cost to health. Identification of alternatives to industrial activities that may be affected by the strategy

Monitoring, Reporting and Evaluation

Project-level monitoring and evaluation will be carried out in accordance with UNIDO requirements as the proposed implementing agency though the Independent Evaluation Division.

Additional mandatory monitoring and evaluation requirements will be met in accordance with the policies and requirements established by potential donors.

Communication and Visibility

Donor support will be highlighted and emphasized during all relevant project activities. The project anticipates the following communication and visibility activities: issuing press releases, distributing data sheets/leaflets and newsletters, publishing project activities on websites, making presentations in workshops, conferences and/or other events, and education/awareness campaigns.

All communication and visibility activities will be carried out in accordance with the Handbook of Communications and Visibility of Donors (if applicable). For example, awareness of the project will be promoted at various levels (national, local, etc.).

In all workshops and training courses, participants will be informed of donor funding. Their logos, along with those of the main partners, will be visible in all printed materials and presentations. Reports will prominently highlight all logos.

Press releases or other media products will refer to the names and logos of the project partners, including the source and the amount of funds.

Project Proposal 3:

Inspection Monitoring and Control of Pesticide residues in Foods

Project title:	Strengthening of the country's institutional coordination for the inspection, monitoring and control of pesticide residues in food
Location:	National level
Duration	4 years
Government Coordinating Agency and Cooperating /Executing Agency:	MSPS UNIDO
Budget (USD):	$2,300,960

1. Project Summary

Colombia is one of the five countries with the highest average levels of pesticide use in the world.

Since the adverse health effects of pesticides have been identified, prohibitions have been instituted regarding their use. Despite the existence of specific regulations for the use of certain types of pesticides, as in the case of Law 1196 of 2008 for POPs (Persistent Organic Pesticides), most researchers believed the illegal use of pesticides is widespread.

Within the framework of the Health and Pollution Action Plan, this project proposal aims to mitigate public exposures to pesticide resides on food. The objective of the project is to strengthen institutional coordination in the country for the inspection, monitoring and control of pesticide residues in food as a tool to reduce public exposures to chemical contaminants that are detrimental to health and well-being.

2. Background

A study of Pesticides in Colombia conducted by the Economic Studies Group of the Superintendent of Industry and Commerce in 2013 established that Colombia stands out as one of the five countries with the highest average levels of pesticide use in the world. Through the study, 1,573 products were monitored consisting of five types of pesticides, most of them herbicides (40.8%), fungicides (35.6%) and insecticides (23.3%).

Based on evidence of existing negative health impacts from pesticides exposures, the MSPS, MADR, ICA, have collaborated to establish regulations of the use of certain pesticides[44].

In addition, Colombia has obligations under the Andean Decision 436 of 1998 concerning the registration and control of chemical pesticides for agricultural use. In Colombia, these requirements are regulated through Decree 502 of 2003.

The pesticides regulatory framework

[44] MADS, 2018. Plan de Implementación del Convenio de Estocolmo sobre Contaminantes Orgánicos Persistentes.

includes: Law 9 of 1979, which dictates measures for the protection of the environment; Law 112 of 2007 concerning the modifications to the General System of Social Security in Health; Resolution 1229 of 2013 which establishes an inspection and control regime for food products; Decree 1843 of 1991, which establishes the mandate and mechanisms for epidemiological control and surveillance of pesticide use and handling; and Resolution 2906, establishing the Maximum Limits of Pesticide Residues (MLPR's) in food for human consumption.

Despite the existence of specific regulations and prohibitions on the use of some types of pesticides, such as Law 1196 of 2008 for POP pesticides, it is presumed that Endosulfan and Lindane are still being illegally used. The existence of the illegal trade and use of banned pesticides has been corroborated through reports of poisoning[45].

Food safety monitoring and control is divided into three stages by different government entities. During food production, the control of animal and plant health is under the authority of the ICA, under the MADR. This entity is responsible for controlling and monitoring the application of during the growing process. When the animal or food is to be harvested and processed, the surveillance and control is passed to the INVIMA. During marketing and distribution of the product, the surveillance is under the jurisdiction of local agencies such as the local Secretary of Health (e.g. Secretary of Health and Bogota, Departmental Secretary of Cundinamarca). The MADS is in charge of managing pesticide residues at the national level, while at a territorial level, CARs are in charge of residue inspection, surveillance and control.

Technical guidelines for monitoring of food residues are contained in Resolution 770 of 2014, which establishes guidelines for the formulation, implementation, monitoring and evaluation of National Sub-sectoral Plans for Monitoring and Control of Residues in Food.

In 2010, INVIMA developed monitoring and control plans for pesticides (including some POPs) and chemical contaminants in animal and vegetable food products. The result of this monitoring is communicated to the ICA for corresponding risk management.

Some of the selection criteria of the products to be included in the yearly Sampling Plan are the levels of consumption determined by The National Survey of Nutritional Status (ENSIN by its Spanish acronym) and the export potential of products. By 2013, approximately 22 sets of products were monitored including fruits, vegetables and legumes.

In 2014, the results of analyses of pesticides residues showed high levels of several pesticides: carbendazim, clothianidin and thiamethoxam in bananas; dithiocarbonates in onions; cypermethrin and difenoconazole in passion fruit; cyhalothrin, dithiocarbamates and cypermethrin in melon; methamiodophos, fipronil and dimethomorph in potatoes; cypermethrin in watermelon; and cypermethrin and carbendazim in tomatoes[46].

For 2015, the analysis of pesticides in food showed the following: difenoconazole and deltamethrin in local onions; difenoconazole and imidacloprid in imported onions; lufenuron, acetamiprid and dimethoate in imported beans; imidacloprid in imported apples; cypermethrin and difenoconazole in passion fruit; difenoconazole, tebuconazole and clothianidin in melon; bifenthrin, dimethomorph and methamidophe in potatoes; carbendazim, cypermethrin, imidacloprid and tebuconazole in tomatoes; and carbendazim in tree tomatoes [47].

It should be noted that in the development of the risk evaluation reports under this project proposal it is essential to distinguish the incidence of pesticide residues from exposure levels so as not to create unnecessary concern

[45] Ibid 44.

[46] MSPS and INVIMA, 2017, Plan Nacional Subsectorial de Vigilancia y Control de Residuos de Plaguicidas y Metales en Alimentos de Origen Vegetal (Hortofruticola) - PNSVCR.

[47] Ibid 46.

about trace amounts of chemicals in places where they have little effect on public health. However, it is also important to consider all sources and pathways of exposure so that an accurate picture of the potential future health effects can be drawn.

The National Quality of Life Survey[48] in 2011 reported that the population between 16 and 45 years of age is most directly exposed to pesticides, while only 7% of minors between 6 and 15 years are exposed. Exposures increase among 16 to 30-year-olds (28%) and 31 to 45-year-olds (36%). After this age, the exposure decreases to 23% for 46 to 60-year-olds, and 6% for individuals over 65.

In 2015, the INS tested various foods and determined that certain foods contained high concentrations of pesticides. The assessment of food safety risks for organochlorine pesticide residues (OCL) in meat and milk indicated that these foods can contain residues of OCL pesticides due to contaminated food and the water consumed by the animals. Even though the use of these chemicals is forbidden or restricted[49].The INS has conducted this type of evaluations in more than 20 food types, however, the data and results have not been made public.

The population groups most susceptible to OCL pesticide exposure through the consumption of meat and milk include: minors, due to their higher milk intake; pregnant women, as OCL compounds can cross the placental barrier; and older adults due to longer exposure throughout their lives[50].

Academic studies confirm cases of milk and meat contamination. For example, Arcor and Jaramillo[51] and Díaz-Pongutá[52], took samples of pasteurized silk in Cartagena and samples of raw milk in Córdoba, and showed that they had levels of lindane higher than the maximum recommended levels established by FAO/WHO (0.01 mg/kg) with a maximum value of 0.062 mg/kg fat base for pasteurized milk. In the case of raw milk, analysis showed elevated levels of DDT (47.17 ng/g), endrin (47.1 ng/g), dieldrin (48.7 ng/g), aldrin (36.6 ng/g) and HCH (469.6 ng/g)[53].

With the purpose of improving risk analysis and ensuring food safety, Colombia established a formal System of Sanitary and Phytosanitary Measures (MSF by its Spanish acronym). There has been considerable progress in the introduction of the system as an integral part of the National Policy on Agricultural Security and Food Safety (CONPES 3375 of 2005). It is also important to highlight the creation of the Phytosanitary and Safety Policy for Fruit and other Vegetable Chains (CONPES 3514 of 2008) and the Consolidation of the Sanitary and Safety Policy for the Milk and Meat Chains (CONPES 3676 of 2010).

In this context, through Decree 2833 of 2006, CIMSF was created in Colombia aimed at coordinating and guiding pesticides residue policies and bridging the sectors of agriculture, health, environment, and trade.

Despite their efforts to monitor and control residues of pesticides effectively and in accordance with national law and systems, the agencies of the Government

[48] MADS, 2012. Diagnóstico Nacional de Salud Ambiental. https://www.minsalud.gov.co/sites/rid/Lists/BibliotecaDigital/RIDE/INEC/IGUB/Diagnostico%20de%20salud%20Ambiental%20compilado.pdf

[49] INS, 2015. Evaluación de Riesgos en Inocuidad de Alimentos - Residuos de plaguicidas organoclorados en matrices de carne y leche de origen bovino.

[50] Ibid 49.

[51] INS, 2015. Residuos de plaguicidas organoclorados en matrices de carne y leche de origen bovino. Documentos de Evaluación de Riesgos en Inocuidad de Alimentos.

[52] Ibid 51.

[53] INS, 2015. Evaluación de Riesgos en Inocuidad de Alimentos - Residuos de plaguicidas organoclorados en matrices de carne y leche de origen bovino.

of Colombia have faced challenges tracing products to their origins, which prevent them from tackling pesticides residue issues at the source. In order to have an effective monitoring and control program, it is necessary to identify existing gaps, as well as build capacities to implement existing policies and programs, including CONPES.

3. Project Description

Beneficiaries

The main direct beneficiaries of the project include three groups:

1. With the implementation of the project, government entities involved in the inspection, monitoring and control of waste in food will have the necessary tools to improve their coordination and have the necessary information to control the quality and safety of food and supplies that are produced and distributed in the country. They will also have the technological and physical infrastructure to detect when maximum permissible limits of certain chemicals or waste are exceeded and the necessary means to mitigate the health risks that these events may pose.
2. Primary producers, processors, distributors, marketers, exporters and all other actors involved in food production and sales will be able to ensure the safety of their products, productivity of their businesses, and the mitigation of financial risks (in the case of export products that could be rejected due to residues).
3. Finally, consumers will be better informed about the quality of the food they eat and the safety controls that the government is capable of implementing, and as a consequence, be less exposed to contaminants harmful to their health.

General Objective

The general objective of the project is to strengthen the risk analysis capacities in the country, regarding inspection, surveillance, and control of pesticides residues in food. This risk analysis will help prevent public exposures to chemical contaminants that are detrimental to health and well-being.

The strengthening of these capacities will be achieved through:

- Identification of ways to streamline and simplify rules concerning the registration, control, use, management and surveillance of pesticides.
- Establishment of an Agriculture Traceability System for priority products potentially contaminated with pesticide residues.
- Implementation of a pilot project for the Agriculture Traceability System for priority products with pesticide residues.
- Implementation of the National Action Plan for Laboratory Certification that allows for the formation of a network

of reference laboratories specialized in the analysis of pesticide residues.

- Strengthening of the risk analysis process in the inspection, monitoring and control of pesticide residues in food.

Intervention Strategy

In order to achieve the proposed general objective, the project has been organized into four components:

A. Harmonization of public policy standards and tools

This involves identification of ways to harmonize the rules concerning the registration, control, use, management, and surveillance of pesticides (including additives). This action will incorporate changes to international standards and obligations under agreements such as the Stockholm Convention (e.g. Decision 436 CAN) and substances that are still the subject of analysis by the institutions responsible for the management of pesticides in the country that are not included in the current legislation.

B. Establishment of the Agriculture Traceability System for priority products with pesticide residues

By establishing the Agriculture Traceability System, based on international benchmarks and adapted to the context and conditions of the country, the institutions in charge of pesticide management will be able to track products back upstream to identify and address contamination problems at the source.

The system will include technical tools (manuals, guides, databases) and information tools (software, applications, computer development), necessary for the centralization, updating, monitoring and dissemination of contamination information.

C. Pilot Project for the Agriculture Traceability System for priority products with pesticide residues

Once the traceability system has been designed, all its elements and components will be tested on a set of priority agricultural products as selected by the government institutions in charge of the pesticides residue risk analysis.

D. Implementation of the National Network of Reference Laboratories certified and specialized in the analysis of pesticide residues.

A network of public and private certified reference laboratories with the capacity to analyze pesticide residues in food will be established to increase the effectiveness, efficiency and general capacities of the government to identify contaminated agricultural products.

National Partners and Donors

In accordance with the guidelines of the Colombian Government regarding institutional coordination and guidance in the implementation of the Agricultural Sanitary and Safety Policy (Decree 2833 of 2006), the project will be organized according to the action plans of the CIMSF. That is, it will be a collaboration among the following entities:

- Minister of MADR or its delegate.
- Minister of MSPS or its delegate.
- Minister of MINCIT its delegate.
- Minister of MADS or its delegate.
- Director of DNP or its delegate.

Likewise, the development of the project will also be carried out with the technical support of the permanent members of the CIMSF, their working groups and advisors:

- Director of the IDEAM, or its delegate.
- Manager of the ICA, or its delegate.
- Director of the INVIMA, or its delegate.

- Director of the INS, or its delegate.
- Superintendent of Industry and Commerce, or its delegate.

During the planning phase of the project, it will be necessary to identify donors and commitments from the national counterparts. In the first case, the Presidential Cooperation Agency will be consulted to find potential donors interested in financing the initiative, according to the subject matter, scope and estimated budget. UNIDO can act as an implementing agency, where as Pure Earth and the Global Alliance for Health and Pollution (GAHP) will provide technical support. In the planning phase, the roles and responsibilities of the respective representatives of each entity will be clearly established.

Project Outcomes

The project aims to achieve the following outputs:

1. Completed and harmonized regulatory framework for the monitoring and control of residues of pollutants in agricultural products

At the end of the project, all laws, decrees, resolutions and other normative instruments concerning chemicals in food, guidelines for the monitoring and control of residues, and traceability systems will be analyzed to allow for effective food safety management and risk reduction.

2. Improved and strengthened risk analysis for the inspection, monitoring and control of pesticide residues in food

The country will have a reliable and efficient risk analysis process that provides government agencies responsible for monitoring food safety the tools not only to identify contamination, but also to take corrective measures to mitigate adverse health effects.

3. Operational Pilot National Agriculture Traceability System

The National Agriculture Traceability System will allow governmental entities in charge of monitoring and controlling food safety to have an updated and centralized record of all actors involved in the different agricultural production chains. It will allow authorities to mitigate adverse effects in human health, as well as financial, logistical and production risks, with the possibility of identifying the root cause and the sources of contamination.

4. Network of Reference Laboratories certified and specialized in pesticide residues analysis in food

The public and private laboratories selected to complete the certification process with international standards will receive the aforementioned certification and will be able to meet the sampling and analysis needs for the effective monitoring and control of pesticide residues in food.

Activities

Output	Activity	Location	Tiempo	Socios
Formulation of tools to strengthen institutional coordination	Diagnosis of the current regulatory framework.	Bogota, Colombia	Q1/Y1	MADR MSPS MADS DNP
	Identification of the institutional roles and responsibilities for pesticide management in the country.	Bogota, Colombia	Q2/Y1	MADR MSPS MADS DNP
	Analysis of obligations under international conventions signed by the country in the field of pesticides.	Bogota, Colombia	Q2/Y1	MADR MSPS MADS DNP Chancellery
	Identification of needs for the harmonization of existing standards.	Bogota, Colombia	Q3/Y1	MADR MSPS MADS DNP
	Harmonization of roles and responsibilities for pesticide management in the country.	Bogota, Colombia	Q4/Y1	MADR MSPS MADS DNP
	Harmonization of the regulatory framework in the field of pesticides.	Bogota, Colombia	Q1-Q4/Y2	MADR MSPS
	Harmonization and generation of tools for the implementation of the National Agricultural Health and Food safety Policy	Bogota, Colombia	Q1-Q4/Y2	MADR MSPS MADS DNP ICA INVIMA INS

Output	Activity	Location	Tiempo	Socios
Design of the National Agricultural Traceability System (SNTV by its Spanish acronym))	International Reference Mapping	Bogota, Colombia	Q1/Y1	Implementing agency
	Evaluation of tools applicable to the national context.	Bogota, Colombia	Q2/Y1	MADR MSPS MADS DNP ICA INVIMA INS National Institute of Metrology (INM by its Spanish acrynoym)
	Design of protocols, methodologies and guides.	Bogota, Colombia	Q3-Q4/Y1 - Q1-Q2/Y2	MADR ICA INVIMA INM
	Validation of protocols, methodologies and guides	National	Q2-Q3/Y2	MADR MSPS MADS DNP ICA INVIMA INS INM
	Creation of computer tools for the SNTV.	Bogota, Colombia	Q4/Y2 - Q1-Q4/Y3 - Q1/Y4	MADR ICA INVIMA INM
	Socialization and training for SNTV.	National	Q2-Q3/Y4	MADR ICA INVIMA INM

Output	Activity	Location	Tiempo	Socios
Implementation of the pilot test of the Agriculture Traceability System.	Baseline of health events that may be indicative of exposure to pesticide residues in food.	Bogota, Colombia	Q1/Y1	MSPS INS
	Establishing a baseline of pesticide possibly responsible for the identified health events.	Bogota, Colombia	Q1/Y1	MSPS INS
	Selection of crops/products (pesticides) for pilot implementation.	Bogota, Colombia	Q2/Y1	MADR MSPS MADS MINCIT DNP ICA INVIMA INS INM
	Inception of the pilot.	National	Q3-Q4/Y1 - Q1-Q2/Y2	MADR ICA INVIMA
	Data, results and adjustment of the pilot analysis.	Bogota, Colombia	Q3-Q4/Y2	MADR MSPS MADS MINCIT DNP ICA INVIMA INS INM
	Socialization of results.	National	Q1-Q2/Y3	MADR MSPS ICA INVIMA INS

Output	Activity	Location	Tiempo	Socios
National Plan of Action for certification of laboratories for pesticide residue control.	Mapping of laboratories in appropriate for the certification process.	Bogota, Colombia	Q1/Y1	MADR ICA INVIMA INM ICONTEC
	Internal audits of sampling and analytical capacities.	National	Q2/Y1	MADR ICA INVIMA INM ICONTEC
	Selection of laboratories to implement the certification process.	Bogota, Colombia	Q2/Y1	MADR ICA INVIMA INM ICONTEC
	Validation of analytical methods and implementation of the Quality Certification (ISO 17025)	Bogota, Colombia	Q3-Q4/Y1 - Q1-Q2/ Y2	MADR ICA INVIMA INM ICONTEC

Gender Mainstreaming

Women, especially pregnant women and those of childbearing age, are disproportionally impacted by toxic pollution. Heavy metals and other chemicals can be transmitted to the fetus in utero and via breast milk[54]. Exposures can exacerbate other health concerns, trigger long-term illness, cause permanent neurological damage and lower IQs. They can have a multigenerational impact, affect the future reproductive and genetic health of a fetus, and have been linked to pre-term birth and infant mortality[55].

Small children often accompany their mothers at work. Women working in livelihoods that involve toxicants or chemicals are at high risk for poisoning themselves, their babies and children[56]. Women are commonly pushed to the fringe in many industries, thereby forming a de facto high-risk population. Women can bring home toxic dust on their clothes and in their hair, creating a secondary source of exposure at home. Inadequate hygiene before meal preparation can contaminate food[57]. Educational differences or biases in access to training may mean that women are less equipped than men to understand, deal with and make decisions about pollution problems

[54] PURE EARTH. (s.f.). Gender Analysis. Reducing the threat of toxic pollution to human health in low - and middle - income countries.

[55] Ibid 54.

[56] Arcury, Thomas A., Quandt, Sara A. (Eds.), 2009. Latino Farmworker in the Eastern United States: Health, Safety and Justice. Springer, ISBN 978-0-387-88347-2

[57] Lacasaña et al. 2006. Maternal and paternal occupational exposure to agricultural work and the risk of anencephalyIbid. DOI: 10.1136/oem.2005.023333.

and exposures[58]. Likewise, the effect of prenatal exposure to pesticides on low birth weight and on the increase of body fat at school age[59] and its impact on the neurocognitive development of children has been studied and demonstrated[60]. Women are also at greater risk for multiple exposures, such as exposures to lead or mercury at work, and particulates released from cook stoves at home. As primary caregivers, women's workloads may be additionally burdened if pollution exposures cause illness or disability in the family[61].

This project will directly address gender issues by ensuring participation in and benefits from the project are equitable, and that all project activities involve and enable women. Gender-appropriate accessible tools, language, and procedures will be used.

Specific gender objectives are to:

1. Ensure equitable participation of women and men in technical assistance and education/communication activities, so that women are represented, can voice their needs/opinions, and can access appropriately presented information and training. Special accommodations will be made for any nursing mothers.
2. Incorporate gender considerations into baseline data collection and project design. Answer key questions, such as: are women and girls disproportionately affected, how and why? What are the economic and socio-cultural reasons? Does this increase or decrease women's risks? Do these differences require different interventions or strategies? Are there sensitivities or existing conflicts or issues to consider regarding gender that the project could potentially worsen? What is the project's potential impact on women? Are there any local female leaders or women's organisations already working on these issues and championing solutions?
3. Hire and train an inclusive project staff representative of the population served, including languages spoken, gender, and cultural background.

The UNIDO Guide on Gender Mainstreaming will be used to ensure gender mainstreaming is integrated into the project. In summary, it establishes the following steps for this integration:

1. Gender analysis.
2. Stakeholder mapping.
3. Integration of Findings.
4. Develop a gender-sensitive outcome framework.
5. Gender-sensitive budget and gender marker.
6. Risk assessment.
7. Selection of the implementation team.
8. Working with partners
9. Develop a gender chart.
10. Follow-up of gender outcomes.
11. Assessing gender outcomes.

[58] Arcury, Thomas A., Quandt, Sara A. (Eds.), 2009. Latino Farmworker in the Eastern United States: Health, Safety and Justice. Springer, ISBN 978-0-387-88347-2

[59] Wohlfahrt-Veje, C., Main, K., Schmidt, I., Boas, M., Jensen, T., Grandjean, P. Andersen, H. (2011). Lower birth weight and increased body fat at. Environmental Health. 10:79. DOI: 10.1186/1476-069X-10-79.

[60] Sullivan, J., & Riccio, C. (2016). Pediatric Neurotoxicology. Academic and Psychosocial Outcomes. Springer, ISBN 978-3-319-32358-9

[61] INS, 2015. Evaluación de Riesgos en Inocuidad de Alimentos - Residuos de plaguicidas organoclorados en matrices de carne y leche de origen bovino

Project Finance and Estimated Budget

Category1	Total (USD)	Year 1 (USD)	Year 2 (USD)	Year 3 (USD)	Year 4 (USD)
Consultants					
International 1	$48,000	$24,000	$24,000		
International 2	$245,000	$22,000	$104,000	$99,000	$20,000
International 3	$85,000	$10,000	$30,000	$25,000	$20,000
National 1	$72,000	$18,000	$18,000	$18,000	$18,000
National 2	$36,000	$9,000	$9,000	$9,000	$9,000
National 3	$24,000	$6,000	$6,000	$6,000	$6,000
Personnel					
National 1	$48,000	$12,000	$12,000	$12,000	$12,000
National 2	$54,000	$13,500	$13,500	$13,500	$13,500
National 3	$54,000	$13,500	$13,500	$13,500	$13,500
Other					
Subcontracts 2	$760,000	$190,000	$190,000	$190,000	$190,000
Subcontracts 3	$411,000	$102,750	$102,750	$102,750	$102,750
Other direct costs					
Trainings, education & meetings	$139,000	$34,750	$34,750	$34,750	$34,750
Printed material	$62,000	$15,500	$15,500	$15,500	$15,500
Travel	$138,960	$34,740	$34,740	$34,740	$34,740
Project Management					
Contracts	$100,000	$25,000	$25,000	$25,000	$25,000
Office Supplies	$20,000	$5,000	$5,000	$5,000	$5,000
Insurance, bank and contingency costs	$4,000	$1,000	$1,000	$1,000	$1,000
Total	**$2,300,960**	**$505,740**	**$607,740**	**$573,740**	**$489,740**

[1] Numbers 1, 2 and 3 refer to the breakdown of costs in the components of the project as follows 1: strengthening institutional coordination; 2: SNTV and pilot; 3: Certifications and Network of laboratories.

The estimated budget for the implementation of the project is USD $2,300,960.

The budget values correspond to reference prices taken from projects financed by the Global Environment Facility (GEF) focused on the management of chemicals and residues[62]. Because of this, once the project is in the planning phase, the values should be adjusted according to the specific requirements of each component.

As mentioned in section D, during project planning phase, the financing process (donors) and commitments of national counterparts will be managed. The project is expected to have financial, technical and logistical support of the MADR, MSPS, MADS, DNP, and perhaps to a lesser extent, the MINCIT.

Sustainability of the Project

The project's sustainability will be ensured through the following actions and elements:

1. The process of policy harmonization will be carried out in an collaborative manner with all government entities with roles and responsibilities in the monitoring and control of pesticide residue in food to create a sense of mutual ownership over the process and results.
2. Design, implementation, validation and operation of the National Agricultural Traceability System will have the continuous participation of the private sector so that all those involved in agricultural production chains are actively involved and can adopt the system as a strategic element in their operations.
3. The CIMSF will be the governing body which will sponsor the development of the project ensuring that the necessary actions for the project are consistent with the Commission's existing mandate and mission.
4. Training, education and dissemination of information will be used to raise awareness among all stakeholders of the scope, development, results and benefits of the project.
5. To complement the strengthening of government capacity in the monitoring and control of pesticide residues in food the project will explore the creation of financial incentives to encourage adoption and adherence among the private sector.
6. The project will also pay particular attention to the financial impacts on, and possible incentives for small farmers.

[62] GEF, Project No. 6928: Reducing UPOPs and Mercury releases from healthcare waste management, e-waste treatment, scrap processing and biomass burning & National Program for the environmental Sound Management and Live Cycle management of Chemical substances. https://www.thegef.org/project/reducing-upops-and-mercury-releases-healthcare-waste-management-e-waste-treatment-scrap

Risks for the project's implementation

Assumptions	Risks	Mitigation actions
Collection of, and access to needed information for inventories and baseline evaluations will be possible.	Low. State entities involved in the creation of the project have shown high interest in actively participating in the implementation.	Establish clear roles and responsibilities for each of the entities involved in the implementation of the project and receive assurances regarding the availability of data.
Congress will accept bills to harmonize rules regarding the monitoring and control of pesticide residues in food.	High. Congressional inaction often delays or blocks the execution of projects.	Keep stakeholders informed throughout the project and advocate for the initiative in Congress.
The private sector is an active part of the construction and implementation of the pilot of the National Agricultural Traceability System (SNTV).	High. Fear or misunderstanding about the project's impacts on business operations may reduce private sector acceptance and participation.	Involve the private sector from the planning phase of the project and raise awareness about the benefits of having a SNTA (e.g. Risk mitigation for health and exports).
Government entities actively participate in the project, particularly in the education and training activities.	Low. State entities involved in the development of the project have shown high interest in actively participating in its implementation.	Establish clear roles and responsibilities for each of the entities involved in the implementation of the project.
Labs make the necessary investments to reinforce the installed capacity required to provide identification and analysis of pesticides residues in food services.	Medium. If costly investments are required to improve the capacity of laboratories, financing may be needed for certification activities.	Select those labs most likely to succeed according to their technical and operational capacity. Promote incentives/ subsidies from the government for private laboratories.
Wide dissemination (national, regional, global) of learned lessons and the results of the project will be possible.	Low. State entities involved in the design of the project initiative have shown high interest in actively participating in the implementation of the project and sharing results.	Generate opportunities for the exchange of information, results and learned lessons of the project, through the organization of workshops, training sessions and making use of social networks and multimedia tools.

Monitoring, Reporting and Evaluation

Monitoring and evaluation will be carried out in accordance with UNIDO requirements through its Independent Evaluation Division.

Additional mandatory monitoring and evaluation requirements will be met in accordance with the policies and requirements established by potential donors.

Communication and visibility

Donor support will be highlighted and emphasized during all relevant project activities. The project anticipates the following communication and visibility activities: issuing press releases, distributing data sheets/leaflets and newsletters, publishing project activities on websites, making presentations in workshops, conferences and/or other events, and education/awareness campaigns.

All communication and visibility activities will be carried out in accordance with the Handbook of Communications and Visibility of donors (if applicable). For example, awareness of the project will be promoted at various levels (national, local, etc.).

In all workshops and training courses, participants will be informed of donor funding. Their logos, along with those of the main partners, will be visible in all printed materials and presentations. Reports will prominently highlight all logos.

Press releases or other media products will refer to the names and logos of the project partners and donors.

National Counterparts

Name of the organization	Profile of the Organization	Capacity	Related experiences
MADR	Entity in charge of formulating, coordinating and evaluating the policies that promote competitive, equitable and sustainable development of forestry, fishing and rural development, with decentralization, concertation and participation criteria, which contribute to improve the level and quality of life of the Colombian population.	National	Registration and control of chemical pesticides for agricultural use.

Name of the organization	Profile of the Organization	Capacity	Related experiences
MSPS	Directs the health and social protection system, through policies of health promotion, prevention, treatment and rehabilitation of disease, as well as inter-sectoral coordination for the development of policies on health determinants.	National	Guidelines for the formulation, execution, monitoring and evaluation of national plans for monitoring and control of pesticide residues in food. Identification and constant analysis of health events, through the National Public Health Surveillance System (SIVIGILA by its Spanish acronym).
MADS	Public entity in charge of defining the national environmental policy and promoting the recovery, conservation, protection, management, use and utilization of renewable natural resources, in order to ensure sustainable development and ensure the right of all citizens to enjoy and inherit a healthy environment.	National	Empty pesticides packing disposal.
MINCIT	The mission of the Ministry of Commerce, Industry and Tourism is to support the business activity, production of goods, services and technology, as well as tourism management in order to improve their competitiveness, their sustainability and to encourage the generation of higher added value.	National	Limits of chemicals and other residues on agricultural products for international commerce
DNP	To lead, coordinate and articulate medium- and long-term planning for the sustainable and inclusive development of the country.	To coordinate the entities that are part of the CIMSF, being in charge of the Technical Secretariat. The Directorate of Sustainable Rural Development has experts in the agricultural area.	Empty pesticides packing disposal.

Name of the organization	Profile of the Organization	Capacity	Related experiences
Chancellery	Promote national interests through the strengthening and diversifying geographical and thematic foreign policy, prioritizing international cooperation and the development of frontiers and promoting links with Colombians abroad.	National	International Trade Treats
ICA	Entity in charge of contributing to sustainable development of the agricultural, fisheries and aquaculture sector.	National	Screening of residues and monitoring quality standards on primary agricultural products.
INVIMA	Entity with the mission of protecting and promoting the health of the population by managing the risk associated with the consumption and use of food, medicines, medical devices and other products that are subject to health surveillance.	The entity has its own lab and the capacity to analyze and report through the Food Directorate.	Design and implementation of Food Residues Monitoring Plans.
INS	Entity with the object of: (i) development and management of scientific knowledge in health and biomedicine to help improve people's health conditions; (ii) conduct basic and applied scientific research in health and biomedicine; (iii) Promote scientific research, innovation and the formulation of studies in accordance with the Institute's public health priorities; (iv) health surveillance and safety in the subjects of its competence; and (v) Act as a national reference laboratory and coordinator of special networks, within the framework of the General System of Social Security in Health and the Science, Technology and innovation System.	National	Identification and regular analysis of health events, and report through the National Epidemiological Fortnightly Reports (IQUENs by its Spanish acronym). Protocols of Chemical Poisoning.
INM	The INM coordinates scientific and industrial metrology, and the execution of activities that support the economic, scientific and technological development of the country.	National	Quality standards.

Name of the organization	Profile of the Organization	Capacity	Related experiences
Colombian Institute of Technical Standards and Certification (ICONTEC by its Spanish acronym)	The main activity of ICONTEC is the study, adoption and promotion of technical standards in the different economic and social activities related to the private and governmental sectors of the country. It is also involved in quality assurance, education and training in quality and standardization systems.	42 different and specified standardization areas and 162 active technical committees. 5 Metrology laboratories that provide calibration services to the industry	Certifies Laboratories in the ISO17025 Standard
District and Departmental Health Secretariats	Responsibility for guaranteeing the right to health.	Local according to jurisdiction	Monitoring of health events (for example, intoxication by exposure to chemicals)

Project Proposal 4:

National Contaminated Sites Identification and Screening Program

Project Title:	National Contaminated Sites Identification and Screening Program
Location:	Colombia
Duration:	3 years
Government coordination agency and Executing agency/cooperating agency:	MADS in collaboration with the non-profit organization Pure Earth
Budget (In EUR):	450,000

1. Project Summary

The National Contaminated Site Identification and Screening Program will establish, for the first time, a database of sites that are contaminated by toxic chemicals in Colombia. The program will aim to identify and screen sites across the country where soil and water pollution pose public health risks.

The program will begin with a review of relevant datasets and publications regarding the presence of chemical contamination throughout the country. Based on this review, the program managers will develop a preliminary list of known or suspected contaminated sites that are targeted for a screening assessment. Once a preliminary list of sites is complete, the managers will prioritize the list based on the human toxicity of the contaminant or the suspected concentration of the contaminant relative to national or international standards, screening thresholds, or guidance levels.

Once a preliminarily list of target sites is developed, a team of trained investigators will conduct rapid site screening assessments following a standardized screening protocol aimed at confirming the presence of chemical contaminants and exposure pathways to human receptors (local population), and evaluating the relative severity of potential public health risks. The screening assessment will include a tour of the source and likely contaminated area, photos, interviews with local stakeholders, the creation of maps, sampling of soil and water, and the collection of relevant geographical, geological, hydrological, social and demographic data used to evaluate the source and migration of contaminants, the likely pathways into the human body and the overall risk to the local population.

The data from the screening assessments will be uploaded into an online database that is designed to collect all relevant types of data and to generate a preliminary risk score for each site. This data and risk score will be used by the Government of Colombia and other stakeholders to begin estimating the morbidity and mortality associated with exposures to chemical pollutants across Colombia and to prioritize cost-effective risk-reduction projects, programs and policies.

2. Background

In low- and middle-income countries (LMICs) around the world, there is a distressing cycle that prevents ministries of environment from adequately addressing pollution. These ministries are often under-funded relative to their mandate. This resource scarcity prevents the ministries from collecting the type of data that would allow them to calculate the national health and economic impacts from chemical pollution. Without compelling data on the impacts, ministries cannot make strong justifications for increased resources to their ministries of finance and international development partners. Without a compelling justification, they continue to be under-resourced and cannot adequately address the challenge.

The Government of Colombia has limited information regarding the prevalence, location and severity of sites contaminated by toxic chemicals and the health risks associated with such sites. Colombia does not have a national database of contaminated "hotspots" such as the U.S. Superfund program. Without a basic understanding of the number, characteristics, severity and locations of contaminated sites within the country, it is impossible to estimate the health and economic toll from exposures to toxic chemical contamination and to design appropriate interventions and policy solutions. Establishing a basic understanding of the country's contamination profile is a critical first step to ensure that resources are properly allocated toward the highest priority issues and to addressing the country's pollution challenges in a systematic and cost-effective manner.

3. Project Description

Beneficiaries

The Program has two primary beneficiary groups: direct beneficiaries and ultimate beneficiaries. The direct beneficiaries of the program include the representatives of IDEAM and the other agencies of the MADS or other ministries that will work on the program or will benefit from access to the data collected. This is estimated to be approximately 500 individuals within the Government or in research institutes.

The ultimate beneficiaries of the program include all residents who are impacted by chemical contamination in Colombia. In similar site assessment programs implemented in other countries, the mean population at risk of exposure to toxic chemicals at each contaminated site is approximately three thousand individuals. After 200 site screenings in Colombia, the beneficiaries would be approximately 600,000 residents whose personal health risks are measured and understood by the relevant government authorities, and who may benefit from future pollution abatement policies, risk-reduction programs and remediation projects.

General Objective

The objective of the National Contaminated Site identification and Screening Program is to reduce the morbidity and mortality associated with exposures to toxic chemicals in soil and water in Colombia by increasing the capacity of the MADS to identify and assess contaminated sites and prioritize high-risk sites for pollution abatement, risk-mitigation or remediation projects.

Intervention Strategy

The program will use human health risks as the primary metric for prioritizing contaminated sites for further detailed assessments and potential interventions. The program will take advantage of existing rapid site screening protocols developed specifically for the purpose of establishing national databases of contaminated sites in low- and middle-income countries where technical capacities and resources may be limited. Similarly, the program will use existing online database software and health risk algorithms developed for similar programs in other countries to store data and analyze health risks based on the screening data collected. The use of existing protocols and database software will reduce costs, increase efficiency and help ensure that the best available tools and methodologies are employed.

The site screening protocol will likely include the collection of the following types of environmental, geographic, geologic, hydrologic, demographic, and health data:

- Site name, location, GPS coordinates
- Abstract or summary of the site, contaminant, source industry
- Date of assessment
- Estimated population exposed to sampling areas and other suspected contaminated areas
- Key pollutant
- Geotagged soil and/or water samples from between 10-20 locations around the site
- Detailed narrative site description including how the population interacts with the contaminated area, how the contaminant migrates from the source to the receptor community, and how the contaminant likely enters the body (inhalation, ingestion, dermal exposure).
- Description of the sources industry type
- Site size of contaminated area in hectares
- Depth of contamination
- Soil type
- Population density
- Land uses in the contaminated area
- Assessment of crops or livestock grown at the site
- Description of the relative ease of public access to the site
- Hydrological information and different water uses at the site
- Slope and elevation of the site
- Interview with local stakeholders
- Photographs
- Maps

Implementation Partnership(s)

The program will be implemented by IDEAM. DEAM is in charge of producing and managing scientific and technical information on the environment of Colombia. IDEAM will implement the program in partnership with the international non-profit organization Pure Earth, which will provide technical support and training. Pure Earth has conducted more than 5,000 rapid site screening assessments in 65 countries and has developed a site screening protocol that is designed to assess a wide variety of contaminants in diverse contexts. Pure

Earth has also developed a sophisticated online database tool that can receive a wide variety of site screening data, can analyze that data to create a relative risk score for each site, and can be transferred to national governments for the purpose of establishing a government owned and operated database.

Project Results/Outputs

Program outputs include:

1. A research report analyzing existing information about contaminated sites and associated impacts and establishing a list of preliminary sites targeted for initial screening assessments
2. A site screening protocol that uses the best available methods from other national and international programs and is modified to address the needs of the Government of Colombia and the types of contamination challenges present in the country
3. An online database capable of storing all relevant site assessment data and generating relative risks scores based on an algorithm that analyzes the type and toxicity of the contaminant/s, the concentration of the contaminant/s in soil and water samples, the exposure pathway to humans, the population at risk of exposure and other geographic and demographic data relevant to estimating environmental health risks
4. A training workshop where government representatives and other partners and stakeholders receive technical training on the site screening protocol

5. Screening assessments conducted at 200 known or suspected contaminated sites across Colombia
6. A report on the findings of the National Contaminated Site identification and Screening Program that contains a summary of the data collected, a list of high-priority sites that require detailed assessments and recommendations to address specific sites and common sources of contamination.

Activities

Output	Activity	Location	Time	Partners
1. Research report on existing information about contaminated sites	1.1. Establish research team	Bogota, Colombia	Q1, Y1	IDEAM, Pure Earth
	1.2. Gather all relevant reports and datasets	Bogota, Colombia	Q1-Q2, Y1	IDEAM, Pure Earth
	1.3. Draft report analyzing existing data and establishing a list of targets sites	Bogota, Colombia	Q2, Y1	IDEAM, Pure Earth
2. Site screening protocol	2.1. Review existing rapid assessment protocols	Bogota, Colombia	Q2, Y1	IDEAM, Pure Earth
	2.2. Draft screening protocol for Colombia	Bogota, Colombia	Q2, Y1	IDEAM
3. Create online database for site screening data	3.1. Transfer Toxic Sites Identification Program online database to IDEAM, translate to Spanish	Bogota, Colombia	Q2, Y1	Pure Earth
	3.2. Conduct training for IDEAM staff in the use of the database	Bogota, Colombia	Q3, Y1	IDEAM, Pure Earth
4. Training in site screening protocol	4.1. Identify a team of site screening investigators including technical staff of IDEAM or other partners who may conduct site screening assessments on behalf of the government	Bogota, Colombia	Q3, Y1	IDEAM, Pure Earth
	4.2. Develop and implement a training workshop for site screening investigators	Bogota, Colombia	Q3, Y1	IDEAM, Pure Earth
5. Site Screening Assessments	5.1. Assign specific sites to site screening investigators and develop an investigation plan and timeline	Bogota, Colombia	Q3, Y1	IDEAM
	5.2. Conduct site screening assessments and upload site data into online database	Colombia, all regions	Q4, Y1 to Q3, Y3	IDEAM
6. Report findings and develop priorities and recommendations	6.1. Analyze site data and develop a list of priority sites for further detailed assessment	Bogota, Colombia	Q4, Y3	IDEAM
	6.2. Draft final report on program findings, priorities for future actions, and recommendations to address specific sites and common problems	Bogota, Colombia	Q4, Y3	IDEAM

Gender Mainstreaming

Women, especially pregnant women and those of childbearing age, are disproportionally impacted by toxic pollution. Heavy metals and other chemicals can be transmitted to the fetus in utero and via breast milk. Exposures can exacerbate other health concerns, trigger long-term illness, cause permanent neurological damage and lower IQs. They can have a multigenerational impact, affect the future reproductive and genetic health of a fetus, and have been linked to pre-term birth and infant mortality.

Small children often accompany their mothers at work. Women working in livelihoods that involve toxicants or chemicals are at high risk for poisoning themselves, their babies and children. Women are commonly pushed to the fringe in many industries, thereby forming a de facto high-risk population. Women can bring home toxic dust on their clothes and in their hair, creating a secondary source of exposure at home. Inadequate hygiene before meal preparation can contaminate food. Educational differences or biases in access to training may mean that women are less equipped than men to understand, deal with and make decisions about pollution problems and exposures. Women are also at greater risk for multiple exposures, such as exposures to lead or mercury at work, and particulates released from cook stoves at home. As primary caregivers, women's workloads may be additionally burdened if pollution exposures cause illness or disability in the family.

This project will directly address gender issues by ensuring participation in and benefits from the project are equitable, and that all project activities involve and enable women. Gender-appropriate accessible tools, language, and procedures will be used.

Specific gender objectives are to:

1. Ensure equitable participation of women and men in technical assistance and education/communication activities, so that women are represented, can voice their needs/opinions, and can access appropriately presented information and training. Special accommodations will be made for any nursing mothers.
2. Incorporate gender considerations into baseline data collection and project design. Answer key questions, such as: are women and girls disproportionately affected, how and why? What are the economic and socio-cultural reasons? Does this increase or decrease women's risks? Do these differences require different interventions or strategies? Are there sensitivities or existing conflicts or issues to consider regarding gender that the project could potentially worsen? What is the project's potential impact on women? Are there any local female leaders or women's organisations already working on these issues and championing solutions?
3. Hire and train an inclusive project staff representative of the population served, including languages spoken, gender, and cultural background.

Project Financing and Indicative Budget

Budget line	Total (EUR)	Year 1 (EUR)	Year 2 (EUR)	Year 3 (EUR)
Project staff:				
National	230,000	70,000	90,000	70,000
Project consultants:				
National	45,000	15,000	15,000	15,000
Sub-contracts	50,000	30,000	10,000	10,000
Other direct costs				
Meetings	30,000	15,000	5,000	10,000
Equipment	45,000	30,000	10,000	5,000
Supplies	15,000	10,000	5,000	5,000
Travel	35,000	10,000	15,000	10,000
TOTAL (EUR)	**450,000**	**180,000**	**150,000**	**125,000**

The program will benefit from significant in-kind contributions from Pure Earth in the form of a ready-to-use online database for the collection and analysis of site screening data that has been developed and refined over a ten-year period at a cost of more than USD 100,000. This database infrastructure will be transferred to the Government of Colombia at no cost.

Sustainability of project results

This program is designed to generate the type of data that will allow the MADS, MSPS, and other stakeholders to communicate the health and economic impacts from exposures to pollution, thus allowing these agencies to make more compelling justifications for increased resources from national and international sources. For example, if the MSPS and MADS could adequately estimate and communicate the economic productivity loss from illness and premature deaths associated with pollution exposures, they could make persuasive cost-benefit arguments about that value of pollution mitigation programs. In this way, the program is fundamentally structured for long-term sustainability, as its primary goal is to create a foundation for increasing future resources to address pollution.

Risks to project implementation

Project assumptions	Risk of failure	Mitigation action(s)
Assumption 1. Existing reports and data will be sufficient to develop a preliminary list of targeted sites for screening assessments.	Low. IDEAM and Pure Earth have previously collaborated on an environmental health program that identified more than 100 published studies on chemical contamination in Colombia and have identified specific chemical and industrial sources that are known to cause contamination within the country. This data should be sufficient for the development of a preliminary list of targeted sites.	IDEAM will reach out to other government agencies, including regional and municipal agencies and research institutes to collect as much information as possible to aid in the development of a list of targeted sites.
Assumption 2. The mandate and priorities of the MADS, and thus those of IDEAM, do not change in a way that discourages or prevents the collection of data from contaminated sites.	Low. IDEAM was expressly created for the collection and management of scientific data pertaining to the environment.	IDEAM will consult with leadership personnel within the MADS to ensure that program activities are in line with the Ministry's priorities and will not be disrupted by elections or other shifting mandates.

Monitoring and Evaluation

All the information (documents and data) obtained in the development of the project will be permanently verified by a project steering committee, which will be convened by the MADS and including all public and private institutions participating in the project. Considering that the generated data is expected to form part of Colombian's Environmental Information System, the validation of the data must be carried out directly by IDEAM.

All reports and protocols must be reviewed and approved by the MADS prior to disclosure or official publication.

Communication and Visibility

All communication and visibility activities will be carried out in accordance with the donor's visibility requirements (if applicable).

Donor support will be highlighted and emphasized during all relevant project activities. The project anticipates the following communication and visibility activities: issuing press releases; distributing data sheets/leaflets; publishing project activities on websites; and making presentations in workshops, conferences and other events.

In all workshops and training courses, participants will be informed of donor

funding. Their logos, along with those of the main partners, will be visible in all printed materials and presentations. Reports will prominently highlight all logos. Press releases or other media products will refer to the names and logos of the project partners, including the source of funding.

National Counterparts

Organization's Name	Organization's Profile	Capacity	Related experiences
MADS	Public entity in charge of defining national environmental policy and promoting the recovery, conservation, protection, ordering, management, use and utilization of renewable natural resources, in order to ensure sustainable development and guarantee the right of all citizens to enjoy and inherit a healthy environment.	National level	Issuance of regulations on Air Quality and Permissible Limit Values of emissions in the environment.
IDEAM	IDEAM is a public institution for technical and scientific support to the National Environmental System, which generates knowledge, produces reliable, consistent and timely information about the state and dynamics of natural resources and the environment, which facilitates the definition and adjustment of environmental policies and decision-making by the public and private sectors.	National level	Development of the national environmental Information system

Annexes

Annex 1:
Contact List

Institution	Name	Title	E-mail
MSPS	Andrea Soler	Coordinator of the Development and Health Group	asoler@minsalud.gov.co
	Lina Guerrero	Specialized professional - Sub-directorate of Environmental Health	lguerrero@minsalud.gov.co
	Germán Hernández	Advisor - Sub-directorate of Environmental Health	ghernandez@minsalud.gov.co
	David Combariza	Professional of the Development and Health Group	dcombariza@minsalud.gov.co
MADS	Sandra Reina	Professional – Direction of Environmental Matters Urban and Sectorial	sareina@minambiente.gov.co
	Mauricio Blanco	Specialized professional - Direction of Environmental Matters Urban and Sectorial	mblanco@minambiente.gov.co
	Viviana Cerón	Professional – Direction of Environmental Matters Urban and Sectorial	vceron@minambiente.gov.co
	María F. Vélez	Professional – Direction of Environmental Matters Urban and Sectorial	mvelez@minambiente.gov.co
DNP	Lizeth Cantor	Professional – Sub-directorate of Environmental Management. Direction of Environment and Sustainable Development.	ycantor@dnp.gov.co
	Alejandra Sánchez	Deputy director - Sub-directorate of Environmental Management. Direction of Environment and Sustainable Development. Technical Secretary CONASA	msancheza@dnp.gov.co
MADR	Sara Zafra	Adviser – International Affairs Office	sara.zafra@minagricultura.gov.co
	Alejandro Zambrano	Professional – Direction of Technological Development and Safety Protection.	alejandro.zambrano@minagricultura.gov.co

Institution	Name	Title	E-mail
INS	Martha Ospina		mospina@ins.gov.co
	Luisa F. Soto	Adviser	lsoto@ins.gov.co
	Nathalia Muñoz	Coordinator – Environmental Risk Factors Group	nmunozg@ins.gov.co
	Jeandran Malagón	Coordinator – Occupational Environmental Health Group	jmalagon@ins.gov.co
	Ivan Sánchez	Coordinator – Risk assessment in food safety and pesticides Group	lsanchez@ins.gov.co
IDEAM	Ana M. Hernández	Professional - Sub-directorate of Environmental Studies	amhernandez@ideam.gov.co
	Leonardo Pineda	Specialized professional	lapineda@ideam.gov.co
INVIMA	Diana Ramírez	Specialized professional - Group of System of Analysis of Chemical Risks of Foods and Beverages	dramirezn@invima.gov.co
PURE EARTH	Drew McCartor	Director of Global Policy and Planning	drew@pureearth.org
	Alfonso Rodríguez	Director Country Colombia	arodriguez@pureearth.org
	Lilian Corra	International Consultant	liliancorra@pureearth.org
	Lina Hernández	Regional Director for Latin America	lina@pureearth.org
	Emily Nash	Program Associate	emily@blacksmithinstitute.org
UNIDO	Nilgün Tas	Chief and Deputy Director Industrial Resource Efficiency Division Department of Environment	N.Tas@unido.org
	Johannes Dobinger	Representative Office for Colombia, Perú, Guyana y Surinam	J.Dobinger@unido.org
	Edward Clarence Smith		eppclarencesmith@gmail.com
	Chung Duc Tran	Expert on Health and Pollution	C.TRAN@unido.org
	Salua Osorio	National Consultant	salua_osorio@hotmail.com
	Lizeth Olaya	National Consultant	l.olayazambrano@unido.org

Annex 2:
Global Alliance for Health and Pollution

The Global Alliance on Health and Pollution (GAHP). GAHP is a global collaborative body that assists low- and middle-income countries to take concrete action to reduce the impacts of pollution on health. GAHP members include more than 40 national ministries of health and environment, development banks, United Nations organizations, other bilateral and multilateral groups, universities, non-governmental organizations, and other actors working on pollution. The current GAHP Secretariat is the New York-based non-profit organization, Pure Earth (also known as the Blacksmith Institute).

More information about GAHP is available at **www.gahp.net**.

Origin and Design of the HPAP Program

The global Health and Pollution Action Plan (HPAP) program is an initiative of the GAHP. It emerged from the recommendations of the Lancet Commission on Pollution and Health and from the expertise and guidance of GAHP members. The Commission report makes six core recommendations, including:

> *"In addition to increased funding, international technical support for pollution control is needed in prioritization and planning of processes to tackle pollution within rapidly industrializing cities and countries; in development of regulatory and enforcement strategies; in building technical capacity; and in direct interventions, in which such actions are urgently needed to save lives or can substantially leverage local action and resources. Financing and technical assistance programmes need to be tracked and measured to assess their cost-effectiveness and to enhance accountability".*

GAHP has received requests from over 20 low- and middle-income country governments to facilitate research, prioritization, planning, project selection and design, and the development of funding strategies to address pollution challenges. Although GAHP is not a funding agency, the expertise and experience of its member organizations can be highly valuable for countries where national institutions face limitations related to funding and technical capacity. In response to these requests for assistance, the GAHP developed the global HPAP program, aimed at low- and middle- income countries.

The goals of the HPAP program are to:

1. Assist governments to identify, evaluate and prioritize existing pollution challenges based on health impacts
2. Establish pollution as a priority for action within national agencies and development plans
3. Define and advance concrete interventions to reduce pollution exposures and related illnesses

The HPAP is a pollution prioritization and planning process. It differs from other planning processes in that it is structured to bring together different agencies and parties that may not frequently work closely together. It is intended to promote collaboration. It is therefore driven by national agencies – Ministries of Environment, Health, Production/Industry, Transport, Energy, Mining, Agriculture and others – with facilitation and support by GAHP. The process can be tailored to the needs of an individual country, and aims to assist governments in identifying, prioritizing and accelerating national interventions to reduce pollution-related illness and death. It is designed to develop and implement well-defined and practical outcomes, with commitments by all the participants, including international partners and donors, to undertake specific short- and medium-term actions to improve environmental health. In countries where a National Environmental Health Action Plan (NEHAP) has already been developed with the support of WHO, the HPAP is intended to support the practical implementation of the key priorities.

Depending on the national context, the scope of the HPAP can include indoor and outdoor air pollution, unsafe water and inadequate sanitation, chemical contamination of soil, and occupational exposures to pollutants.

The HPAP process is flexible and can be tailored to the needs of each country, but generally includes the following steps.

- **PHASE 1.** Collection, compilation and analysis of available information on health impacts from pollution and existing pollution management programs by the Ministries of Health, Environment and Industry/Production, with assistance of GAHP.
- **PHASE 2.** Inception meeting to prioritize pollution issues, define next steps, including roles and responsibilities of stakeholders through a participatory process.
- **PHASE 3.** Preparation of a draft Health and Pollution Action Plan describing priority pollutants, pollution sources, health impacts, cost-effective interventions to reduce exposures, resources needed and potential sources of funding by a joint National Working Group with participants from the Ministries of Health, Environment, Transportation, Agriculture, Energy, Industry, Mining and with support from GAHP.
- **PHASE 4.** Circulation of the draft Action Plan to national and international stakeholders, which are invited to provide comments. The National Working Group integrates stakeholder comments and a final Health and Pollution Action Plan is created. Stakeholders reconvene to officially endorse and validate the Action Plan and discuss next steps toward implementing suggested actions.
- **PHASE 5.** Dissemination, promotion, fund raising, implementation, monitoring and review of the HPAP through domestic and international initiatives, in collaboration with GAHP, under the guidance of a joint coordinating team between the Ministries of Health and Environment.

Annex 3:
Available national data

Organization	Nature of available data	Remarks
INVIMA	INVIMA annually reports the results of samples and analyses of pesticide and metal residues in food of agricultural origin. In the case of pesticides, as many molecules are analyzed as the laboratory methods allow.	Since 2010, INVIMA has developed plans for surveillance and control of pesticides (including some POPs) and chemical contaminants in foods of animal and vegetable origin, whose results are communicated to the ICA to inform risk management strategies. The selection criteria of the products to be included each year in the sampling plan are the consumption levels according to the National Nutritional Situation Survey (ENSIN) and their exporting potential.
INS	Through the SIVIGILA, cases of chemical exposure poisoning are monitored, analyzed and reported.	Identification and continuous analysis of health events, and reporting through the National Epidemiological fortnightly reports (IQUENs by its Spanish acronym). Chemical Poisoning Protocols, report probability of exposure by average intake of food and residue content in the matrices under study.

Annex 4: Global Burden of Disease Data

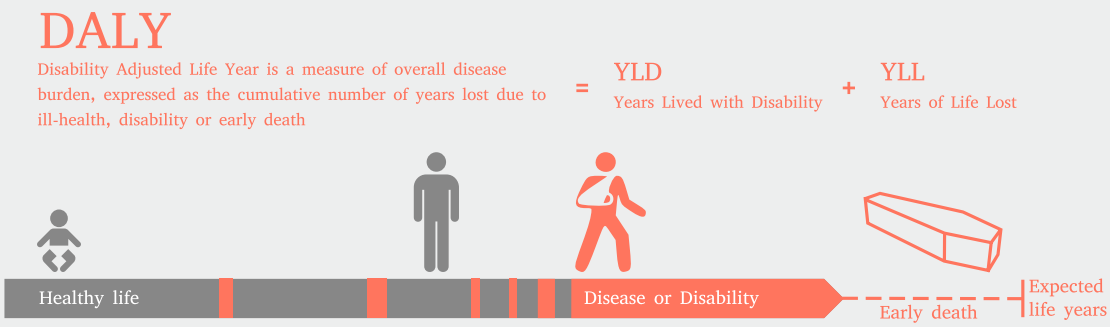
Agencies such as the World Health Organization (WHO) and the Institute for Health Metrics and Evaluation (IHME) have conducted increasingly sophisticated global studies on the burden of disease using data from government agencies, universities and other research groups to reveal death and disease rates associated with different risk factors, including exposures to various forms of contamination. These studies show that pollution is now responsible for between nine million and thirteen million deaths annually and is one of the main risk factors that cause premature deaths in the world.

HPAP analysis is mainly based on the data from the IHME study on Global Burden of Disease (GBD). GBD quantifies health decrements from hundreds of diseases, injuries, and risk factors, so policymakers can fully understand their country's health challenges, and how these challenges change over time. Data from Ministries of Health and other research organizations are compiled and analyzed by a consortium of more than 2,300 researchers in more than 130 countries. The data captures the premature death and disability of more than 300 diseases and injuries in 195 countries, by age and sex, from 1990 to the present, which allows analyses between age groups, among populations, and over time.

Global Burden of Disease information allows decision makers to compare the effects of different diseases, such as malaria and cancer, and risk factors, such as pollution and malnutrition, and then use that information to establish policies in their country.

Disability Adjusted Life Years (DALYs)

The GBD study presents its data in the form of disability-adjusted life years (DALY). A DALY is a measure of the total burden of the disease, expressed as the number of years lost due to poor health, disability or premature death. The DALY is being used more and more in the field of public health. It goes beyond years of life lost due to premature death to also include equivalent years of healthy living lost due to poor health or disability. In this way, mortality and morbidity are combined into a single common metric.



Economic Costs of Pollution

Premature deaths and pollution-based illnesses impose excessive costs on national budgets and health-care spending, especially in low-income industrialized countries. Diseases caused and exacerbated by pollution result in medical expenses and pain and suffering.

Pollution-related diseases can reduce labor force participation, labor market productivity, and economic performance.

In children, pollution-related illnesses can cause school absence and perpetuate intergenerational poverty. Early exposures to neurotoxic contaminants such as lead and mercury can affect cognition, decrease concentration capacity, and alter behavior, thus reducing lifetime earnings.

The costs of disease and premature death caused by pollution, especially the most modern forms of pollution, are rapidly increasing.

The costs of pollution-related diseases are often overlooked and underestimated because they are associated with non-communicable diseases that appear and extend for many years after the initial exposure, they are distributed among large populations, and they are not reflected in the standard economic indicators. These costs are much more difficult to calculate than the costs of pollution control, which are usually tangible and concrete. While the costs of pollution-related illnesses can have significant effects on the budgets of health ministries and increase spending on health systems, they are usually buried in general health costs and hospital budgets, and they are hidden in productivity reports. Because these health costs are not attributed to pollution, they are not considered when budgets for environmental ministries are developed.

The costs of pollution-related illness include: 1) direct medical expenses, including hospital, medical and drug costs, long-term rehabilitation or home care, and non-clinical services such as administration, support services and health insurance costs; 2) health-related overhead, such as lost time in school or work, special education costs, and the cost of investments in the health system (including health, research and development infrastructure, and medical training); 3) decreased economic productivity in people whose brains, lungs and other organ systems are permanently damaged by pollution; and 4) losses in productivity as a result of premature death.

Pollution-related disease is also responsible for intangible costs, such as poor health for people who are sick from contamination, disruption of family stability when a working-age person is disabled or dies prematurely as a result of pollution, and loss in years of life.

Annex 5:
Criteria and parameters for the prioritization of pollutants

Criteria	Definition	Parameters (*)
Source Type	It determines if there is risk of exposure to the contaminant according to the state of activity of the contamination source.	• Illegal Active Source (4) • Inactive or Suspended or Abandoned source (3) • Industrial Active Source (2) • Natural Source (1)
Physicochemical characteristics of the pollutant	Some physicochemical characteristics of contaminants are an indicator of their hazardousness. Persistence and bioaccumulation are used as a reference parameter, according to the scale established by REACH[63]	• The contaminant meets the criteria of being very persistent (vP) or very bio accumulative (vB) (4) • The contaminant complies with the criteria of persistent (P) and bio accumulative (B) (3) • The contaminant meets the criteria of persistent (P) or bio accumulative (B) (2) • The contaminant does not meet the criteria of being persistent (P) nor bio accumulative (B) (1)
Geographic extent of pollution	Presence of the pollutant in different geographical scales of the country.	• National (4): affects more than one municipality in more than one department. • Regional (3): affects more than one municipality in the same department. • Local (2): affects more than 60% of a municipality. • Punctual (1): affects an area within a municipality.

[63] Regulation (Ec) No 1907/2006 of the European Parliament and of the Council of December 18th, 2006

Criteria	Definition	Parameters (*)
Demographic vulnerability	Description of the distribution of the population exposed in terms of vulnerable groups.	• Children's exposure (4) • Exposure of women of gestational age (3) • Third-age adult exposure (2) • Exposure of people of productive age (1)
Health impact	Health effects by exposure to the pollutant	• Carcinogenic, mutagenic or reproductive disruptor (4) • Other chronic effects (3) • Acute effects with sequelae (2) • Acute effects without sequelae (1)
Applicable regulations	The existence of legal requirements that address the pollution issue.	• There is no legislation (4) • There is a ruling against the State (3) • There are partially or unregulated standards (2) • Unimplemented regulated rules (1)
Social vulnerability	The vulnerability is "the result of exposure to risks, coupled with the inability to cope with them and the ability to actively adapt"	• Twice above the national average 41.66% • Up to 1.5 times above the national average 41.66% (3 • Equal to national average (2) • Below national average (1) NBI: 27.7% being the national average Note. NBI components do not include health issues (access, quality, availability, etc.)

Annex 6:
Calculation Base – Pollutant rating according prioritization criteria

Contaminant		Arsenic						Copper				Chrome					
Matrix		Soil		Water		Food		Air		Soil		Soil		Water		Food	
Criteria	Peso	Valor	Resul	Valor	Resul	Valor	Resul	Valor	Resul	Valor	Resul	Valor	Resul	Valor	Resul	Valor	Resul
Source	0,05	2,00	0,11	1,00	0,05	4,00	0,22	2,00	0,11	2,00	0,11	2,00	0,11	2,00	0,11	2,00	0,11
Extension	0,12	2,00	0,23	4,00	0,46	1,00	0,12	1,00	0,12	2,00	0,23	2,00	0,23	3,00	0,35	1,00	0,12
Demographics	0,10	4,00	0,41	4,00	0,41	4,00	0,41	1,00	0,10	4,00	0,41	4,00	0,41	4,00	0,41	4,00	0,41
Standards	0,08	4,00	0,33	1,00	0,08	1,00	0,08	4,00	0,33	4,00	0,33	4,00	0,33	1,00	0,08	1,00	0,08
Social value	0,33	3,00	0,99	2,00	0,66	4,00	1,32	1,00	0,33	2,00	0,66	4,00	1,32	2,00	0,66	4,00	1,32
Pollutant	0,17	2,00	0,34	2,00	0,34	4,00	0,68	2,00	0,34	3,00	0,51	3,00	0,51	3,00	0,51	4,00	0,68
C. Disease	0,14	4,00	0,57	4,00	0,57	4,00	0,57	4,00	0,57	4,00	0,57	4,00	0,57	4,00	0,57	4,00	0,57
Final Result		2,99		2,59		3,40		1,90		2,83		3,49		2,69		3,29	

Contaminant		Dioxines		Furans		HAP				Mercury							
Matrix		Soil		Air		Air		Soil		Air		Soil		Water		Food	
Criteria	Peso	Valor	Resul	Valor	Resul	Valor	Resul	Valor	Resul	Valor	Resul	Valor	Resul	Valor	Resul	Valor	Resul
Source	0,05	2,00	0,11	2,00	0,11	2,00	0,11	2,00	0,11	4,00	0,22	4,00	0,22	4,00	0,22	4,00	0,22
Extension	0,12	4,00	0,46	4,00	0,46	4,00	0,46	4,00	0,46	4,00	0,46	2,00	0,23	4,00	0,46	4,00	0,46
Demographics	0,10	1,00	0,10	1,00	0,10	1,00	0,10	4,00	0,41	1,00	0,10	4,00	0,41	4,00	0,41	4,00	0,41
Standards	0,08	2,00	0,17	2,00	0,17	2,00	0,17	4,00	0,33	1,00	0,08	2,00	0,17	1,00	0,08	1,00	0,08
Social value	0,33	3,00	0,99	3,00	0,99	3,00	0,99	4,00	1,32	4,00	1,32	4,00	1,32	4,00	1,32	4,00	1,32
Pollutant	0,17	4,00	0,68	4,00	0,68	2,00	0,34	2,00	0,34	2,00	0,34	4,00	0,68	4,00	0,68	4,00	0,68
C. Disease	0,14	4,00	0,57	4,00	0,57	4,00	0,57	4,00	0,57	4,00	0,57	4,00	0,57	4,00	0,57	4,00	0,57
Final Result		3,08		3,08		2,74		3,55		3,10		3,60		3,75		3,75	

CONVENTIONS

Peso = Weight
Valor = Value
Resul = Results

Contaminant		Nickel		Pesticides								Lead							
Matrix		Soil		Air		Soil		Water		Food		Air		Soil		Water		Food	
Criteria	Peso	Valor	Resul	Valor	Resul	Valor	Resul	Valor	Resul	Valor	Resul	Valor	Resul	Valor	Resul	Valor	Resul	Valor	Resul
Source	0.05	2.00	0.11	2.00	0.11	2.00	0.11	2.00	0.11	2.00	0.11	2.00	0.11	4.00	0.22	2.00	0.11	4.00	0.22
Extension	0.12	3.00	0.35	4.00	0.46	4.00	0.46	4.00	0.46	4.00	0.46	4.00	0.46	2.00	0.23	4.00	0.46	4.00	0.46
Demographics	0.10	4.00	0.41	1.00	0.10	4.00	0.41	4.00	0.41	4.00	0.41	1.00	0.10	4.00	0.41	4.00	0.41	4.00	0.41
Standards	0.08	4.00	0.33	1.00	0.08	1.00	0.08	1.00	0.08	1.00	0.08	1.00	0.08	4.00	0.33	1.00	0.08	1.00	0.08
Social value	0.33	4.00	1.32	2.00	0.66	4.00	1.32	3.00	0.99	4.00	1.32	2.00	0.66	4.00	1.32	2.00	0.66	4.00	1.32
Pollutant	0.17	2.00	0.34	3.00	0.51	4.00	0.68	4.00	0.68	4.00	0.68	2.00	0.34	4.00	0.68	4.00	0.68	4.00	0.68
C. Disease	0.14	4.00	0.57	4.00	0.57	4.00	0.57	4.00	0.57	4.00	0.57	4.00	0.57	4.00	0.57	4.00	0.57	4.00	0.57
Final Result		3.44		2.50		3.64		3.31		3.64		2.33		3.77		2.98		3.75	

Contaminant		PM10		Zinc				Cadmium							
Matrix		Air		Air		Soil		Air		Soil		Water		Food	
Criteria	Peso	Valor	Resul	Valor	Resul	Valor	Resul	Valor	Resul	Valor	Resul	Valor	Resul	Valor	Resul
Source	0.05	2.00	0.11	2.00	0.11	2.00	0.11	2.00	0.11	2.00	0.11	2.00	0.11	2.00	0.11
Extension	0.12	4.00	0.46	4.00	0.46	2.00	0.23	4.00	0.46	2.00	0.23	2.00	0.23	4.00	0.46
Demographics	0.10	1.00	0.10	1.00	0.10	1.00	0.10	1.00	0.10	4.00	0.41	4.00	0.41	4.00	0.41
Standards	0.08	3.00	0.25	2.00	0.17	4.00	0.33	1.00	0.08	4.00	0.33	1.00	0.08	1.00	0.08
Social value	0.33	2.00	0.66	2.00	0.66	2.00	0.66	2.00	0.66	3.00	0.99	1.00	0.33	4.00	1.32
Pollutant	0.17	4.00	0.68	2.00	0.34	4.00	0.68	2.00	0.34	3.00	0.51	3.00	0.51	4.00	0.68
C. Disease	0.14	4.00	0.57	1.00	0.14	1.00	0.14	1.00	0.14	1.00	0.14	1.00	0.14	1.00	0.14
Final Result		2.84		1.98		2.26		1.90		2.73		1.82		3.21	

Contaminant		Asbestos		Benzene, Toulene, Xylene		Cyanide			
Matrix		Air		Air		Soil		Water	
Criteria	Peso	Valor	Resul	Valor	Resul	Valor	Resul	Valor	Resul
Source	0.05	3.00	0.16	2.00	0.11	4.00	0.22	4.00	0.22
Extension	0.12	4.00	0.46	4.00	0.46	3.00	0.35	3.00	0.35
Demographics	0.10	1.00	0.10	1.00	0.10	1.00	0.10	1.00	0.10
Standards	0.08	4.00	0.33	1.00	0.08	4.00	0.33	1.00	0.08
Social value	0.33	2.00	0.66	3.00	0.99	4.00	1.32	4.00	1.32
Pollutant	0.17	2.00	0.34	3.00	0.51	2.00	0.34	2.00	0.34
C. Disease	0.14	4.00	0.57	4.00	0.57	4.00	0.57	4.00	0.57
Final Result		2.64		2.83		3.24		2.99	

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