

## **Data documentation archive**

**Red de Monitoreo de Calidad  
del Aire de Bogotá (RMCAB)**

Document No. 001  
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Bogotá, Colombia

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# 1. What is the RMCAB?

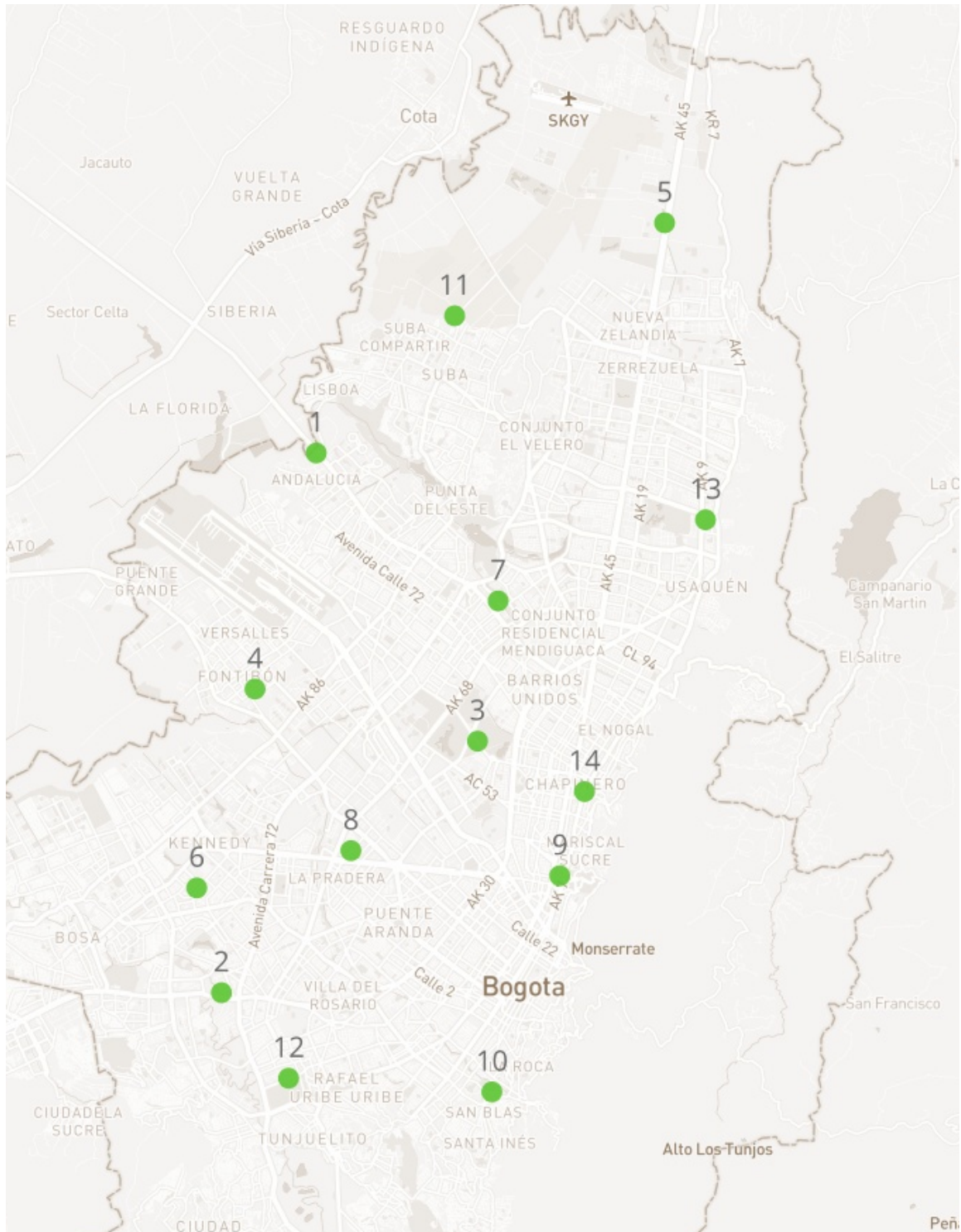
The Bogota Air Quality Monitoring Network (Red de Monitoreo de Calidad del Aire de Bogotá - RMCAB in spanish) is a system operated by the Secretaría Distrital de Ambiente that allows the collection and transmission of information about the concentration of pollutants of anthropogenic and natural origin and the behavior of the meteorological variables that regulate the distribution of the same in the Bogotá atmosphere.

The network is made up of 13 fixed stations and one mobile station that continuously monitor the following variables:

- Concentrations of particulate matter
  - PM10
  - PM2.5
- Polluting gases
  - SO<sub>2</sub>
  - NO
  - NO<sub>2</sub>
  - CO
  - O<sub>3</sub>
- Weather variables
  - Precipitation
  - Wind speed and direction
  - Temperature
  - Solar radiation
  - Relative humidity
  - Barometric (atmospheric) pressure

The information is openly available with data from 2010 to the present, with intervals of 1 hour between each measurement.<sup>1</sup>

## 1.1 Stations



**1. Bolivia**

Av. Calle 80 No. 121 - 98

**2. Carvajal**

Autopista Sur No. 63 - 40

**3. Centro de Alto Rendimiento**

Calle 63 No. 59A - 06

**4. Fontibón**

Kr 96 G No. 17B - 49

**5. Guaymaral**

Autopista Norte No. 205 - 59

**6. Kennedy**

Kr 80 No. 40-55 Sur

**7. Las Ferias**

Av. Calle 80 No. 69Q - 50

**8. Puente Aranda**

Calle 10 No. 65 - 28

**9. Sagrado Corazón**

Calle 37 No. 8 - 40

**10. San Cristóbal**

Kr 2 Este No 12 - 78Sur

**11. Suba**

Kr 111No. 159A - 61

**12. Tunal**

Kr 24 No. 49 - 86Sur

**13. Usaquén**

Kr 7B Bis No. 132 - 11

**14. Unidad Móvil**

AK 7 Calle 60

## 2. About the data

### 2.1 Variables

The network stations measure the following pollutants and meteorological variables:

**Particulate matter concentration (PM)**

- **PM10:** Coarse particles whose size is between 2.5 and 10 micrometers ( $\mu\text{m}$ ) in diameter. They are formed primarily through mechanical processes, such as construction sites, resuspension of dust from roads and the lifting of dust and wind by vehicles on roads. Its unit of measurement is the  $\mu\text{g}/\text{m}^3$  (microgram per cubic meter).<sup>2</sup>

- **PM2.5:** Fine particles of 2.5 micrometers ( $\mu\text{m}$ ) in diameter or less that can only be seen with an electron microscope. They are produced from all types of

combustion, including motor vehicles, power plants, residential wood burning, forest fires, agricultural burning, and some industrial processes. Its unit of measurement is the  $\mu\text{g}/\text{m}^3$ .<sup>3</sup>

### **Polluting gases**

- **S02:** Sulfur dioxide ( $\text{SO}_2$ ) is a colorless gas with a characteristic suffocating odor. It is a reducing substance that, over time and in contact with air and humidity, turns into sulfur trioxide. Its unit of measurement is the  $\mu\text{g}/\text{m}^3$  or the ppb (parts per billion).<sup>4</sup>

- **NO2:** Nitrogen dioxide ( $\text{NO}_2$ ) is a chemical compound formed by the elements nitrogen and oxygen, one of the main pollutants among the various nitrogen oxides. It has a yellowish-brown color. It is formed as a by-product in high-temperature combustion processes, such as in motor vehicles and power plants. Its unit of measurement is the  $\mu\text{g}/\text{m}^3$  or the ppb.<sup>5</sup>

- **CO:** Carbon monoxide, whose chemical formula is  $\text{CO}$ , is an odorless, colorless, flammable and highly toxic gas. It can be fatal when breathed in at high levels. It is produced when combustible materials such as gas, gasoline, kerosene, coal, oil, tobacco, or wood are burned in low-oxygen environments. Fireplaces, furnaces, water heaters and household appliances that burn fuel, such as stoves in the kitchen or kerosene heaters, can also produce it if they are not working well. Vehicles stopped with the engine running also produce it. Its unit of measurement is the  $\mu\text{g}/\text{m}^3$  or the ppm (parts per million).<sup>6</sup>

- **O3:** Ozone is a highly reactive, pale blue gas, made up of three oxygen atoms in its molecular structure. Ozone is considered one of the pollutants of greatest concern today, since it is highly oxidizing and affects living tissues. It is associated with various ailments in human health. Its unit of measurement is the  $\mu\text{g}/\text{m}^3$  or the ppb.<sup>7</sup>

### **Meteorological variables**

- **Precipitation:** Rain is the precipitation of liquid water

particles with a diameter greater than 0.5mm or of smaller, but very dispersed drops. Rain is measured in millimeters per year: less than 200 are insufficient, between 200 and 500 are scarce, between 500 and 1000 are sufficient, between 1000 and 2000 are abundant and more than 2000 are excessive.<sup>8</sup>

- **Speed and direction of the wind:** Speed and direction of air movement in the atmosphere, especially in the troposphere, produced by natural causes. Its units of measurement are m/s (meter per second) for speed and degrees for direction.<sup>9</sup>

- **Temperature:** It refers to the degree of specific heat of the air in a given place and time as well as the temporal and spatial evolution of said element in the different climatic zones. Its unit of measurement is °C (centigrade scale).<sup>10</sup>

- **Solar radiation:** Set of electromagnetic radiation emitted by the Sun. The magnitude that measures the solar radiation that reaches the Earth is the irradiance, which measures the energy that, per unit of time and area, reaches the Earth. Its unit of measurement is the W/m<sup>2</sup> (watt per square meter).<sup>11</sup>

- **Relative humidity:** amount of water vapor present in the air. It can be expressed absolutely by absolute humidity, or relatively by relative humidity.<sup>12</sup>

- **Barometric (atmospheric) pressure:** pressure exerted by air at any point in the atmosphere. Normally it refers to the earth's atmospheric pressure, but the term can be extended to the atmosphere of any planet or satellite. Its unit of measurement is the mmHg (millimetre of mercury).<sup>13</sup>

## 2.2 Bogota Air Quality Index

The Bogota Air Quality Index (Índice Bogotano de Calidad de Aire - IBOCA in spanish) is a dimensionless multipurpose indicator, calculated from the concentrations of air pollutants at a time and place in the city. It communicates the environmental risk from air pollution, the state of the air quality of Bogotá, health effects and recommendations and voluntary measures for citizens to contribute to maintaining or improving air quality in the city.<sup>14</sup>

ATRIBUTOS DEL IBOCA			RANGOS DE CONCENTRACIÓN Y TIEMPO DE EXPOSICIÓN PARA CADA CONTAMINANTE					
A Rangos numéricos	B Estado de calidad del aire	C Estado de actuación y respuesta	PM10, 24h (µg/m3)	PM2.5, 24h (µg/m3)	O <sub>3</sub> , 8h (µg/m3)	CO, 8h (µg/m3)	SO <sub>2</sub> , 1h (µg/m3)	NO <sub>2</sub> , 1h (µg/m3)
0-10	FAVORABLE	Prevención	(0 -54)	(0 -12)	(0 -116) [0-59]	(0 -5038) [0.0-4.4]	(0 -93) [0-35]	(0 -100)
10,1 - 20	MODERADA	Prevención	(55 -154)	(12.1 -35.4)	(117 -148) [60-75]	(5039 -10762) [4.5-9.4]	(94 -198) [36-75]	(101 -188)
20,1 - 30	REGULAR	Alerta Amarilla	(155 -254)	(35.5 -55.4)	(149 -187) [76-95]	(10763 -14197) [9.5-12.4]	(199 -486) [76-185]	(189 -67) [101-360]
30,1 - 40	MALA	Alerta Naranja	(255 -354)	(55.5 -150.4)	(188 -226) [96-115]	(14198 -17631) [12.5-15.4]	(487 -797) [186-304]	(678 -1221) [361-649]
40,1 - 60	MUY MALA	Alerta Roja	(355 -424)	(150.5 -250.4)	(227 -734) [116-374]	(17632 -34805) [15.5-30.4]	(798 -1538) [305-604]	(1221 -2349) [650-12491]
60,1 - 100	PELIGROSA	Emergencia	(425 -604)	(250.5 -500.4)	(734 -938) [374-938]	(34806 -57703) [30.5-50.4]	(1584 -2630) [605-1004]	(2350 -3853) [1250-2049]

Table available in [governanzadelaire.uniandes.edu.co/?page\\_id=164](http://governanzadelaire.uniandes.edu.co/?page_id=164) and [rmcab.ambientebogota.gov.co/home/text/1508](http://rmcab.ambientebogota.gov.co/home/text/1508).

**Important:** On January 22, 2021, the Secretaría Distrital de Ambiente released an announcement announcing the update of the IBOCA. More information by [clicking here](#). NSI will update this document according to the new parameters.



## 2.3 Formats

The RMCAB data can be downloaded as:

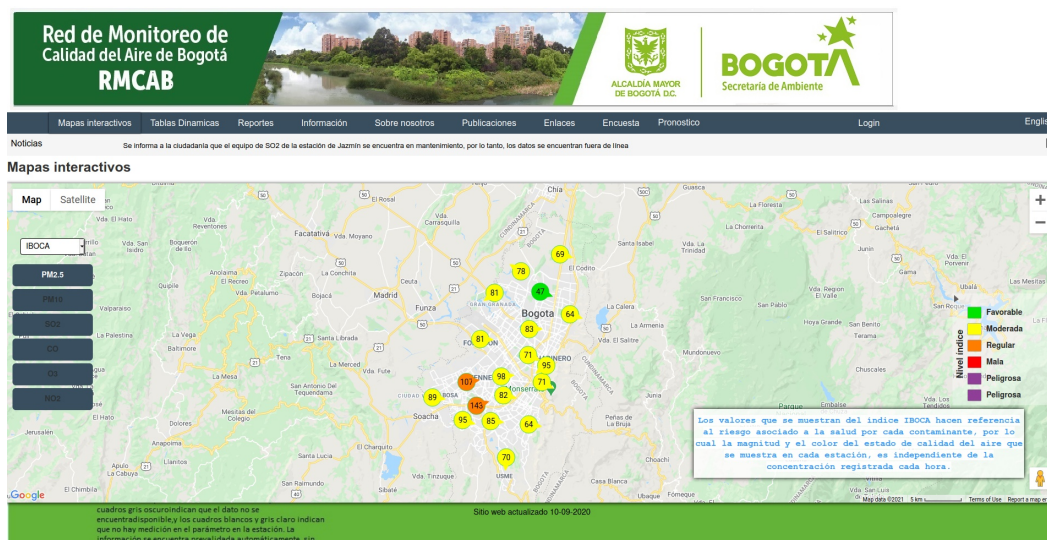
- **Office Open XML (.xlsx)**: format used by Microsoft Excel to store and represent spreadsheets.
- **Portable Network Graphics (.png)**: graphic format used to store images.

## 3. Downloading the data

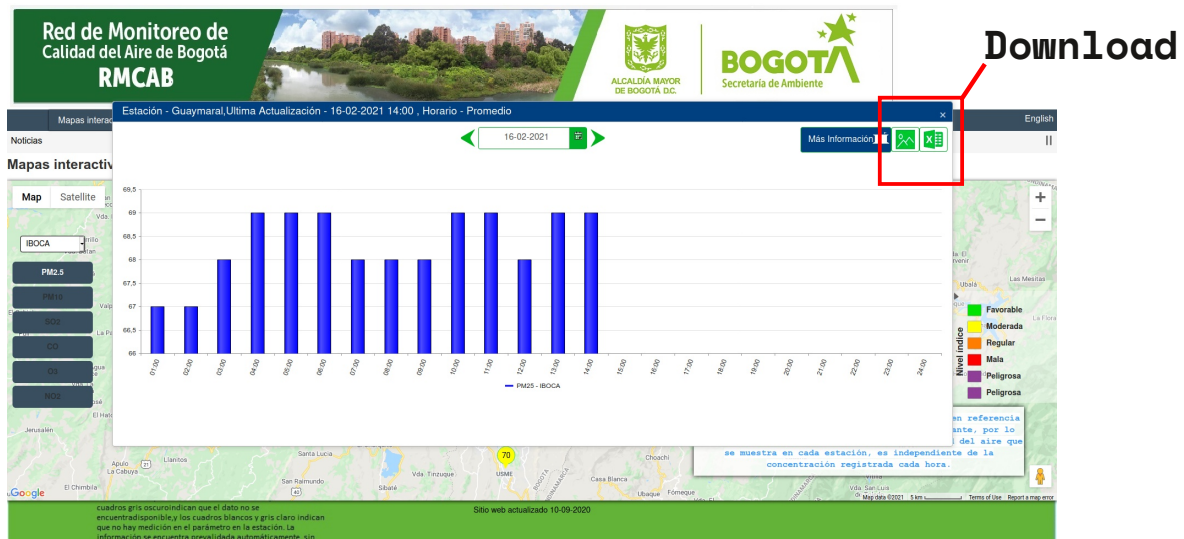
The RMCAB page can be accessed through the browser with the following URLs:

<http://201.245.192.252:81>  
<http://rmcab.ambientebogota.gov.co/>

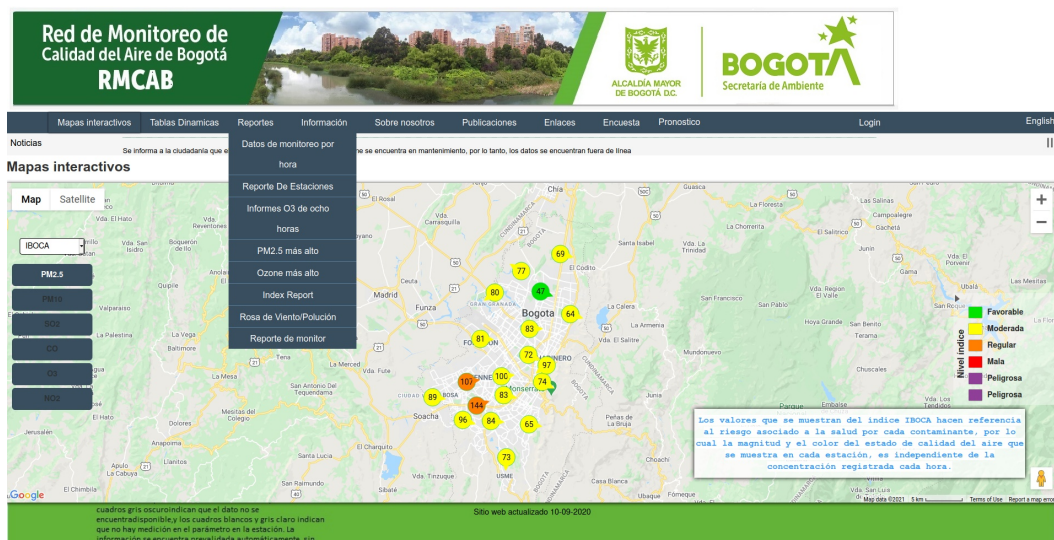
Once you have entered the page, you will find a main menu with the different sections that can be accessed and a map that shows the latest readings from the stations.



When you click on any of the points, a window will open displaying a bar graph that shows the last readings of the chosen variable and other options, among which are the download of the graph in .png and .xlsx format.



To download the data in batch (selecting the period of time and the variables) you must enter **Reportes>Reporte de Estaciones** in the main menu.



Upon entering, you will see an interface that will allow you to consult and download the information of the desired stations. The interface has the following components:

The screenshot shows a web interface for consulting station data. It is divided into several sections:

- 1. Properties of the stations:** This section on the left includes three dropdown menus for 'Propósito:', 'Seleccione Zona:', and 'Propietario:', all currently set to 'Todos'. Below these is a checkbox labeled 'Mostrar estaciones activas' which is checked. A list of station names follows, each with a small arrow icon to its left: 'blivia', 'osa', 'arvajal - Sevillana', 'entro de Alto Rendimiento', 'iudad Bolivar', 'olina', 'ontibon', 'uaymaral', 'azmin', and 'ennedy'.
- 2. Name and available variables:** This is indicated by the numbered callout pointing to the list of station names in section 1.
- 3. Format and periodicity:** This section on the right includes a 'Seleccione vista del reporte:' area with buttons for 'tabla' (selected), 'Gráfica', and 'Excel'. Below this is a 'Periódico:' section with buttons for 'Diario' (selected), 'Ayer', 'Semanal', 'Mensual', 'Anual', and 'Personalizado'.
- 4. Range:** This section includes date and time pickers: 'De la fecha' (16-02-2021), 'De la hora' (00:01), 'A fecha' (17-02-2021), and 'A hora' (00:00). Each has a calendar or clock icon for selection.
- 5. Type of data and resolution:** This section includes a 'Tipo' dropdown set to 'Promedio', and two 'De la base de tiempo' and 'A base de tiempo' dropdowns, both set to '1 Minuto'.

At the bottom of the interface are two buttons: 'Cancelar' and 'Mostrar'. To the right of the interface is a 3D illustration of a station unit with a sensor on top.

**1. Properties of the stations:** the purpose, the location zone, etc.

**2. Name and available variables:** by clicking on the arrow to the left of the name, the variables that are monitored in each station will be displayed.

**3. Format and periodicity:** the way the data is displayed (a table, a graph, an .xlsx file; daily, monthly or yearly data).

**4. Range:** the range of dates for which information will be displayed or downloaded.

**5. Type of data and resolution**

## To download:

- Leave the properties as they appear.
- Select the name of the station and the variables of interest.
- Select the *Excel* option in the format.
- Select the desired periodicity.
- Adjust the range of dates for which you want to know the information.
- Select the type of data and the resolution (although it is most likely that in *De la base de tiempo* and *A base de tiempo* only the option *1 Hour* will appear).
- Click on *Mostrar*.
- Download the file.

**Result selecting the MinAmbiente station, variable PM2.5, monthly periodicity, average rate:**

	A	B	C	D	E	F	G	H	
1	Tipo: Promedio, Base de tiempo: 1 Hora, Mensual: 01-01-2021-01-02-2021								
2									
3		MinAmbiente							
4		PM2.5							
5	DateTime	µg/m3							
6	01-01-2021 01:00	6							
7	01-01-2021 02:00	12							
8	01-01-2021 03:00	----							
9	01-01-2021 04:00	11							
10	01-01-2021 05:00	13							
11	01-01-2021 06:00	----							
12	01-01-2021 07:00	10							
13	01-01-2021 08:00	11							
14	01-01-2021 09:00	11							
15	01-01-2021 10:00	6							
16	01-01-2021 11:00	1							
17	01-01-2021 12:00	5							
18	01-01-2021 13:00	3							
19	01-01-2021 14:00	3							
20	01-01-2021 15:00	5							
21	01-01-2021 16:00	3							

## 4. References

1 Secretaría Distrital de Ambiente. *Red de Monitoreo de Calidad del Aire de Bogotá - RMCAB*. Available in <http://ambientebogota.gov.co/red-de-calidad-del-aire>

2 Gobernanza del Aire. *¿Cuáles son los principales contaminantes del aire?*. Available in <https://gobernanzadelaire.uniandes.edu.co/#contaminantes>

3 Ibid.

4 RMCAB. *Información de contaminantes*. Available in <http://rmcab.ambientebogota.gov.co/home/text/1507>

5 Ibid.

6 Ibid.

7 Ibid.

8 RMCAB. *Información meteorológica*. Available in <http://rmcab.ambientebogota.gov.co/home/text/1506>

9 Ibid.

10 Ibid.

11 Ibid.

12 Ibid.

13 Ibid.

14 Secretaría Distrital de Ambiente. *Calidad del aire en Bogotá*. Available in <http://www.ambientebogota.gov.co/calidad-del-aire>

## 5. Revision record

The following table shows the revision and change log for this document: the date it was made, a short description, and the sections of the document that changed.

Number and date	Description	Section affected
001_2021-02	Creation and edition of the first version of the document.	All