Ministerio del Medio Ambiente

Gobierno de Chile

Manual on the Basic Set of Environment Statistics of the FDES 2013

Air Quality Statistics

Topic 1.3.1 of the Basic Set of Environment Statistics of the FDES 2013

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(**Bold Text - Core Set/Tier 1**; Regular Text - Tier 2; *Italicized Text - Tier 3*)	
a.	Local air quality
	1. **Concentration level of particulate matter (PM_{10})**
	2. **Concentration level of particulate matter ($PM_{2.5}$)**
	3. **Concentration level of tropospheric ozone (O_3)**
	4. **Concentration level of carbon monoxide (CO)**
	5. **Concentration level of sulphur dioxide (SO_2)**
	6. **Concentration levels of nitrogen oxides (NO_X)**
	7. Concentration levels of heavy metals
	8. Concentration levels of non-methane volatile organic compounds (NMVOCs)
	9. *Concentration levels of dioxins*
	10. *Concentration levels of furans*
	11. Concentration levels of other pollutants
	12. Number of days when maximum allowable levels were exceeded per year
b.	Global atmospheric concentrations of greenhouse gases
	1. Global atmospheric concentration level of carbon dioxide (CO_2)
	2. Global atmospheric concentration level of methane (CH_4)

2. Introduction/Relevance

- This topic includes statistics on the ambient concentration of the most important air pollutants, including suspended solid particles, gases and other relevant pollutants that can have a negative effect on human and ecosystem health.
  - more than 2 million premature deaths attributable to the effects of urban air pollution and indoor air pollution occur every year (WHO).

- Air quality is measured at monitoring stations. Data availability varies according to the country's circumstances.

- National monitoring of air quality is usually limited to urban settlements where polluting activities and the affected population are concentrated.

- This topic provides relevant information for public policy at national/subnational/local and international levels (air quality standards, SDG indicator, OECD GGI, etc.).

3. Definitions and description of the statistics

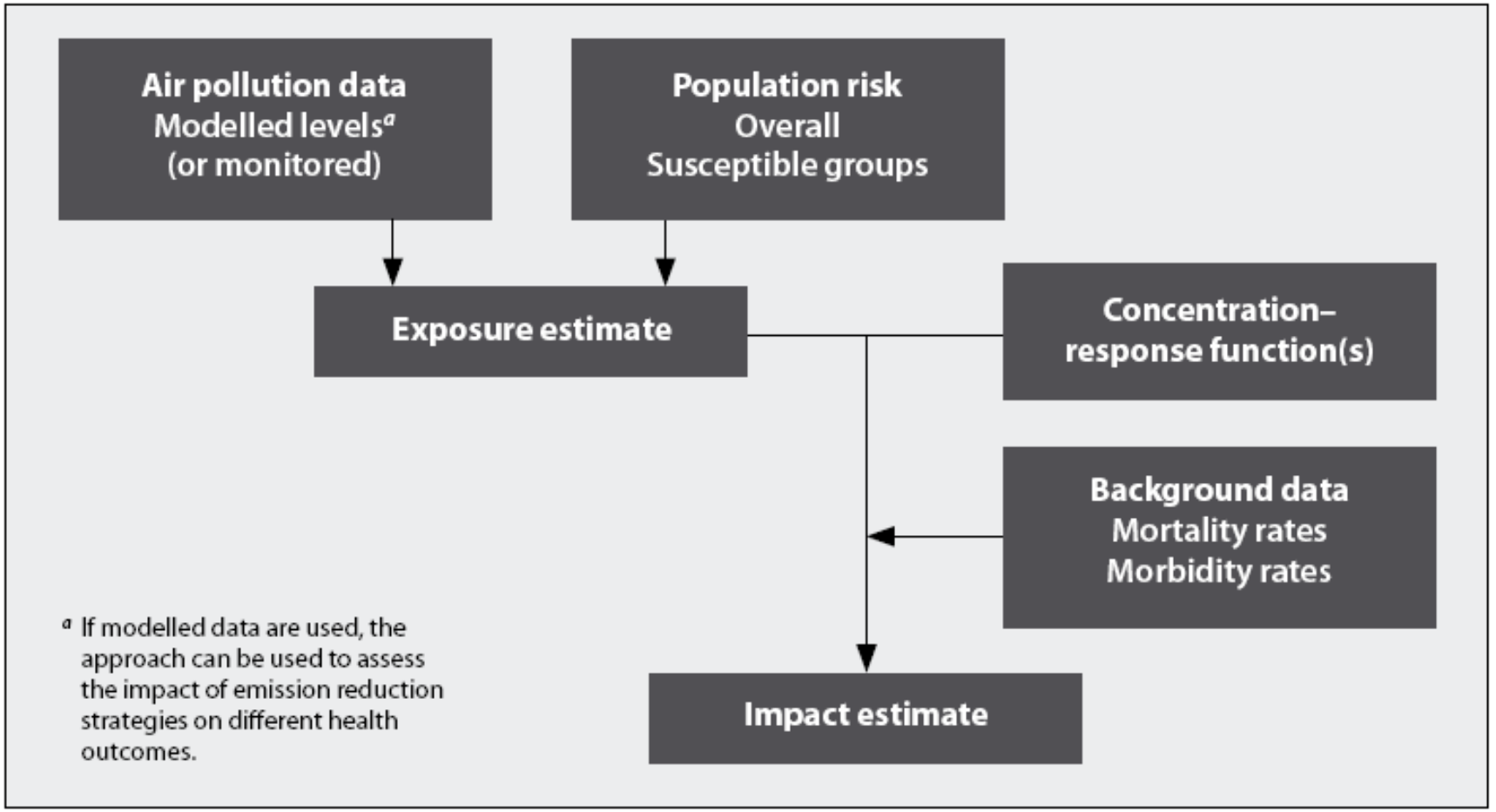
- General definitions:
  - Air quality
  - Local / Global
  - Concentration
  - Pollution
  - Pollutant:
    - Primary vs Secondary
    - Gaseous vs Particulate, Respirable
  - Scales: Urban, Regional, Hemispheric and global
  - Types of Source

3. Definitions and description of the statistics

- General definitions:
  - Impacts: population, environment
  - Human Exposure:
    - Source->Emission->Concentrations->Exposure->Dose->Health effects
    - Microenvironments:
      - Indoor vs outdoor
      - Devoloped vs developing
      - Urban vs rural
    - Different population susceptibility: genetic, socioeconomic status, age, nutrition, gender, chronic diseases
  - Environmental equity
  - Criteria pollutants: PM, O3, CO, SOx, NOx, Pb
  - Standards:
    - Primary (population) and secondary (environment)
    - Latent and saturated areas
  - Health impact assement

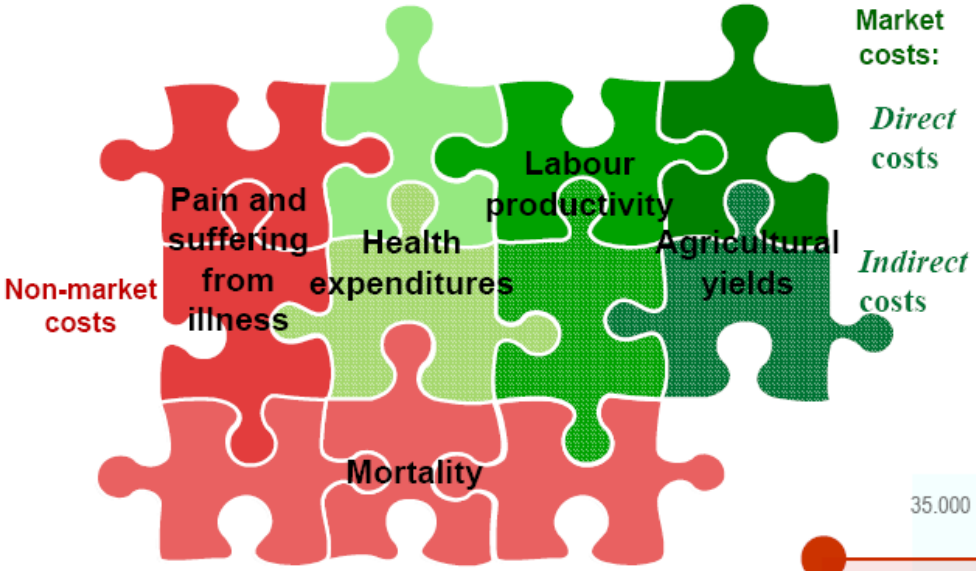
3. Definitions and description of the statistics

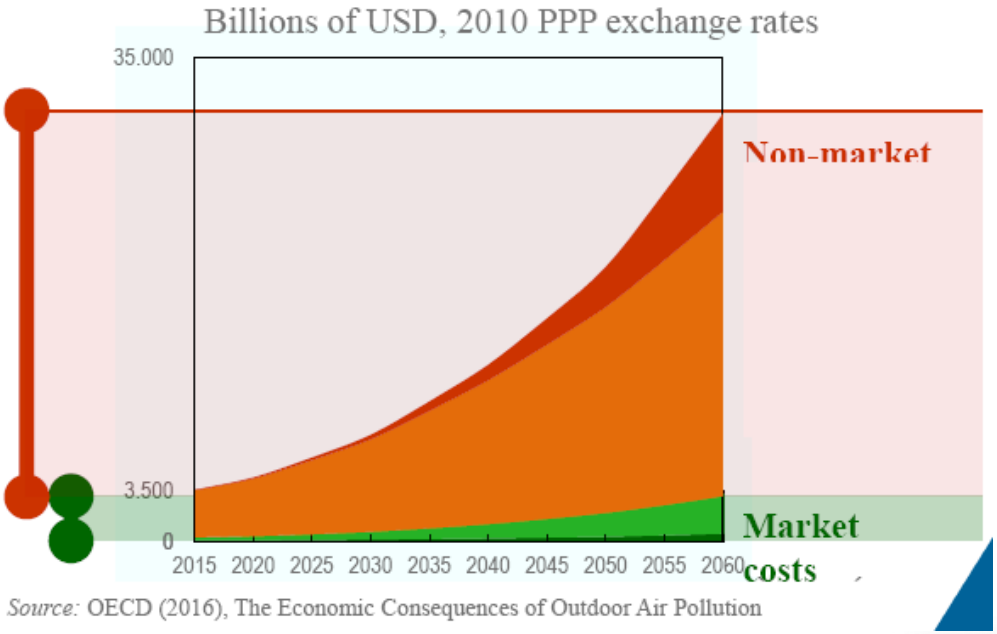
Health impact assessment



Source: WHO

3. Definitions and description of the statistics
Costs of inaction of Air Pollution





Source: OECD (2016), The Economic Consequences of Outdoor Air Pollution

3. Definitions and description of the statistics

- Description of the statistics:
  - Sources for the definitions:
    - WHO Air Quality Guidelines-Global Update 2005, Particulate matter, ozone, nitrogen dioxide and sulfur dioxide.
    - WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide, Global Update 2005, Summary of risk assessment .
    - UNECE Standard Statistical Classification of Ambient Air Quality (1990).
    - European Environment Agency
    - USEPA Air Quality Planning and Standards.
    - World Meteorological Organization (WMO)
    - Agency for toxic substances and diseases (ATSDR)
    - The United Nations Environment Programme (UNEP)
    - Pan American Health Organization
    - Clean Air Institute
    - National Air Quality Legislations
  - Structure for each statistic:
    - General description
    - Statistical description

3. Definitions and description of the statistics

- Description of the statistics, example:

  - **1.3.1.a.1 Concentration level of particulate matter (PM10)**
    - **General description:**
      - Particulate matter," also known as particle pollution or PM, is a complex mixture of extremely small particles and liquid droplets. Particle pollution is made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles.
      - The size of particles is directly linked to their potential for causing health problems. Particles that are 10 micrometers in diameter or smaller generally pass through the throat and nose and enter the lungs. Once inhaled, these particles can affect the heart and lungs and cause serious health effects.
      - "Inhalable coarse particles," such as those found near roadways and dusty industries, are larger than 2.5 micrometers and smaller than 10 micrometers in diameter.
    - **Statistical description:**
      - PM10 measurements are reported as average concentrations of mobile 24-hour, daily and annual particulate in the air, expressed in micrograms on cubic meter to normal pressure and temperature µg/m3N. Normal temperature and pressure conditions is a standard that allows the comparison of the experimental measures between different sets of data measures. One of the most used standard is the temperature of 293,15 K and a pressure of 1 atm (National Institute of Standards and Technology, NIST).
      - WHO standards:
        - » 20 µg/m3 annual mean
        - » 50 µg/m3 24-hour mean

4. International sources and recommendations
4.A Classifications and groupings

- Different classifications of air pollutants
  - Source of generation
  - Local/Global
  - Evolution in the atmosphere
  - gaseous pollutants
  - Particulate matter
  - Criteria pollutants
  - Greenhouse effect
  - ozone layer depletion

4. International sources and recommendations
4.B Reference to international statistical recommendations, frameworks and standards

- International sources:
  - WHO Air Quality Guidelines-Global Update 2005, Particulate matter, ozone, nitrogen dioxide and sulfur dioxide.
  - WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide, Global Update 2005, Summary of risk assessment .
  - UNECE Standard Statistical Classification of Ambient Air Quality (1990).
  - European Environment Agency (environment statistics and indicators)
  - OECD (Air quality statistics and indicators, GGI)
  - USEPA Air Quality Planning and Standards.
  - World Meteorological Organization (WMO)
  - Agency for toxic substances and diseases (ATSDR)
  - The United Nations Environment Programme (UNEP)
  - Pan American Health Organization
  - Clean Air Institute
  - National Air Quality Legislations

4. International sources and recommendations
4.C Sources of global and regional environment statistics and indicators series

- Global and regional:
  - WHO
  - World Bank
  - UNSTAT
  - OECD
  - EUROSTAT
  - EEA
  - ECLAC
  - UNEP

- National:
  - Ministries of the Environment
  - NSOs

5. Transforming data into environment statistics
5.A Data collection and sources of data

- Source type: Monitoring Systems (Air quality monitoring stations) collect time series of pollutants, by hour, day, month, year.

- Institutional partners: Ministry o the Environment, Ministry of Health, Universities, Research Institutions, Private institutions, etc.

- Availability of data:
  - Determining the study objective: diagnosis
  - Design of a sampling plan:
    - Objectives, pollutants
    - Temporal and Spatial considerations
    - Representativeness of data

- Data quality: Data analysis, interpretation and review.

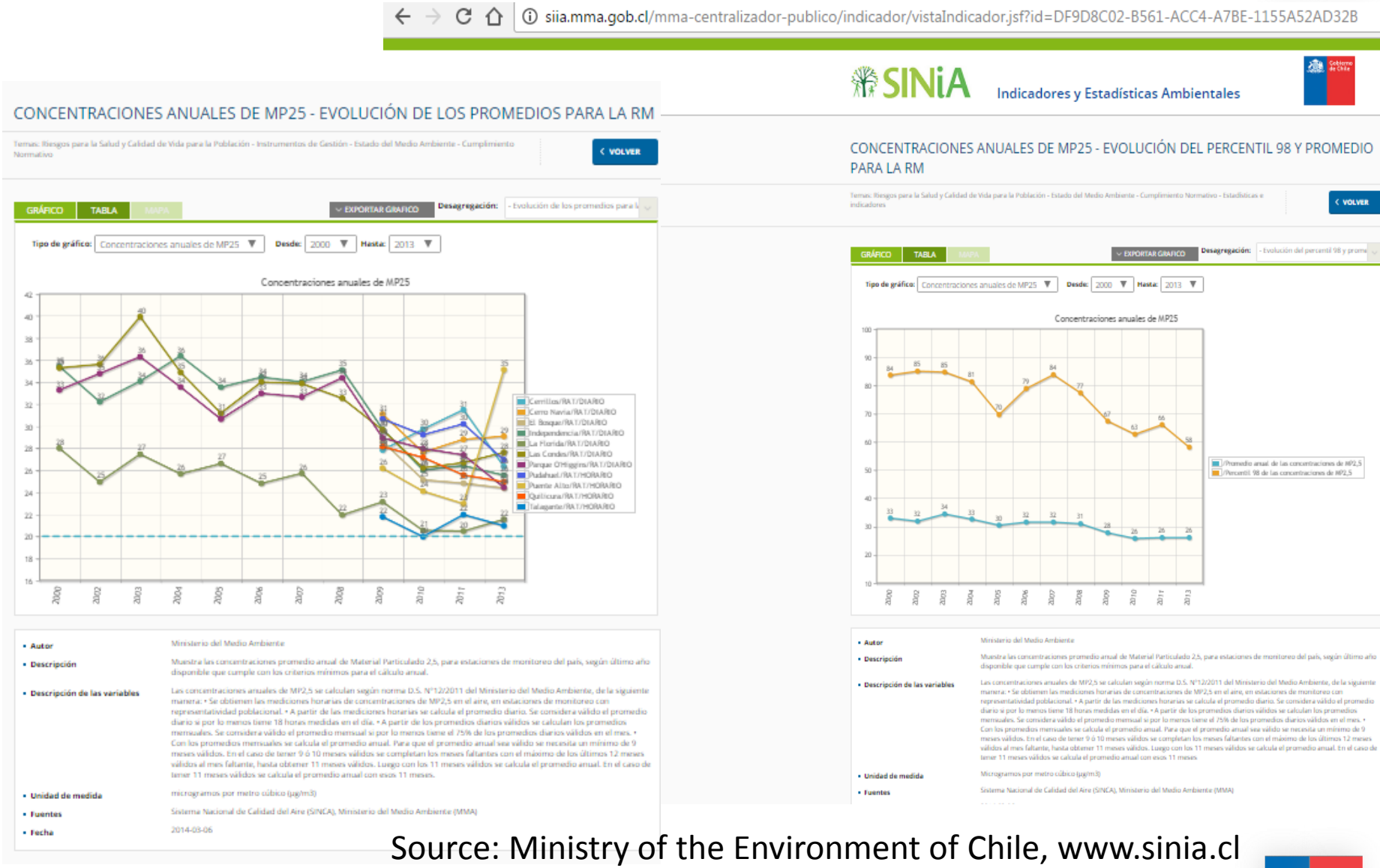
5. Transforming data into environment statistics
5.B Data compilation (procedures and instruments) and transformation into environment statistics series

- Data collection: Monitoring Systems (Air quality monitoring stations)
- Data validation:
  - correct errors in data due to maintenance of equipment, electrical faults or deviations in data without technical support.
  - Useful measures: number of data, central tendency (mean, median, mode), relative position (percentiles), dispersion (range, variance, standard deviation, coefficient of variation, interquartile range) and Association (correlation).
  - Graphics: time series, 2 scales, box.

5. Transforming data into environment statistics
5.B Data compilation (procedures and instruments) and transformation into environment statistics series

- Transformation into statistics:
  - Process the time series to obtain moving averages, daily averages and annual averages, depending on the parameter that is being analyzed. To obtain a representative indicator it is necessary to have a minimum of data (f.e.: not less than 75% of the hourly data).
  - Moving averages are calculated taking the hourly data as many hours backwards needed the moving average.
  - Daily averages correspond to the average of the 24 hourly data recorded on the day.
  - The maximum daily corresponds to the maximum value recorded in the 24 hourly data of the day.

6. Uses and dissemination
6.A Potential presentation/dissemination formats



Source: Ministry of the Environment of Chile, www.sinia.cl

6. Uses and dissemination
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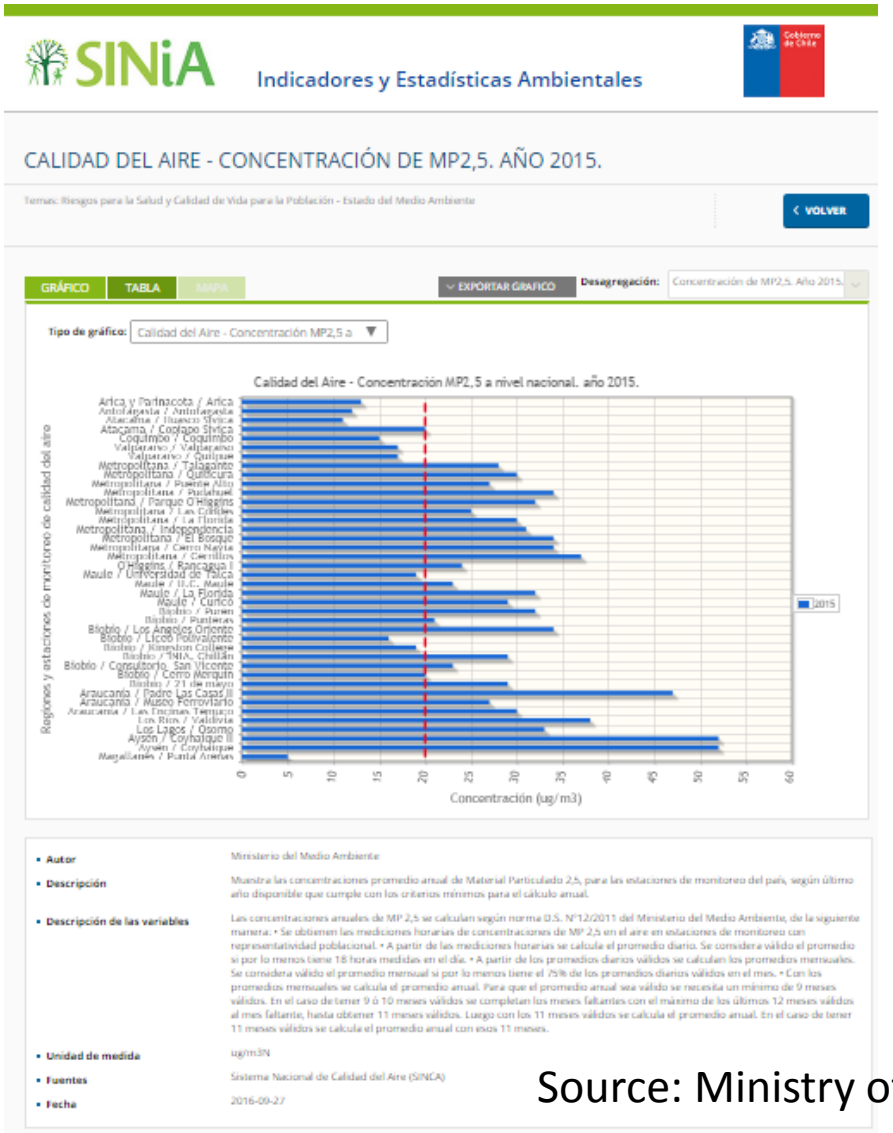

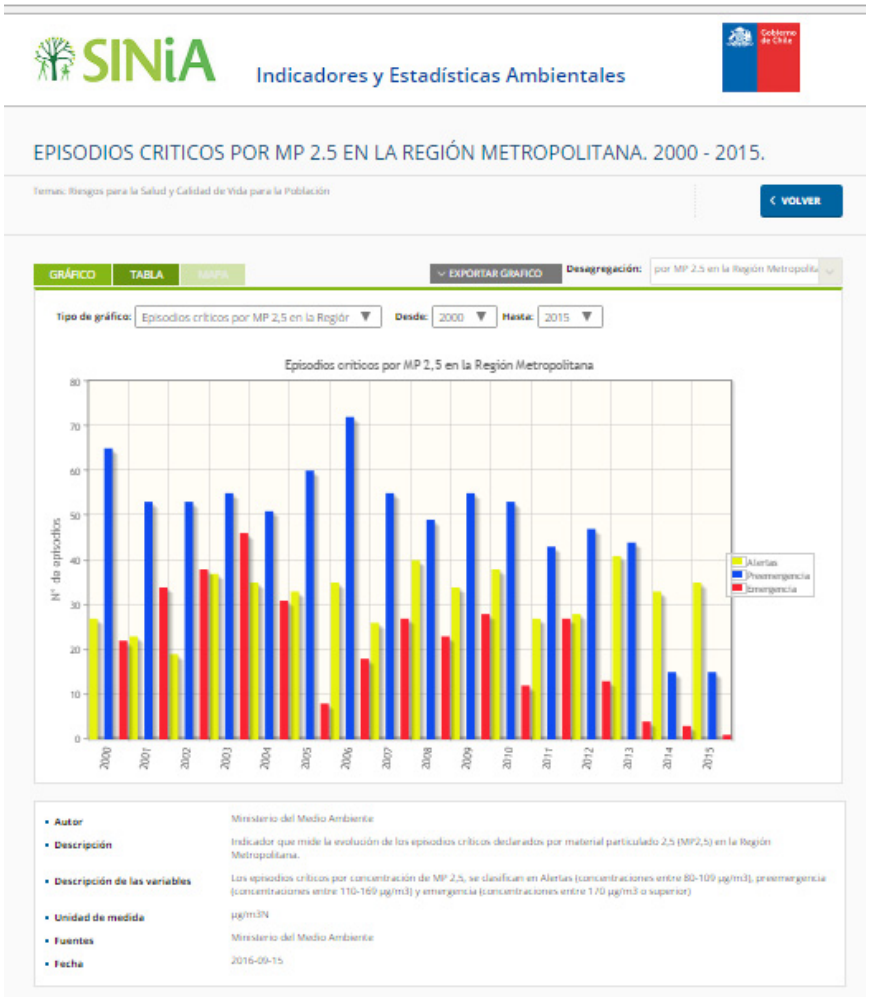

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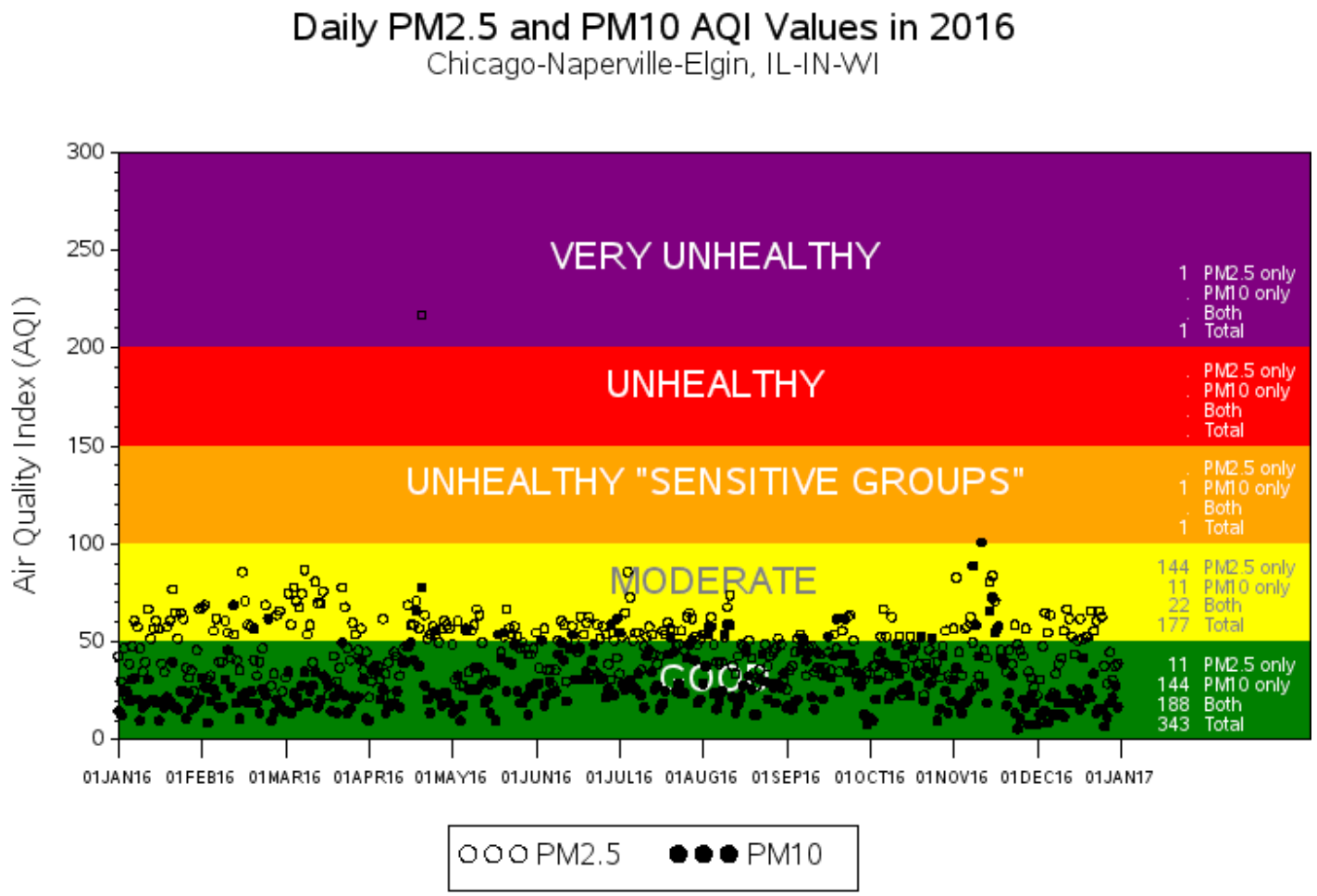
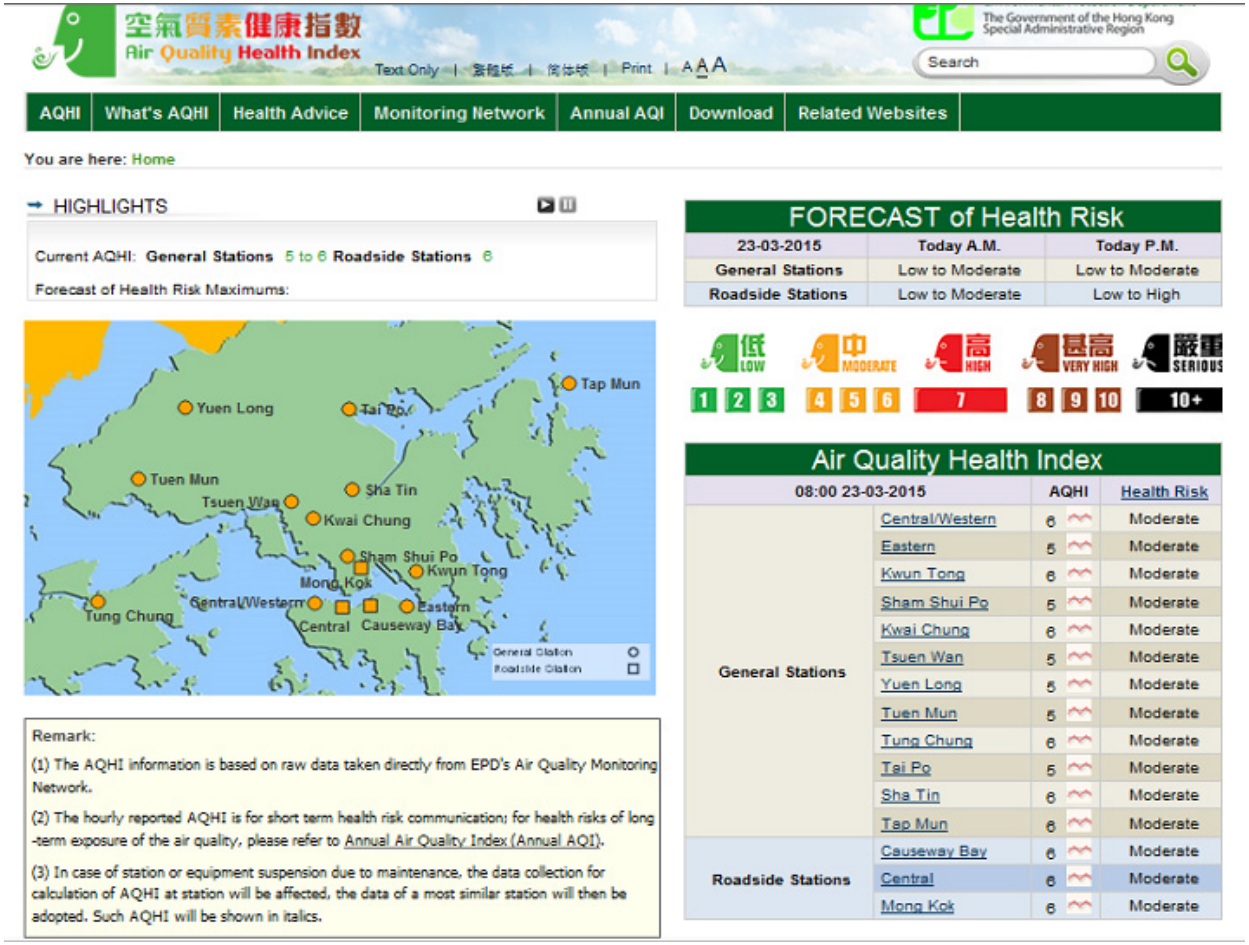


Source: U.S. EPA AirData <https://www.epa.gov/air-data>

6. Uses and dissemination
6.A Potential presentation/dissemination formats

Air Quality Health Index



Source: Environmental Protection Department of Hong Kong
http://www.aqhi.gov.hk/en.html

6. Uses and dissemination
6.B Commonly used indicators that incorporate this statistic

- Concentrations of air pollutants: mean, percentile, maximum, etc
- Excedence of air quality limit values (standard)
- Air Quality Index
- Population exposure to air pollution
- SDG Indicator : 11.6.2 - Annual mean levels of fine particulate matter (e.g. PM2.5 and PM10) in cities (population weighted)
- OECD Green Growth Indicators:Exposure to air pollution:
  - Mean population exposure to PM2.5 (Micrograms per cubic metre)
  - Percentage of population exposed to more than 10 micrograms/m3 (Percentage)
  - Percentage of population exposed to more than 35 micrograms/m3 (Percentage)

6. Uses and dissemination
6.C SEEA accounts/tables that use this statistic

- The SEEA Central Framework doesn't include air quality accounts (concentrations). But it includes emissions to the air (different FDES topic).
- The SEEA Experimental Ecosystem Accounting includes air filtration (clean air) and sequestering of carbon as ecosistem services.

Table 3.2 Physical flows of ecosystem services for an EAU

	Type of LCEU				
	Forest tree cover	Agricultural land*	Urban and associated developed areas	Open Wetlands	…
Type of ecosystem services (by CICES)					
Provisioning services	e.g. tonnes of timber	e.g. tonnes of wheat			
Regulating services	e.g. tonnes of CO_2 stored/released	e.g. tonnes of CO_2 stored/released	e.g. tonnes of CO_2 stored/released	e.g. tonnes of P absorbed	
Cultural services	e.g. number of visitors/hikers		e.g. hectares of parkland	e.g. hectares of duck habitat	

* Medium to large fields rainfed herbaceous cropland

Source: SEEA EEA 2012

Thank you

Gracias

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