Air Pollution and Health in Africa

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Session: Health effects of air pollution: context, evidence and policy applications

Africa in context

Inequity, inequality, poverty

Development trajectory

THE GLOBAL GOALS
For Sustainable Development

THE STATE OF AIR QUALITY AND HEALTH IMPACTS IN AFRICA

A REPORT FROM THE STATE OF GLOBAL AIR INITIATIVE

2022

The State of Global Air is a collaboration between the Health Effects Institute and the Institute for Health Metrics and Evaluation's Global Burden of Disease project.

HEI IHME

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Population-weighted annual average $PM_{2.5}$ exposures in countries across Africa

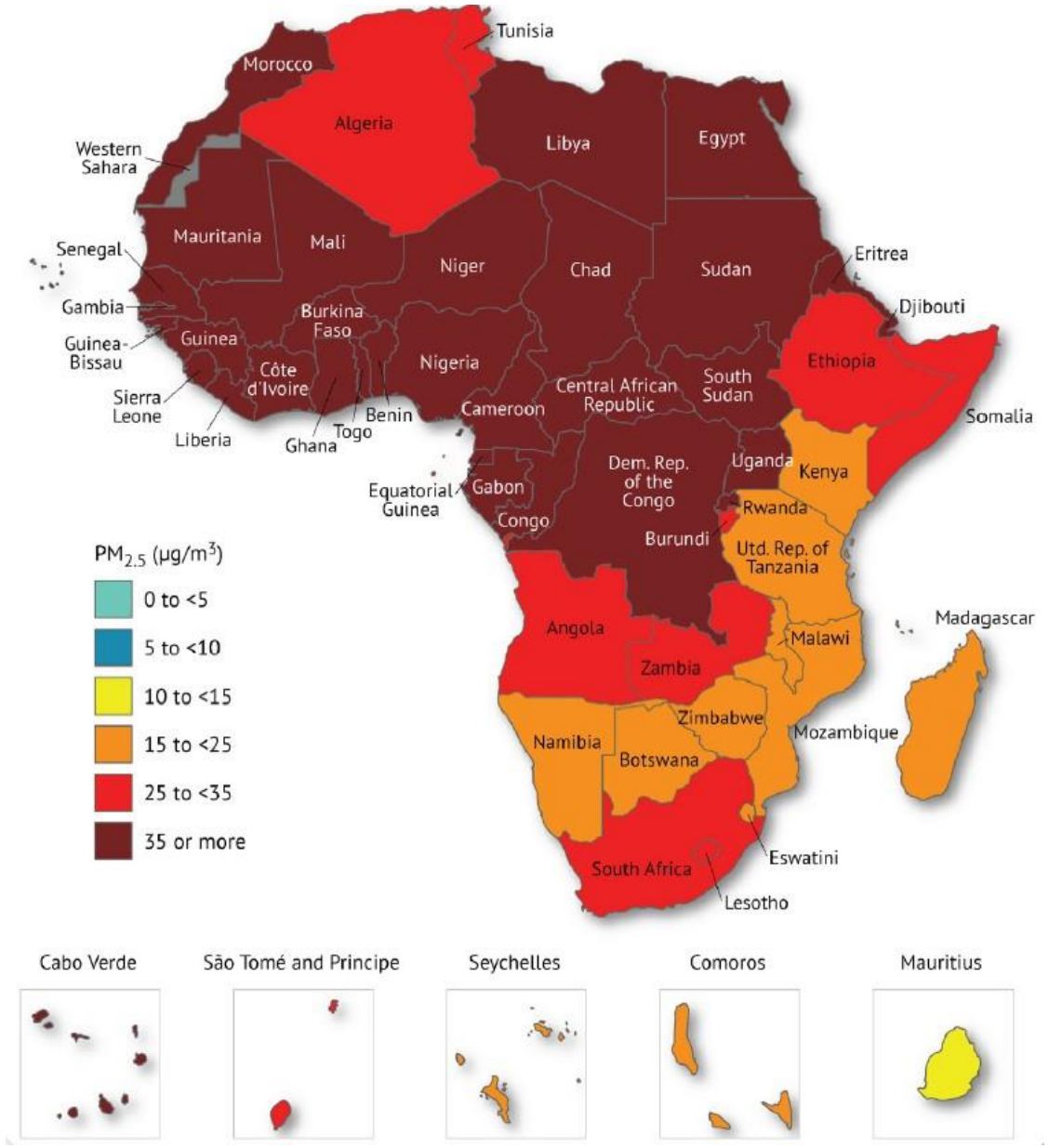

Table 0.1. Recommended AQG levels and interim targets

Pollutant	Averaging time	Interim target				AQG level
		1	2	3	4	
$PM_{2.5}$, µg/m³	Annual	35	25	15	10	5
	24-hour[a]	75	50	37.5	25	15
PM_{10}, µg/m³	Annual	70	50	30	20	15
	24-hour[a]	150	100	75	50	45
O_3, µg/m³	Peak season[b]	100	70	–	–	60
	8-hour[a]	160	120	–	–	100
NO_2, µg/m³	Annual	40	30	20	–	10
	24-hour[a]	120	50	–	–	25
SO_2, µg/m³	24-hour[a]	125	50	–	–	40
CO, mg/m³	24-hour[a]	7	–	–	–	4

[a] 99th percentile (i.e. 3–4 exceedance days per year).
[b] Average of daily maximum 8-hour mean O_3 concentration in the six consecutive months with the highest six-month running-average O_3 concentration.

TABLE 1 Population-weighted annual average $PM_{2.5}$ exposures in 2019 and percentage of population living in areas that exceed the least stringent interim target set by WHO in top 10 countries with the highest $PM_{2.5}$

Country	Population-Weighted $PM_{2.5}$ (µg/m³) (Uncertainty Intervals)	National Ambient Air Quality Standards
Niger	80.1 (42.2–145)	✗
Nigeria	70.4 (45.4–105)	✓
Egypt	67.9 (47.8–67.9)	✓
Mauritania	66.8 (37.6–108)	✗
Cameroon	64.5 (43.8–92.6)	✗
Mali	60.6 (33.7–103)	✗
Senegal	60.2 (37.6–92.7)	✓
Chad	59.3 (34.6–94.8)	✗
The Gambia	58.1 (35–92.6)	✓
Côte d'Ivoire	55.6 (32.7–90.3)	✓

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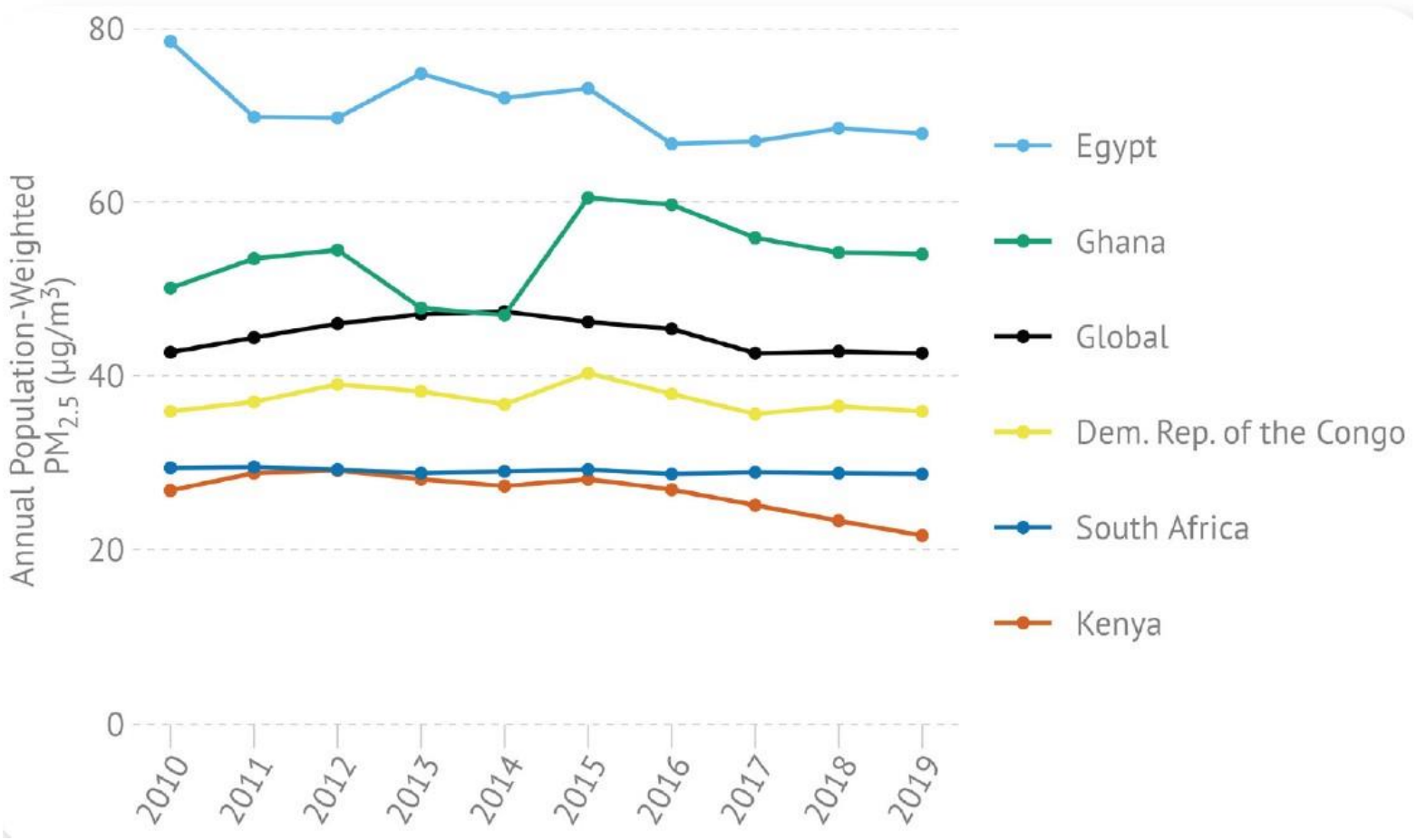
Change in population-weighted annual average PM2.5 exposure for the five countries of interest, 2010–2019



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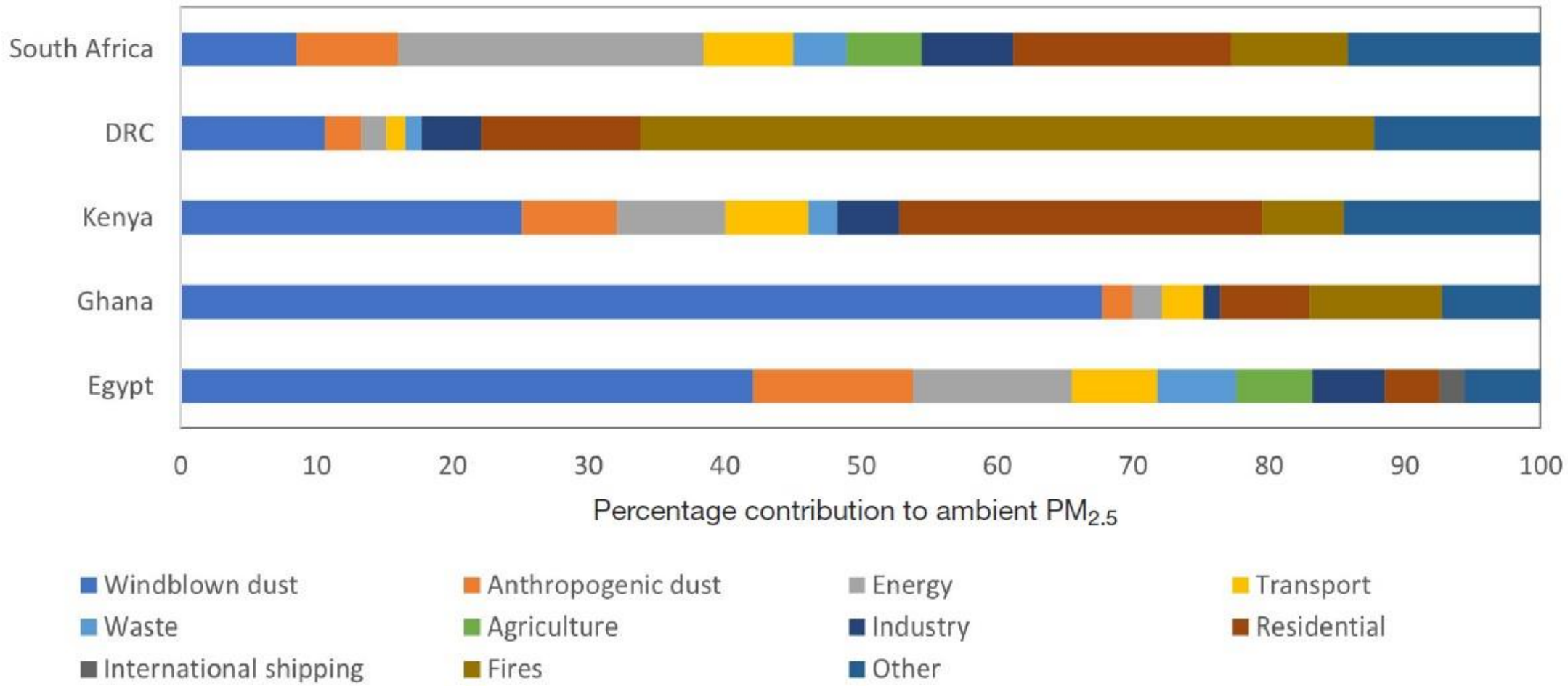
Contribution of key sources to $PM_{2.5}$ exposures in 2019



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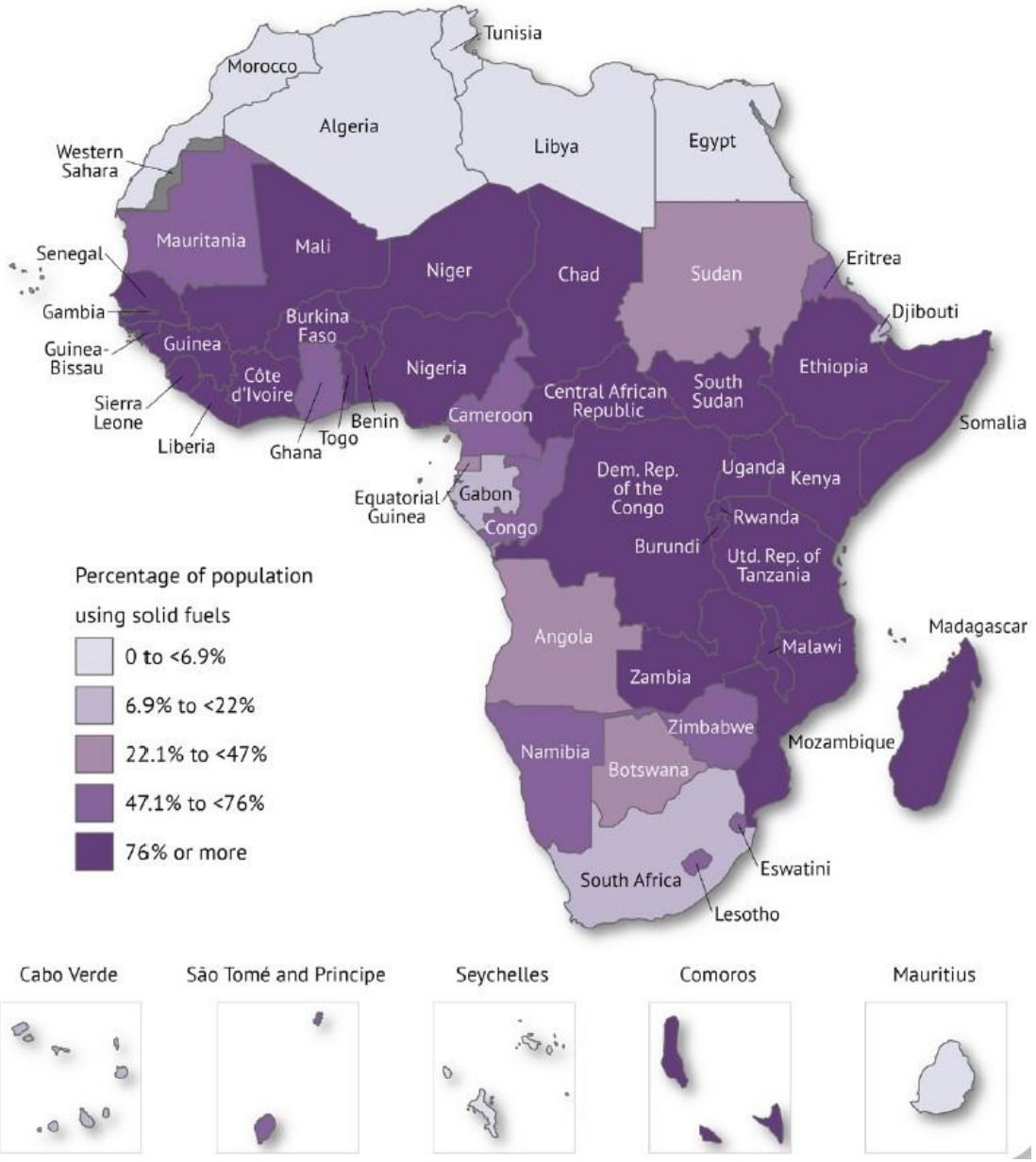
“Air pollution is a climate and health emergency, in Africa and around the world.”



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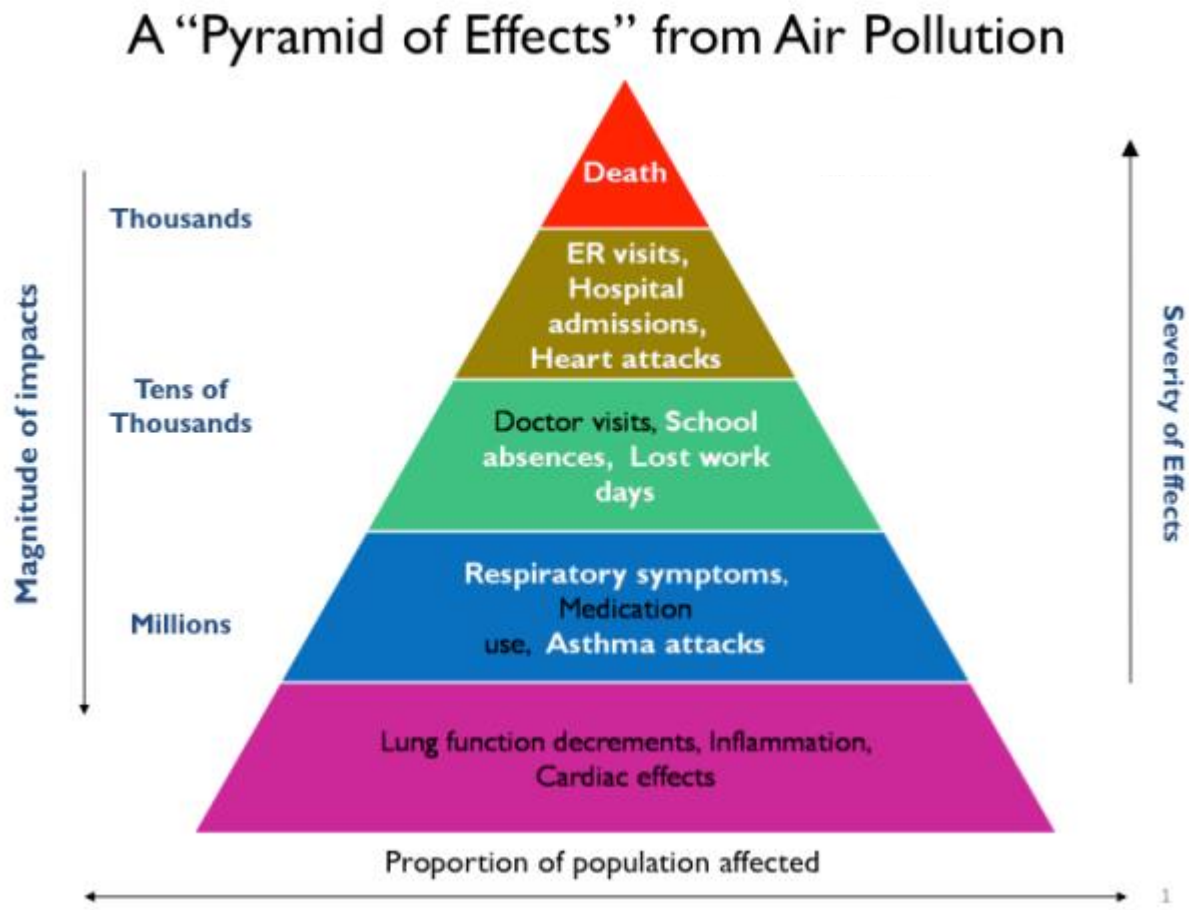
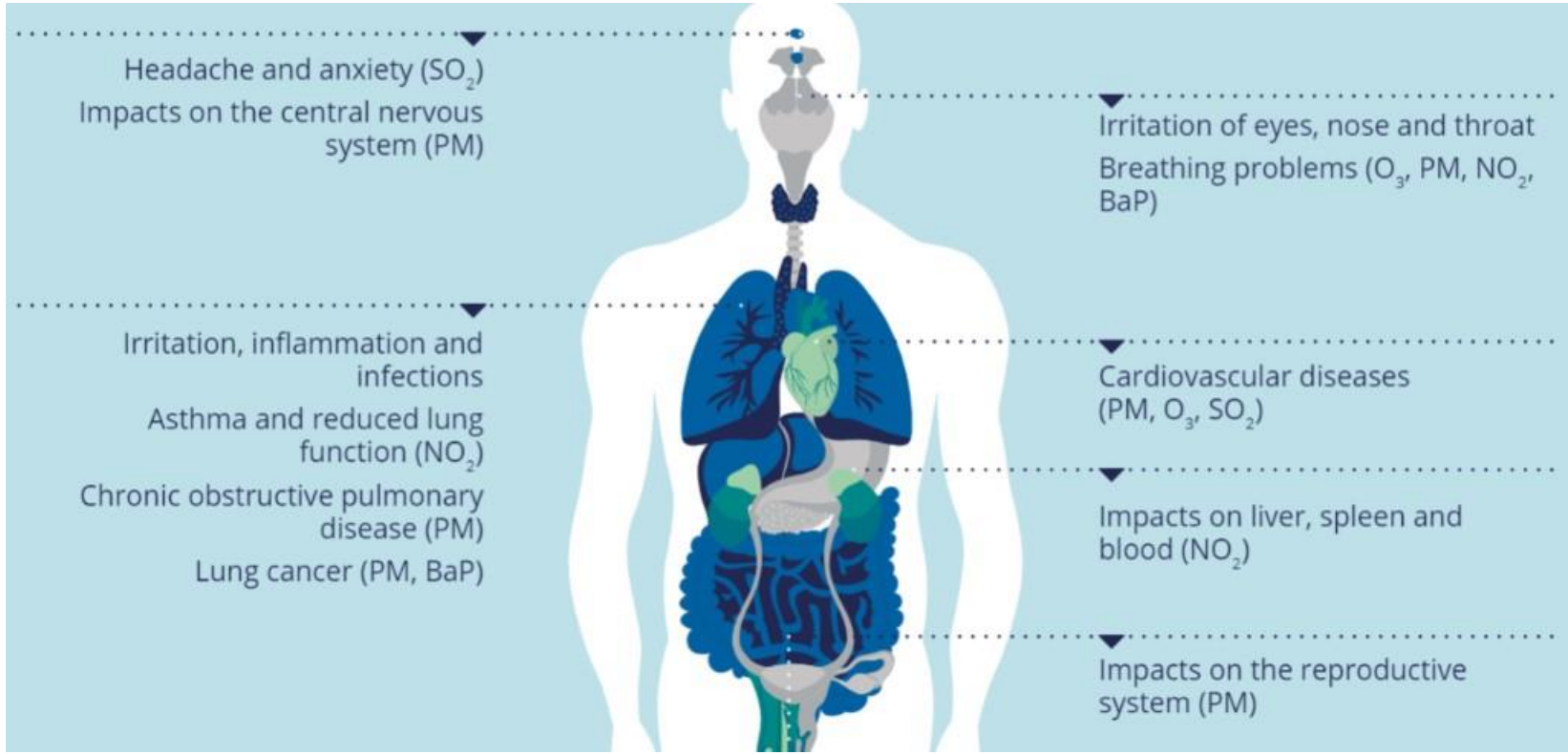


https://www.epa.gov/benmap/how-benmap-ce-estimates-health-and-economic-effects-air-pollution

Air pollution affects people from the beginning until the end of life

- Almost all organs, systems and processes in the human body may be impacted by air pollution.
- Lungs, heart, brain, vascular system, metabolism, reproduction system are all affected.



Air pollution impacts on human health

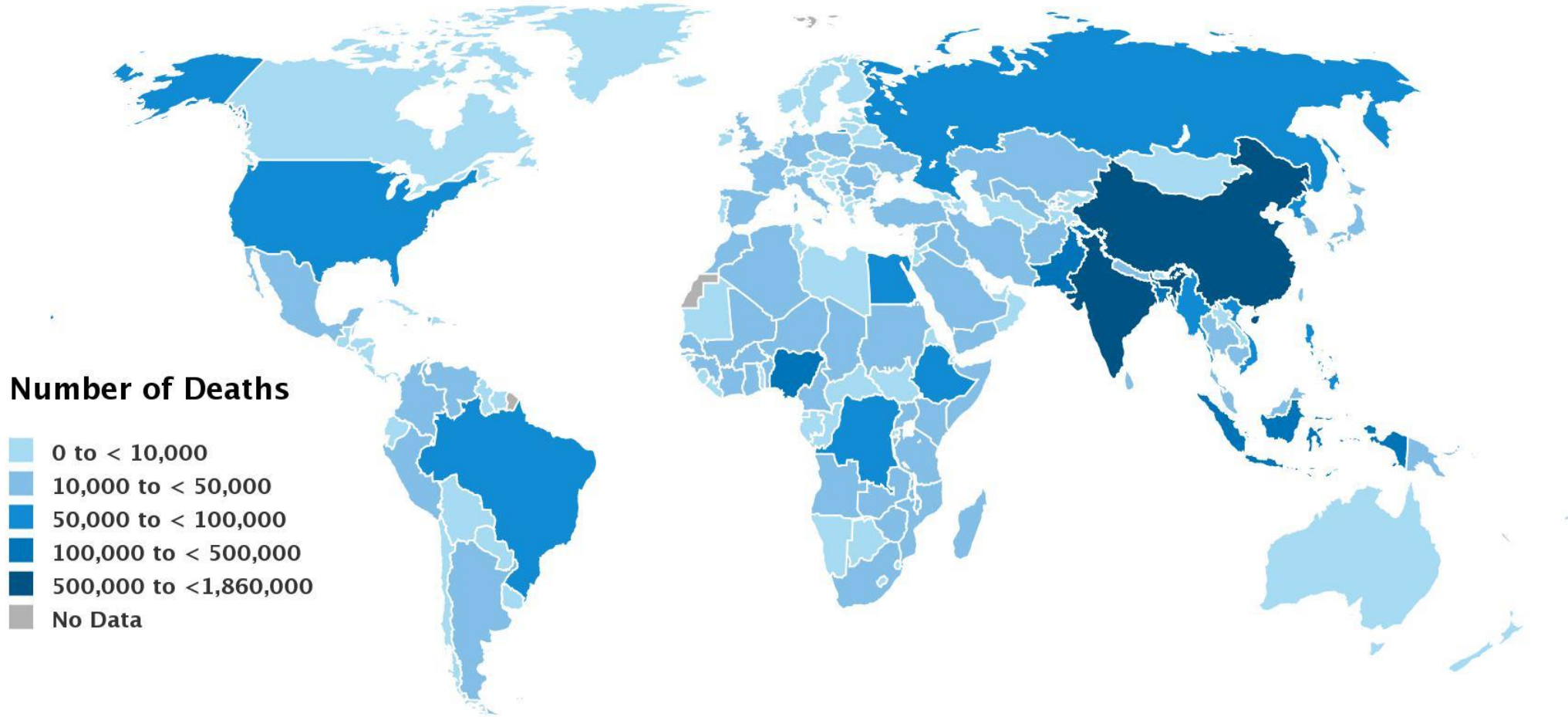
- Short-term exposure to air pollution can lead to a range of diseases including:
  - Aggravated asthma
  - Lower respiratory infections
  - Emergency room visits
  - Ear, nose throat irritation, breathing difficulties
  - Chronic obstructive pulmonary disease
  - Heart attacks among people with heart disease

- Long-term exposure to air pollution can lead to a range of diseases including:
  - Pre-term birth, low birth weight
  - Heart disease, stroke
  - Trachea, bronchus and lung cancers (IARC has classified $PM_{2.5}$ as carcinogenic)
  - Cataract
  - Type 2 diabetes, obesity, systemic inflammation
  - Alzheimer's disease, dementia

Air pollution and vulnerable groups

- Unborn children
- Infants
- Children under 5 year
- Pregnant women
- The elderly
- People with pre-existing diseases
- Minority groups

Number of Deaths Attributable to Air Pollution in 2019



State of Global Air

TABLE 2 Death rates linked to $PM_{2.5}$ across African regions in 2019

Region/Focus Country	$PM_{2.5}$ Death Rate* (UI)**
Northern Africa	55.8 (46.7–65.1)
Egypt	91.4 (67.5–118)
Southern Africa	38.6 (29.8–47.3)
South Africa	44.6 (35.4–53.8)
Western Africa	27.4 (16.7–40.7)
Ghana	39.8 (25.5–56.2)
Central Africa	15.6 (7.9–27)
Democratic Republic of the Congo	12.6 (5.3–23.8)
Eastern Africa	9.8 (5.3–15.8)
Kenya	10.9 (6.5–17)

*Death rate refers to the number of deaths per 100,000 people per year.

**UI - Uncertainty interval refers to the 95% uncertainty interval.

TABLE 3 Top 10 countries with the highest number of deaths linked to $PM_{2.5}$ across Africa in 2019

Country	Total Number of $PM_{2.5}$-Linked Deaths
Egypt	90,600 (66,800–116,900)
Nigeria	68,500 (41,500–101,700)
Morocco	27,000 (20,300–34,000)
South Africa	25,800 (19,700–30,000)
Algeria	21,600 (15,300–29,000)
Sudan	16,600 (10,200–24,400)
Ghana	12,500 (8,000–17,800)
Democratic Republic of the Congo	11,000 (4,700–20,900)
Cameroon	10,200 (6,100–14,800)
Ethiopia	9,000 (4,200–16,200)

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TABLE 5 Top 10 countries with the highest number of deaths linked to household air pollution across Africa in 2019

Country	Total Number of $PM_{2.5}$-Linked Deaths
Nigeria	128,200 (88,700–171,600)
Ethiopia	67,800 (52,700–82,400)
Democratic Republic of the Congo	58,000 (41,200–77500)
United Republic of Tanzania	39,200 (29,200–49,900)
Somalia	27, 600 (19,600–39,00)
Niger	26, 500 (18,300–35,600)
Mozambique	25,000 (18,800–32,000)
Burkina Faso	24,300 (17,500–32,100)
Uganda	23,000 (16,900–29,300)
Mali	22,600 (15,900–29,700)
Madagascar	21,500 (15,800–27,900)

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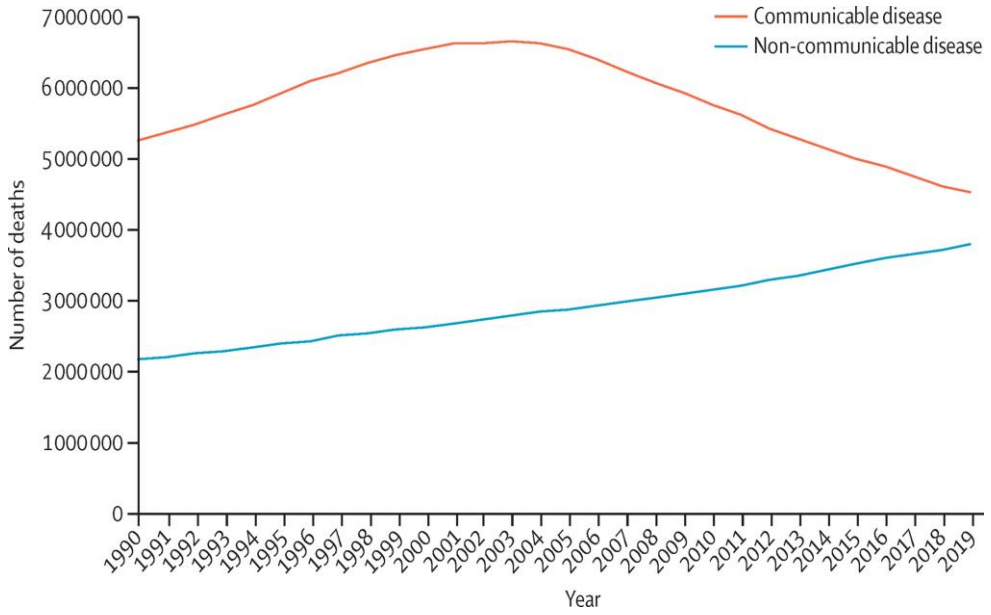
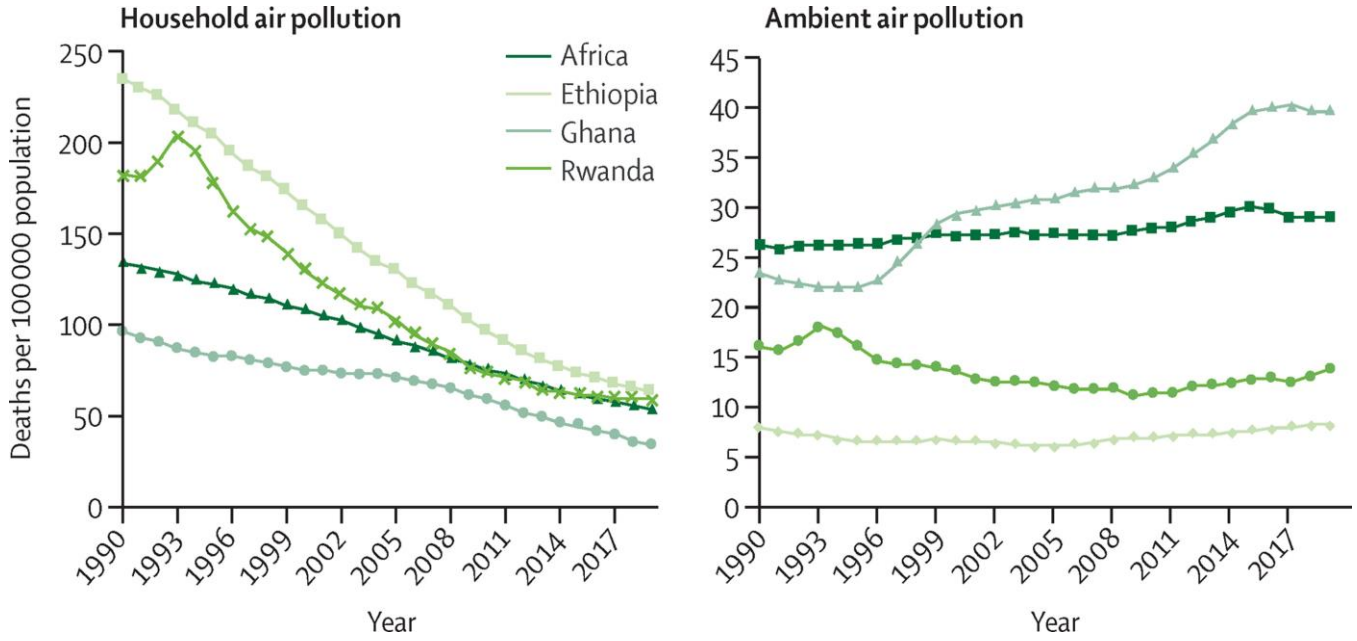


Deaths attributable to communicable and non-communicable disease in Africa, 1990–2019



Deaths attributable to household air pollution and ambient particulate matter $(PM)_{2.5}$ air pollution in Ethiopia, Ghana, Rwanda, and overall, in Africa, 1990–2019

Fisher S, Bellinger DC, Cropper ML, Kumar P, Binagwaho A, Koudenoukpo JB, Park Y, Taghian G, Landrigan PJ. Air pollution and development in Africa: impacts on health, the economy, and human capital. Lancet Planet Health. 2021 Oct;5(10):e681-e688. doi: 10.1016/S2542-5196(21)00201-1.

Data sources for Africa: air pollution and health impacts

- Global Durden of Disease (https://www.healthdata.org/gbd)
- HEI / IHME (https://www.healthdata.org/policy-report/state-air-quality-and-health-impacts-Africa)
- WHO Global Health Data Observatory (https://apps.who.int/gho/data/node.main-afro.127?lang=en)
- Country networks (e.g., https://saaqis.environment.gov.za/ in South Africa)
- AirQo (https://airqo.africa/explore-data)
- Satellite data

STATE OF GLOBAL AIR

South Africa

Air Pollution and Health Factsheet

Air pollution was among the top 10 risk factors for death in South Africa in 2019, accounting for nearly 6% of all deaths (more than 30 thousand). Considered separately, ambient particulate matter ($PM_{2.5}$) ranked as the first leading risk factor for deaths, and household air pollution (HAP) ranked fifth. Ozone was not in the top 20 risk factors.

Key statistics at a glance for 2019

28% of the population of South Africa lives in areas where $PM_{2.5}$ levels are above the least stringent WHO guideline for healthy air (35 µg/m^3)

46% of outdoor $PM_{2.5}$ comes from fossil-fuel combustion (i.e., coal, oil and gas)

8% of deaths due to air pollution are in children under 5

Exposure to Air Pollution

$PM_{2.5}$ (presented as population-weighted annual average concentration)

- **No Change** in 2019 (29 µg/m^3) than in 2010 (29 µg/m^3)
- **Equal or below** than the global average (44 µg/m^3)
- South Africa **ranks first** among 6 Southern Sub-Saharan Africa countries
- **More than 100 stations** monitored for $PM_{2.5}$ in South Africa ***

Ozone (presented as populatiom-weighted seasonal average concentration)

- **Higher** in 2019 (40 ppb) than in 2010 (35 ppb)
- **Equal or below** the global average (50 ppb)

HAP (% of population relying on solid fuels for cooking)

- **Lower** in 2019 (12%) than in 2010 (21%)

* Please note that $PM_{2.5}$ concentrations reported here are estimated using a combination of satellite data, ground air quality monitoring data, and chemical transport models. These estimates can be more uncertain where ground monitoring data are limited or not available. In South Africa, the best estimate of the annual average exposure is 29 µg/m^3, but it may range from 24 µg/m^3 to 34 µg/m^3.

** Based on data from GBD-MAPS - Global Project. Find out more.

*** Based on data from OpenAQ

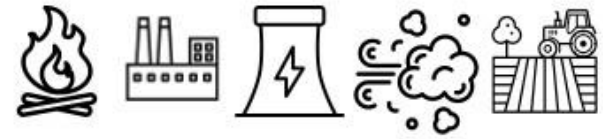
Health Impacts of Air Pollution

- Air pollution is among the top 10 risk factors for death in South Africa; more than 30 thousand in 2019 deaths were linked to air pollution.
- There are 73 deaths per 100,000 people due to air pollution in South Africa which is lower than the global average (86 deaths per 100,000), adjusted for differences in age.
- 8% of total air-pollution-attributable deaths in South Africa are in children under 5, and 9% are in adults over 70.
- Air pollution reduced life expectancy in South Africa by 1 years.

Percentage of Deaths (by Cause) Due to Air Pollution in South Africa in 2019

19%	20%	19%	25%	18%	17%	12%
of stroke deaths	of diabetes deaths	of ischemic heart disease deaths	of COPD deaths	of lung cancer deaths	of lower-respiratory infection deaths	of neonatal deaths

Top 5 Sources of Outdoor $PM_{2.5}$ and Associated Health Burden in South Africa in 2019



	Residential	Industry	Energy	Anthropogenic Dust	Agriculture
Contribution to total outdoor $PM_{2.5}$	16%	7%	22%	8%	6%
Number of $PM_{2.5}$ linked deaths	4,006	1,752	5,508	2,003	1,502

For More Information:
For the full report and additional data, please visit www.stateofglobalair.org

Additional Resources:
For open-access, real-time air quality data, visit OpenAQ
UN Environment Program Pollution Action Note

@HEISoGA

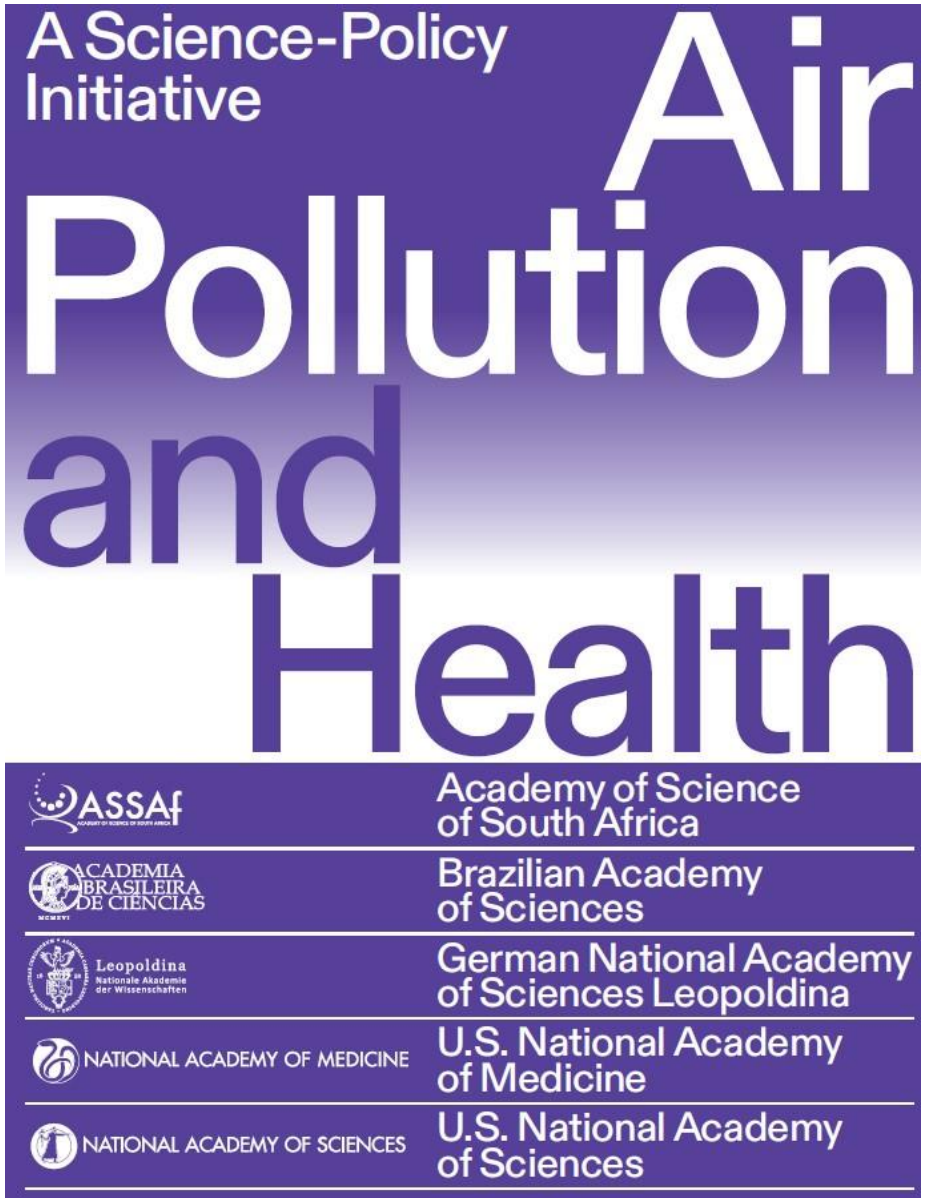
For more details, please visit
www.stateofglobalair.org
Contact us
contactsoga@healtheffects.org

The State of Global Air website is a collaboration between the Health Effects Institute and the Institute for Health Metrics and Evaluation, with expert input from The University of British Columbia.

International Day of Clean Air for blue skies

A call to action

- **Adoption of a global compact on air pollution**
- Need political leadership and partnerships
- Many policy and technological solutions to reduce harmful products of combustion exist
- Effective policies and technologies need to be shared
- **Share success stories in controlling air pollution**
- Optimize the costs and benefits of actions
- Sufficient monitoring of key pollution metrics
- Mobilize finance and investment in opportunities to reduce air pollution



Acknowledgements

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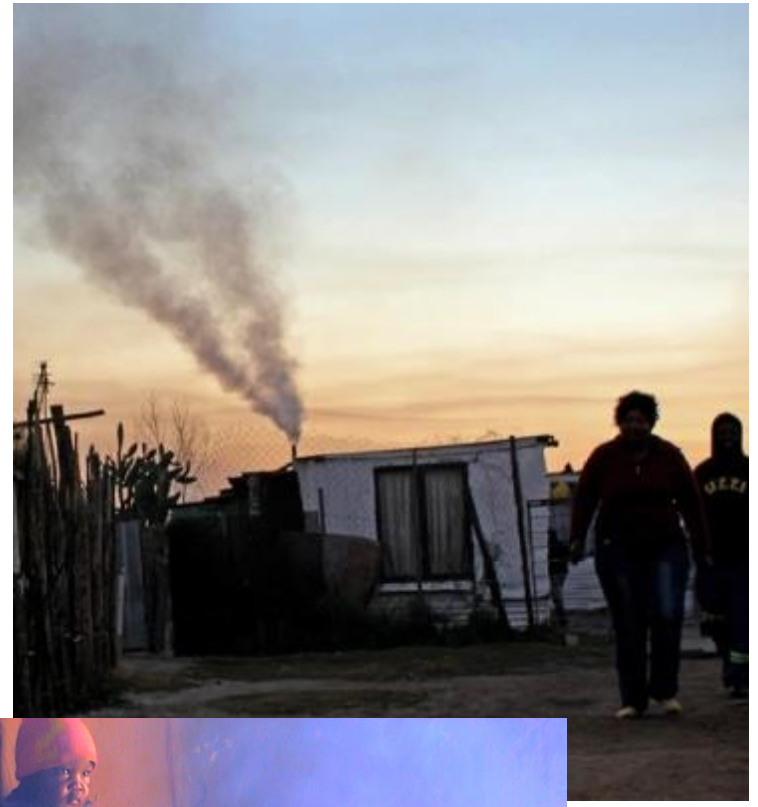
- Eastern Africa GEO Health Hub (Kenya)
- AirQo
- Victor Nthusi and Pallavi Pant
- South African Medical Research Council



“Be the change ”