My China Experience +

August 13, 2015


June 22, 2015
ACE2015
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MDEQ Official Challenges EPA Administrator Gina McCarthy to Game of Thumb War


Beijing, China
July 22, 2015

The Carolyn Photos

March 2012


03/15/2012 09:11


03/15/2012 09:08


03/16/2012 12:05


CUCAC
2015中美空气净化研讨会
2015China US Clean Air Conference
中美空气净化领域的合作和发展
Cooperation and Development of US and China Air Purification
中方主办单位：中国生物样性保护与绿色发展基金会（中国绿发会）
中国低碳产业投资中心
中方协办单位：中国环境科学学会 国际绿色经济协会
美方协办单位：美中科技创新协会 UCTIA
(US China Technology Innovation A
诺贝尔奖得主国际科学交流协会
空气和废物管理协会
(Air& Waste Management Association)
承 办 单 位：北京高创汇智科技有限公司
赞 助 商：
SVIEF
硅谷高创会
国开东方
CHINA DEVELOPMENT ORIENT


CUCAC


Dallas Baker
空气和废物管理协会主席
1962
1964
1966
1975
1979
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2015中美空气净化研讨会
2015China US Clean Air Conference


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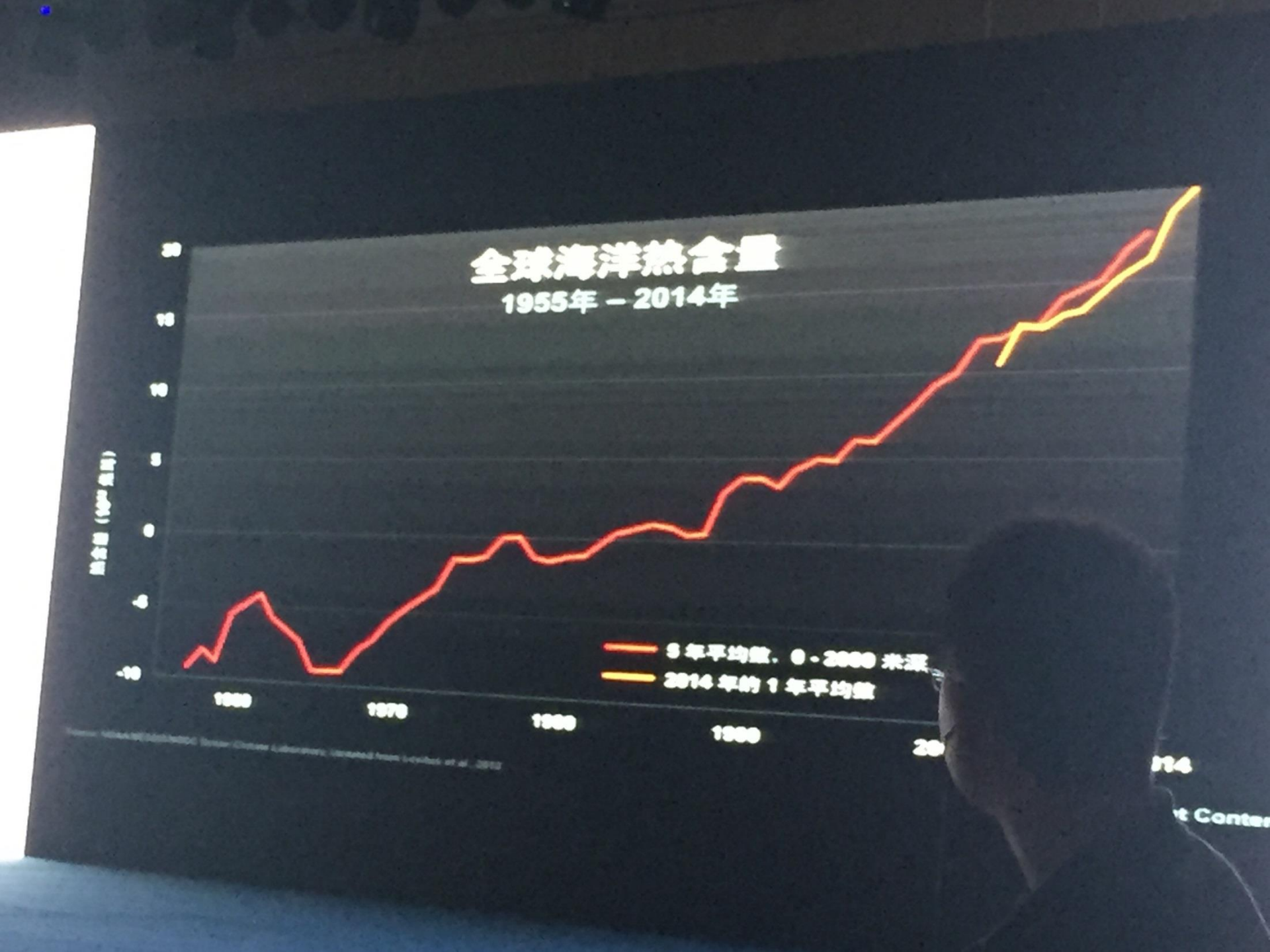
2001年 – 2011年
基线（1961 年 - 1990 年）平均
Baseline (1951 - 1980) mean
比平均温度低
Cooler than average
平均温度
Average
比平均温度高
Warmer than average
极热
Extremely hot
0.5
0.4
0.3
0.2
0.1
0
-5
-4
-1
0
1
2
3
4
5
离均差积和
2001 – 2011


全球海洋熱含量
1955年 – 2014年
15
10
5
0
-5
-10
1960
1970
1980
1990
2014
5 年平均值，0 - 2000 米深
2014 年的 1 年平均值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中美空气净化研讨会
China US Clean Air Conference

国际空气净化领袖论坛

James Lents
南加空气管理局前局长

James Lents 是美国著名环境保护方面的领导者，因协助丹佛市治气污染而广为人知。1986年经全国遴选，担任南加空气管理局的局在这个位置上，他没有让人失望。任期内，他成功推进了轻轨、低柴油引擎和低排放汽车等原来被认为是政治上不可行的项目，也成服辖区的政治家，将南加空气管理局的雇员增加到千人，年度办公超过一亿美元。

Andrew Chiu
Verliant Energy 首席执行官

Andrew Chiu 有着成功的新企业创业纪录，他 成功地商业化了从、可再生能源到环保等多个产业的新兴科技。 自2012年秋季以Andrew一直担任Verliant Energy公司的首席运营官。 他在许多着丰富的经验和专业知识，包括通讯技术，理财管理和可再生能等。他的目标是将Verliant Energy打造成通过一种创新的技术改物管理公司和能源供应商的运营方式的公司，从而改变社会，使业的人都能受益。 Andrew成功带领Verliant 进入了中国市场。在中国、菲律宾与其他东南亚国家中取得了与多个政界、商界的系，并为Verliant成功融资。

Richard Stedman
加州蒙特利湾空气污染统一管理区 空气污染管理官员

20 年一月至2009年二月，Richard曾任华盛顿州奥 克区 理处（ORCAA）执行 在此之前，他曾任华 顿州卫 项目及联邦有毒物 登记处的经理和首 。 的空气污染控制 于加州圣芭芭拉 程师。Richard 构已经政府部 空气清洁协会 染控制


CUCAC
2015中美空气净化研讨会
2015China US Clean Air Conference
颗粒物对人体健康的影响
THE HEALTH EFFECTS OF PM
心血管
Cardiovascular
呼吸系统
Respiratory
RAMBOLL
China US Clean Air Conference, Beijing, China July 2015

Conference Takeaways

- 50% reduction in air pollution since 2008 Olympic Games
- 2013 Air Pollution Control Action Plan of China (5 year plan)
- China does have NAAQS (90% of cities failed in '13)
- Expect 40-60% reductions by 2017
- Gore: "99.999% of scientists agree in AGW"
- Gore: "10' sea level rise in our lifetime"
- Gore: "Coal is dead in the United States"
- Lents: LA in 1980, 180 days of O_3 violations; 0 in '13.
- China is forming a single air control "agency"
- Steadman: Key to CA – forming a regional collaboration


adidas


中华人民共和国万岁
世界人民大团结万岁


ENGINEERING
Ole Miss

China US Clean Air Conferance

Air Pollution and the Effects on Human Health

Dallas Baker, P.E., BCEE
A&WMA President
July 25, 2015

Air & Waste Management Association
Since 1907

A&WMA

Mission

To assist in the professional development and critical environmental decision-making of our members to benefit society

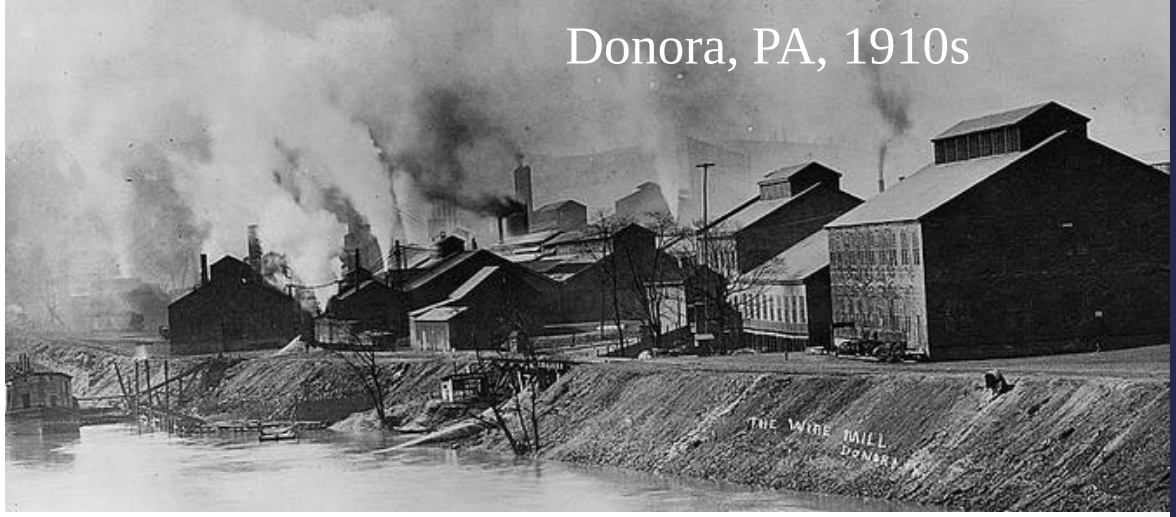
Core Purpose

To improve environmental knowledge and decisions by providing a neutral forum for exchanging information

Core Values

- Benefit society and the environment
- Inclusiveness and respect for multiple points of view
- High ethical standards and integrity
- Life-long learning and development

History



Donora, PA, 1910s

1920 to 1950:

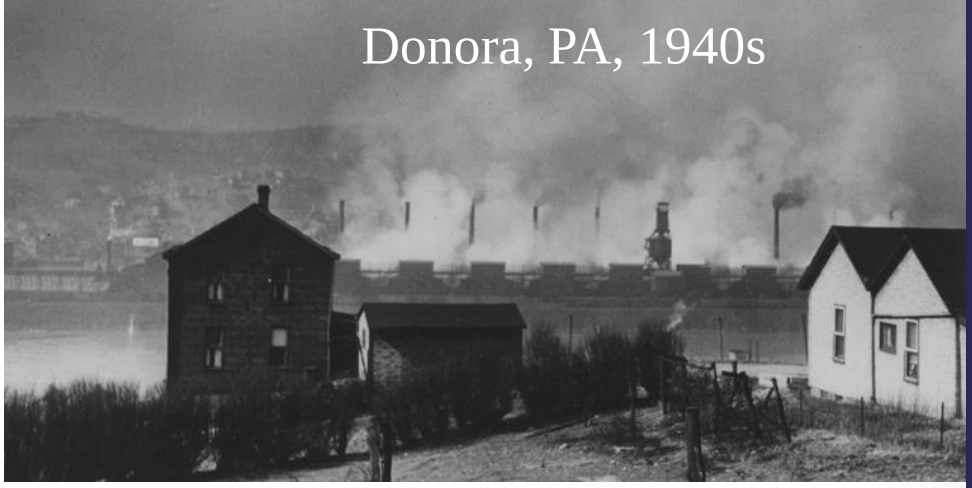
- **Air pollution episodes more frequent**
- **Smog alerts**
- **Air pollution research began**
- **Natural gas pipeline infrastructure laid**
- **Diesel locomotive replaced steam locomotive (coal-firing).**

History

1950 to 1980:

- **A 1952 episode led to Britain's Clean Air Act of 1956, which called for smokeless fuels for home heating.**
- **In 1955, Air Pollution Control Act gave authority to U.S. Department of Health's Public Health Service (research & training).**
- **In 1963, U.S. Clean Air Act**

History


Donora, PA, 1940s

Famous Air Pollution Episodes:

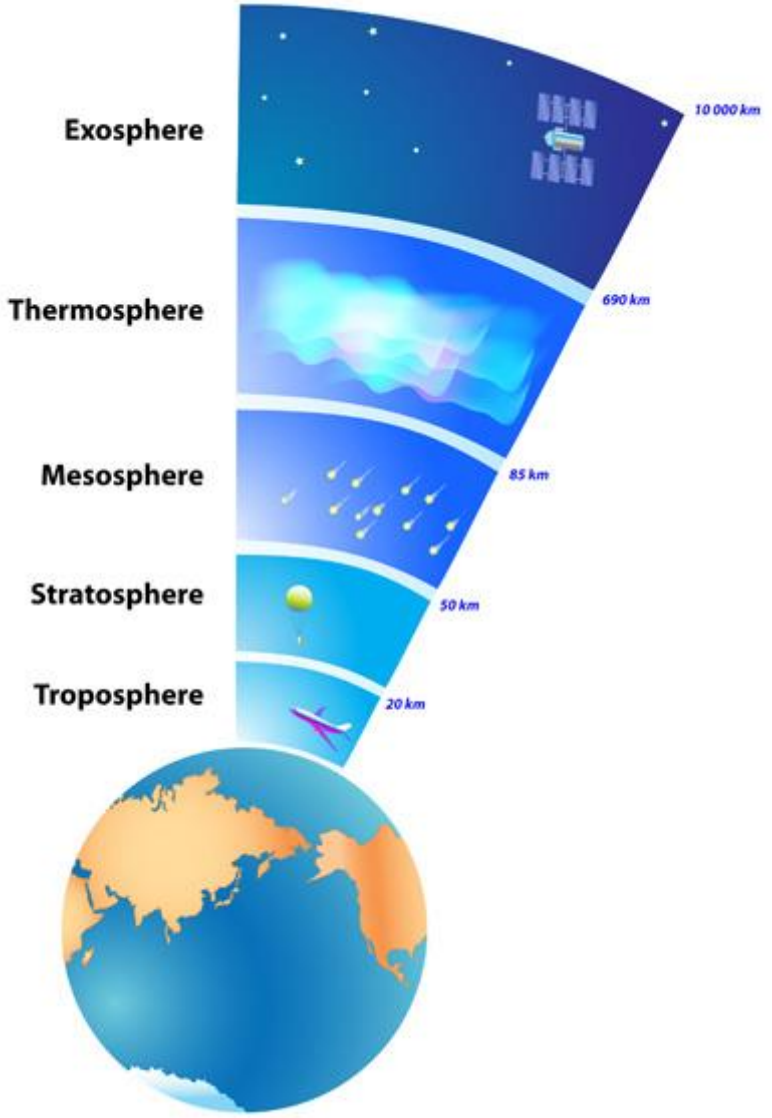
- **In 1948 in Donora, PA, a four-day smog caused 7,000 people to fall ill with 20 deaths.**
- **The 1952 episode in London, England involved a three-day smog that attributed to 4,000 deaths.**
- **In 1984 in Bhopal, India, an explosion at the Union Carbide pesticides plant released poison gas, killed 6,500 and injured tens of thousands more.**

History

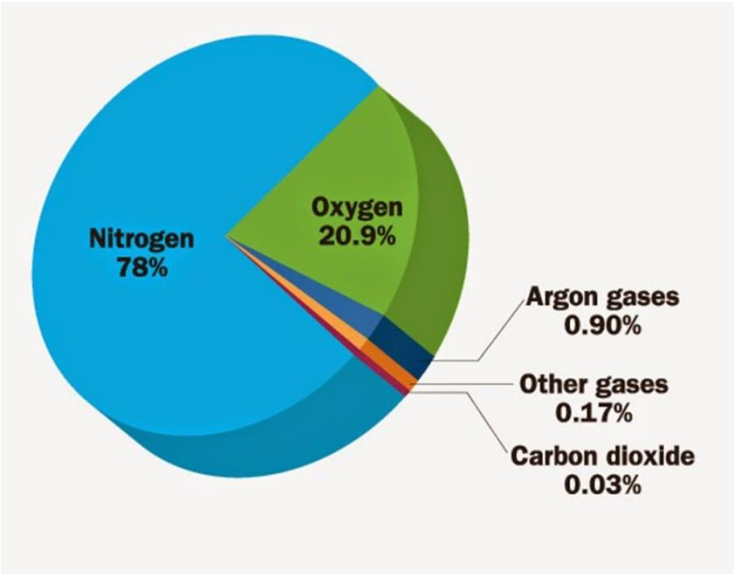
- 1970 Clean Air Act Amendments:
  - Created U.S. Environmental Protection Agency
  - Created National Ambient Air Quality Standards (NAAQS)
    - Primary - public health
    - Secondary - public welfare
    - Forced States to submit Plans for attainment of NAAQS by 1975.
      - How standards will be achieved, maintained, and enforced.

Atmosphere

- **Exosphere**: contains few particles that move into and from space.
- **Thermosphere**: temperature increases with height. The temperatures can rise to 1,500 degrees Celsius, but it would not feel warm because of the low air pressure in this layer
- **Mesosphere**: the layer in which most meteors burn up after entering Earth's atmosphere and before reaching Earth's surface.
- **Stratosphere**: contains the ozone layer; the layer where volcanic gases can affect the climate.
- **Troposphere**: the layer closest to Earth's surface in which all weather occurs.



Atmosphere



Unpolluted air composition (%):

	Dry Basis	Wet Basis
Nitrogen	78.0	75.6
Oxygen	20.9	20.2
Water	---	3.1
Argon	0.93	0.90
Carbon Dioxide	0.04	0.03

National Ambient Air Quality Standards (NAAQS)

Pollutant [final rule cite]		Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide [76 FR 54294, Aug 31, 2011]		primary	8-hour	9 ppm	Not to be exceeded more than once per year
			1-hour	35 ppm	
Lead [73 FR 66964, Nov 12, 2008]		primary and secondary	Rolling 3 month average	0.15 µg/m^3 (1)	Not to be exceeded
Nitrogen Dioxide [75 FR 6474, Feb 9, 2010] [61 FR 52852, Oct 8, 1996]		primary	1-hour	100 ppb	98th percentile, averaged over 3 years
		primary and secondary	Annual	53 ppb (2)	Annual Mean
Ozone [73 FR 16436, Mar 27, 2008]		primary and secondary	8-hour	0.075 ppm (3)	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
Particle Pollution Dec 14, 2012	$PM_{2.5}$	primary	Annual	12 µg/m^3	annual mean, averaged over 3 years
		secondary	Annual	15 µg/m^3	annual mean, averaged over 3 years
		primary and secondary	24-hour	35 µg/m^3	98th percentile, averaged over 3 years
	PM_{10}	primary and secondary	24-hour	150 µg/m^3	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide [75 FR 35520, Jun 22, 2010] [38 FR 25678, Sept 14, 1973]		primary	1-hour	75 ppb (4)	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year

Source: epa.gov

Receptors

Something which is adversely affected by polluted air.

- **People and animals - health effects**
- **Crops and vegetation - growth & yield**
- **Materials (stone, metals, cloth, paint)**
- **Aquatic life - acidification**

Receptors

Stone Statues

1908

1969

Adverse Responses

Human Effects

Primarily effects:

- **Very young children** (respiratory and circulatory systems are maturing)
- **The elderly** (these systems function poorly)
- **Persons with pre-existing diseases** (asthma, emphysema, and heart disease)

Adverse Responses

Human Effects

Function of:

- **Concentration**
- **Time of Exposure**
- **Individual's Activity Pattern**

Adverse Responses

Human Effects

Primarily effects:

- **Respiratory system** **(principle route of entry)**
- **Circulatory system**
- **Olfactory system**

Health effects of pollution

Air pollution

Water pollution

Soil contamination

Headache
Fatigue

CO

Particulate matter

Nerve damage

Ozone

Lead

SO_2
NO_X

Volatile organic compounds

Respiratory illness

- Bacteria
- Parasites
- Chemicals

Cardio-vascular illness

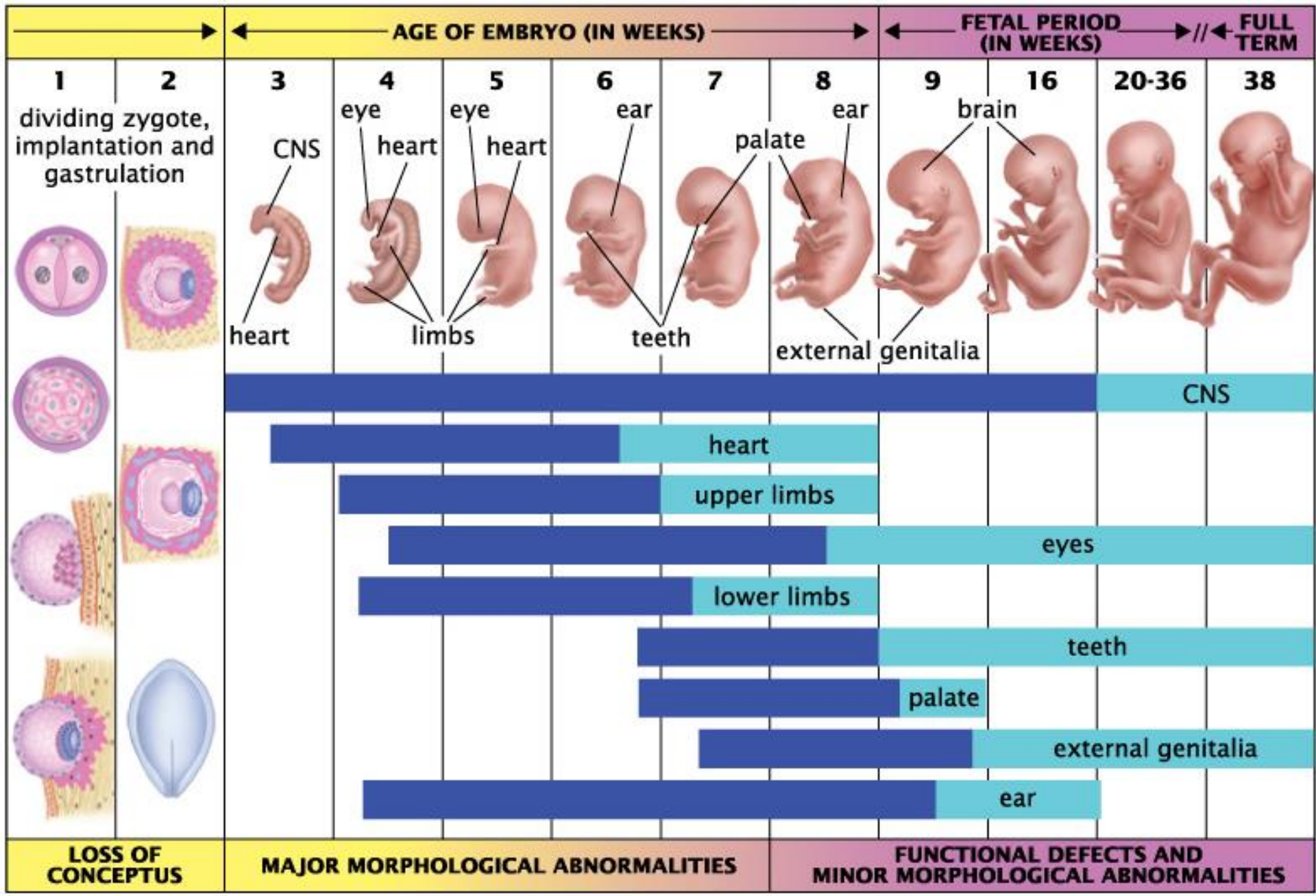
Gastroenteritis

Cancer risk

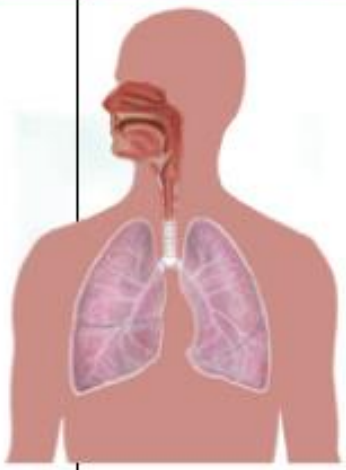
Pesticides

Nausea

Skin irritation



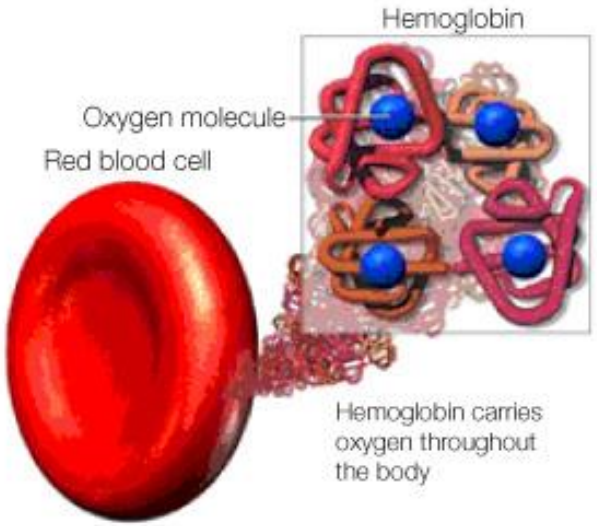
Source: http://www.environment.ucla.edu/reportcard/article1700.html (Ritz & Wilhelm, UCLA) **DK BLUE**: major **LIGHT BLUE**: minor

Stage: Age:	Newborn 0–2 mos	Infant/Toddler 2 mos–2 yrs	Young Child 2–6 yrs	School-Age Child 6–12 yrs	Adolescent 12–18 yrs
					
Lung development:	Alveolar development				
	High respiratory rate				
			Increasing lung volume		
Air pollution risks:	Respiratory death				
			Chronic cough and bronchitis		
			Reduced lung function		
			Wheezing and asthma attacks		
		Respiratory symptoms and illnesses*		Respiratory-related school absences	

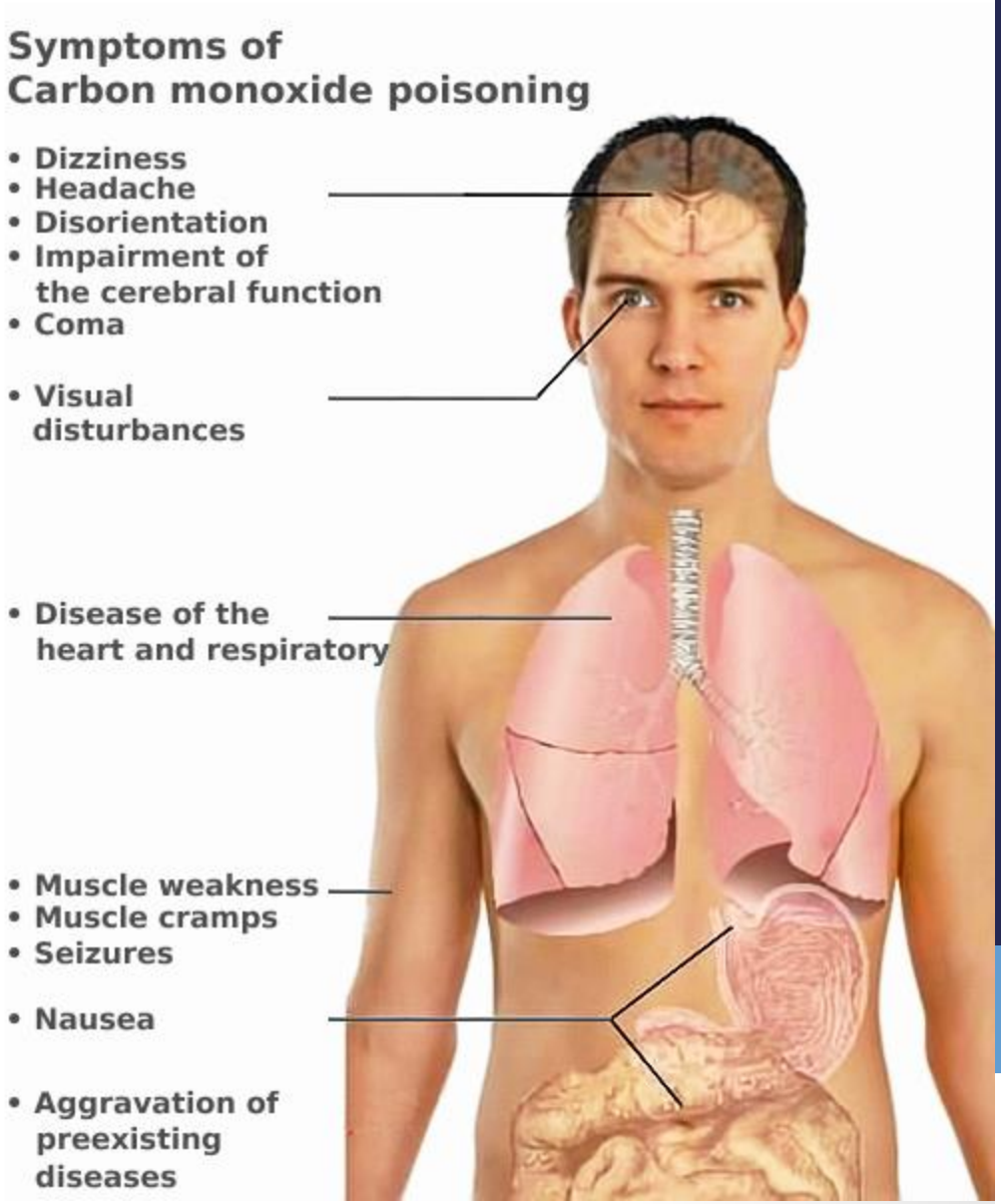
Source: http://www.environment.ucla.edu/reportcard/article1700.html (Ritz & Wilhelm, UCLA) **DK BLUE**: major **LIGHT BLUE**: minor

CARBON MONOXIDE (CO)

Often affects people indoors with incomplete combustion in heating and cooking. Smokers experience elevated levels. Inhaled, enters the bloodstream, it binds to hemoglobin more strongly than O_2, thus limiting transportation of O_2 through the body.

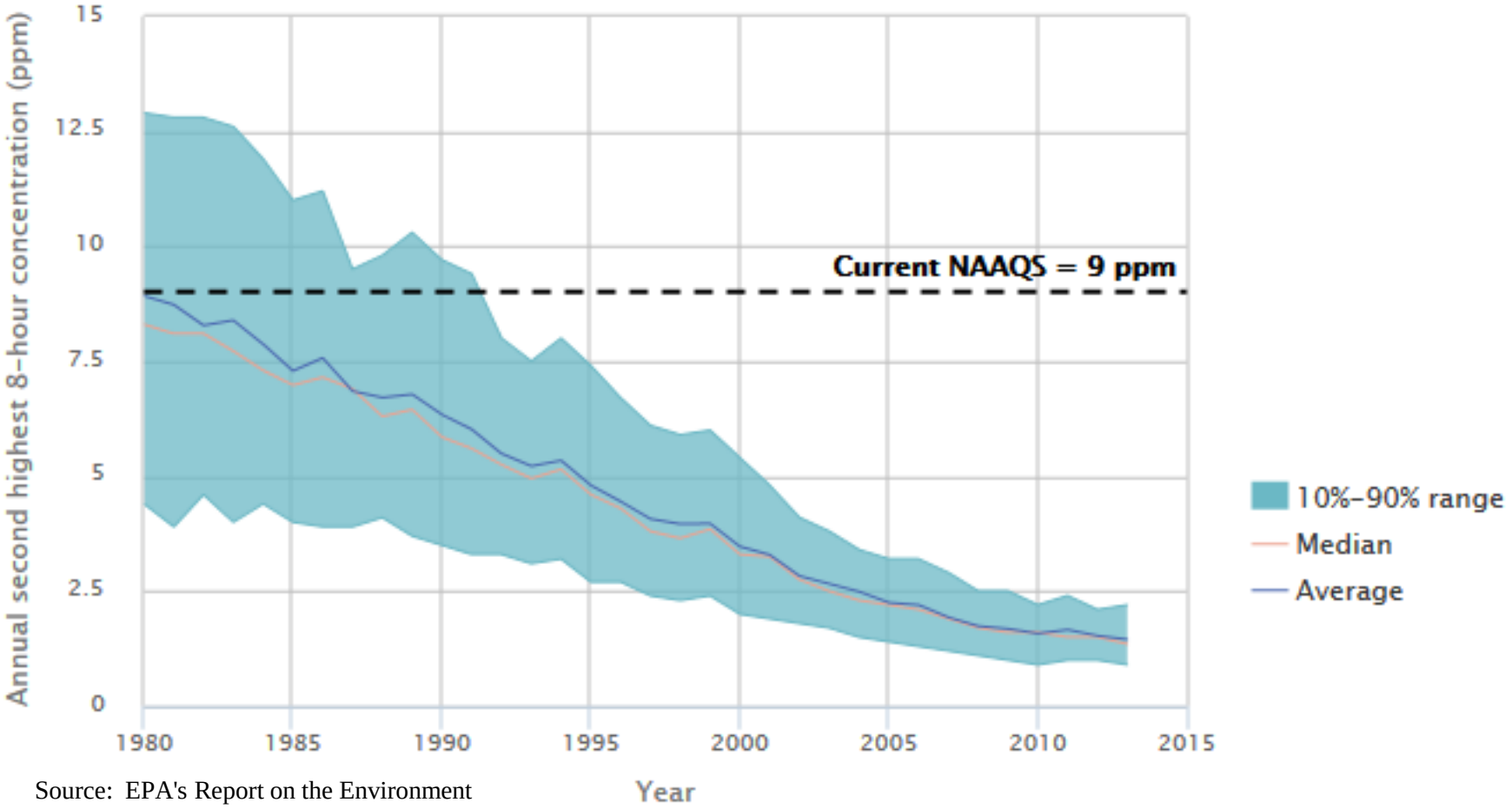


CARBON MONOXIDE (CO)



CARBON MONOXIDE (CO)

Exhibit 1. Ambient 8-hour CO concentrations in the U.S., 1980–2013



Source: EPA's Report on the Environment

The current CO NAAQS was established in 1971 and has not been revised since (U.S. EPA, 2014b).

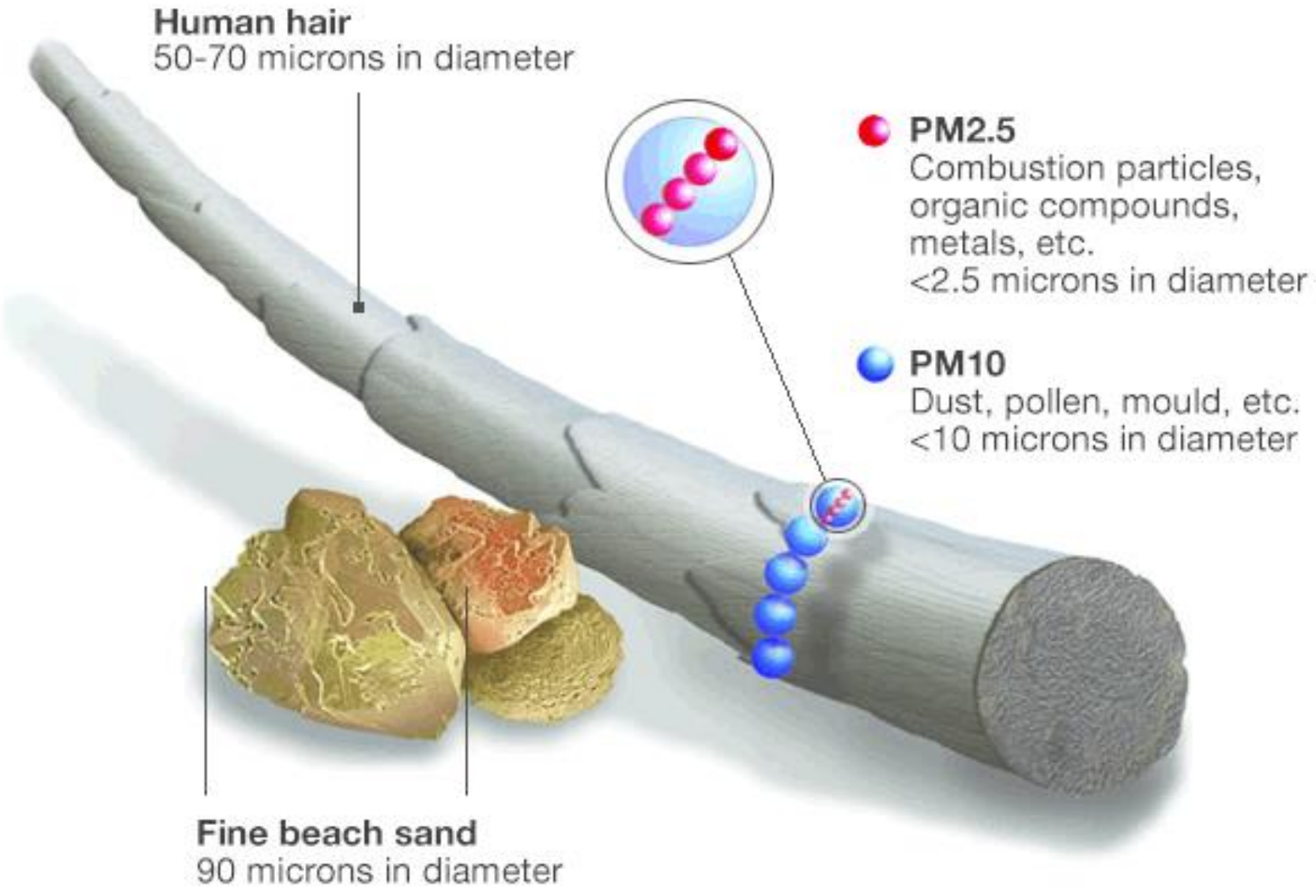
PARTICULATE MATTER (PM)

PM - Any airborne finely divided solid or liquid material with an aerodynamic diameter < 100 μm

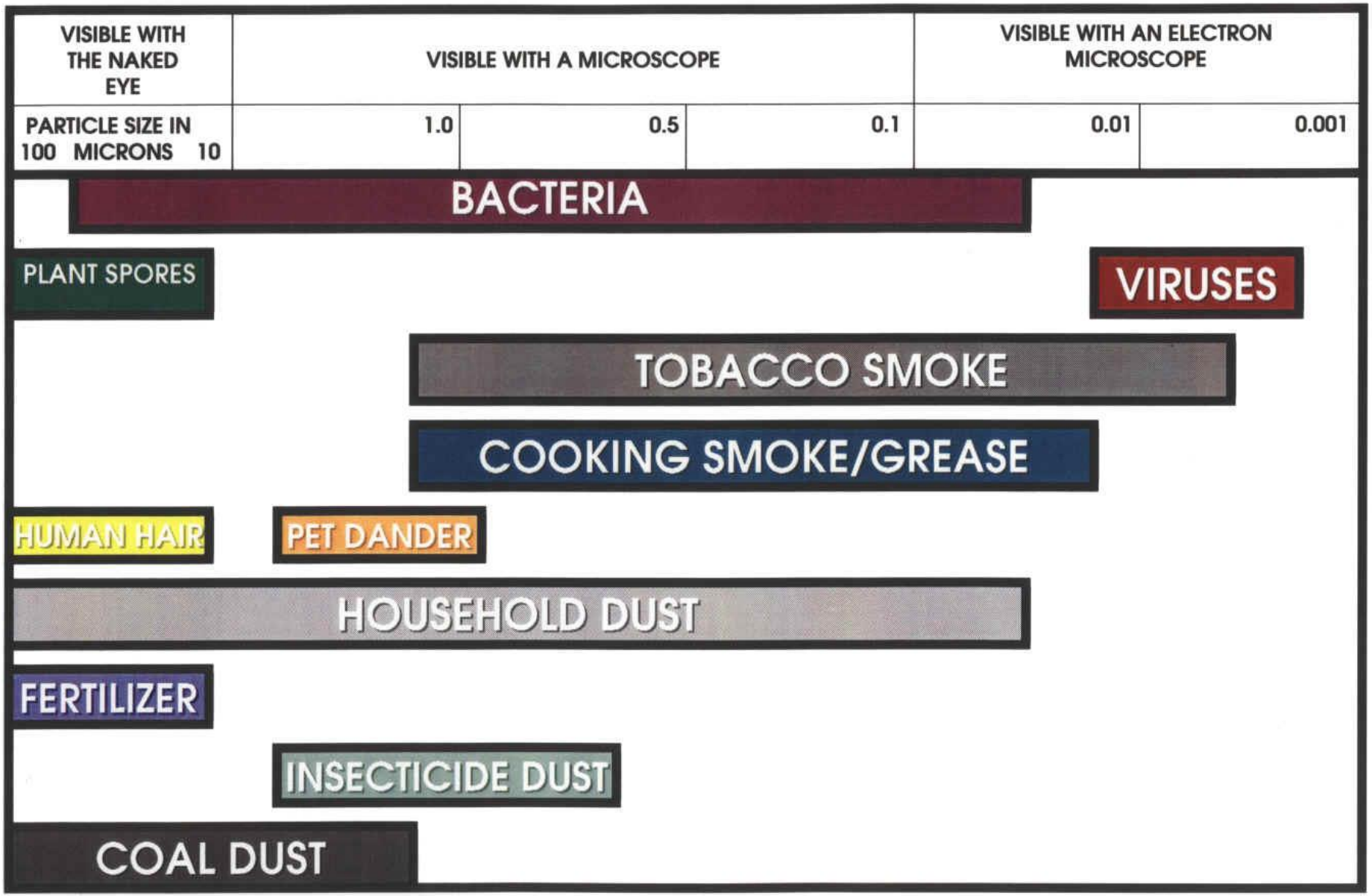
PM10 - Particulate matter with an aerodynamic diameter < 10 μm

PM2.5 - Particles with a diameter <2.5 μm

PARTICULATE MATTER (PM)



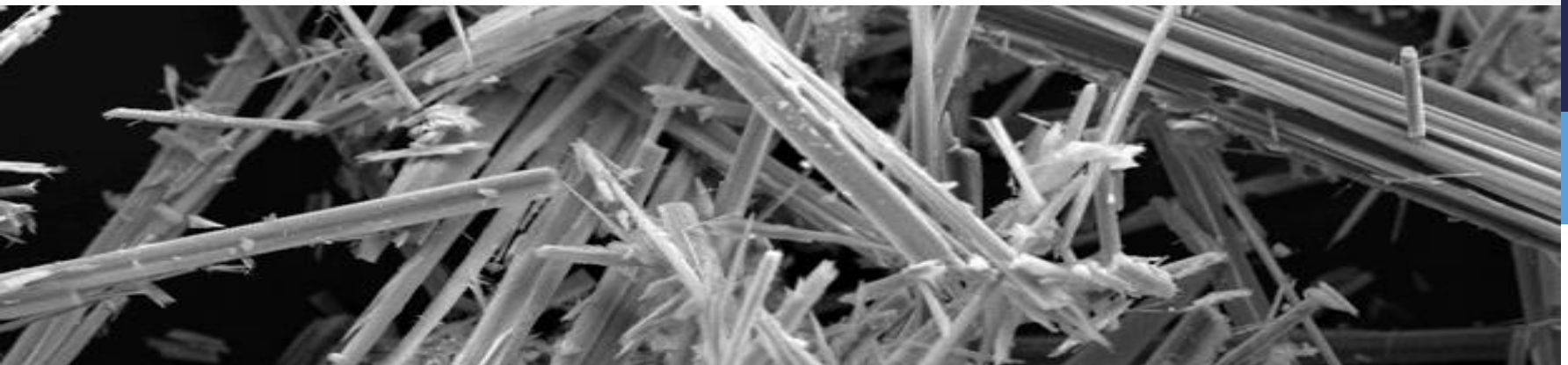
Source: US EPA


VISIBLE WITH THE NAKED EYE
VISIBLE WITH A MICROSCOPE
VISIBLE WITH AN ELECTRON MICROSCOPE
PARTICLE SIZE IN 100 MICRONS 10
1.0
0.5
0.1
0.01
0.001
BACTERIA
PLANT SPORES
VIRUSES
TOBACCO SMOKE
COOKING SMOKE/GREASE
HUMAN HAIR
PET DANDER
HOUSEHOLD DUST
FERTILIZER
INSECTICIDE DUST
COAL DUST

PARTICULATE MATTER (PM)

Effects are highly dependent of particle size & shape. If inhalation is greater than the body's natural scrubbing mechanisms, accumulation occurs over time, increases risk of acute respiratory disease.

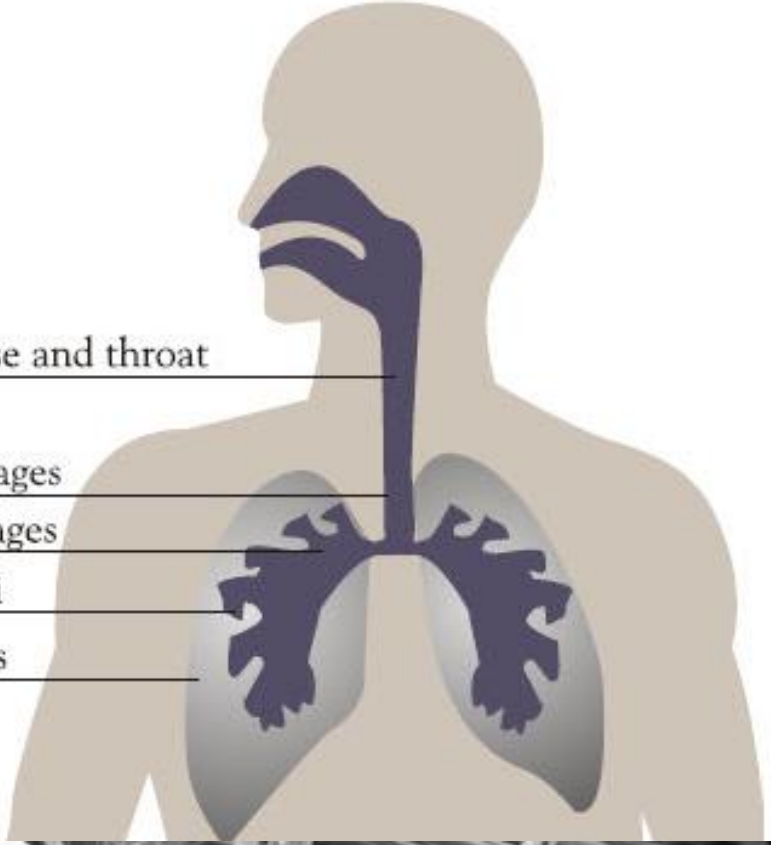
Ex: asbestosis; barbed fiber particles

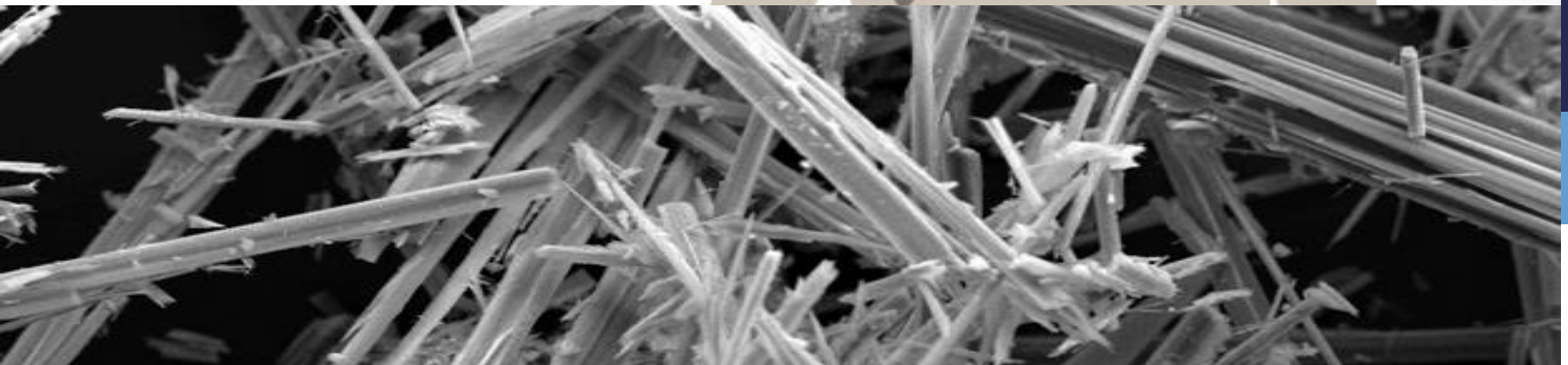


PARTICULATE MATTER (PM)

Where airborne particulate go.

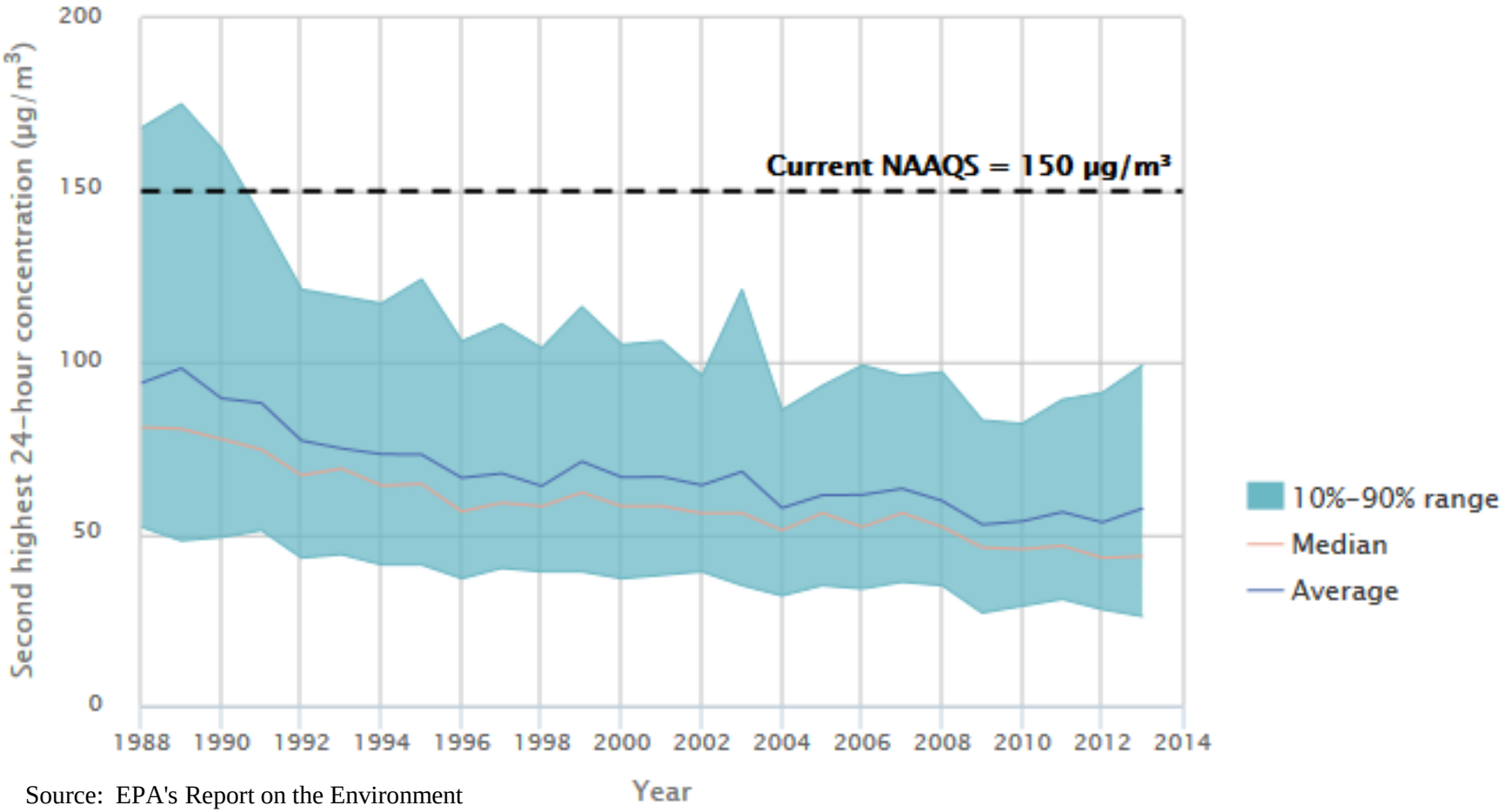
Particle Size	Effect
5.5 - 9.2 microns	Lodges in nose and throat
3.3 - 5.5 microns	Main breathing passages
2.0 - 3.3 microns	Small breathing passages
1.0 - 2.0 microns	Bronchi
0.3 - 1.0 microns	Air sacs





PARTICULATE MATTER (PM)

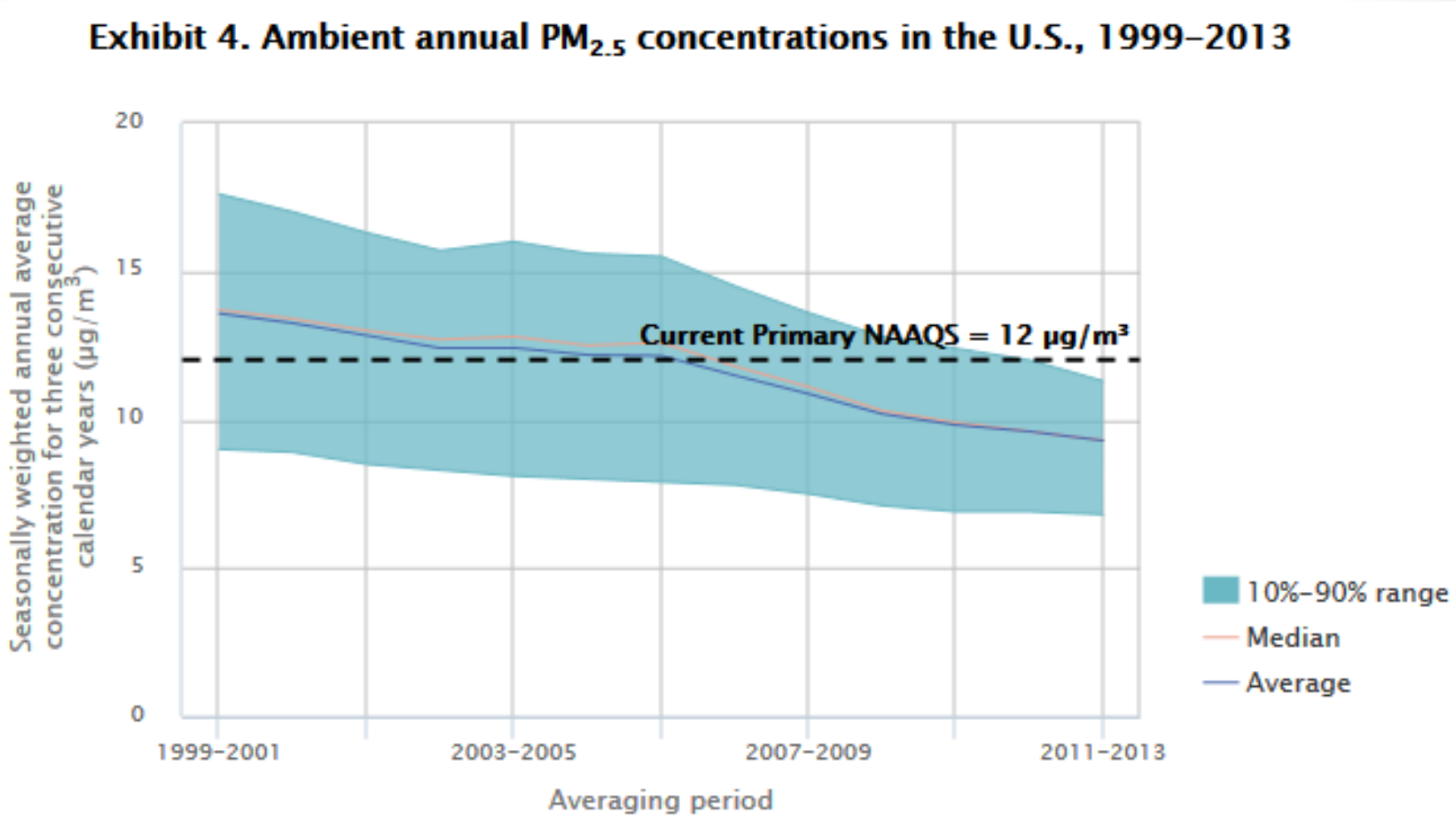
Exhibit 1. Ambient 24-hour PM_{10} concentrations in the U.S., 1988–2013



Source: EPA's Report on the Environment

The current 24-hour PM_{10} NAAQS was established in 1987 and has not been revised since (U.S. EPA, 2014b).

PARTICULATE MATTER (PM)



Source: EPA's Report on the Environment

SULFUR DIOXIDE (SO_2)

A primary product of combustion.

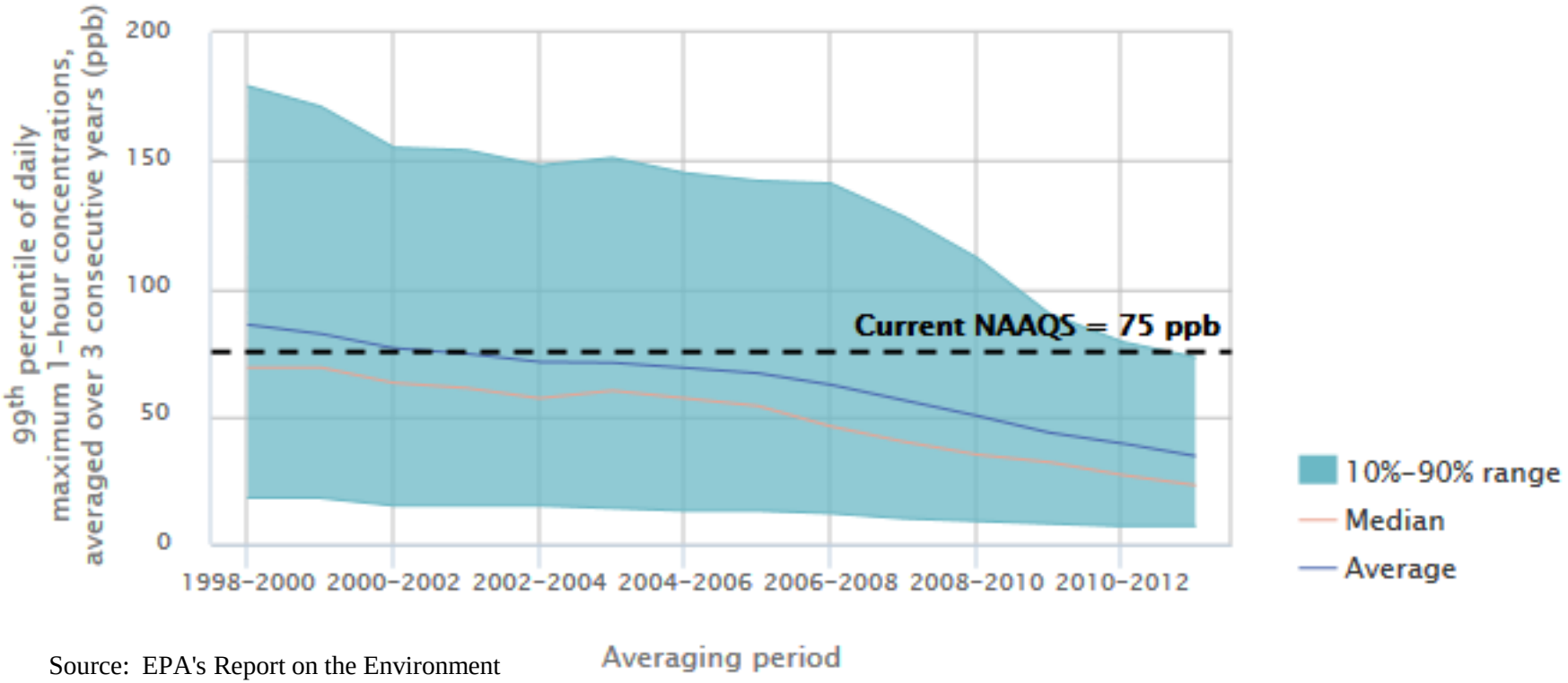
0.3 - 0.1 ppm: taste and odor

> 1 ppm: brochoconstriction

> 10 ppm: eye, nose, throat irritation

SULFUR DIOXIDE (SO_2)

Exhibit 5. Ambient 1-hour SO_2 concentrations in the U.S., 1998–2013



Source: EPA's Report on the Environment

The current 1-hour SO_2 NAAQS was established in 2010 and is shown to provide context for the magnitude of pollutant concentrations. No 1-hour SO_2 NAAQS existed prior to 2010 (U.S. EPA, 2014b).

NITROGEN OXIDES (NOx)

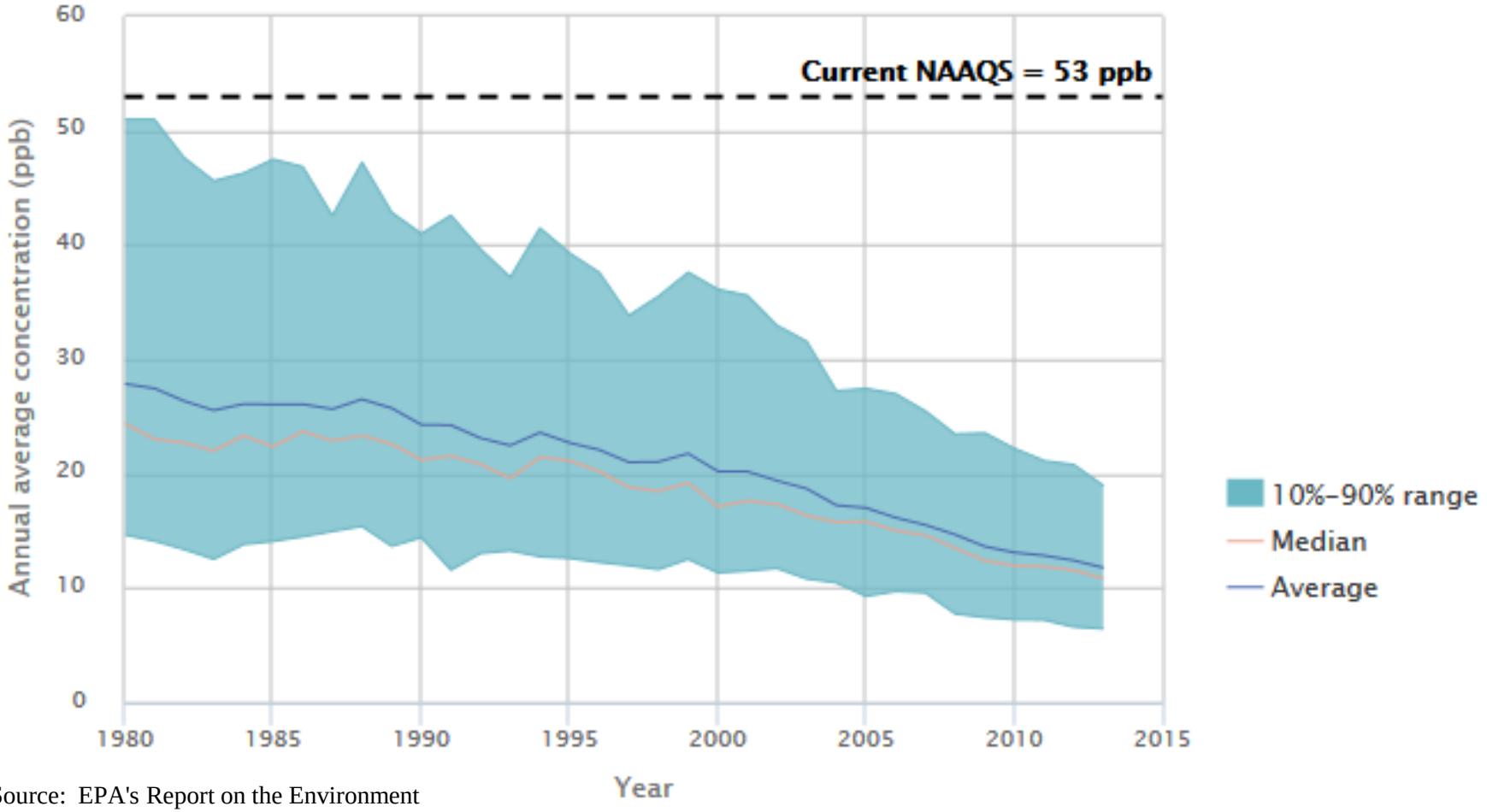
A primary product of combustion.

Inhalation increases susceptibility to respiratory pathogens.

Photochemically react to form ozone, along with VOCs.

NITROGEN OXIDES (NOx)

Exhibit 1. Ambient annual NO_2 concentrations in the U.S., 1980–2013



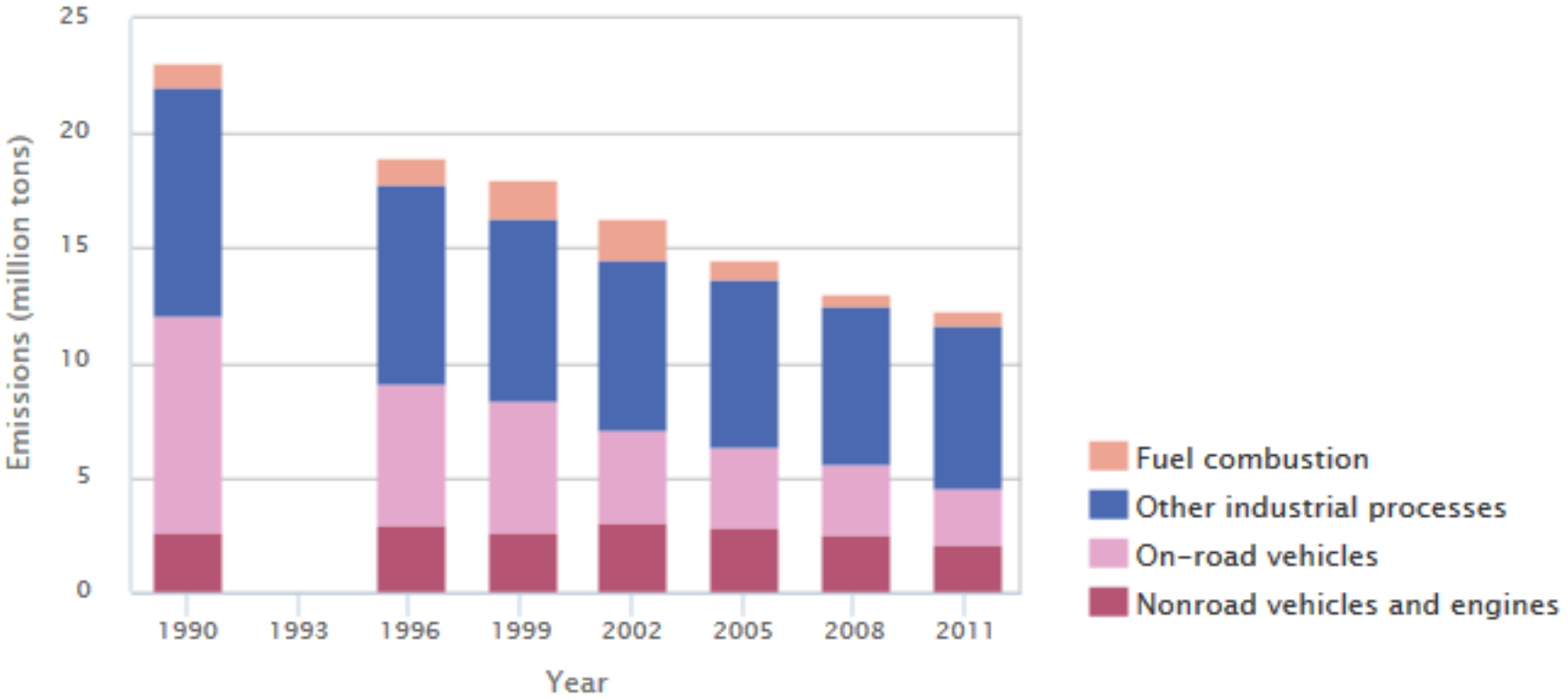
Source: EPA's Report on the Environment

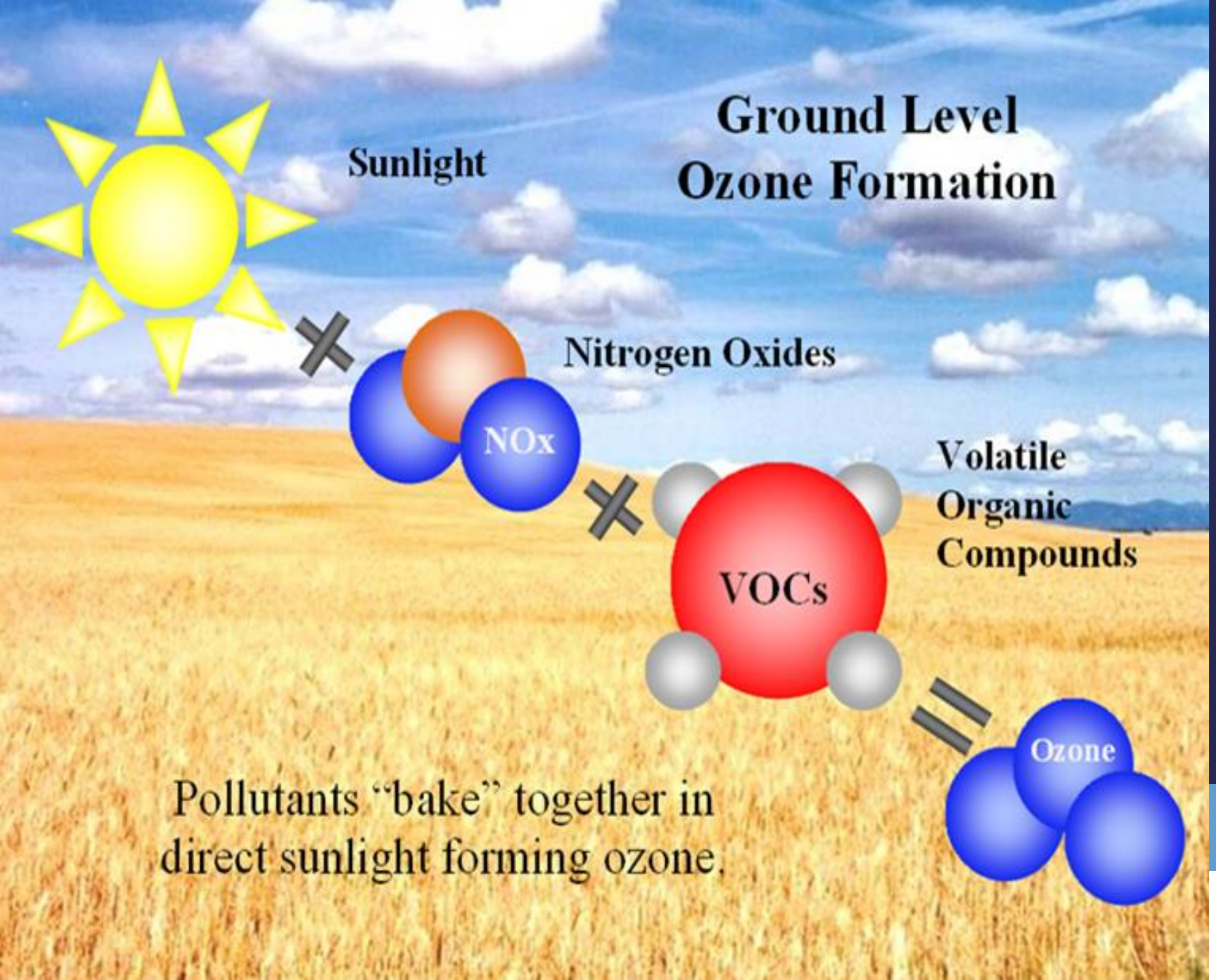
The current annual average NO_2 NAAQS was established in 1971 and has not been revised since (U.S. EPA, 2014b).

VOLATILE ORGANIC COMPOUNDS (VOCs)

Source: EPA's Report on the Environment

Exhibit 1. Anthropogenic VOC emissions in the U.S. by source category, 1990–2011




Ground Level
Ozone Formation
Sunlight
Nitrogen Oxides
NOx
Volatile
Organic
Compounds
VOCs
Ozone
Pollutants "bake" together in
direct sunlight forming ozone.

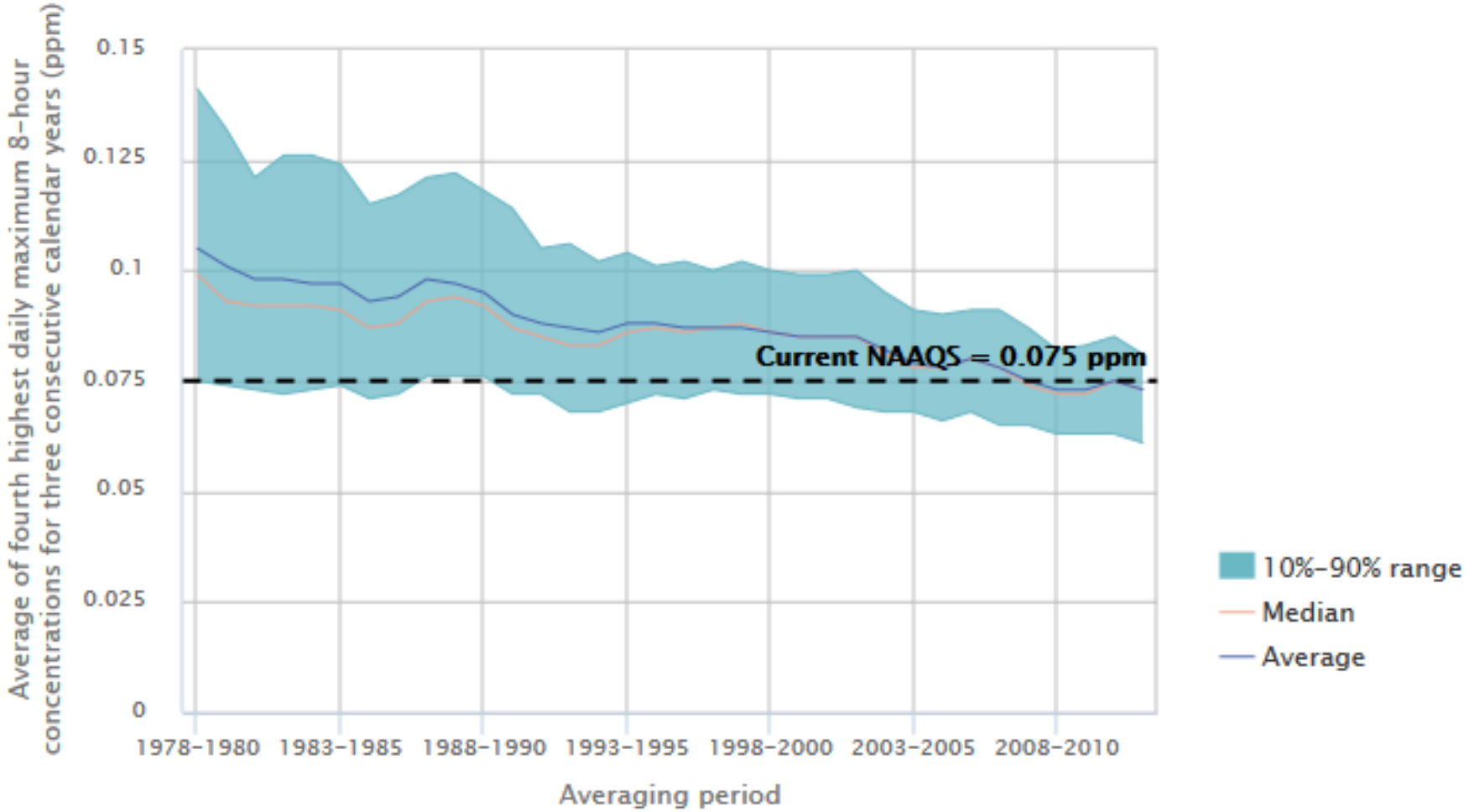
OZONE (O_3)

Normally a stratospheric presence

- **Decrement in pulmonary function**
- **Coughing, chest discomfort**
- **Increased asthma attacks**

OZONE (O_3)

Exhibit 1. Ambient 8-hour ozone concentrations in the U.S., 1978–2013



Source: EPA's Report on the Environment

The current ozone NAAQS was established in 2008 and is shown to provide context for the magnitude of pollutant concentrations. It is more stringent than all previous ozone NAAQS (e.g., the concentration levels for the previous ozone NAAQS are higher) (U.S. EPA, 2014b).

PHOTOCHEMICAL SMOG

New York City, 1988

The chemical reaction of sunlight, nitrogen oxides and volatile organic compounds in the atmosphere, which leaves airborne particles and ground-level ozone. Noxious mixture of:

- Aldehydes
- Nitrogen oxides, such as nitrogen dioxide
- Peroxyacyl nitrates
- Tropospheric ozone
- Volatile organic compounds

ODOR

Perceived via the olfactory system

- **Difficult to quantify**
- **Nausea, vomiting, headaches**
- **Upset sleep, depression, annoyance**
- **Destruction of general well-being**

LEAD (Pb)

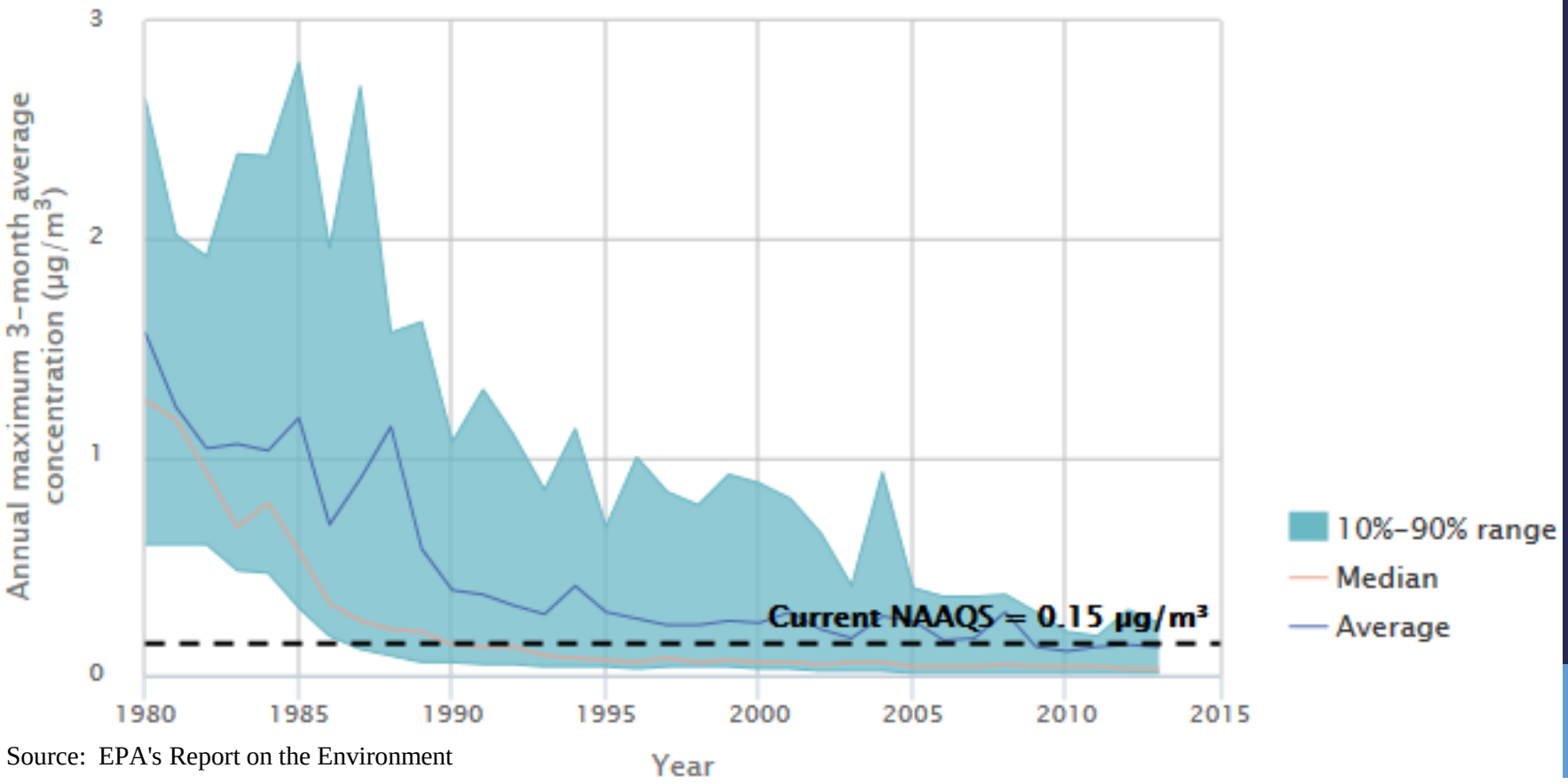
Airborne sources examples are leaded gasoline, incineration of solid wastes and discarded oil, and certain manufacturing processes.

Can degrade renal function, impair hemoglobin synthesis, and alter the nervous system. Lowers IQ in children.


Lead poisoning
Lead buildup in the body causes serious health problems
Symptoms
- Headaches
- Irritability
- Reduced sensations
- Agressive behavior
- Difficulty sleeping
- Abdominal pain
- Poor appetite
- Constipation
- Anemia
Additional complications for children:
Lead is more harmful to children as it can affect developing nerves and brains
Loss of developmental skills
Behavior, attention problems
Hearing loss
Kidney damage
Reduced IQ
Slowed body growth
Source: MedlinePlus/Mayo Clinic
240809 AFP

LEAD (Pb)

Exhibit 1. Ambient 3-month lead concentrations in the U.S., 1980–2013



Source: EPA's Report on the Environment

The current lead NAAQS was established in 2008 and is shown to provide context for the magnitude of pollutant concentrations. It is more stringent than all previous lead NAAQS (e.g., the concentration levels for the previous lead NAAQS are higher) (U.S. EPA, 2014b).

HAZARDOUS AIR POLLUTANTS

Those pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects.

HAZARDOUS AIR POLLUTANTS

Pollutant	Trend Period	Number of Trend Sites	Percent Change in Average Concentrations over Trend Record	Exhibit Depicting Trend
Formaldehyde	2003-2013	69	17% decrease	2
Benzene	2003-2013	137	45% decrease	3
Acetaldehyde	2003-2013	67	28% decrease	4
Carbon tetrachloride	2003-2013	111	3% increase	5
1,3-Butadiene	2003-2013	109	53% decrease	6
Hexavalent chromium (in TSP)	2005-2012	14	45% decrease	7
Arsenic (in PM_{10})	2005-2013	23	39% decrease	8
Tetrachloroethylene	2003-2013	117	73% decrease	9

Source: EPA's Report on the Environment

HAZARDOUS AIR POLLUTANTS

Human Effects of Dioxin

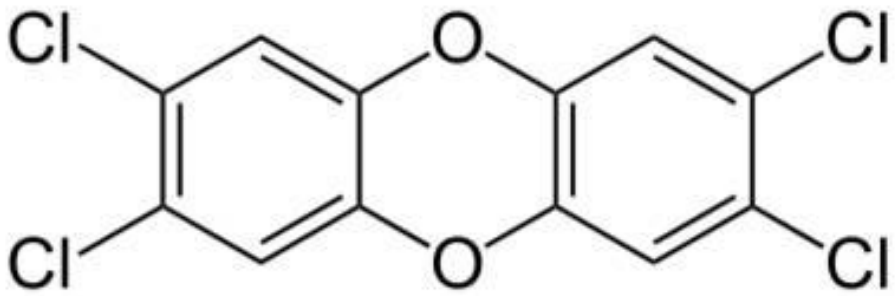
Dioxin is the name given to a group of persistent, very toxic chemicals. The most toxic form of dioxin is 2,3,7,8-tetrachlorodibenzo-p-dioxin or TCDD. TCDD is more commonly recognized as the toxic contaminant found in Agent Orange and at Love Canal, New York and Times Beach, Missouri.

Dioxin is not deliberately manufactured. Rather, it is the unintended by-product of industrial processes that use or burn chlorine.

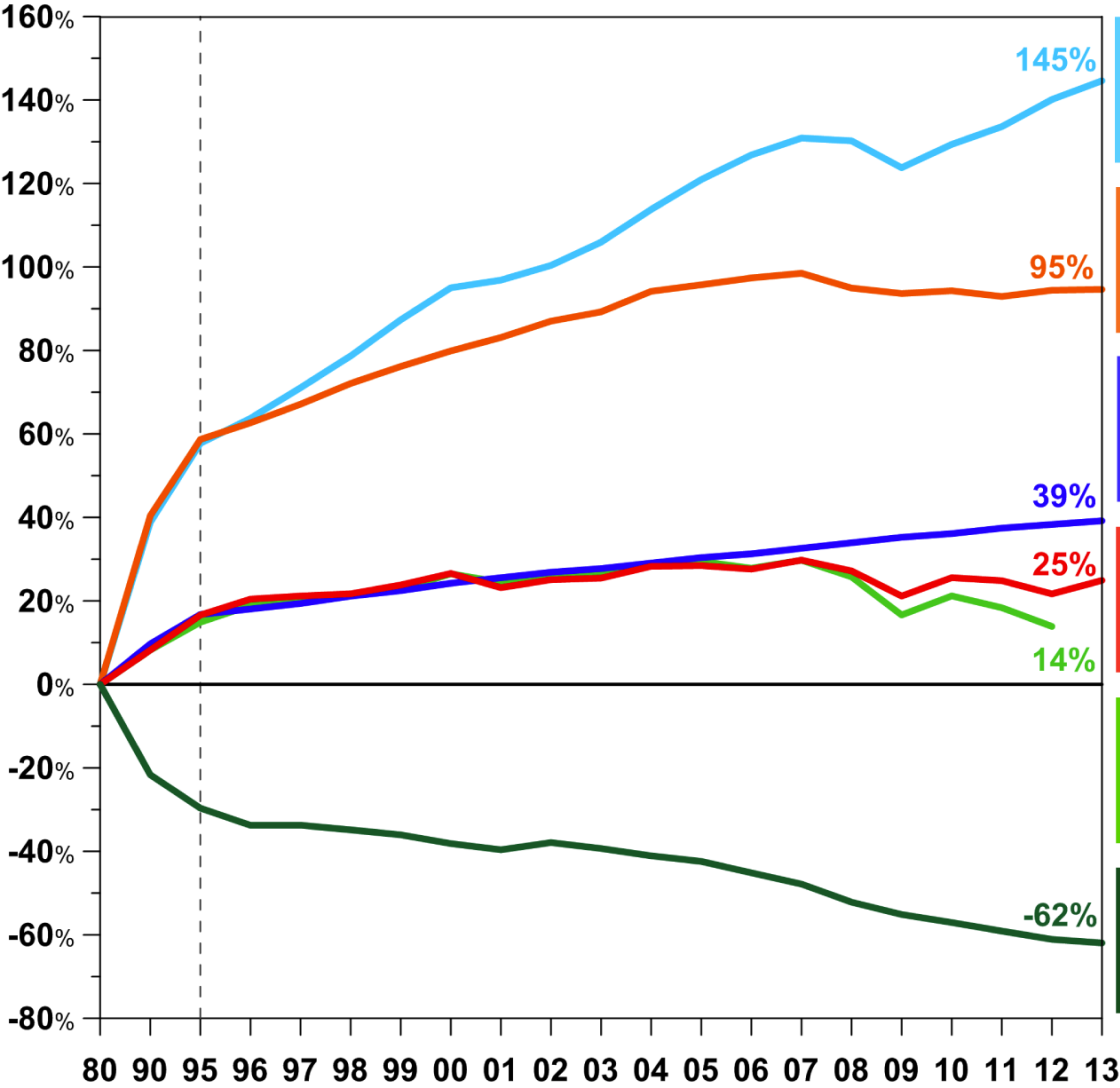
HAZARDOUS AIR POLLUTANTS

Human Effects of Dioxin

Dioxin also causes a wide range of non-cancer effects including reproductive, developmental, immunological, and endocrine effects in both animals and humans.



U.S. AIR QUALITY TRENDS



Gross Domestic Product

Vehicle Miles Traveled

Population

Energy Consumption

CO_2 Emissions

Aggregate Emissions (Six Common Pollutants)

Source: EPA.gov

CUCAC

China US Clean Air Conferance

Thank you for your attention.

AIR & WASTE MANAGEMENT ASSOCIATION

SINCE 1907

Dallas Baker, P.E., BCEE
A&WMA President
president@awma.org


Oversight Hearing to examine
the Fish and Wildlife Service.
Dallas Baker,
Air Director and Chief of Air Division,
Mississippi Department
Quality; National President, Air and Waste
Management Association


Dallas Baker,
Air Director and Chief of Air Division,
TALK
5:00
TIME REMAINING