

Unit 7 Air Pollution and Global Atmospheric Changes



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How do you want to be known as the inventor of fire or the
First man to pollute the troposphere?

Air is composed of water vapor and gases

- $\text{N}_2 = 78\%$
- $\text{O}_2 = 21\%$
- $\text{Ar} = 0.93\%$
- $\text{CO}_2 = 0.04\%$

March 2018: 409.46 ppm

March 2017: 407.18 ppm

Last updated: April 9, 2018

February 2016: 403.28 ppm

February 2015: 399.88 ppm

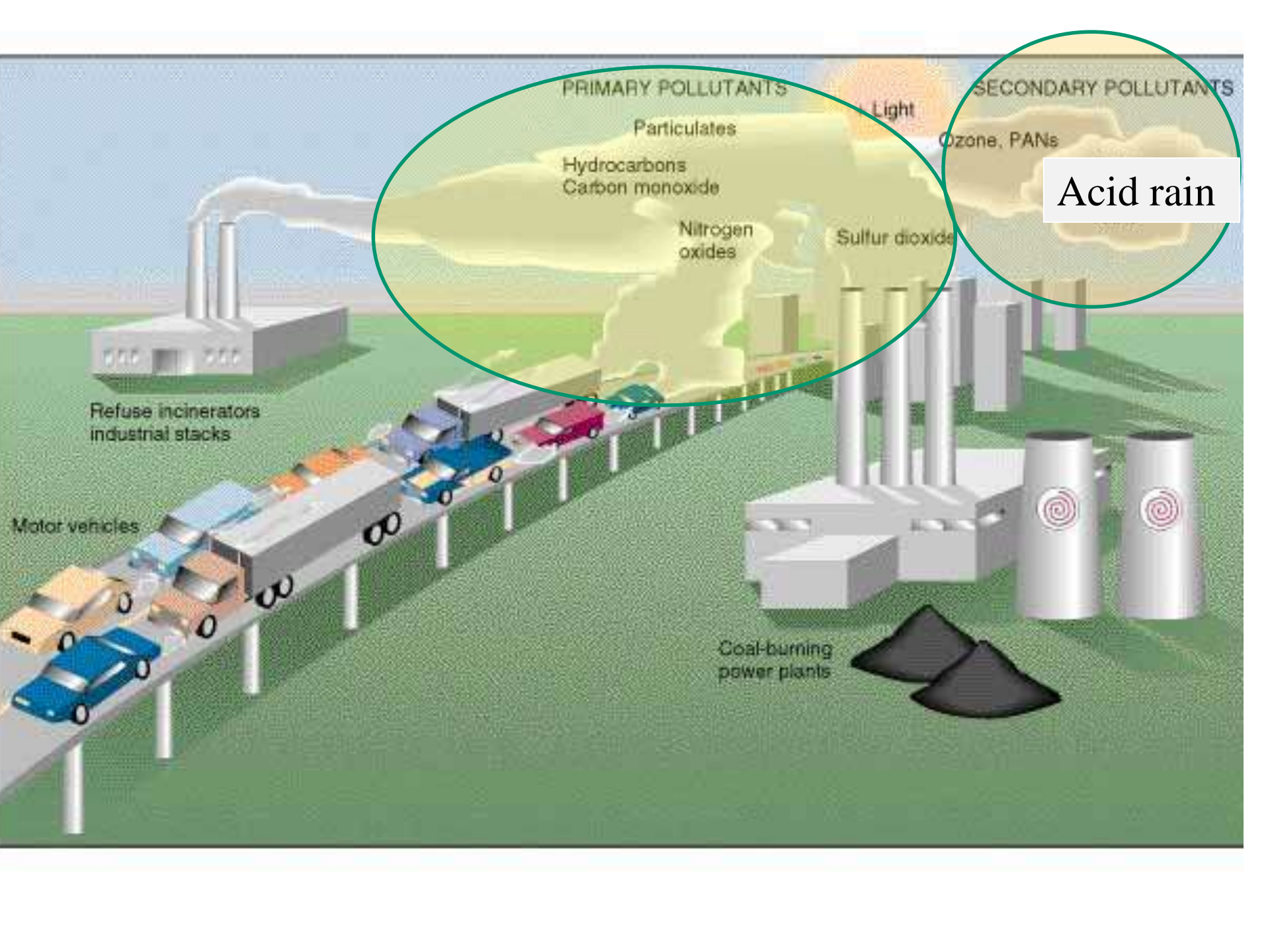
Last updated: April 5, 2016

A healthy atm. → ecosystem services

- Blocks UV rays
- Moderates climates
- Water and biogeochemical cycling
- → O₂ for respiration and CO₂ for photosynthesis

2 types of Air pollutants

1. Primary (1°) air pollutants (are harmful by themselves)
2. Secondary (2°) air pollutants (harmful products of photochemical reactions in the air)



PRIMARY POLLUTANTS

- Particulates
- Hydrocarbons
- Carbon monoxide
- Nitrogen oxides
- Sulfur dioxide

SECONDARY POLLUTANTS

- Light
- Ozone, PANs
- Acid rain

Refuse incinerators
industrial stacks

Motor vehicles

Coal-burning
power plants

8 Major Classes of Air Pollutants

1. Particulate Matter
2. Nitrogen oxides
3. Sulfur oxides
4. Carbon oxides
5. Hydrocarbons = VOCs (volatile organic cmpds)
6. Ozone
7. Lead and heavy metals
8. Others (ex: radon)

1) Particulate matter (PM) (1° and 2°)

= suspended solids (dust) or liquids (mists)

➤ → dec. photosynthesis

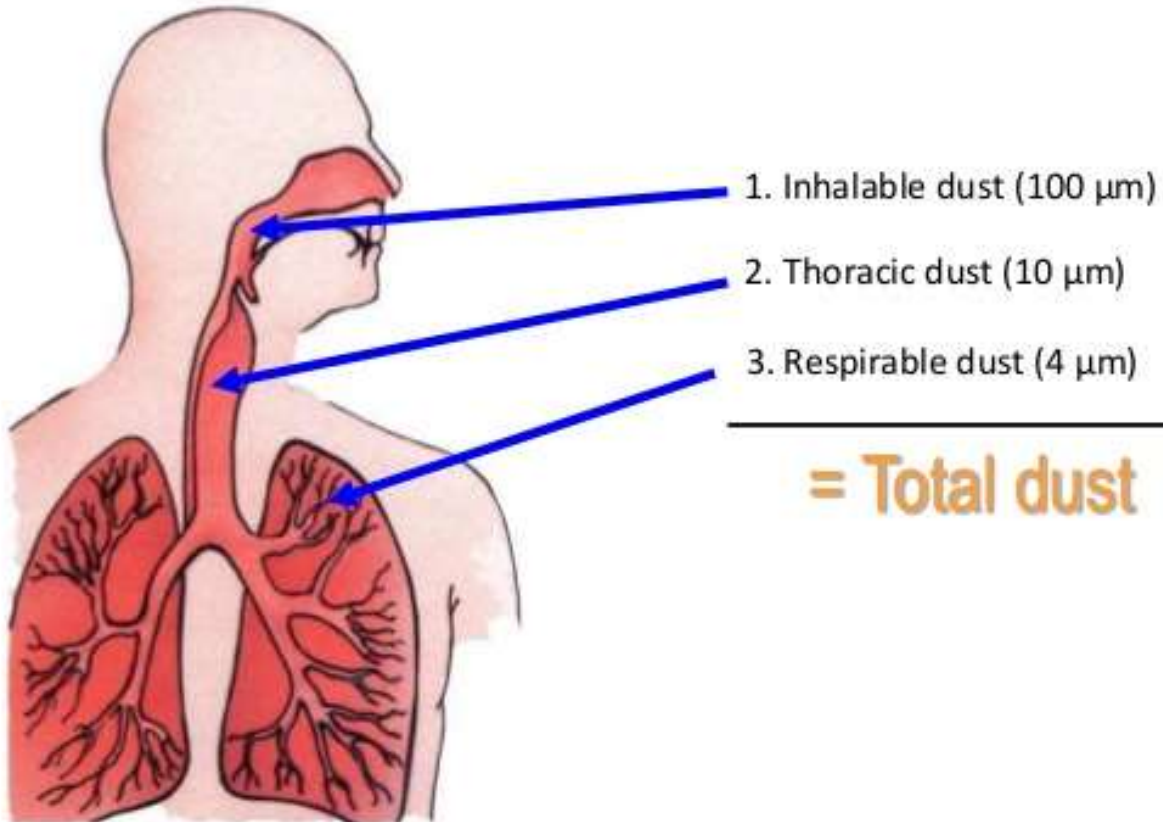
➤ Health problems (ex: asthma, bronchitis...)

Ex: Black carbon, soot, lead, asbestos, sea salt,
sulfuric acid droplets



Particle size matters

Particles are split into three groups according to their health risks



Define anthropogenic

Sources

- Natural
 - Volcanoes
 - Forest fires
 - Soil erosion caused by wind
 - Sea spray
- Anthropogenic
 - Crematoriums
 - Incinerators
 - Construction/road work
 - agriculture

2) Nitrogen oxides (1° and 2°)



KNOW YOUR NITROGEN OXIDES



NITROGEN OXIDES

The x represents a number: either 1 (for nitric oxide) or 2 (for nitrogen dioxide). Both are produced by vehicles. Nitrous oxide isn't included in this generic term.



NITRIC OXIDE

Air pollutant formed by high temperature oxidation of nitrogen in air. It reacts with atmospheric oxygen to form nitrogen dioxide, and can also deplete ozone.



NITROGEN DIOXIDE

Prominent air pollutant. It helps generate ground-level ozone, which affects human health, causes crop damage, and acts as a potent greenhouse gas.



NITROUS OXIDE

Also known as 'laughing gas', and used as an anaesthetic. It's used in racing engines to increase power, and is also produced by catalytic converter processes.



$\text{NO}_x = 1^\circ \text{ Pollutant}$



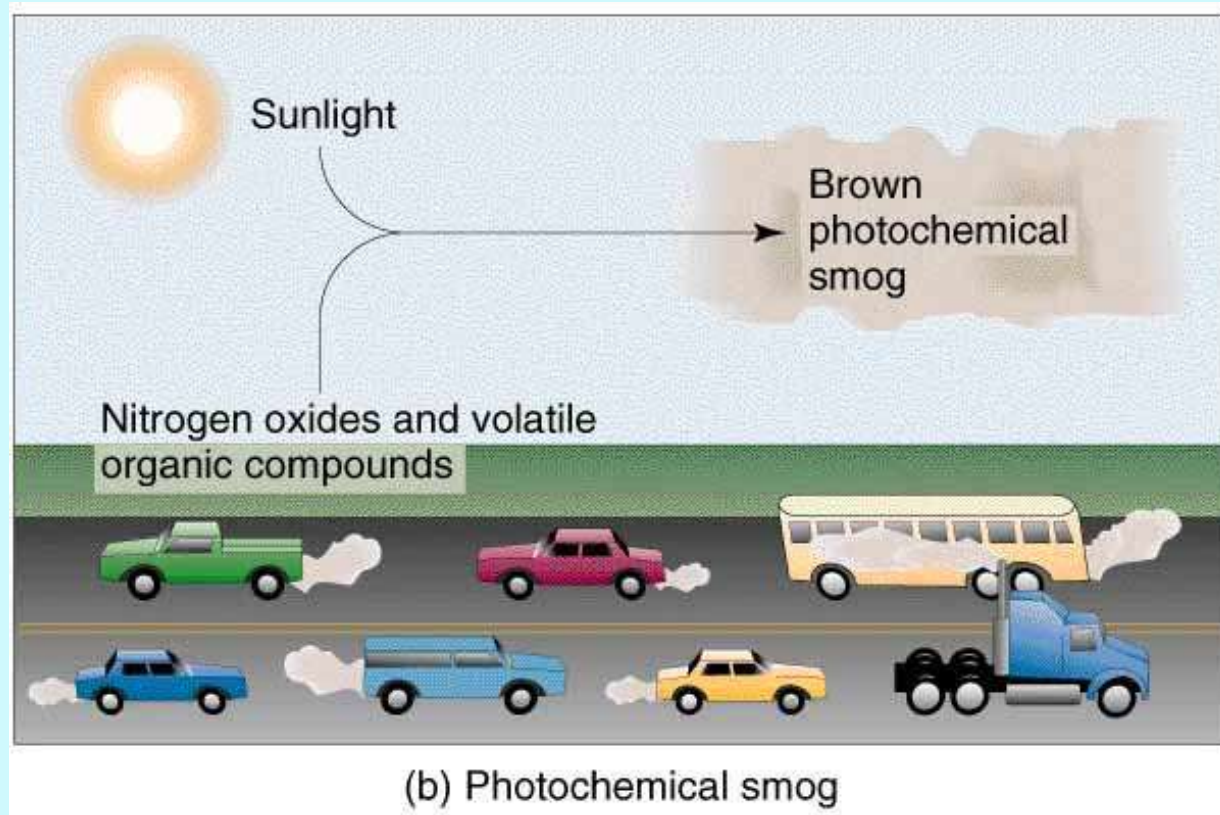
Burning fossil fuels (esp. cars), lightening and volcanoes $\rightarrow \text{NO}_x$

- Can \rightarrow
 - Human effects
 - (respiratory problems, eye irritations)
 - Env. effects
 - (dec. plant growth, dec. plant immunity)

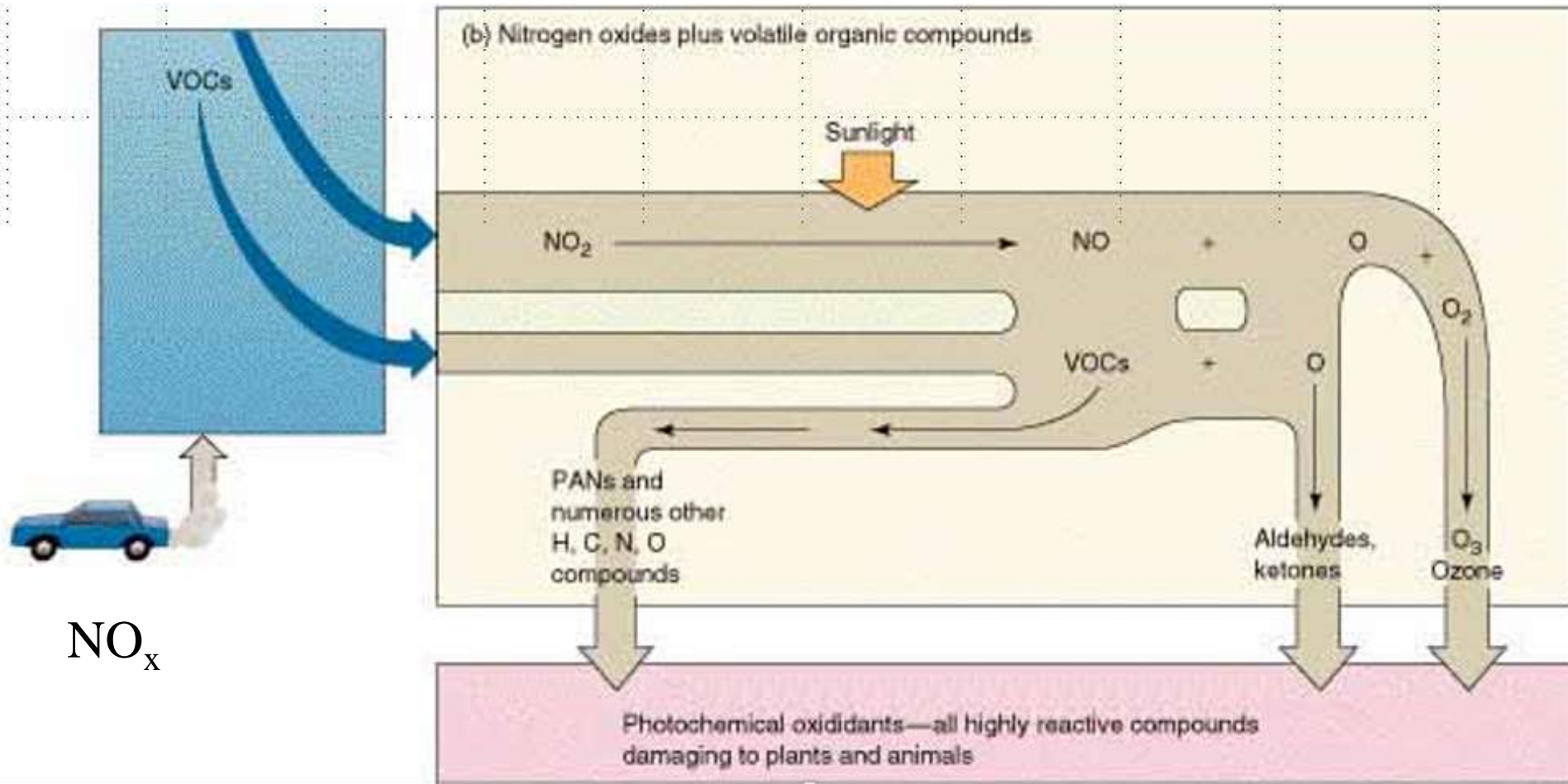
$\text{NO}_x + \text{sunlight} \rightarrow 2^\circ \text{ pollutants}$

Ex #1: Photochemical Smog

Sun = catalyst → photochemical reactions → smog



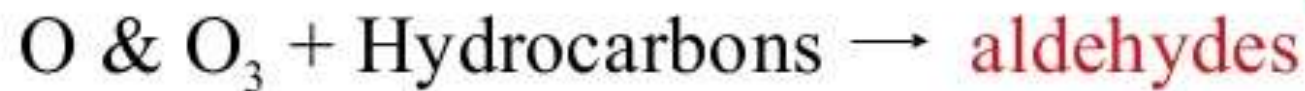
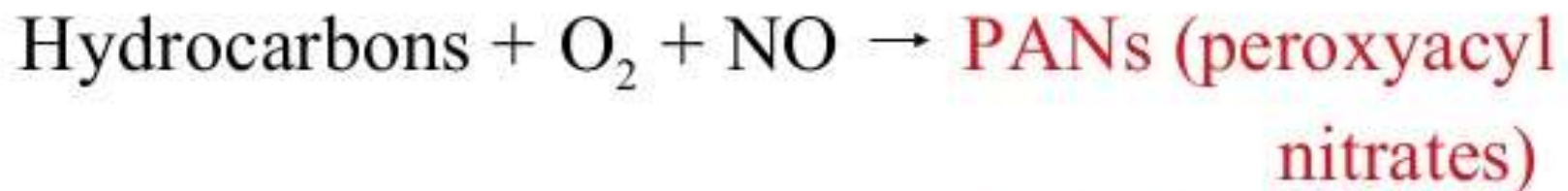
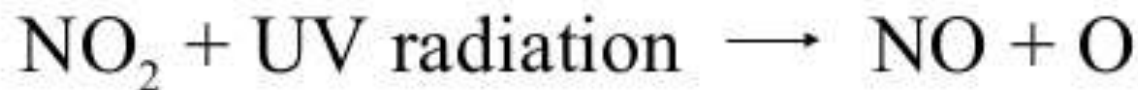
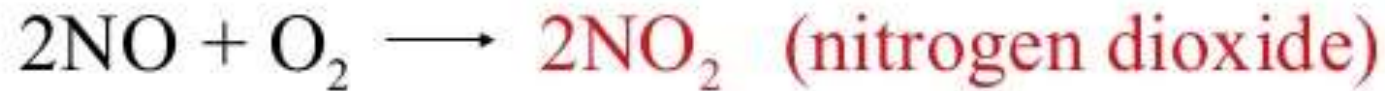
Formula for Photochemical Smog



Chemical Reactions resulting in Photochemical Smog



In the troposphere



Note: tropospheric ozone is bad

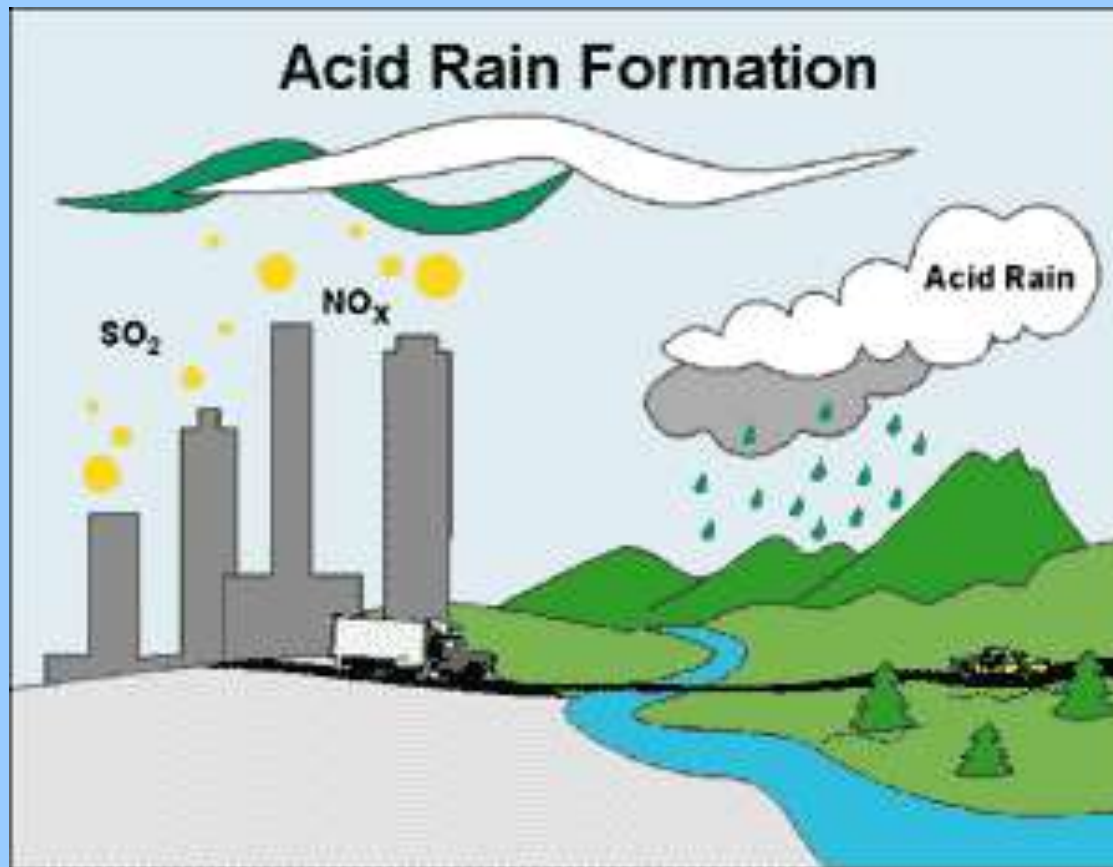


PAN s (peroxyacyl nitrates) 2°

- Human effects =
 - Resp. problems
 - Weakened immunity
 - Eye irritant
- Environmental effects
 - Damages plant tissues
 - Dec. photo
 - greenhouse gas
 - Resp. problems in animals

$\text{NO}_x \rightarrow \text{Acid Rain (2}^\circ\text{)}$

$\text{NO and NO}_2 + \text{H}_2\text{O} + \text{O}_2 \rightarrow \text{HNO}_3 \text{ and HNO}_2 \text{ (Acid Rain)}$



- Human effects =
 - irritates eyes, nose or throat,
 - damage lungs

- Env. effects=
 - inc. leaching → dec. soil fertility
 - Acidity → inc. solubility of toxic metals
 - Damage aquatic life and soil organisms
 - Damage plants (and forests)



Bacterial decomposition of fertilizers



Nitrous Oxide



Global Warming
Potential: **265***

Current atmospheric
concentration:
1.2 times
pre-1700 levels

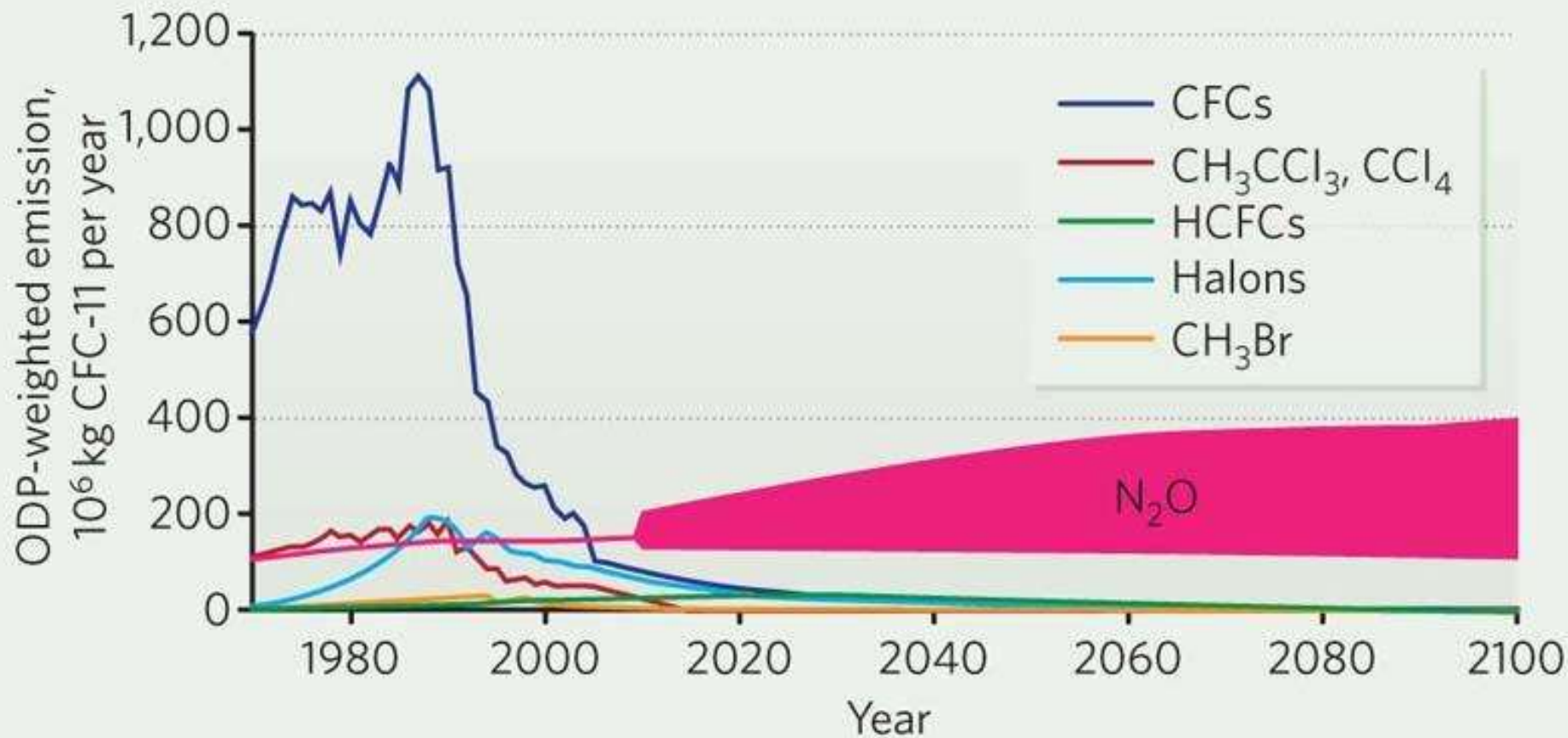
Lifespan in atmosphere:
121 years

Agriculture soil
mismanagement
responsible for
75% of all N_2O
emissions
in the U.S.

N_2O -containing
fertilizer runoff in
the Midwest U.S.
continues to result in
Gulf of Mexico
“Dead Zone”

* Global Warming Potential is a measure of how many times more potent a greenhouse gas is compared to carbon dioxide.

OZONE-DEPLETING GASES



3) Sulfur oxides (1° and 2°)



Sulfur dioxide (SO_2) = colorless gas primarily from burning of **coal**

- SO_2 Damages plants
- Irritate respiratory tracts



Volcanoes → sulfur aerosols and SO₂

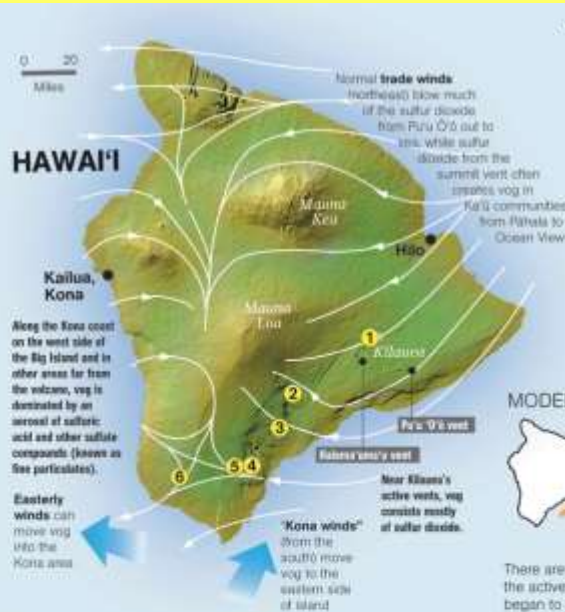
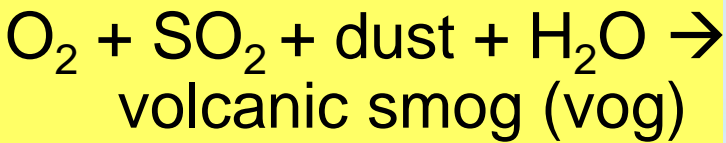
- Sulfur Aerosols → **global cooling** and *short term ozone depletion*
 - Mount St. Helens, Washington (1980), El Chichon, Mexico (1982), and Mount Pinatubo, Philippines (1991)
 - All → decreased temps in troposphere and ozone depletion in stratosphere



Eruptions of Kilauea Volcano

Sulfur aerosols and $\text{SO}_2 \rightarrow 2^\circ$ pollutants

Sunlight = catalyst



AFFECTED COMMUNITIES INCLUDE:

(See map above)

- 1 Volcano
- 3 Pihela
- 5 Wai'ōhinu
- 2 Wood Valley
- 4 Nā'ālehu
- 6 Ocean View

Population:

Estimates vary widely, but lawmakers believe about 20,000 people live in the direct path of the vog

Median household income:

\$31,500 a year
33% of residents are below the federal poverty level

Health:
9.1% are diabetic
24.4% are obese
23% are smokers

WAYS TO PROTECT YOURSELF

1. Monitor current air conditions daily.

Residents in vogy areas are encouraged to monitor vog conditions daily. Check conditions at www.hawaii.gov/vog/vog and click on "monitor air conditions." Daily updates are also available at the state's vog help line at 866-767-5044.

2. Make your own safe zone. During periods of heavy vog conditions, avoid strenuous physical activity (especially outdoors). At night, close windows and use fans. Keep vents closed on air conditioners and use re-circulated air.

3. Drink lots of water.

4. Be prepared. People with asthma, heart or lung disease, and older adults who are particularly vulnerable should keep their medication refilled and use daily (controller) medication as prescribed. Have emergency or evacuation medications available, and anyone experiencing asthma symptoms, such as difficulty breathing, increased coughing or chest tightness should seek medical help.

5. Use a nontoxic dust mask or damp cloth. These might be helpful in periods of heavy vog, but don't use them if they make breathing more difficult. Note these masks are not effective in removing gases such as sulfur dioxide.

VOG

Vog (volcanic smog) is a visible haze made up of gas, fine particulates and acidic droplets. It is created when sulfur dioxide and other gases emitted from Kilauea volcano chemically interact with sunlight and atmospheric oxygen, moisture and dust.

MODEL OF PLUME COVERAGE OVER A TWO-DAY PERIOD



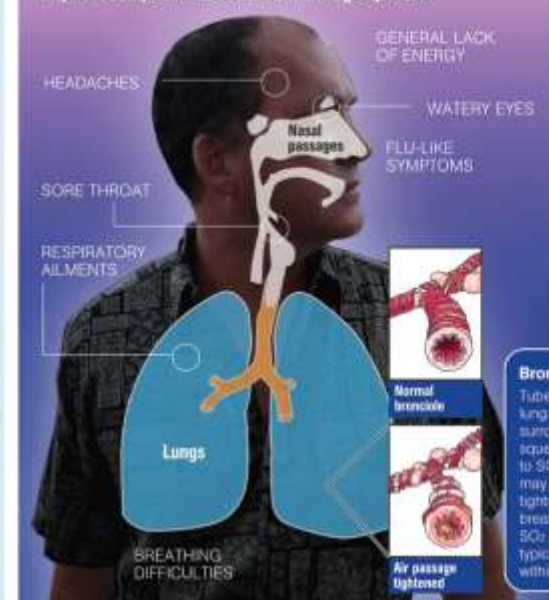
There are currently two main sources of sulfur dioxide emissions on Kilauea – Pu'u Ō'ō (east rift) and the active vent in Halema'uma'u Crater (summit). The amount of sulfur dioxide emitted by Kilauea began to increase in mid-2007 and has been particularly high since the new gas vent in Halema'uma'u opened in March 2008. In the past few weeks, however, the levels have been dropping.

HOW IT AFFECTS THE BODY

Long-term health effects of vog are unknown. Short-term exposure to heavy vog can affect pre-existing respiratory ailments. The two components in vog that trigger health effects are sulfur dioxide and fine particulates.

Physical complaints associated with vog exposure:

- HEADACHES
- SORE THROAT
- RESPIRATORY AILMENTS
- BREATHING DIFFICULTIES
- GENERAL LACK OF ENERGY
- WATERY EYES
- FLU-LIKE SYMPTOMS



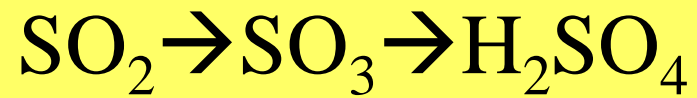
Sulfur dioxide

Sulfur dioxide is a colorless gas and an irritant that is usually removed by the nasal passages. Moderate activity levels that trigger mouth breathing are needed for Sulfur dioxide to cause health problems. People with asthma are most likely to experience health effects. The main effect, even with a short exposure, is a narrowing of the airways, called bronchoconstriction.

Bronchoconstriction

Tubes, or bronchioles, in the lungs where air flows are surrounded by a muscle that squeeze tight when reacting to SO_2 . As a result, there may be wheezing, chest tightness and shortness of breath. When exposure to SO_2 stops, lung function typically returns to normal within an hour.

Acid rain a secondary pollutant



4) Carbon Oxides

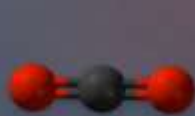
CO₂ and CO are produced more than any other air pollutant

- CO₂ = greenhouse gases → global warming
- CO = reduce blood's ability to carry O₂
- Both can form carbonic acid → acid rain

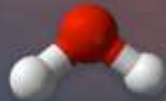
OCEAN ACIDIFICATION

HOW WILL CHANGES IN OCEAN CHEMISTRY AFFECT MARINE LIFE?

CO₂ absorbed from the atmosphere



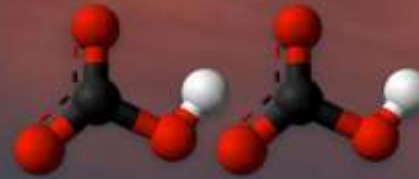
carbon dioxide



water



carbonate ion



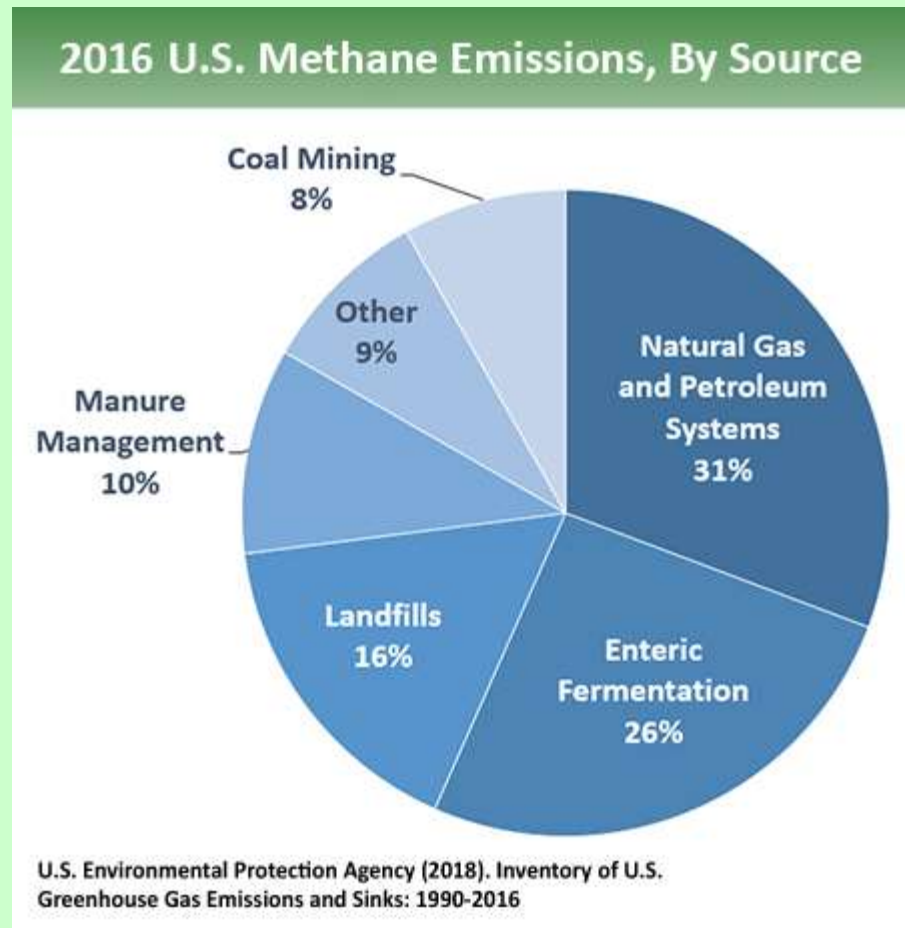
2 bicarbonate ions

consumption of carbonate ions impedes calcification



5) Hydrocarbons and VOCs (volatile organic compounds)

- Small = CH_4
(methane) =
greenhouse gas
 - Produced in
anaerobic env.
(landfill, farms,
swamps...)



VOC (volatile organic compounds)

- Evaporate at room temp
- **React photochemically**
- More concentrated indoors
- Examples:
 - **Benzene** (cigarette smoke)
 - **Formaldehyde** (photocopiers, adhesives, wall boards...)
 - CFC's (in refrigerants)



Effects of VOC's

- Human health
 - Sick building syndrome
 - Acute = eye, nose and throat irritation, headaches, dizziness
 - Chronic = cancer, liver and kidney damage, central nervous system damage
- Environmental
 - Photochemical smog
 - Methane = greenhouse gas → global warming
 - Chlorofluorocarbons → ozone depletion

Are our buildings making us sick?



SAN DIEGO
GREEN BUILDING
COUNCIL

The potential impact of indoor air quality on human health is considerable

Americans spend an average of 90% of their time indoors



Concentration of indoor pollutants are often 2 to 5 times higher than typical outdoor concentrations



Sick building

- More than one person
- Symptoms start when you enter building and stop when you leave

INDOOR AIR QUALITY IN SCHOOLS | YOUR CHILD MAY BE AT RISK

MOST PEOPLE SPEND 90% OF THEIR TIME INDOORS

SHORT-TERM EFFECTS

- HEADACHE
- FATIGUE
- DIZZINESS AND NAUSEA
- INABILITY TO CONCENTRATE
- HYPERACTIVITY
- SHORT-TERM MEMORY LOSS

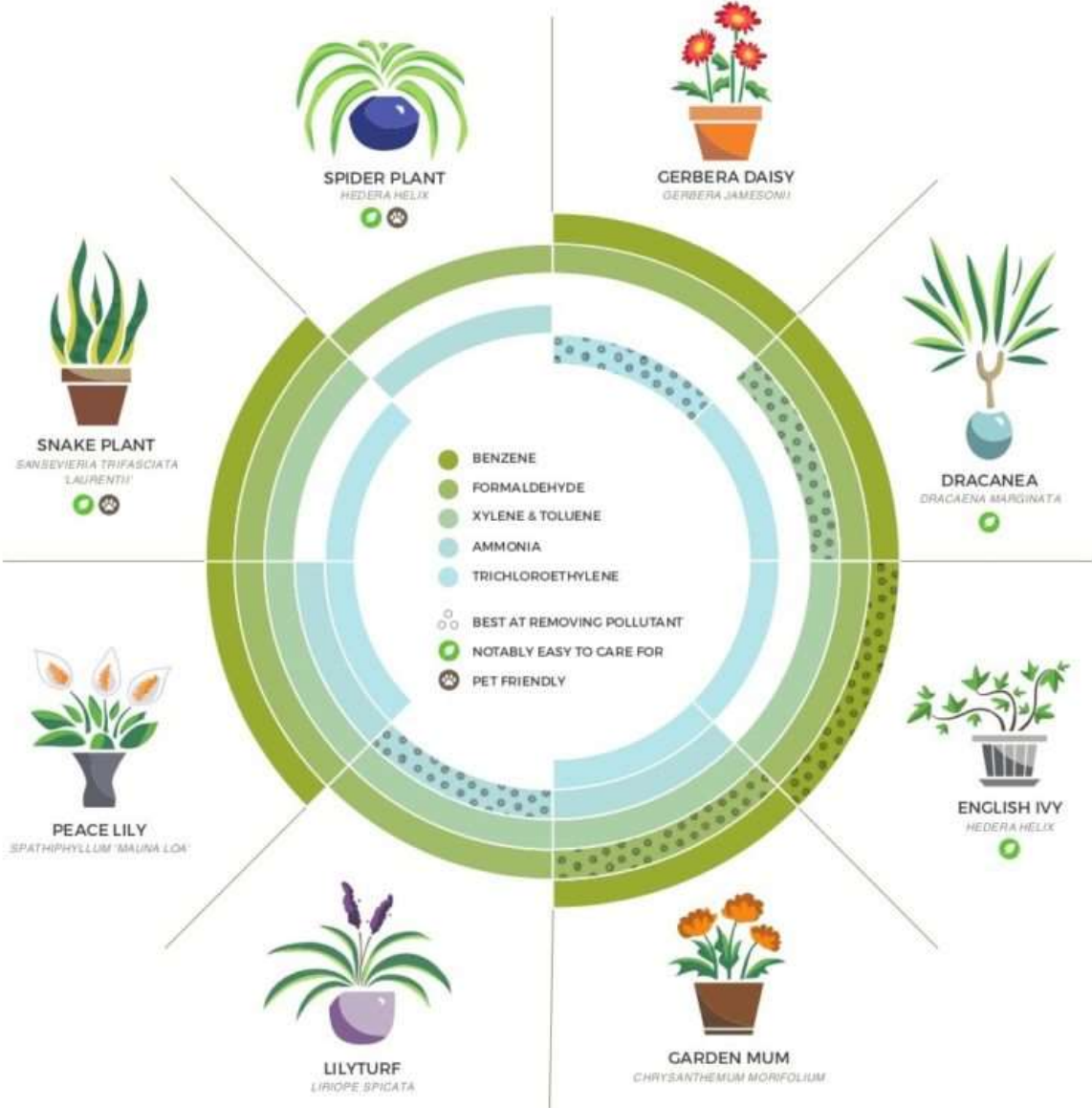
LONG-TERM EFFECTS

- RASHES AND SKIN IRRITATION
- NASAL CONGESTION
- SHORTNESS OF BREATH
- COUGHING AND SNEEZING
- ITCHY, WATERY EYES
- NOSE AND THROAT IRRITATION
- ASTHMA

Poor indoor air quality is a concern in many schools and jeopardizes the health of students and staff. Fortunately you can improve the air quality with regular air quality testing, which will detect mold, mildew, asbestos, VOCs and other indoor air pollutants.

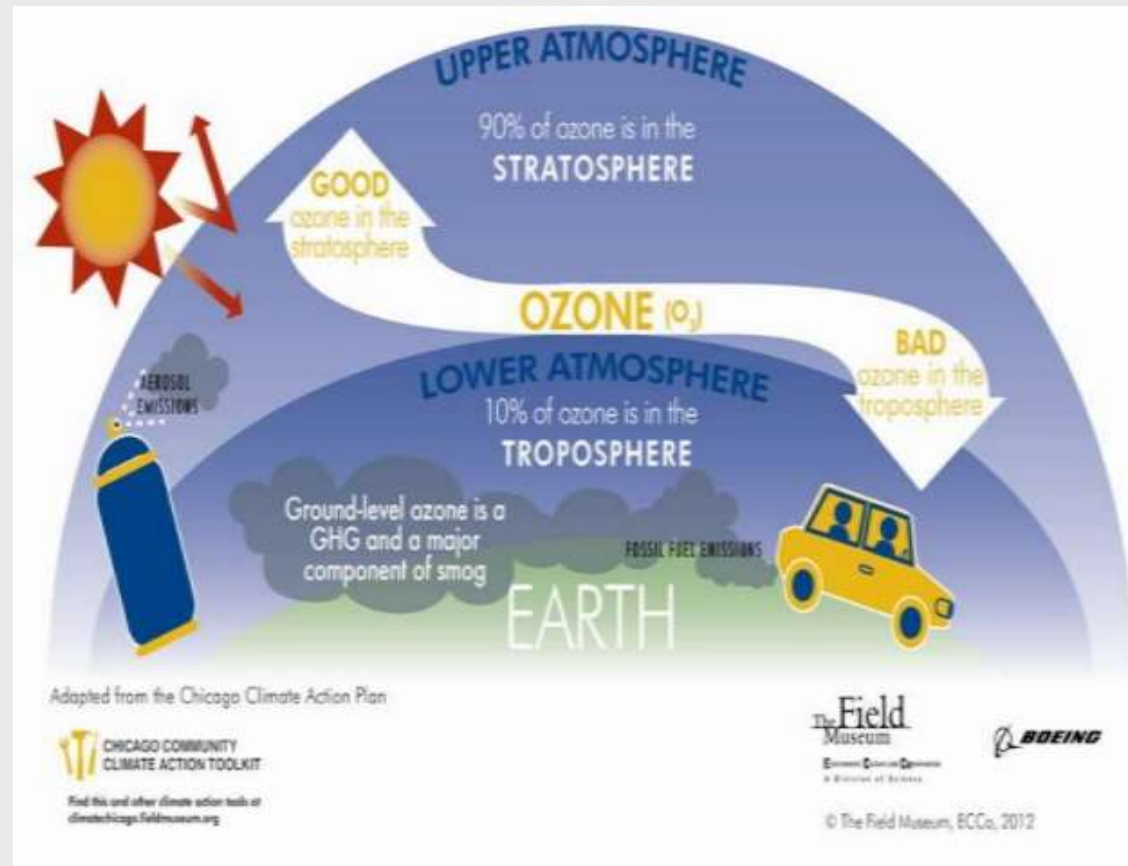
by **MOLD BUSTERS**

POLLUTANT FIGHTING PLANTS



6) Ozone (O_3)

- 90% in stratosphere
 - Decreasing due to CFCs
- 10% in troposphere
 - Increasing due to photochemical smog



Positive feedback loop
Global warming increases ozone
Ozone decreases photosynthesis → more
CO₂ → more global warming



More Funny & Amazing Pictures © www.MastPhotos.com

one is toxic to green
ce
plifying the global

Less CO₂
uptake
Climate
change
feedback

Forest
damage



some of the major sources of oxides of nitrogen
(NO_x) and volatile organic compounds (VOC).

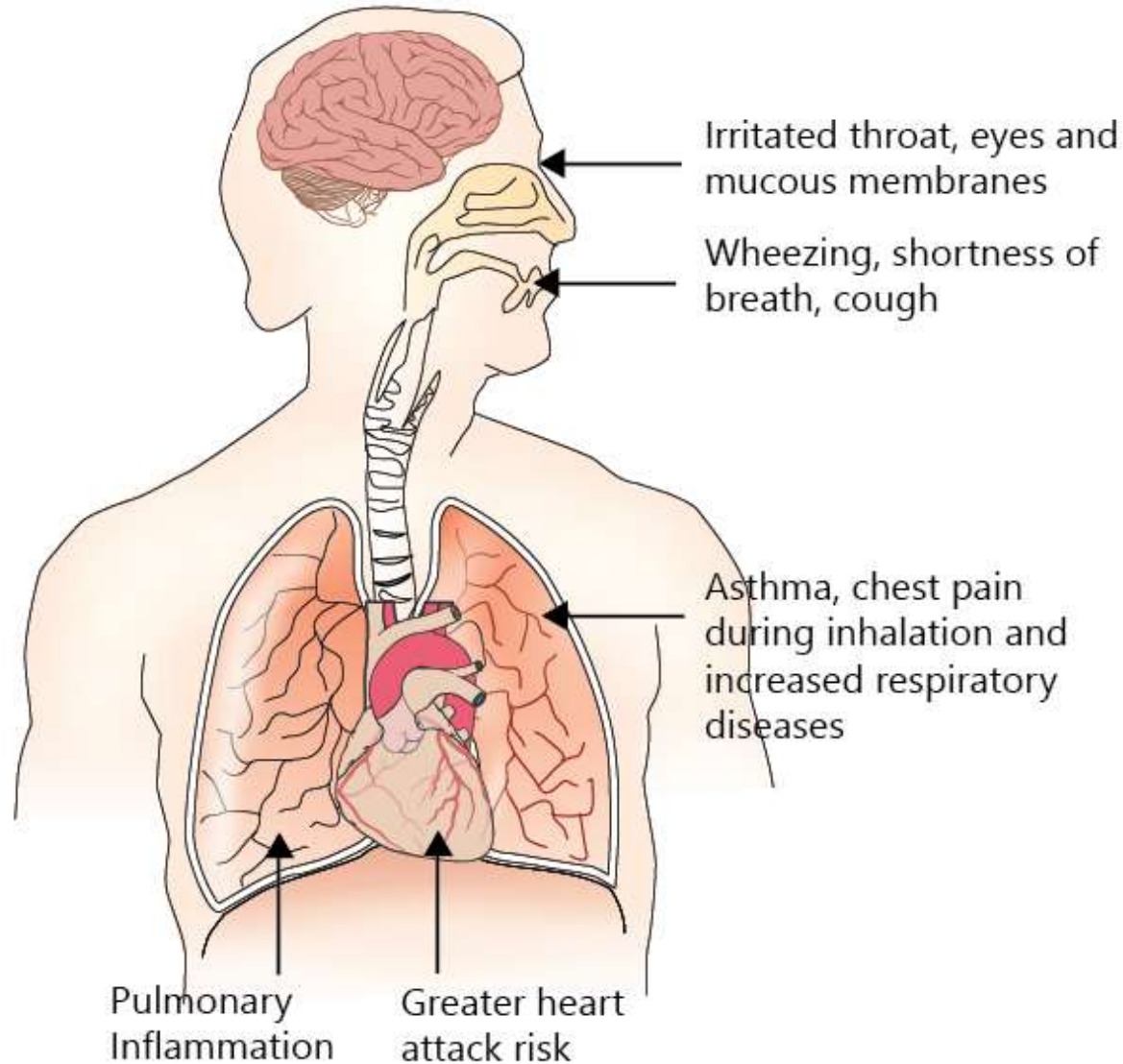
Global warming
increases ground l

Fossil fuel air pollut

into the air, but is created by chemical
between NO_x and VOCs in the presence
of heat & sunlight.



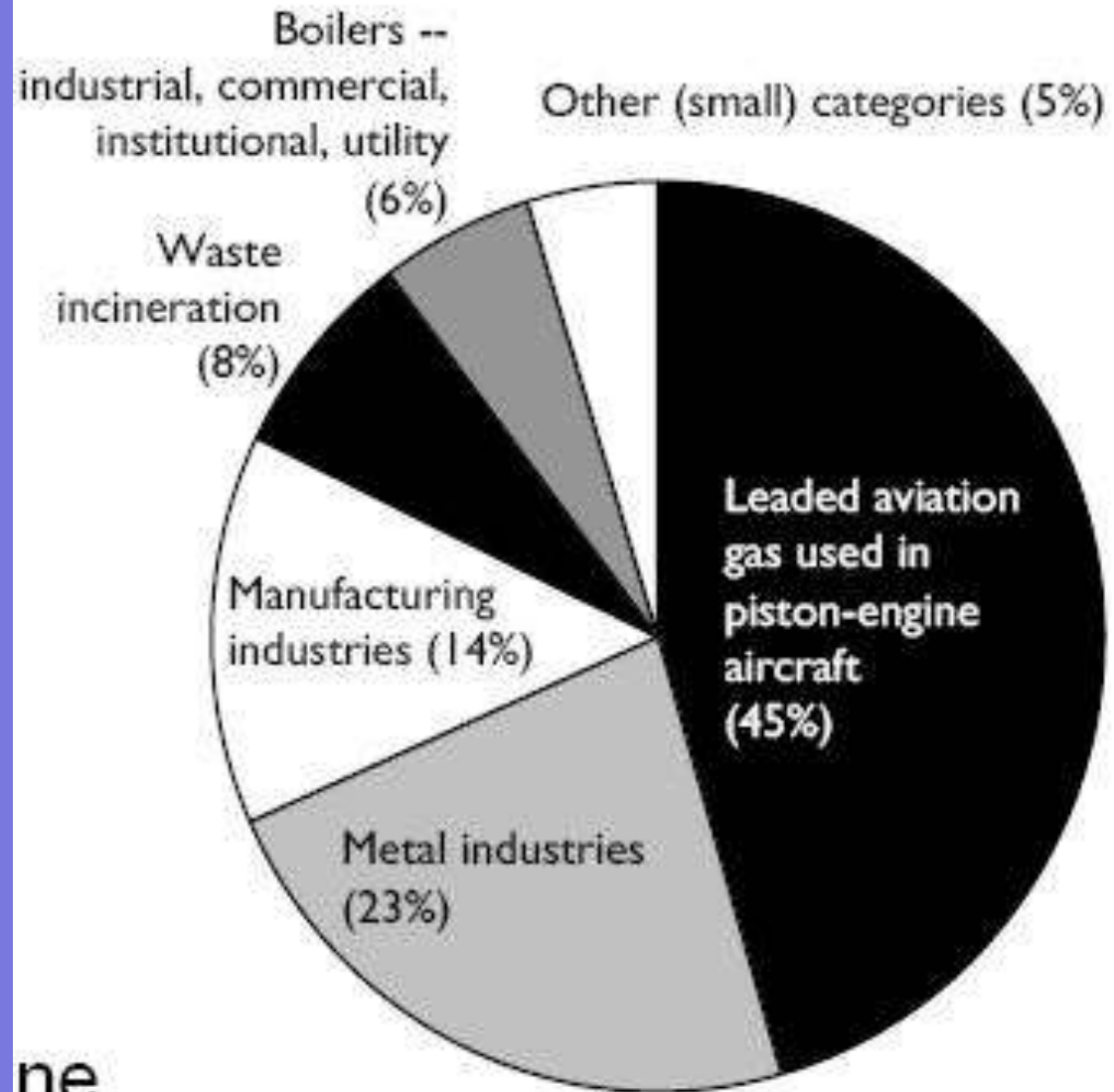
ILL-EFFECTS OF OZONE INHALATION



7) Heavy metals

- **Lead (Pb)**
- **Mercury (Hg)**

Source Sectors of Lead Emissions in the U.S.



ne.
g a

Chart based on EPA's 2002 National Emission Inventory (NEI) with modifications documented in Tom Pace's 05/01/08 memorandum and Marion Hoyer's 05/12/08 and 05/14/08 memoranda to the docket.

Other sources of lead:

- Old paint
- Leaded gasoline
- Lead batteries

#BanLeadPaint

FACT: LEAD IS TOXIC

It is harmful to everyone and

DAMAGES:



BRAIN



KIDNEYS



LIVER



BLOOD



REPRODUCTIVE SYSTEM

Young children

are most vulnerable. Their nervous systems are still developing and they absorb 4-5 times more than adults, which can cause:

- intellectual disability
- underperforming at school
- behavioural issues



In adults

lead exposure increases the risk of:

- ischaemic heart disease
- stroke



In pregnant women

lead exposure damages many organs but also affects:

- the developing foetus



There is no safe level of lead exposure



World Health Organization

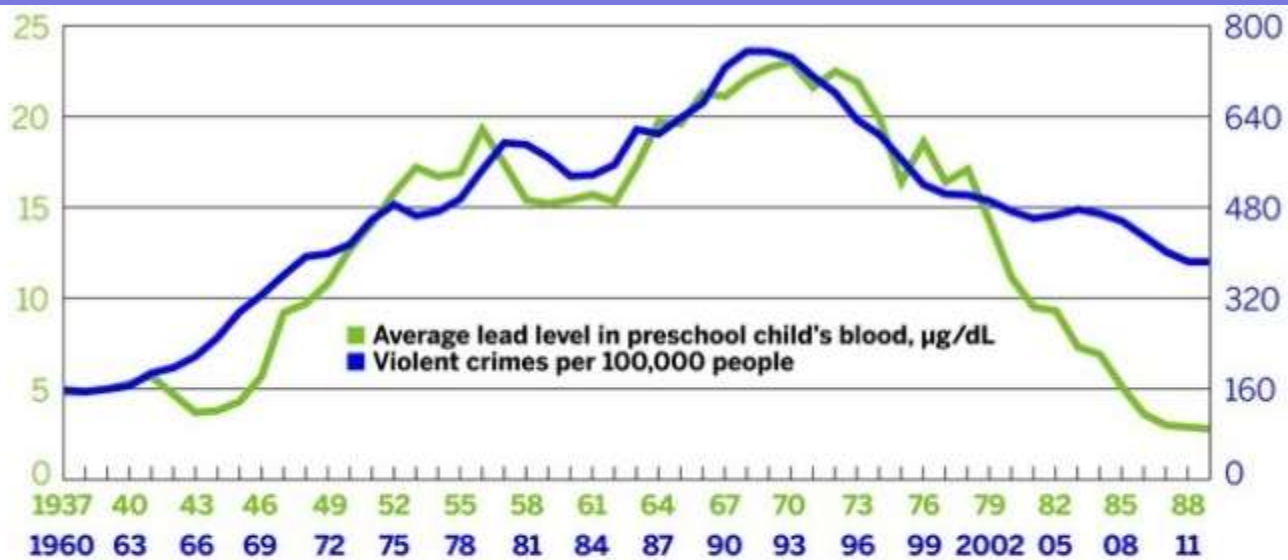
- **VERY TOXIC**
- **Neurological disorders**
- **lower IQ's,**
- **attention deficit disorders**
- **kidney failure**

Lead bullets impact wildlife



- As of 2011, thirty-five states prohibited lead shot use in such specially-specified areas when hunting

Lead legislation does work



A timeline of lead reduction

1970

CDC sets acceptable blood-lead level of **40 µg/dL**

1973

EPA mandates a phaseout of leaded gasoline

1978

CPSC bans residential lead paint

1991

CDC sets acceptable blood-lead level of **10 µg/dL**

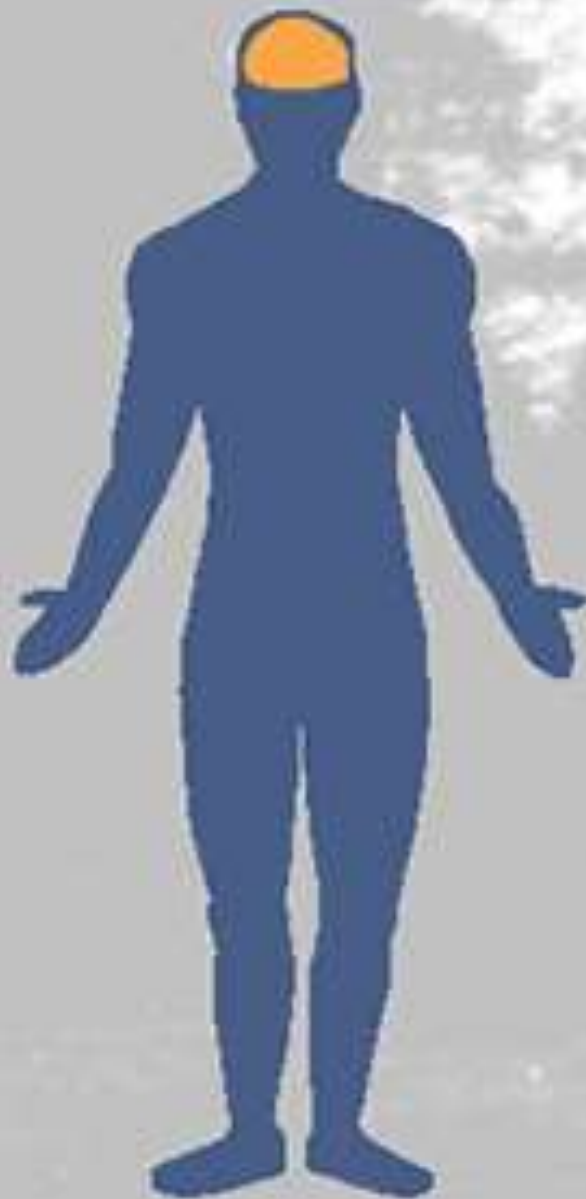
1996

EPA eliminates lead from all U.S. motor fuel

2012

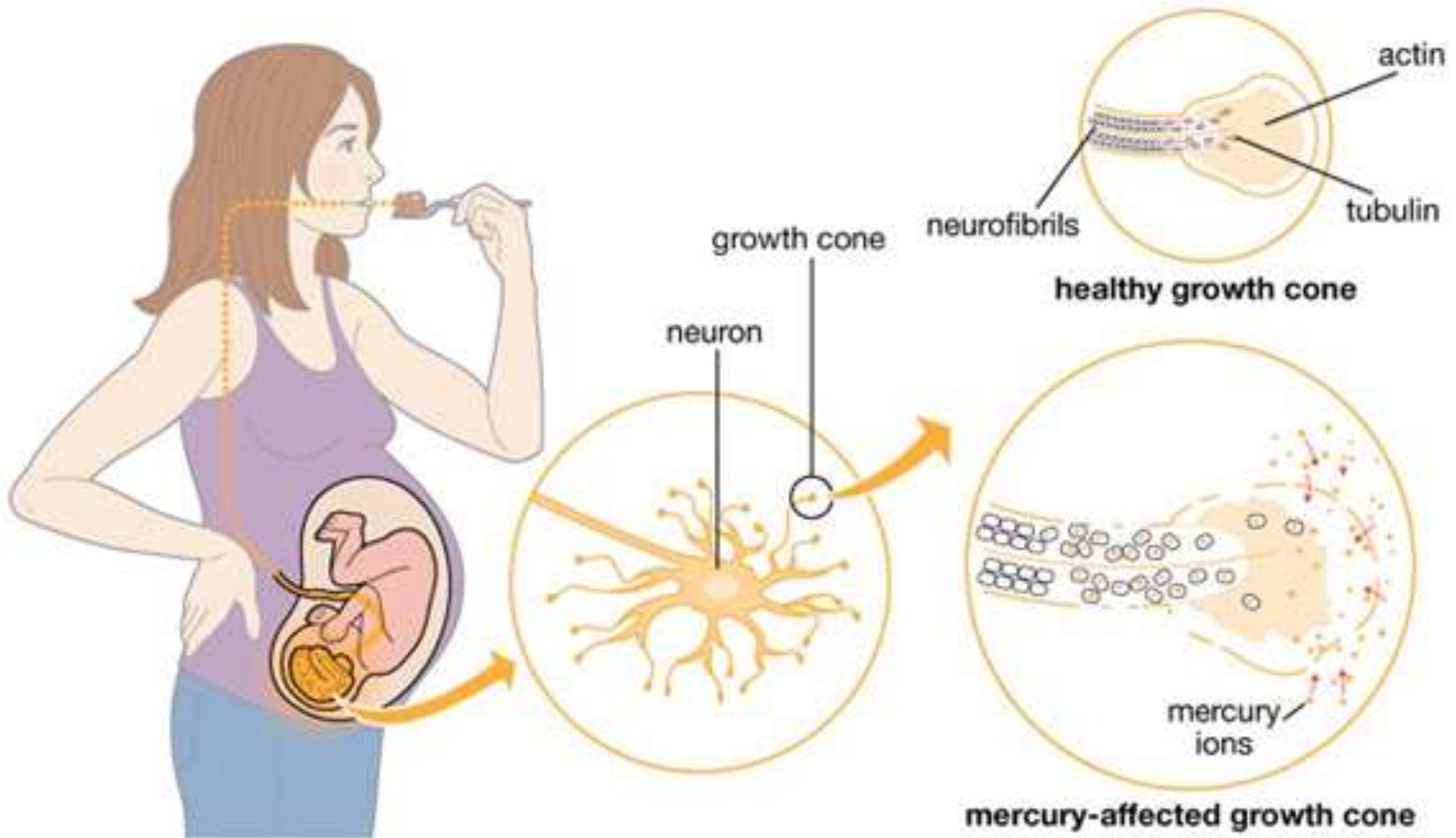
CDC describes blood-lead level of **>5 µg/dL** as elevated

MERCURY HEALTH EFFECTS

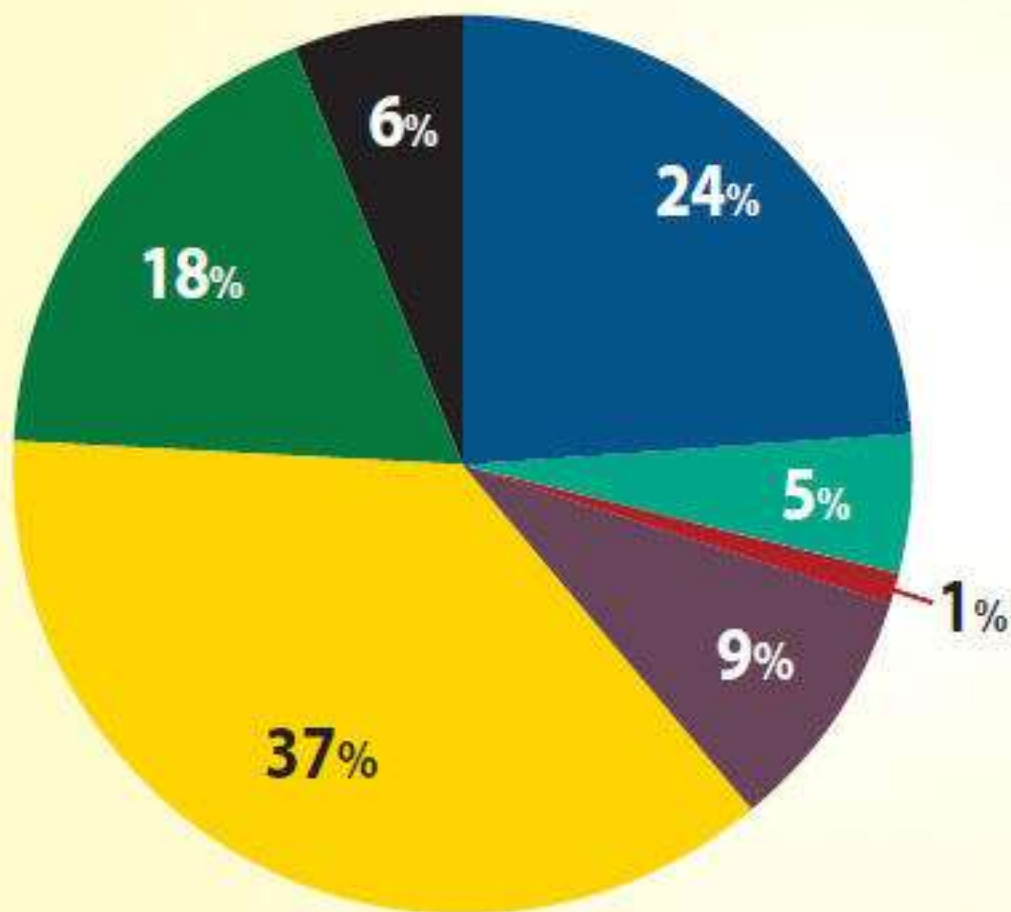


- Deteriorates nervous system
- Impairs hearing, speech, vision and gait
- Causes involuntary muscle movements
- Corrodes skin and mucous membranes
- Causes chewing and swallowing to become difficult

Impacts brain development



Global anthropogenic mercury emissions in 2010



Fossil fuel combustion (power & heating)



Metal production (ferrous & non-ferrous)



Chlor-alkali industry



Waste incineration, waste & other



Artisanal and small-scale gold mining



Cement production

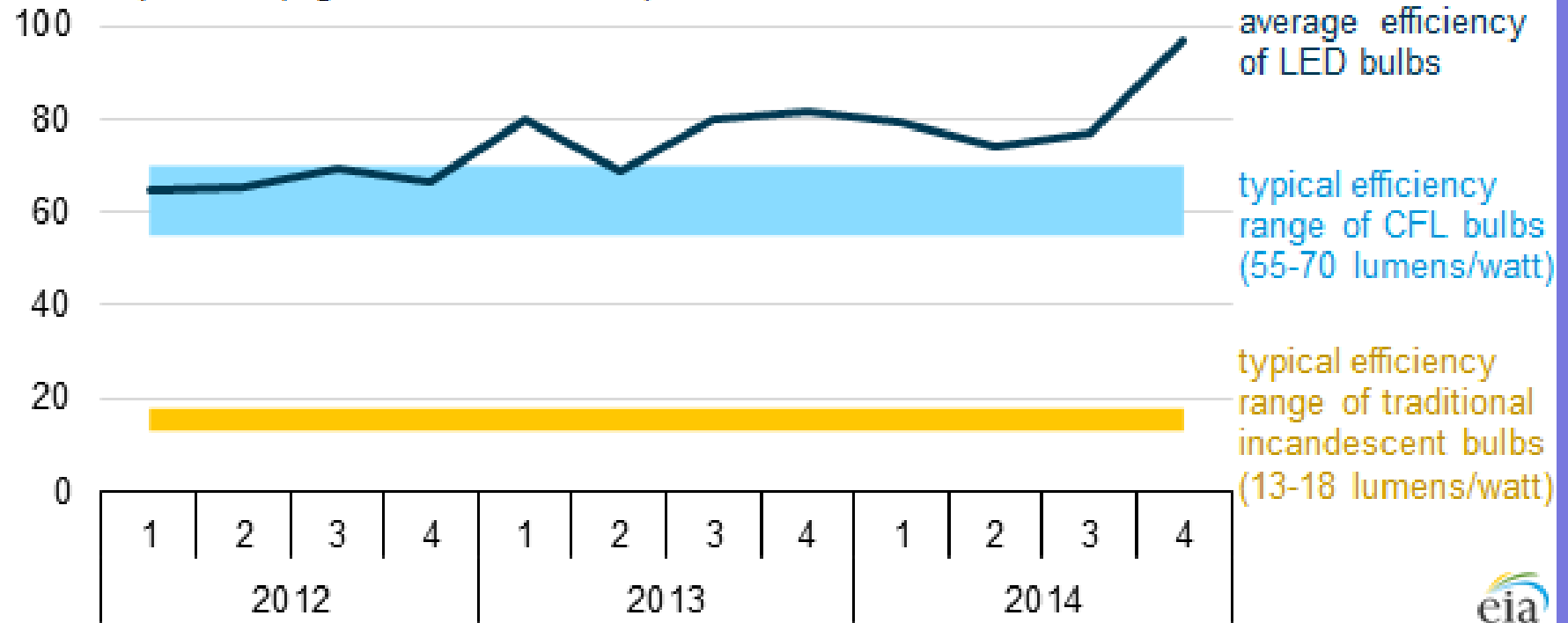


Other

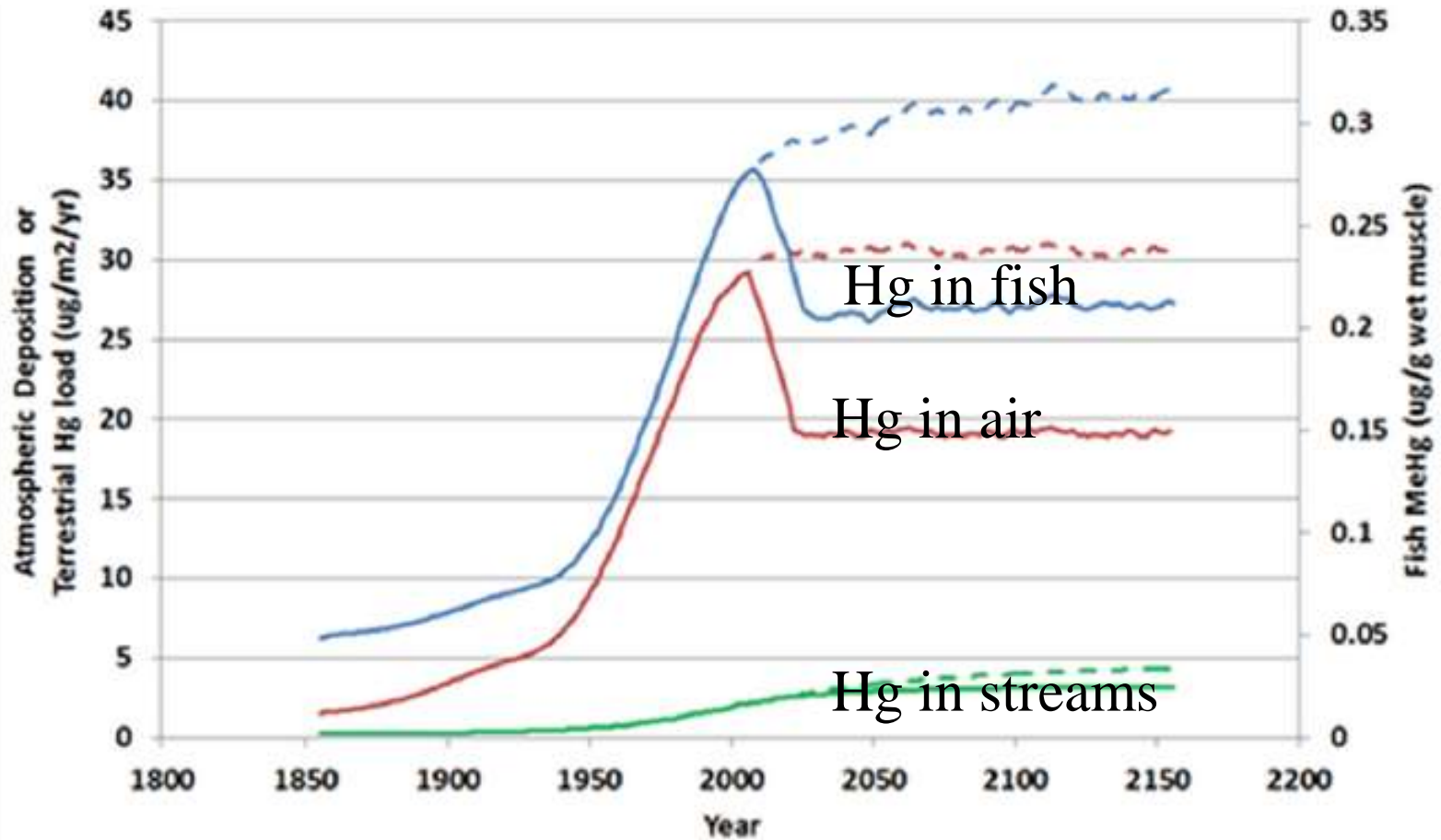
Listed lighting efficiency (efficacy) of commercially available LED light bulb models

quarterly data, 2012-14

lumens per watt (higher = more efficient)

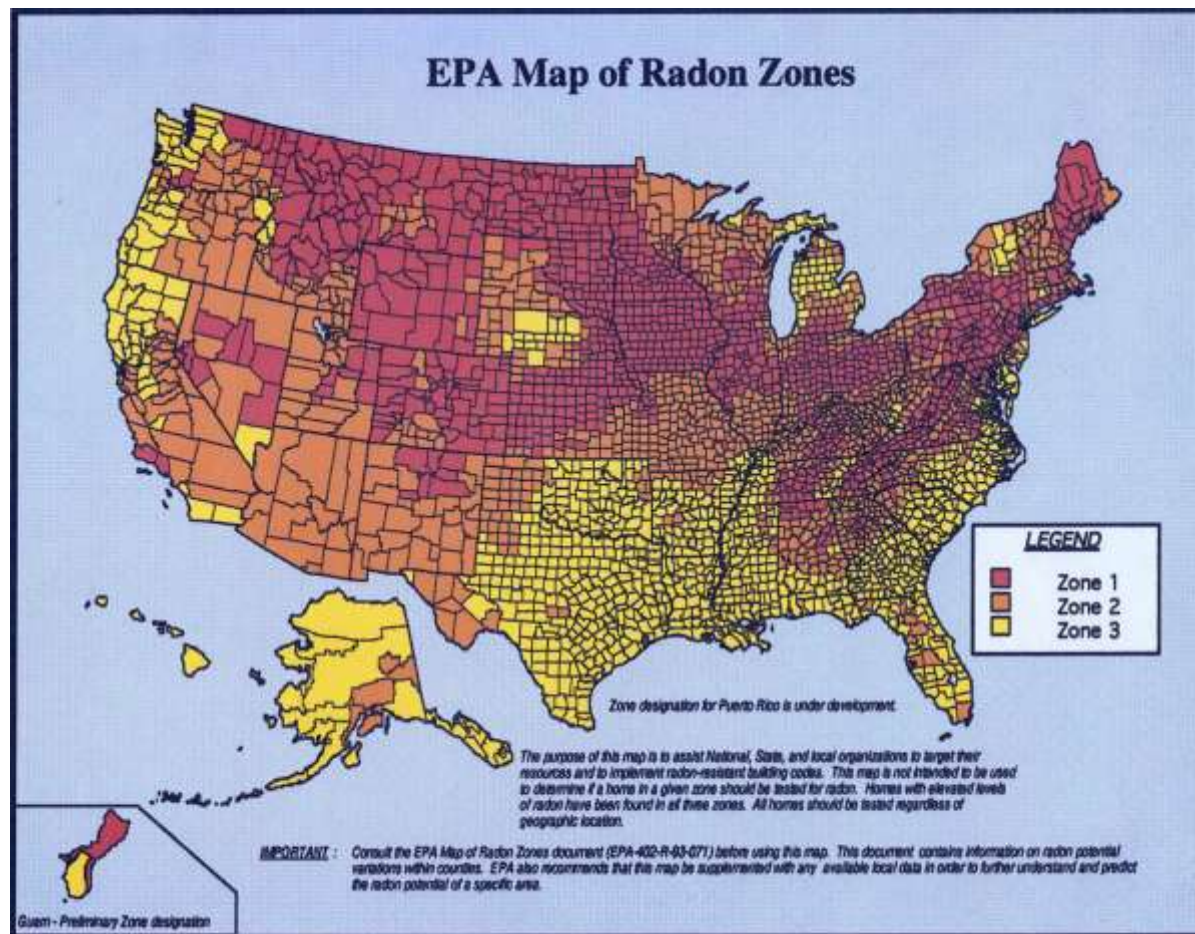


Hg bioaccumulates → makes fish unfit to eat



8) Others

- Hundreds of other air pollutants can be found in low concentrations in atmosphere
- Local concentrations can be hi (esp. near incinerators, industry and fossil fuel burning plants)
- Ex: Hi concentrations of radon gas → lung cancer
- Ex: Cl, HCl, radioactive substances, flouride, dioxins....



Zone 1 counties have a predicted average indoor radon screening level greater than 4 pCi/L (pico curies per liter) (**red zones**)

Highest Potential

Zone 2 counties have a predicted average indoor radon screening level between 2 and 4 pCi/L (**orange zones**)

Moderate

Zone 3 counties have a predicted average indoor radon screening level less than 2 pCi/L (**yellow zones**)

Low Potential

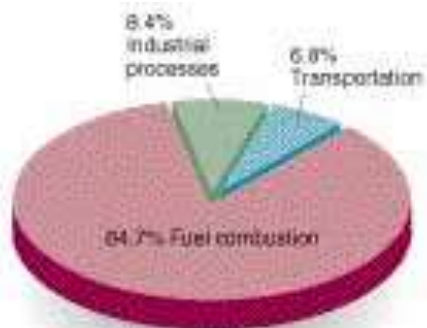


Sources of air pollution (some mobile (Dispersed), some stationary (Point))

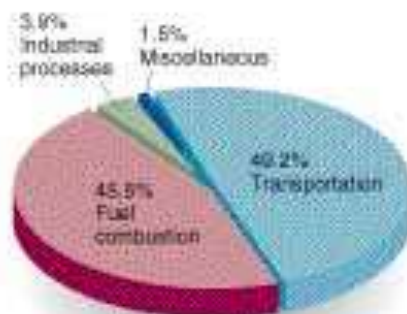
1. **Transportation** → (**NO_x, CO_x, particulate matter, hydrocarbons**) = mobile

Cars < SUV's < diesel (consumes less pollutes more) < small motors (lawn mowers, jet skis, outboard motors, snowmobiles...)

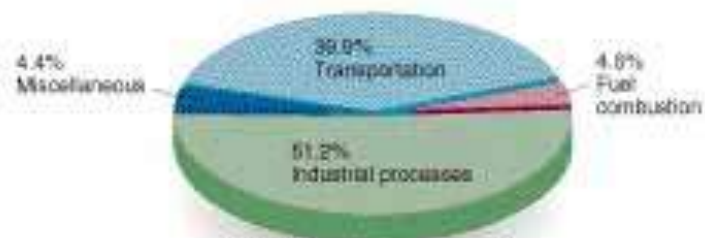
2. Fuel combustion for heating and electricity = stationary or point sources
3. **Industry** = stationary (often → **hydrocarbons**)
4. **Construction and mining** → most particulate matter
5. **Agriculture** → lots of dust and particulate matter



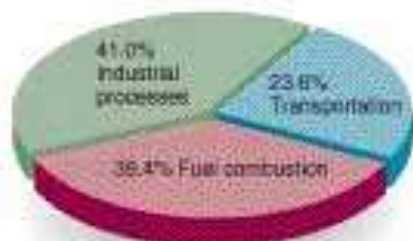
Sulfur dioxide
18.5 million metric tons



Nitrogen oxides
21.5 million metric tons



Volatile organic compounds
17.6 million metric tons



PM-10 particulate matter
2.83 million metric tons



Carbon monoxide
79.6 million metric tons

Air pollution and human health

- Sulfur oxides, nitrogen oxides, ozone, and particulate matter →
 - asthma = constricting airways and
 - Chronic bronchitis = inflammation of bronchi
- Cancer = uncontrolled cell division caused by
 - smoking = #1 cause of lung cancer
 - Radon gas (released from bedrock)
 - asbestos exposure
- Note: smoking also → indoor air pollution
 - benzene = one of several carcinogens found in cigarettes
 - Smoking also → emphysema = loss of elasticity of air sacs → breathlessness

More human health

- Ozone → irritates eyes, nose, and throat,
 - Also → decreased photosynthesis
- CO binds to hemoglobin → dec. O₂ in blood
- Children are more affected than adults due to small size and high metabolic rates

Carcinogen classifications

- A = human carcinogen
- B = probable human carcinogen
- C = possible human carcinogen
- D = not classifiable as to human carcinogenicity
- E = evidence of noncarcinogenicity for humans

Urban Air Pollution

2 types of smog

1. **London type** (industrial) = SO_x and particulate = worse in winter due to heating (increased with increased **coal burning**)
2. **Photochemical** (Los Angeles) worst in summer, major contributors = **automobiles, bakeries, and dry cleaners**

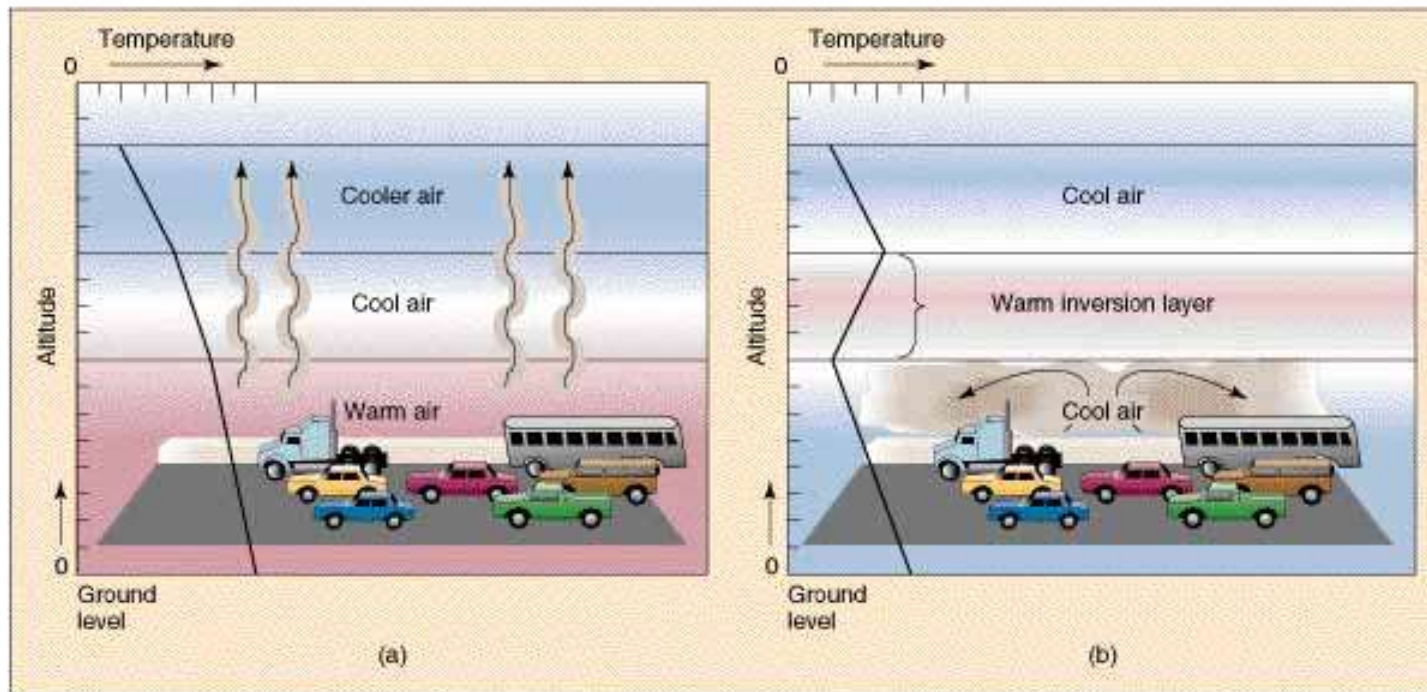
Sun + VOC's + NO_x → PANs + ozone

Damages plants, eyes, nose, throat

Weather and topography

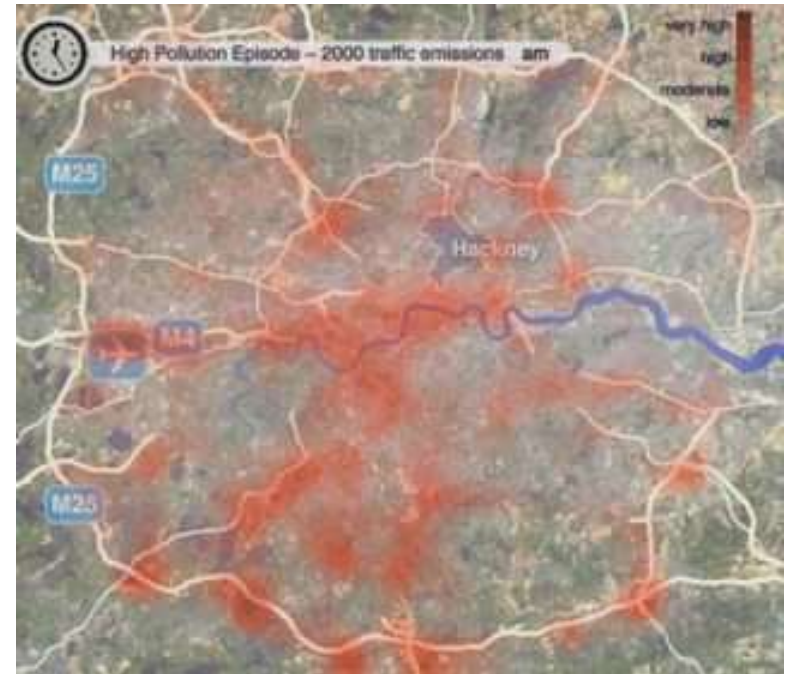
- Normally warm air rises and disperses
- During temperature inversions (cold air is trapped below layer of warm) pollution cannot escape and disperse
- Occur more commonly in cities, on coasts, and near mountains

Temperature Inversions



Cities are usually warmer than surrounding areas

- Due to
- increased absorption of solar radiation and
- increased production of heat
- **Cities** → **urban heat islands** surrounded by dust domes (areas with increased concentrations of pollutants)



London air pollution

<http://www.primidi.com/2005/06/19.html>

Controlling air pollution

1. Decrease emissions
2. Decrease particulates (with electrostatic precipitators, fabric filters and scrubbers)
3. Decrease sulfur (cleaner burning coal, coal gasification, fluidized bed combustion, collectors on smokestacks)
4. Dec. nitrogen fertilizers
5. Catalytic converters → dec. hydrocarbons
6. More stringent emission standards
7. Reduce sulfur content of gasoline (possible but expensive)

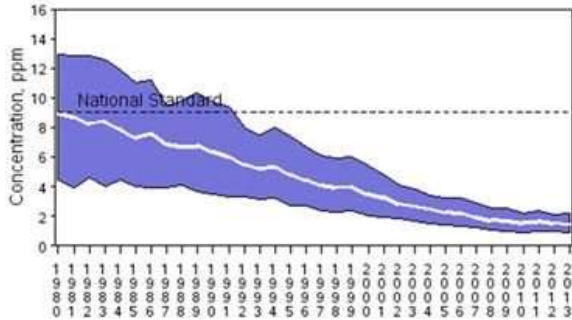
Clean Air Act 1970

- EPA sets limits on air pollutants
- States need to comply to get funding
- Focus has been on (lead, particulates, SO₂, CO, NO_x and ozone)
- Continues to be ammended

Recent concern about global warming
expected to aim at dec. CO₂

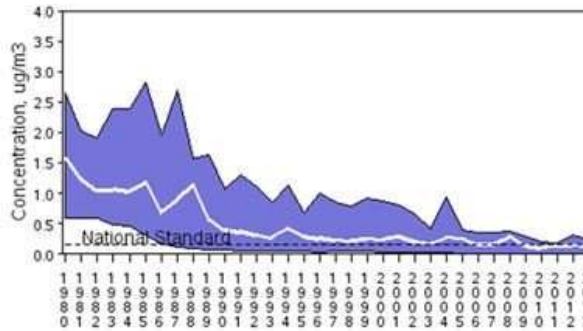
CO Air Quality, 1980 - 2013

(Annual 2nd Maximum 8-hour Average)
National Trend based on 82 Sites



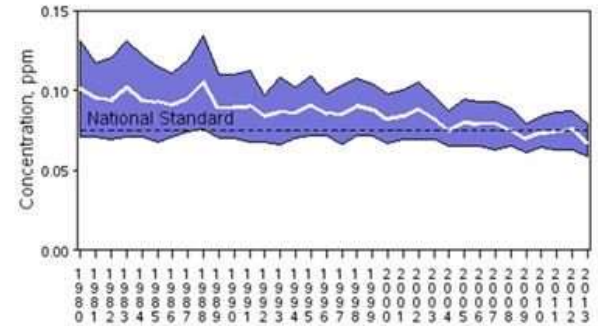
Lead Air Quality, 1980 - 2013

(Annual Maximum 3-Month Average)
National Trend based on 12 Sites



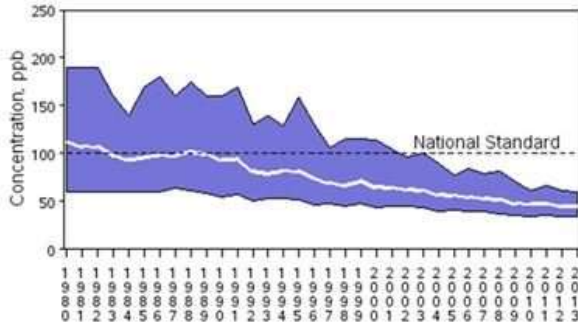
Ozone Air Quality, 1980 - 2013

(Annual 4th Maximum of Daily Max 8-Hour Average)
National Trend based on 222 Sites



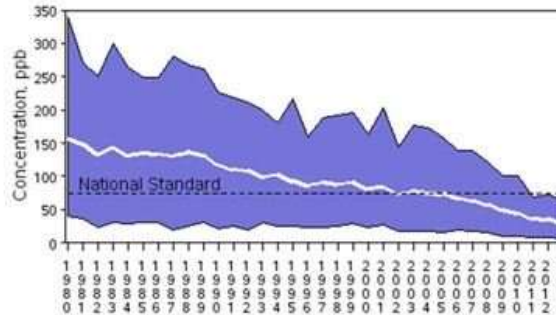
NO2 Air Quality, 1980 - 2013

(Annual 98th Percentile of Daily Max 1-Hour Average)
National Trend based on 29 Sites



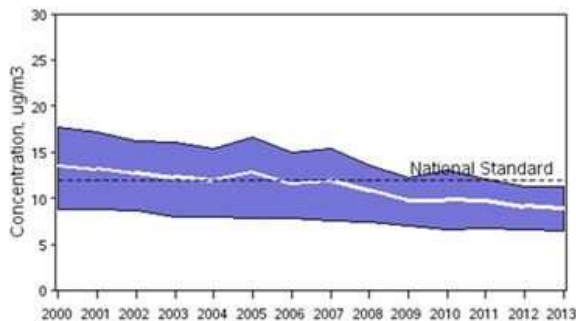
SO2 Air Quality, 1980 - 2013

(Annual 99th Percentile of Daily Max 1-Hour Average)
National Trend based on 47 Sites



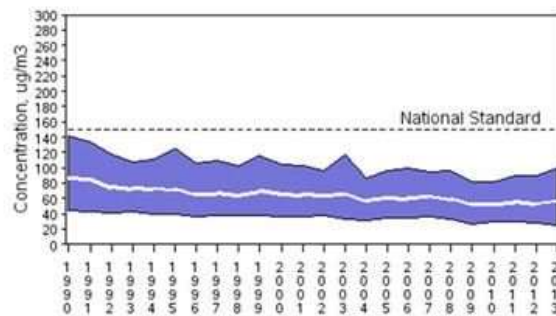
PM2.5 Air Quality, 2000 - 2013

(Seasonally-Weighted Annual Average)
National Trend based on 537 Sites



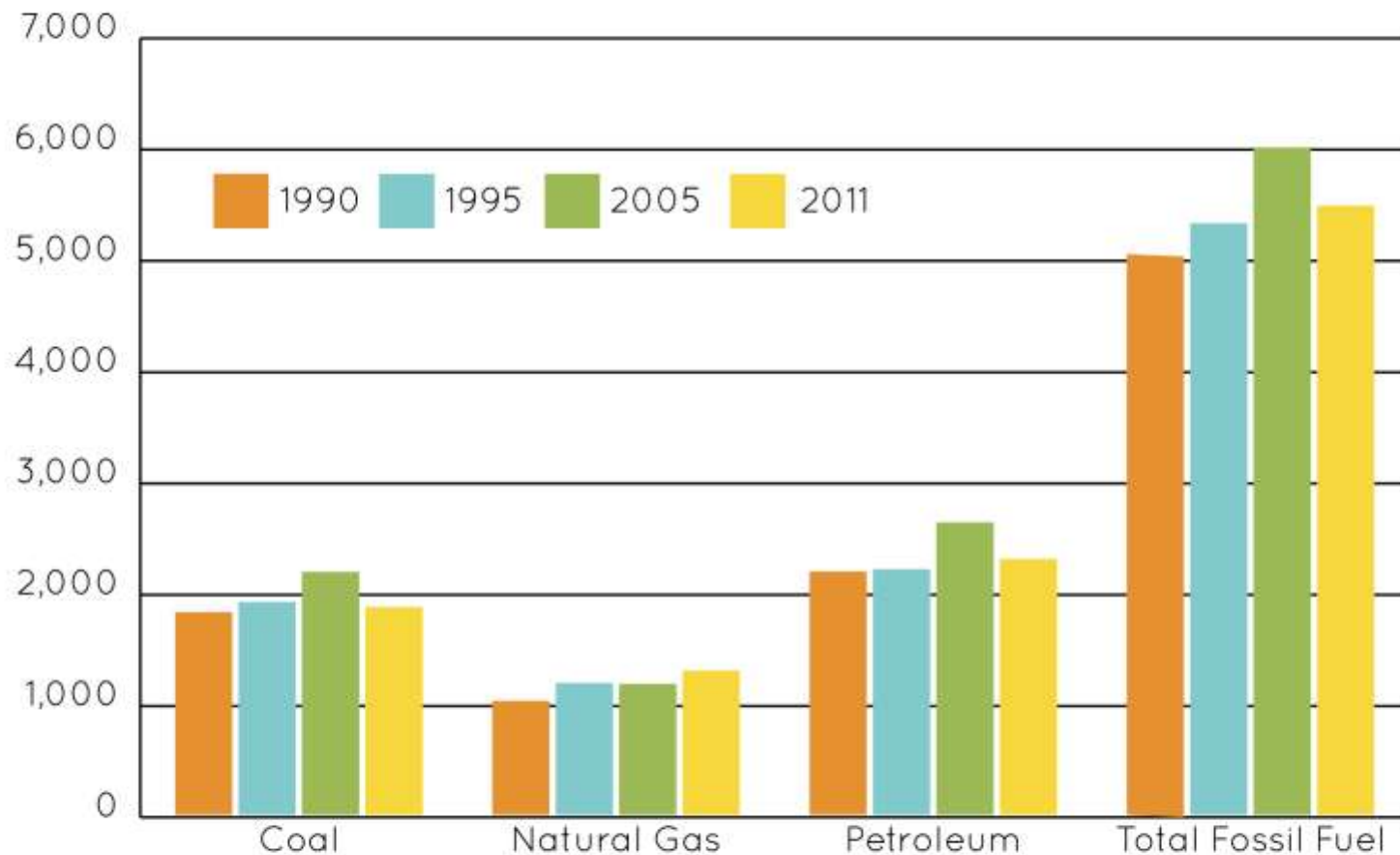
PM10 Air Quality, 1990 - 2013

(Annual 2nd Maximum 24-Hour Average)
National Trend based on 207 Sites



Carbon Dioxide Emissions from Fossil Fuels, 1990, 1995, 2005, 2011

(million metric tons)



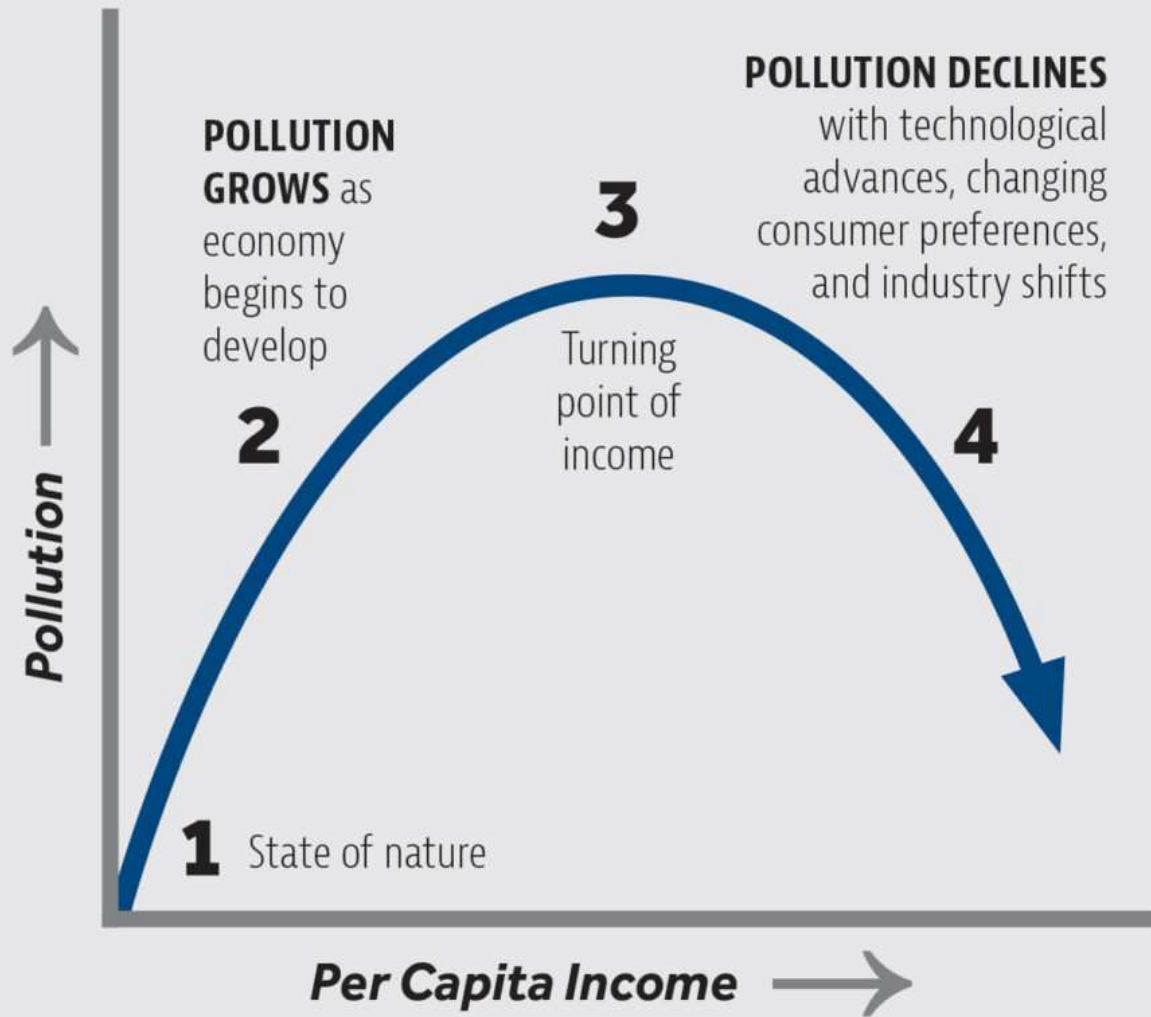
Clean Air Act →

- Cars produce fewer emissions (but increase in # of cars still a problem)
- Cities not reaching standards are classified as **non-attainment cities**
 - LA = historically the worst
 - Chicago, Houston, NYC, and Milwaukee 2nd
 - Baltimore, Philadelphia and Sacramento 3rd

Globally

- 5 worst = Mexico City, Beijing-China, Shanghai-China, Tehran-Iran, Calcutta-India
- Developing countries have fewer standards and higher pollution
 - Ex: **leaded gasoline is still used in many developing nations (lead → neurological and learning disabilities)**

Environmental Kuznets Curve



Air pollution moves

- **Prevailing winds carry pollutants → global distillation effect → high concentrations of pollutants at the poles**
 - High mercury levels found in native Inuit populations (due to hi fish consumption)
- Many compounds **persist**
- **(ex: DDT and PCB's, dioxins...)**

Indoor Air Pollution

- Pollutants become concentrated in enclosed places (ex: automobiles, homes, schools, offices)
- Anything volatile = bad
- Can lead to sick building syndrome if
 - Multiple people are affected
 - Symptoms occur when you are in the enclosed space and disappear upon leaving

Examples of indoor air pollutants

- CO and benzene from automobiles
- Radon gas (an alpha emitter → lung cancer)
 - Note highest US radon levels in Reading Prong (which runs thru Penn, NY, NJ) and Iowa
- Cigarette smoke
- NO₂ from unvented gas and kerosene appliances and wood stoves

Caused by

- Formaldehyde from furniture, carpeting, particle board, foam insulation



Household pesticides and cleaners



Ozone from copiers and some air purifying machines



Asbestos (used in fire protection and electrical insulation)



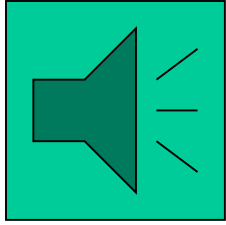
Asbestos removal



Sick building caused by

- Bacteria, molds and toxins build up in water damaged buildings
 - Can → headaches, neurological problems
 - Survive in heating and ventilation ducts





Noise Pollution

- Measured in decibels
- Intensity = loudness
- Cochlea = spiral shaped portion of inner ear

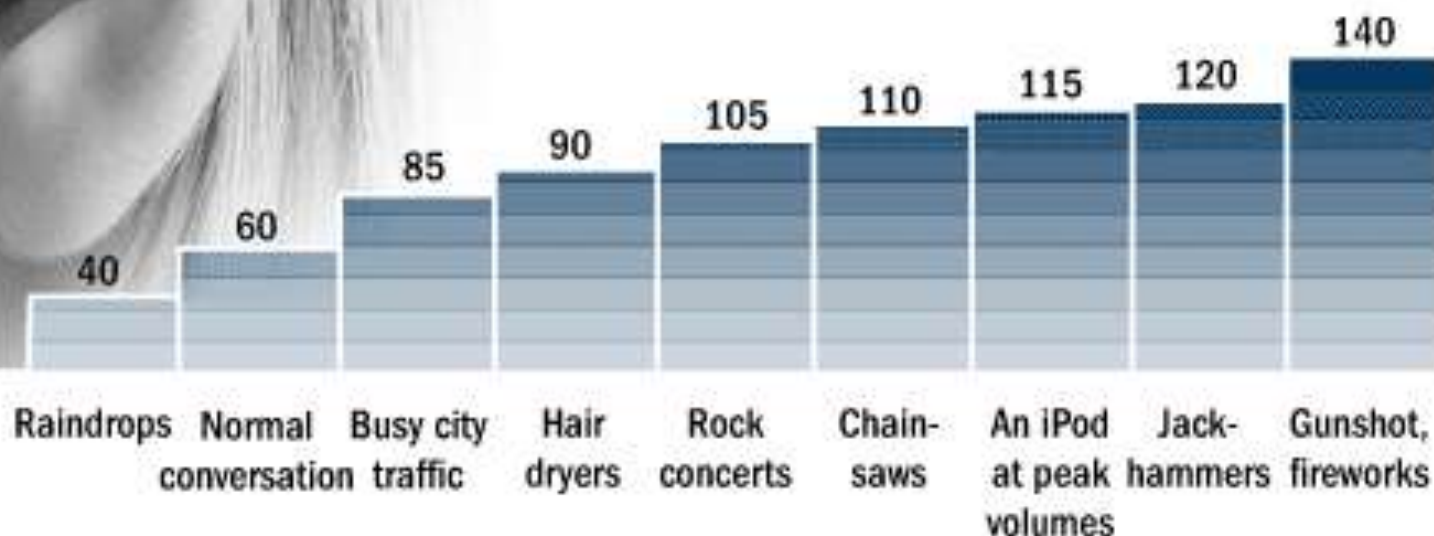


<http://www.sickkids.ca/auditorysciencelab/images/cochlea.jpg>



How Loud Is Too Loud?

Noise-induced hearing damage is related to the duration and volume of exposure. Government research suggests the safe exposure limit is 85 decibels for eight hours a day. Some common decibel levels:



Sources: dangerousdecibels.org; WSJ research

Prevention

- Sound shields
- Earplugs



Noise Pollution

- Loud, high pitched noise → physiologic stress
 - Injures hairs in cochlea
 - Inc. heart rate
 - Dilate pupils
 - Cause muscle contractions, migraine headaches, nausea, dizziness, ulcers, stress

OSHA regulations protect workers

The screenshot shows a web browser window displaying the Occupational Safety and Health Administration (OSHA) website. The browser's address bar shows the URL <https://www.osha.gov>. The website header features the OSHA logo, the text "UNITED STATES DEPARTMENT OF LABOR", and a search bar labeled "Find it in OSHA". Below the header, the main navigation menu includes "Occupational Safety & Health Administration" and several sub-menus: "A to Z Index", "Contact Us", "FAQs", "About OSHA", and "What's New". A secondary navigation bar lists various topics: "Worker Rights", "Anti-Retaliation", "Regulations", "Employers", "Data & Statistics", "Enforcement", "Training", "Publications", "Hazards", and "En Español".

The main content area is dominated by a large banner image of a worker in a green shirt and safety vest. Overlaid on the image is the text "The Costs of Failing to Protect Workers on the Job" and a "Report*" button. To the right of the banner is a vertical list of links: "Adding Inequality to Injury", "Filing a Complaint", "Worker Safety in Hospitals", "Reporting Fatalities & Severe Injuries", and "Protecting Temporary Workers".

Below the banner, there are three sections: "IN FOCUS" with a "Know Your Rights!" link, "4,405 workers died on the job in 2013" with a "Fatality Reports" button and a video player showing a worker's accident, and "HOW TO..." with links for "File a complaint", "Get a FREE OSHA poster", and "Get information on reporting severe work-related injuries, illnesses and fatalities to OSHA".

The bottom of the image shows the Windows taskbar with various application icons and the system tray displaying the time as 8:36 AM on 4/14/2015.

Electromagnetism

- Electric and magnetic fields (EMF's) are produced by power lines, microwave ovens, video displays, cell phones...
- May be linked to cancer
 - Higher incidence of leukemia in children living near power lines and workers exposed to high voltages on a regular basis.