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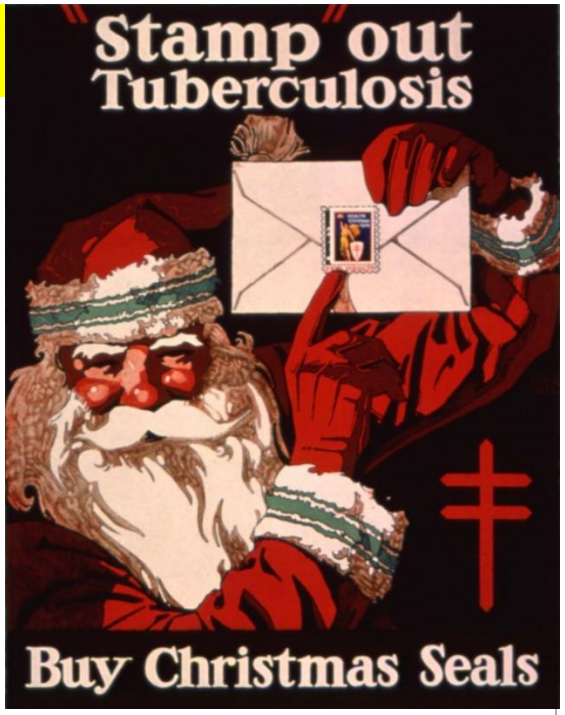
CLEAN AIR CHOICE®

CLEAN AIR CHOICE® IMPROVING THE AIR WE BREATHE

Angela Tin
Seoul June 2018

OUR HISTORY – 1904 TO TODAY

- National Tuberculosis Association
- Oldest voluntary heath organization
- Before EPA (outdoor)
- Public Health (indoor)
- Link Environmental Pollution to Health Concerns



WHEN YOU CAN'T BREATHE, NOTHING ELSE MATTERS

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Big Smoke and Great Pea Soup of London 1952

CAUSE AND EFFECTS

- Weather related: temperature inversion (cold stagnant air trapped under warm air)
- 5 Days: 1952
- Pollutants: home & industrial chimneys
  vehicle exhaust
  sulfuric acid (1500 tons)
  PM 300 ug/m3
  PM (China 800 ug/m3; 400 India ug/m3)
- Yellowish fog
- Creation of England's Clean Air Act of 1956

ACUTE AND CHRONIC HEALTH HAZARDS

Acute (short term) health effects quickly seen after exposure to fairly high concentrations

- ✓High concentration may be lethal concentration
- ✓Deaths (4,000) (8,000) (12,000)

Chronic (long term) develop slowly, but more drastic effect

- ✓100,000 people impacted
- ✓Asthma – 20% increase
- ✓Developmental problems
- ✓Lifelong damages
- ✓Levels similar to current levels in Beijing & Mumbai

WHY TELL PEOPLE ABOUT AIR QUALITY?

54% of the worlds population live in urban areas, and another 2.5 billion by 2050, exceeding **6 billion**

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CHILDREN, TEENS FACE HIGHER RISK

Children, teens have growing lungs, spend more time outdoors, inhale more air per pound.

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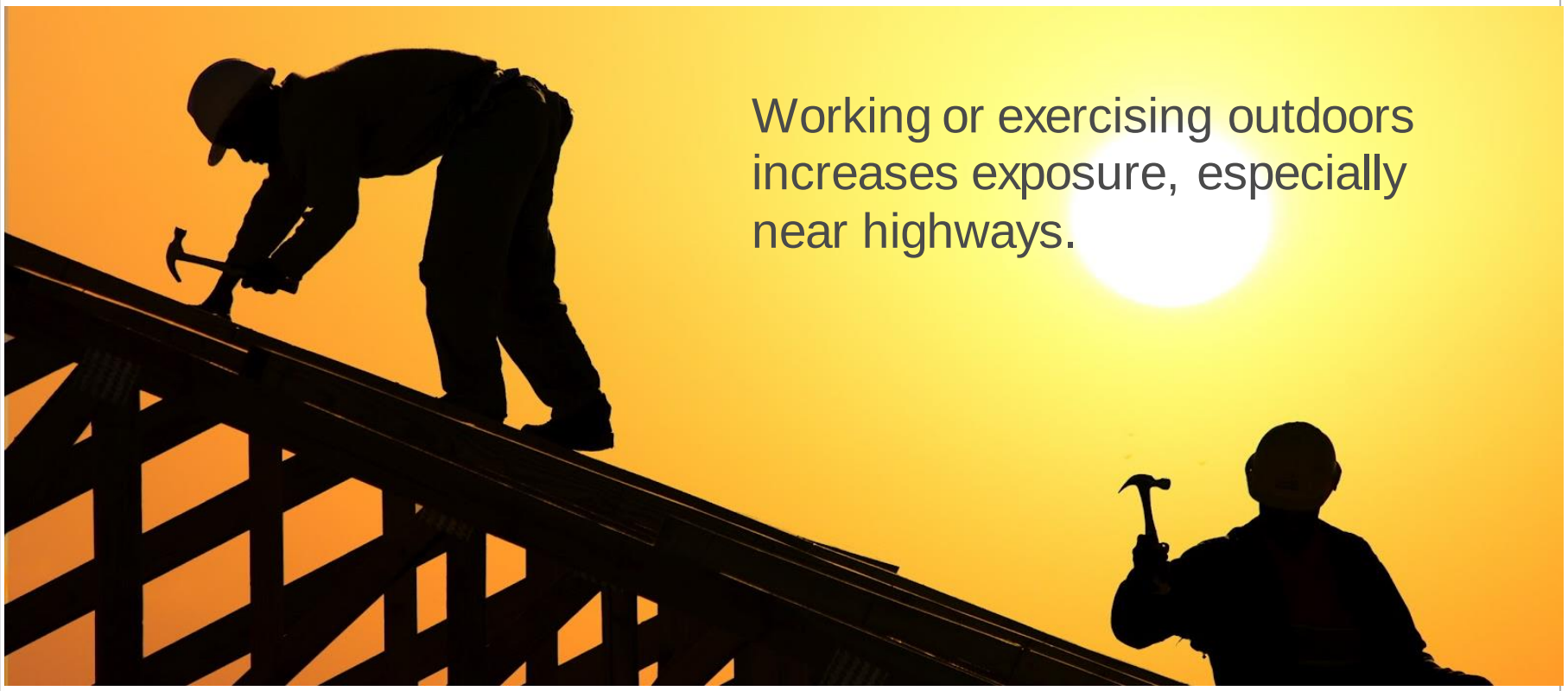
OLDER ADULTS FACE HIGHER RISK

Aging brings a gradual decline in the body's systems that makes us more vulnerable.

CHRONIC DISEASES INCREASE RISK

Having **asthma or other lung diseases, cardiovascular disease or diabetes** puts you at higher risk.

EVEN HEALTHY ADULTS CAN FACE INCREASED RISK



PEOPLE WITH LOW INCOMES FACE INCREASED RISK

Poorer people often live closer to sources of pollution, may have higher incidence of disease, and less access to care.

PEOPLE LIVING IN RURAL AREAS ARE ALSO AT RISK

CAUSES OF LUNG DISEASE & CANCER

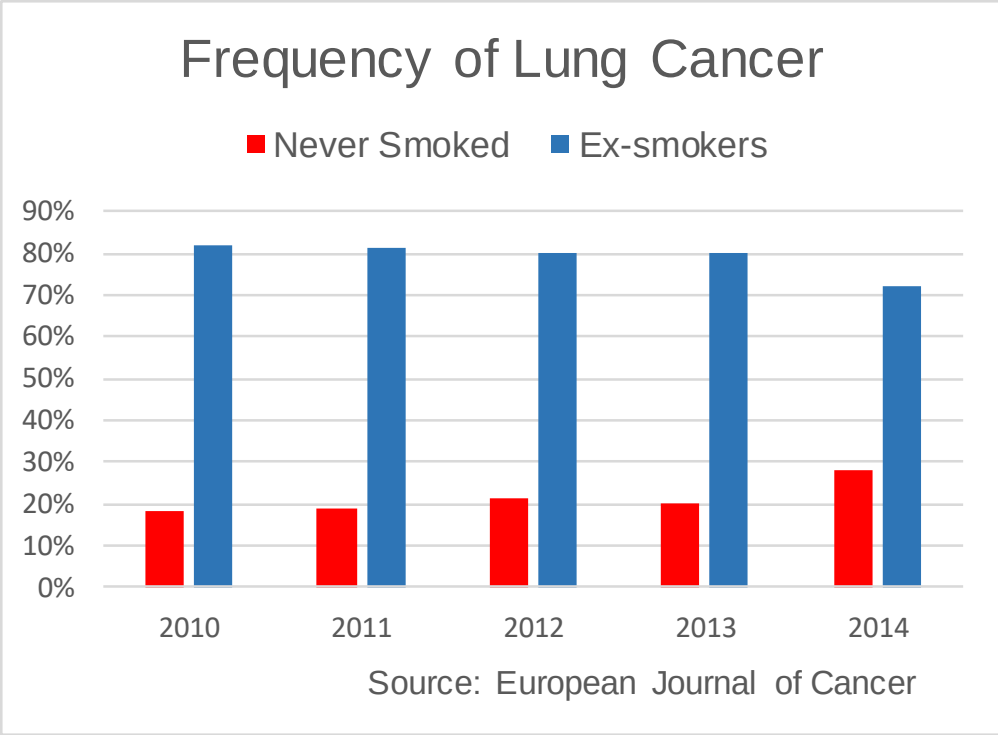
1. **Smoking**
2. Exposure to radon gas
3. Exposure to chemicals –workplace (asbestos, silica)
4. **Air pollution – transportation/industrial sources**

PREVENTABLE VERSUS LIMITED ACTION

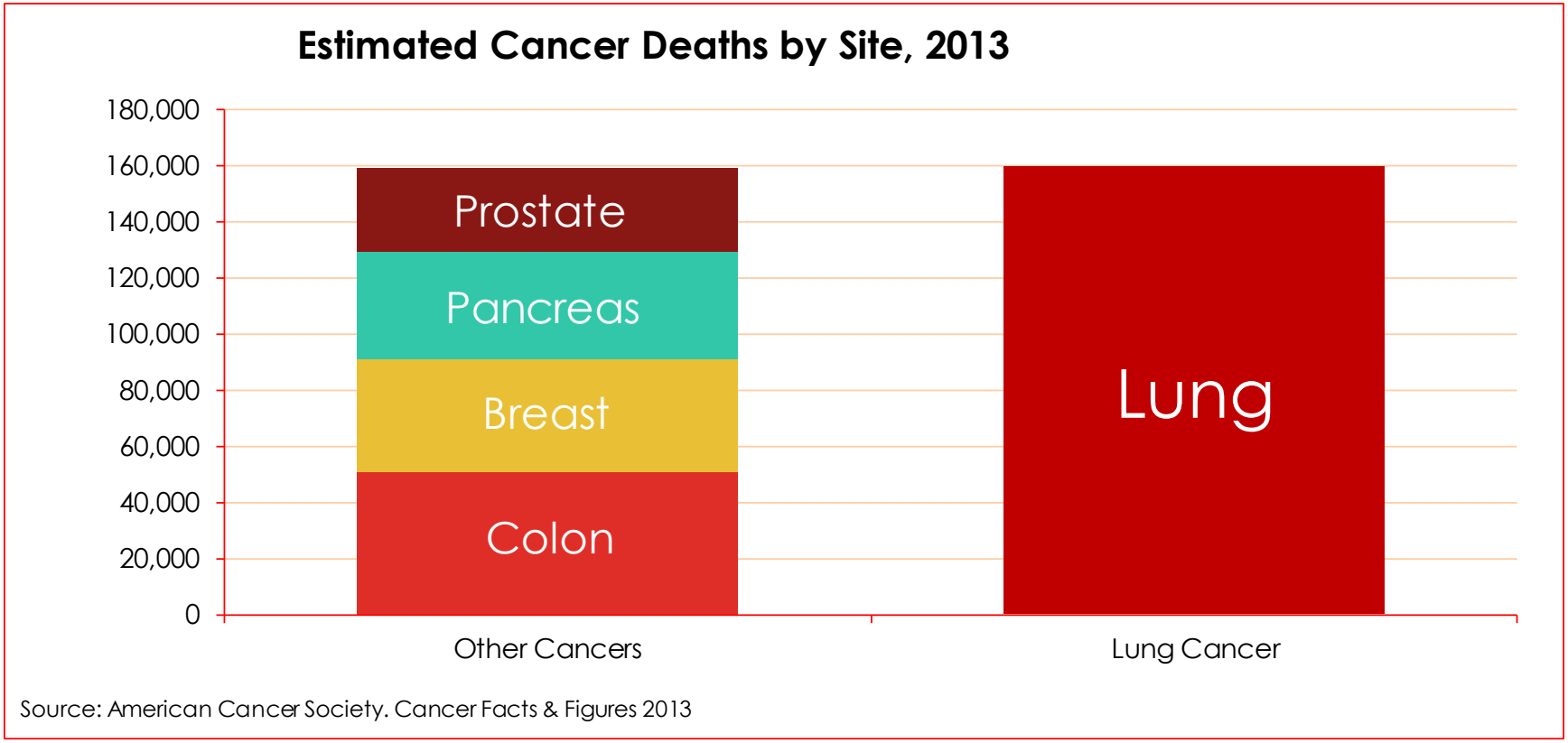
5. Previous lung disease - tuberculosis
6. Family history of lung cancer
7. Past cancer treatment
8. Previous smoking related cancer (tobacco products)
9. Lowered immunity (AIDS, HIV)

LUNG CANCER

- Cigarette smoking rates have decreased (20% – 16%)
- **2/3 lung cancers occur in never/ex smokers**



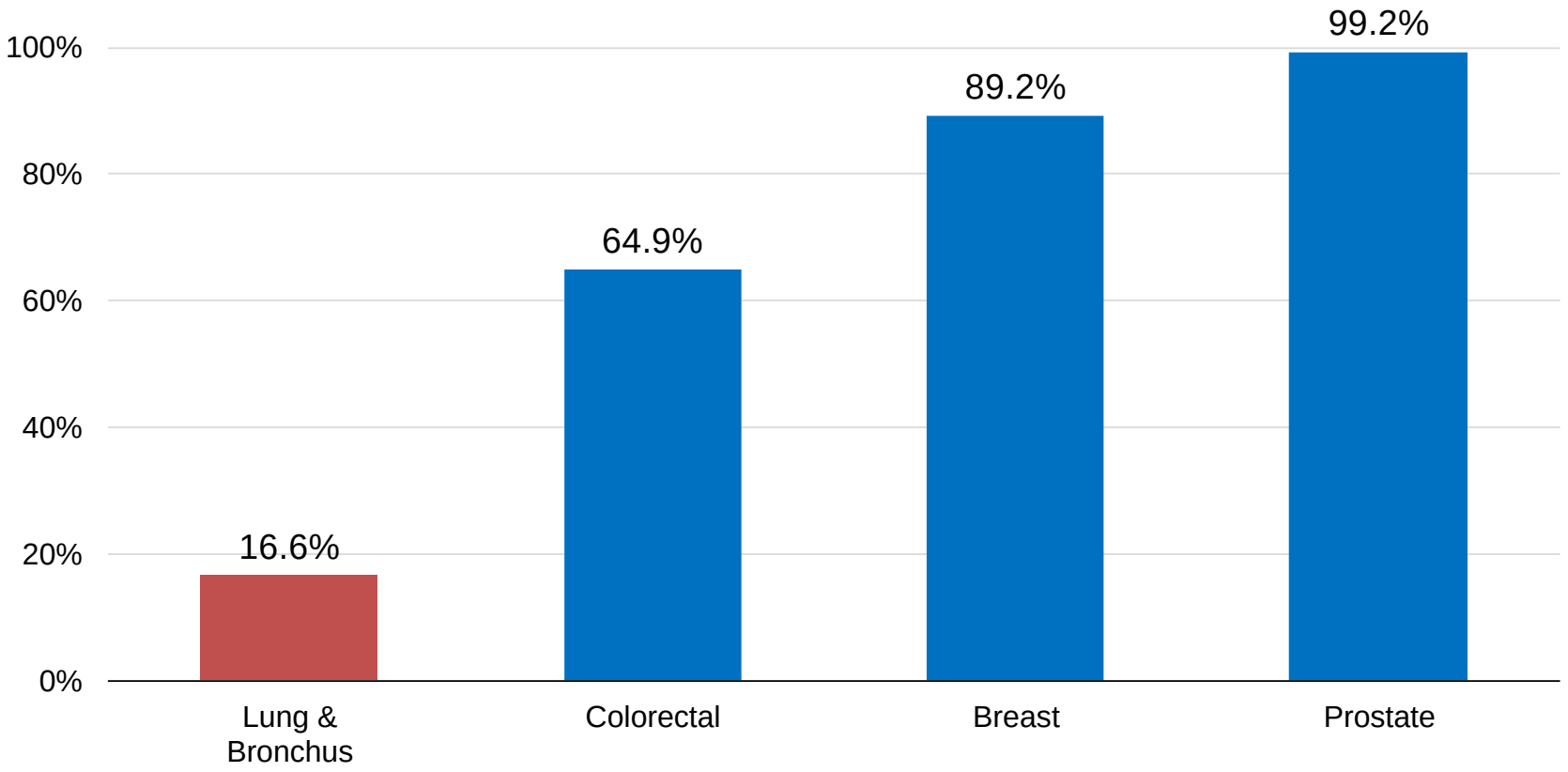
LUNG CANCER IS THE DEADLIEST CANCER



Source: American Cancer Society. Cancer Facts & Figures 2013

MOST LUNG CANCER IS CAUSED BY SMOKING (WHILE THE NUMBER OF SMOKERS ARE DECREASING, THE INCIDENCE OF LUNG CANCER IS INCREASING)

5 YEAR SURVIVAL RATES



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THE COST OF LUNG CANCER

U.S cancer care costs in the United States

- $147.5 Billion in 2015
- $13.4 Billion due to lung cancer (10%)

Lost productivity (earning potential) due to early death

- $134.8 Billion in 2005
- $36.1 Billion due to lung cancer (27%)

U.S. National Institute of Health. National Cancer Institute. Cancer Trends Progress Report – Financial Burden of Cancer Care. November 2015

AIR ENVIRONMENTAL POLLUTION

Health Conditions linked to Air Pollution exposure (such as lung cancer and emphysema) are often fatal

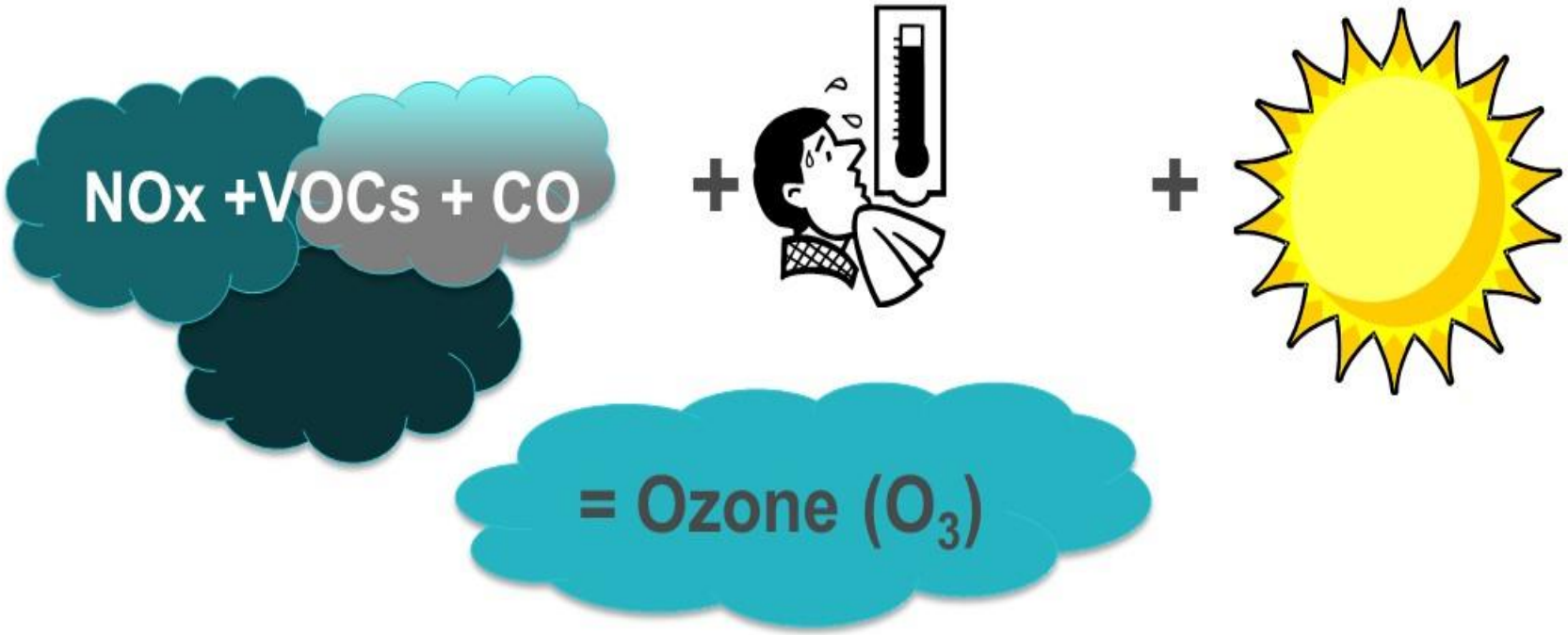
- **Globally* = 6.1 million death from air pollution (12% of global deaths in 2016)**
  - **✓4.1 million = outdoor or ambient air pollution**
  - **✓2.6 millions = indoor fires and heat**

**University of Washington's Institute for Health Metrics and Evaluation*

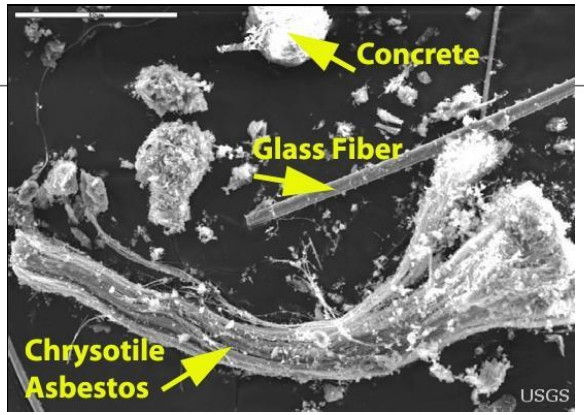
WHAT IS OZONE?

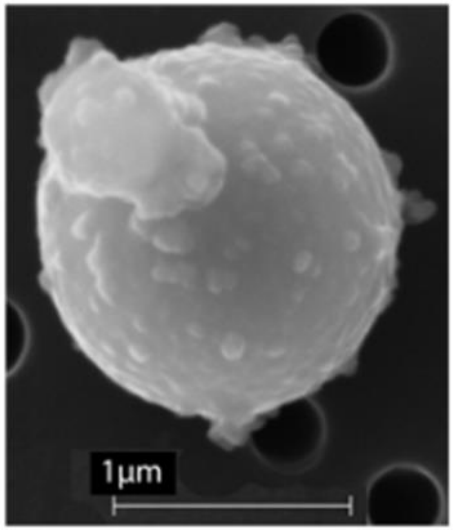
Ozone is a gas, sometimes called smog.

It is created in the atmosphere.

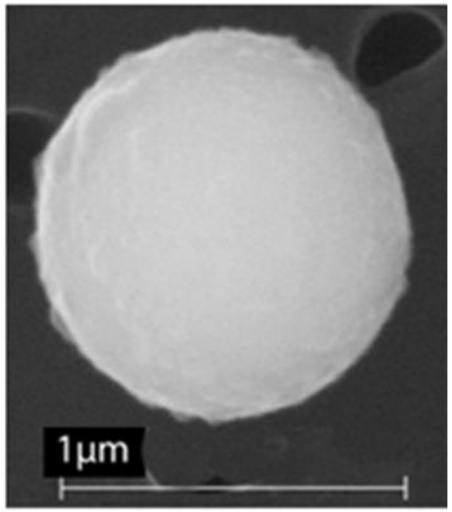


PARTICULATE MATTER

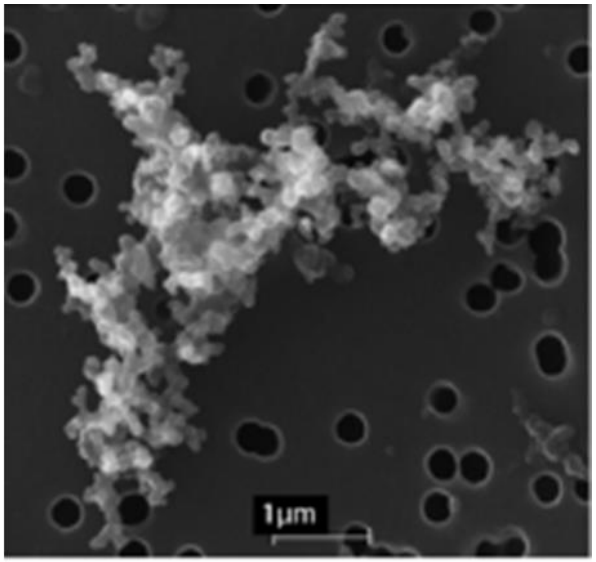




From a coal-fired power plant

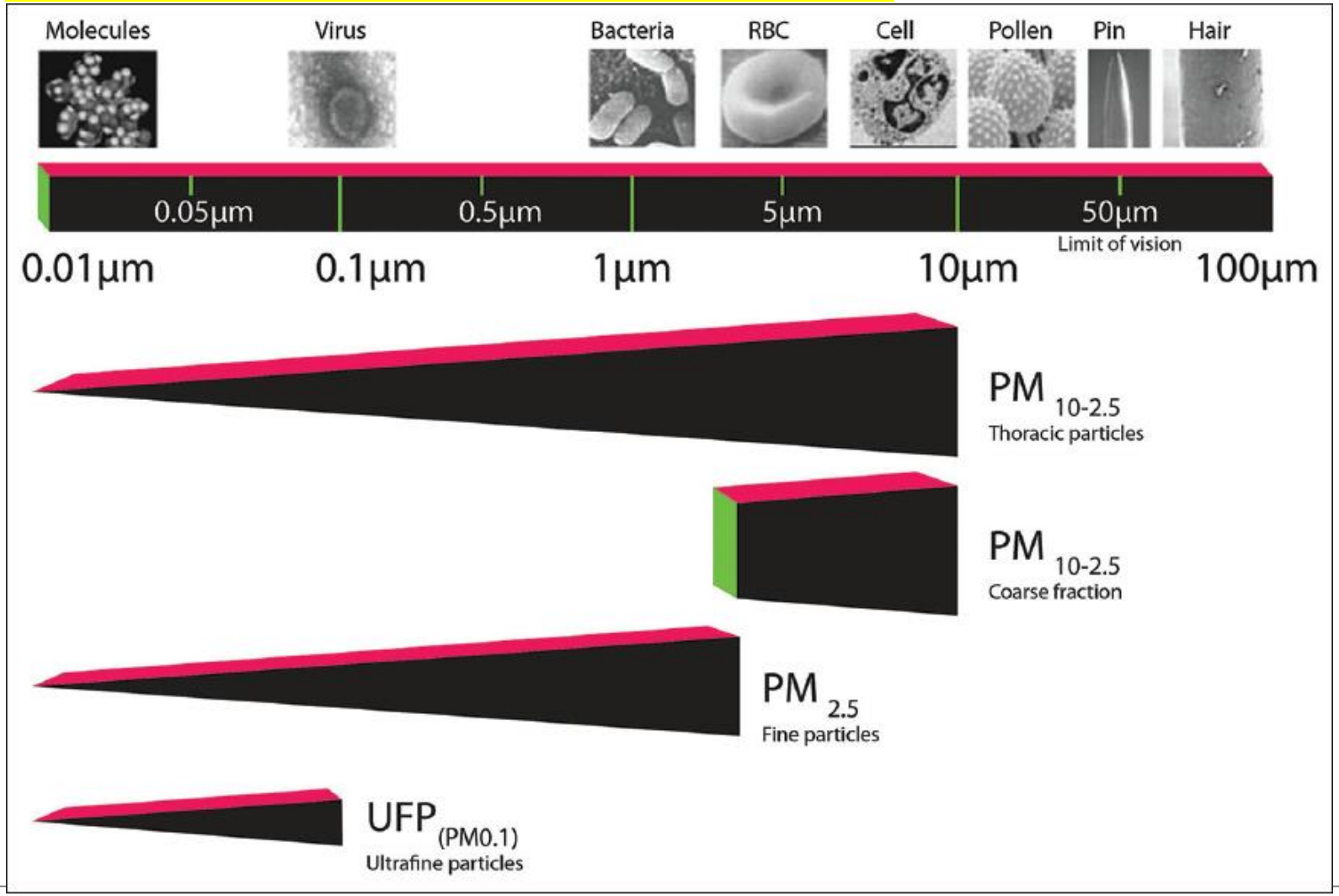


From a steel manufacturing plant



Carbon soot from a diesel engine—has lots of tiny particles

PARTICULATE MATTER



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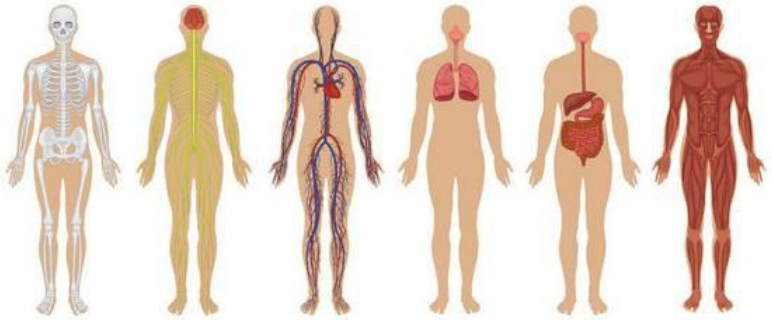
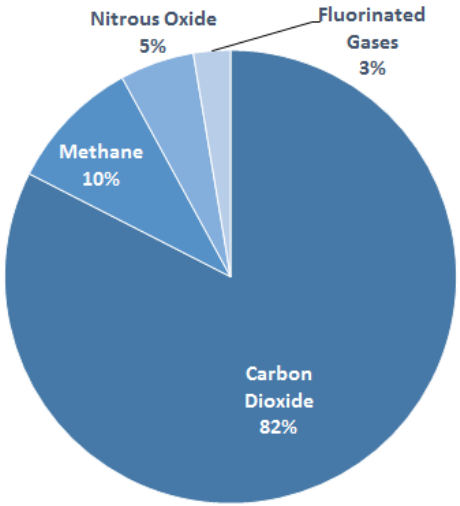
STUDIES HAVE INCREASED SINCE 1990

- Respiratory symptoms in adults
- Lung function in children
- Respiratory systems in children
- Neurological degenerative diseases
- Low birth weight
- Cognitive function in children
- Mortality long-term effects
- Mortality short-term effects
- Diabetes
- Dementia
- Parkinson's Disease
- Multiple sclerosis



CLIMATE CHANGE & GREENHOUSE GASES

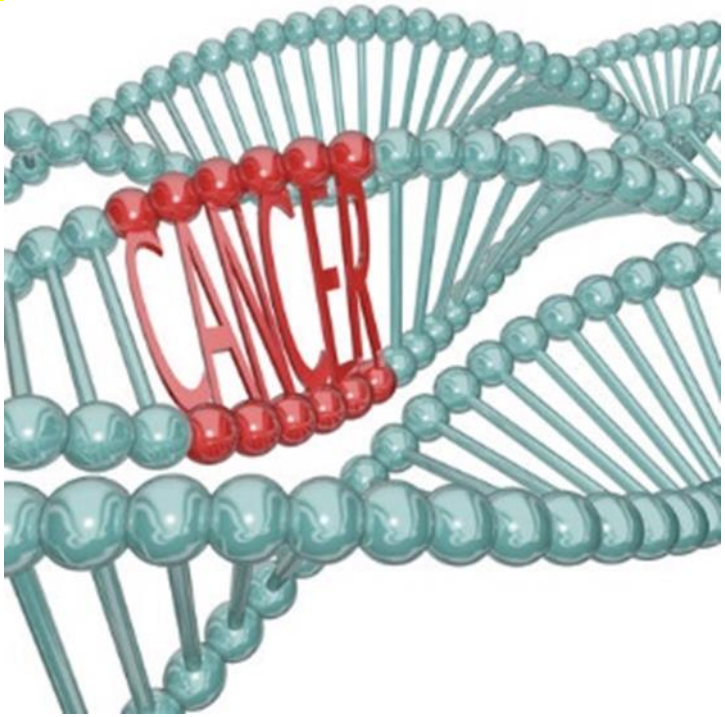
- **Carbon dioxide**
  burning of fossil fuels
  (coal, natural gas,
  & petroleum fuels)
- Result of chemical reactions (**mfg of cement**)
- Usually removed by plants as a part of biological carbon cycle
  (**except when in excess**)

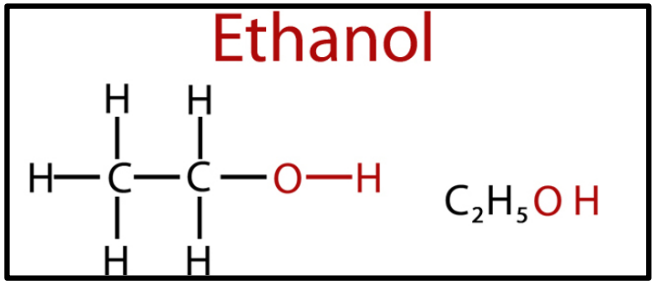


RISKS FROM TOXIC COMPONENTS

- Mixture of over 200 + Chemicals varies raw material & refinery process
- **BENZENE Group A: "Human Carcinogen" (**45% – 25%)

  Sufficient evidence from epidemiologic studies to support cause and effect
- Toxic at low concentrations
- Persistent, Bioaccumulative, Toxic
- Travels in groundwater (causes groundwater contamination
- Oil exploration/refining/spills (massive, tremendous impact)



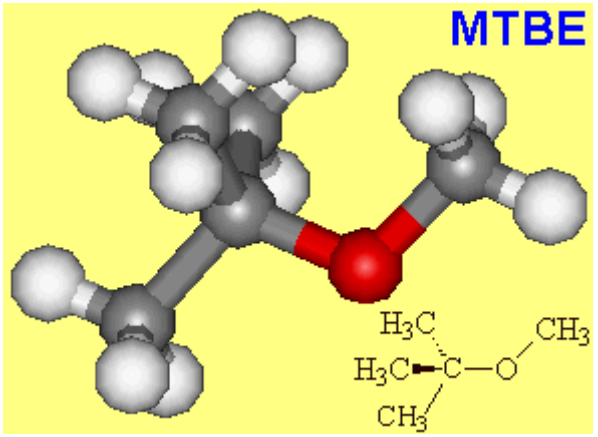


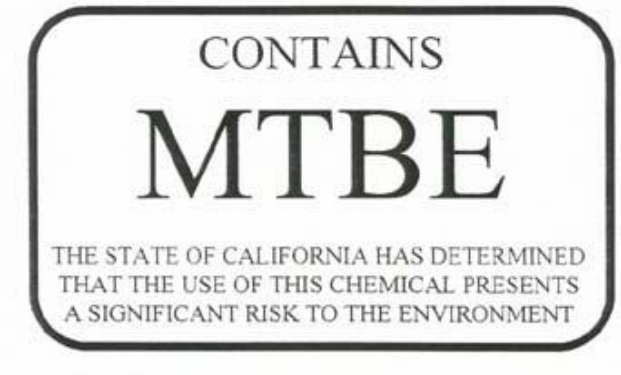
WHAT IS THE SOURCE OF LEAD (PB)?

- Leaded gasoline
- 1975 – 90% reduction due to removal of PB from gasoline
- Ingestion and inhalation
- Into bloodstream
- Bio-accumulates in body
- 6000 lead studies in children
- Neurological and kidney damage

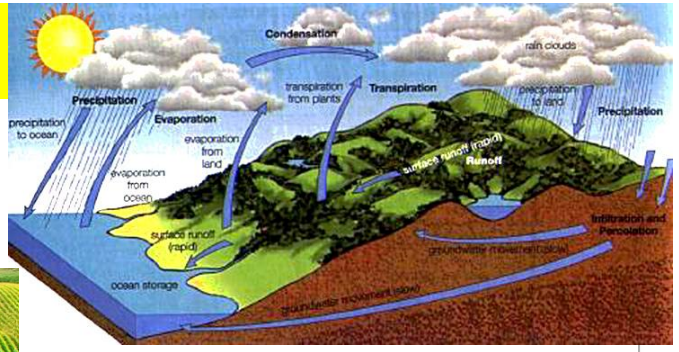
WHAT IS MTBE?

- Oxygenate similar to ethanol
- Octane booster, used 1990 to 2005.
- Not naturally occurring, not biodegradable.
- Very hard to clean up when spills reach groundwater – unlike ethanol.
- Disagreeable taste at low concentrations (0.053 ppm) in drinking water
- Ethanol taste threshold of 49 ppm – a thousand times lower.
- Now banned in the USA.



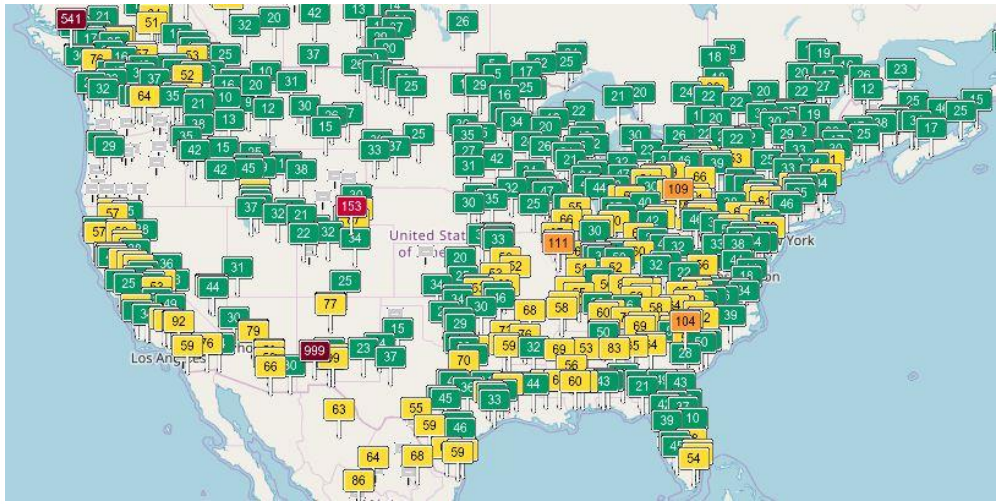


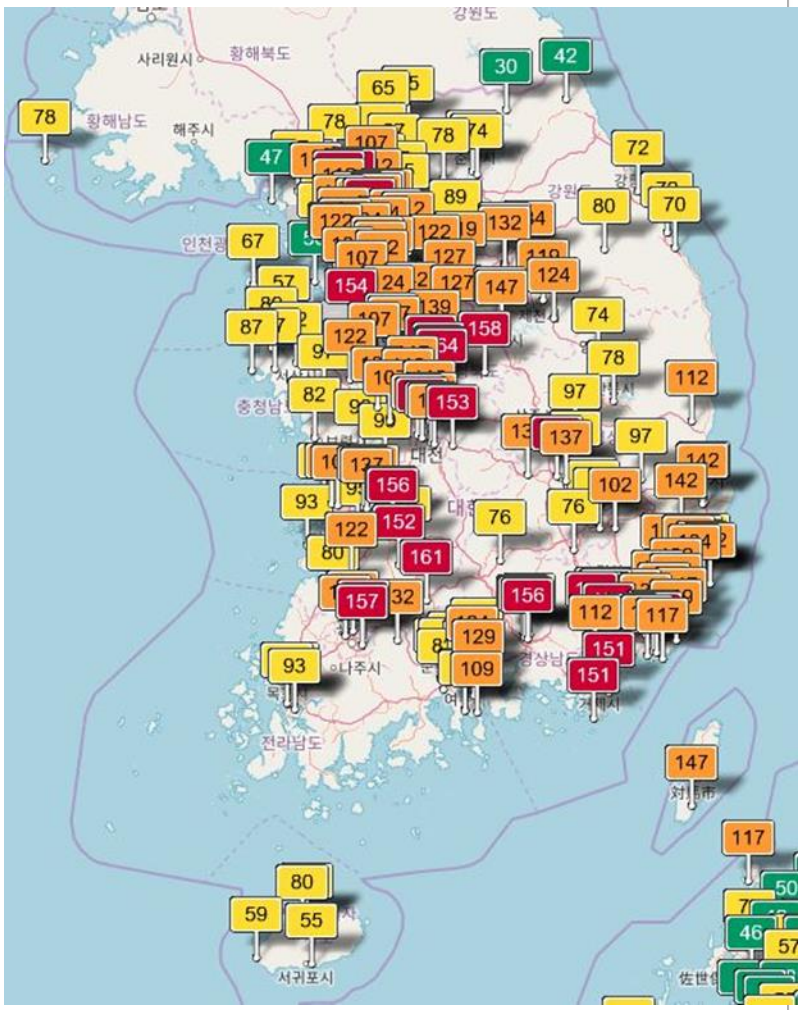
OTHER ENVIRONMENTAL EFFECTS



- Haze & smog
- Cloud formation & precipitation
- Water acidity
- **Damage to crops**
- Effects on ecosystems
- Corrosion and damage to materials/buildings
- Injury to vegetation
- Accelerates aging of rubber materials, dye fading and paint erosion (at low levels long duration)

U.S. AND KOREA AIR QUALITY INDEX





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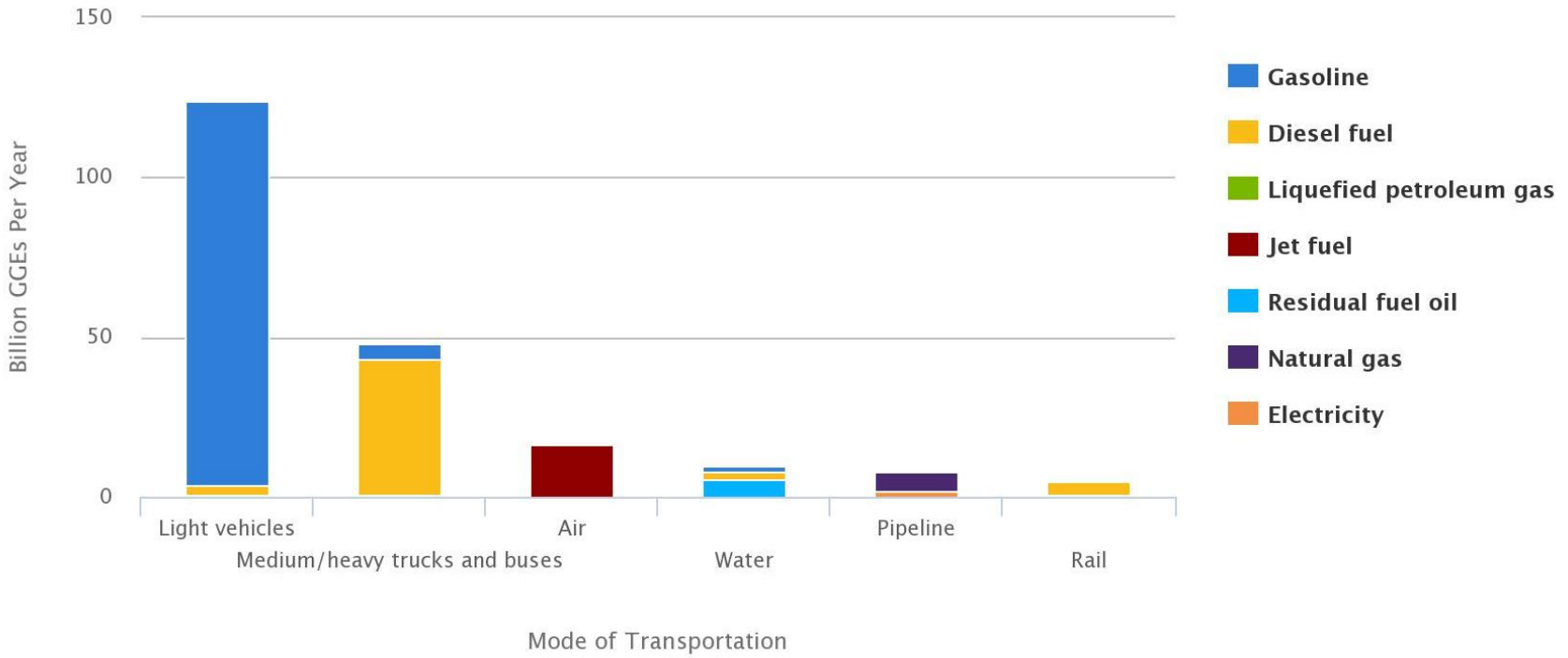
MOBILE SOURCES

TRANSPORTATION ENERGY USE BY MODE AND FUEL TYPE IN THE U.S.



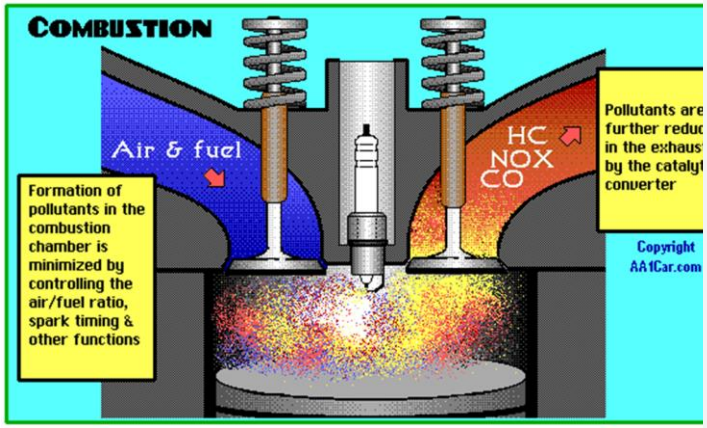
- A new vehicle today is up to 95% percent cleaner than a new vehicle in 1970.
- By 2020, mobile sources are projected to account for up to 50% of the NOx emissions, and substantial hydrocarbon and PM emissions.

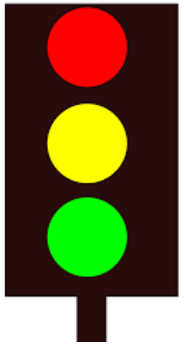
MOBILE SOURCE EMISSIONS

Engine operation

Fuel components

- Exhaust emissions
- In car emissions
- Trip emissions
- Refueling emissions
- Evaporative emissions (hot days>cold days)





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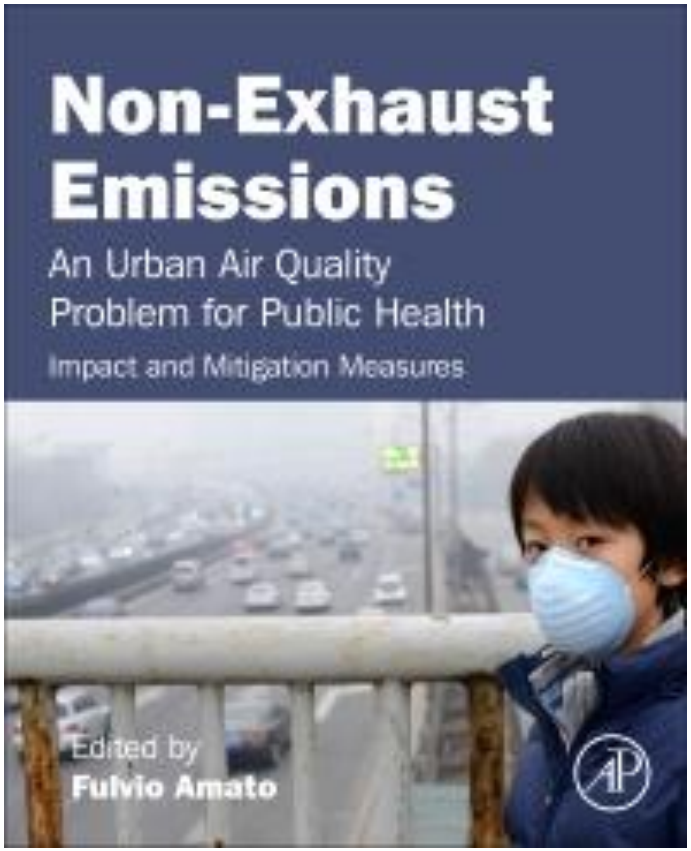
MOBILE SOURCE EMISSIONS

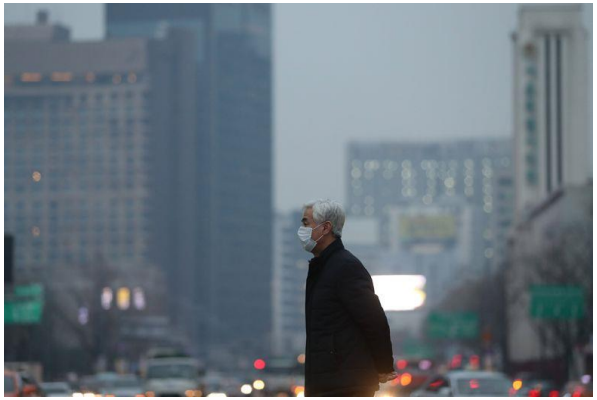
Non-Exhaust Emissions

- Direct brake wear
- Direct tire wear
- Road wear
- Road dust suspension



POSSIBLE SOLUTIONS?

- Wear dust masks
- Coal/industry/diesel
- Being downwind
- Stay indoors
- Limit number of vehicle purchase
- Limit patterns of driving (days/times/area/lights/parking/ construction)
- Promote mass transportation



PROVEN SOLUTIONS IN THE U.S.

Engine operation

Fuel components

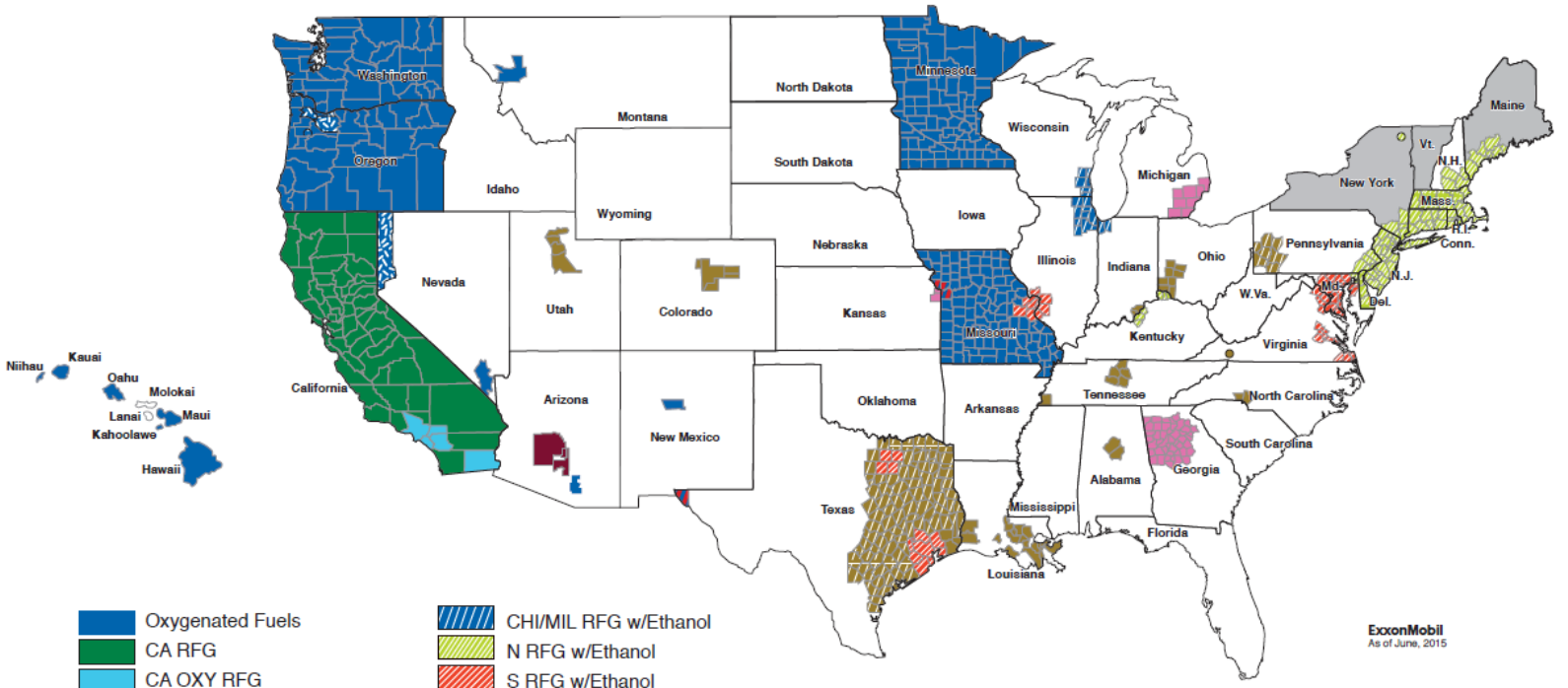
- Upgrade engine performance through mobile source standards
- Require the use of alternative fuel or alternative technologies

USEPA MOBILE SOURCE CLEAN AIR RULES

- Clean Cars and Passenger Trucks –Tier 3
- Clean Heavy-Duty Trucks and Buses
- Mobile Source Air Toxics Rule
- Clean Non-road Diesel Engines and Equipment
- Locomotive and Marine Diesel Standards
- Ocean-going Vessels
- Small Gasoline and Recreational Marine Standards
- Ultra-low Sulfur Fuel Requirements
- Renewable Fuel Standards

A new vehicle today is up to 95% percent cleaner than a new vehicle in 1970. Still, by 2020, mobile sources are projected to account for up to 50% of the NOx emissions, and substantial hydrocarbon and PM emissions.

U.S. Gasoline Requirements

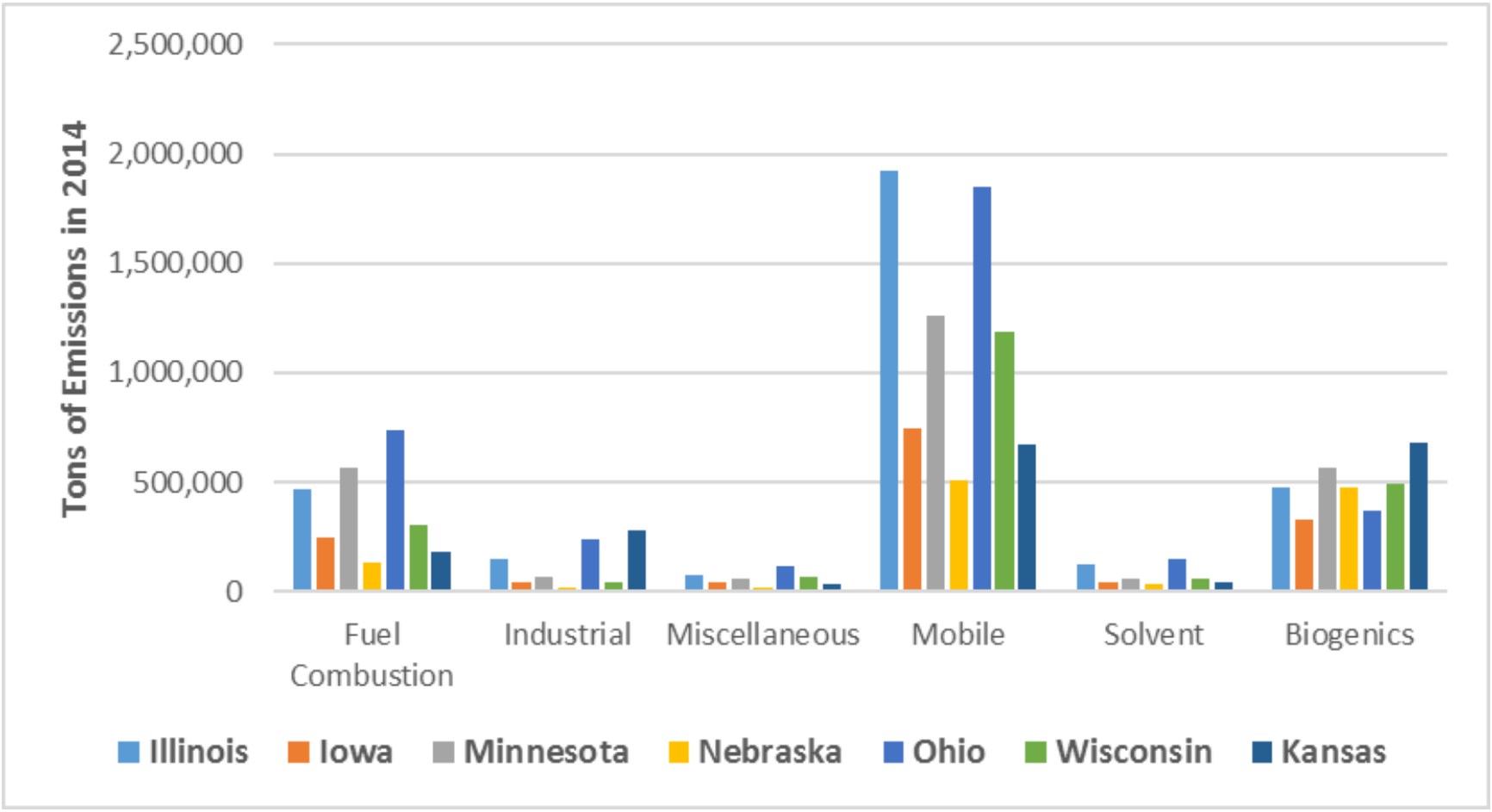


ExxonMobil
As of June, 2015

This map is not intended to provide legal advice or to be used as guidance for state and/or federal fuel requirements, including but not limited to oxy fuel or RFG compliance requirements. ExxonMobil makes no representations or warranties, express or otherwise, as to the accuracy or completeness of this map.

K.W. Gardner
IN# 52715

AIR QUALITY IN MIDWEST REGION



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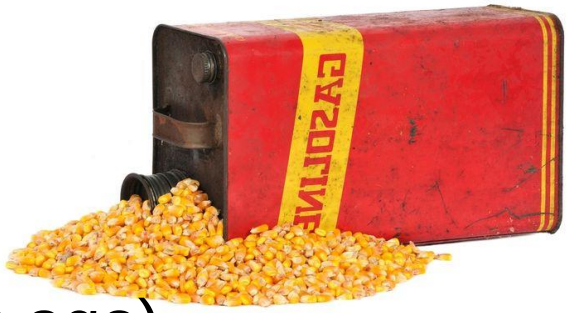
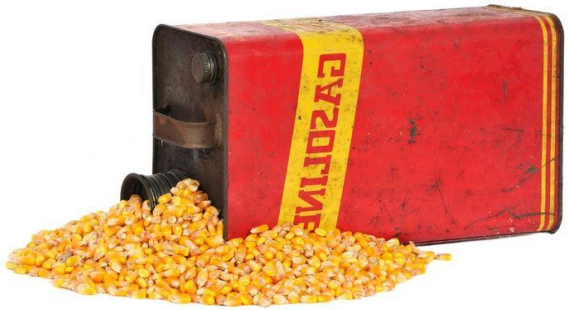
REFORMULATED GASOLINE



- Why needed?
  - ✓ Cars are 98% cleaner (>30 years ago)
  - ✓ Twice as many cars today
  - ✓ Cars are kept longer (costs/maintainance)

- Required since 1995
- Areas with high levels of smog
- Gasoline w/ additional refinery processing
- Blended at the refinery to burn more cleanly
- Has reduced evaporative properties
- Requires an oxygenate to improve combustion

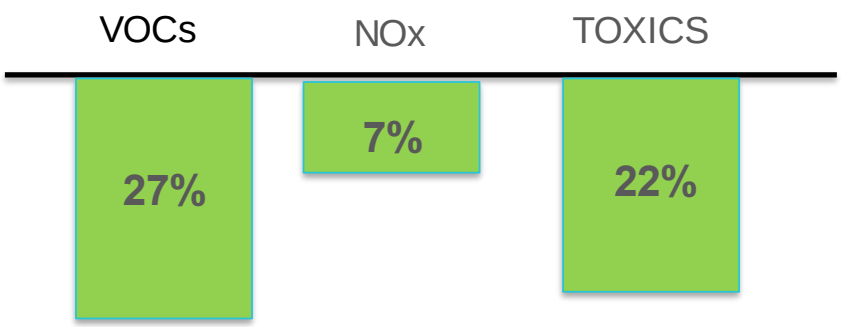
REFORMULATED GASOLINE



- Midwest started using 10% ethanol in Chicago
- California used MTBE
- Water quality problems, MTBE banned by states
- Currently 10% ethanol in 95% of all gas
- Less petroleum gasoline burned
  & and lower exhaust temperatures
- Higher octane rating (improves engine knock)
- Less benzene (and other toxins) by 43%

REFORMULATED GASOLINE (RFG) IN 1995

Vehicle emissions reduced (1995 – 2000)



Reduced cancer risk associated with gasoline vapors by 19%

Smog forming pollution reductions automobile reductions)

105,000 tons of reduced emissions/year

Equal = 16 MILLION CARS not driven

253 million cars in U.S.

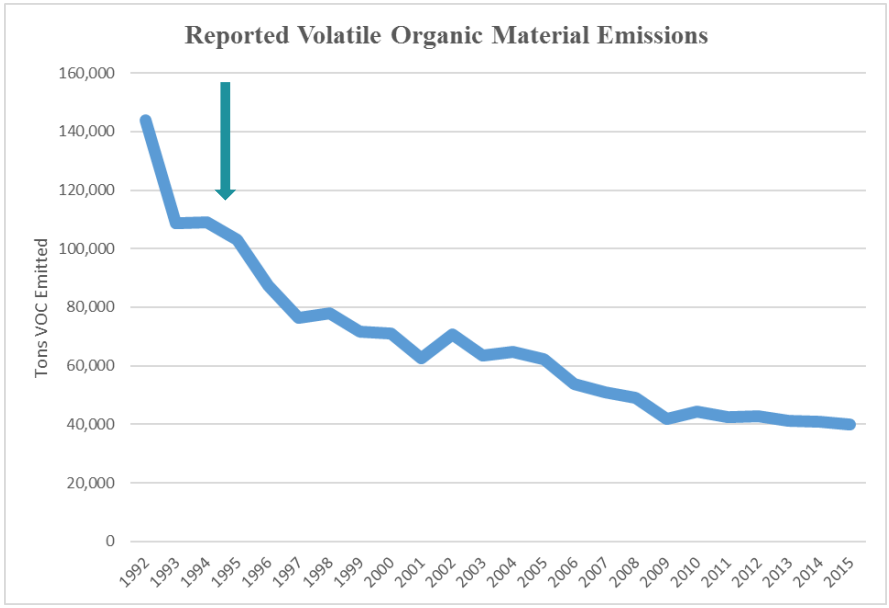
MOBILE SOURCE AIR TOXICS 2011

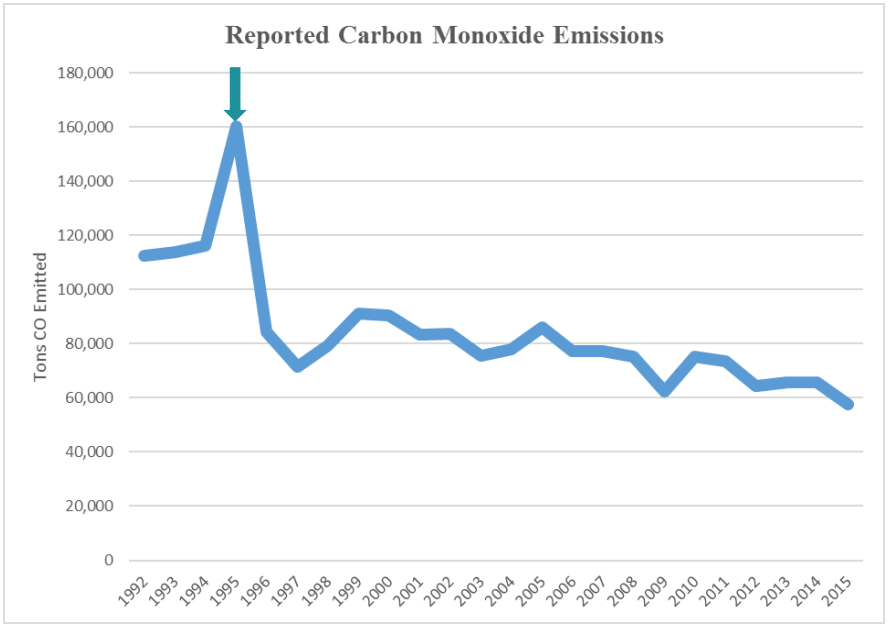
- Required since 2011
- Reduction in air toxics (Benzene, 1,3-butadiene, formaldehyde, acrolein, naphthalene)
- Required at the refinery

AIRQUALITY DATA

- Air pollution monitors
- Point source monitoring
- Modeling studies (other agencies)

CONTINUOUS AIR QUALITY MONITORING IN ILLINOIS





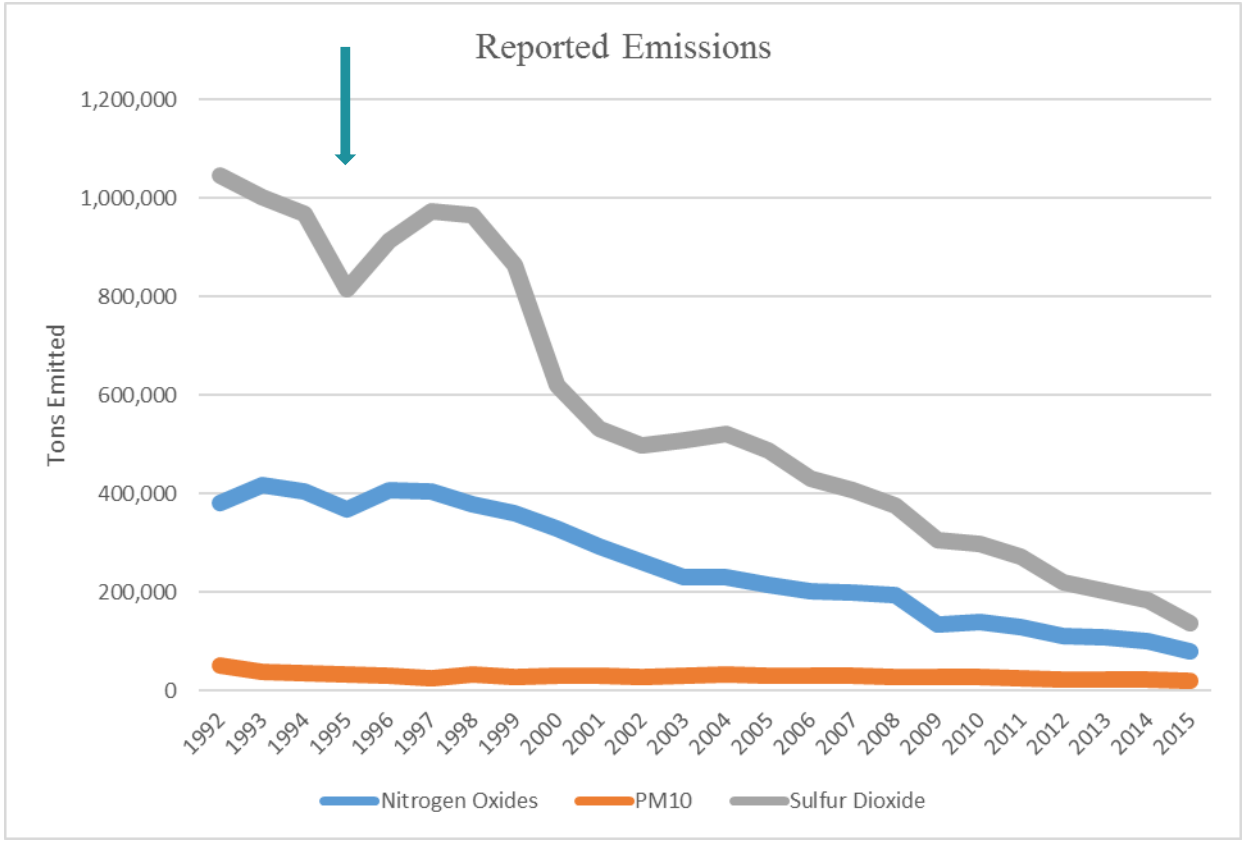
Reformulated Gas in 1995

72% Decrease in VOCs

64% Decrease in CO

- Continuous monitoring at 64 monitoring sites with more than 140 instruments
- Point source monitoring at 6400 sites

Reformulated Gas in 1995



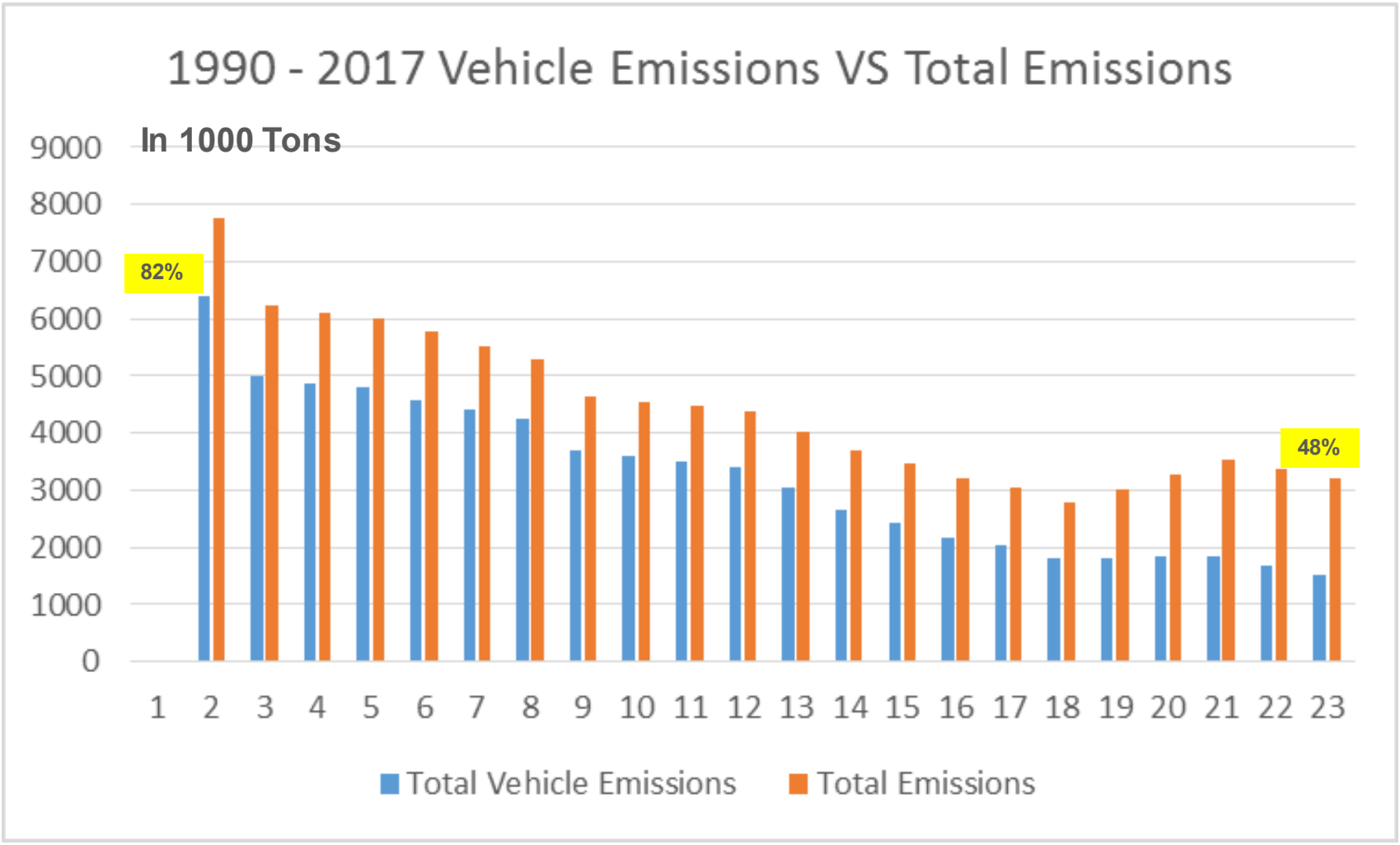
87% Decrease in SO2

81% Decrease in NOx

60% Decrease in PM10

With the removal of lead from gasoline, there is almost no lead in either the air or water

ILLINOIS TREND ANALYSIS



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Health Benefits

REFORMULATED GAS SUBSTANTIALLY REDUCES HARMFUL GASOLINE EMISSIONS

2016 USDA Report Lifecycle Greenhouse Balance of Ethanol The Health Benefits of Ethanol: C. Boyden Gray	
Air Toxics	-28%
Volatile Organic Compounds	-17%
Nitrogen Oxides	-3%
Carbon Monoxide	-13%
Sulfur Oxides	-11%
Carbon Dioxide (Green House)	-4% (-30%) (43% - 76%)
Particulate Matter	-9% (-50% for fine PM)
Reduced Cancer Risk	**-20 – 30%**

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THE PRESENT & THE FUTURE

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..\VIDEOS\CLEARING THE AIR ON THE ETHANOL VS. GASOLINE DEBATE - YOUTUBE [720P].MP4

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CLEAN AIR CHOICE®

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