The intertwined impacts of pollution and inequality on health

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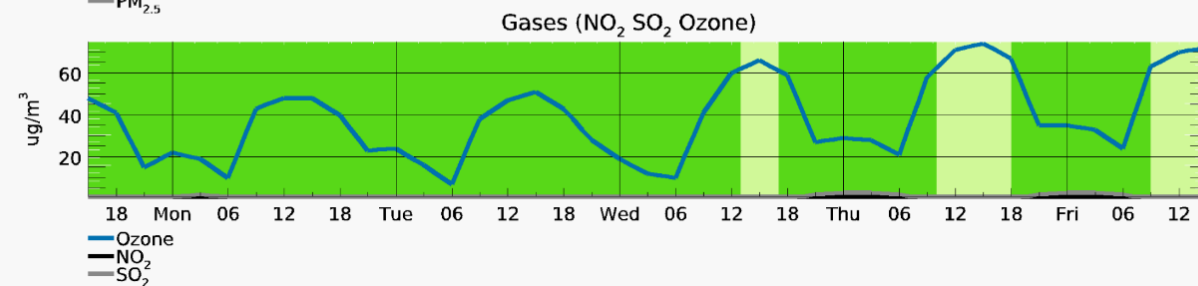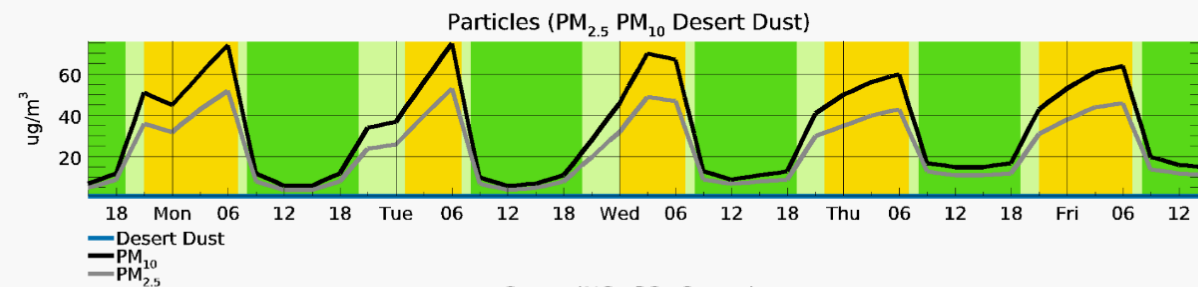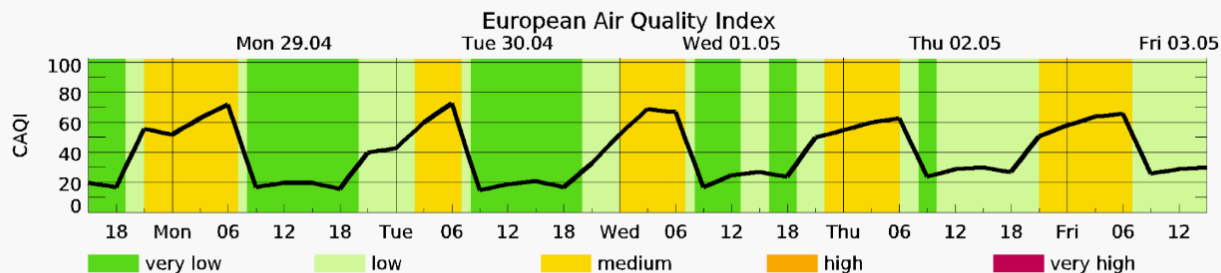Maasai Mara University
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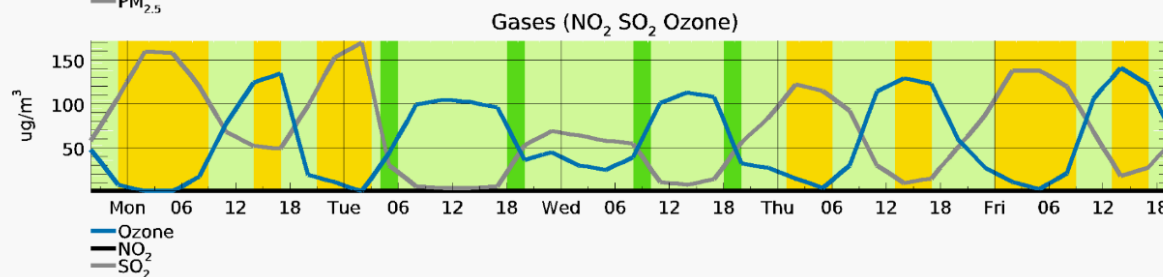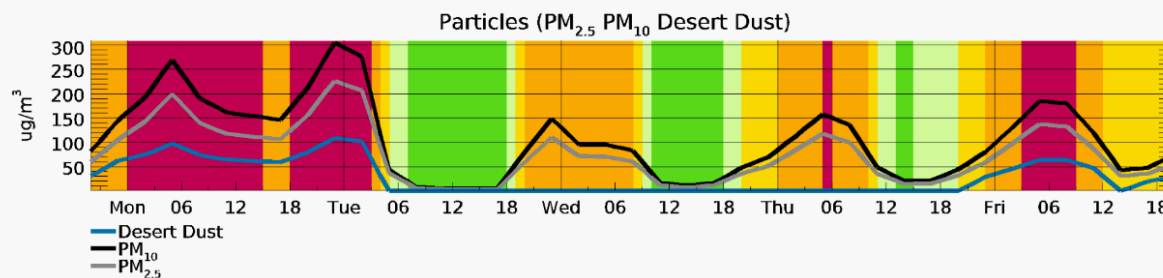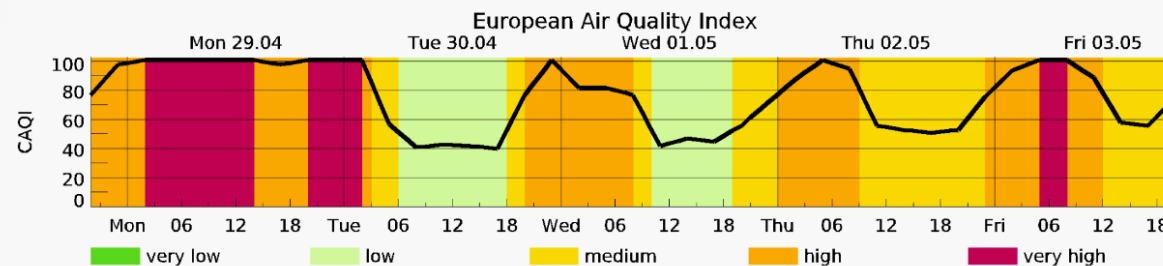
UNHEALTHY ENVIRONMENTS

Deaths per capita attributable to the environment, by region and disease group, 2012

Legend: Infectious, parasitic, neonatal and nutritional diseases — Non-communicable diseases — Injuries

Y-axis: Deaths per 1,000,000 capita attributable to the environment

Values by region:
- Africa, sub-Saharan: 241
- Americas — High level income OECD countries: 87
- Americas — non OECD countries: 90
- South-East Asia: 208
- Europe — High level income OECD countries: 112
- Europe — non OECD countries: 206
- Eastern Mediterranean: 142
- Western Pacific — High level income OECD countries: 92
- Western Pacific — non OECD countries: 202
- World: 179

Disease	Disease Adjusted LY's per year	Risk factor
Diarrhoeal diseases	57 million	Inadequate water, sanitation
Asthma	11 million	Air pollution, second-hand tobacco smoke, indoor mould and damp, asthmagens
Lower respiratory infections	51 million	Household and ambient air pollution
Chronic obstructive pulmonary disease	32 million	Use of polluting fuels for cooking and exposure to dust
Cardiovascular diseases	119 million	Air pollution, lead and tobacco smoke exposure
Cancer	49 million	Exposure to air pollution, radiation, chemicals
Neonatal conditions	26 million	Exposure of mothers to air pollution, tobacco smoke, pesticides and chemicals, unsafe water and inadequate sanitation

INCOMPLETE COMBUSTION

TOXIC ENVIRONMENTS

NATURAL EVENTS

NATURAL EVENTS

Air Pollution & Sources

INCOMPLETE COMBUSTION

Stationary sources power plants, manufacturing facilities and mining with limited emission controls.

Households especially in low-income countries that rely on biomass fuels for heating and cooking and where people are greatly exposed.

Controlled and uncontrolled biomass burning sources related to agricultural waste burning, land and forest clearance and wildfires, plus residential and some waste combustion.

Mobile sources of air pollution include petroleum-powered cars, trucks, and buses especially in cities, and from ships and aircraft in ports and airports . Old and poorly maintained vehicles that burn low-grade fuels are especially hazardous.

DUSTSTORMS
Enable aerosolised, particulate matter to be transported thousands of kilometres into heavily populated areas, where people can die from asphyxiation or be exposed to fine mineral particulates, and harmful combinations of pollutants, spores, bacteria, fungi, and potential allergens carried along with the mineral dusts

Air pollution & human health

Air pollution causes **disease, disability and death across the lifespan**. In lower-middle-income and low-income countries, air pollution is the **single largest cause** of Non-Communicable Disease mortality.

Air pollution causes **low birth weight, slows growth of the developing lungs, prematurity , pneumonia, bronchitis** and **asthma** and **affects brain development** in infants and children.

It contributes to **heart disease, stroke, cancer, asthma, chronic obstructive pulmonary disease, diabetes, allergies, eczema,** and **skin ageing** and contributes to **dementia** in adults.

Caused by fine particles:
Shorter life
Learning disabilities
Alzheimer's
Depression
Stroke
Autism
Heart disease
Asthma*
Lung cancer
Reduced lung function
Obesity
Birth defects
Low birth weight
Diabetes
*Also caused by ozone.

■ Accepted effects
■ Possible effects
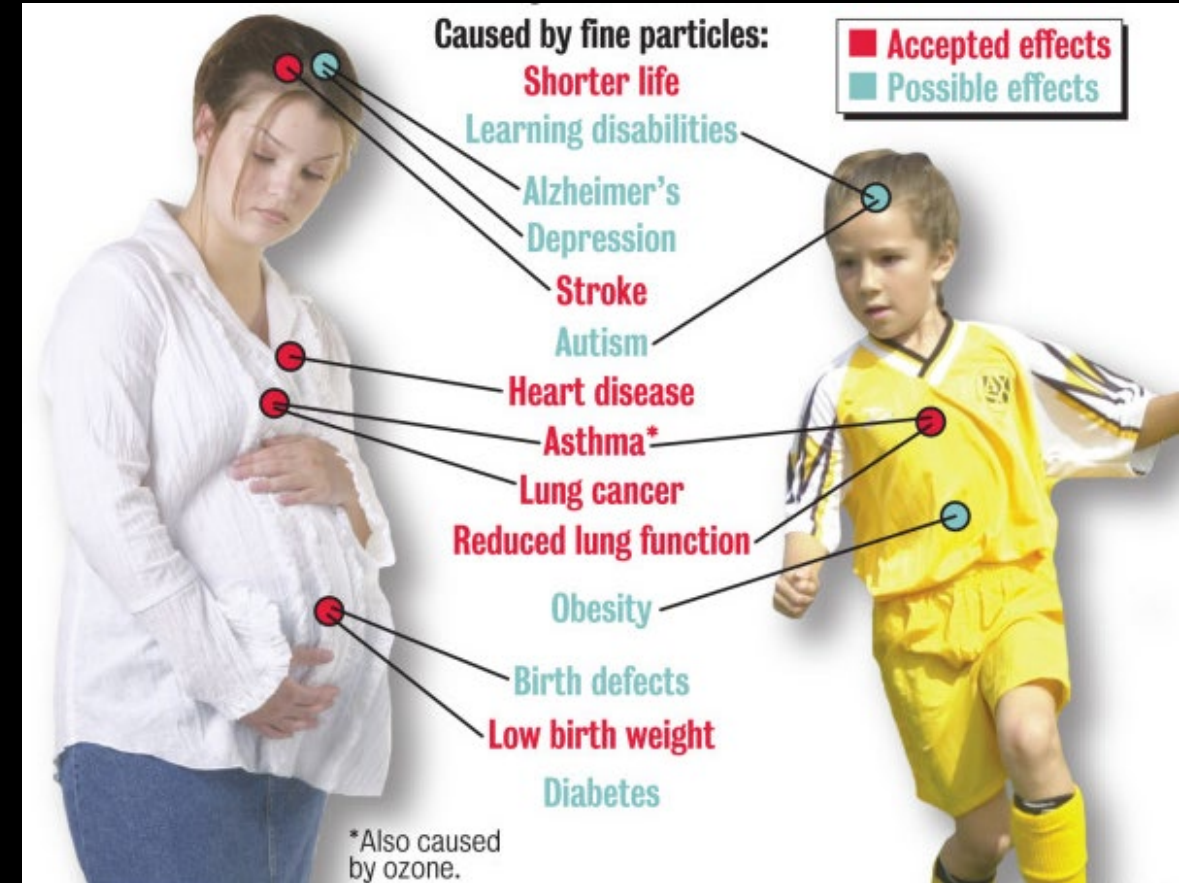
CONTAMINATED SOURCES

CONTAMINATED SOURCES

CONTAMINATED SOURCES

UNCONTROLLED SOURCES

Water Pollution & Sources

2.4 billion people still use unimproved sanitation facilities

946 million practice open defecation

Unsafe water, inadequate sanitation or insufficient hygiene result in **3.5 million deaths worldwide**, a quarter of premature deaths of children younger than 14.

Contaminated water is linked to transmission of cholera, diarrhoea, dysentery, hepatitis A, typhoid and polio, and persistent stunting due to subclinical bacterial infections.

Almost **1,000 children per day die** from diarrhoeal diseases

In Europe's low and middle-income countries, about **10 people die per day from diarrhoea** due to inadequate clean water, sanitation and hand hygiene.

Only **20 per cent of globally produced wastewater receives proper treatment**

Excessive nutrients in fresh and coastal receiving waters leads to **eutrophication**, negatively affecting ecosystems and livelihoods.

High concentrations of nitrates and nitrites also affect health negatively.

AGRICULTURE, CONSTRUCTION, MINING AND WASTE

TOXIC ACTIVITIES: MINING

Lat: 6° 13' 50.52"N : Lon: 1° 44' 7.33"W   Grid Off

2015/03/14 – expanded artisanal mining

Land and Soil Pollution

The primary pollutants of concern in land and soil are heavy metals such as lead, mercury, arsenic, cadmium and chromium, persistent organic pollutants and other pesticides, and pharmaceuticals, such as antibiotics used for livestock management.

These degrade soil biodiversity and functioning, and can reduce agricultural productivity, thus negatively impacting livelihoods, disease control and food security, and cause a variety of non-communicable diseases, and even death in humans and wildlife.

Many low- and middle-income countries lack basic information about the location, severity and potential risks of "pollution hotspots".

MARINE POLLUTION:
POOR MANAGEMENT OF SOURCES

Marine Pollution & Sources

Nutrient risk indicator categories
Lowest | Low | Medium | High | Highest

PCBs concentration range (nanograms per gram pellet)
<10 | 10–50 | 50–200 | 200-500

Floating plastic debris risk categories
Lowest | Low | Medium | High | Highest
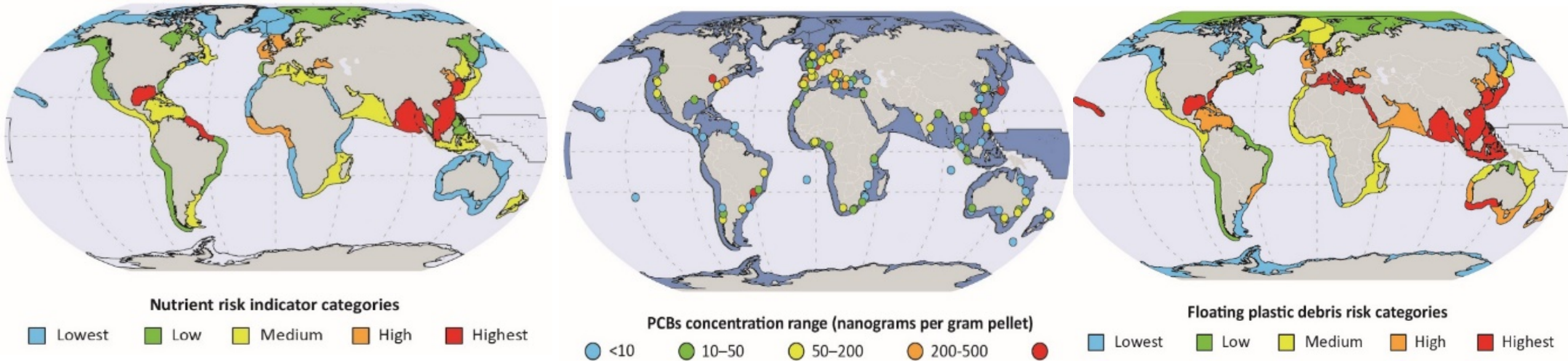
It is estimated that **three quarters of marine litter is now comprised of plastic**

4.8 to 12.7 million tonnes of plastic waste enters the ocean every year from inadequate waste management

1.15 to 2.41 million tonnes of plastic waste entering the ocean every year from rivers, three quarters occurring between May and October.

Top **20 polluting rivers** are mostly located in Asia, and account for 67 per cent of the global total .

CHEMICALS & WASTE

Chemical Pollution & Sources

In 2010, 107,000 people die annually from **exposure to asbestos** and 674,000 died from **exposure to lead**

36 per cent – 568,000 **deaths from lung cancer** are estimated to be linked to occupational exposure to chemicals and air pollution

Globally, in 2013, **3.3 million cases of human poisonings** were reported (it is likely that many cases were not reported) – almost the same as those injured from assaults with firearms (3.6 million)

On a yearly basis, it is estimated that excessive exposure to and inappropriate use of pesticides contribute to **poisoning a minimum of 3 million people**, especially impoverished rural workers

The impacts on health from activities such as mining, particularly affect vulnerable communities in Africa, Latin America and Asia

Hazardous chemicals & wastes and impacts on human health
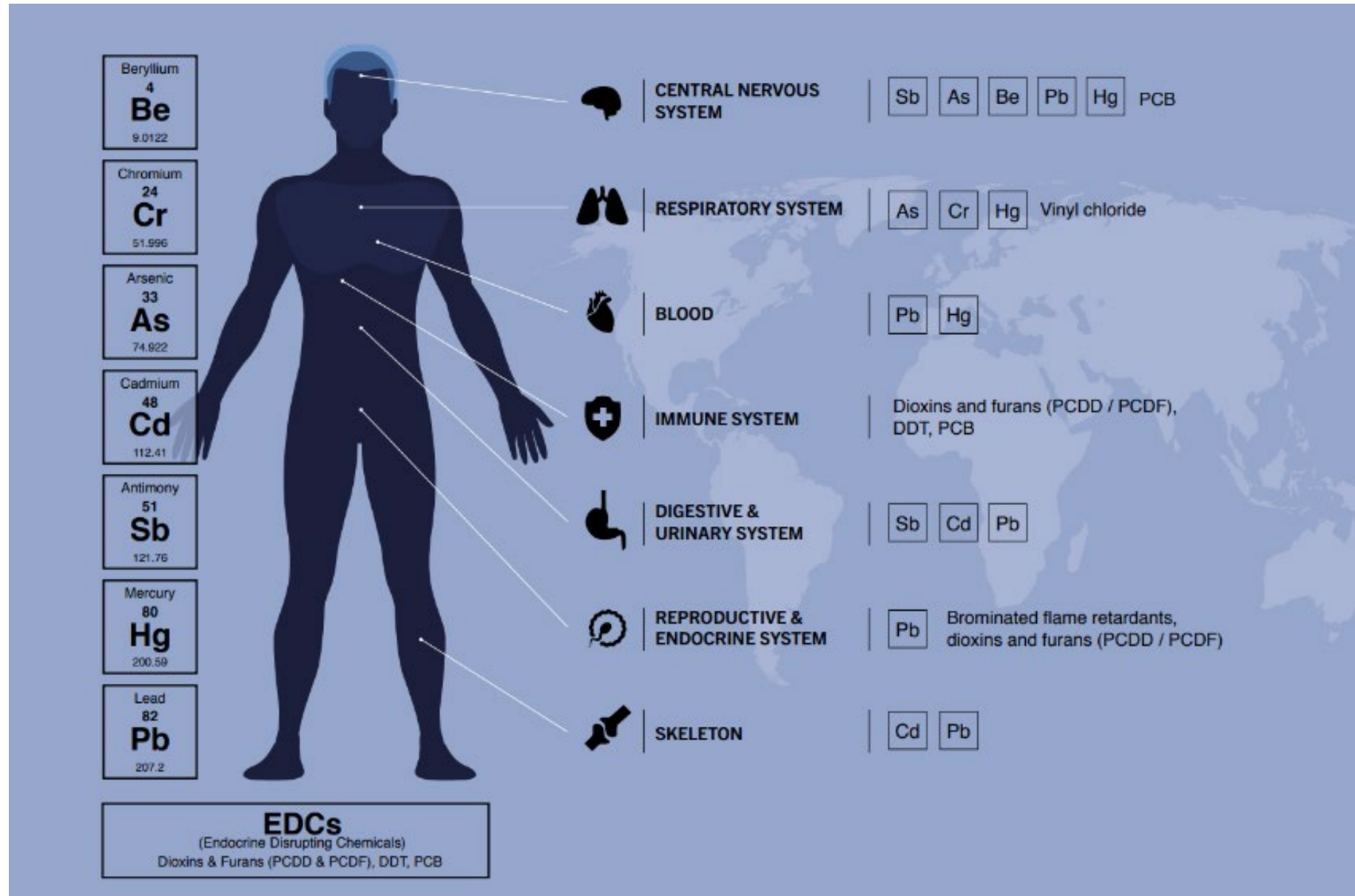
RISK FACTORS FOR ALZHEIMER'S

AGE **GENETICS** **FAMILY HISTORY**

Alzheimer's Disease

NON-GENETIC FACTORS

- Viruses
- Prions
- Toxins
- Cognitive Ability
- Head Trauma
- Blood Pressure
- Aging
- Heart Disease
- Low level of education
- Physical Exercise
- Diet
- Diabetes

ENVIRONMENT + AGING

GENETIC FACTORS

- Down's syndrome (trisomy 21)
- PS1 (Chromosome 14)
- PS2 (Chromosome 1)
- Other genes (?)
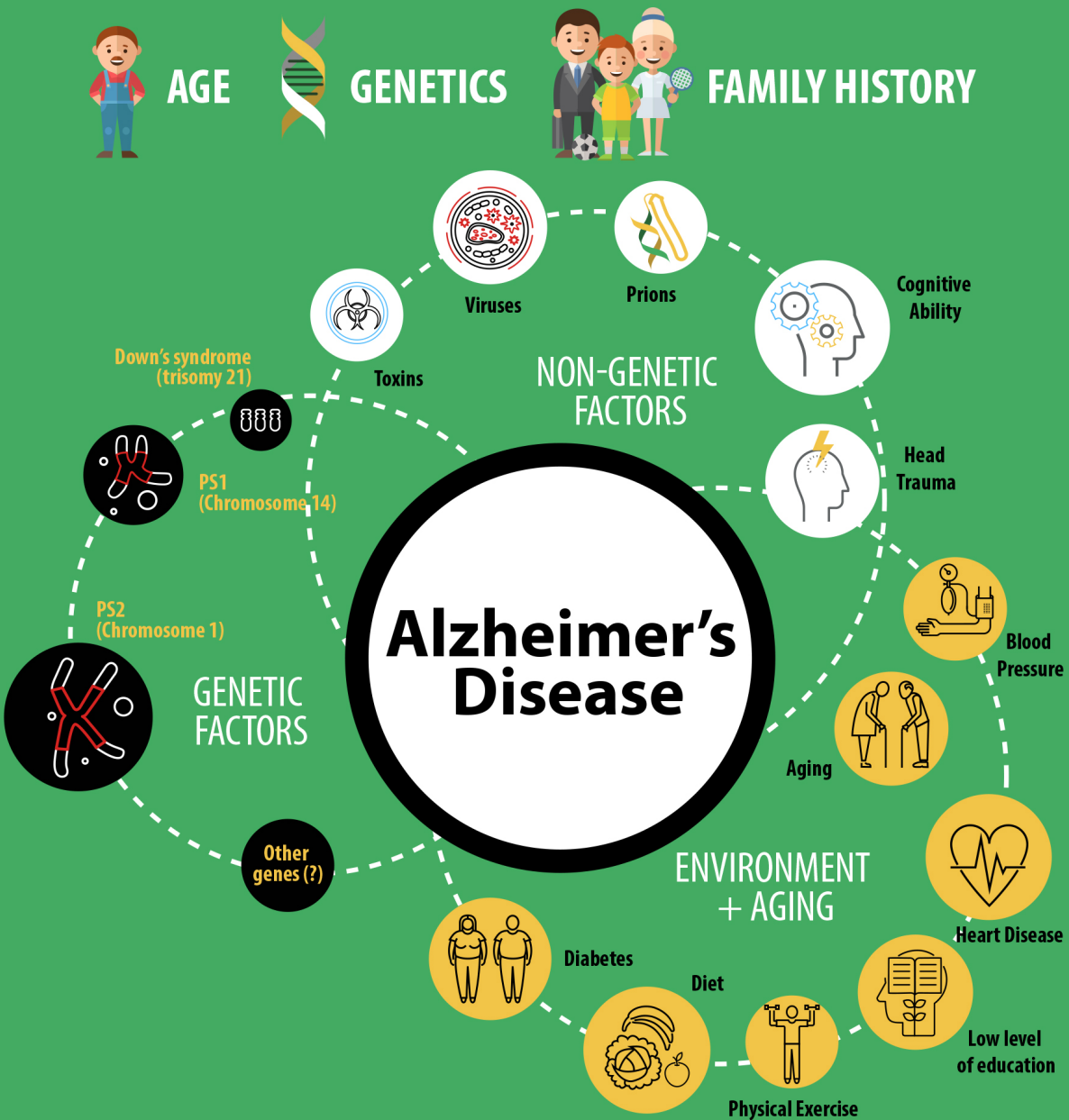
Pollutants and the Brain

ENVIRONMENTAL FACTORS

Aβ Degradation

Pesticides Metals NPs

Al Pb

Aβ Plaques

CSF

Diet (Antioxidants)

Pb Al Cd? Fat diet

sAPPβ

Al As?

ROS

Aβ Aggregation

Clearance

Fat diet

APP

β-sec

Synthesis

Aβ Peptide

LRP1

Pb Al? MeHg NPs

γ-sec

AICD

NEP

Pb Al As Cd NPs Pesticides

Hg Cd Pb? NPs

Exercise

MT-associated Tau

Al

Cd

Hg

Pb

Tau

Tau Paired Helical Filaments

ROS

As, Hg, Pb, NPs, Pesticides

Diet?

Pb Hg

PP2

Kinases

Al

Hyper P-Tau

Legend:

- Beta secretase
- Gamma secretase
- Neprilysin
- Low density lipoprotein receptor-related protein 1
- Amyloid beta peptide
- Tau protein
- Hyperphosphorylated Tau
- Microtubules
- Protein phosphatase 2

AICD: Amyloid intracelular domain
Al: Aluminum
APP: Amyloid precursor protein
As: Arsenic
CSF: Cerebroespinal fluid
Cd: Cadmium
Hg: Mercury
MeHg: Methyl mercury
MT: Microtubules
NPs: Nanoparticles
Pb: Lead
ROS: Reactive oxygen species
sAPPβ: Soluble APP beta

Delays in legislation despite sufficient evidence to act

Legend:
- Science: Early warning to scientific confidence causality
- Policy Action: National
- Policy Action: Regional
- Policy Action: Global
- Impact/Harm reduction

Categories (top to bottom): Mercury, Asbestos, Acid Rain, Tobacco, DDT, Climate Change, PCB, Lead, Ozone Layer
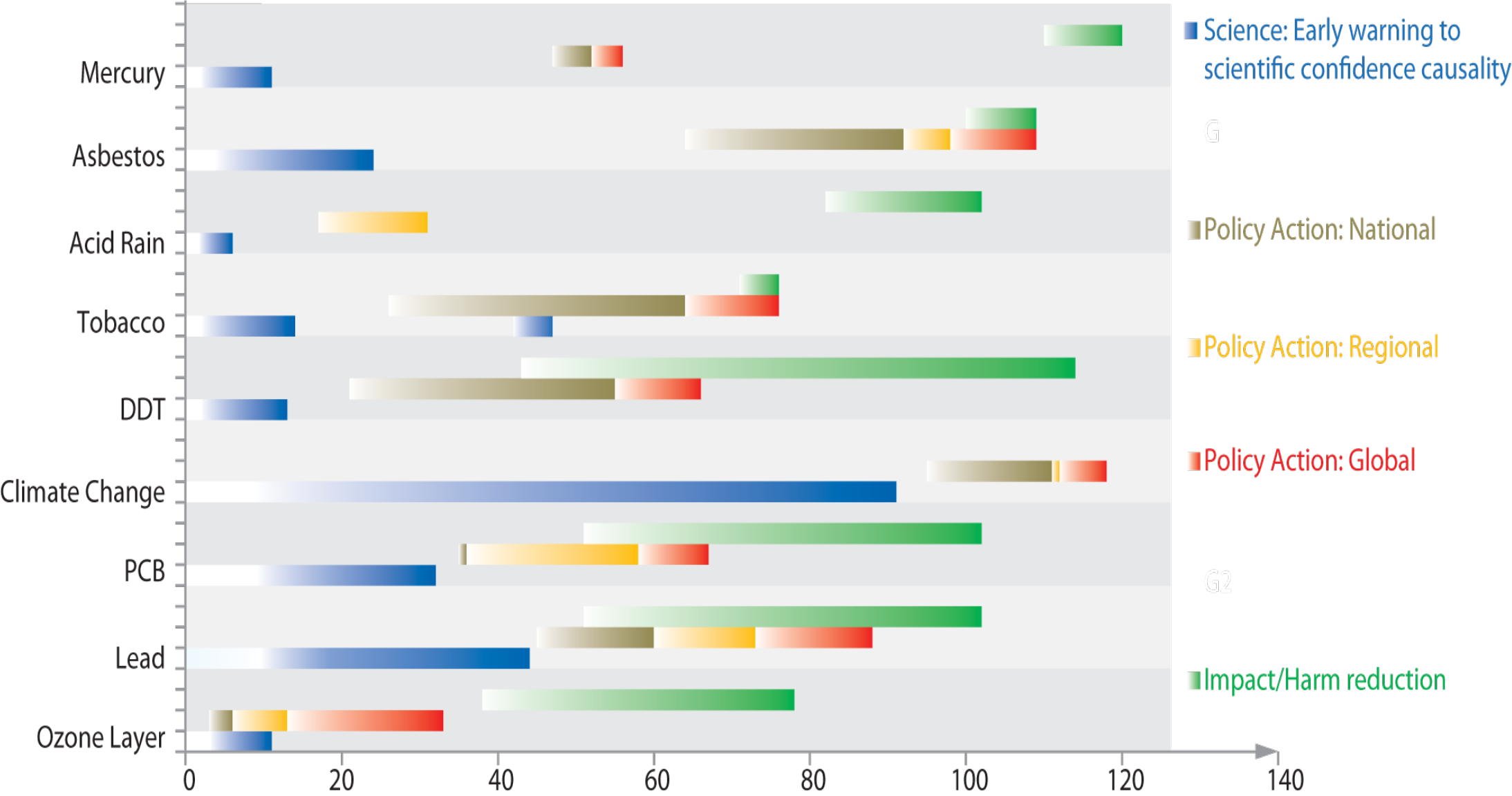
Preventing lead poisoning through legislation and policies: USA & globally
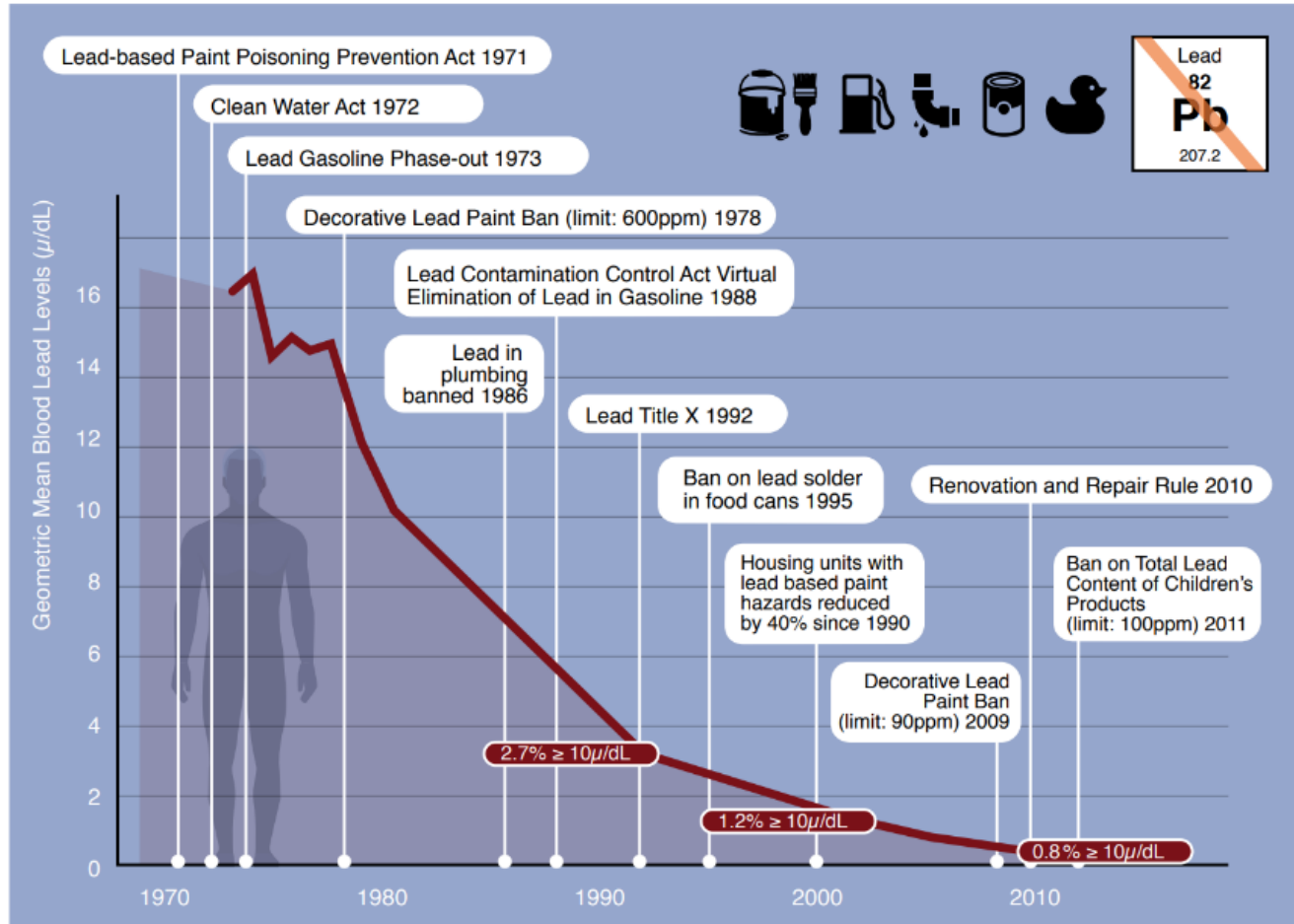
Source: Centers for Disease Control and Prevention (United States)

Lead in automobile fuels has been almost completely phased out. Now *decorative paint is one of the largest sources of exposure to lead*.

Although global regulation started **as early as 1921**, decorative paint containing lead is still sold in many developing countries.

Preventing air pollution through legislative and policy mixtures

Multi-layered legislation, policies & actions for pollution prevention

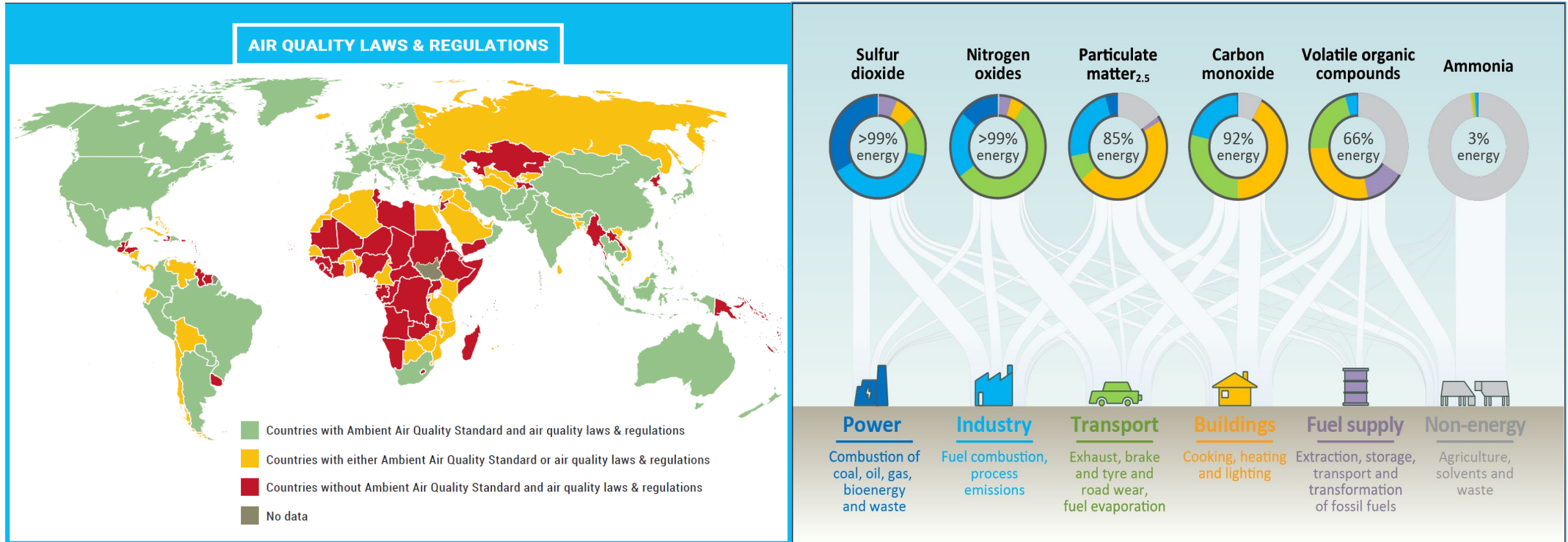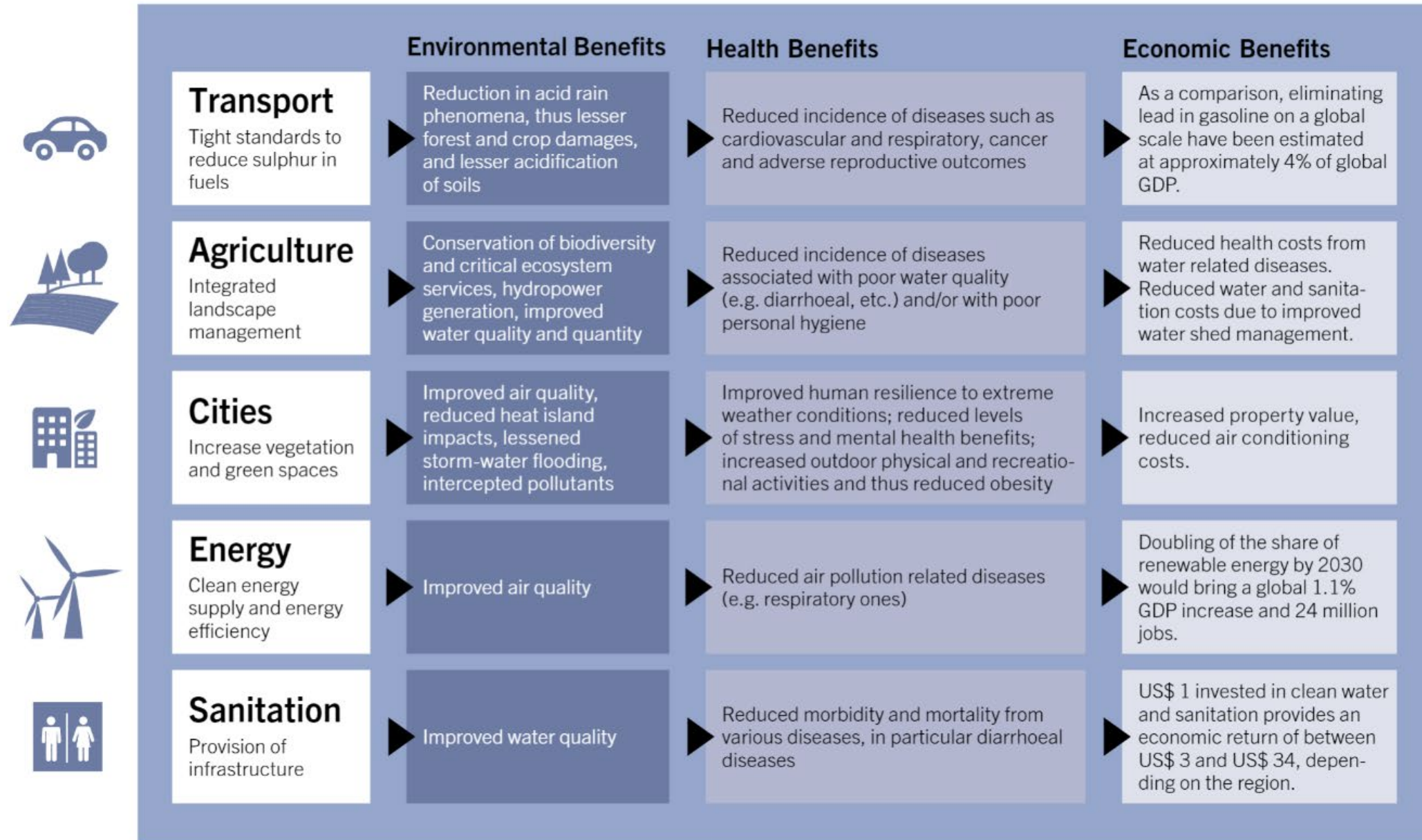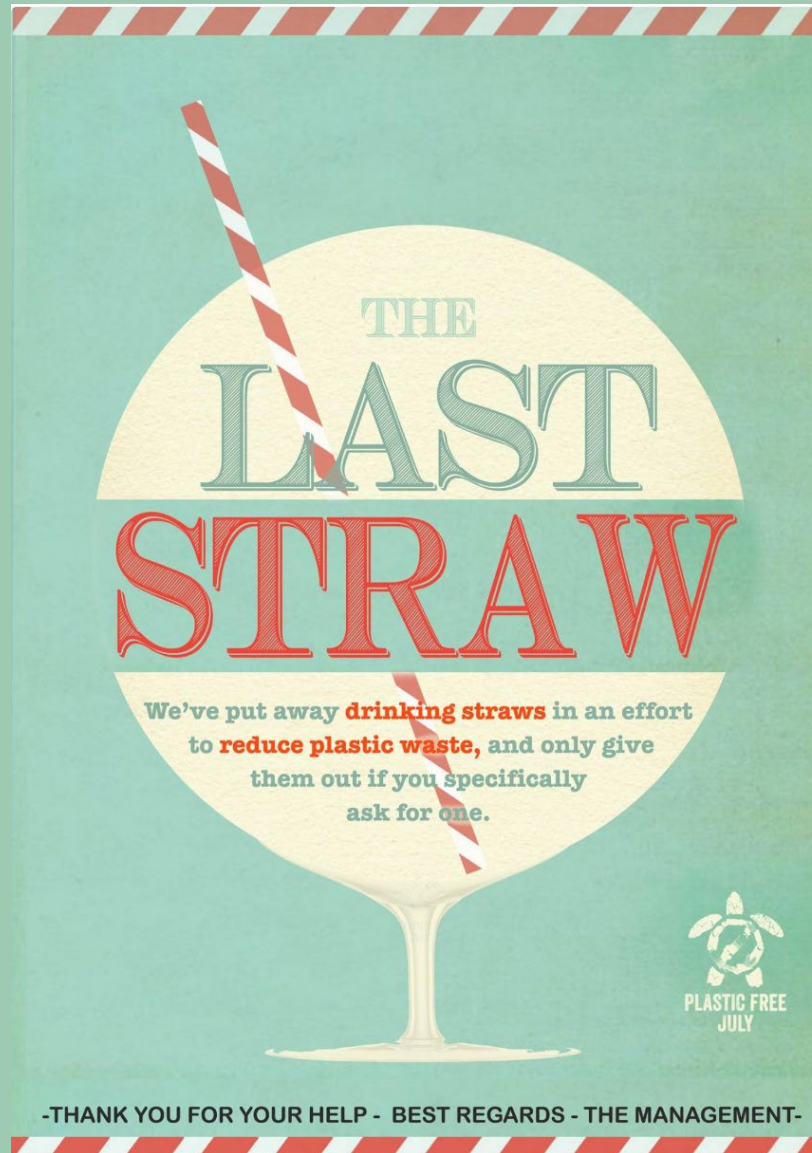|		Environmental Benefits	Health Benefits	Economic Benefits
Transport	Tight standards to reduce sulphur in fuels	Reduction in acid rain phenomena, thus lesser forest and crop damages, and lesser acidification of soils	Reduced incidence of diseases such as cardiovascular and respiratory, cancer and adverse reproductive outcomes	As a comparison, eliminating lead in gasoline on a global scale have been estimated at approximately 4% of global GDP.
Agriculture	Integrated landscape management	Conservation of biodiversity and critical ecosystem services, hydropower generation, improved water quality and quantity	Reduced incidence of diseases associated with poor water quality (e.g. diarrhoeal, etc.) and/or with poor personal hygiene	Reduced health costs from water related diseases. Reduced water and sanitation costs due to improved water shed management.
Cities	Increase vegetation and green spaces	Improved air quality, reduced heat island impacts, lessened storm-water flooding, intercepted pollutants	Improved human resilience to extreme weather conditions; reduced levels of stress and mental health benefits; increased outdoor physical and recreational activities and thus reduced obesity	Increased property value, reduced air conditioning costs.
Energy	Clean energy supply and energy efficiency	Improved air quality	Reduced air pollution related diseases (e.g. respiratory ones)	Doubling of the share of renewable energy by 2030 would bring a global 1.1% GDP increase and 24 million jobs.
Sanitation	Provision of infrastructure	Improved water quality	Reduced morbidity and mortality from various diseases, in particular diarrhoeal diseases	US$ 1 invested in clean water and sanitation provides an economic return of between US$ 3 and US$ 34, depending on the region.

The Last Straw

THE
LAST
STRAW

We've put away **drinking straws** in an effort to **reduce plastic waste,** and only give them out if you specifically ask for one.

PLASTIC FREE JULY

-THANK YOU FOR YOUR HELP - BEST REGARDS - THE MANAGEMENT-

On the Jersey Path to Zero Waste

WHAT ACTION WILL YOU TAKE?

|			
Never throw rubbish, chemicals or solvents into storm drains or sewers	Stop using disposable shopping bags and other single-use plastic	Never burn waste and minimize the burning of wood	Let my electronics live longer, then dispose of them properly or resell them
Compost and recycle	Use public transport, carpool, cycle or walk	Eat less meat and more organic and unpackaged foods	Refuse to buy cosmetics with microbeads
Choose natural cleaning products and lead-free paint	Use pesticides and fertilizers efficiently and choose natural alternatives when I can	Use clean technologies to light and power my home	Collect and use rainwater
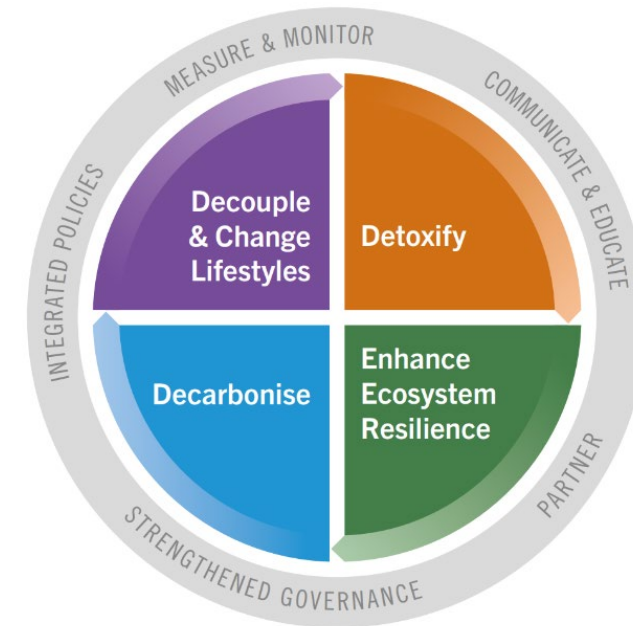
"Every hour, 800 people are dying, many after years of suffering, from cancer, respiratory illnesses or heart disease directly caused by breathing polluted air."David Boyd, UN Human Rights Special Rapporteur, Geneva March 2019

"Surely if there is a human right to clean water, there must be a human right to clean air. Both are essential to life, health, dignity and well-being,"