



THE LANCET

COMMISSION ON POLLUTION AND HEALTH



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POLLUTION

A GLOBAL PUBLIC HEALTH CRISIS



0:00 / 1:28



COMMISSION AUTHORS

SECTION 1

Burden of Disease

Dr. Philip
Landrigan

SECTION II

Economic Impact

Maureen
Cropper

SECTION III

Pollution and Poverty

Karti Sandilya

SECTION IV

Effective Intervention

Richard Fuller





SECTION I

Global Burden of Disease from Pollution

Dr. Philip Landrigan

The background of the slide is a sepia-toned photograph of an industrial facility. Several tall, lattice-structured smokestacks are visible, with thick plumes of white smoke or steam rising from them into a hazy, orange-brown sky. The overall atmosphere is one of environmental degradation and industrial activity.

POLLUTION DEFINED

Any material introduced into the environment by human activity that endangers human health or harms living resources and ecosystems.

DATA SOURCES

Institute for Health Metrics and Evaluation

2015 Global Burden of Disease analysis

World Health Organization

2012 Burden of Disease analysis

Pure Earth/GAHP Toxic Sites Inventory

Soil pollution at contaminated sites

MAJOR TYPES OF POLLUTION

**Household
Pollution**



**Soil
Pollution**



**Ambient Air
Pollution**



Occupational



**Water
Pollution**



Lead





**HOUSEHOLD AIR
POLLUTION
KILLS ALMOST 3 MILLION PER YEAR**

AMBIENT AIR POLLUTION KILLS ABOUT 4 MILLION PER YEAR





**POLLUTED WATER &
POOR SANITATION
KILL ABOUT 1.7 MILLION PER YEAR**

A photograph showing a scene of environmental pollution. In the foreground, two young children are looking towards the camera. The child in front is wearing a patterned shirt and a pink headband, leaning on a large, rusted metal wheel. Behind them, another child is visible. In the background, a large fire is burning, with thick black smoke rising into the air. A person wearing a red beanie and a dark vest is standing near the fire, holding a long pole. The ground is covered in trash and debris, including plastic containers and other waste. The overall atmosphere is one of environmental degradation and its impact on vulnerable populations.

**POLLUTED SOIL,
CHEMICALS, HEAVY METALS
KILL OVER 1.1 MILLION PER YEAR**

LEAD POISONING

KILLS MORE THAN 500,000 PER YEAR



COMMISSION'S MAIN HEALTH FINDINGS

Pollution killed an estimated 9 MILLION people in 2015...

3 TIMES MORE than AIDS, tuberculosis and malaria combined.



9 MILLION
premature deaths

=

16% of all deaths
worldwide

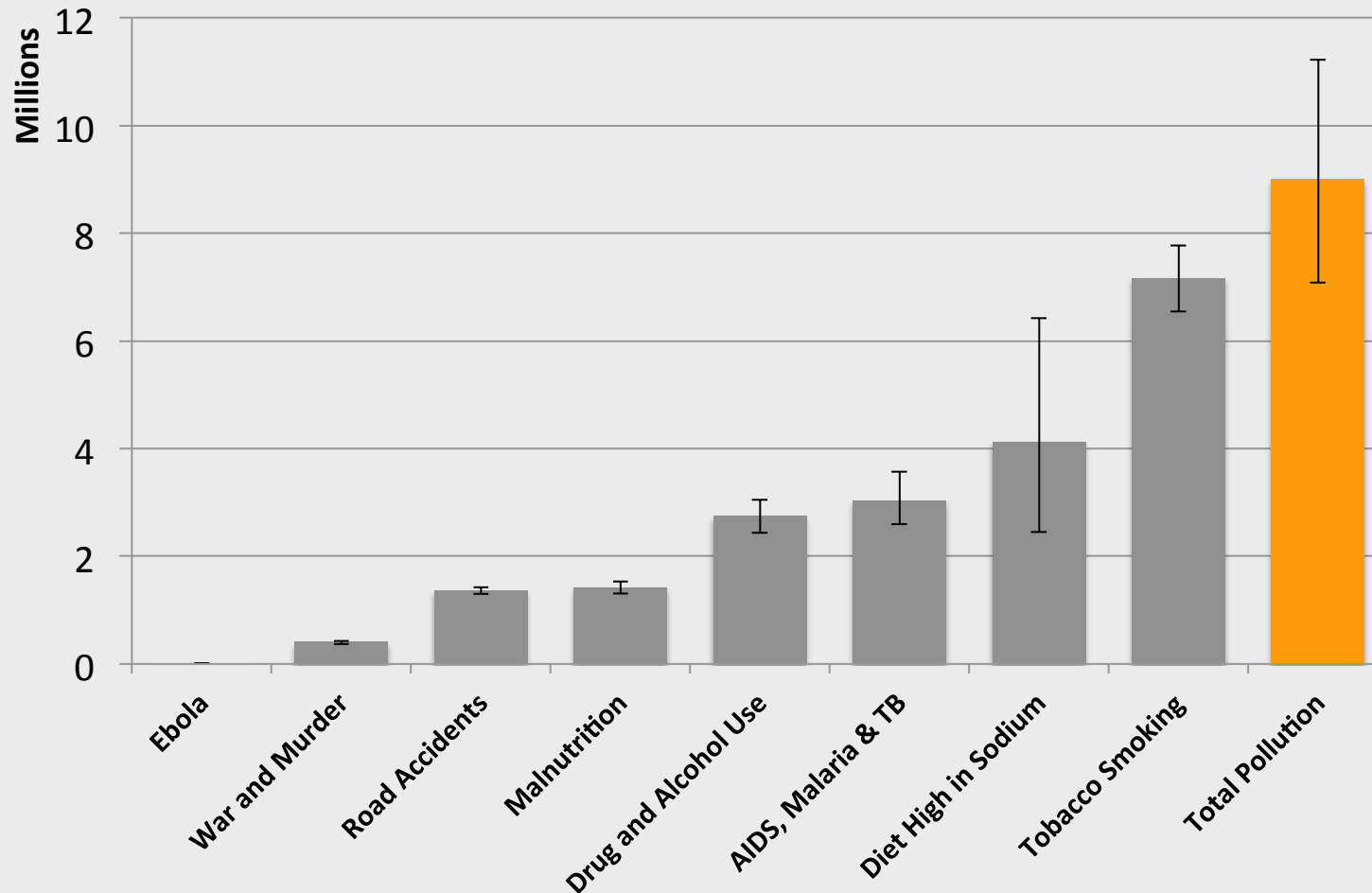
COMMISSION'S MAIN HEALTH FINDINGS



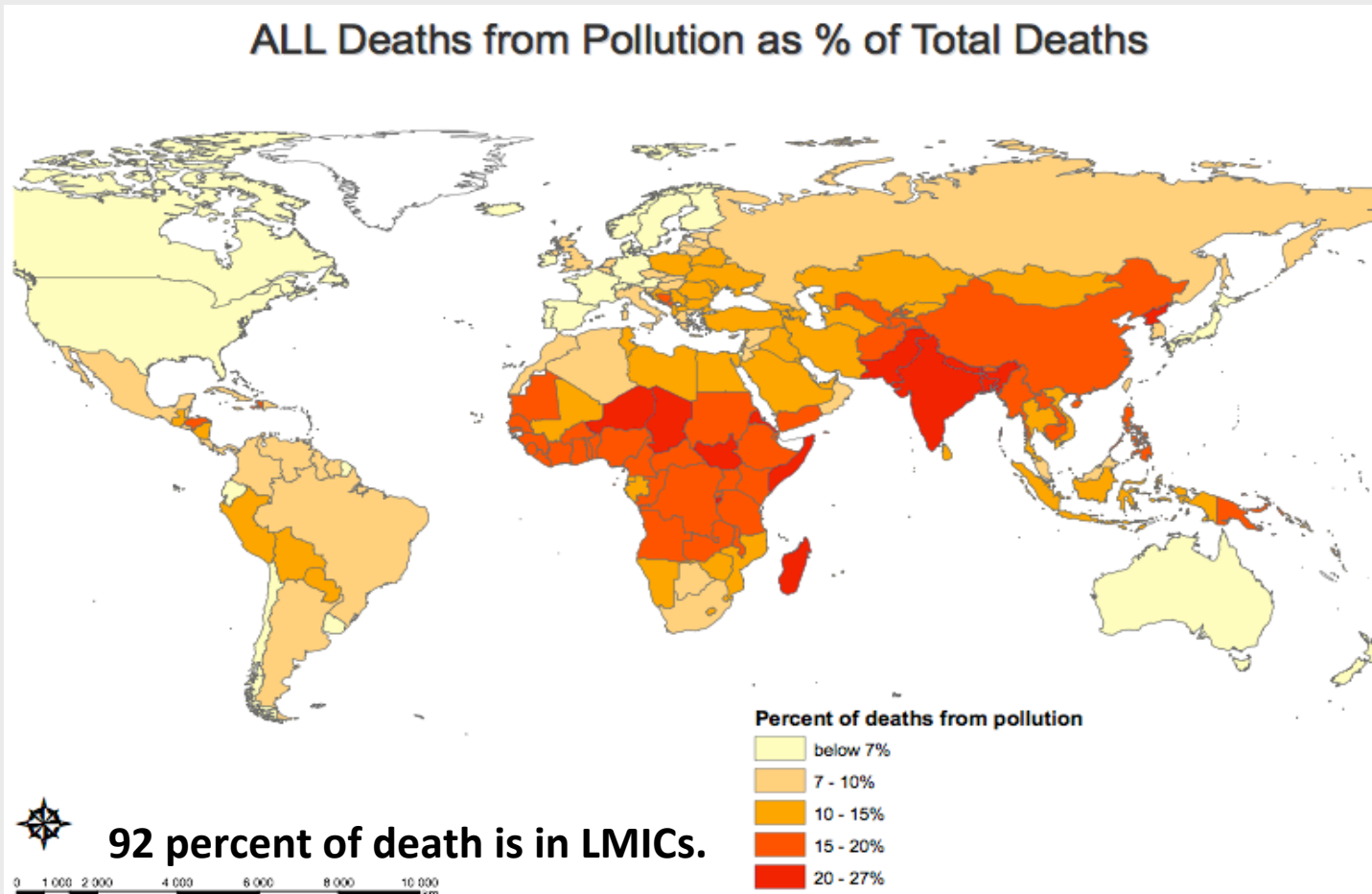
In 2015, pollution was responsible for...

- 268 million DALYs
- 254 million years of life lost
- 14 million years lived with disability

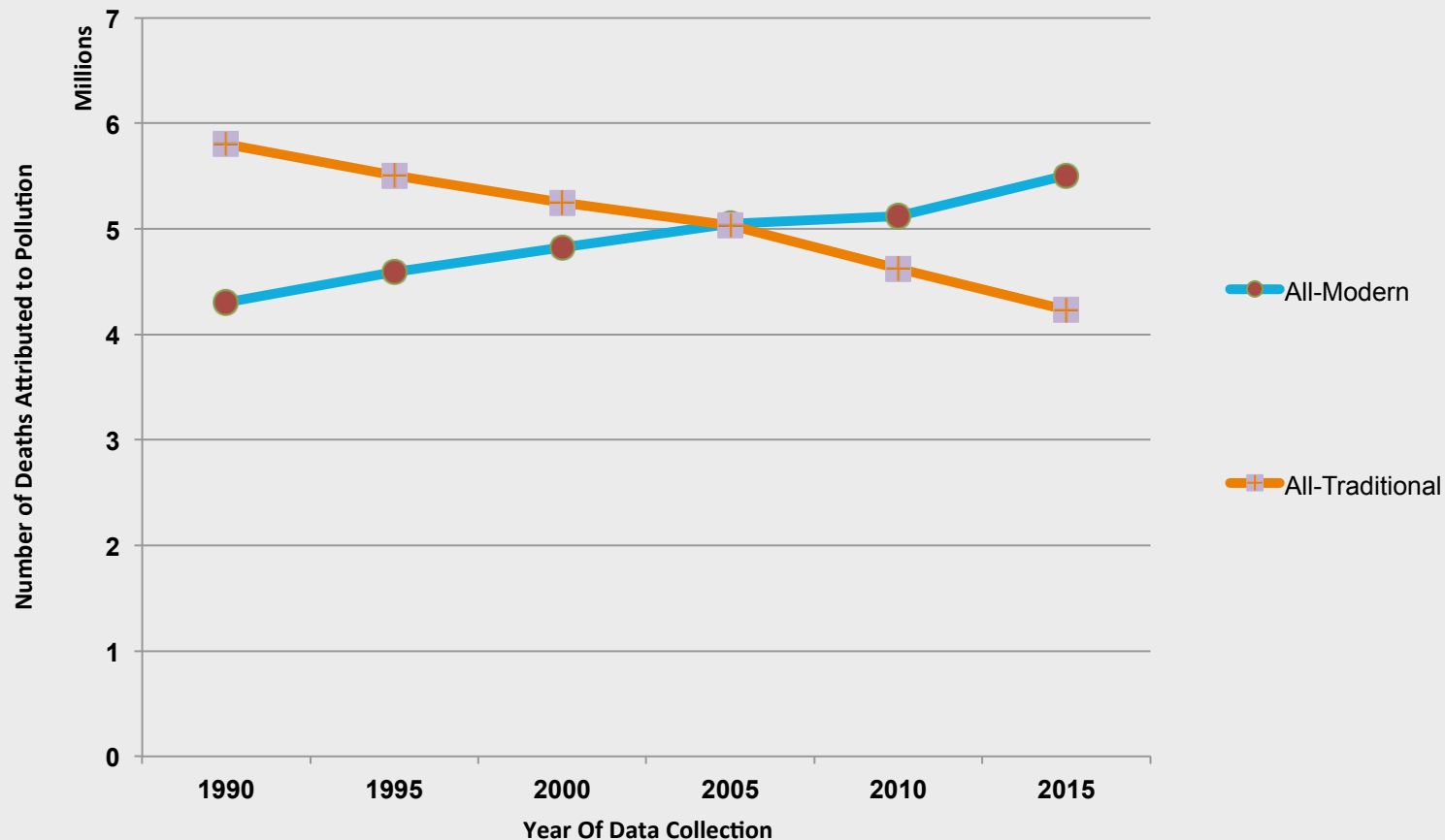
DEATHS FROM POLLUTION VERSUS OTHER MAJOR RISK FACTORS



POLLUTION-RELATED DISEASE IS ABUNDANT IN LOW- AND MIDDLE-INCOME FAMILIES



DEATHS DUE TO AMBIENT AIR, SOIL, AND CHEMICAL POLLUTION ARE RISING



Source GBD study, 2016

THESE ESTIMATES ARE CONSERVATIVE



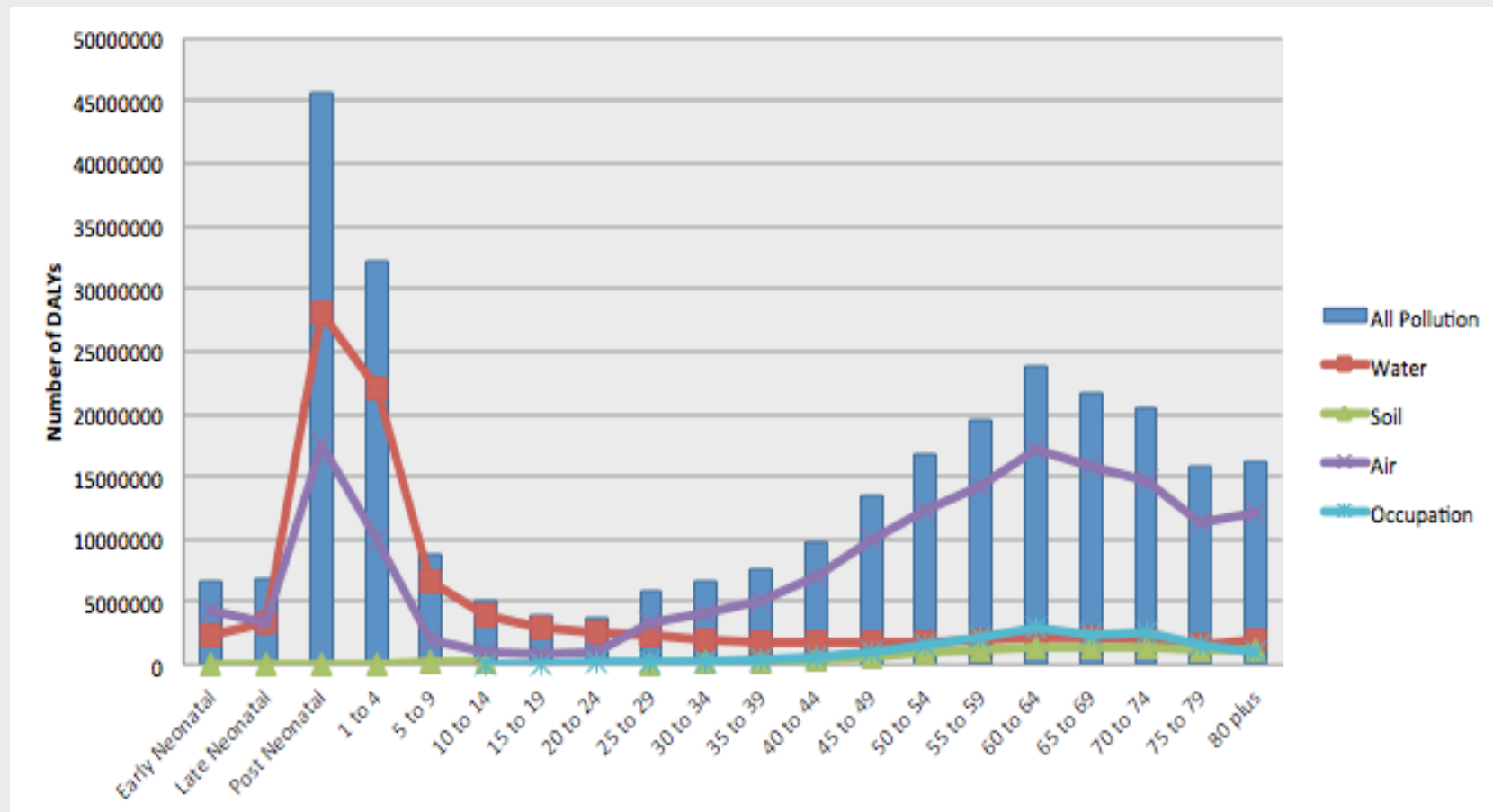
- Modern pollution not well researched
- Soil and chemical—very limited coverage
- Many chemical toxins NOT included in estimates

CHILDREN ARE EXQUISITELY SENSITIVE



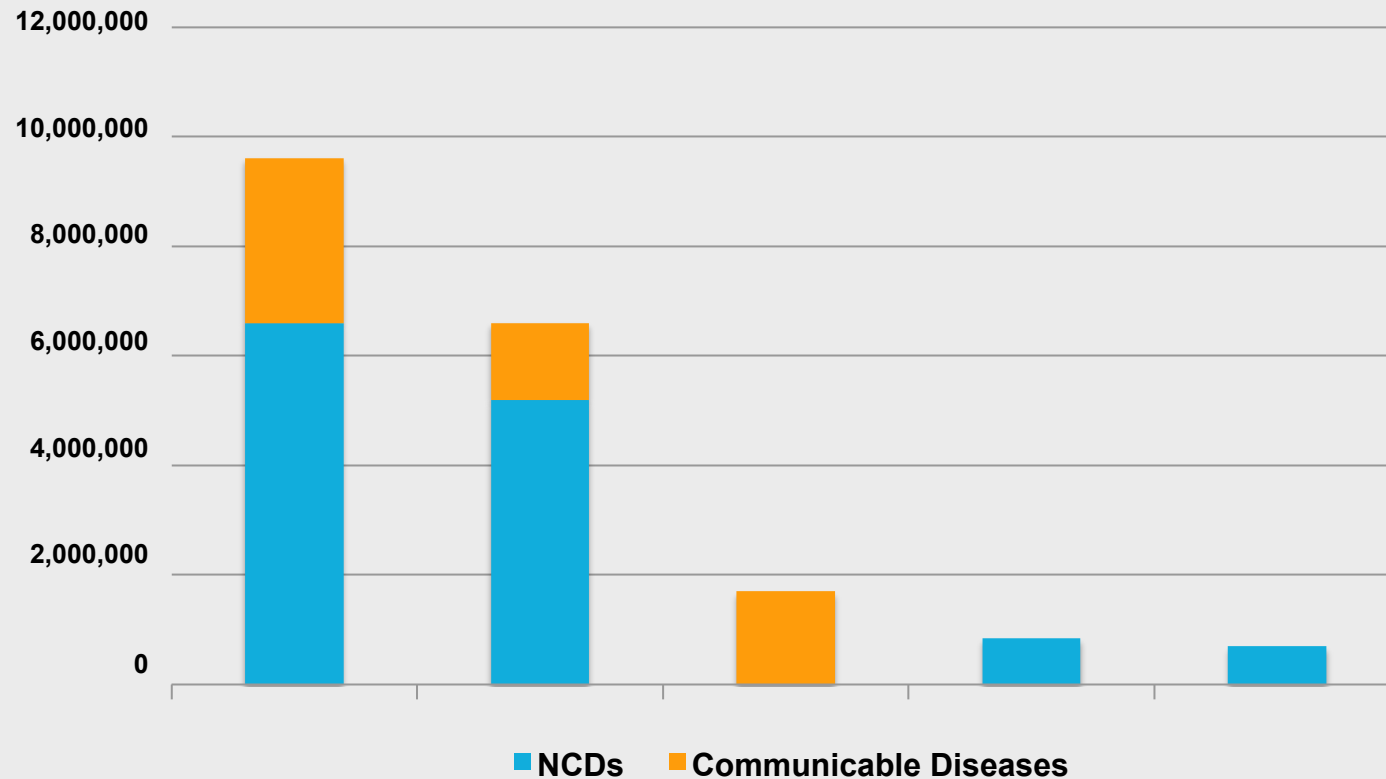
- Greater exposure proportionate to body mass
- 7 times more water per Kg per day; Hand-to-mouth activity
- Diminished ability to detoxify many chemicals
- Heightened biological vulnerability—e.g. *thalidomide*, *DES*, *fetal alcohol syndrome*, *lead*
- More years of future life

BOTH YOUNG AND OLD ARE AFFECTED



70 PERCENT OF POLLUTION-RELATED DISEASE IS NON-COMMUNICABLE DISEASE

Communicable vs. Non-communicable Disease and Pollution



THE POLLUTOME: WHAT WE KNOW AND DON'T KNOW ABOUT POLLUTION

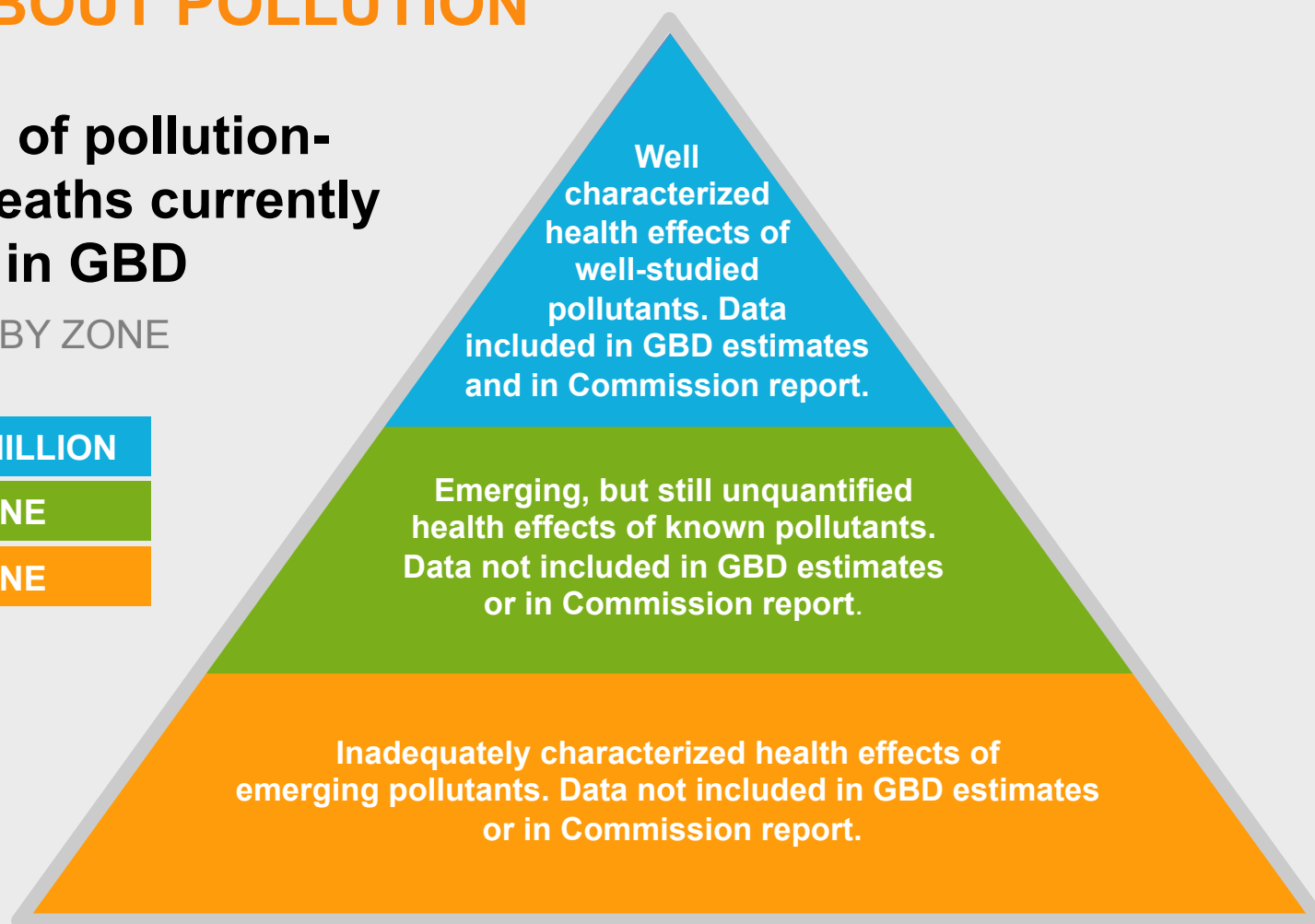
Numbers of pollution-related deaths currently included in GBD

ESTIMATES BY ZONE

Zone 1: 9 MILLION

Zone 2: NONE

Zone 3: NONE



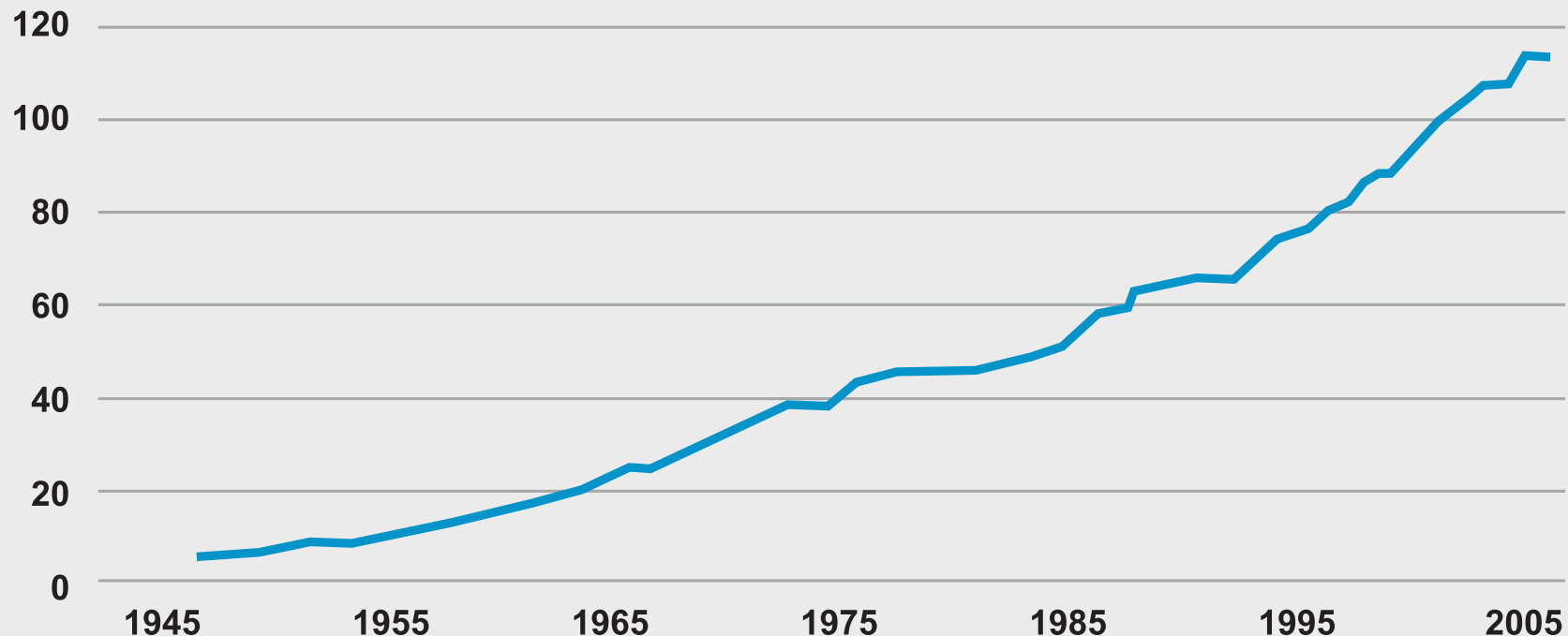
EMERGING CHEMICAL POLLUTANTS

- Developmental neurotoxicants
- Endocrine disruptors
- Novel classes of insecticides such as the neonicotinoids
- Chemical herbicides
- Pharmaceutical wastes

THE GROWING CHALLENGE OF POLLUTION BY TOXIC CHEMICALS AND PESTICIDES

U.S. Chemical Production, 1947–2007

Production index (100 = year 2002)



CLIMATE CHANGE & POLLUTION INEXTRICABLY LINKED



**Tackling pollution benefits long-term climate goals
and short-term health goals**



SECTION II

Economic Impact of Pollution

Dr. Maureen Cropper

COMMISSION'S MAIN ECONOMIC FINDINGS

Up to **2% of GDP in low- and middle-income countries** from loss of productivity. A drain on growth that can undercut national development.

These are costs associated with premature mortality and **exclude costs of morbidity**

Willingness to pay to eliminate pollution estimated at **\$4.6 trillion per year = 6% of global GDP**

Additional costs resulting from **environmental degradation** not counted in this analysis

**POLLUTION REDUCES
ECONOMIC OUTPUT**

Toxic releases devalue
potential of land for human
and industrial uses



PRODUCTIVITY LOSSES

- Measure present value of loss in future GDP when a person dies before age 65
- Calculated for each country, for 5 pollutants
- Does not capture all output losses (home production, informal sector output not in GDP)
- Places no value on output after age 65
 - Working age = 15–64
- **An incomplete measure of economic impact, but losses are substantial in low income countries**

PRODUCTIVITY LOSSES IN 2015 AS A PERCENTAGE OF GROSS DOMESTIC PRODUCT (GDP)

	Ambient and household air pollution	Unsafe water and unsafe sanitation	Lead exposure	Total
High income	0.048%	0.0033%	0.0029%	0.054%
Upper-middle income	0.15%	0.027%	0.0059%	0.18%
Lower-middle income	0.40%	0.40%	0.013%	0.82%
Low income	0.86%	1.03%	0.013%	1.90%

WELFARE LOSSES

- Measure what people would be willing to pay to reduce their risk of death from pollution
- Willingness to pay reflects loss in enjoyment as well lost output
- Calculated for each country, for each of 5 pollutants
 - Willingness to pay varies by country per capita income
- Willingness to pay calculated per person, and also summed across all people
 - In both cases, reflects willingness to pay to reduce pollution to zero

GLOBAL WELFARE LOSSES FROM POLLUTION

Estimated at **\$4.6 trillion**
per year, the equivalent
to **6% of global GDP**



POLLUTION IS NOT INEVITABLE

Kuznets Curve Hypothesis need
not hold for pollution





SECTION III

Pollution and Poverty

Karti Sandilya

A satellite image of Earth showing a large, dense plume of air pollution, likely from Asia, extending across the Pacific Ocean towards the western United States. The plume is visible as a thick, greyish-brown layer over the ocean and parts of the land. The text "POLLUTION KNOWS NO BORDERS" is overlaid in white, bold, sans-serif font.

POLLUTION KNOWS NO BORDERS

Air pollution from Asia
accounts for up to
20% of ozone pollution
in western U.S. States

—JPL Study, 2012



**POVERTY
CAN FORCE
PEOPLE TO
LIVE IN
PLACES
THAT MAKE
THEM ILL**



POLLUTION, HUMAN RIGHTS AND ENVIRONMENTAL INJUSTICE

It affects the rights of the child, the right to safe work, and protection of the most vulnerable



INEQUITABLE EXPOSURE OF POOR AND MARGINALIZED COMMUNITIES TO POLLUTION

Disproportionate
burden among these
communities
of pollution-related
disease

POLLUTION IS A HUMAN RIGHTS ISSUE

**92% of deaths
occur in low- and
middle-income
countries. Children
are most affected.**



- In countries at all income levels, pollution disproportionately affects the poor and marginalized
- Women, children, the elderly and minorities are the main victims

SUSTAINABLE DEVELOPMENT GOALS

GOAL 3.9 “By 2030, substantially reduce the number of deaths and illness from hazardous chemicals and air, water and soil pollution and contamination.”



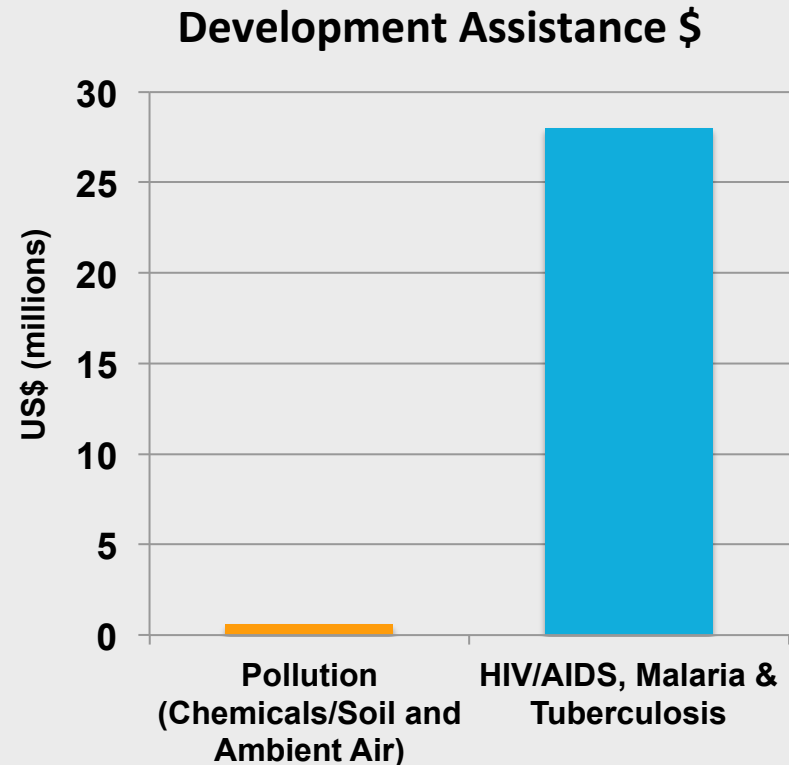
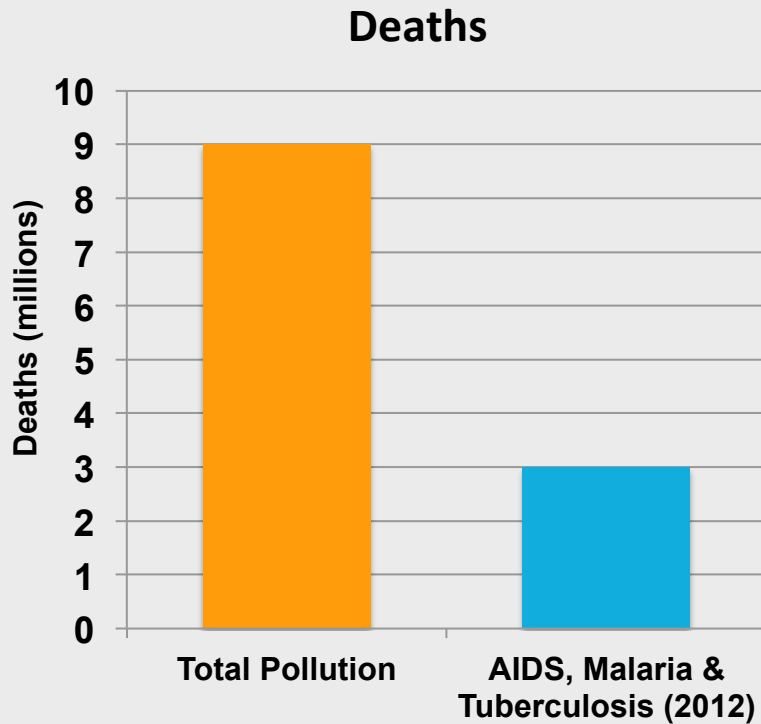


SECTION IV

Effective Interventions

Richard Fuller

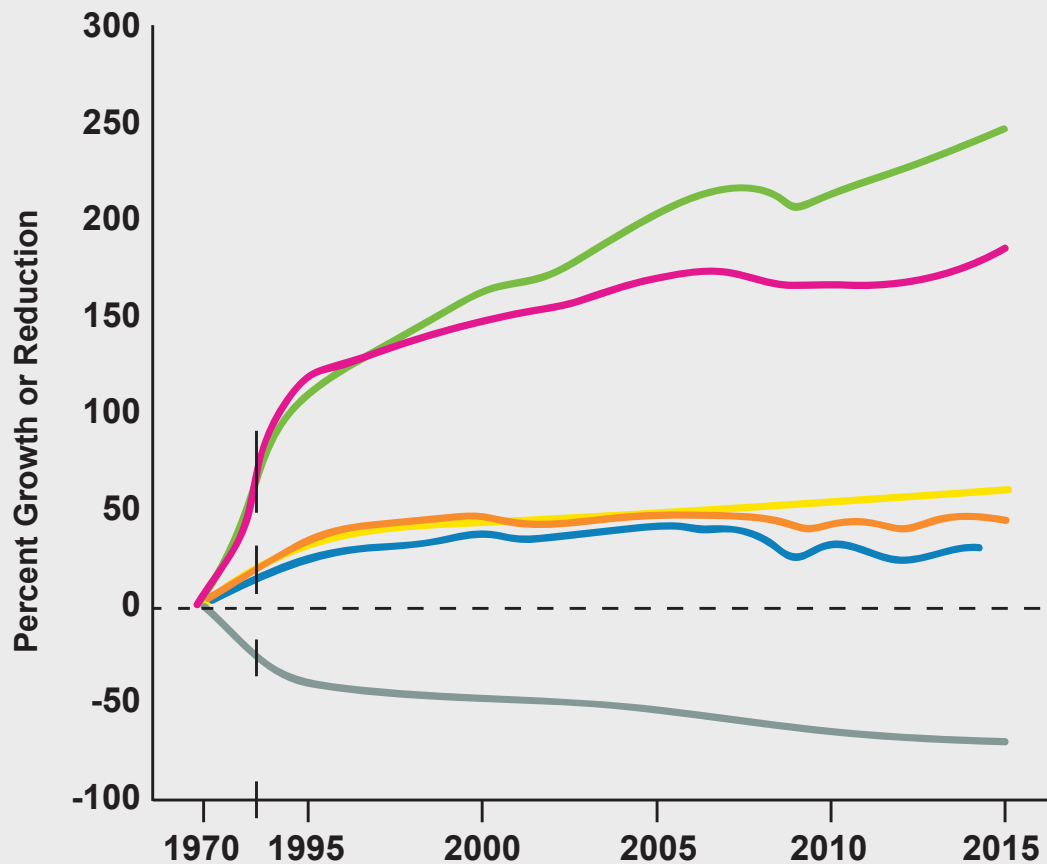
IMPACTS ARE UNDERCOUNTED, SOLUTIONS ARE UNDERFUNDED



SOLUTIONS EXIST BUT NOT PRIORITIZED

- Few are aware of pollution's huge impact
- Political will often lacking: myth of pollution vs. jobs
- Evidence—success in developed world

POLLUTION CONTROL AND GDP, UNITED STATES, 1970-2015



GDP GREW
BY **250%**, WHILE
AIR POLLUTION
FELL BY **70%**

- Gross domestic product
- Vehicle miles traveled
- Population
- Energy consumption
- CO₂ emissions
- Aggregate emissions (six common pollutants)

POLLUTION CONTROL YIELDS GREAT ECONOMIC BENEFITS

- Control of ambient air pollution in the United States yields about \$30 in benefits for every \$1 invested
 - An aggregate benefit of \$1.5 trillion against an investment since 1970 of \$65 billion
- Removal of lead from gasoline has added billions of dollars to economies around the world

POLLUTION CAN BE CONTROLLED AND PREVENTED

- Transition toward a sustainable, circular economy
- High-income and some mid-income countries are making good progress against pollution

ATTENTION IS GROWING

- SDGs include pollution
- UNEA3
- World Bank focal area

BUT MUCH MORE IS NEEDED...

CREATING COUNTRY DEMAND

- Health and Pollution Action Plans (HPAP) are identifying country-based environmental health priorities.
 - All government agencies, Health, Environment, Industry, Development, Finance, Transport
- Focus on most substantive problems
- Design programs and projects accordingly

PROJECTS TO ACHIEVE HEALTH OUTCOMES

AIR

Indoor air—
move to
cleaner fuels,
clean cooking.



WATER

Sanitation
investments,
full WASH



WORKPLACE

Bring in
international
good practices



OUTDOOR AIR

control large
point source,
establish clean
fuels, etc.



SOIL, CHEMICALS, METALS

Identify
priorities,
clean up
urgent hotspots



RESEARCH

- 1 Quantify the global burden of disease associated with chemical pollutants of known toxicity—lead, mercury, chromium, arsenic, asbestos, and benzene.
- 2 Discover the diseases caused by new and emerging chemical pollutants, and new diseases from known pollutants.
- 3 Fund country/local research

TRACKING PROGRESS—GAHP

- Pollution and Health—follow up on *Lancet* report
- Metrics related to interventions
 - Health burden
 - Exposure
 - Investments undertaken
 - Regulatory structures and implementation
 - Efficacy of solutions, knowledge transfer
- Aggregating data from others (SDG's, etc.) relevant to pollution



GENERAL PUBLIC

An open-source pollution mapping platform

www.pollution.org

to advance research
and make information
on pollution at the
local level available
to the global public



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COMMISSION ON POLLUTION AND HEALTH



Achim Steiner

Administrator

UN Development Programme

Gina McCarthy
Former Administrator
US EPA

Carlos Salinas
Former President,
Mexico

A close-up photograph of two hands, palms facing forward. The skin is a deep brown color, showing signs of age and wear. There are several dark, irregular stains on the palms and fingers, possibly from ink or dirt. The hands are positioned centrally against a dark, blurred background. Overlaid in the center of the image is the text "THANK YOU" in a bold, white, sans-serif font.

THANK YOU