

Environmental Health - 1

Department of Community Medicine

What is Environmental Health? Definition?

Environmental health is the branch of public health that is concerned with **all aspects of the natural and built environment that may affect human health.**

Those aspects of the human health and disease that are determined by factors in the environment. It also refers to the theory and practice of assessing and controlling factors in the environment that can potentially affect health (WHO 1999).

Why do doctors need to know about it?

ENVIRONMENTAL IMPACTS ON HEALTH

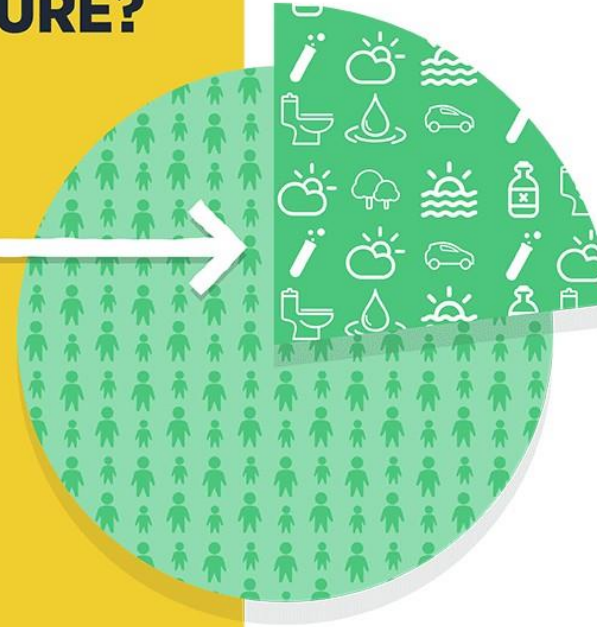
WHAT IS THE BIG PICTURE?

FACT:

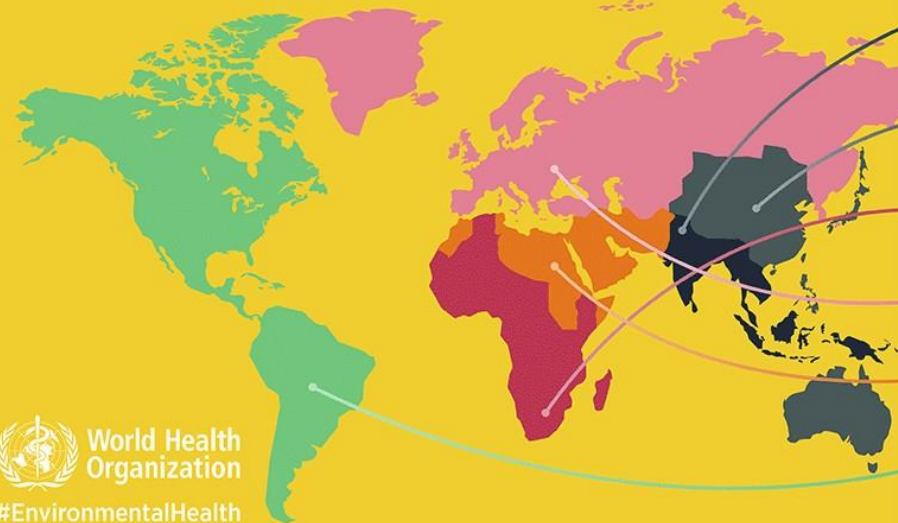
23%

of all global deaths are linked to the environment.

That's roughly **12.6 million deaths** a year.



WHERE IS IT HAPPENING?



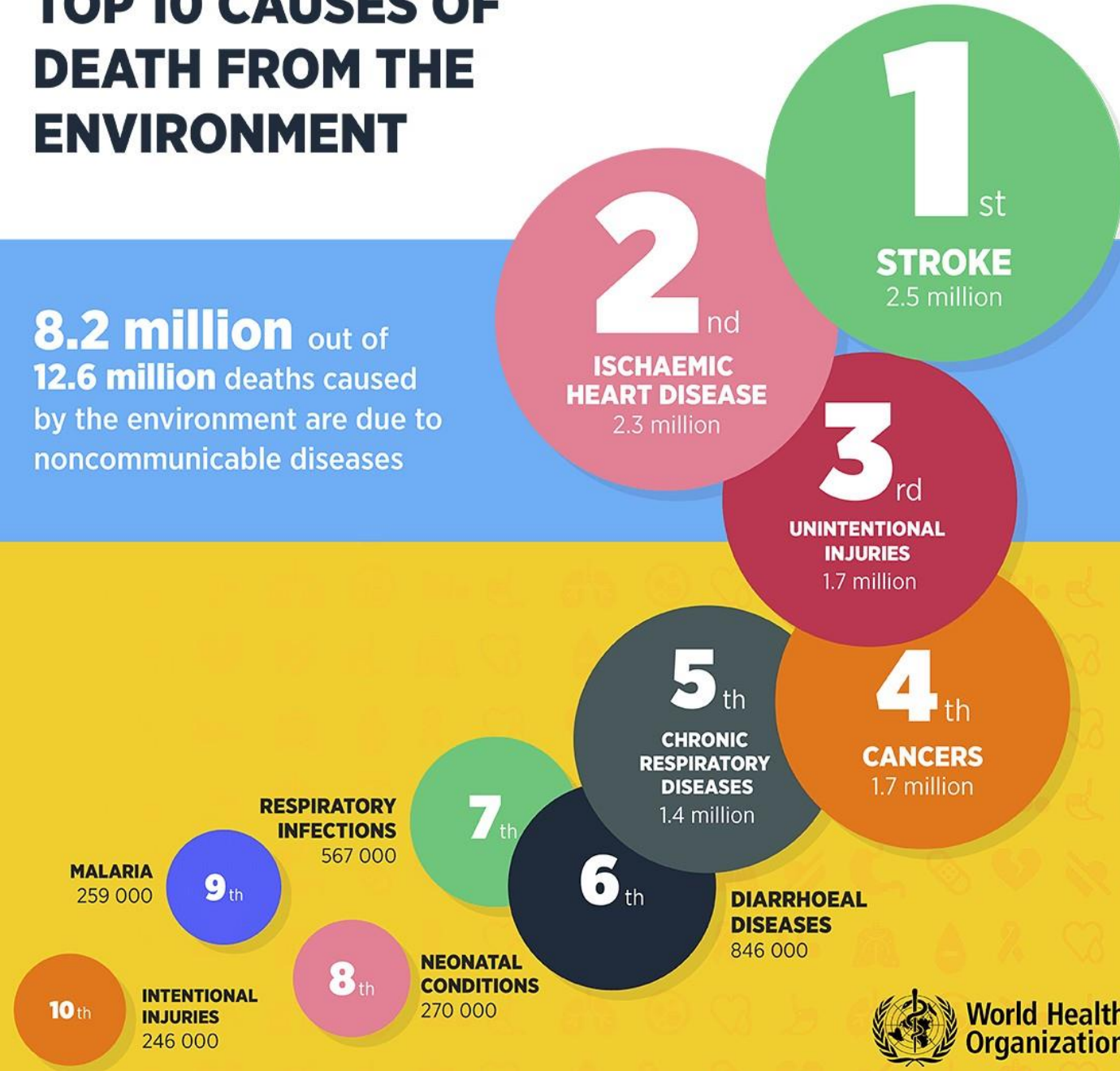
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- 3.8 million**
in South-East Asia Region
- 3.5 million**
in Western Pacific Region
- 2.2 million**
in Africa Region
- 1.4 million**
in European Region
- 854 000**
in Eastern Mediterranean Region
- 847 000**
in the Region of the Americas

TOP 10 CAUSES OF DEATH FROM THE ENVIRONMENT

8.2 million out of **12.6 million** deaths caused by the environment are due to noncommunicable diseases



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HOW THE ENVIRONMENT IMPACTS OUR HEALTH

People are exposed to risk factors in their homes, work places and communities through:

AIR POLLUTION
including indoors and outdoors



INADEQUATE WATER, SANITATION
and hygiene



CHEMICALS
and biological agents



RADIATION
ultraviolet and ionizing



COMMUNITY NOISE



OCCUPATIONAL RISKS



CLIMATE CHANGE



BUILT ENVIRONMENTS
including housing and roads



AGRICULTURAL PRACTICES
including pesticide-use, waste-water reuse



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WHO IS MOST IMPACTED BY THE ENVIRONMENT

Environmental impacts on health are uneven across age and mostly affect the poor.

Low- and middle-income countries bear the greatest share of environmental disease.



Men

are slightly more affected due to occupational risks and injuries.

Women

bear higher exposures to traditional environmental risks such as smoke from cooking with solid fuels or carrying water.

Children under five and adults between 50 and 75 years old are most affected by the environment.



YEARLY

4.9 MILLION

Deaths in adults

between 50 and 75 years. The most common causes are noncommunicable diseases and injuries.

1.7 MILLION

Deaths in children

under five. The most prominent causes are lower respiratory infections and diarrhoeal diseases.



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WE CAN IMPROVE OUR ENVIRONMENT TO IMPROVE OUR HEALTH

These WIN-WIN
strategies are
fundamental
to achieving the

SUSTAINABLE DEVELOPMENT GOALS
17 GOALS TO TRANSFORM OUR WORLD



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1. Apply low **carbon strategies** in energy generation, housing and the industry.



2. Use more active and **public transportation**.



3. Introduce **clean fuels** for cooking, heating and lighting and clean technologies.



4. Reduce **occupational exposures** and improve working conditions.



5. Increase **access to safe water** and adequate sanitation and promote hand washing.



6. Change **consumption patterns** to lower the use of harmful chemicals, minimize waste production and save energy.



7. Implement interventions that can increase **sun protective behaviour**.



8. Pass **smoking bans** to reduce exposure to second-hand tobacco smoke.



9. Always use a **health in all policies** approach to create healthier environments and prevent disease.

Let's all work towards a healthier
environment for our health.

What do you need to know?

1. Air pollution
2. Water pollution
3. Waste management
4. Housing environment
5. Food safety and hygiene
6. National and International Health Regulations
7. Disaster management
8. Health management at special circumstances (festivals)

Air pollution

Objectives:

1. Define and describe sources of air pollution and its effects in general and for the health of living being
2. Describe indoor air pollution (biological, tobacco, chemicals, pesticides etc.) and its health effects
3. Describe prevention of indoor and outdoor air pollution

Define Air Pollution

Chemicals/ particles added to the atmosphere by natural events or human activities in high enough concentrations to be harmful

~92% of the world's population lives in places with poor quality air
(Pollutant levels exceeding WHO standards)
Low- and middle income countries experience higher burden

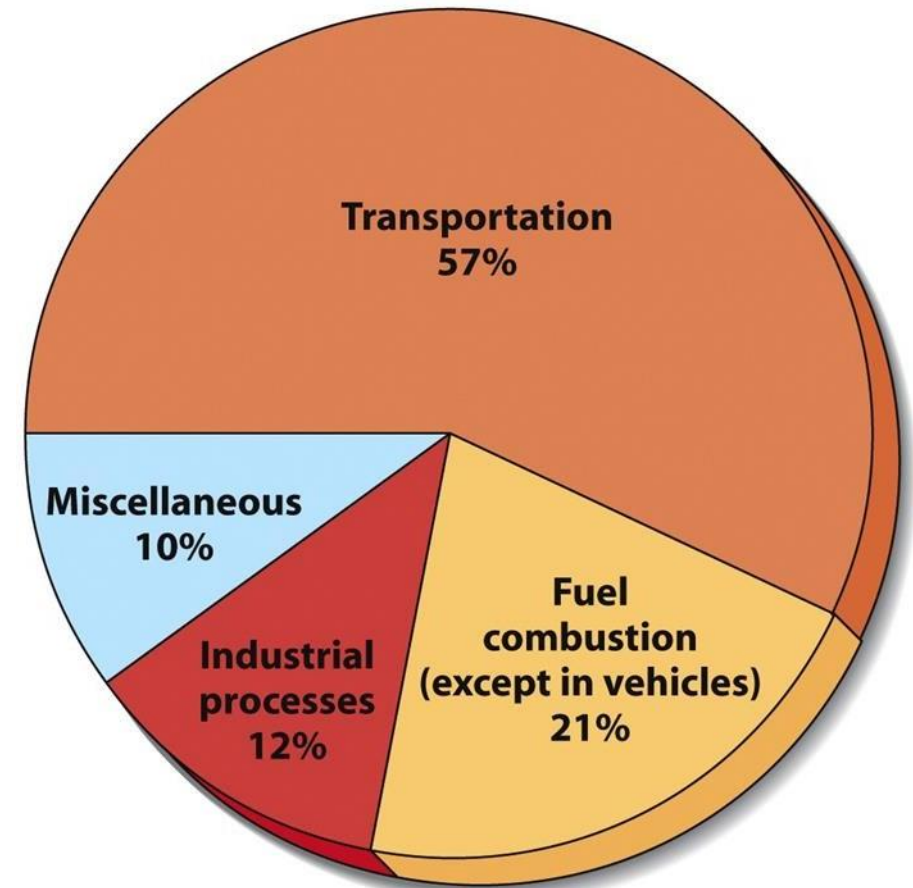


Two types

- ambient (outdoor) air pollution
- household (indoor) air pollution

Major sources of outdoor air pollution

- Vehicle emissions
- Power generation
- building heating systems
- agriculture/waste incineration
- industry



Major sources of indoor air pollution

- polluting fuel used for cooking, heating & lighting
- tobacco
- vapors from building materials, paint, furniture
- pesticides
- other materials within the house emitting unhealthy chemicals

Ambient air pollution - a major threat to health and climate



Effects of Outdoor (ambient) Air Pollution

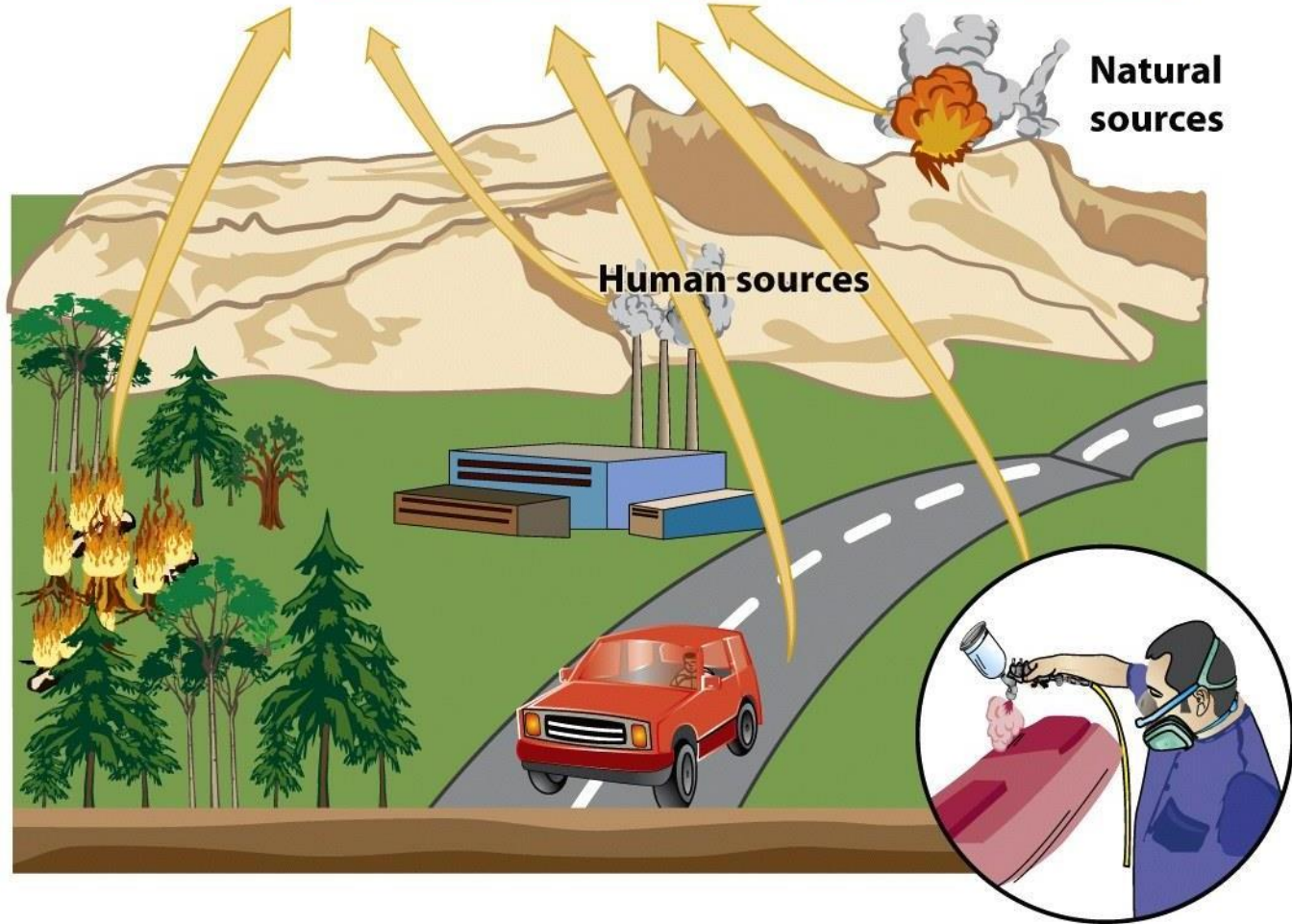
- Ambient air pollution -> estimated 3 million deaths/year (mostly by NCDs)
 - 25% of all deaths and disease from lung cancer
 - 17% of all deaths and disease from ALRI
 - 16% of all deaths from stroke
 - 15% of all deaths and disease from IHD
 - 08% of all deaths and disease from COPD
- Short- & long term exposure in children & adults
 - Reduce lung functions, RTI, aggravate asthma
- Maternal exposure
 - LBW
 - Pre-term births
 - Small for gestational age babies (IUGR)

Primary air pollutants

CO CO₂
SO₂ NO NO₂
Most hydrocarbons
Most particulates

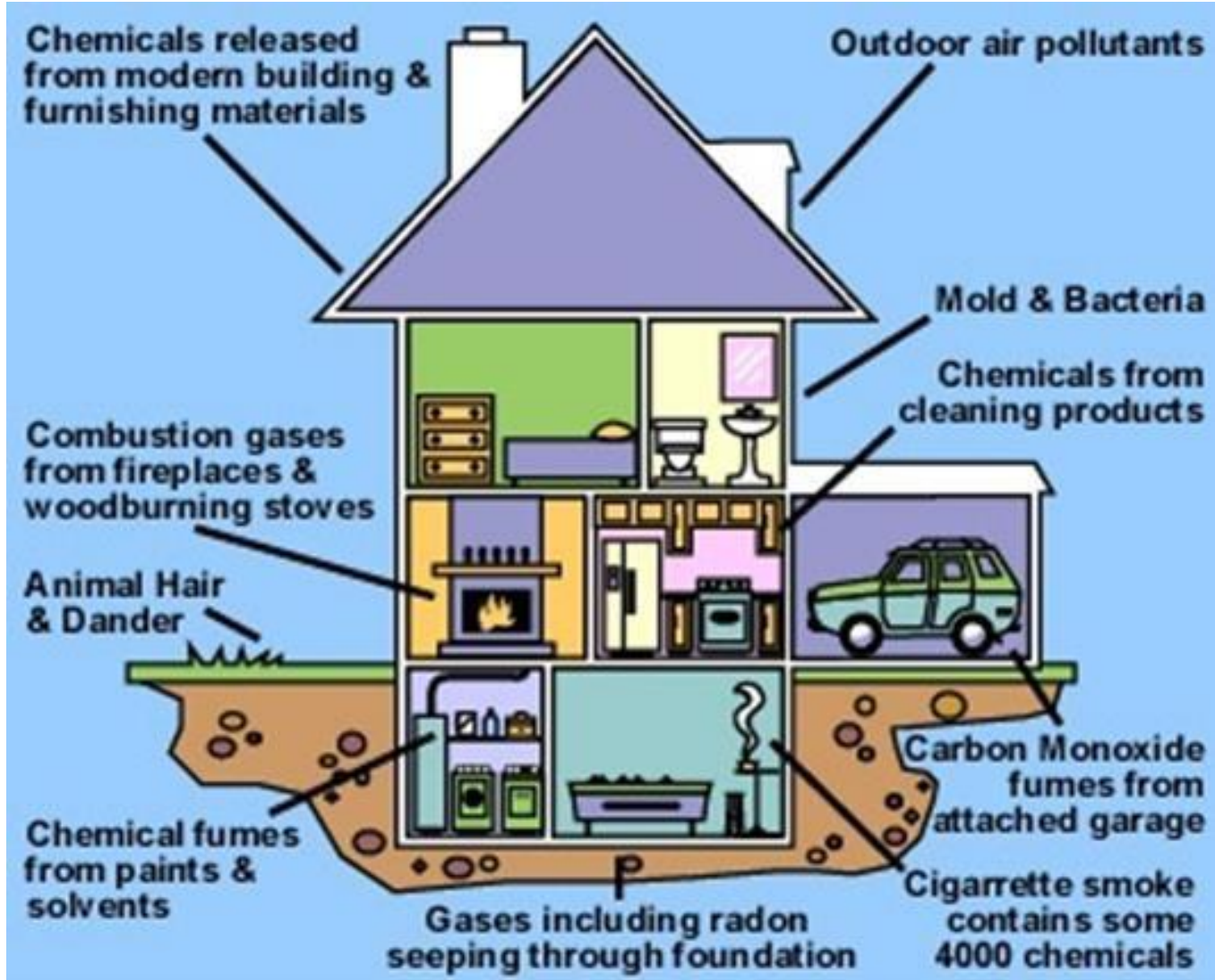
Secondary air pollutants

HNO₂ SO₃
HNO₃ H₂SO₄
H₂O₂ O₃ PANs
Most NO₃⁻ and SO₄²⁻
salts



Indoor Air Pollution





Effects of Indoor Air Pollution

- Indoor air pollution -> estimated 4.3 million deaths/ year
- wheezing and exacerbation of asthma
- RTI including TB
- COPD
- Lung cancers
- Cataract
- LBW and increased perinatal deaths

Pollutants with strongest evidence of public health concern:

- PM
- Ozone
- NO₂
- SO₂
- CO, CO₂
- Hydrocarbons

Table 20.1 Major Air Pollutants

<i>Pollutant</i>	<i>Composition</i>	<i>Primary or Secondary</i>	<i>Characteristics</i>
<i>Particulate matter</i>			
Dust	Variable	Primary	Solid particles
Lead	Pb	Primary	Solid particles
Sulfuric acid	H ₂ SO ₄	Secondary	Liquid droplets
<i>Nitrogen oxides</i>			
Nitrogen dioxide	NO ₂	Primary	Reddish-brown gas
<i>Sulfur oxides</i>			
Sulfur dioxide	SO ₂	Primary	Colorless gas with strong odor
<i>Carbon oxides</i>			
Carbon monoxide	CO	Primary	Colorless, odorless gas
Carbon dioxide*	CO ₂	Primary	Colorless, odorless gas
<i>Hydrocarbons</i>			
Methane	CH ₄	Primary	Colorless, odorless gas
Benzene	C ₆ H ₆	Primary	Liquid with sweet smell
<i>Ozone</i>	O ₃	Secondary	Pale blue gas with acrid odor
<i>Air toxics</i>			
Chlorine	Cl ₂	Primary	Yellow-green gas

* Discussed in Chapter 21.

Source: Environmental Protection Agency.

Particulate matter

- Thousands of different solid or liquid particles suspended in air
 - Includes: soil particles, soot, lead, asbestos, sea salt, and sulfuric acid droplets
- Dangerous for 2 reasons
 - May contain materials with toxic or carcinogenic effects
 - Extremely small particles can become lodged in lungs

Nitrogen and Sulfur Oxides

- Nitrogen Oxides

- Gases produced by the chemical interactions between atmospheric nitrogen and oxygen at high temperature
- Problems
 - Greenhouse gases
 - Cause difficulty breathing

- Sulfur Oxides

- Gases produced by the chemical interactions between sulfur and oxygen
- Causes acid precipitation (acid rains)

Carbon Oxides and Hydrocarbons

- Carbon Oxides
 - Gases carbon monoxide (CO) and carbon dioxide (CO₂)
 - Greenhouse gases
- Hydrocarbons
 - Diverse group of organic compounds that contain only hydrogen and carbon (ex: CH₄- methane)
 - Some are related to photochemical smog and greenhouse gases

Ozone

- Tropospheric Ozone
 - Man- made pollutant in the lower atmosphere
 - Secondary air pollutant
 - Component of photochemical smog
- Stratospheric Ozone
 - Essential component that screens out UV radiation in the upper atmosphere
 - Man- made pollutants (ex: CFCs) can destroy it

Health effects of different air pollutants

Table 20.2 Health Effects of Several Major Air Pollutants

<i>Pollutant</i>	<i>Source</i>	<i>Effects</i>
Particulate	Industries, electric power plants, motor vehicles, construction, agriculture	Aggravates respiratory illnesses; long-term exposure may cause increased incidence of chronic conditions such as bronchitis; linked to heart disease; suppresses immune system; some particles, such as heavy metals and organic chemicals, may cause cancer or other tissue damage
Nitrogen oxides	Motor vehicles, industries, heavily fertilized farmland	Irritate respiratory tract; aggravate respiratory conditions such as asthma and chronic bronchitis
Sulfur oxides	Electric power plants and other industries	Irritate respiratory tract; same effects as particulates
Carbon monoxide	Motor vehicles, industries, fireplaces	Reduces blood's ability to transport oxygen; headache and fatigue at lower levels; mental impairment or death at high levels
Ozone	Formed in atmosphere (secondary air pollutant)	Irritates eyes; irritates respiratory tract; produces chest discomfort; aggravates respiratory conditions such as asthma and chronic bronchitis

Prevention of ambient air pollution

- Policies and investments supporting
 - cleaner transport, walking and cycling networks
 - energy-efficient housing, building and urban design
 - power generation: electricity production from renewable power sources
 - industry and
 - better municipal waste management

Prevention of indoor air pollution

- expanding access to clean household fuels and technologies
- Eliminate odors, without masking them
- Keeping houses clean, free of dust, animal dander
- Proper waste handling to minimize attraction of pests
- Stop smoking
- Using safer paint/ chemicals

The Greenhouse Effect

- A natural process that keeps the Earth surface around 30°C warmer than it would be otherwise.
- The Earth's climate is driven by a continuous flow of energy from the sun: - About 30% is immediately scattered back into space -Most of the remaining 70% passes down through the atmosphere to warm the Earth's surface.
- The blockers of this 70% of energy are greenhouse gases
- They avoid the direct escape of this energy directly from the surface to space.
- Main greenhouse gases: water vapor, carbon dioxide, ozone, methane, nitrous oxide, and halocarbons and other industrial gases.
- Apart from industrial gases, all occur naturally -Together, they make up less than 1% of the atmosphere -This is enough to produce a natural greenhouse effect that keeps Earth habitable

The enhanced Greenhouse effect

- Levels of all key greenhouse gases are rising as a direct result of human activity.
- Emissions from: -
 - carbon dioxide, mainly from burning coal, oil, & natural gas
 - methane and nitrous oxide (due mainly to agriculture and changes in land use),
 - ozone (from automobile exhaust fumes and other sources)
 - long-lived industrial gases

They are changing how the atmosphere absorbs energy.

This is all happening at an unprecedented speed.

The result is known as the enhanced greenhouse effect.

Water pollution

- Describe water pollution and health effects of consumption of unsafe polluted water (i.e., diarrhea, typhoid, CKDu/ CINAC)
- List the strategic interventions to ensure the quality of drinking water
- List the stakeholders in the environmental health services
- Describe steps to ensure safe drinking water at household level
 - Protected well in rural areas
 - Urban water supply scheme
- Describe the steps of water purification process

Water pollution

– Describe the role of PHI

- For ensure safe water to the community
- Water quality surveillance
 - Water testing for bacteriological contamination and resource
 - laboratories available for water testing

What Is Water Pollution?

- Water pollution is defined as the presence in groundwater of toxic chemicals and biological agents that exceed what is naturally found in the water and may pose a threat to human health and/or the environment.
- Additionally, water pollution may consist of chemicals introduced into the water bodies as a result of various human activities. Any amount of those chemicals pollutes the water, regardless of the harm they may pose to human health and the environment.



Water and health

- Uses of water
 - Domestic uses, public purposes, industrial purposes, agricultural purposes, hydropower production
- Sources of water
 - Rain water, surface water, ground water
- Water pollution
 - Sewage, industrial and trade pollutants, agricultural pollutants, physical pollutants, radioactive substances

Water purification

- In small scale
 - Household level:
 - boiling
 - Filtration
 - chemical disinfection
 - Disinfection of wells

Water purification in large scale

- Aeration
- Storage
- Coagulation
- Filtration
- Chlorination

Water borne diseases

(passive transport of pathogen through water)

- Viral
 - Viral hepatitis A, Hepatitis E, Poliomyelitis
- Bacterial
 - Typhoid, Paratyphoid, Bacillary dysentery, Cholera, Diarrhoea
- Protozoal
 - Amoebiasis, giardiasis
- Helminthic
 - Round worm, Thread worm, Hydatid disease

Water based diseases

(spread through aquatic invertebra)

- Snail
 - Schistosomiasis
- Cyclops
 - Guinea worm, fish tape worm

Water washed/ scarce diseases

(spread due to poor personal hygiene from inadequate supply of water for washing)

- Scabies
- Fungal infections

Water related diseases

- Acute and chronic toxic effects of chemical pollutants
 - CKDu etc
- Dental health problems
 - fluorosis
- Water Related Vector borne diseases
 - Dengue, malaria

Water quality criteria and standards

- The guidelines for drinking water quality was recommended by the WHO in 1993 and 1996, on following variables
 - Acceptability aspects
 - Microbiological aspects
 - Chemical aspects
 - Radiological aspects

The role of PHI

- To ensure safe water to the community
 - Responsible to implement prescribed guidelines in construction of wells, toilet pits, disposal of waste water
 - Performs water sampling: testing for bacteriological contamination and resource
 - Make recommendations bases on sampling reports
 - Laboratories for water testing: MRI

Food safety and hygiene

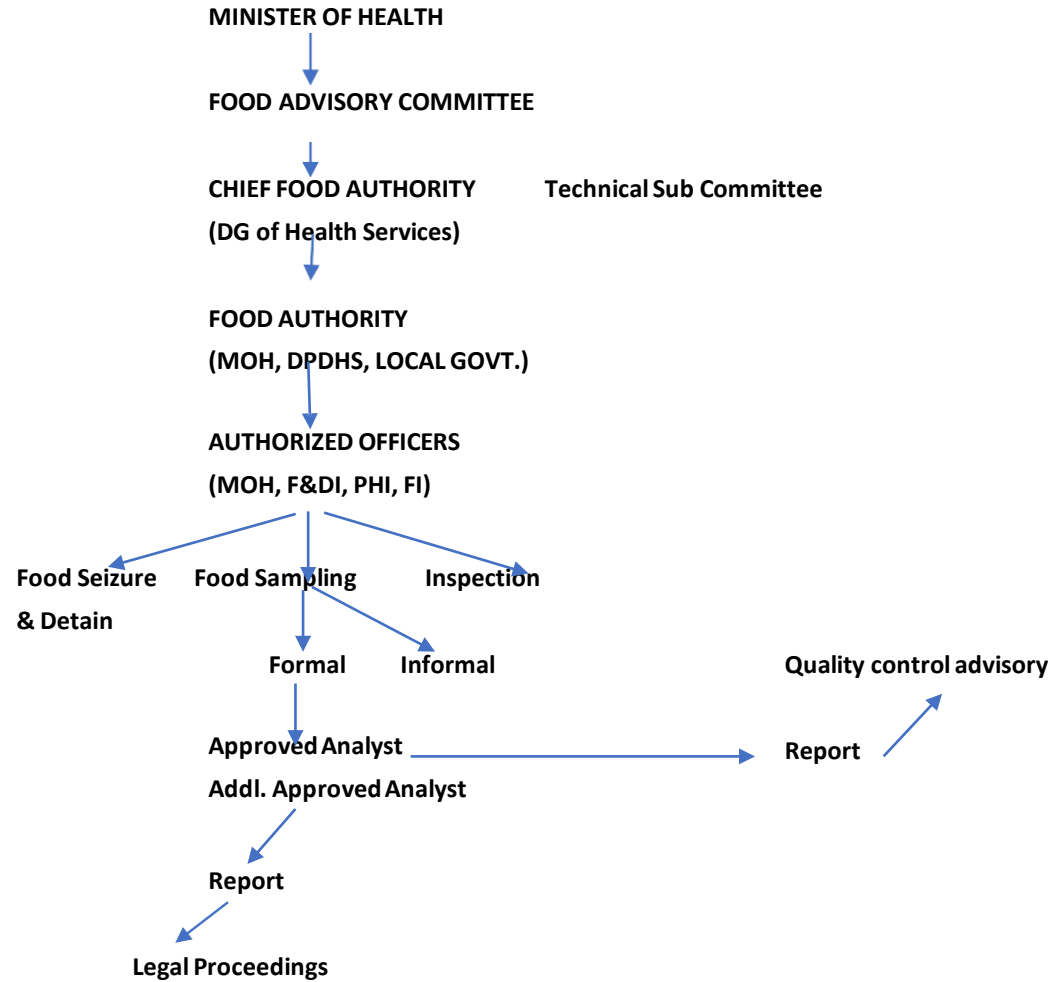
Describe food safety and hygiene

1. Food act (Food Act No. 26 of 1980 & amended in 1991)
2. Prohibitions under the food act and registration of food handling establishments
3. Consumer protection act
4. Food labelling
5. Implementing authorities and food advisory committee
 1. Levels of food control activities carried out in the country
 2. Authorized officers for implementing food act in a MOH area
 3. Main functions of authorized officers
6. Sanitary requirements of eating places, groceries etc. (environment, utensils, food storage, preparation and handling and personal hygiene of food handlers) and genetically modified food

Food regulations

- Why do we need Regulations?
 - To protect consumer
 - To protect industry
 - To control imports
-
- Food Act No. 26 of 1980
 - Food (Amendment) Act No. 20 of 1991

Authorized persons in enacting food regulation



Food Authority

- Director General of Health Services - Chief Food Authority
- In an area of a Municipality - Municipal Council
- Other Local Authority area - Local Authority named by the Minister
- Medical Officer of Health/Divisional Health Officer - If the Local Authority is not appointed as the Food Authority or when a Municipal Council is unable to execute its functions as Food Authority
- Excise Commissioner in relation to food under the Excise Ordinance
- Principal Collector of Customs in relation to importation of food which are prohibited under the Food Act

Authorized officers for implementing food act in a MOH area

- Medical Officer of Health or Divisional Health Officer
- Food and Drugs Inspector
- Food Inspector
- Public Health Inspector
- Veterinary Surgeon for meat inspection
- An Officer authorized by the Excise Commissioner
- An Officer authorized by the Principal Collector of Customs

Duties of Authorized Officers

- Inspection of premises/vehicles, open and examine any receptacle or package.
- Seize and detain (inform the relevant Food Authority)
- Sampling – formal or informal
- When AO is MOH, DG of Customs, Commissioner General of Excise they can examine books, records and documents and make copies.
- No person shall obstruct AO
- No person shall make misleading or false statements to AO

FOOD ACT NO. 26 OF 1980

- No person shall manufacture, import, sell, expose for sale, store or distribute any food,
 - a) That is injurious to health
 - b) Unfit for human consumption
 - c) Insect infested
 - d) Adulterated
 - e) With added substances not permitted by regulations
 - f) Not in accordance with regulations

FOOD ACT NO. 26 OF 1980

contd....

- g) Prepared/stored under unsanitary conditions
- h) With misleading/deceptive labels
- i) Food which does not conform to standards prescribed in regulations
- j) Spoilt food for animal food shall be authorized by Food Authority
- k) Without a warranty
- l) Premises has to be registered in Food Authority

Food (Labelling & Advertising) Regulations 2005

- Package or container is labeled in accordance with the regulations
- Label with two languages (with certain exceptions)
- Label indelibly printed or painted or affixed on the main panel (Supplementary label may be affixed for imported foods)
- Main panel:
 - Common Name - two languages
 - Brand/Trade Name - one or more languages (Shall not mislead the public)
 - Net contents in international symbols (eg: g or kg, ml or l)

Food (Labelling & Advertising) Regulations 2005 contd.....

- Main or any other panel – anyone or more of the three languages
 - Food Additives by name or INS number
 - Instructions for storage/use, if any
 - Name & address of manufacturer, packer or distributor in Sri Lanka
 - Batch No. or Code No. or decipherable code marking
 - The date of expiry
 - The date of manufacture
 - Bulk imports & repacking – date of manufacture, date of repacking
 - List of ingredients in descending order

Food (Labelling & Advertising) Regulations 2005 contd.....

- Country of origin for imported foods
- Any other declarations required by regulations
- Letter Size
 - Common name minimum height 3 mm and shall be not less than 1/3 of brand name
 - When common name consisted of more than one word, the words shall be in identical type and size and similarly displayed
 - 25 g or 30 ml or less size packs – letter size shall not be less than 1.5 mm (exceptions may be allowed by Chief Food Authority for packages not exceeding 25 sq.cm.)

Food safety and hygiene

- Explain the role and responsibilities of PHI on food safety
 - Inspection of food handling establishments
 - Grading of trades and frequency of inspections
 - Formal and informal food sampling

Housing environment

Describe the housing environment

1. With linkage of health and housing environment
2. On housing and legislation [Improvement Ordinance (H & TI)]
3. Building application and commencement
 - Requirements of sanitary housing
 - Inspection by PHI
 - Certification of conformity

Describe the health related regulations

Describe National health regulations

Nuisance ordinance

Act by National authority on Tobacco and Alcohol prevention

Prevention of mosquito breeding act

Describe International health regulations

Port health

Quarantine

Vaccines

Deratting

Thank you