Introduction & diseases related to environmental health & hazard

- **Objectives :**

1. To understand the definition of environmental health.
2. To identify the components of the environment.
3. To describe the interaction between different factors with the environment to produce disease.
4. To enumerate different environmental hazard concerns.
5. To describe sources of water hazards.
6. To describe sources of air hazards.
7. To be able to decide on appropriate method for water treatment.
8. To list the steps for environmental risk assessment.

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- **Resources :**
  Slides.
  Doctor's notes.

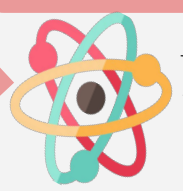
[Colors index : Important | Notes | Note | Slides | Extra] [Editing file | Share note]

Environment

All external factors, living and nonliving, surrounding man

Components of the environment:

Physical environment



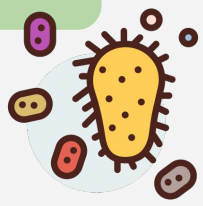
Noise, radiation, Temperature

Chemical

Air, toxic waste, pesticides, water

Biological environment

Disease organisms, allergens, insects



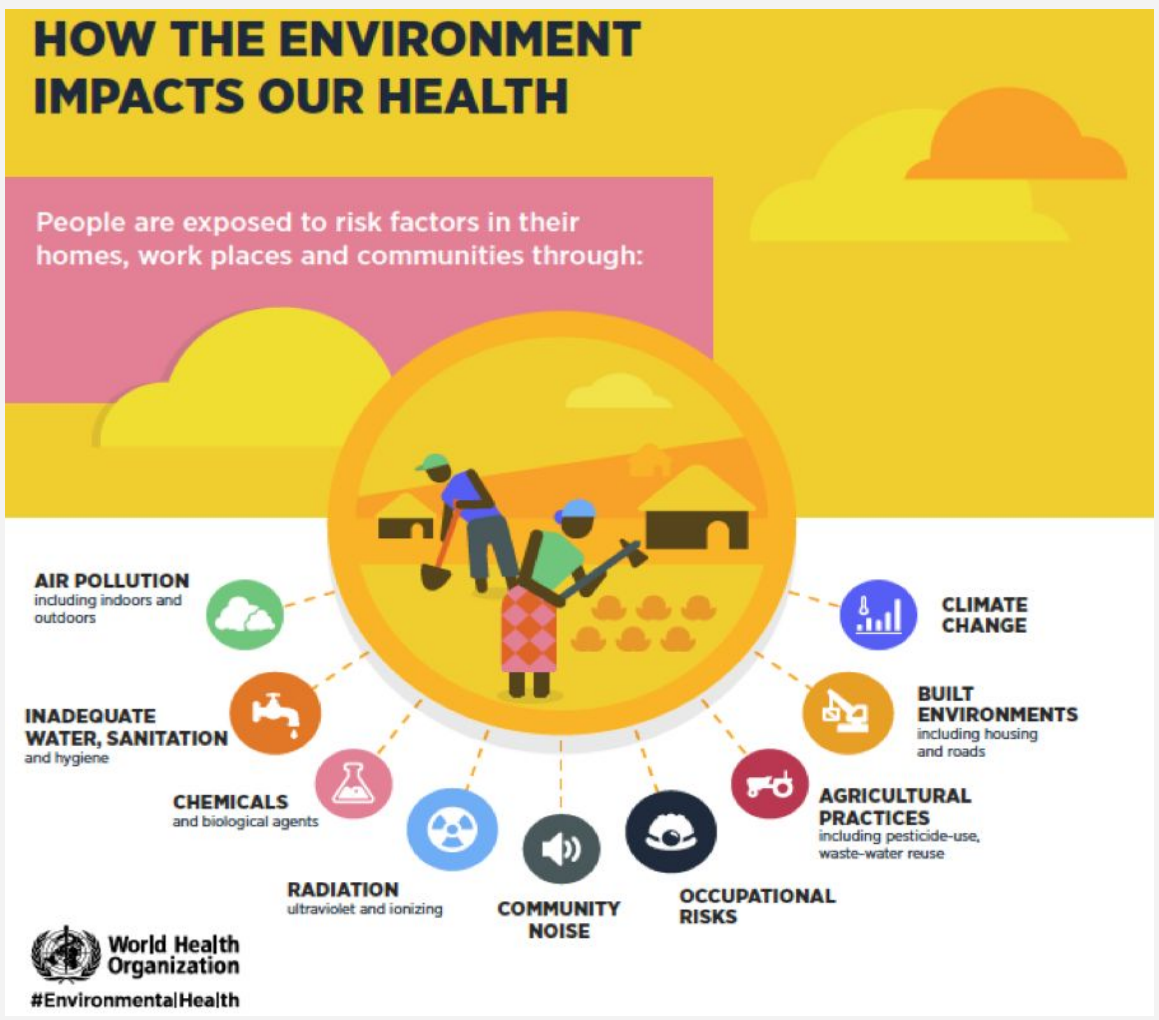
Social environment

Culture, habits, access to healthcare

Environmental Health

Environmental health is the science and practice of preventing human injury and illness and promoting well- being by:

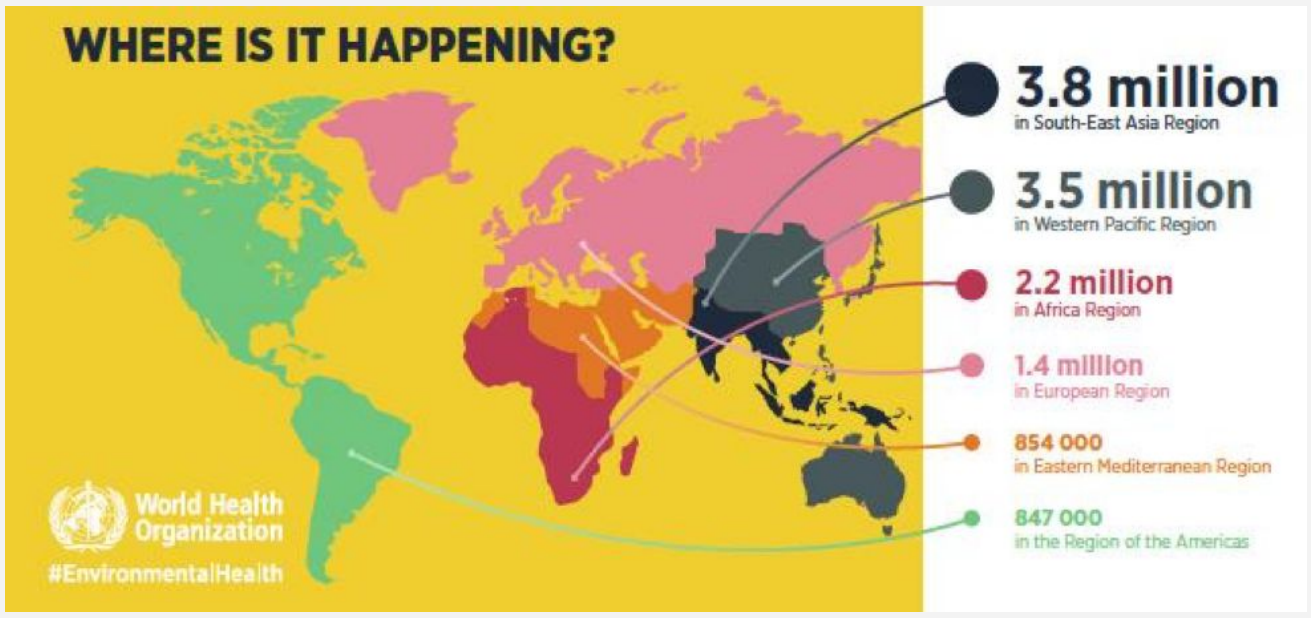
- Identifying and evaluating environmental sources and hazardous agents and
- limiting exposures to hazardous physical, chemical, and biological agents in air, water, soil, food, and other environmental media or settings that may adversely affect human health
- Occupational hazard like in people who works in Industrial factories (Ex:Asbestosis) might lead to Interstitial lung diseases .

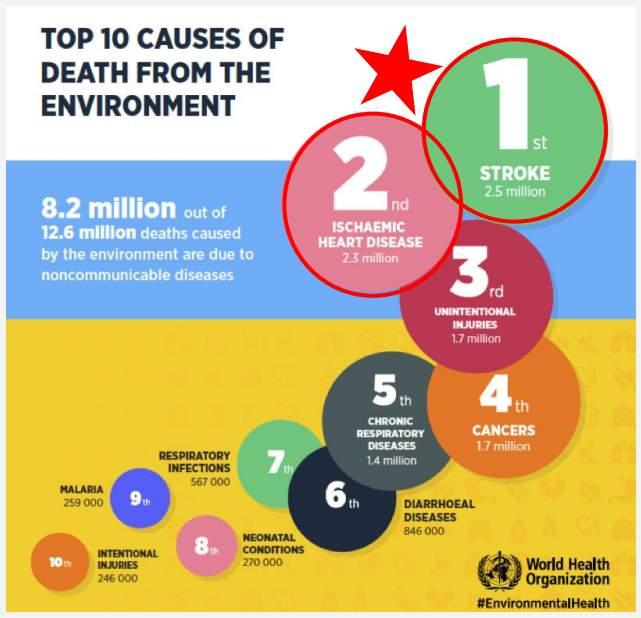


Source: National Environmental Health Association. Definition of Environmental Health. Available at: https://www.neha.org/about-neha/definitions-environmental-health Accessed on Feb 18, 2019.

World Health Organization Estimates

23% of global deaths are related to environment





Environmental Health Concerns

Hazard

- Water quality
- Disasters
- Climate change
- Air quality
- Human industrialization
- Chemical substances
- Biological substances
- Occupational hazard

Disasters can be: 1-Natural like volcanos or 2-Man made

Disposal of waste

How do humans damage the environment?

Air → Water

Soil → Biota

Biota means Biological organism

Chemicals

Lead	Arsenic	Chromium	Mercury	Nitrogen Oxides
Carbon Monoxide				Pesticides
Benzene		*Environmental Chemicals of Concern*		Particulate Matter
Asbestos				Ozone
Phthalates	Radon	Toluene	Volatile Organic Compounds	Sulfur Dioxide

Air Quality

Air pollution

Air pollution is the introduction of chemicals, particulate matter, or biological materials that cause harm or discomfort to humans or other living organisms, or cause damage to the natural environment or built environment, into the atmosphere.

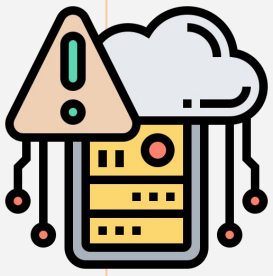
Pollutants

An air pollutant is known as a substance in the air that can cause harm to humans and the environment. Pollutants can be in the form of solid particles, liquid droplets, or gases. In addition, they may be natural or man-made.

Types of pollutants:

- **Primary (directly emitted)** **Immediately goes to the body**
  - Sulphur oxide, Nitrogen oxides, carbon monoxide (CO), CO 2, volatile organic compounds, particulate matter, persistent free radicals, chlorofluorocarbons, ammonia, odors, radioactive material.
- **Secondary (form in air when primary pollutants interact)**
  - Ozone, smog, peroxyacetyl nitrate.

Water Sanitation and Availability



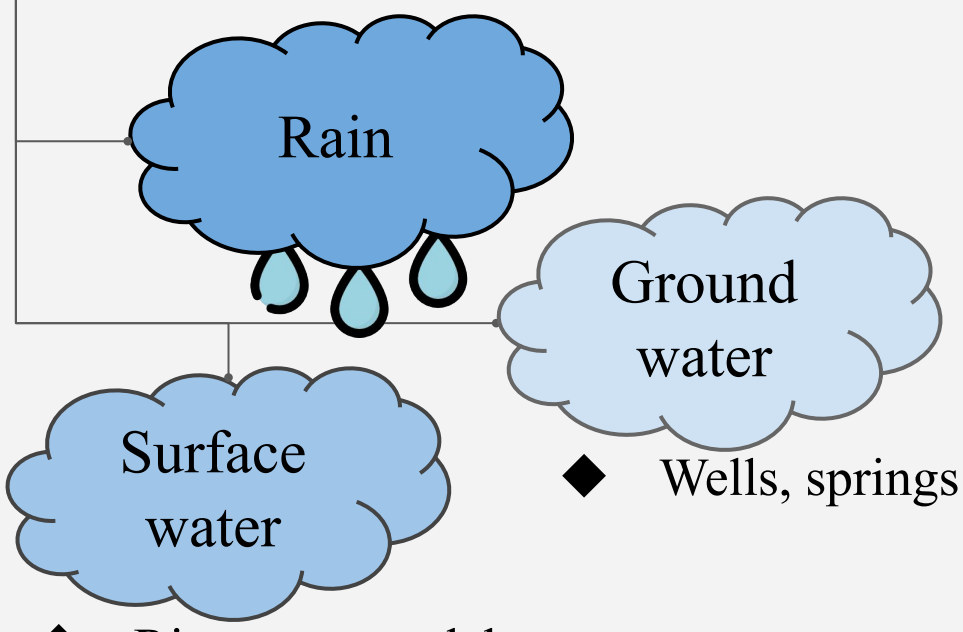
Issues with water:

- ❑ Humans need 2 litres of water per day
- ❑ Water should be available
- ❑ Should be sanitary
- ❑ Problems with Quality and quantity

In order for water to be safe for human consumption:

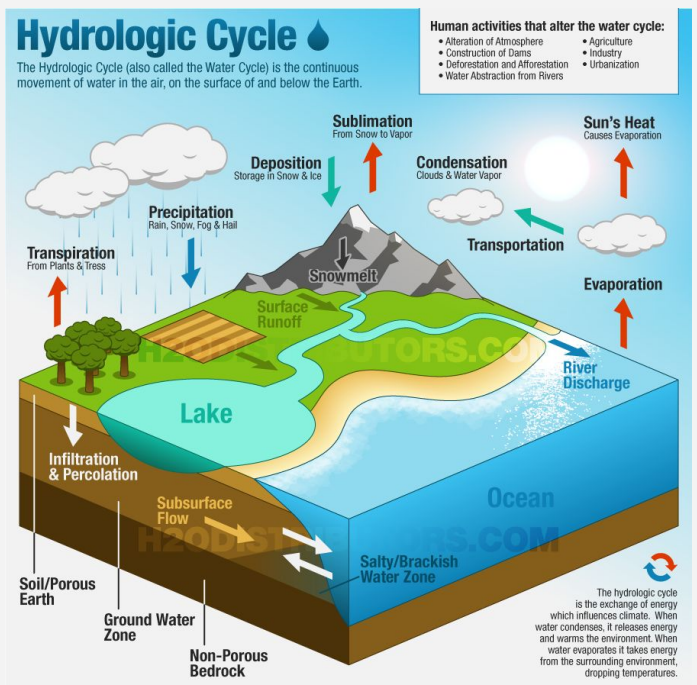
- ❑ Free of pathogenic agents
- ❑ Free of harmful chemical substances
- ❑ Pleasant to taste
- ❑ Usable for domestic purposes

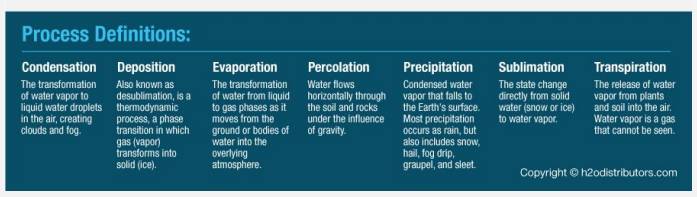
Sources of water:



- ◆ Wells, springs
- ◆ River, stream, lake

Volume of water on earth depends on hydrologic cycle:





Water pollution:

Water appears naturally with impurities (**not hazardous**)

- Dissolved gasses
  - (CO_2 , N, H_2S)
- Dissolved minerals
  - (Ca, Mg, Na)
- Suspended impurities
  - (Clay, sand, mud)

Pollution of water due to industrialization (**hazardous**)

- Sewage
- Toxic waste
- Agricultural pollutants (insecticide, fertilizers)
- Heat and radioactive materials

Water Sanitation and Availability

Water related diseases:

Biological causes:
- Viral, bacterial, protozoal, helminthic, snail(schistosoma), cyclopes

Chemical causes:
- Cyanides, dyes, heavy metals, bleaching agents(Used to disinfect water but too much is bad), ammonia
- Directly cause disease or indirectly (fish life)

Water purification:

Filtration | Storage | Disinfection

Depends on source:
➔ Wells and springs: only disinfection
➔ Surface water: needs more treatment

Water storage
- To preserve water from further contamination and pollution
- Provides a small amount of purification
  - Number of bacteria die out
  - Suspended impurities fall by gravity
  - Chemical composition changes (↓free ammonia, ↑nitrates)
- Must be stored within a certain period
  - Prolonged periods cause vegetable growth (algae)

Methods for disinfection:
1. Heat (boiling for 10-20 min kills most organisms and sterilizes water)
2. Chlorination (kills bacteria but not spores and viruses) most common one
3. Ozonation
4. Bleaching powder (chlorinated lime)
5. Bromination

Challenges with disinfection:
- Sterilization is impractical at a large scale (only feasible at homes)
- Chlorination is the most widely method used
- Organisms resistant to chlorination (E coli, salmonella, polio, HAV)
- Decision for disinfection method depends on:
  - Costs; availability of technology and method Like in developing countries
  - Target organism to get rid of
  - Ability to produce residual to provide post-treatment disinfection

Source: National Research Council (US) Safe Drinking Water Committee. Drinking Water and Health: Volume 2. Washington (DC): National Academies Press (US); 1980. II, The Disinfection of Drinking Water. Available from: https://www.ncbi.nlm.nih.gov/books/NBK234590/

Risk Assessment

What is risk assessment?

"Risk assessment in the process of estimating the potential impact of a chemical, physical, microbiological or psychosocial hazard on a specified human population or ecological system under a specific Set of condition and for a certain time frame."

In other words, we try to estimate the risk for exposure to a specific hazard in the environment, based on the several assumptions.

Environmental risk assessment involves assessing impacts of :

- Chemical pollutants and contaminants in air, water, soil and food
- Radiation sources
- Climate and climate change
- Pathogenic microbiological contaminants in food and water
- Electromagnetic fields (EMFs)

Things to keep in mind when attempting risk assessment

- ❖ Heavily relies on assumptions (not what really happens)
- ❖ Does not take into account the different interaction of environment with other factors
- ❖ Exposures and outcomes on which the risk assessment is based are poorly defined

Types of environmental risk assessment:

- Individual and population-based
- Quantitative and qualitative
- Categories of risk vs. numeric estimation

Risk Assessment

The *five* stages of environmental hazard risk assessment:

1 Issue Identification

- What is the problem in question?
- Can the problem be addressed by the proposed risk assessment?
- Do we have the technology and capabilities to apply the assessment process?
- Are there any factors that contribute to persistence of that risk?
- Did the risk come about as a breach in public health measures?

2 Hazard Identification

- How severe are the health effects? And are they reversible?
- Is there interaction between this hazard and other agents in the environment?
- Is the onset of the effect immediate or delayed after exposure to hazard?
- Is there a critical window for exposure?

3 Dose-response Relationship

- Does the exposure to the hazard exhibit a dose response relationship for the effect to appear?
- Is there a critical threshold for exposure? (cut-off point over which the effects will take place)
- For example viral load in which each unit of exposure increases the risk of outcome

4 Exposure Assessment

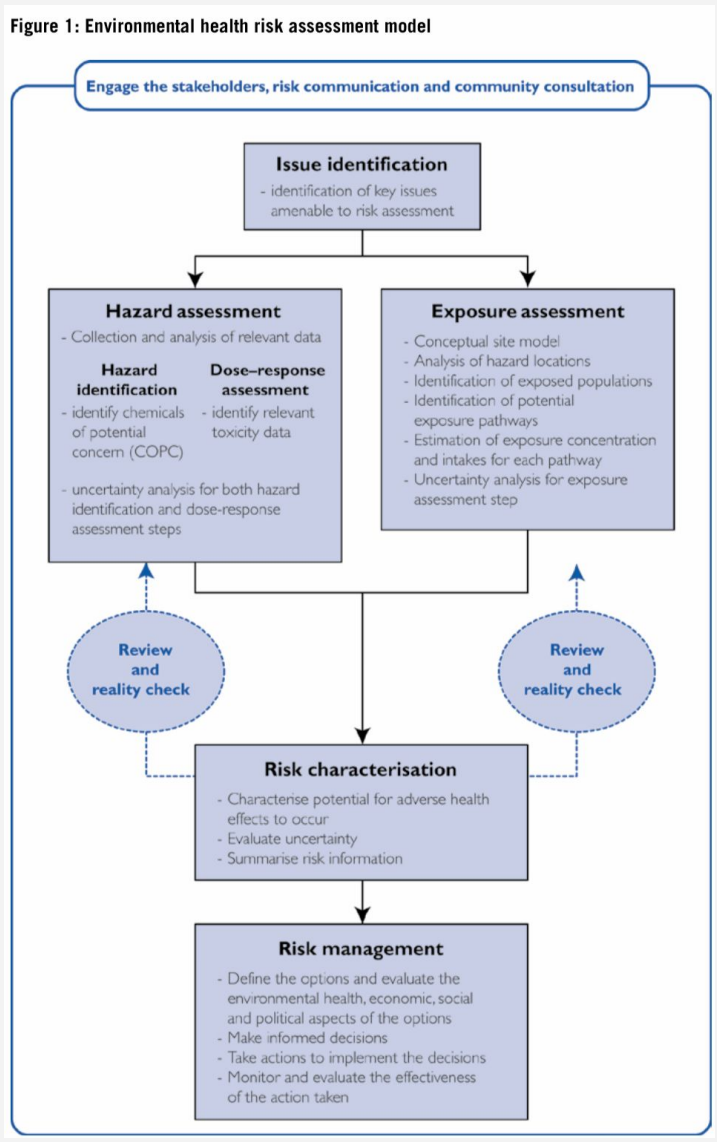
- What is the nature of exposure?
- Is there a specific frequency of exposure?
- Is there a latency period for exposure?
- Can the critical time of exposure be determined?
- (In order to be targeted for prevention and control measures)
- Has the route for exposure been identified? Is there more than one route?
- Is exposure one time, continuous or intermittent?

5 Risk Characterization

- Is there genetic variability in exposure to the hazard?
- Do personal characteristics play a role in exposure to hazard?
- Or do they play a role in the development of the health outcome following exposure to hazard?
- Should we consider any population characteristics or dynamics?

Risk Assessment

Important to Understand it



- Let's take an Example of Risk assessment model: **Stroke.**
- **First**: we will identify the risk factors(Exposure) which they are DM,HTN, Smoking and Hypercoagulable state.
- **Then** we will assess the hazard by seeing the mortality and morbidity (In thoses who were exposed and whom are not).
- **Then** you should make a plan to prevent this diseases by educating the Community about the disease

Prevention and control

Monitoring water

- Biological surveillance of water:
- Sanitary surveys
- Inspection of manufacturing of water bottles and ice
- inspection of reservoirs and wells †Establishing policies and procedures for extracting water from wells, and maintaining water safety and storing water

Monitoring air pollution

By monitoring the concentration of:

- Sulphur dioxide
- Smoke
- Suspended particles

The Importance of Risk assessment model or framework is to prevent or control an environmental hazard (which could be Chemical ,Biological like coron virus or Physical)

MCQs

1. Radiation is considered which of the environment components?
A. physical
B. chemical
C. biological
D. all of the above

2. Sulphur oxide is considered which type of pollutants?
A. secondary
B. primary
C. tertiary
D. all of the above

3. Which of the following causes pollution of water?
A. agricultural pollutants
B. radioactive materials
C. sewage
D. all of the above

4. Which of the following is chemical causes leading to water disease?
A. Helminthic
B. Protozoal
C. Cyclopes
D. Cyanides

5. Which of the following is method of disinfection?
A. Heat
B. Chlorination
C. Bromination
D. All of the above

1 - A
2 - B
3 - D
4 - D
5 - D