



Instructor:
Hamza Nasir

Climate Change: Impact on Occupational Health and Safety (OHS)

Occupational Health and Safety (CH161)

Ghulam Ishaq Khan Institute of Engineering Sciences & Technology



We will be discussing:

Introduction

- What is climate?
- What is climate change?
- Climate change: How do we know?
- Climate change: How does it affect us?

Key impacts of climate change on worker safety and health.

Climate change: Who is at risk?

Climate change: What needs to be done?

Introduction

- What is Climate?

Climate:

The climate in a narrow sense is usually defined as *the "average weather"*

(*Climate Change 2007: Working Group II: Impacts, Adaptation and Vulnerability , glossary*)



Weather refers to day-to-day temperature and precipitation activity

or

*“The statistical description in terms of **the mean and variability of relevant quantities over a period of time ranging from months to thousands of years.***

The classical period is 3 decades”.

(*The World Meteorological Organization (WMO)*)

Introduction

- What is climate change?



Climate change refers to any change in *climate* over time, whether due to natural variability or as a result of **human activity**.

(*Climate Change 2007: Working Group II: Impacts, Adaptation and Vulnerability, glossary*)

According to the ***United Nations Framework Convention on Climate Change (UNFCCC)***, climate change is defined as:

“A change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods”.



Q No. 7: What is climate change?

1.

Climate change refers to any change in *climate* over time, whether due to natural variability or as a result of **human activity**.

2.

“A change of climate which is attributed directly or indirectly to **human activity that alters the composition of the **global atmosphere** and which is in addition to natural climate variability observed over comparable time periods”.**

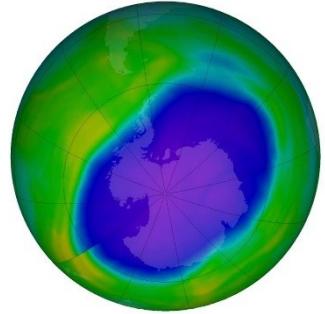
Climate Change: How do we know?

→ Global temperature rise (Global warming)

- Temperature has risen about **2.0 degrees Fahrenheit** (1.1 degrees Celsius) since the late 19th century, due to CO₂ emission.
↑
- Each of the last 3 decades has been successively **warmer** than any preceding decade since 1850.
- Most of the warming **occurred in the past 35 years**, with 16 of the 17 warmest years on record occurring since 2001.
- **2016** is the **warmest year** recorded.

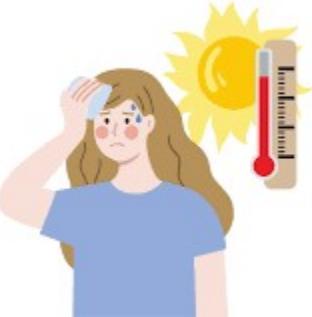


GLOBAL CLIMATE CHANGE
Vital Signs of the Planet



Key Impacts of Climate Change on Worker Safety and Health

1. Heat stress
2. Air pollution
3. Ozone depletion
4. Pests and pesticides
5. Infertile soil and fertilizers
6. Vector distribution and ecology
7. Major Industrial Accidents (MIA)





HEAT STRESS



REDUCED WORK HOURS

- Heat stress refers to heat received more than that which the body can tolerate without suffering physiological impairment.
- The rise in global temperatures will make heat stress more common.
- Heat stress have higher rates of:
 - Working poverty
 - Informal employment
 - Subsistence agriculture
 - Working hours reduction

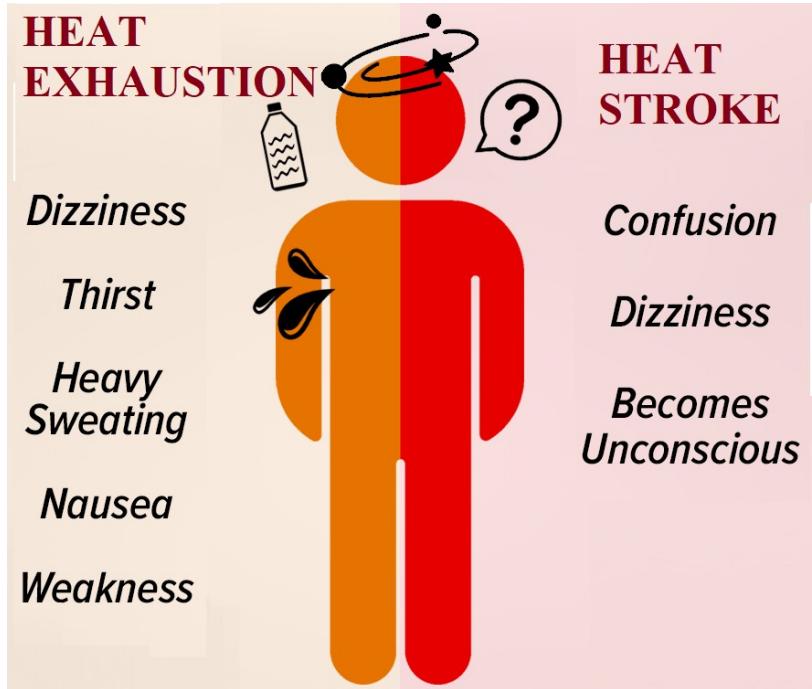


HEAT STRESS



IMPACT ON WORKER SAFETY AND HEALTH:

- Heat stress restricts a worker's physical functions and capabilities, work capacity and productivity.
- Excessive heat can increase OSH risks, impacting physical, as well as mental health.
- It can lead to heat stroke, heat exhaustion, heat cramps, heat rash and even death.
- It is also associated with changes in the way chemicals are processed by the body, which can worsen any toxic effects.



AIR POLLUTION

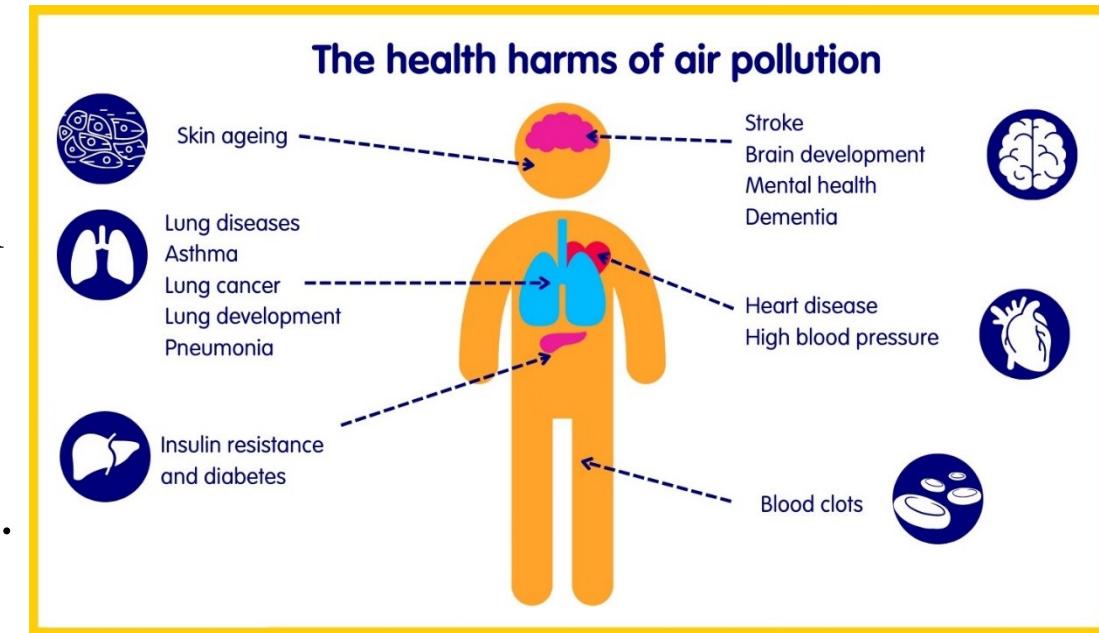
- Different air pollutants increase **global warming**, and it leads to the formation of **air pollutants**.
- Higher temperatures can lead to an increase in **ground-level ozone** or **smog**, and also **particulate matter**.
- Workers are impacted by **poor-quality air work environments**.
- The most common Pollutants present in the air include:
 - **Particulate matter**
 - **Ozone**
 - **NOx**
 - **SOx**
 - **CO** and **CO₂**



AIR POLLUTION

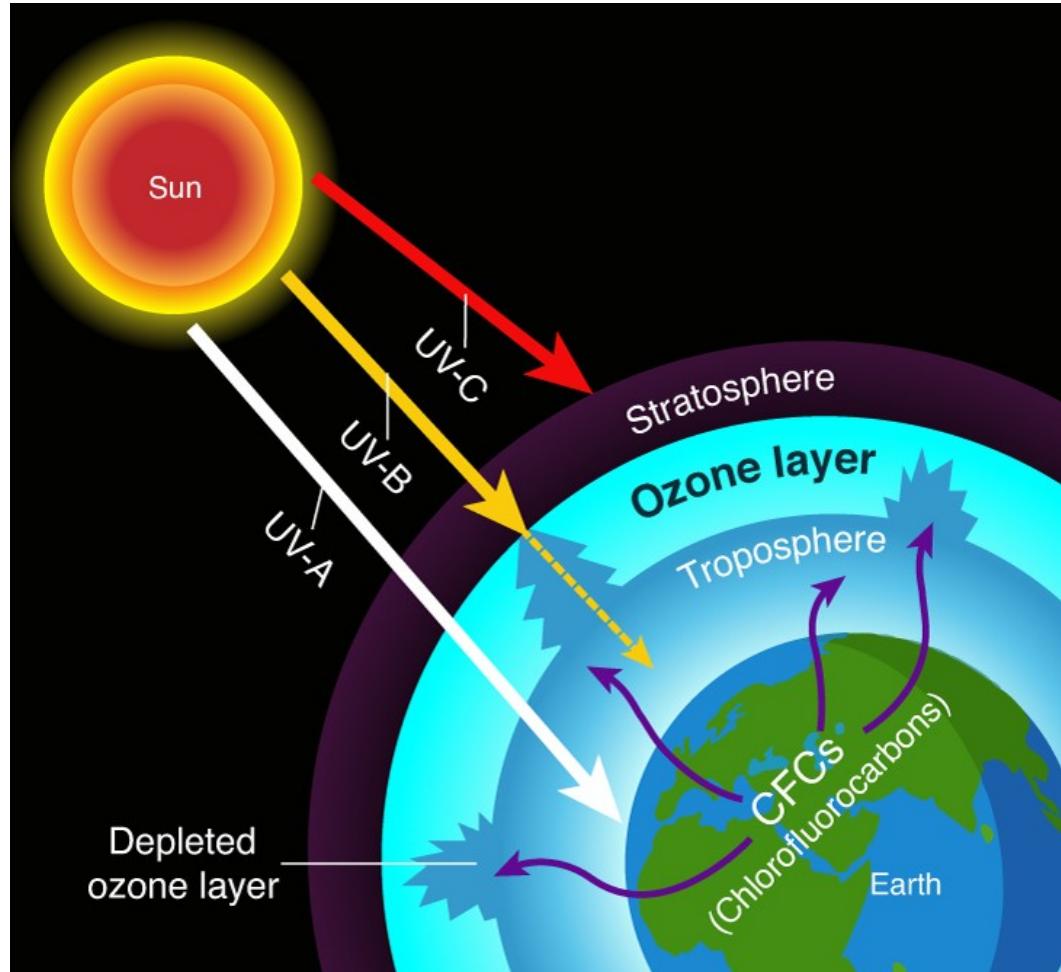
IMPACT ON WORKER SAFETY AND HEALTH

- 860,000 deaths a year can be attributed to occupational exposure to air pollutants, although the real magnitude is likely to be **much higher** (WHO 2018a).
- The IARC has classified air pollution, and particulate matter, as **carcinogenic** to humans and has found sufficient evidence that air pollution can cause **lung cancer** (IARC 2013a).
- For lung cancer alone, air pollution causes **223,000 deaths per year** worldwide (IARC 2013b).
- Air pollution has also been linked to **stroke**, heart disease and both **chronic and acute respiratory diseases**, including **asthma**.



OZONE DEPLETION

- The gradual thinning of Earth's ozone layer in the upper atmosphere is due to the release of chemical compounds containing gaseous chlorine or bromine, from industry and other activities of humans.



OZONE DEPLETION

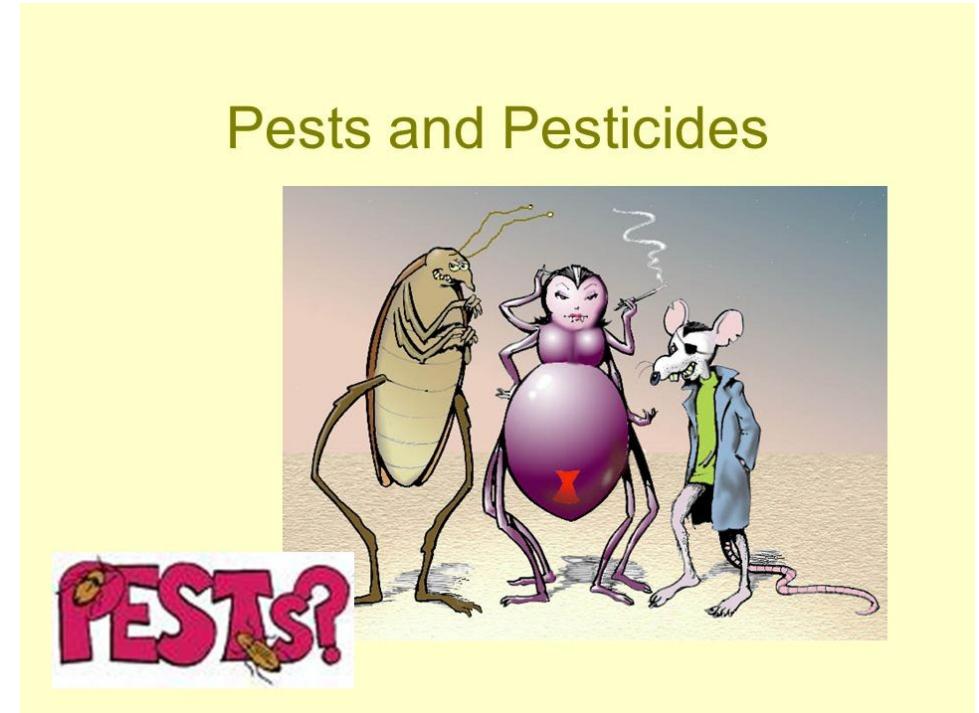
IMPACT ON WORKER SAFETY AND HEALTH

- Ozone depletion increases the amount of **ultraviolet (UV) radiation** that reaches Earth's surface.
- Outdoor construction workers can accumulate sufficient solar UV exposure over 30-40 years of work, to more than double their risk of **non-melanoma skin cancer**.
- Other high-risk occupations include **lifeguards, power utility workers, gardeners, postal workers and dock workers**, among others.



PESTS AND PESTICIDES

- Pesticides contribute, both directly and indirectly, to climate change.
- For example, **fossil fuels** are used in their production and transportation.
- Three main greenhouse gases are emitted during their production: **carbon dioxide, methane and nitrous oxide**.
- Pesticide use is directly impacted by **pesticide efficacy, crops and pest occurrence**, which are due to climate change.



PESTS AND PESTICIDES

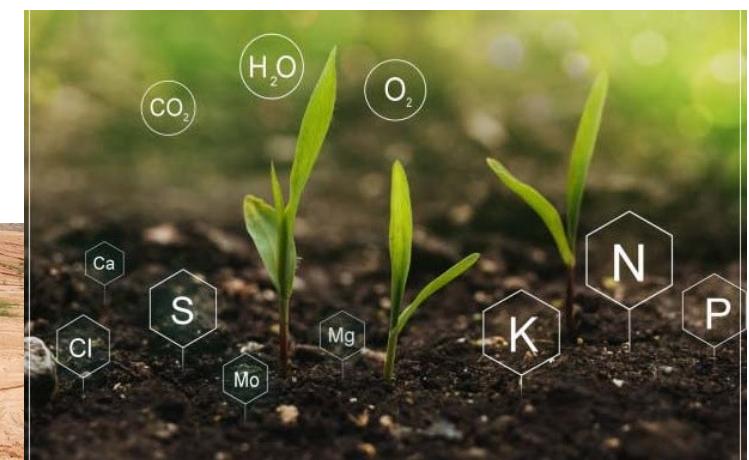
IMPACT ON WORKER SAFETY AND HEALTH

- WHO considers **HHPs** as a major public health concern (WHO 2019).
- Highly Hazardous Pesticides (**HHP**) use is associated with adverse health impacts in agricultural workers.
- Acute effects are related to **pesticide poisonings**, which occur commonly in developing economies where pesticides are often mislabeled.
- Other health impacts include **neurotoxic effects**, for example, **Parkinson's disease** and **Alzheimer's disease**, and **Endocrine disruption** (ILO 2021).



INFERTILE SOIL AND FERTILIZERS

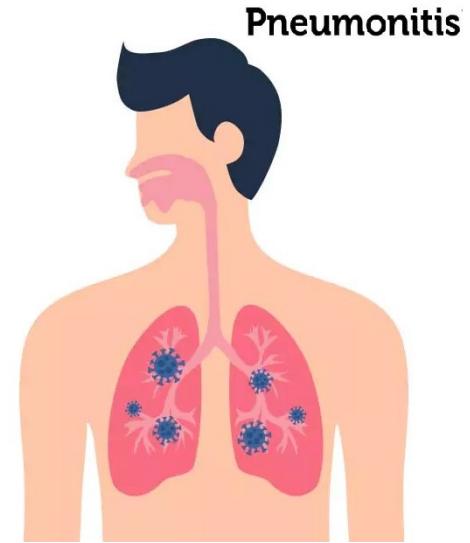
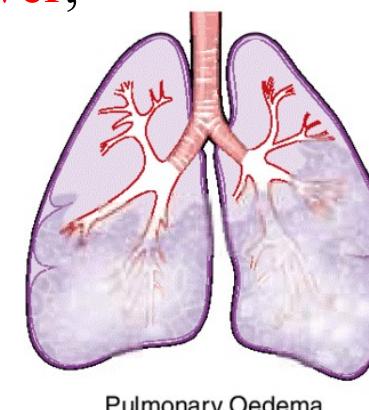
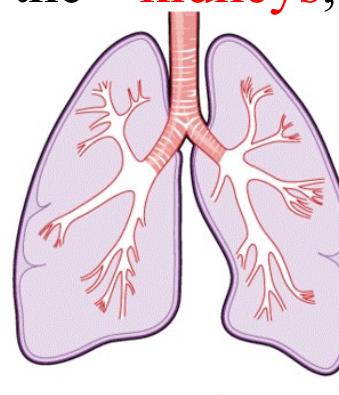
- Fertilizer use can impact climate change, and it can also affect **soil** and **water quality**.
- Increased precipitation due to climate change can cause **soil erosion**.
- It decrease essential **soil nutrients** such as **nitrogen** and **phosphorus**, which are essential for plant growth.
- Loss of **fertile soil** can exert pressure on agricultural workers to increase use of chemical fertilizers and other agrochemicals, impacting safety and health.



INFERTILE SOIL AND FERTILIZERS

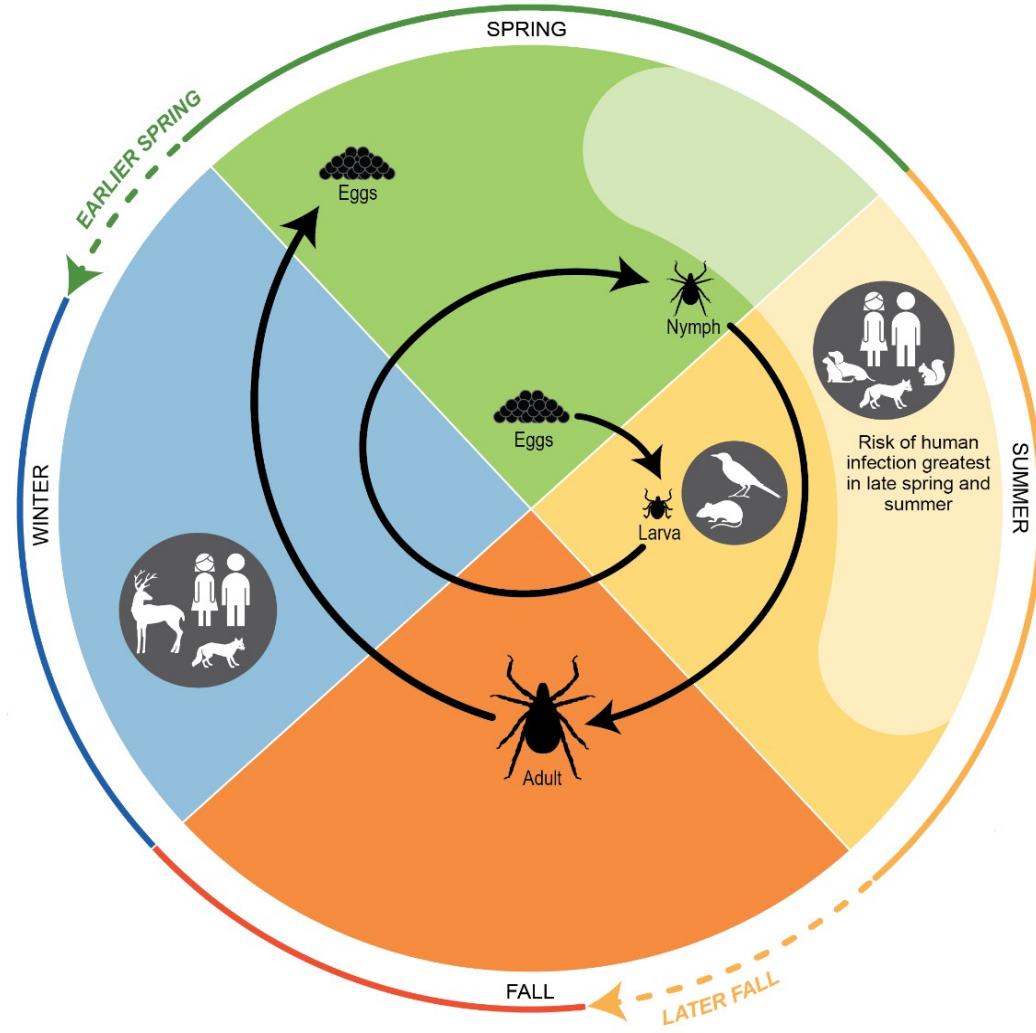
IMPACT ON WORKER SAFETY AND HEALTH

- Nitrogen-based fertilizers are made from ammonia, which can cause burns, laryngeal edema, pneumonitis and pulmonary edema, as well as permanent effects, including visual impairment and chronic pulmonary diseases (ILO 2022).
- White phosphorus, used in some artificial fertilizers, is extremely toxic to humans and can damage the kidneys, liver, cardiovascular system and central nervous system (EPA 2000).



VECTOR DISTRIBUTION AND ECOLOGY

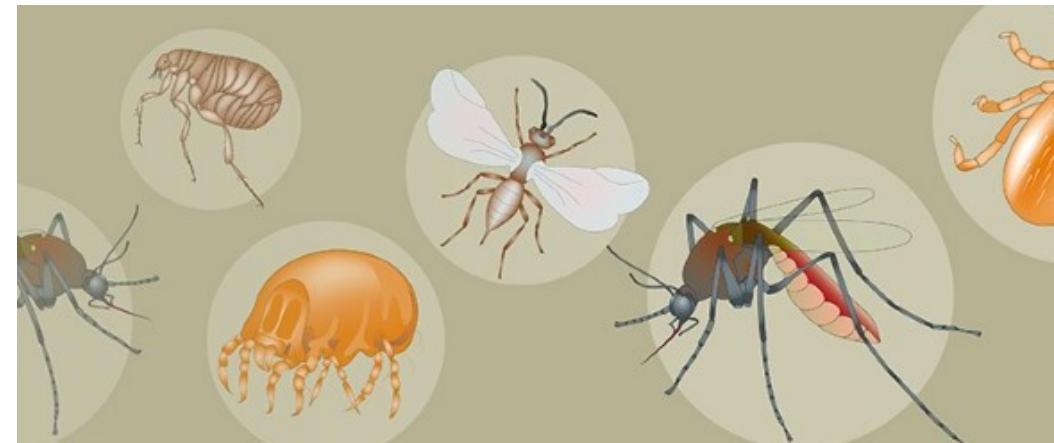
- Vector-borne diseases are responsible for more than 17% of all infectious diseases, causing more than **700,000 deaths** annually (WHO 2020).
- Changing climatic conditions i.e., **rainfall patterns, temperature** and **humidity**, can impact vector-borne disease transmission, by affecting survival rate of vectors.
- For Example, higher ambient temperatures is linked to expanded distribution of some vectors, such as **mosquitoes**, as increasing **reproduction rate, biting behaviour** and **survival**.



VECTOR DISTRIBUTION AND ECOLOGY

IMPACT ON WORKER SAFETY AND HEALTH

- Outdoor workers are mainly susceptible to vector-borne diseases, as they have the highest exposure to vectors such as **mosquitoes**, **ticks**, and **fleas**, that can transmit **parasites**, **viruses**, or **bacteria**.
- High risk sectors include **construction**, **landscaping**, **forestry**, **brush clearing**, **land surveying**, **farming**, **oil field** and **utility work**, **natural resources management**, and **firefighting**.



MAJOR INDUSTRIAL ACCIDENTS (MIA)

- MIA can occur in **major hazard installations**, such as **factories** or **extraction sites**, which use hazardous substances.
- They are events which occur outside the norms of the operation and include **fires**, **explosions** and uncontrolled **chemical releases**.
- Over the past decades, successive MIA caused by chemicals, have caused **deaths**, **injuries**, significant **environmental pollution** and massive **economic losses**.



MAJOR INDUSTRIAL ACCIDENTS (MIA)

IMPACT ON WORKER SAFETY AND HEALTH

- Acute exposure to toxic chemicals can result in local injury, such as skin burns from corrosive agents or systemic damage affecting the entire physiological system, as seen in cases of mercury poisoning.
- If large quantities of hazardous chemicals are released, they have the potential to kill or injure people who are far away from the plant.
- Chlorine and ammonia, commonly utilized in major quantities, both have a history of major accidents.
- Workers may face exposure to toxic fumes during fires.
- Explosions can lead to workers being blown over, knocked down, buried under collapsed structures, or injured by flying glass.

How does climate change affect us?



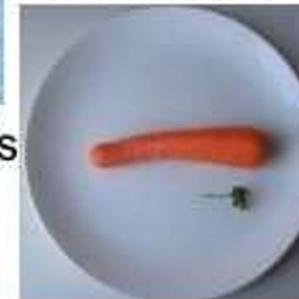
Droughts and Floods



Many animals and plants disappear

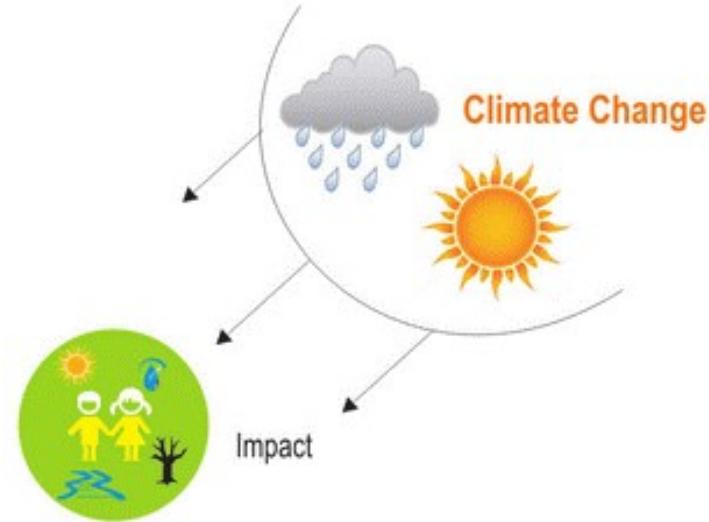


Melting ice & rising sea levels



More tropical diseases (dengue, malaria)





Direct Impacts

Thermal stress

Increased deaths due
to increased floods,
droughts and storms

Indirect Impacts

Food availability and
quality

Air Quality

Water availability and
quality

Vector and water-
borne diseases

Climate Change: WHO IS AT RISK??

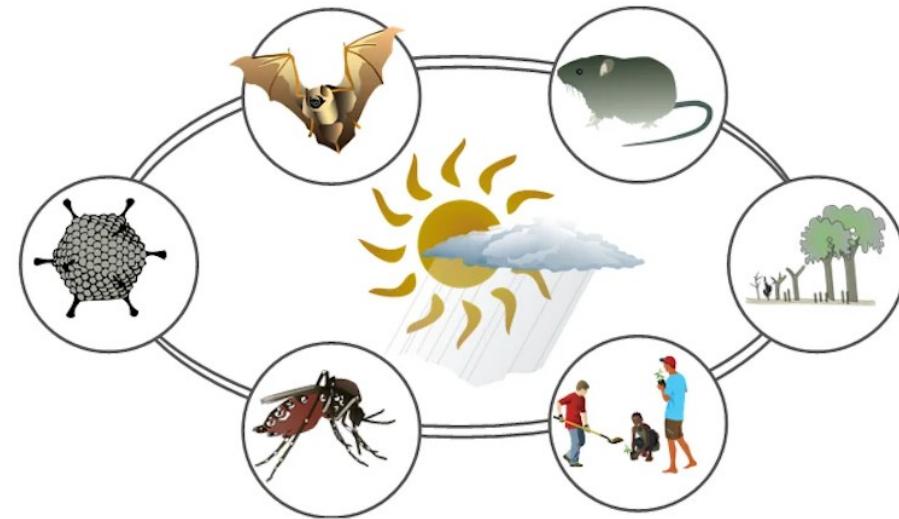
WORLD!

- Lack of safe water supply, sanitation, and poor hygiene increases the risk of diarrheal disease, causing over 500,000 deaths annually in children under 5 years.
- Rising temperatures and variable precipitation contribute to malnutrition, resulting in 3.1 million deaths each year.
- Urban air pollution claims the lives of approximately 800,000 people.
- Malaria causes over 400,000 deaths annually, primarily among African children under 5 years.



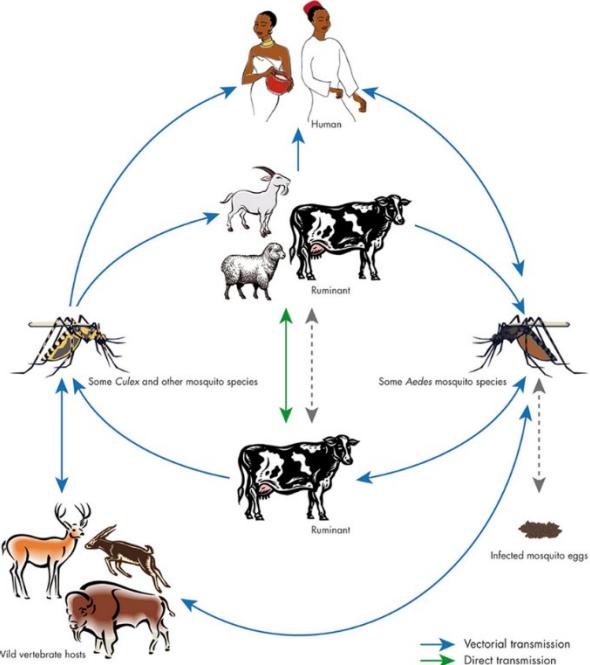
Climate Change: WHO IS AT RISK??

- Climate change leads to increased migration and is projected to cause approximately **250,000 additional deaths** annually between 2030 and 2050.
- 90% of the burden of **malaria** and **diarrhea**, as well as nearly all diseases associated with **under-nutrition**, are borne by children aged **5 years or less**, mainly in developing countries.
- **Climate-sensitive diseases** impose an enormous burden on child health.
- Arctic ice melting: drives **extreme weather** affecting hundreds of millions across **North America, Europe, and Asia**.



Climate Change: WHO IS AT RISK??

- Australia Wildfires August and November 2013: Australia has just experienced its **hottest 12 months** on record.
- European heat wave in **2003**: resulted in approximately **70,000 additional deaths** that summer.
- Rift Valley fever outbreaks in Africa: are typically associated with rains.
- Hurricane Katrina, **2005** led to over **1800 deaths** and **displaced thousands**.
- Malaria in the East African highlands: over the last 30 years, warmer temperatures have also created more favorable conditions for **mosquito** populations.



Climate Change: WHO IS AT RISK??

- Epidemics of cholera in Bangladesh: are closely linked to flooding and unsafe water.
- Russia Drought: 2012 drought – following the severe drought of 2010 – led to crop losses in 22 regions.
- Pakistan Floods August 2013: affected up to one-fifth of the country, impacting an estimated 20 million people.
- Philippines Typhoon: is the strongest tropical cyclone in history, affecting 11.3 million people and displacing over 700,000.
- Fukushima Nuclear Accident: while not a natural disaster, is a significant disaster.



WHAT NEEDS TO BE DONE?

- Putting health at the heart of climate change agenda.
- Strengthening **public health systems**.
- Choosing healthy paths to a **low-carbon future**.
- Mobilizing the strength of the health community.
- Implementing collaborative and responsive **health care**.
- Promoting **Public education**, including in health-care settings such as clinics, and hospitals.
- Establishing **Preventive program**: e.g., vaccines, mosquito control, food hygiene and inspection, and nutritional supplementation.



WHAT NEEDS TO BE DONE?

- Provision of health care (especially mental health promotion and primary care) for communities affected by environmental adversity.
- Surveillance of disease, especially infectious diseases, and environmental, social, and biological risk factors for those diseases.
- Health sector workforce training (primary and specialty care) to attune to climate-related health risks.
- Education and mass media campaigns strong enough to spark commitment and action among governments, international organizations, donors, etc.
- Forecasting future health risks from projected climate change.



WHAT NEEDS TO BE DONE?



- Creation of awareness and public understanding of the global and locally relevant health consequences of climate change.
- Advocacy for interdisciplinary and intersectoral partnerships from the local to international level.
- Improved water catchments in water-deprived regions.
- Disaster preparedness across sectors.
- Enhanced urban planning: green space and green city.
- Penalties for violations of laws regarding environment protection must be imposed according to the income status of the person/industry/company.





Thank you !