



GW & CC

Unit 3

Climate change impact in various sector

S3 & S4

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Unit 3 - Climate change impact in various sector

S3

- Socio economic impact – tourism
- Industries and business

S4

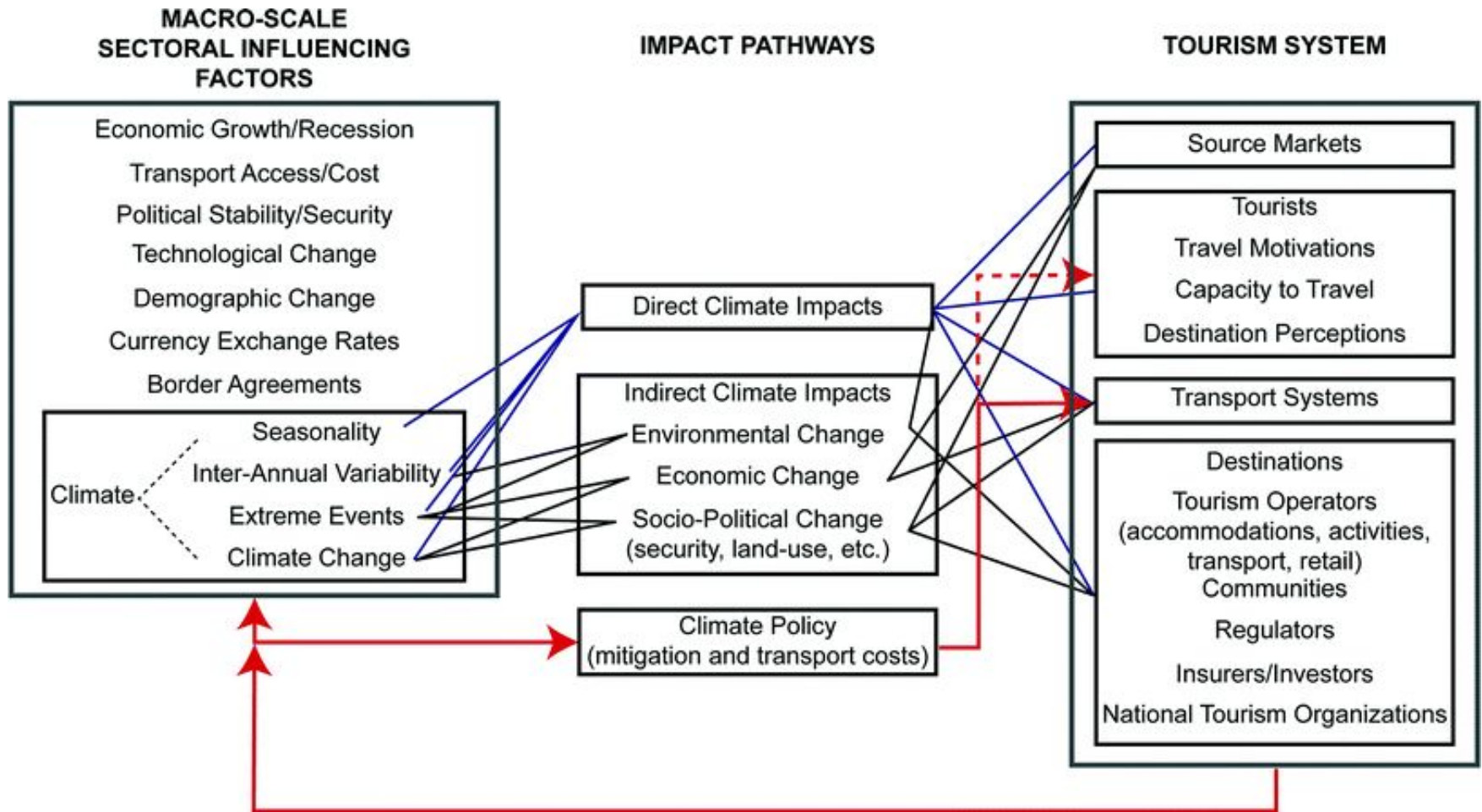
- Acid rain and human health impact
- Sea surface temperature increases and aquatic organisms impact

Unit 3 Climate change impact in various sector

– S3.1

SOCIO ECONOMIC IMPACT – TOURISM

Socio economic impact – tourism



Impact of Climate Change on Tourism

- The tourism sector depends heavily on a natural and cultural heritage.
- The tourism sector is highly climate sensitive as climate defines the length and quality of tourism seasons, affects tourism operations, and influences environmental conditions that both attract and deter visitors.
- Tourists will quickly switch their choice of destination when the results of climate change impact on their enjoyment.
- Generating more than USD 6 trillion in revenue each year and providing livelihoods to more than 255 million people, the tourism sector is particularly important for some of the world's poorest countries.

Impact of Climate Change on Tourism

Subsectors at risk include:

- Mountain and Snow tourism
- Forest and Lake tourism
- Biodiversity and Agricultural tourism
- Cities and Urban Centre tourism
- Beach and Coastal tourism
- Ocean and Sea Life tourism

Impact of Climate Change on Tourism

Operational level impacts will include:

- Reduced water availability could lead to disputes with local industry and communities
- Extreme weather events will increase operational uncertainty, particularly in poorer countries
- Expensive or unavailable insurance in areas exposed to extreme weather or sea-level rise
- Efforts to cut emissions may add costs to the industry, particularly from transport emissions

Some impacts of climate change in



<http://www.theatlantic.com/infocus/2011/10/bangkok-underwater/100178/#img10>



<http://daily.bangkokbiznews.com/gallery/2011011>

<http://61.19.55.253/mcrd/?p=83>



Destroyed infrastructure and beaches in Thailand



Flooding beaches in Chennai



Coral reef



Impact on Society

- As a society, we have structured our day-to-day lives around historical and current climate conditions.
- We are accustomed to a normal RANGE of conditions and may be sensitive to extremes that fall outside of this range.

- Climate change could affect our society through impacts on a number of different social, cultural, and NATURAL RESOURCES.
- For example, climate change could affect human health, infrastructure, and transportation systems, as well as energy, food, and water supplies.

impact on society

- Some groups of people will likely face greater challenges than others.
- Climate change may especially impact people who live in areas that are vulnerable to COASTAL storms, drought, and sea LEVEL rise or people who are poor.
- Some types of professions and industries may face considerable challenges from climate change.
- Professions that are closely linked to weather and climate, such as outdoor tourism and agriculture, will likely be especially affected.

- Projected climate change will affect certain groups of people more than others, depending on where they live and their ability to cope with different climate hazards.
- In some cases, the impacts of climate change would worsen EXISTING vulnerabilities.
- People who live in poverty may have a difficult time coping with changes.
- These people have limited financial resources to cope with heat, relocate or evacuate or respond to increases in the cost of food.

- Climate change may make it harder and more expensive for many people to insure their homes, businesses, or other valuable assets in risk-prone areas.
- Insurance is one of the primary mechanisms used to PROTECT people against weather-related disasters
- Climate change will also likely affect tourism and recreational ACTIVITIES.

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INDUSTRIES AND BUSINESS

INDUSTRIES AND BUSINESS

- Climate change will have an impact on both industrial raw material supplies and processes.
- Although the greatest effect will most likely be via global MARKET development, climate change can have notable impacts to those industrial sectors in India whose raw materials are heavily dependent on weather and other changes in the natural environment.

- As discussed earlier most of the supplies coming from forests, agriculture and livestock would be heavily hampered due to climate change.
- This could in turn affect industries and pose a problem in procurement of raw materials.

- Climate change can produce new challenges to the CONSTRUCTION industry when changing weather conditions demand the implementation of new type of construction materials and plants.
- For example, the changing damp conditions, frequency of storms and thawing of ground frost require attention.
- Basic work during the winter may become easier due to warmer weather, although rainy weather increases the risk of damage to the structures and increases drying costs.

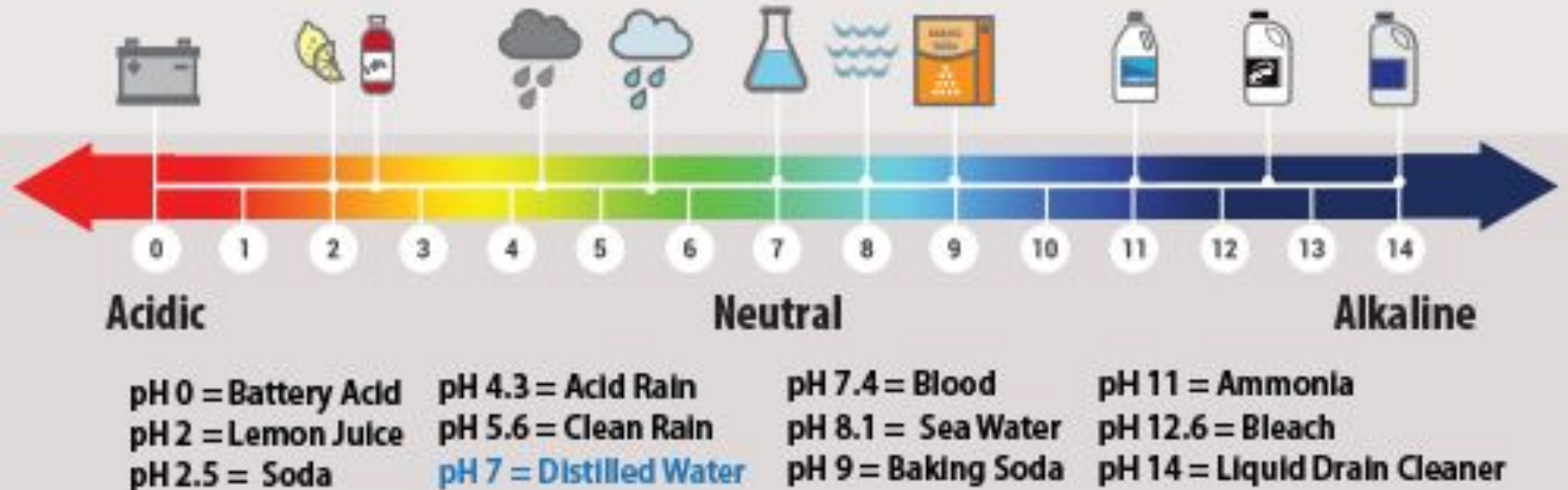
- Climate change would severely affect the infrastructure and transportation systems hereby compromising with the logistics and supply chain of the industry.
- Changes in temperature, precipitation, sea level, and the frequency and severity of extreme events will likely affect how much energy is produced, delivered, and consumed

- Water impacts due to climate change can drastically affect the industry.
- Power plants can require large amounts of water for cooling.
- It will also increase the electricity consumption.
- Growing crops for biomass and biofuel energy could stress water resources in certain regions, depending on the type of crop, where it is grown, agricultural production in the region, and current water and nutrient management practices.

- Rising temperatures, increased evaporation, and drought may increase the need for energy-intensive methods of providing drinking and irrigation water.
- For example, desalinization plants can convert salt water into freshwater, but consume a lot of energy.

- Flooding and intense storms can damage power lines and electricity distribution equipment.
- These events may also delay repair and maintenance work.
- Electricity outages can have serious impacts on other energy systems as well.
- Climate change could impact wind and solar power, but there is little research in this area.
- Impacts will depend on how wind and cloud cover patterns change, which are very difficult to project using current climate models.

The pH Scale

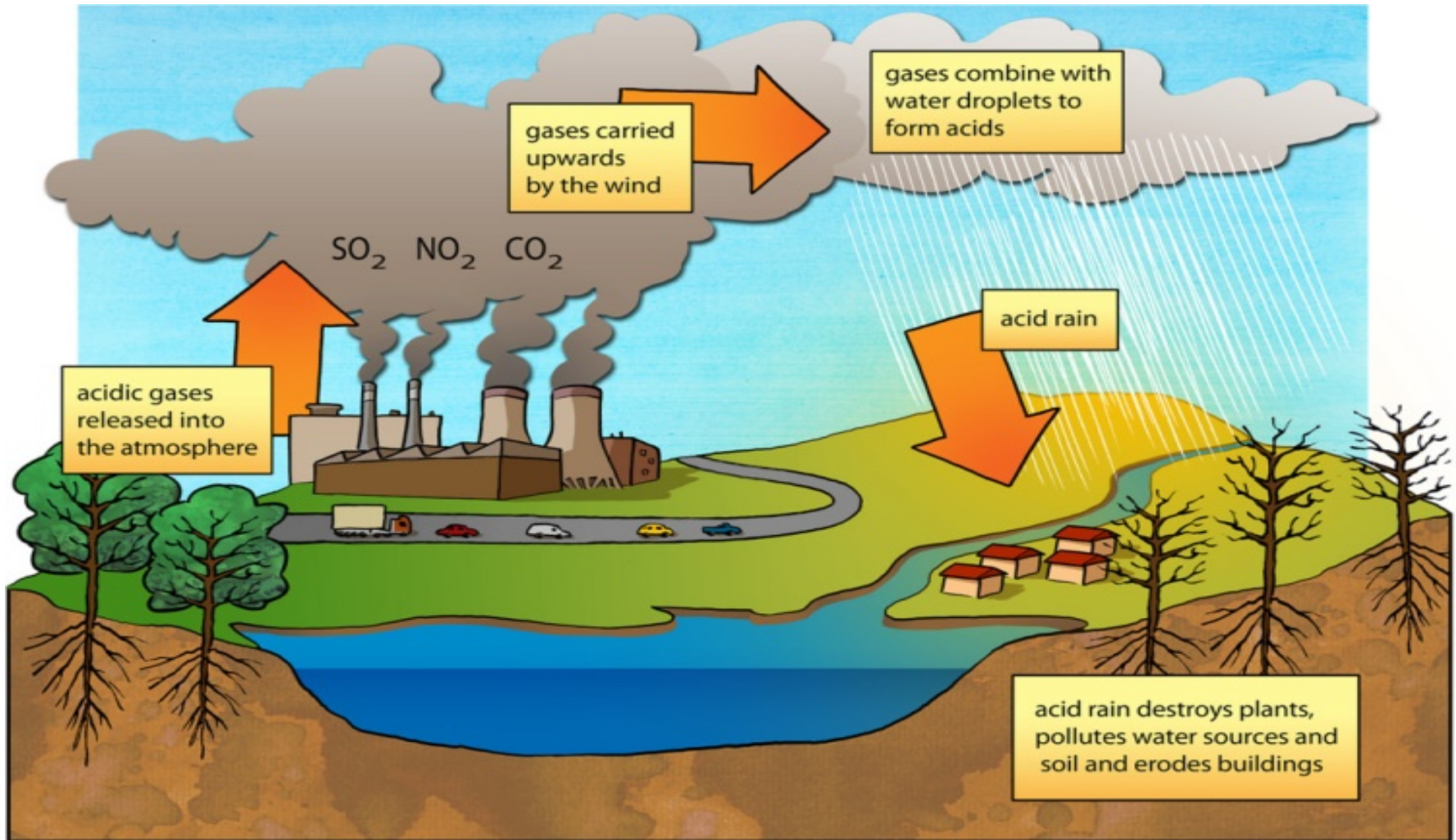


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ACID RAIN AND HUMAN HEALTH IMPACT

Acid rain



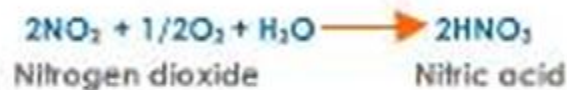
Acid rain

- Climate change and acid rain are closely associated, so much so that acid rain's impacts need to be part of climate change studies.
- Acid rain really has left a legacy in terms of how it has changed our systems.
- Acid rain is caused by air pollutants, mostly **nitrogen oxides and sulfur dioxide**, which are produced by power plants and gasoline-powered vehicles.
- Most rain is slightly acidic, but these pollutants can make rain much more acidic (to a pH of 4 -- neutral pH is 7).
- Acid rain has many ecological effects, especially on lakes, streams, wetlands, and other aquatic environments.
- Acid rain makes such waters more acidic, which results in more aluminum absorption from soil, which is carried into lakes and streams. ... Trees' leaves and needles are also harmed by acids.

Sun's Energy
Photochemical
reactions are
driven by
the sun

Wind

Oxidation



Acid Rain

Acid-forming gases and particles have been linked to a variety of impacts, including forest decline, accelerated leaching of metals from rocks and soils, the decay of limestone, marble and other building materials, and damage to the human respiratory system

What Causes Acid Rain?

- Acid rain results when **sulfur dioxide (SO_2)** and **nitrogen oxides (NO_x)** are emitted into the atmosphere and transported by wind and air currents. The SO_2 and NO_x react with water, oxygen and other chemicals to form sulfuric and nitric acids. These then mix with water and other materials before falling to the ground.
- While a small portion of the SO_2 and NO_x that cause acid rain is from natural sources such as volcanoes, most of it comes from the burning of fossil fuels. The major sources of SO_2 and NO_x in the atmosphere are:
 - Burning of fossil fuels to generate electricity. Two thirds of SO_2 and one fourth of NO_x in the atmosphere come from electric power generators.
 - Vehicles and heavy equipment.
 - Manufacturing, oil refineries and other industries.
- Winds can blow SO_2 and NO_x over long distances and across borders making acid rain a problem for everyone and not just those who live close to these sources.

Acid Rain

Causes

- Natural Causes
- Electricity generation
- Vehicles
- Agriculture
- Industrial processes and consumption levels

Effects

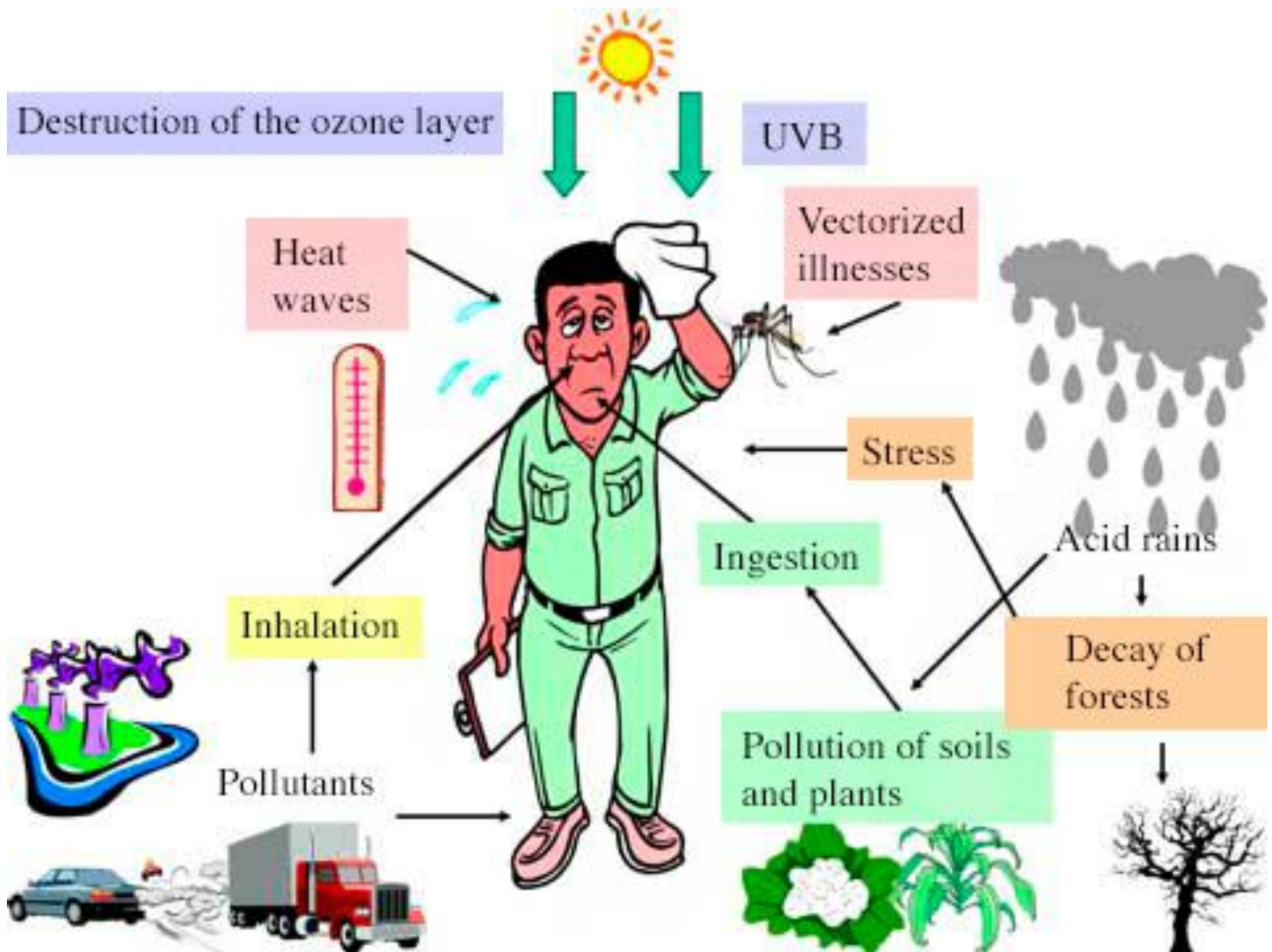
- Effects on aquatic environments
- Effects on animals and plants
- Effects on forests
- Effects on global warming
- Effects on soil
- Effects on vegetation cover
- Effects on buildings
- Effects on health

Solutions

- Optimize fossil energy processes
- Transition to renewable energies
- Confine the use of fertilizers and pesticides
- Restoring environments
- Save energy
- Reduce consumption levels
- Convince others
- Education
- Government regulations

Human health impact

- Weather and climate play a significant role in people's health. Changes in climate affect the average weather conditions that we are accustomed to.
- Warmer average temperatures will likely lead to hotter days and more frequent and longer heat waves which could increase the number of heat related illness and deaths



HUMAN HEALTH IMPACT

- Increases in the frequency or severity of extreme weather events such as storms could increase the risk of dangerous flooding, high winds, and other direct threats to people and property.
- Warmer temperatures could increase the concentrations of unhealthy air and water pollutants.

- Heat waves can lead to heat stroke and dehydration, and are the most common cause of weather-related deaths. Young children, older adults, people with medical conditions, and the poor are more vulnerable than others to heat-related illness.

- Climate change could lead to extreme weather events which would reduce the availability of fresh food and water;
- Interrupt communication, utility, and health care services;
- Contribute to carbon monoxide poisoning from portable electric generators used during and after storms;
- Increase stomach and intestinal illness among evacuees & Contribute to mental health impacts such as depression and post-traumatic stress disorder (PTSD).
- Climate change could lead to reduced air quality caused due to increases in Ozone, changes in Fine Particulate Matter and changes in allergen.

- Changes in temperature, precipitation patterns, and extreme events could enhance the spread of some diseases.
- These include food borne diseases
 - caused due to rapid growth of bacteria in warm environments and contamination of crops due to overflow
- water-borne diseases
 - caused due to increase in water-borne parasites like Giardia caused due to flooding and storm water runoff
- Animal borne diseases
 - caused due to changes in air temperatures

Every year foodborne diseases cause:

almost
 **in 10**
people to fall ill

33 million
healthy life years lost

Foodborne diseases can be deadly, especially in children <5


420 000
deaths



Children account for
almost **1/3**
of deaths from
foodborne diseases

For more information: www.who.int/foodsafety

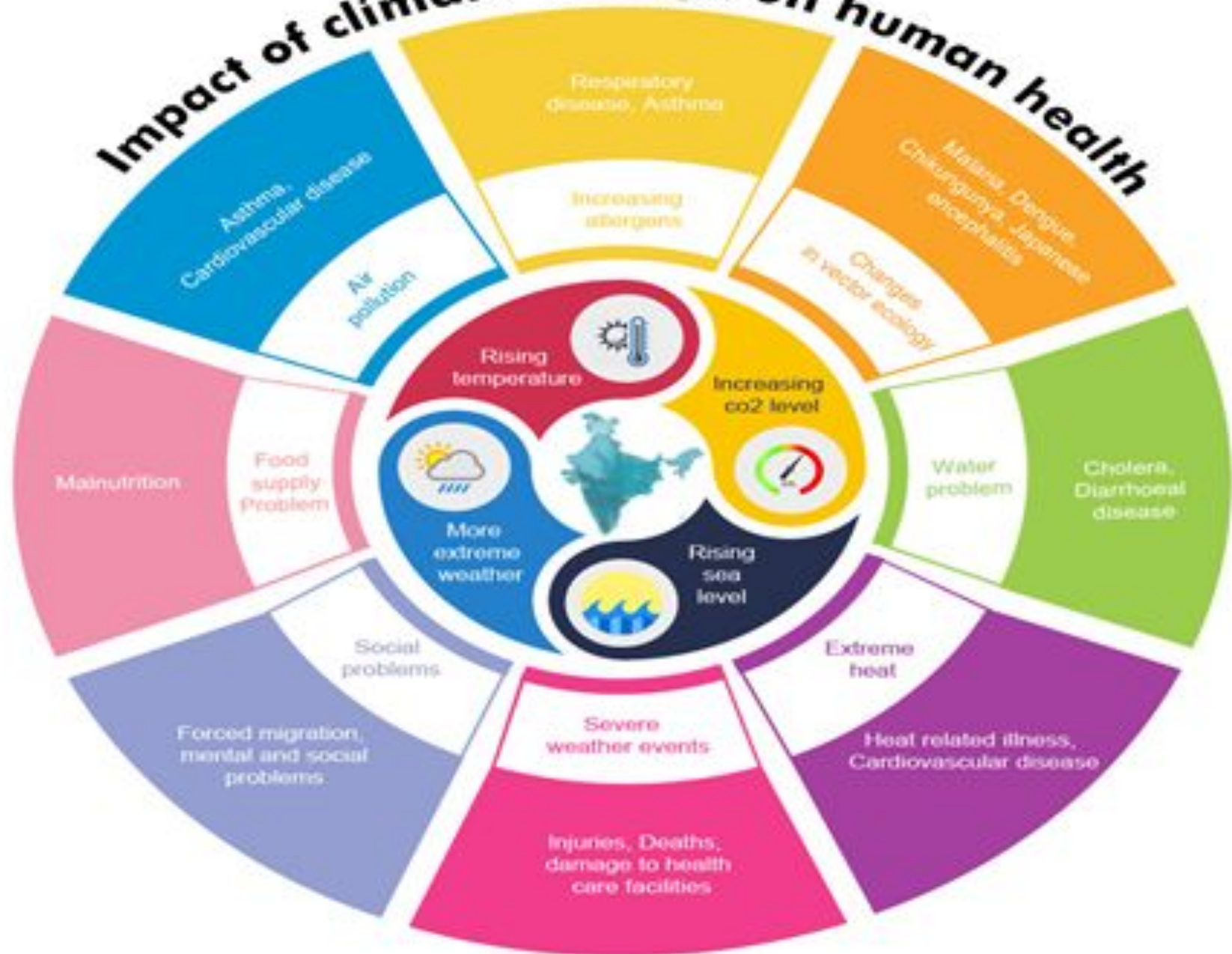
#SafeFood

Source: WHO Estimates of the Global Burden of Foodborne Diseases, 2015.



**World Health
Organization**

Impact of climate change on human health



Farm to Table

The Potential Interactions of Rising CO₂ and Climate Change on Food Quality and Safety



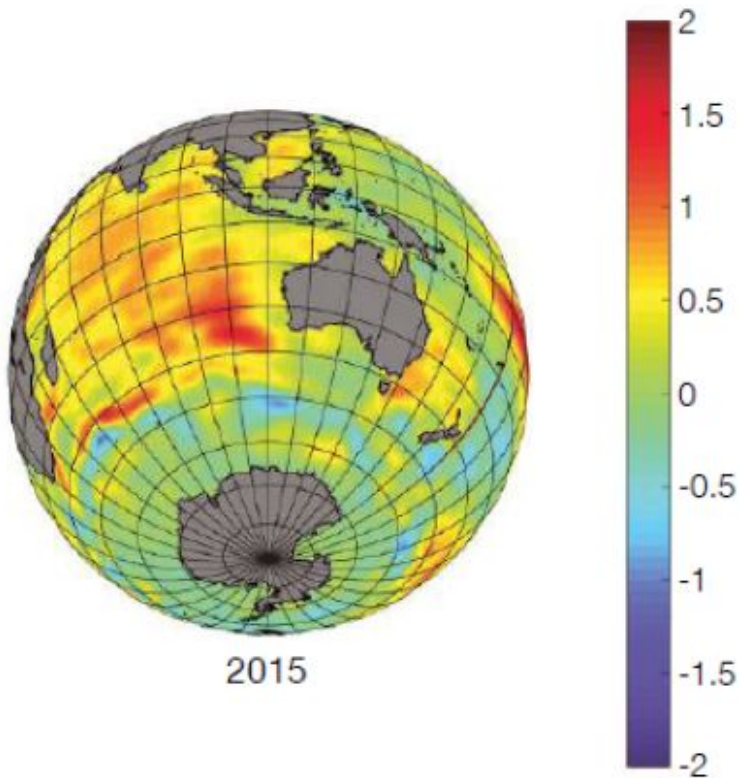
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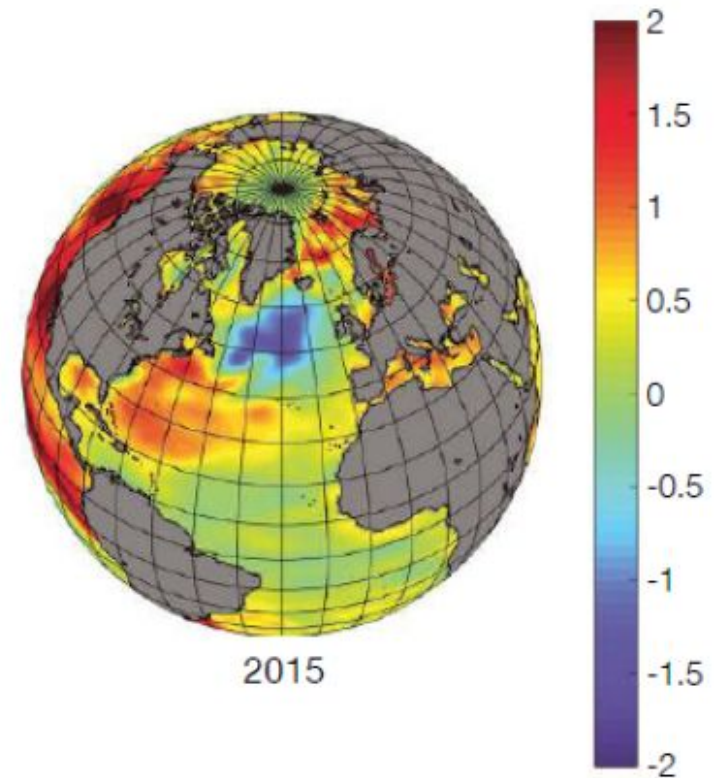
SEA SURFACE TEMPERATURE INCREASES AND AQUATIC ORGANISMS IMPACT

- The ocean absorbs vast quantities of heat as a result of increased concentrations of greenhouse gases in the atmosphere, mainly from fossil fuel consumption.
- The Fifth Assessment Report published by the Intergovernmental Panel on Climate Change (IPCC) in 2013 revealed that the ocean had absorbed more than 93% of the excess heat from greenhouse gas emissions since the 1970s. This is causing ocean temperatures to rise.

SST anomalies Southern Ocean 2015



SST anomalies North Atlantic Ocean 2015




The distribution of excess heat in the ocean is not uniform, with the greatest ocean warming occurring in the Southern Hemisphere and contributing to the **subsurface melting of Antarctic** ice shelves.

- The ocean's ability to absorb excess heat has shielded humans from even more rapid changes in climate. Without this oceanic buffer, global temperatures would have risen much more than they have done to date.
- IPCC's Fourth Assessment Report published in 2007 estimated that the Earth had experienced a warming of 0.55°C since the 1970s.
- According to an analysis by the Grantham Institute, if the same amount of heat that has gone into the top 2,000 m of the ocean between 1955 and 2010 had gone into the lower 10 km of the atmosphere, the Earth would have seen a warming of 36°C.

Why is it important ?

- Ocean warming leads to de-oxygenation – a reduction in the amount of oxygen dissolved in the ocean – and sea-level rise – resulting from the thermal expansion of sea water and continental ice melting.
- The rising temperatures,
 - coupled with ocean acidification (the decrease in pH of the ocean due to its uptake of CO₂)
 - affect marine species and ecosystems and, consequently
 - the fundamental benefits humans derive from the ocean.


Earth's energy imbalance  < 


Atmospheric temperature 

Atmospheric moisture 


E - P Extreme events 

Snow cover, glaciers 

Global surface temperature 


Flooding 

Land ice 

Drought 

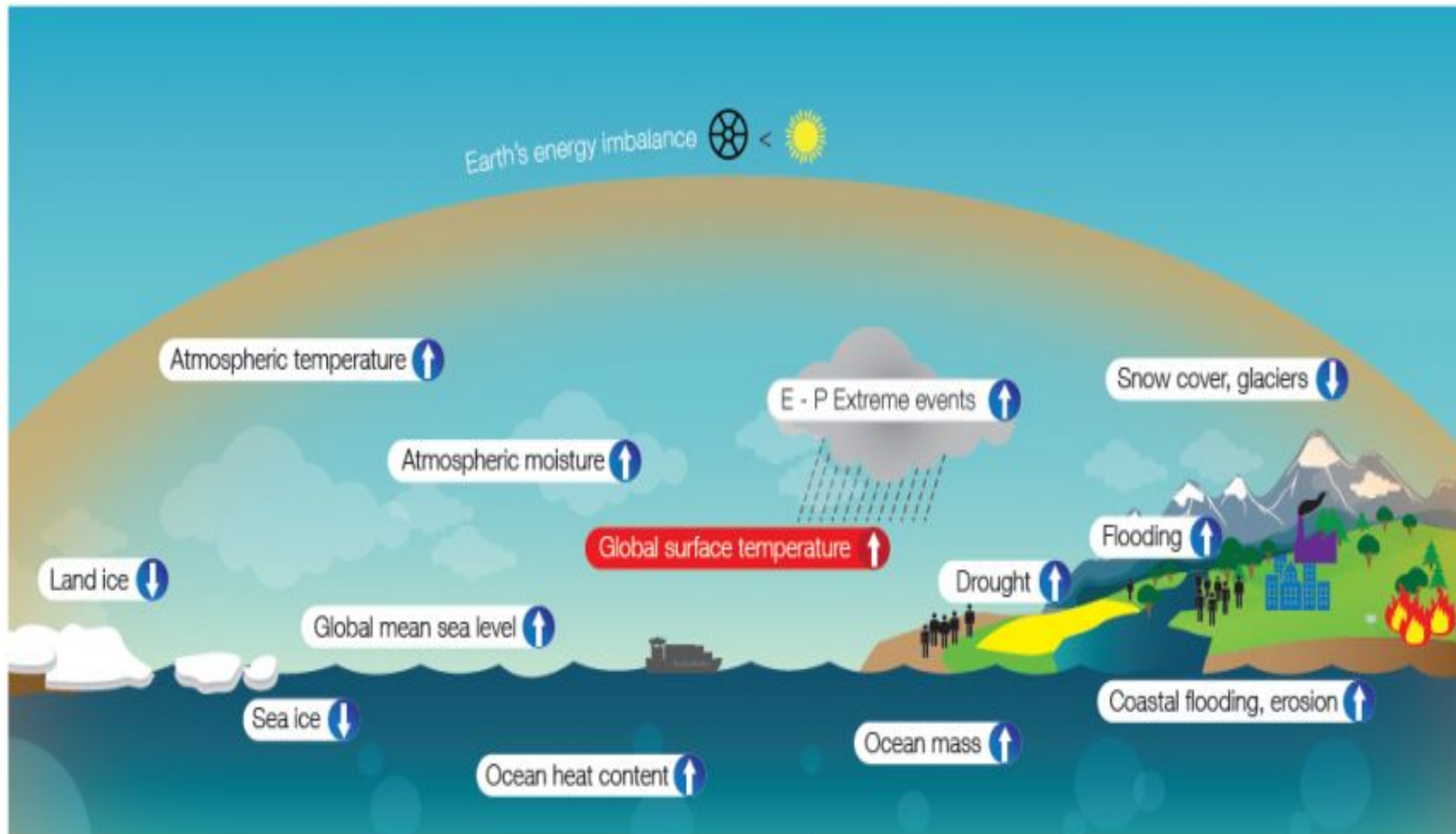
Global mean sea level 

Coastal flooding, erosion 

Sea ice 

Ocean mass 

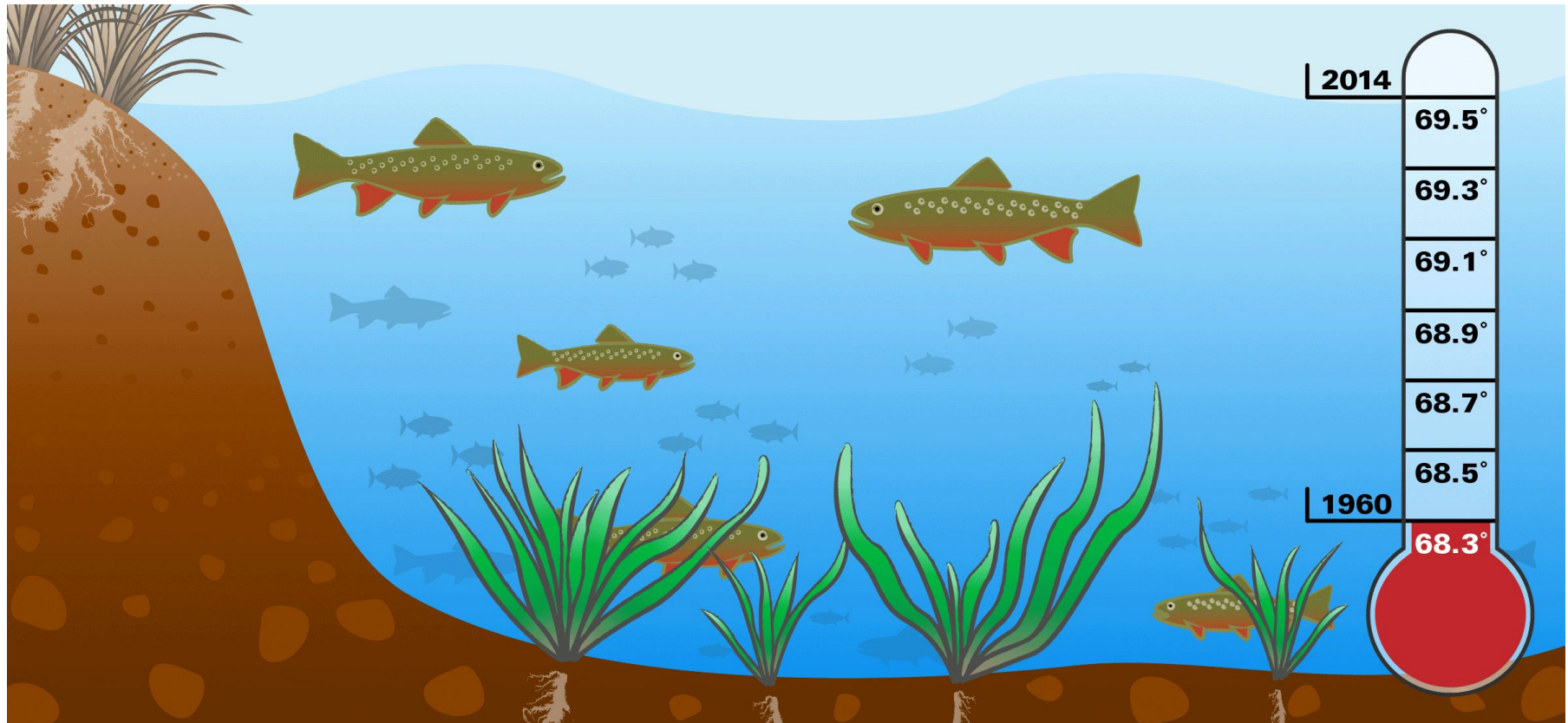
Ocean heat content 

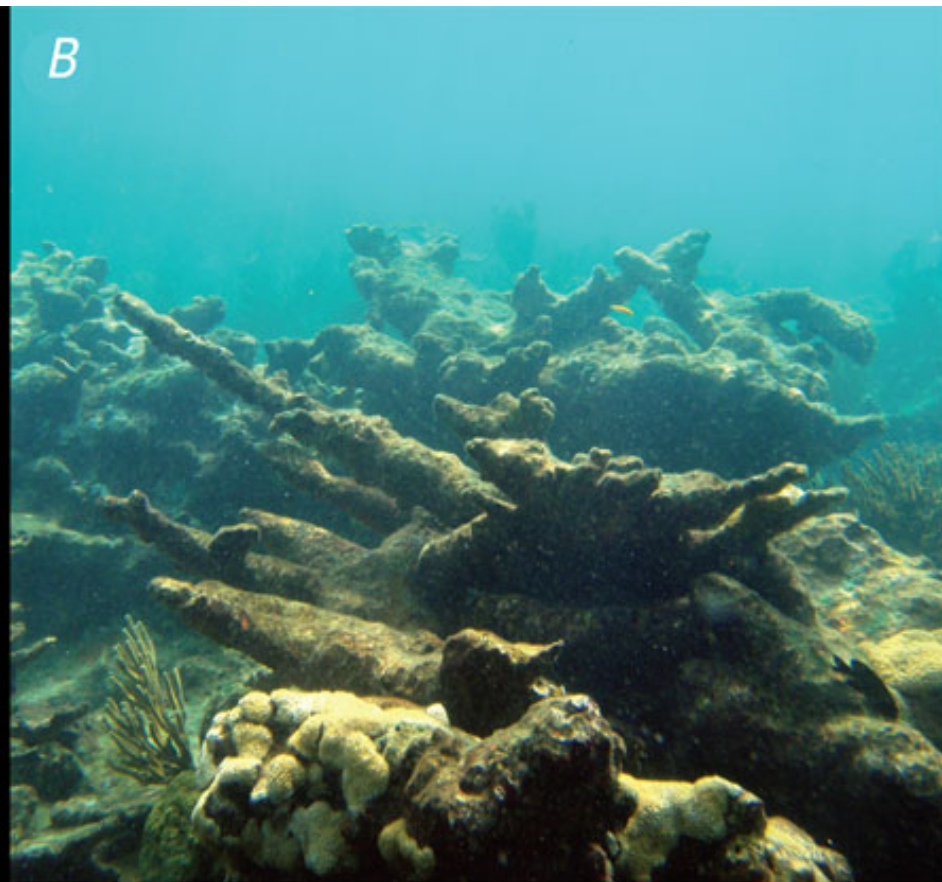


Impact on marine species and ecosystems

- Marine fishes, seabirds and marine mammals all face very high risks from increasing temperatures, including high levels of mortalities, loss of breeding grounds and mass movements as species search for favorable environmental conditions.
- Coral reefs are also affected by increasing temperatures which cause coral bleaching and increase their risk of mortality.

Impact on marine species and ecosystems





Impact on humans

- A 2012 report by the Food and Agriculture Organization of the United Nations estimates that marine and freshwater capture fisheries and aquaculture provide 4.3 billion people with about 15% of their animal protein.
- Fisheries and aquaculture are also a source of income for millions of people worldwide. By altering distributions of fish stocks and increasing the vulnerability of fish species to diseases, ocean warming is a serious risk to food security and people's livelihoods globally.
- Economic losses related to ocean warming are likely to run from tens to hundreds of millions of dollars.
- Rising temperatures also affect vegetation and reef-building species such as corals and mangroves, which protect coastlines from erosion and sea-level rise.
- Rising sea levels and erosion will particularly affect low-lying island countries in the Pacific Ocean, destroying housing and infrastructure and forcing people to relocate.

- The rise in sea surface temperatures is causing more severe hurricanes and the intensification of El Niño events bringing droughts and floods. This can have significant socio-economic and health effects in some regions of the world.
- Warming ocean temperatures are linked to the increase and spread of diseases in marine species.
- Humans risk direct transmission of these diseases when consuming marine species, or from infections of wounds exposed in marine environments.

What can be done?

Limiting greenhouse gas emissions

There is an urgent need to achieve the mitigation targets set by the Paris Agreement on climate change and hold the increase in the global average temperature to well below 2°C above pre-industrial levels. This will help prevent the massive and irreversible impacts of growing temperatures on ocean ecosystems and their services.

Protecting marine and coastal ecosystems

Well-managed protected areas can help conserve and protect ecologically and biologically significant marine habitats. This will regulate human activities in these habitats and prevent environmental degradation.

Restoring marine and coastal ecosystems

Elements of ecosystems that have already experienced damage can be restored. This can include building artificial structures such as rock pools that act as surrogate habitats for organisms, or boosting the resilience of species to warmer temperatures through assisted breeding techniques.

Improving human adaptation

Governments can introduce policies to keep fisheries production within sustainable limits, for example by setting precautionary catch limits and eliminating subsidies to prevent overfishing. Coastal setback zones which prohibit all or certain types of development along the shoreline can minimise the damage from coastal flooding and erosion. New monitoring tools can be developed to forecast and control marine disease outbreaks.

Strengthening scientific research

Governments can increase investments in scientific research to measure and monitor ocean warming and its effects. This will provide more precise data on the scale, nature and impacts of ocean warming, making it possible to design and implement adequate and appropriate mitigation and adaptation strategies.