



Climate Change and Peace

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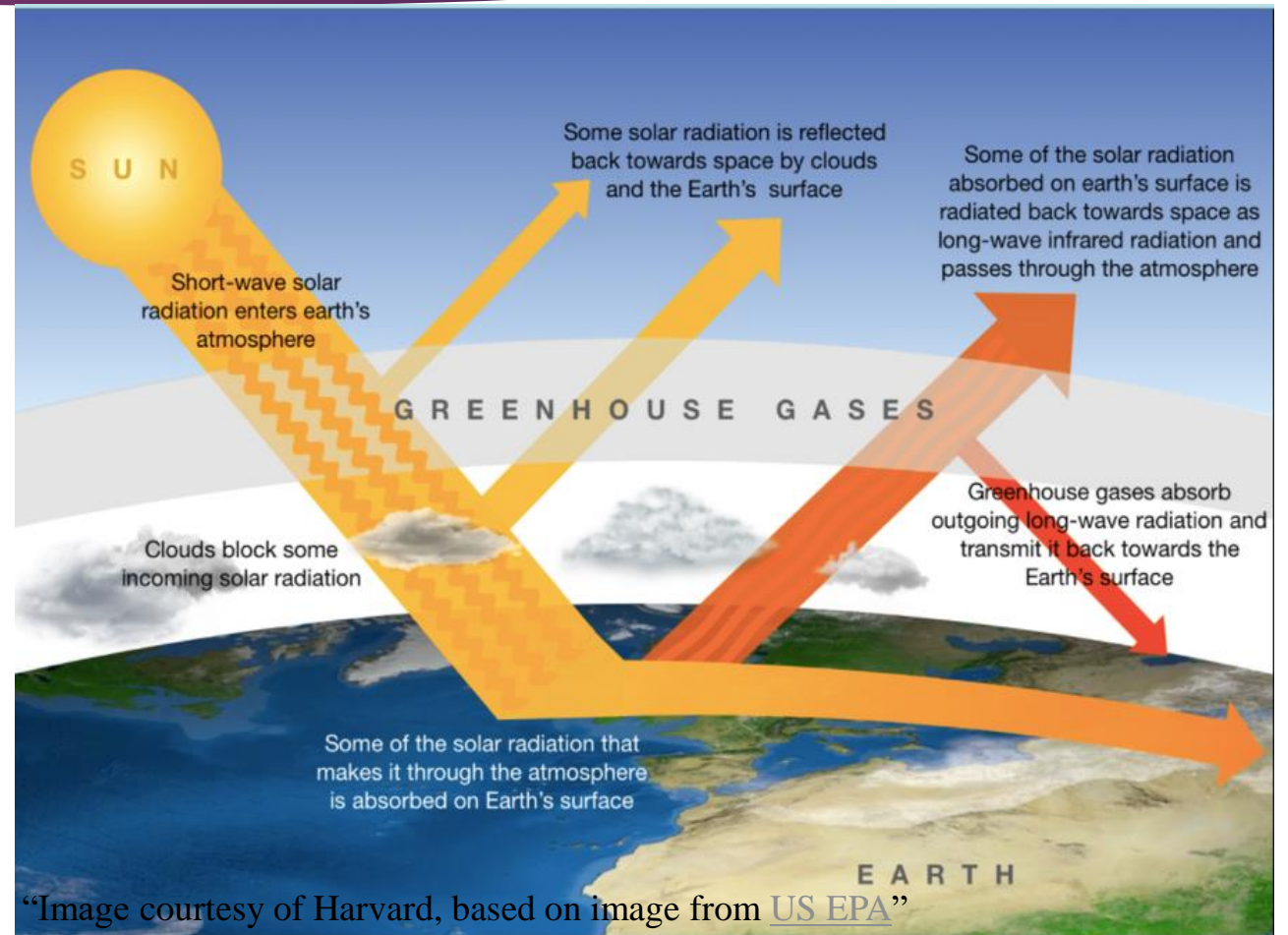
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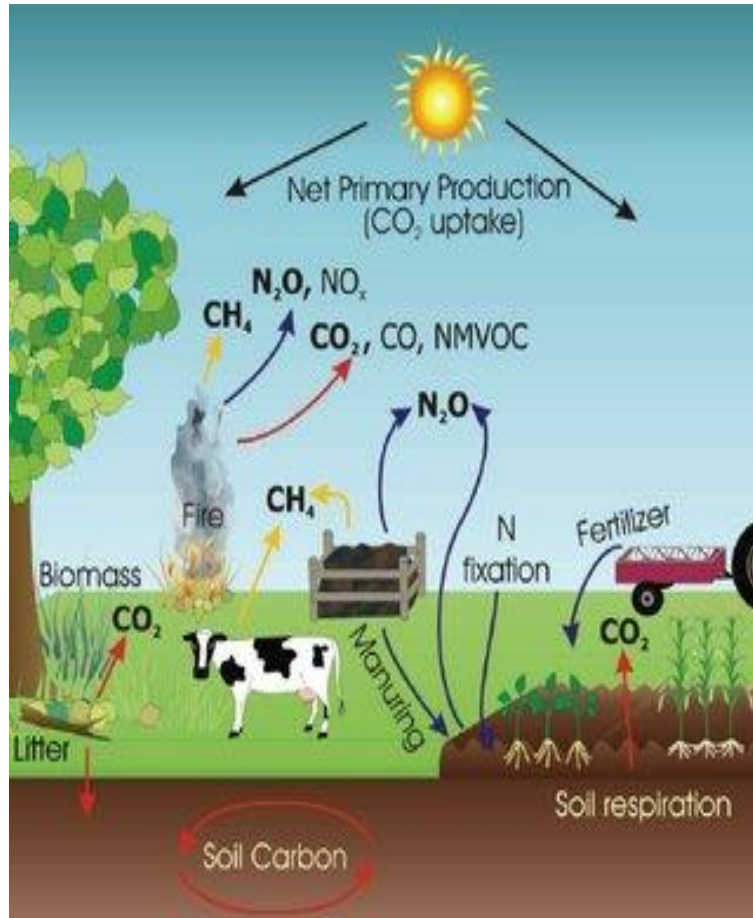
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Greenhouse Effect

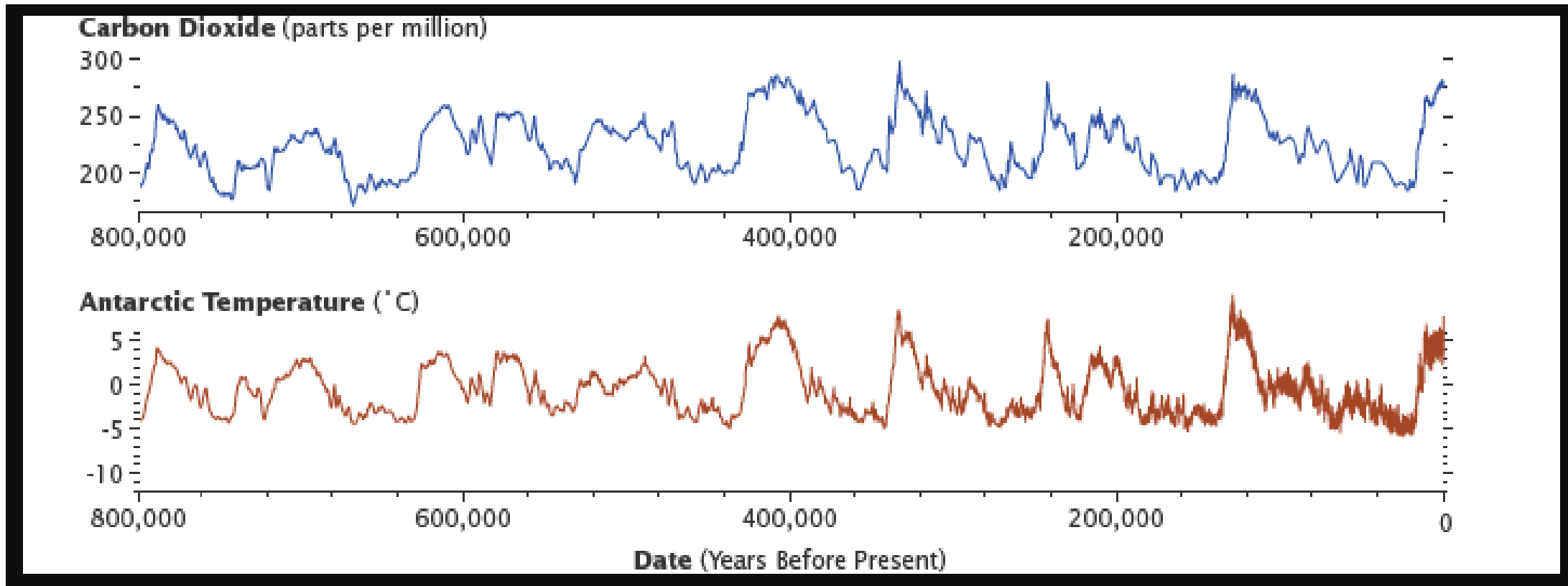
- ▶ It is a process that occurs when gases in Earth's atmosphere trap the Sun's heat.
- ▶ This process leads to an increase in the Earth's temperature.
- ▶ Greenhouse gases: CO_2 , H_2O , O_3 , CH_4 , N_2O , HFCs, PFCs, CFCs, and SF_6



Sources of Greenhouse Gases

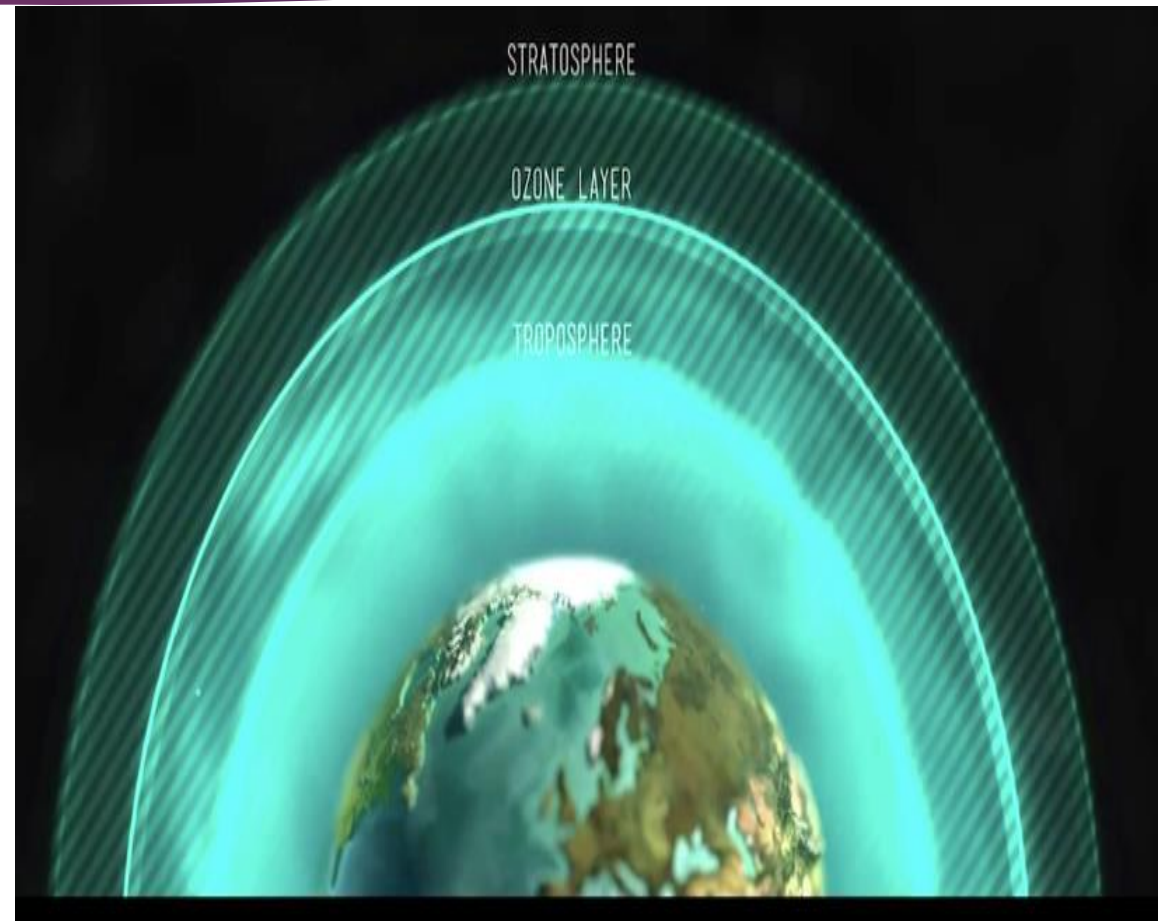
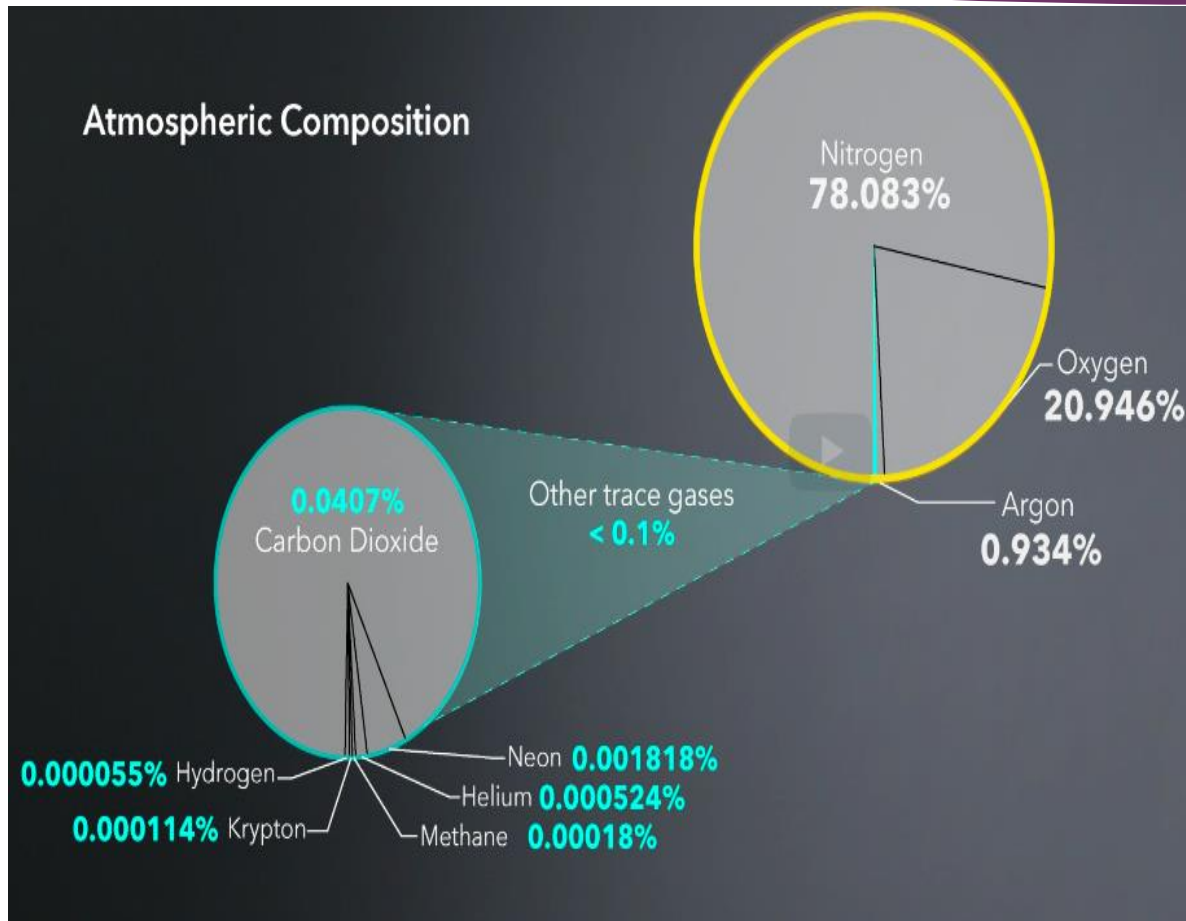


CO₂ and Temperature



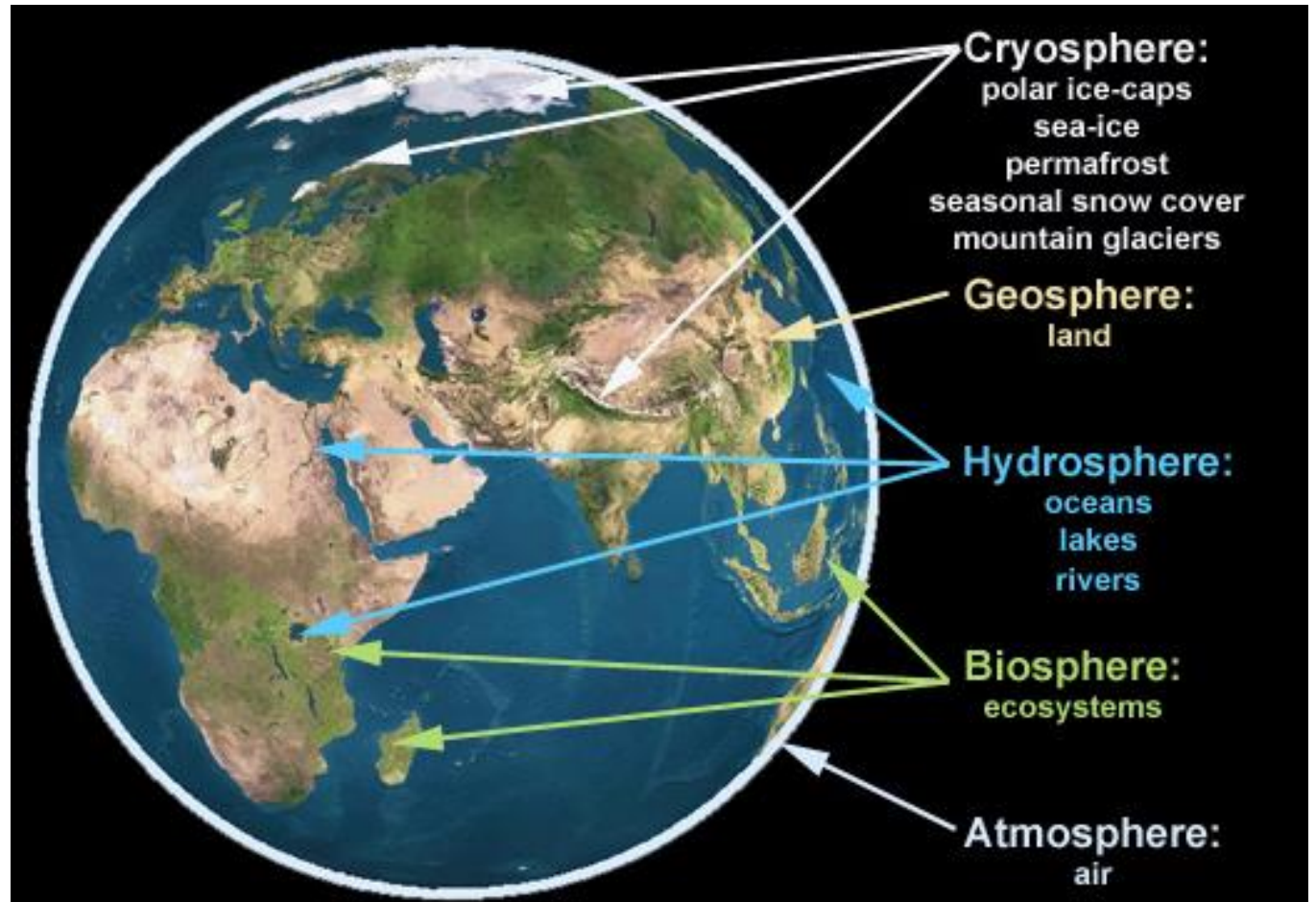
“Image courtesy of [NASA Earth Observatory](#), EOS Project Science Office at NASA Goddard Space Flight Center”

Atmospheric Composition



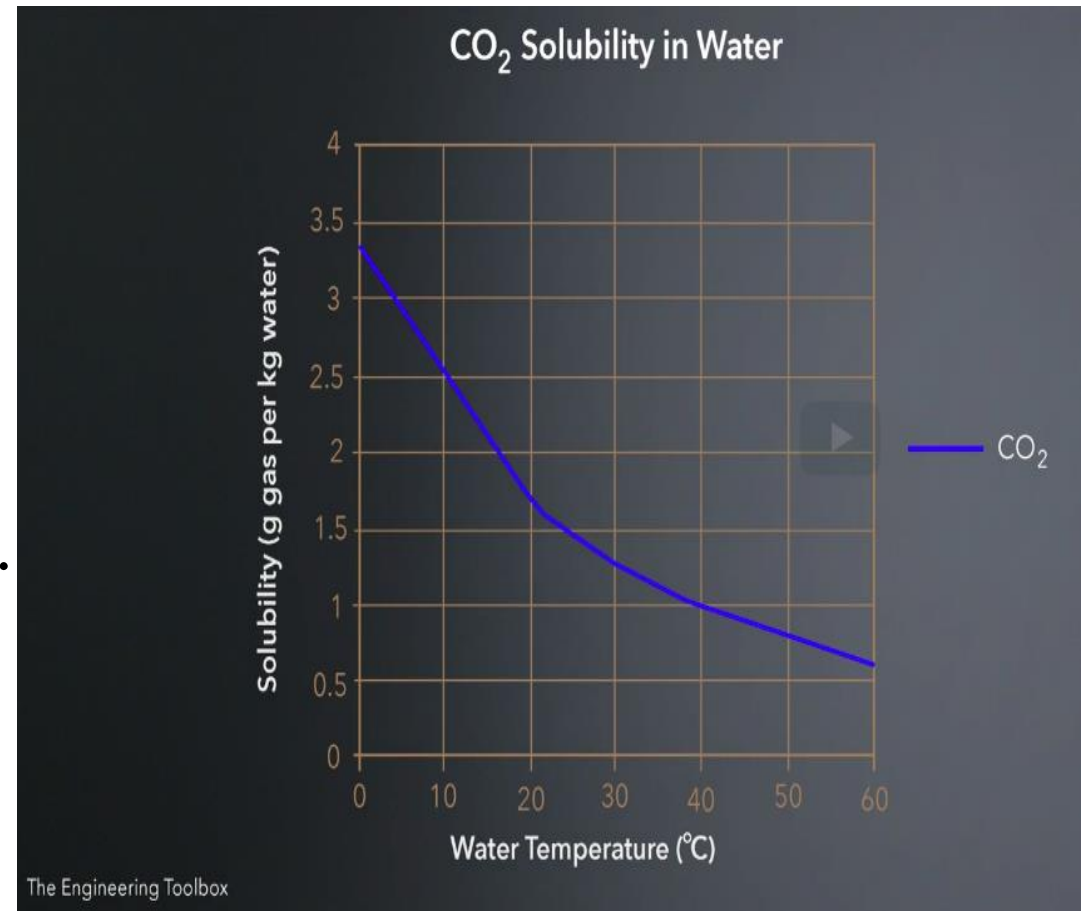
Earth's Climate system

- ▶ Atmosphere.
- ▶ Biosphere.
- ▶ Hydrosphere.
- ▶ Geosphere
- ▶ Cryosphere.

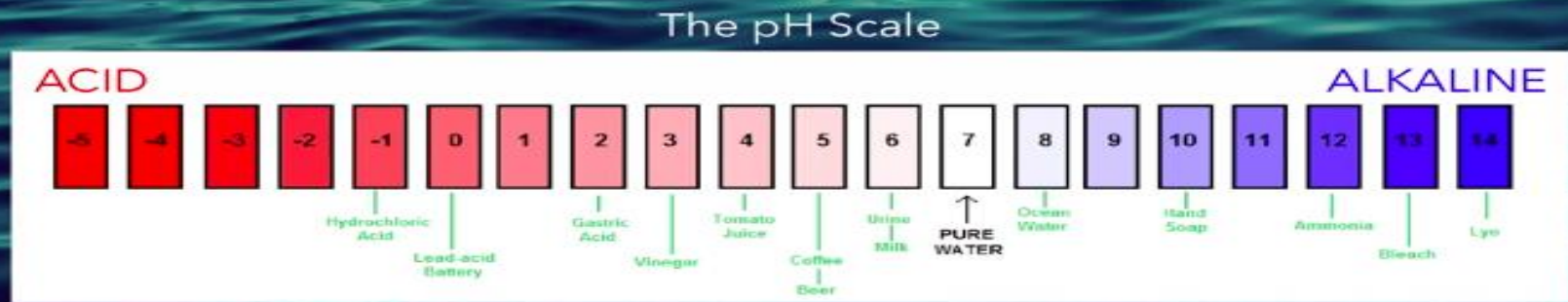


Carbon Cycle

- ▶ Carbon is absorbed by various reservoirs:
 - ▶ Only 55% in the atmosphere.
 - ▶ 30 to 35% into the oceans.
 - ▶ 15 to 20% into the terrestrial biosphere.



Ocean Acidification



Silicate Weathering

CO₂ and H₂O forms carbonic acid

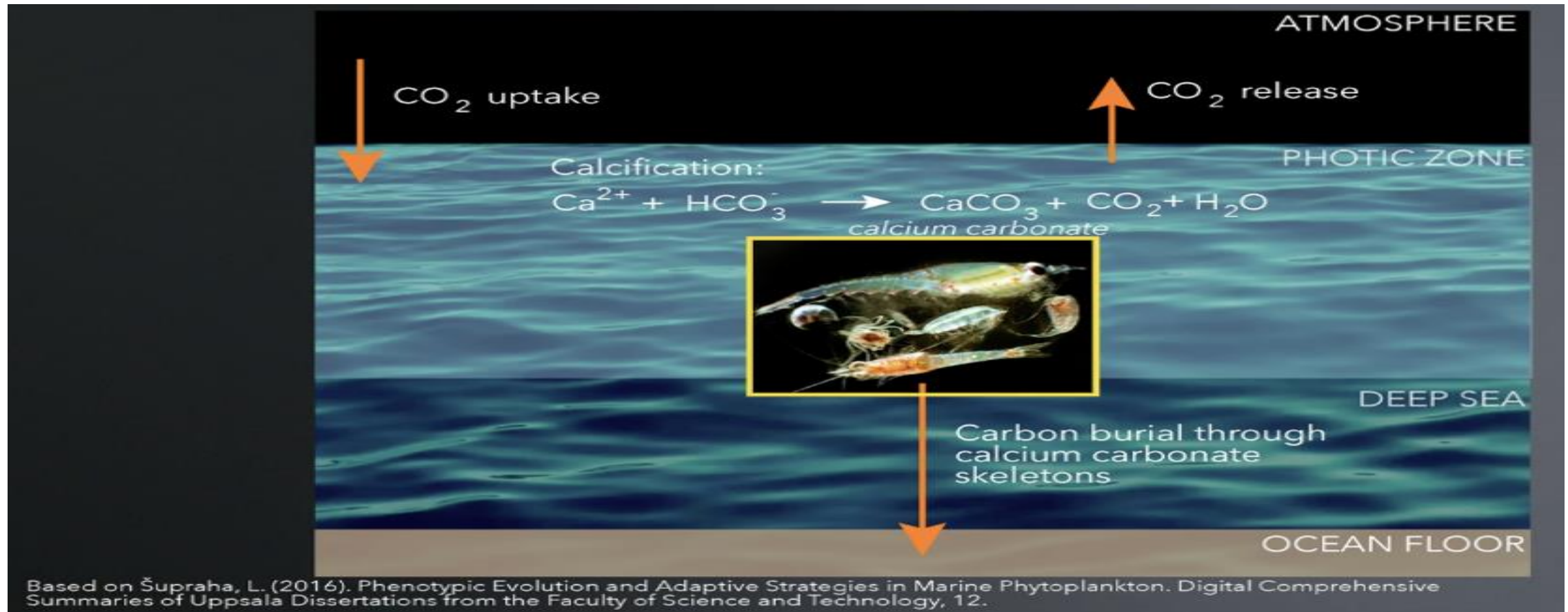
Silicate Weathering
 $2(\text{CO}_2) + 3(\text{H}_2\text{O}) + \text{CaSiO}_3 \rightarrow \text{Ca}^{2+} + 2(\text{HCO}_3^-) + \text{H}_4\text{SiO}_4$

Dissolved salts run off river systems into the ocean

$\text{Ca}^{2+} + 2(\text{HCO}_3^-) \rightleftharpoons \text{CaCO}_3 + \text{CO}_2 + \text{H}_2\text{O}$

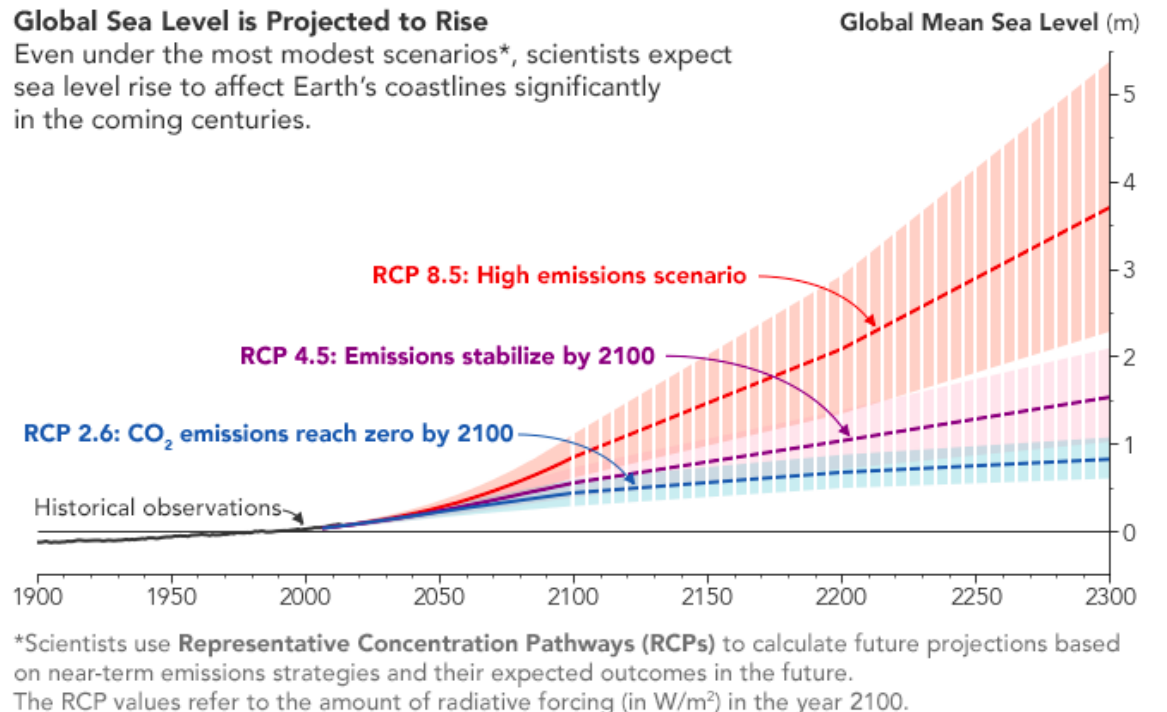
Based on graphic by John Garrett

Oceanic Carbon Pump



Sea Level Rise

- ▶ Primary contributors:
 - ▶ The mass loss from glaciers.
 - ▶ Ocean thermal expansion
- ▶ A sea rise level of 2 m (over the next century).
- ▶ A sea rise level of 5 m (by 2300).



Coastal Erosion

- ▶ Coastal erosion is the process by which local sea level rise, strong wave action, and coastal flooding carry away rocks, soils, and/or sands along the coast.
- ▶ Coastal erosion eats away at coastlines and make them more vulnerable to flooding from storms and high tides.
- ▶ Sea level rise can destroy wetlands, mangrove forests, saltwater marshes, and other natural barriers that protect coastal areas from flooding.
- ▶ Sea level rise and loss of natural barriers make high tide and flooding events more frequent.

Coastal Erosion (Cont'd)

- ▶ 600 million people worldwide, 160 million people in the US can be affected.
- ▶ In the US, coastal erosion costs about \$500 million/year for coastal property loss.
- ▶ Indonesia spent tens of billions to relocate its capital from Jakarta, a city of 10 million people vulnerable to sea level rise.



Beach Erosion in New York

Coastal Erosion (Cont'd)

- ▶ The U.S. Geological Survey's Coastal Change Hazards Portal offers a Coastal Vulnerability Index that can help identify locations where coastal erosion may occur.

<https://toolkit.climate.gov/tool/usgs-coastal-change-hazards-portal>

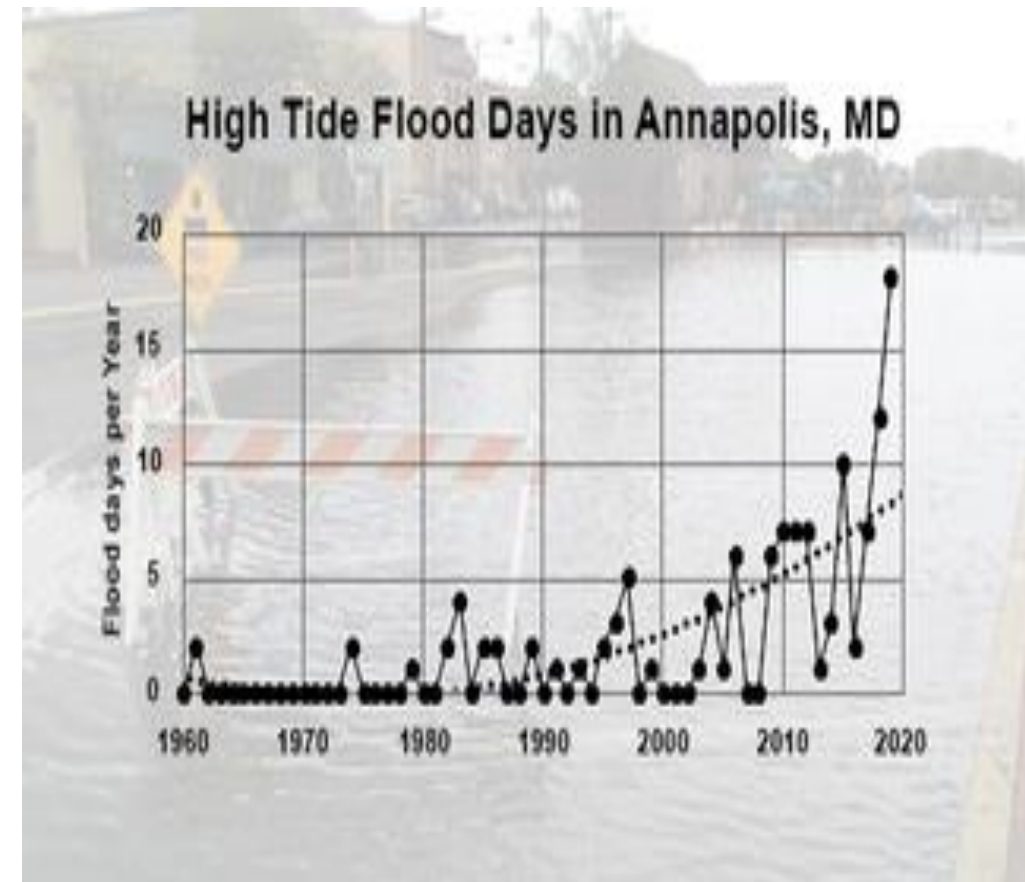
- ▶ Information is also available on various forms of Storm-Induced Coastal Change.

<https://coastal.er.usgs.gov/hurricanes/coastal-change/index.php>

Tidal Effects

Without additional flood management efforts, the frequency of this kind of flooding is projected to double or triple by 2030, and could be as much as 15-fold higher by 2050.

This means high-tide flooding could occur 180 days a year in some locations

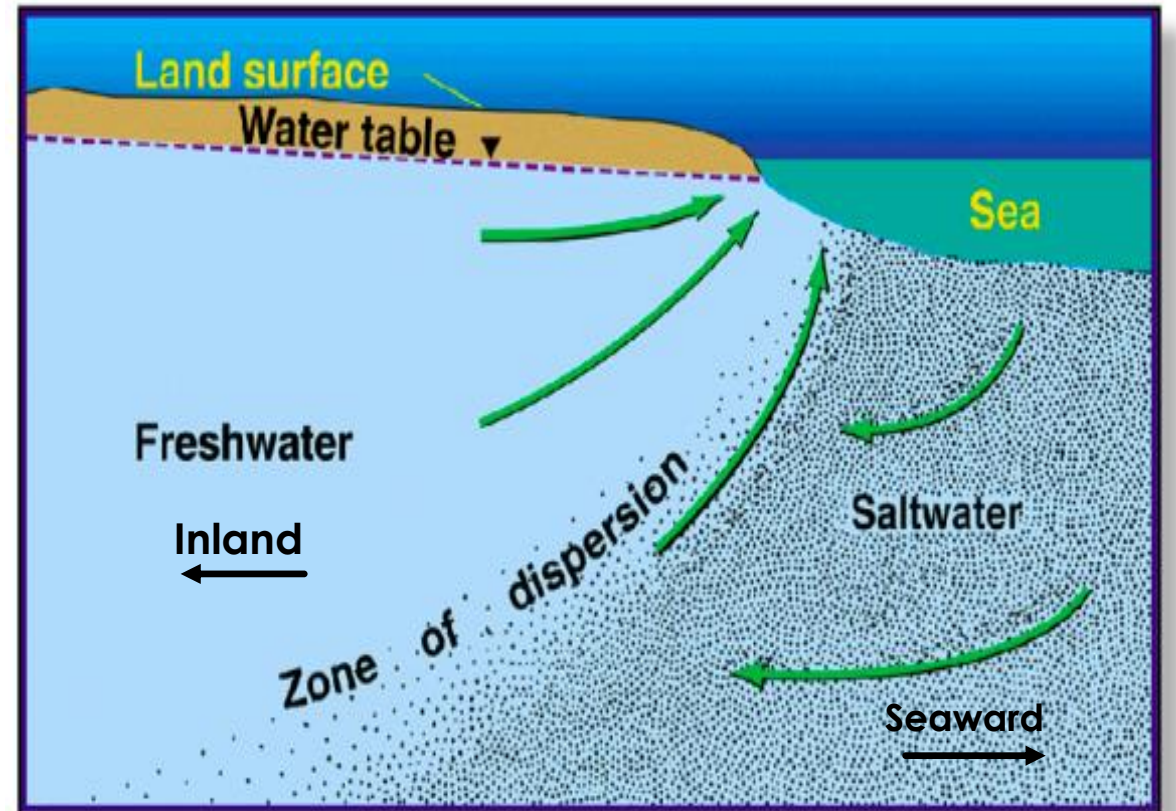


Tidal Effects (Cont'd)

- ▶ If sea level rose between 0.5 and 2.1 meters, this may lead to tidal increase between 0.1 and 0.5 meters.
- ▶ Between 2000 and 2015, high-tide flooding in the U.S. doubled from an average of three days per year to six along the Northeast Atlantic, according to the 2018 National Oceanic and Atmospheric Administration (NOAA) report.

Saltwater Intrusion

- ▶ Sea-level rise could increase the risks of saltwater intrusion.
- ▶ Saltwater intrusion refers to the process by which sea water infiltrates coastal groundwater systems, thus mixing with the local freshwater supply.



Source: US Geological Survey

Saltwater Intrusion (Cont'd)

- ▶ Saltwater intrusion is a problem for coastal regions around the world, including Atlantic Canada.
- ▶ Currently, the Atlantic Regional Adaptation Collaborative (RAC) of Natural Resources Canada started to investigate the potential impact of saltwater intrusion in the context of climate change.

Ecosystems and Biodiversity Impacts

▶ Golden toad:

- ▶ The outbreaks of a fungus known as Chytrid.
- ▶ The golden toad became more susceptible to these fungus.

▶ Polar bear :

- ▶ Polar bears require a sea ice environment to hunt their primary food source.
- ▶ More than 1 degrees Celsius warming, make the climate condition not suitable.

Ecosystems and Biodiversity Impacts (Cont'd)

- ▶ Coral reefs are home to 25% of all marine species:
 - ▶ Bleaching of coral reefs and ocean acidification make them it more difficult to form their skeletons (e.g Caribbean).
- ▶ Amphibians are under threat of disappearance from global warming with less than two degrees Celsius additional warming.
- ▶ Above 2° C warming, a loss of as much as a third of all species.
- ▶ At 3° C additional warming, a 50% loss of all species can occur worldwide.
- ▶ At 4° C warming, the percentage rises to 70%.
- ▶ We are currently causing the sixth major extinction event in geological history.

Climate change and food production

- ▶ Global warming lead to substantial decrease in the yield of some crops such as rice, wheat.
- ▶ A sharp decrease in global agricultural yields can be observed at warming exceeding 3° C, .

International Treaties

United Nations Framework Convention on Climate Change (UNFCCC):

- ▶ It establishes a framework and a process for agreeing to specific actions.
- ▶ 185 states have ratified.
- ▶ It took effect on 21 March 1994.
- ▶ It sets an "ultimate objective" of stabilizing "greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system."

International Treaties (Cont'd)

- ▶ Countries agree to develop national programs to reduce climate change impacts.
- ▶ It directs that "such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner."
- ▶ The convention encourages to share technology to reduce greenhouse gas emissions, especially from energy, transport, industry, agriculture, forestry, and waste.

International Treaties (Cont'd)

- ▶ The convention encourages scientific research on climate change.
 - ▶ Each country must develop a greenhouse gas "inventory" listing its national sources and sinks.
 - ▶ The inventories must be updated regularly and made public.
- ▶ They agree to support climate change activities in developing countries by providing financial support.

International Treaties (Cont'd)

Kyoto Protocol:

- ▶ In 1997, governments responded to growing public pressure by adopting the Kyoto Protocol.
- ▶ A protocol is an international agreement that stands on its own but is linked to an existing treaty.
- ▶ The convention is designed to allow countries to weaken or strengthen the treaty in response to new scientific developments. For example, they can agree to take more specific actions by adopting "amendments" or "protocols" to the convention.

International Treaties (Cont'd)

- ▶ It builds on these by adding new commitments which are stronger and far more complex and detailed than those in the Convention.
- ▶ It sets legally binding targets and timetables for cutting developed country emissions.
- ▶ The Protocol addresses the six main greenhouse gases (CO₂, CH₄, N₂O, HFCs, PFCs, and SF₆).
- ▶ The Protocol does not cover CFCs because they were phased out under the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer.

International Treaties (Cont'd)

- ▶ It highlights effective domestic policies and measures for reducing emissions.
 - ▶ Shift to renewable energy sources such as wind and solar power.
 - ▶ Adopting new technologies that reduce the methane emitted by livestock and rice fields.
- ▶ The protocol flags reducing methane emissions from waste management and energy systems, and protecting forests and other carbon sinks.

International Treaties (Cont'd)

- ▶ The Protocol supports giving parties credit for reducing emissions in other countries.
- ▶ An emissions trading regime will allow industrialized countries to buy and sell emissions credits amongst themselves.
- ▶ Joint implementation projects will offer "emissions reduction units" for financing projects in other developed countries.
- ▶ A clean development mechanism will provide credit for financing emissions-reducing or emissions-avoiding projects in developing countries.

International Treaties (Cont'd)

Paris Agreement:

- ▶ The Paris Agreement was adopted in pursuit of the objectives of the United Nations Framework Convention on Climate Change (UNFCCC).
- ▶ It was adopted by 196 parties at COP 21 (Conference of the Parties, United Nations climate change conference) in Paris, on 12 December 2015 and entered into force on 4 November 2016.
- ▶ It aims to reduction of global warming to well below 2° C , preferably to 1.5° C, compared to pre-industrial levels.

Mitigation and Solutions

- ▶ Direct CO₂ capture by forestation.
- ▶ Reducing carbon pollution from its sources:
 - ▶ Transition to renewables (Wind and solar energy).
 - ▶ Battery storage.
 - ▶ Progress in transportation (electric vehicles).
 - ▶ Recycling of lithium ion batteries.
 - ▶ Food production
 - ▶ Fossil fuels for fertilizers, herbicides and pesticides production.

Mitigation and Solutions (Cont'd)

- ▶ Decarbonizing Agriculture:
 - ▶ Reducing demand for livestock and beef.
 - ▶ Reducing red meat consumption can reduce risk for diseases such as heart disease and cancer.
 - ▶ Organic food production avoids the use of synthetic fertilizers, herbicides and pesticides.
 - ▶ Food waste management.

Egypt's Status

- ▶ National GHG inventory based on Intergovernmental Panel on Climate Change (IPCC) guidelines “Egypt First Biennial Update Report to the United Nations Framework Convention on Climate Change, 2018”.
 - ▶ Energy.
 - ▶ Industrial Process and Product Use (IPPU).
 - ▶ Agriculture, Forestry, and other Land Use (AFOLU).
 - ▶ Waste.

Egypt's Status (Cont'd)

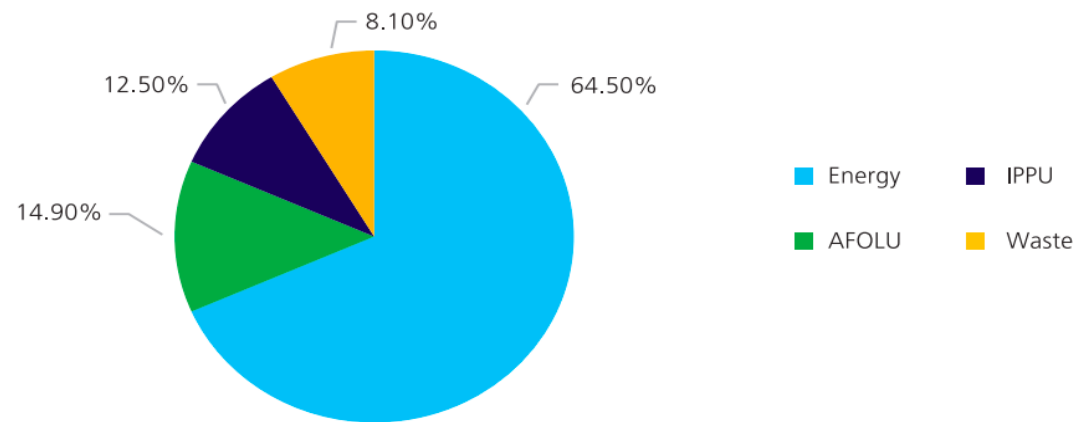


Figure A: GHG contribution of each sector to the total emissions, 2015

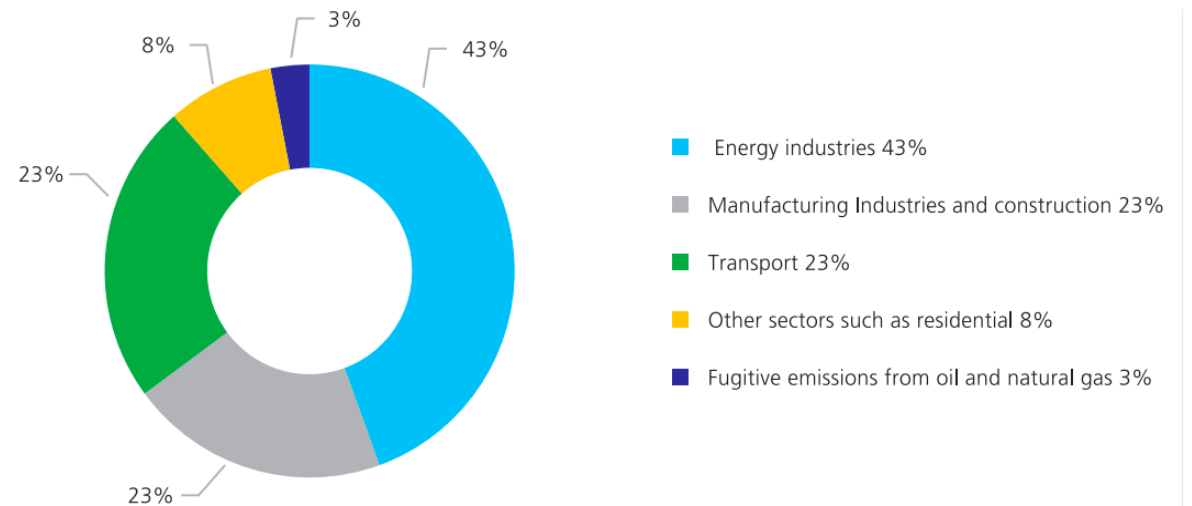


Figure B: Emissions per category for the energy sector, 2015

Egypt's Status (Cont'd)

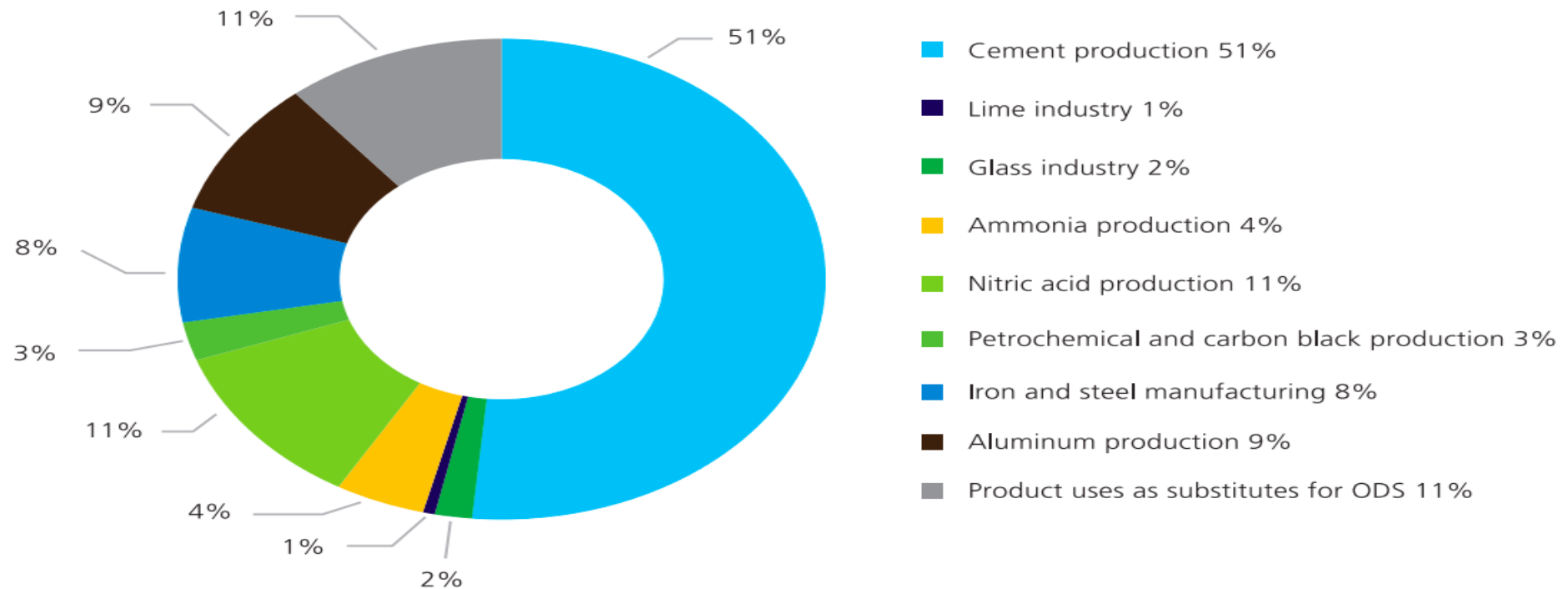


Figure C: Emissions per category for the IPPU sector, 2015

Egypt's Status (Cont'd)

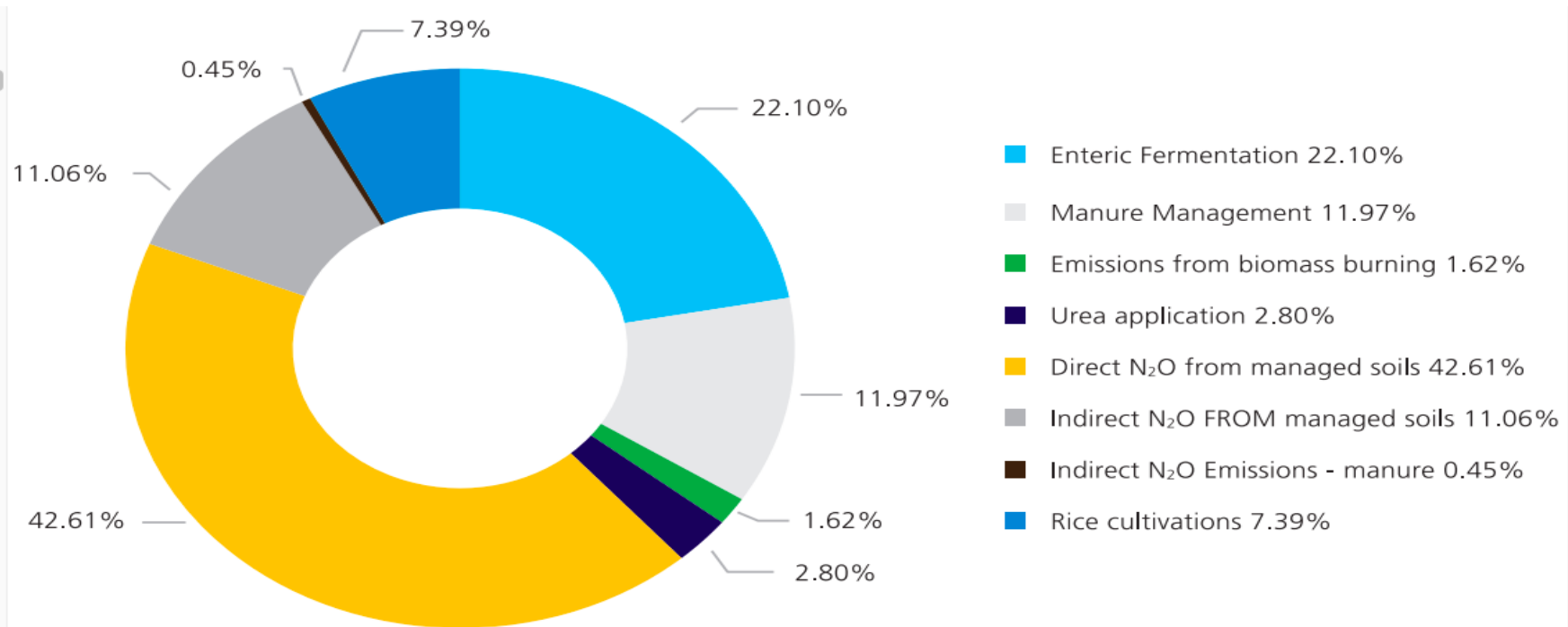


Figure D: Emissions per category for the AFOLU sector, 2015

Egypt's Status (Cont'd)

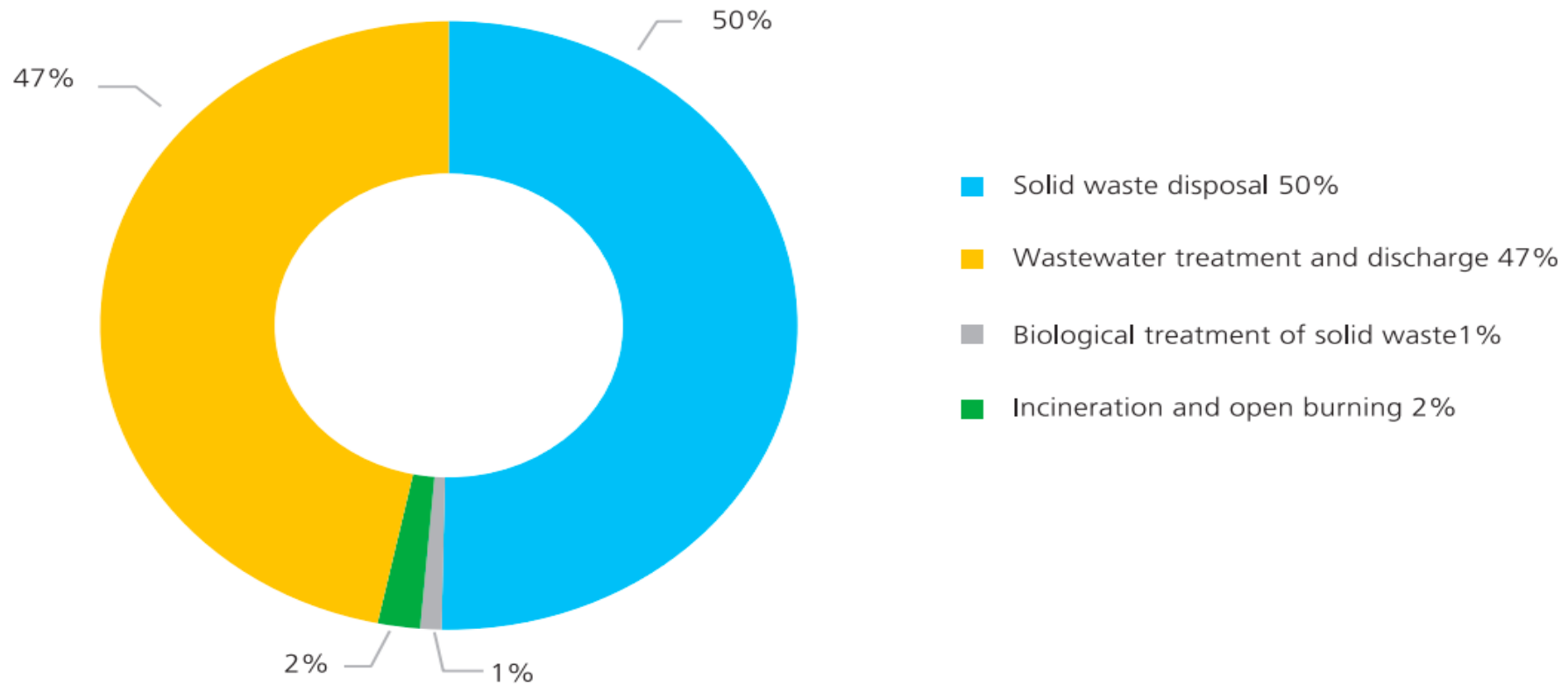


Figure E: Emissions per category for the waste sector, 2015

Mitigation Policies and Actions in Egypt

▶ Energy Sector:

- ▶ Electricity sector subsidy reform program.
 - ▶ The electricity subsidies were removed through gradual increase of tariff.
- ▶ Increase of renewable energy contribution to the national electricity generation (2013-2015).
 - ▶ Hydropower energy (452 GWh), wind energy (1444 GWh), solar energy (167 GWh).
 - ▶ GHG reductions: 0.48 million tCO₂e.
- ▶ Energy efficiency for the electricity generation and end-users.
 - ▶ Improved electricity consumption (energy efficient lighting and awareness campaigns)

Mitigation Policies and Actions in Egypt (Cont'd)

- ▶ Sustainable transport program and expansion of metro network (2009-2015).
 - ▶ GHG reductions: 1.05 million tCO₂e in 2015 from lines 2&3 of the Cairo Metro.
- ▶ **Industrial Process and Product Use (IPPU) sector:**
 - ▶ Industrial Energy Efficiency Project (2013-2015).
 - ▶ An integrated approach that combines capacity building and technical assistance interventions.
 - ▶ GHG reductions: 2.44 million tCO₂e.

Mitigation Policies and Actions in Egypt (Cont'd)

- ▶ Egyptian Pollution Abatement Project (EPAP) (Phase II, 2007-2015).

 - ▶ GHG reductions: 656,336 tCO₂e per year.

- ▶ **Waste sector:**

 - ▶ Egyptian National Solid Waste Management Program.

 - ▶ It conducted capacity building for governmental and non-governmental sectors to establish an efficient waste management system.

Mitigation Policies and Actions in Egypt (Cont'd)

- ▶ **Agriculture, Forestry, and other Land Use (AFOLU) sector:**
 - ▶ Bioenergy for sustainable rural development.
 - ▶ The use of biomass as an energy source (biogas production).
 - ▶ GHG reductions: 240 tCO₂e over 20 years lifetime.

References

- ▶ NASA Earth Observatory.
- ▶ Intergovernmental Panel on Climate Change (IPCC).
- ▶ US Geological Survey.
- ▶ Ministry of Environment in Egypt.
- ▶ Egypt's First Biennial Update Report (BUR) to the United Nations Framework Convention on Climate Change, 2018”.

Thank You

