- **Climate and Green Finance Agenda in EU**

Climate Change - Global Impact and Mitigation Policies

PART 2

Jean Monnet Module **"Promoting knowledge on EU policy in fiscal administration, climate, and energy topics – PRO-Facts"**

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Topic content

- How does the climate system work?
- What are the observed and predicted changes in climate?
- What are the consequences of climate change?
  - The human aspect of climate change

How does the climate system work?

- Difference between climate and weather
- Description of the climate system and the main climate drivers
- Steps and elements of the "carbon cycle"

Climate and weather

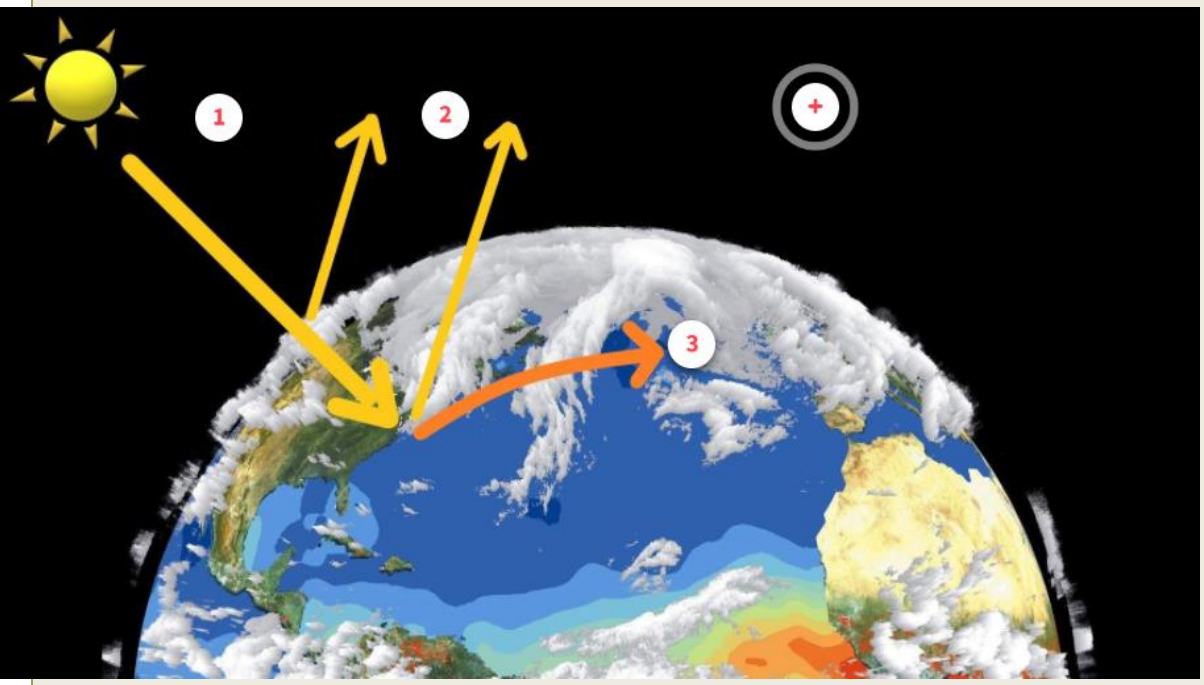
- *"Climate is what we expect, weather is what we get." - Mark Twain“*
- *Weather is one football game, climate is the history of the National Football League." - @MikeNelson247 via @CC_Yale“*
- *Climate tells you what clothes to buy, weather tells you what clothes to wear." - 9-year-old student*


WHICH IS SCARIER?
SNOW
CNN
24/7
CLIMATE NEWS
2014 HOTTEST
YEAR EVER
ADAM
2015

Climate and weather

- "*Climate in a narrow sense is usually defined as the "average weather", or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands or millions of years*" - World Meteorological Organisation (WMO)

A scheme already known



- 1 – Solar radiation
- 2 – Energy absorption and reflection in space
- 3 – Redistribution of absorbed energy

= Energy balance

Energy balance

- Incomming energy
  - Sun = the most important source of energy
  - Of the 343 Watts per m2 entering the ground, only 240 Watts per m2 passes through the atmosphere
- Outgoing energy
  - Half of the solar radiation that passes through the atmosphere is absorbed by the earth's surface
  - The remaining half is absorbed by the atmosphere or returned (reflected) back into space via clouds, airborne particles, snow, and deserts.
  - Part of the energy absorbed by the earth's surface is re-emitted to the atmosphere in the form of thermal energy

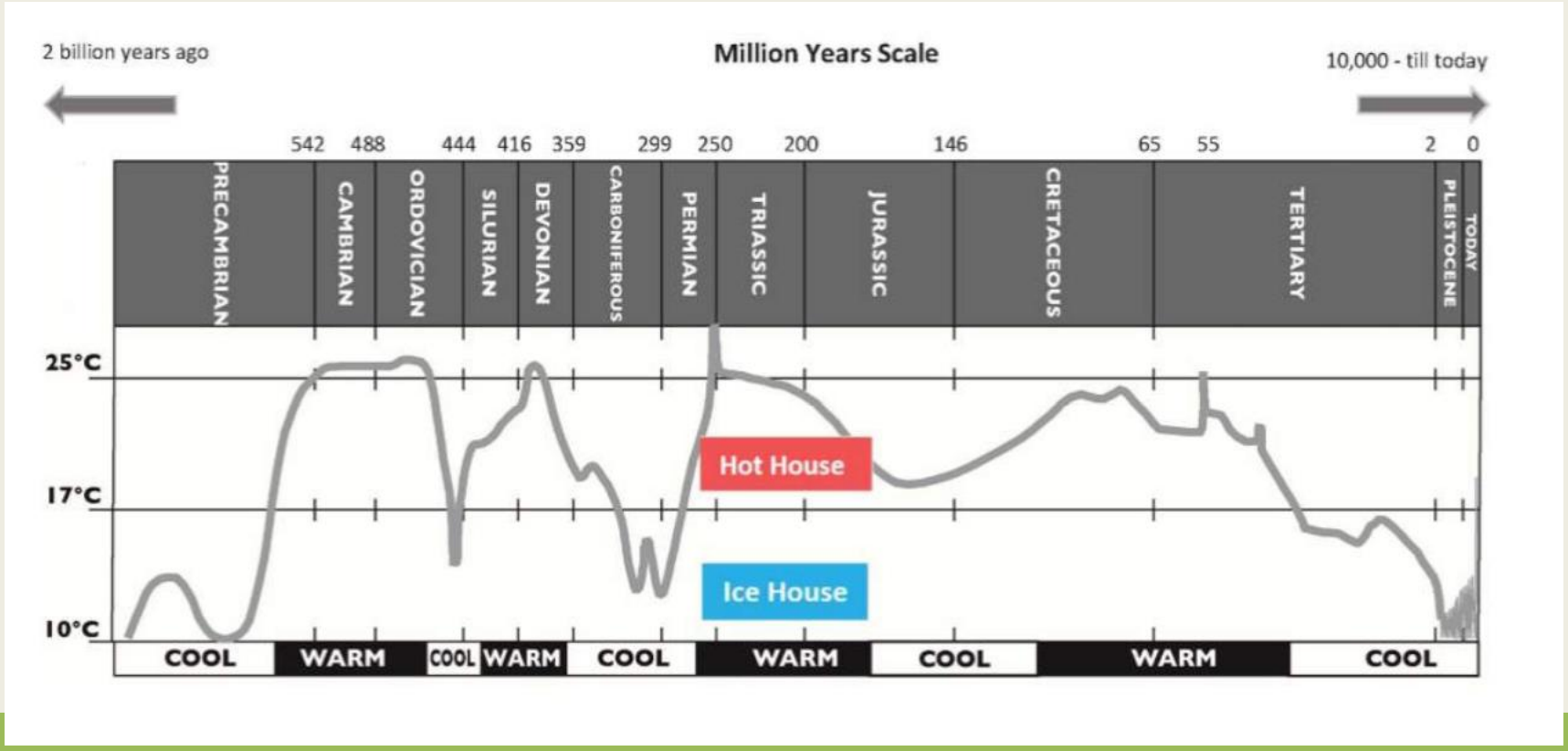
Energy balance

- Earth's temperature is ensured by the balance between solar energy entering the earth and that leaving the earth
- The temperature we feel is provided by the heat that "gets stuck" on Earth in the atmosphere
- The thermal energy absorbed and reflected on the earth's surface by GHG molecules and clouds (greenhouse effect) allows an average earth temperature of 14 degrees Celsius.
- Without the greenhouse effect, the temperature on earth would be -19 degrees Celsius

The greenhouse effect

- The greenhouse effect ensures life on earth
- However, more GHG molecules in the atmosphere cause more heat
- This causes the gradual change in temperature, otherwise known as "climate change".

How has the earth's climate evolved?



Why does climate change happen?

- 3 main factors:
  - Solar variation: changes in the amount of radiation emitted by the Sun, or small changes in the rotation of the Earth in its orbit, can change the amount of energy received by the Sun. However, there has been very little solar variation over the past 140 years.
  - Volcanic activities: unpredictable volcanic eruptions can cause climate variability. Powerful eruptions inject aerosols into the atmosphere, which cool the Earth's surface.
  - Changes in the carbon cycle: When the amount of greenhouse gases in the atmosphere increases, it causes direct effects on climate change.

Climate System

- https://www.youtube.com/watch?v=2KVTo_NqmiU&feature=emb_logo

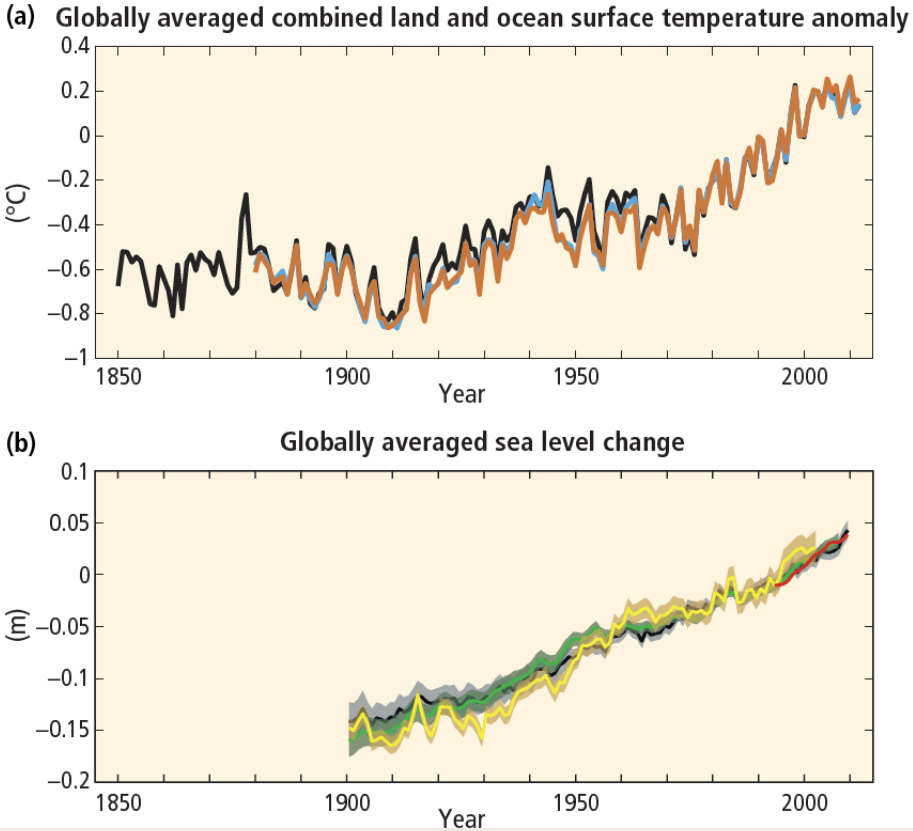
Climate Indicators

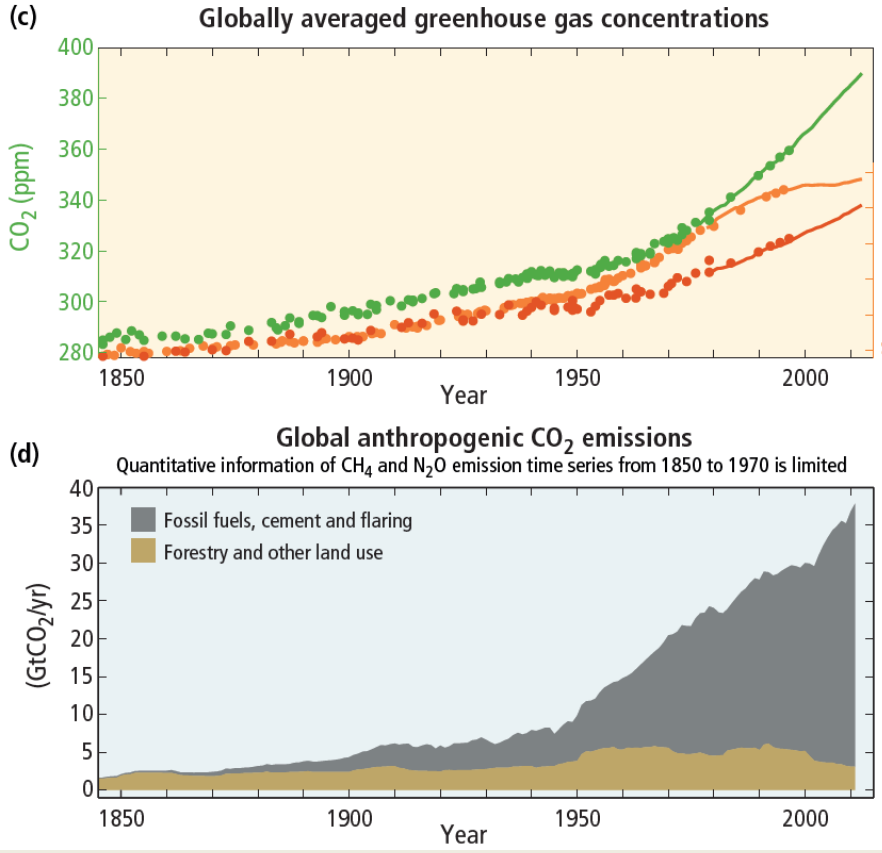
- https://www.youtube.com/watch?v=gcoTOCOrzCo&feature=emb_logo

Climate indicators

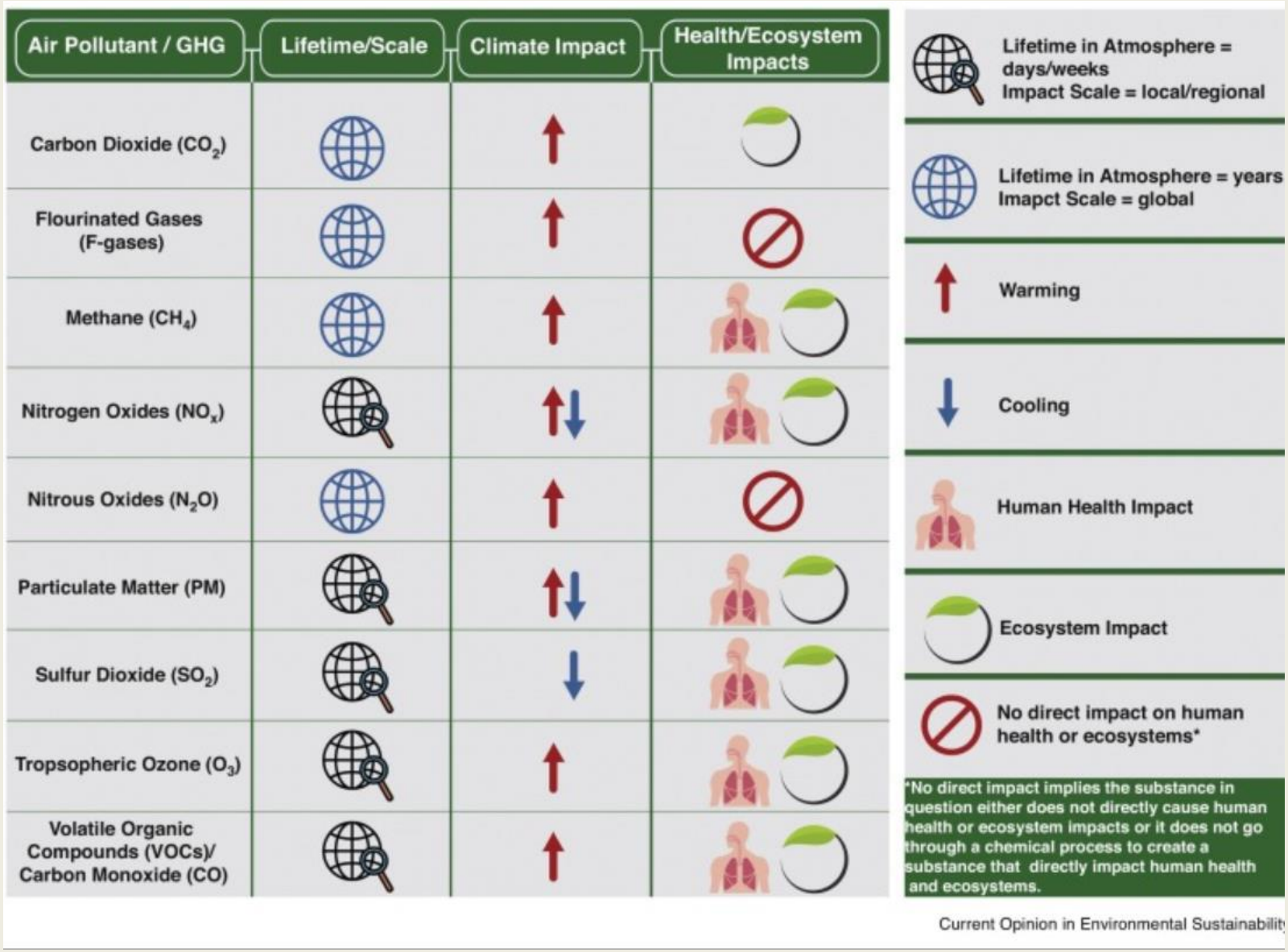
- Surface temperature
- Concentration of greenhouse gases
- RainfallThe temperature of the oceans
- The extent of the polar ice cap
- Sea level rise
- Ocean acidification

Graphs


(a) Globally averaged combined land and ocean surface temperature anomaly
(°C)
0.4
0.2
0
−0.2
−0.4
−0.6
−0.8
−1
1850
1900
1950
2000
Year
(b) Globally averaged sea level change
(m)
0.1
0.05
0
−0.05
−0.1
−0.15
−0.2
1850
1900
1950
2000
Year


(c) Globally averaged greenhouse gas concentrations
CO_2 (ppm)
400
380
360
340
320
300
280
1850
1900
1950
2000
Year
(d) Global anthropogenic CO_2 emissions
Quantitative information of CH_4 and N_2O emission time series from 1850 to 1970 is limited
Fossil fuels, cement and flaring
Forestry and other land use
($GtCO_2$/yr)
40
35
30
25
20
15
10
5
0
1850
1900
1950
2000
Year

GHG


Air Pollutant / GHG
Lifetime/Scale
Climate Impact
Health/Ecosystem Impacts
Carbon Dioxide (CO_2)
Flourinated Gases (F-gases)
Methane (CH_4)
Nitrogen Oxides (NO_x)
Nitrous Oxides (N_2O)
Particulate Matter (PM)
Sulfur Dioxide (SO_2)
Tropsopheric Ozone (O_3)
Volatile Organic Compounds (VOCs)/ Carbon Monoxide (CO)
Lifetime in Atmosphere = days/weeks
Impact Scale = local/regional
Lifetime in Atmosphere = years
Imapct Scale = global
Warming
Cooling
Human Health Impact
Ecosystem Impact
No direct impact on human health or ecosystems*
*No direct impact implies the substance in question either does not directly cause human health or ecosystem impacts or it does not go through a chemical process to create a substance that directly impact human health and ecosystems.
Current Opinion in Environmental Sustainability

Climate projections

- The future of carbon
  - By adding carbon data to climate models, scientists have come up with different scenarios of possible emissions by 2100.
  - Depending on the amount of greenhouse gas emissions in the atmosphere, different global surface temperature scenarios are predicted.

Data and its uses

- **Weather forecast -** a weather forecast is a prediction of what the weather will be like in the short to medium term. Weather forecasts are usually accurate up to 7 days in advance. A climate forecast or climate forecast is generated on a seasonal, interannual or long-term time scale
- **Projections** - Climate projections help us predict the response of the climate system to drivers such as the concentration of GHG emissions. Projections depend on assumptions about future socio-economic and technological developments. For example, obtaining renewable energies**.**
- **Models -** a climate model is complex software that aims to reproduce as faithfully as possible the real climate system through mathematical simulations. Because of the many variables associated with those complex processes, climate science prepares different models and compares them (see: IPCC models).

Climate projections

- The Representative Concentration Pathways (RCP) describe four different scenarios of GHG emissions and atmospheric concentrations, air pollutant emissions and land use throughout the 21st century.
- The RCPs include a strict mitigation scenario (RCP2.6), two intermediate scenarios (RCP4.5 and RCP6.0) and a scenario with very high GHG emissions (RCP8.5).
- The scenarios without CC ('baseline scenarios') lie between RCP6.0 and RCP8.5.RCP2.6 is the representative scenario that aims to keep potential global warming below 2 °C above pre-industrial temperatures.

Climate projections

Projected changes in climate indicators in numbers.

>1.5°C | >2°C

A global surface temperature change of 1.5°C is among the most optimistic scenarios. Yet, it will still significantly affect our climate indicators.

Sea level	**0.26 to 0.77 m** global mean sea level rise (relative to 1986–2005)
Ocean heat and acidification	**Coral reefs** are projected to decline by a further 70–90%. Global annual catch fo**r marine fisheries** will decrease by 1.5 million tonnes
Temperature anomalies	**3°C hotter extreme hot days** in mid-latitudes 4.5°C warmer extreme cold nights in high latitudes

Source: IPCC, 2018: Summary for Policymakers. In: Global Warming of 1.5°C.

Climate projections

>1.5°C	>2°C

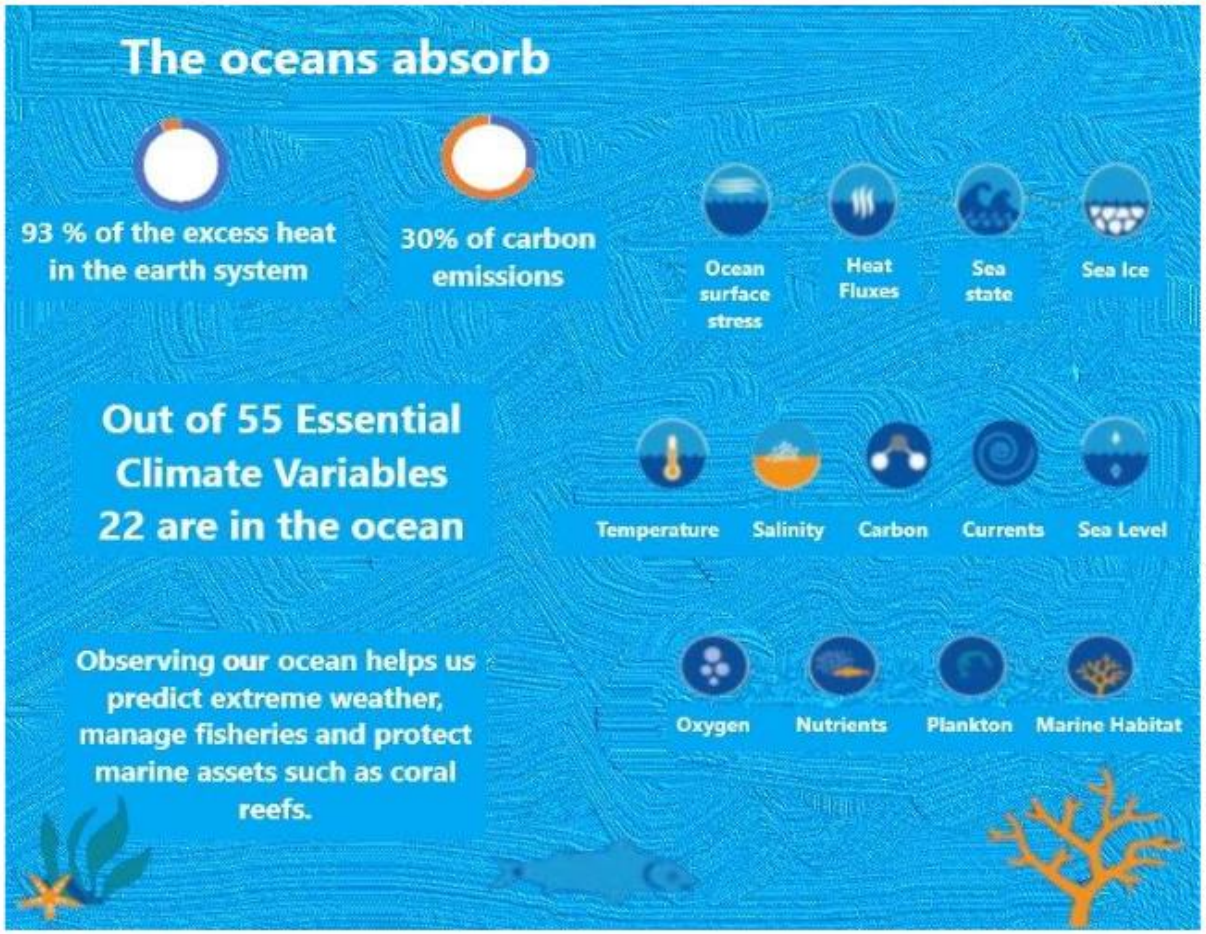
Carbon emissions leading to a 2°C temperature change is the greatest tolerable change. It will still vastly affect our climate indicators.

Sea level	**0.30 to 0.83 m** global mean sea level rise (relative to 1986–2005) **10 million more people** exposed to sea-level rise risks (relative to >1.5°C)
Ocean heat and acidification	**Coral reefs** are projected to decline by **99%** Global annual catch for **marine fisheries** will decrease by **3 million tonnes**
Temperature anomalies	**4°C hotter** extreme hot days in mid-latitudes **6°C warmer** extreme cold nights in high latitudes
Other	• Higher risks from heavy precipitation and droughts • Higher risks from forest fires • Risks from some vector-borne diseases, such as malaria and dengue fever

Source: IPCC, 2018: Summary for Policymakers. In: Global Warming of 1.5°C.

Data

Ocean: observed variables



Data

Upper-air: observed variables

Risk and consequences of CC

- https://www.youtube.com/watch?time_continue=5&v=ijsrNBKdzgM&feature=emb_logo

Risk and consequences of CC

"*Climate change will amplify existing risks and create new risks for natural and human systems. Risks are unevenly distributed and are generally greater for disadvantaged people and communities in countries at all levels of development*" (IPCC, 2014)

Risk and consequences of CC

- Consequences at the regional level:
  - Biodiversity (extinction of species)
  - Food security (production of different crops, fishing)
  - Water supply (increased competition between sectors)
  - Health (exacerbation and worsening of existing health problems)
  - Urban zone (increased risk from extreme weather events, such as drought, very hot days, and floods, storms)
  - Rural areas (water supply, crop production, etc.)
- Global consequences:
  - Reducing the rate of economic growth
  - Increasing poverty
  - Displacement of individuals (climate migration)

Aspekti njerëzor i ndryshimeve klimatike

- "Climate Migration":
  - "*Environmental Migration*"
  - Greater interest and discussion
  - Two perspectives:
    - *Alarmist perspective:*
    - *Sceptical perspective:*
- The impact of immigrants on the environment vs. The impact of environmental changes on the flows of immigrants

Environmental immigration

- Cross-disciplinary issues:
  - Basis in the natural sciences, consequences in the social sciences
- The name was first used officially in 1985 by El-Hinnawi in the UNEP report 'Environmental Refugees‘
- The difference between:
  - temporary displacement associated with temporary environmental stress,
  - permanent displacement associated with permanent environmental stress and
  - temporary or permanent displacement due to progressive environmental change

The Alarmist Perspective

- Genesis to environmental researchers, natural sciences
- Migration:
  - A consequence of environmental change and a predictor of future conflicts over natural resources
  - Main concern:
  - The possibility of inciting conflicts – up to extreme cases of armed conflicts, ethnic conflicts, etc
  - Transferring conflicts from the country of origin to the destination
  - Increasing uncertainty – policy response (US, Canada, Germany, EU, etc.

- …'when global warming takes hold, there could be as many as 200 million people overtaken by sea-level rise and coastal flooding, by disruption of monsoon systems and other rainfall regimes, and by droughts of unprecedented severity and duration' (Myers, 2002)

The Skeptical Perspective

- Kibreab:
  - Depoliticization of the causes of migration
  - Treating environmental migration as a separate phenomenon – a threat to immigrants
  - Limitation of asylum policies
  - Insecurity is a cause of migration, not a consequence
- Others:
  - Interests?
  - The links between environmental changes, conflicts and migrants are not based on empirical analysis, but on simple generalizations
  - Definition "Environmental refugee" - not clear
  - Migration – multi-causal phenomenon

Consequences in international politics

- How will environmental refugees be treated?
- Approaches:
  - Skepticism
  - Law makers
  - Alarmists
- Migration policies and environmental policies:
- International organizations
- International conventions

Climate Change

- Climate change dominates today's debates on the environment, and therefore also in the field of environmental migration. The term "climate migrant" has taken attention away from other environmental problems associated with migration. Why?
  - CC involve many types of environmental changes
  - CC is expected to significantly increase the flows of environmental migrants
  - The ongoing climate negotiations create a fertile ground for addressing environmental migration in international politics
  - Most environmental funding today is allocated to CC-related consequences

- … ‘amid the diverse social and political causes, the Darfur conflict began as an ecological crisis, arising at least in part from climate change’ (Ki-moon 2007).

- https://www.youtube.com/watch?v=qQwCCm-H-sU

Readings

- Topic 1 dhe 2:
  - IPCC, 2014: *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Core writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.
- François Gemenne "How they became the human face of climate change. The emergence of 'climate refugees' in the public debate, and the policy responses it triggered"