Climate Deck Cards

HOW TO PLAY

You will need one deck of cards per team (4-8 people), a large sheet of paper and some pens.

The aim for each team is to place the cards in order on the table, finding the chain of events of causes, impacts, calculations and solutions. Illustrate these relationships by drawing out arrows to show what climate change is all about.

Deal the cards by each set and wait until every card has been set out on the table before dealing the next set. Debrief and discuss your choices after each set.

Time Recommendations: 1 hour to place the cards and 1 hour to discuss and reflect on what you have learnt.

A Simple Questionnaire Before the Game

Food

Are you a ☐ vegan / a ☐ meat-eater?

How many groceries do you spend weekly? ☐ £5 ☐ £10 ☐ £ 20

How many groceries do you spend weekly? ☐ £5 ☐ £10 ☐ £ 20

Travel

How do you usually go out? ☐ walk ☐ car ☐ train ☐bus ☐bike

How much do you cost on fuel oil bill monthly?

☐ around £50 ☐ around £80 ☐ £100 above

How often do you travel by plane?

☐0~5 times/yr ☐5 times above/yr

Living

What kind of house are you living?

☐ Straw/ Bamboo ☐ Brick/Concrete ☐ Wood ☐ Adobe ☐ Steel/Other

Consumptions

How many eco-friendly/recycling products are you using?

☐ none ☐1~5 units ☐ 5 units above

How much do you cost on electricity bill monthly?

☐ £20 ☐ £50 ☐ £50 above

How much do you cost on natural gas bill monthly?

☐ £20 ☐ £50 ☐ £50 above

ROUND 1: Natural GHG cycle

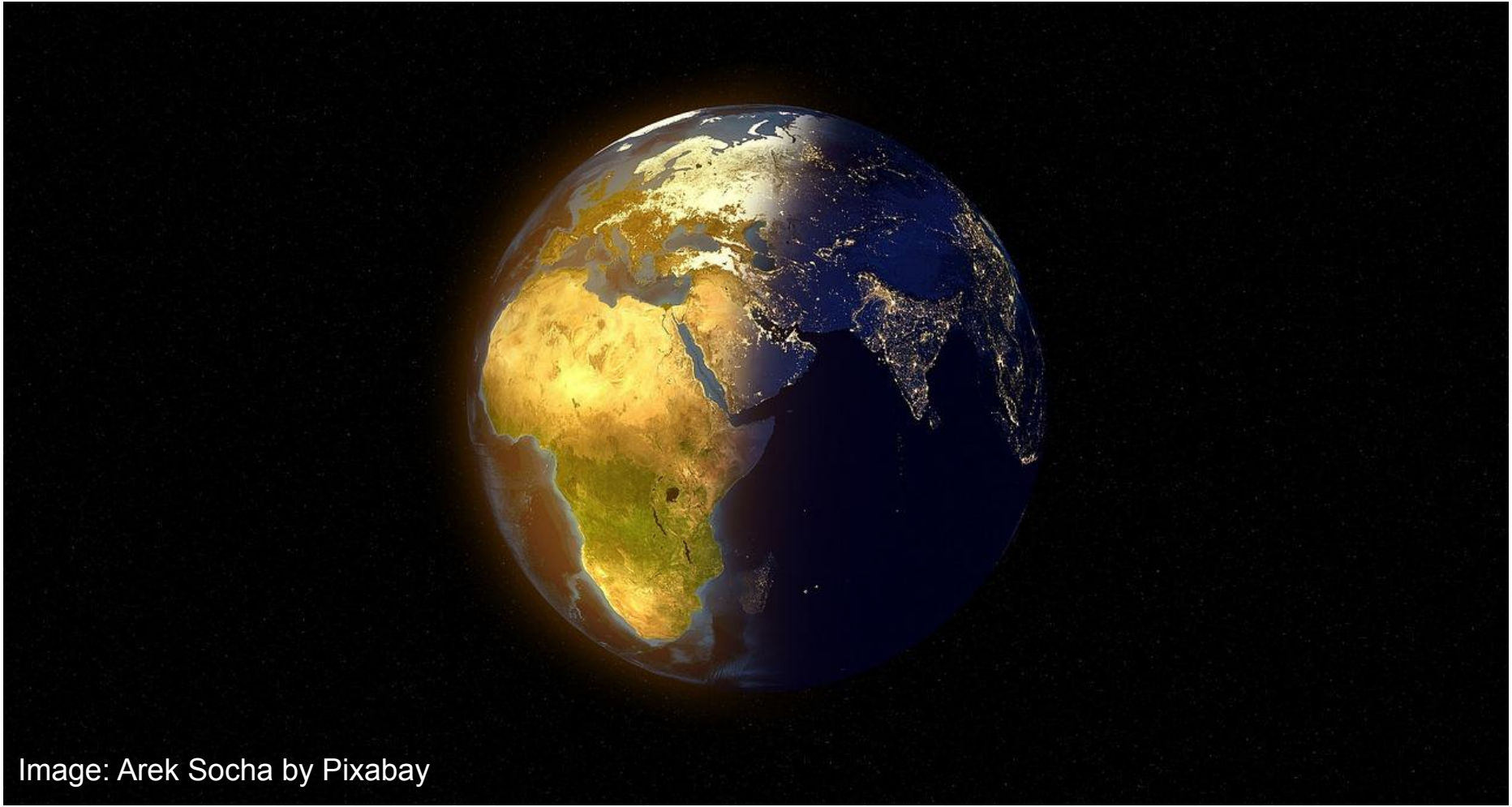


Image: Arek Socha by Pixabay

Greenhouse effect

The greenhouse effect is a natural process itself, in which gases help retain heat from solar radiation on Earth surface.

Without it, the average temperature on Earth would be around -18 ºC (instead of 15 ºC).

The main greenhouse gases (GHGs) are CO_2 (carbon dioxide), CH_4 (methane), N_2O (nitrous oxide) and water vapour. Each one has its own global warming potential (GWP) and persists for a different length of time in the atmosphere.

For comparisons, GHG emissions are usually converted to CO_2 equivalents (CO2e). E.g.: Releasing 1 kg of CH_4 is equivalent to 25 kg of CO_2, and 1 kg of N_2O is equivalent to 298 kg of CO_2*!

* IPCC (2007) cited in https://climatechangeconnection.org/emissions/co2-equivalents/ (Accessed on 26 nov. 2022).

When does the greenhouse effect become dangerous?

Having too much carbon dioxide, methane, nitrous oxide and water vapour in the air trap heat.

This causes the Earth's temperature to increase to extreme temperatures.

This has knock on effects such as glaciers melting, an increase in sea-level, a loss of biodiversity, holes in the ozone and many more detrimental effects.

GHGs come from many natural processes and human activities.

Image: Water Sea Carribean by Pixabay

Natural sources/processes

Respiration

Decomposition of organic matter

Release of gases from the ocean

Natural wetlands

Forest fires

Permafrost

Volcanoes

Earthquakes

Image: Tongass National Forest by National Geographic

Carbon sinks

A carbon sink is anything that absorbs more carbon from the atmosphere than it releases.

Forests are typically carbon sinks as they continually take carbon out of the atmosphere via photosynthesis.

The ocean is the biggest carbon sink on Earth.


Image: Joe by Pixabay

Human activities

In order to obtain food, shelter and clothing, and also in transportation, humans engage in lots of activities that produce waste and GHGs.

In the beginning, they caused little impact on the ecosystem since waste were mainly organic and GHG emissions were negligible.

Pre-industrial revolution Activities

Horseback Photo by Yaroslav Shuraev: https://www.pexels.com/photo/man-riding-a-horse-in-the-grass-valley-8968547/ / DOA: 25/11/22
Sailboat Photo by Pixabay: https://www.pexels.com/photo/sailboat-in-water-33688/ DOA: 25/11/22
Nomad Photo by cottonbro studio: https://www.pexels.com/photo/female-shepherd-near-sheep-3934631/ / DOA: 25/11/22
Donkey Photo by Kunzang Dorjey: https://www.pexels.com/photo/travelers-with-horses-and-donkey-crossing-river-in-highland-5125858/ DOA: 25/11/22

During the Pre-Industrial Revolution, people mainly travelled via horseback, walking or via ship.

The use of domesticated animals for travel purposes was common and people generally did not travel very far.

These travel modes do not release large amounts of carbon dioxide into the atmosphere.

Cars, Planes and Cargo Ships

Cargo ship Photo by Martin Damboldt: https://www.pexels.com/photo/photography-of-ship-799091/ DOA: 25/11/2022
Plane Photo by Pixabay: https://www.pexels.com/photo/jet-cloud-landing-aircraft-46148/ DOA: 25/11/2022
Cars Photo by Phearak Chamrien: https://www.pexels.com/photo/cars-on-a-road-under-the-rain-13055137/ DOA: 25/11/2022
Lorry Photo by Mike B: https://www.pexels.com/photo/a-cargo-trucks-moving-on-the-road-13520550/ DOA: 25/11/2022

Following the Industrial Revolution, the use of cars, planes and large cargo ships became the main modes of travel.

These are carbon intensive methods of travel.

Fossil fuels are burned and are used to create energy to power these transport vehicles.

This aids both people and products in travelling further distances.

Nomadic huts and Stone mansions

Nomad Photo by ArtHouse Studio: https://www.pexels.com/photo/adult-ethnic-woman-against-hills-in-countryside-4321774/ DOA: 25/11/2022
Medieval Photo by Julia Volk: https://www.pexels.com/photo/medieval-stone-castle-under-gloomy-sky-5273514/ DOA: 25/11/2022
Castle Photo by Miguel Rosselló Calafell: https://www.pexels.com/photo/architectural-photography-of-brown-and-gray-castle-3061171/ DOA: 25/11/2022
Stone house Photo by Miro Alt: https://www.pexels.com/photo/brown-house-surrounded-by-snow-covered-field-near-snow-covered-mountain-under-yellow-blue-and-orange-sunset-179845/ DOA: 25/11/2022

Pre-Industrial Revolutions buildings were often constructed using renewable materials such as wood, or materials that there were surplus of, such as stone.

These materials are not carbon intensive and were not transported long distances.

These homes were built using materials that were available and not materials that were manufactured.

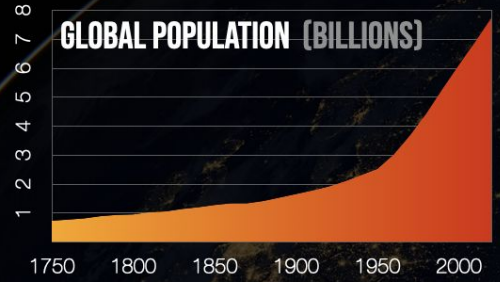
Sky scrapers and high rise

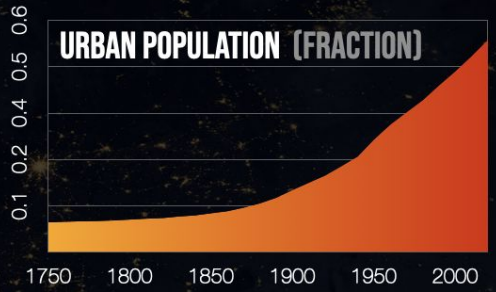
Photo by Cameron Casey: https://www.pexels.com/photo/sears-tower-usa-1722183/ DOA: 25/11/2022
Photo by sergio souza: https://www.pexels.com/photo/modern-residential-buildings-in-city-district-5047473/ DOA:25/11/2022
Photo by sergio souza: https://www.pexels.com/photo/cityscape-with-modern-buildings-at-sunrise-5047154/ DOA: 25/11/2022

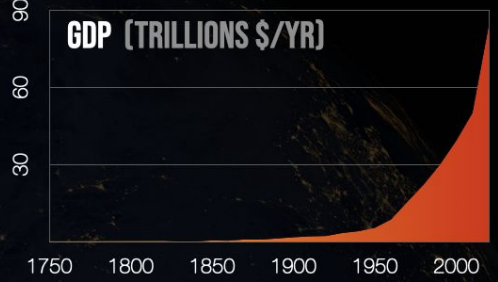
Modern day building processes are carbon intensive, with steel and cement being major contributors to greenhouse gas emissions in the form of carbon-based electricity for manufacture. These materials are non-renewable.

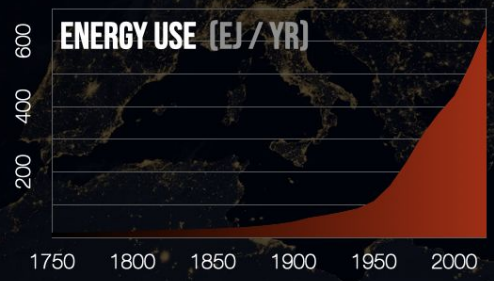
In addition, raw materials are transported long distances, significantly increasing the carbon footprint of modern building techniques.

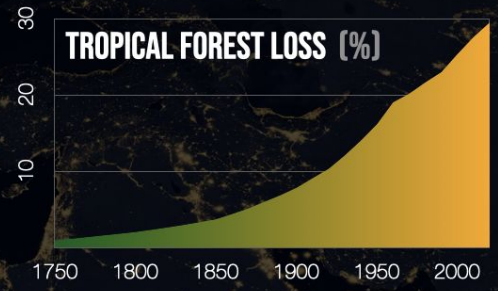
Compounding the issue, recycling infrastructure is not a major feature of modern building.



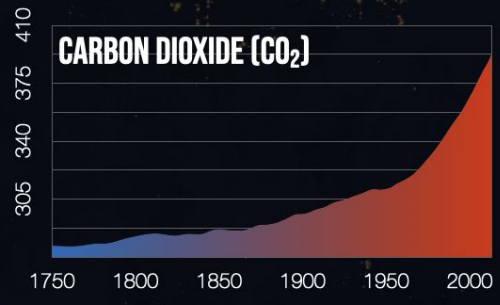


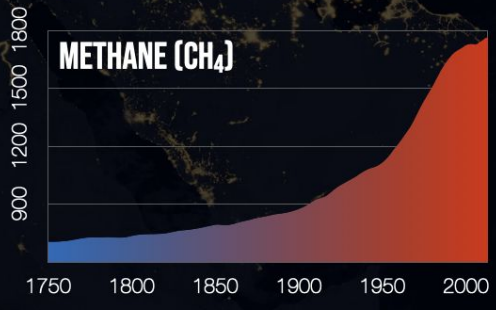


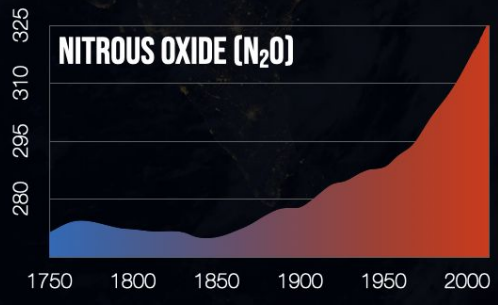




CLIMATE







PROJECT DRAWDOWN

Source: IGBP "Great Acceleration" Report

Human impact became significant

Industrialization and increased use of fossil fuels along with demand for goods and services has made anthropogenic GHGs emissions grow exponentially in the last century.

The graphics illustrate the correlation between GHG concentration (CO_2, CH_4 and CO_2) in the atmosphere and increase in world population, gross domestic product, energy use and deforestation.

ROUND 2:
Post-Industrial Human Activities

Image: David Mark by Pixabay

Fossil fuels

A fossil fuel is a hydrocarbon-containing material formed naturally in the Earth's crust from the remains of dead plants and animals that is extracted and burned as a fuel. The main fossil fuels are coal, crude oil and natural gas.

Today, more than 80% of the primary energy consumption in the world is from fossil fuels, since many of the goods and services we use depends on fossil fuels.

Source: Wikipedia contributors, "Fossil fuel," Wikipedia, The Free Encyclopedia, https://en.wikipedia.org/w/index.php?title=Fossil_fuel&oldid=1119304167 (accessed November 5, 2022).

Image: Brigitte Werner by Pixabay

Image: Angil Akyurt by Pixabay

Transportation

For thousands of years, carriages and wind ships were the basic means of transportation for humans, with negligible greenhouse gas emission.

Today, trucks and cars are the primary means of transportation, along with motor ships, airplanes and trains, all dependent on fossil fuels.

This means people can travel further and has made traveling more comfortable, but currently, 14% of all greenhouse gas emission come from transportation*.

Source: *https://drawdown.org/

Image: Pete Linnforth by Pixabay

Image: Finn Bjurvoll Hansen by Pixabay

Food and fiber production

To produce food and fiber, to make clothes and paper for instance, a lot of fossil fuels are needed. Not just to move machinery, but also as inputs for pigments, pesticides, fertilizers and other chemicals.

Livestock produce methane (CH_4) as part of their digestive process, and is the main source of GHG from agriculture. Liming, urea application, paddy fields and the burning of crop residues are other sources of GHG in agriculture*.

It is estimated that agriculture and forestry account for almost 25% of the current greenhouse gas emission**.

Sources: *https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions#agriculture. **https://drawdown.org/

Image: JamesDeMers by Pixabay

Image: Sharath G. by Pexels

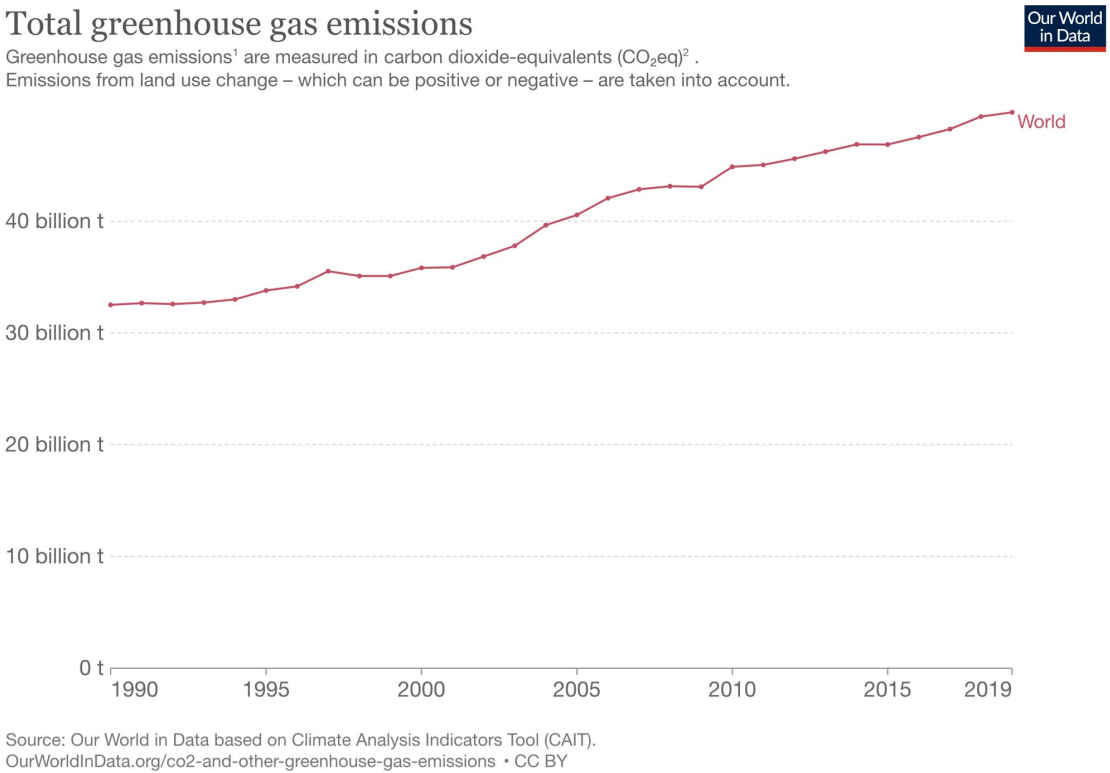
Buildings

Rocks, clay, wood, straw, ice… Humans used a variety of natural resources to build their houses and other structures, with incredible success!

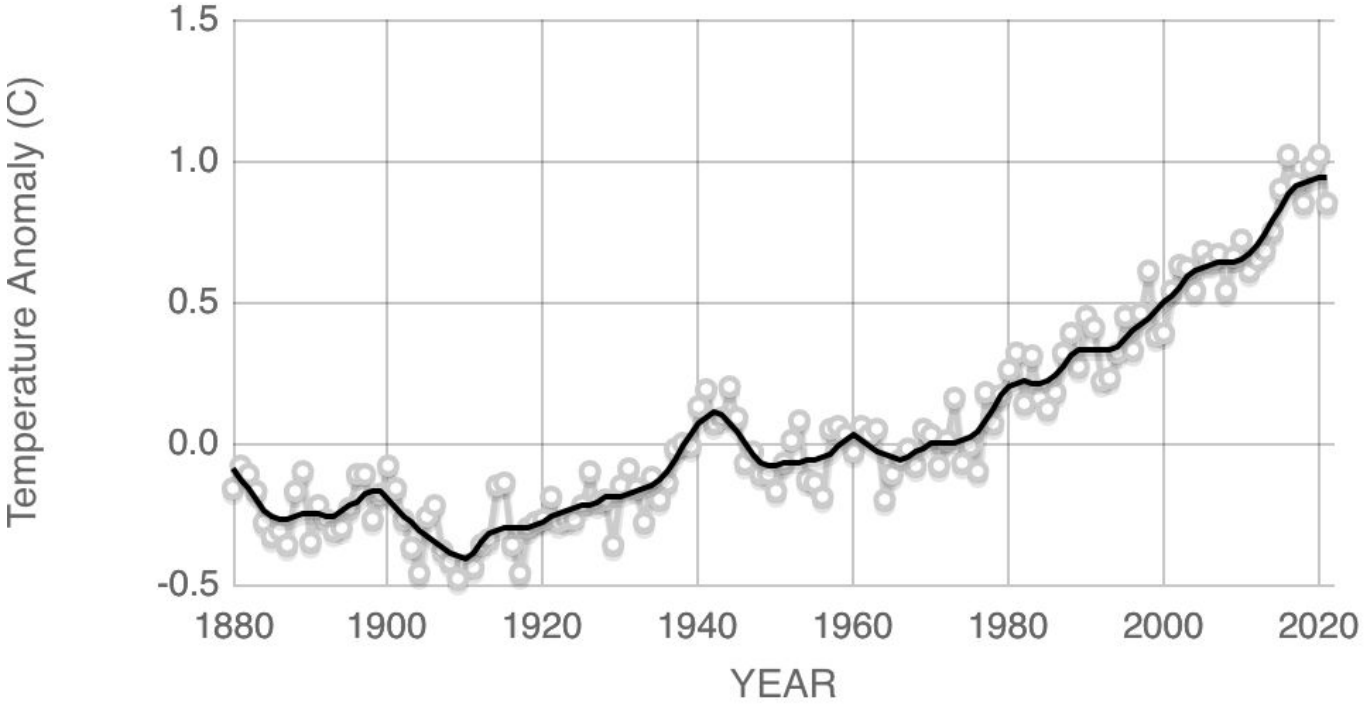
The main materials used in buildings today are concrete, bricks and steel*. Besides using these non-renewable, illumination and acclimatization of buildings require lots of energy. Buildings contribute to 6% of the current greenhouse gas emissions**.

Source: *Zhong et al., *Nature Communications* 12 (2021). https://doi.org/10.1038/s41467-021-26212-z. **https://drawdown.org/.

INCREASED GHG EMISSIONS



INCREASED GLOBAL TEMPERATURE



Source: climate.nasa.gov

Organizations' Scope 3 Emissions

Scope 1: **Direct Emissions**
- Factories
- Facilities
- Company Vehicles

Scope 2: **Indirect Electricity Emissions**
- Electricity use (lights, machinery)
- Emissions occur when generate electricity

Scope 3: **Value Chain Emissions**
- Purchase goods & services
- Transportation & distribution
- Investment
- Business travel

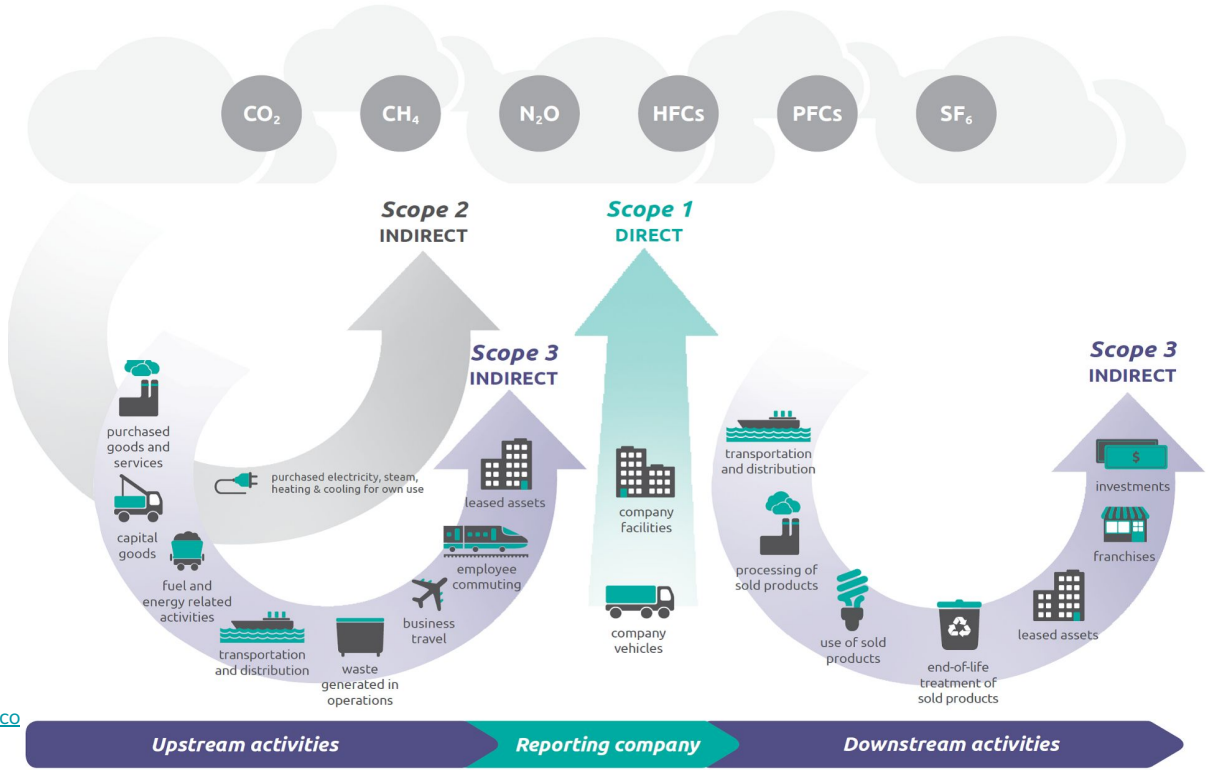


Image from CIBO:
https://www.cibotechnologies.com/pathway/overview-of-ghg-protocol-scopes-and-emissions-across-the-value-chain-2/

ROUND 3: CARBON CALCULATING

CAR EMISSIONS

Lisa drives a 2012 VW Golf. It emits 134g/km and she drives 100km a week. This means she emits 13.4kg of CO_2 every week which makes just under 697kg of CO_2 per year!

The average car in the UK emits 138.4g/km and the average person drives 210km per week (Yurday, 2022; Yurday, 2021). This means the average person emits 29kg of CO_2 per week or 1.5 tonnes of CO_2 per year!

<u>YOUR TURN:</u>

I drive a …….. It emits ……..g/km and I drive ……... km per week. This means my emissions are ……..kg of CO_2 every week which makes ……..tonnes CO_2e per year!

Photo by Khunkorn Laowisit from Pexels:https://www.pexels.com/photo/smoke-coming-from-the-exhaust-pipes-5233284/

Global Car Emissions

There are an estimated 8 billion people in the world.

Use this formula to calculate how what car emissions would look like if the world adopted your lifestyle.

…….. annual emission of CO_2 (tonnes) x 8 bn = ……tonnes CO_2e.

There are an estimated 1.4 billion drivers in the world. Use this variable to calculate how car emissions would look if only the drivers of the world adopted your lifestyle:

…….. tonnes CO_2e

Total Country Emissions (or per capita)

Putting this into perspective → if the world adopted your car lifestyle this would be large as the annual carbon emissions (tonnes CO2) as these countries:

Country	Carbon Dioxide Emissions (million tonnes)
Malawi	1.5
Iceland	4
France	810
Germany	1350
Russia	1940
China	4300
USA	8250

Table Adapted from (Berners-lee, 2010)

MEAT CONSUMPTION

The food we buy adds up to roughly 20% of our carbon footprint.

Jane buys a 500g packet of chicken, cheese and steak respectively per week. Totalling her carbon emissions up by using the resource graph or table provided this produces 39kg of CO_2e per week. Therefore, she emits 2.03 tonnes of CO_2 per year just on meat and dairy alone.

<u>YOUR TURN:</u>

I eat …… per week. This produces a total of ……..…kg of CO_2e per week and therefore, ……. tonnes of CO_2 per year.

This calculation does not account for the methane emissions expelled from cow ruminants (and rice paddy fields). Methane is responsible for an enormous 35% of food system greenhouse gas emissions*.

Photo by Kat Smith: https://www.pexels.com/photo/two-cows-735968/ (Accessed: 28/11/22)

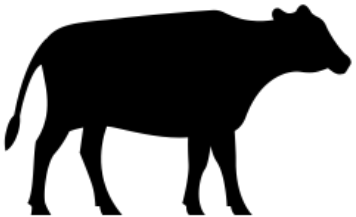
*Food Systems account for more than one third of global greenhouse gas emissions (no date) FAO. Available at: https://www.fao.org/news/story/en/item/1379373/icode/ (Accessed: November 28, 2022).

Global Meat Consumption

According to the Food and Agriculture Organization of the United Nations (FAO), global livestock production makes up 14.5 percent of all anthropogenic (human caused) emissions – 7.1 billion tonnes of CO_2 equivalent per year*.

Use this formula to calculate what emissions would look like if the world adopted your lifestyle:

…….. annual emission of CO_2 (tonnes) x 8 bn [global population] = ……billion tonnes of CO_2e.



Using this number, let's compare it to total global agricultural emissions:

…… 7.1 billion = …….. times bigger/smaller

This means if the whole world followed *just* your meat consumption, global carbon emissions would be …… bigger/smaller than current emissions.

*Key facts and findings (no date) FAO. Available at: https://www.fao.org/news/story/en/item/197623/icode/ (Accessed: November 28, 2022).

Housing

Housing refers to the building we live in. Many aspects influence our CO_2 emissions from housing: the materials used for construction, location, type (house or apartment) etc. However, the source of emissions we have most control over is energy consumption.

In our homes, we use energy mainly for lighting, home appliances, cooking and air temperature regulation. Residential energy use accounts for roughly 20% of greenhouse gas (GHG) emissions in the United States*.

Photo by Max Vakhtbovych.* US Energy Information Administration (2019) apud Goldstein et al., PNAS (2020)

Estimating your housing contribution

- Firstly, you must know your monthly electricity consumption (e.g. 100 kWh).
  - If you use only solar energy, consider it 0.
- Then, consider the type of fuel you use for cooking and its quantity.
- Additionally, if applicable, the type and quantity of fuel you use for air heating.
- Sum it all up.
- On the right you will find a table to help you convert your numbers into CO_2 emissions.

Source	Unit	$kgCO_2e$/unit
Electricity consumption	kWh	0.211 (conversion factor for UK)
Coal	20 kg bag	2.88
Natural gas	kWh	0.183
Propane	L	1.540
Wooden pellet	kg	0.050

Table adapted from https://www.carbonfootprint.com/calculator.aspx

ROUND 4: SOLUTIONS

MEAT FREE (OR LESS) DIET

Photo by Lum3n from Pexels: https://www.pexels.com/photo/close-up-of-vegetables-in-market-319798/

VEGETARIAN AND ‘FLEXITARIAN’ DIETS

The carbon footprint of a **vegetarian diet** is about **half that of a meat-lover’s diet***. Not only is pastoral farming carbon intensive but it also consumes a large amount of fresh-water too, a finite resource.

Alternatively, to transition away from meat-eating taking up a ‘flexitarian’ diet is also a successful method. A review of the research on the sustainability of plant-based diets found that switching from the average Western diet to flexitarian eating, in which meat is partially replaced by plant foods, could decrease greenhouse gas emissions by 7%**.

These diets help to lower farming inputs, land clearing, and associated emissions

*Eatz, J.of G. (no date) Food's carbon footprint, Green Eatz. Available at: https://www.greeneatz.com/foods-carbon-footprint.htm l (Accessed: November 28, 2022).
**Streit, L. (2022) The flexitarian diet, Healthline. Healthline Media. Available at: https://www.healthline.com/nutrition/flexitarian-diet-guide#sustainability (Accessed: November 28, 2022).

Eating Other Proteins

Bear in mind that just because meat has a high carbon footprint, it is not sustainable to switch over your diet to just fish as a substitute. The world's fish stocks are dangerously depleted so let's say you substituted all of your meat-based protein with other low-carbon protein alternatives.

Use the resource links and graph provided to calculate your carbon emissions if you substituted meat for low-carbon alternatives like nuts, fish, poultry or soy beans.

If I ate …… per week, it would produce a total of

……..kg of CO_2e per week and therefore ……. tonnes per year.

Photo: Michi by Pixabay.

SUSTAINABLE AGRICULTURE AND LOCAL PRODUCTION

Conventional agriculture relies on high inputs of agrochemicals and machinery to achieve high yields in large monocultural areas. Also, many products travel long distances to reach our homes.

Many agricultural practices and systems have been developed to reduce the negative impacts of agriculture in the environment.

Agroforestry systems, regenerative farming, organic production, integrated crop-livestock-forest systems and agroecology are some terms related to sustainable agriculture.

Organic farming, for instance, emits about 20% less GHG than conventional systems*. Buying local products reduces transport emissions and contributes even more to mitigation.

* Holka, M., Kowalska, J. and Jakubowska, M. (2022) Reducing carbon footprint of agriculture-can organic farming help to mitigate climate change?, MDPI. Multidisciplinary Digital Publishing Institute. Available at: https://doi.org/10.3390/agriculture12091383 (Accessed: November 28, 2022).

ACTIVE TRANSPORT

Photo by Nubia Navarro (nubikini) from Pexels: https://www.pexels.com/photo/woman-and-man-riding-on-bike-386024/

Active Transport

Recent studies have found that shifting to active transport (walking or cycling) could save as much as a quarter of personal carbon dioxide emissions from transport*.

Those who switch just one trip per day from car driving to cycling **reduce** their carbon footprint by about **0.5 tonnes over a year***.

These SMALL actions have BIG impact. By taking your car off the road you are also reducing everyone else's queuing time and simultaneously reducing their emissions too!

*Dunning, H. (2021) Ditching the car for walking or biking just one day a week cuts carbon footprint: Imperial News: Imperial College London, Imperial News. Available at: https://www.imperial.ac.uk/news/214235/ditching-walking-biking-just-week-cuts/ (Accessed: November 28, 2022).

Working from home once a week

Lets calculate how working from home once a week decreases your carbon footprint. Use the resource links or table provided to make these calculations.

David uses the bus to get to work and travels 15 miles to get there. This means he emits 0.225kgCO_2e every journey to work or 0.45kg to get there and back!

YOUR TURN:

The means of transport to get to work is by ……. And I travel …….. Miles. This means I emit …….kgCO_2e every journey to work and …….kg to get there and back. If I worked from home once a week I could save this.

SOLAR ENERGY

Image: Ulrike Leone by Pixabay

Solar Energy

Since 2012, the costs of solar energy system installation have dropped more than 50%*! On the contrary, non renewable energy source prices tend to grow.

Even more, many countries are stimulating renewable and distributive energy, that is, the generation of energy near the use points, including the possibility to sell the excedent of the energy produced in your home.

Therefore, installing photovoltaic panels in your building might not only reduce your light bill and CO_2 emission to 0, but also increase your income! It is also possible to install boilers and other technologies to specific uses of solar energy, such as heating water.

*IHS Markit (2022). 10 Cleantech Trends in 2022. Available at: https://cdn.ihsmarkit.com/www/pdf/0222/IHS-Markit-Top-10-Cleantech-Trends-2022-Whitepaper.pdf (Accessed November 28, 2022).

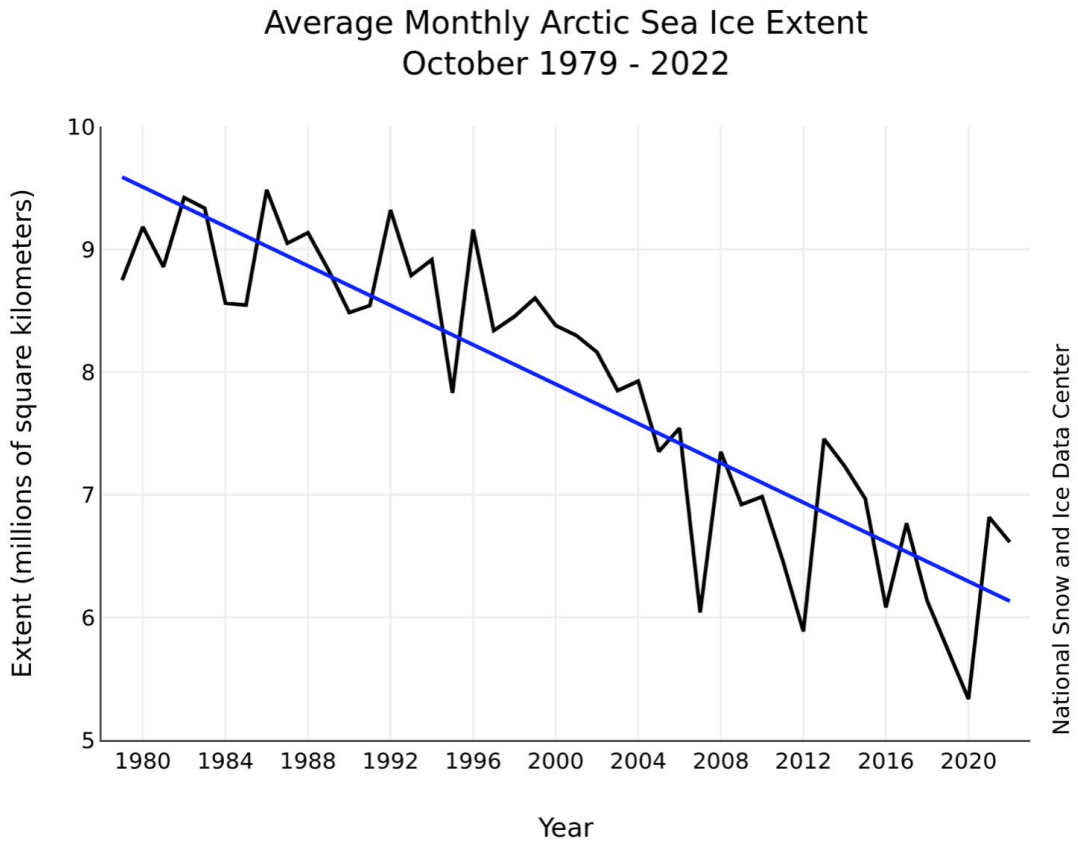
ROUND 5: IMPACTS

Photo by Francesco Ungaro:
https://www.pexels.com/photo/green-bushes-on-desert-998653/

The Earth’s temperature has risen by 0.14° Fahrenheit (0.08° Celsius) per decade since 1880. However, the rate of warming since 1981 is more than twice that.* The rising temperatures contributes to sea ice melt, altered weather patterns as well as an increase in natural disasters.

*https://www.climate.gov/news-features/understanding-climate/climate-change-global-temperature

Photo by ArtHouse Studio from Pexels: https://www.pexels.com/photo/antarctic-landscape-with-broken-ice-on-water-and-frozen-mounts-4338092/


Average Monthly Arctic Sea Ice Extent
October 1979 - 2022
Extent (millions of square kilometers)
10
9
8
7
6
5
1980
1984
1988
1992
1996
2000
2004
2008
2012
2016
2020
Year
National Snow and Ice Data Center

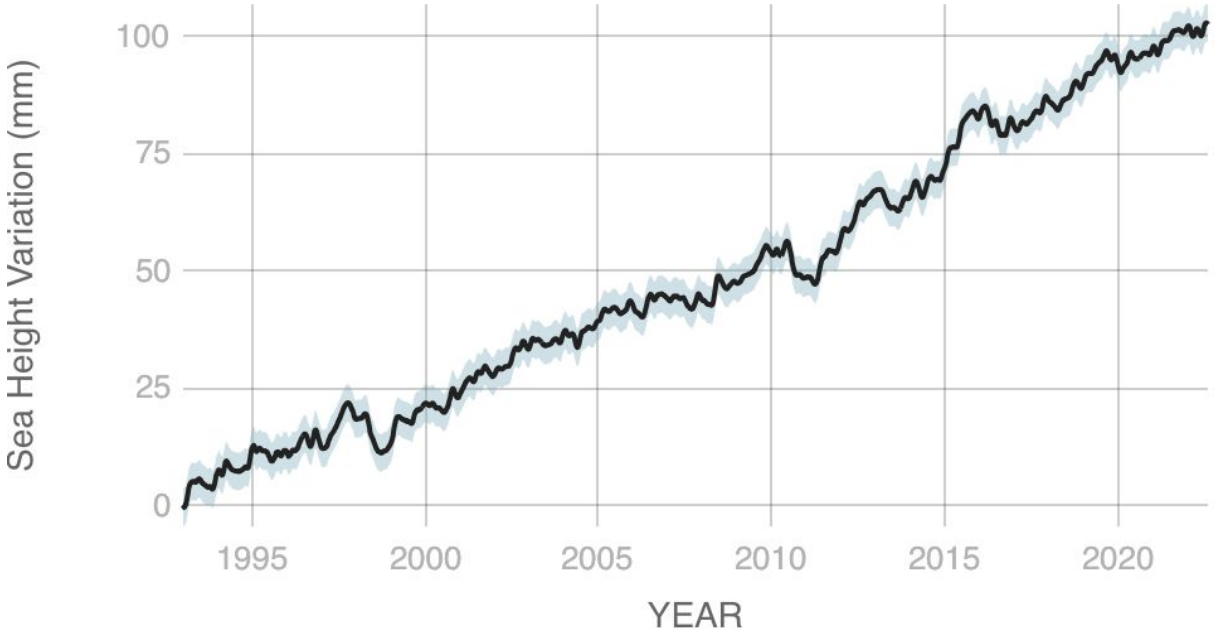
OCEAN ACIDIFICATION

The ocean absorbs around 30% of carbon dioxide from the Earth's atmosphere*. As levels of atmospheric CO2 climb from the increased release of greenhouse gases, the amount of carbon dioxide absorbed also increases.

Water and carbon dioxide combine to form carbonic acid, decreasing the Earth's PH level to become progressively acidic.

*https://www.noaa.gov/education/resource-collections/ocean-coasts/ocean-acidification

Sea level rise is caused primarily by two factors related to global warming: the added water from melting ice sheets and glaciers, and the expansion of seawater as it warms.



Source: climate.nasa.gov

DEATH OF CORAL REEFS

Low PH levels of the oceans dissolve and weaken shells and corals. This is known as ‘coral bleaching’. Amongst other factors such as increased sea temperatures, this has caused 14% of coral reefs to die between 2009-2018*.

Photo by Francesco Ungaro from Pexels: https://www.pexels.com/photo/scenic-photo-of-coral-reef-3157890/.
*https://www.unep.org/news-and-stories/story/why-are-coral-reefs-dying

DEFORESTATION

Photo by Pok Rie: https://www.pexels.com/photo/bird-s-eye-view-of-lumbers-1268068/

80% of global deforestation is a result of agricultural production*. Increasingly, the world's agriculture system is expanding its terrestrial footprint to produce livestock feed that meets the growing demand for meat and dairy products or crop-based biofuels.

*https://www.greenpeace.org/usa/forests/issues/agribusiness/

ADVERSE HEALTH EFFECTS

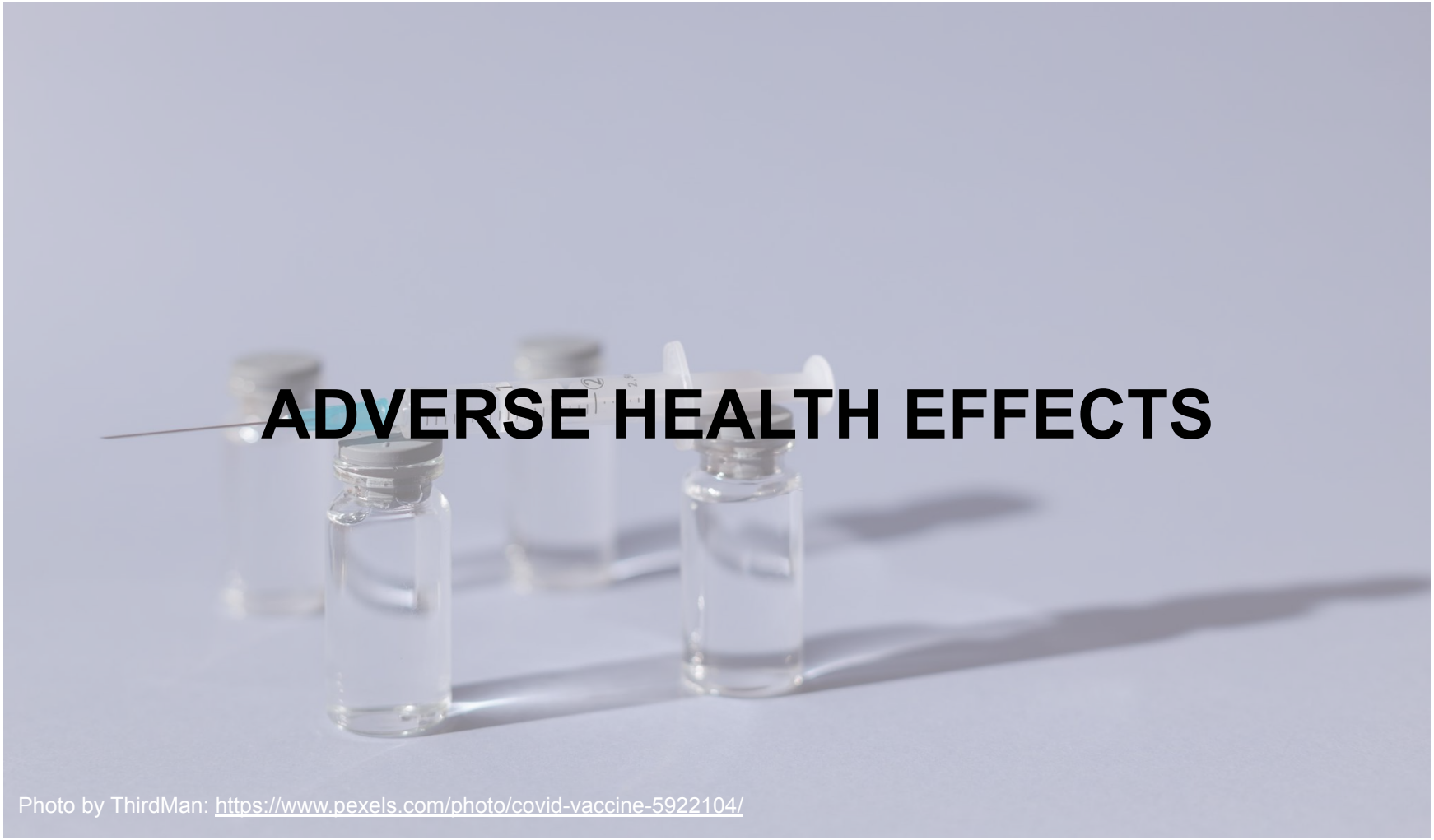


Photo by ThirdMan: https://www.pexels.com/photo/covid-vaccine-5922104/

Climate change can severely impact human health. Extreme heat can cause heat-related illness, cardiovascular failure and even death. The impact that climate change has on water and food supplies can result in malnutrition or diarrheal disease. The constant fluctuation of temperatures can adversely affect water quality which can result in cholera, harmful algal blooms, cryptosporidiosis and more. Environmental degradation can force individuals to migrate which in turn can trigger mental health issues, and can cause civil conflict. Climate change can have a huge impact on people's mental health due to its devastating impacts.*

*https://www.cdc.gov/climateandhealth/effects/default.htm

SHIFTS IN BIODIVERSITY

Photo by Tyler Lastovitch: https://www.pexels.com/photo/green-leafed-trees-572688/

Rising temperatures can increase many species mortality rate due to changes that result in less food, less successful reproduction and the alteration of their habitats.* This results in changes within the natural environment which can trigger knock-on effects for other animals such as food shortages due to the increased mortality rates of other animals.

*https://www.nps.gov/articles/000/wildlife-climateimpact.htm

Photo by Elizabeth Armstrong: https://www.pexels.com/photo/red-apples-635705/

Increasing temperatures alter weather patterns. This can alter the quantity and quality of crops. This can result in a decrease in the amount of food available which can lead to food insecurity.

Please Share Your Feedback With Us

1. What have you learned from the card game?

2. How will you take action from your daily life?

Discarded cards (trash can)

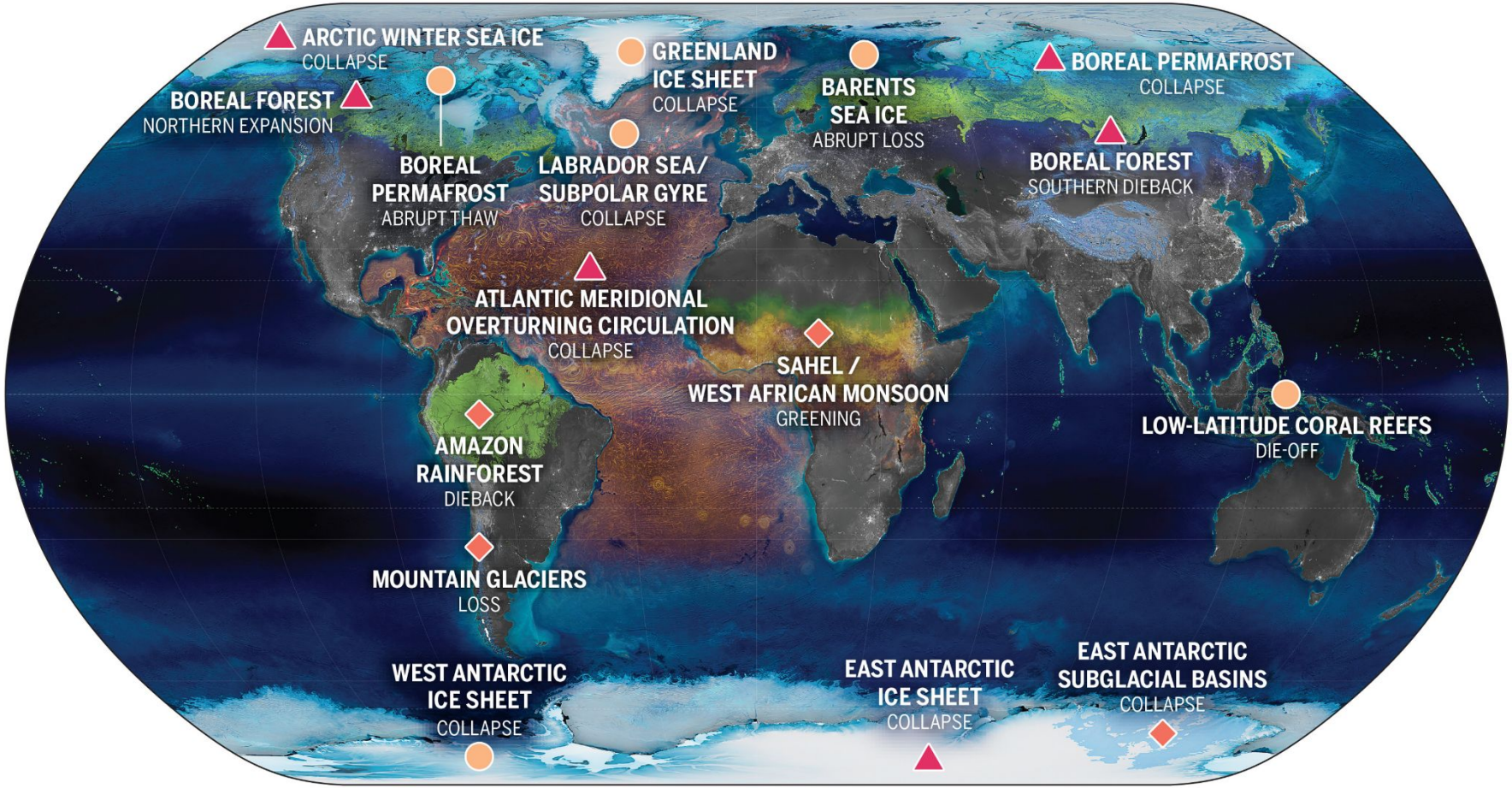


Image: Mckay et al., Science, v. 377, n. 6611, 2022.

Tipping points

Climate tipping points are conditions beyond which changes in a part of the climate system become self-perpetuating.

The figure illustrates how much temperature increase is needed to trigger 16 tipping points around the world.

These changes may lead to abrupt, irreversible, and dangerous impacts with serious implications for humanity.

Source: Mckay et al., Science, v. 377, n. 6611, 2022.

Estimating you housing contributing

Housing refers to the building you live in. You will be given the following questions and options:

- Which housing type best describes your home?
  - Freestanding
  - Apartment
  - Luxury apartment (duplex) or condominium
- What material is your house constructed with?
  - Straw, bamboo our wood
  - Brick/concrete
  - Steel/other
- How many people live in your house?
  - 1-2
  - 3-4
  - 5+
- What is the size of your home?
  - Small (uo to 45 m^2)
  - Medium (up to 139 m^2)
  - Large (140 m^2+)
- …

FOOD EMISSIONS

Growing tomatoes in March compared to July in the UK can increase carbon dioxide emissions by 49.6kg!

Comparing the strawberry:
150 g CO2e (or 600 g per kilo) grown in season in your own country
1.8 kg CO2e (or 7.2 kg per kilo) grown out of season and flown in, or grown locally in a hot house

This illustrates that buying out of season or air-freighted produce can increase your footprint by 10 times.

Photo by Markus Spiske: https://www.pexels.com/photo/green-and-red-oval-fruits-965740/

Car Emission Calculation Resources

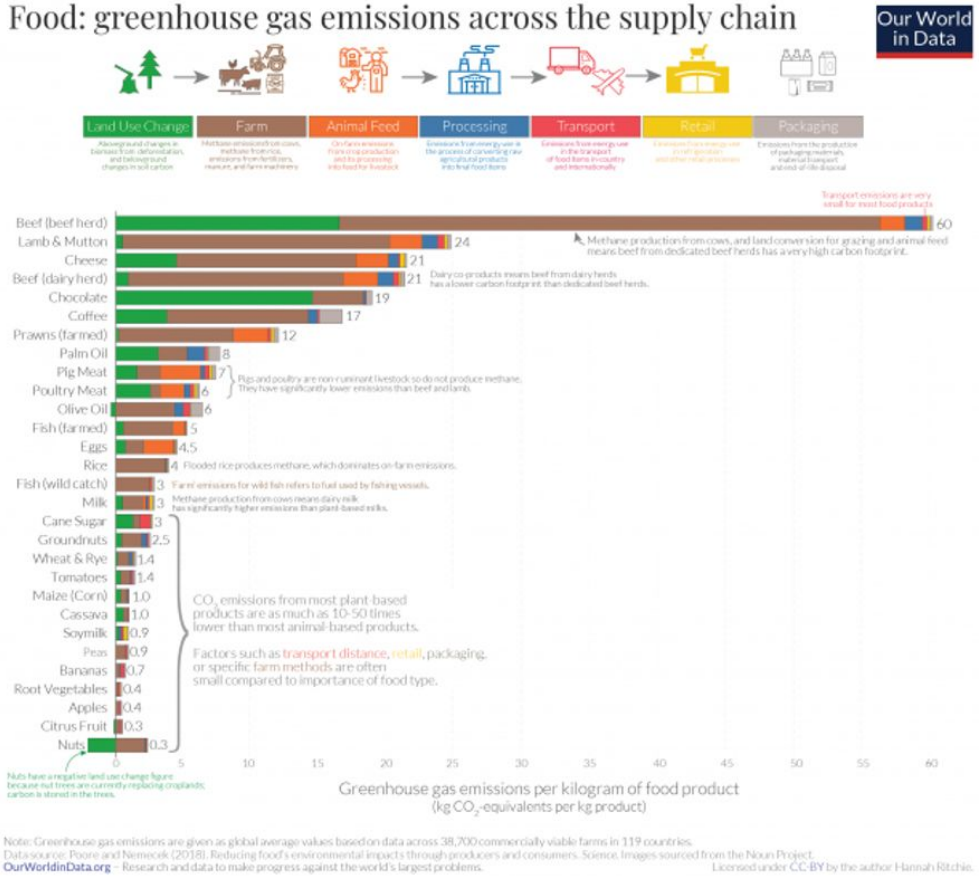
To find the exact CO_2 emissions by the make and model of your car use the Car Emissions website: https://www.car-emissions.com/cars/model/Volkswagen/Golf/2012

Alternatively, a helpful source to *automatically* calculate your carbon emissions from driving can be found using this link, CO_2myClimate: https://co2.myclimate.org/en/portfolios?calculation_id=5233638

TYPE OF CAR	CO_2 emissions (gCO_2/km)
Average car (UK standard in 2015)	153.0
Average new car (UK standard in 2015)	120.1
Plug-in Hybrid vehicle	94
Fully Electric Vehicles	0

Please Note – These figures are not final truths. There is always uncertainty and many are based on average/typical numbers.

Meat and Dairy Emissions Resources



Use these resources to calculate your consumption of meat foods and their contribution to carbon emissions.

MEAT	Carbon Emissions / CO_2e per packet (packet = 500g)
Beef	30kg
Lamb	12kg
Cheese	6kg
Poultry	3kg

Table adapted from graph: (Poore and Nemecek, 2018)