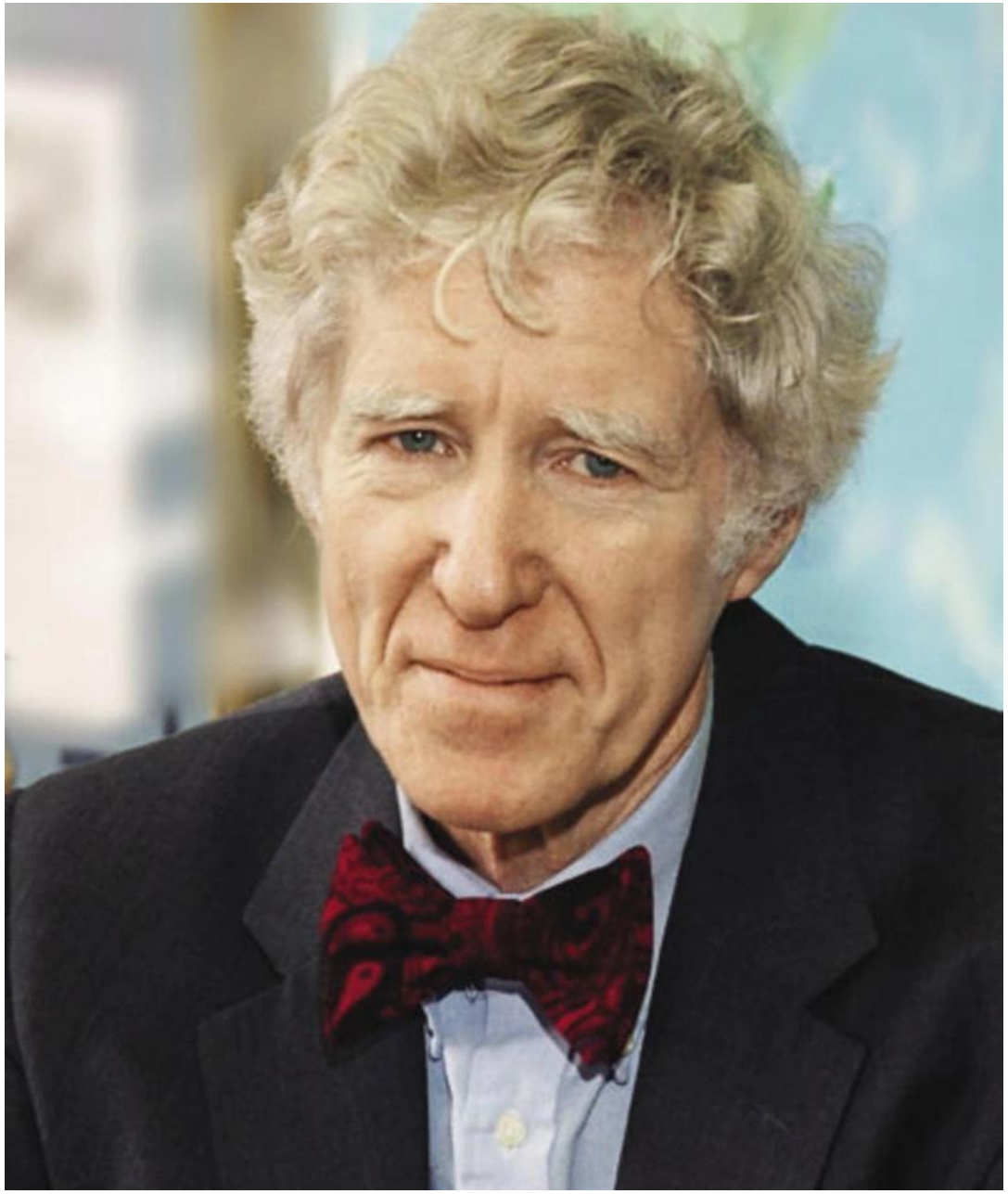
Living in the Environment

FRANCISCO FERREIRA

February 2025

No civilization has survived the ongoing destruction of its natural support system. Nor will ours.
LESTER R. BROWN



The **environment** is everything around us. It includes the living and the nonliving things (air, water, and energy) with which we interact in a complex web of relationships that connect us to one another and to the world we live in.

Despite our many scientific and technological advances, we are utterly dependent on the earth for clean air and water, food, shelter, energy, fertile soil, and everything else in the planet's *life-support system.*

Source: Living in the Environment, 18th edition

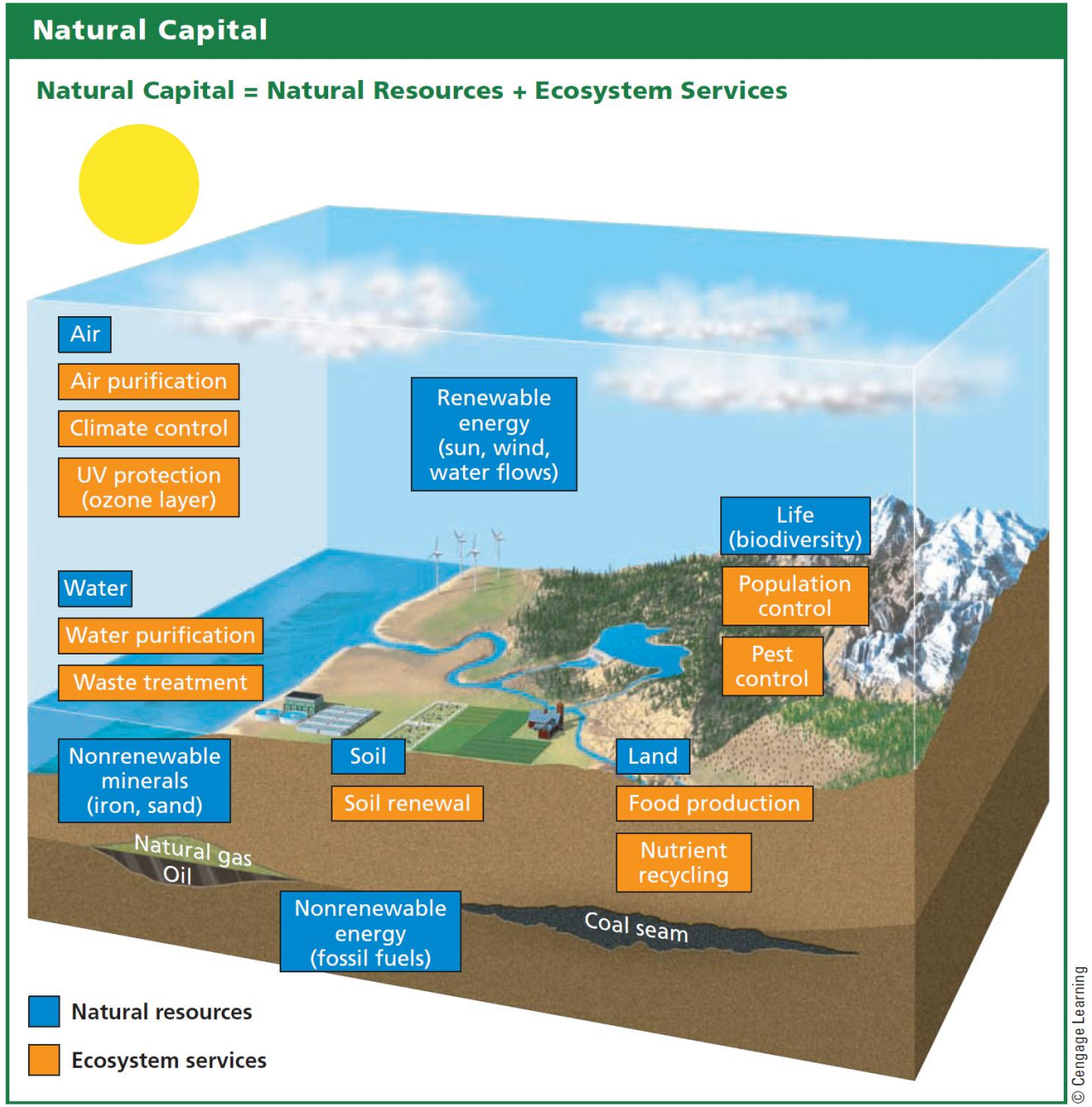
Mentimeter

What does “sustainability” reminds you?

Sustainability is the capacity of the earth's natural systems and human cultural systems to survive, flourish, and adapt to changing environmental conditions into the very long-term future.

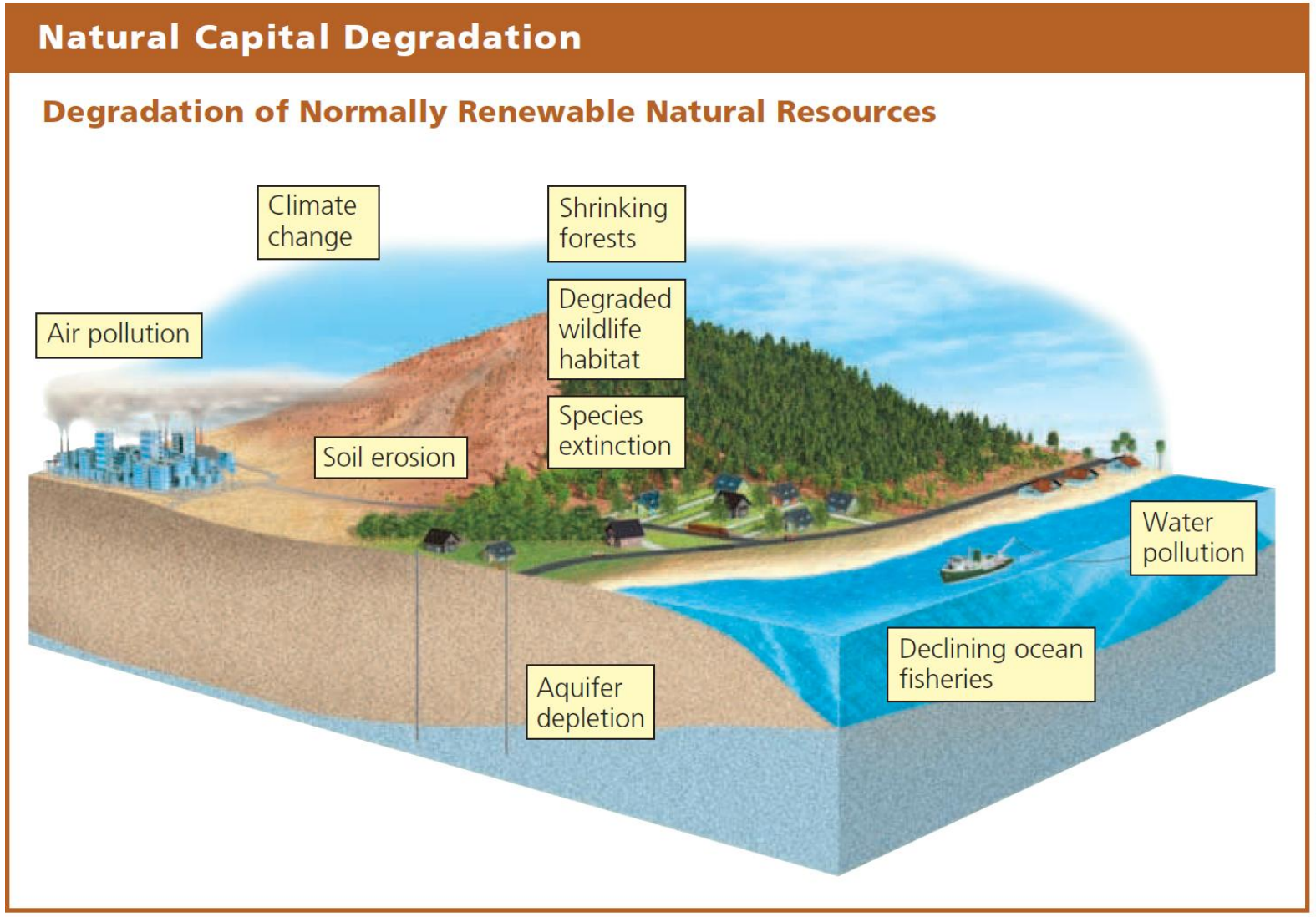
Natural Capital

Sustainability depends on the natural resources and ecosystem services that support all life and economies.



Natural Capital Degradation

how human activities can degrade natural capital.



Source: Living in the Environment, 18th edition

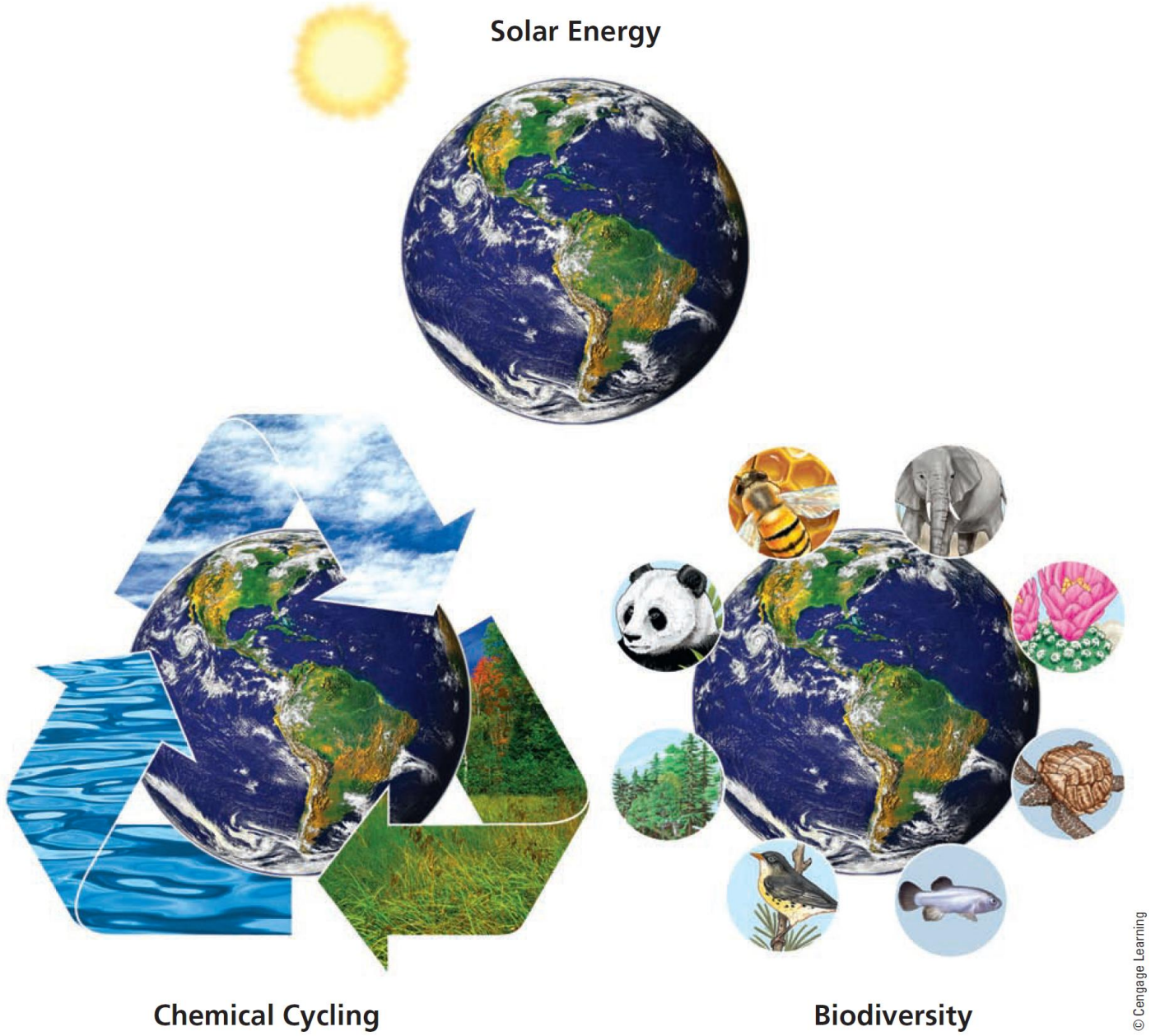
Solutions
Existing and proposed solutions to environmental problems in a balanced manner and challenge students to use critical thinking to evaluate them

Trade-offs
The search for solutions involves tradeoffs, because any solution requires weighing advantages against disadvantages.

Individuals Matter!

Source: Living in the Environment, 18th edition

Three Scientific Principles of Sustainability



Source: Living in the Environment, 18th edition

Dependence on solar energy:

The sun warms the planet and provides energy that plants use to produce **nutrients**, or the chemicals necessary for their own life processes along with those of most other animals, including humans. The sun also powers indirect forms of **solar energy** such as wind and flowing water, which we use to produce electricity.

Source: Living in the Environment, 18th edition

Biodiversity (short for *biological diversity*):

Biodiversity is the variety of genes, organisms, species, and ecosystems in which organisms exist and interact.
The interactions among species, especially the feeding relationships, provide vital ecosystem services and keep any population from growing too large. Biodiversity also provides countless ways for life to adapt to changing environmental conditions, even catastrophic changes that wipe out large numbers of species.

Source: Living in the Environment, 18th edition

Chemical cycling

Chemical cycling, or **nutrient cycling**, is the circulation of chemicals necessary for life from the environment (mostly from soil and water) through organisms and back to the environment. Because the earth receives no new supplies of these chemicals, organisms must recycle them continuously in order to survive. This means that there is little waste in nature, other than in the human world, because the wastes of any organism become nutrients or raw materials for other organisms.

Source: Living in the Environment, 18th edition

Three Social Principles of Sustainability

Left: ©Minerva Studio/Shutterstock.com. Center: mikeledray/Shutterstock.com. Right: ©Yuri Arcurs/Shutterstock.com.

Key concepts

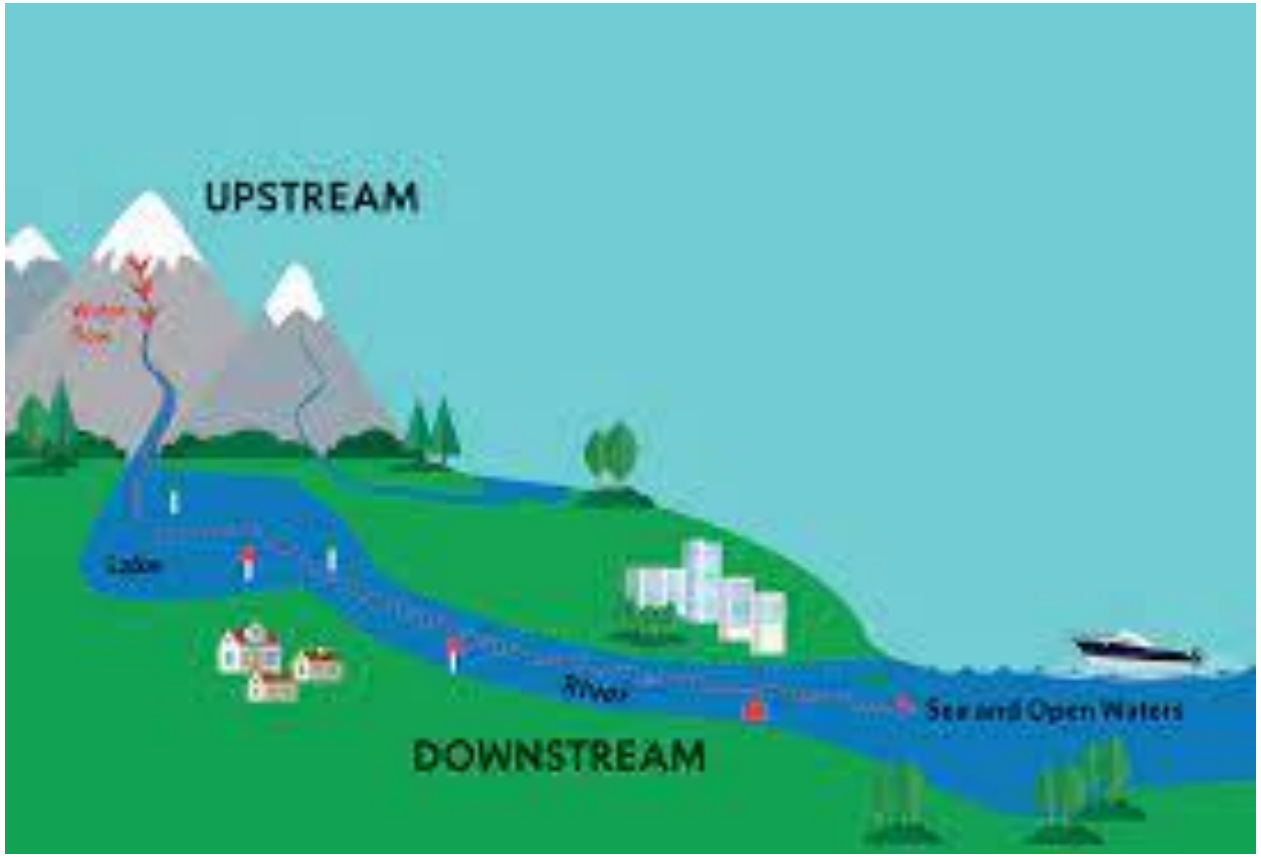
Pollution, which is contamination of the environment by a chemical or other agent such as noise or heat to a level that is harmful to the health, survival, or activities of humans or other organisms.
Polluting substances, or *pollutants,* can enter the environment naturally, such as from volcanic eruptions, or through human activities,

Point sources are single, identifiable sources.

Nonpoint sources are
dispersed and often difficult to identify.

Source: Living in the Environment, 18th edition

Key concepts



Pollution prevention, efforts focused on greatly reducing or eliminating the production of pollutants.

Pollution cleanup, which involves cleaning up or diluting pollutants after we have produced them.

Source: Living in the Environment, 18th edition

The context

Climate crisis

Probably the biggest challenge for humanity this century

Biodiversity crisis

With an irreversible lost of species

Resources crisis

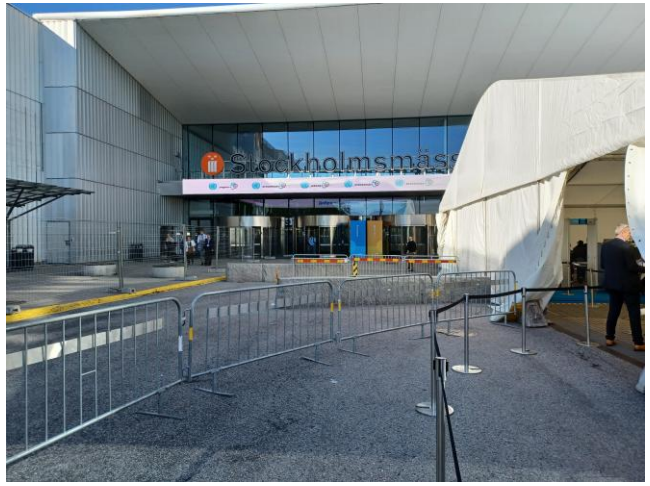
When our ecological footprint is far beyond the limits of what nature renews every year


BBC NEWS | PIDGIN

2-3 JUNE 2022

STOCKHOLM +50

A HEALTHY PLANET FOR THE PROSPERITY OF ALL
– OUR RESPONSIBILITY, OUR OPPORTUNITY



2-3 June 2022
6000 participants

Numbers from 1972 to now

Only about a tenth of the hundreds of global targets in the areas of environment and sustainable development agreed upon by countries have been achieved or made significant progress.

Natural **resource use has more than tripled since 1970** and continues to grow. The use of these resources and their benefits are unevenly distributed across countries and regions. **The poorest half of the global population owns just 2% of total global wealth, while the richest 10% own 76% of all wealth.**

The poorest half of the global population contributed 10% of greenhouse gas emissions that contribute to global warming and consequent climate change; **the richest 10% of the global population emitted more than half of total carbon emissions during 1990–2015** .

Numbers from 1972 to now

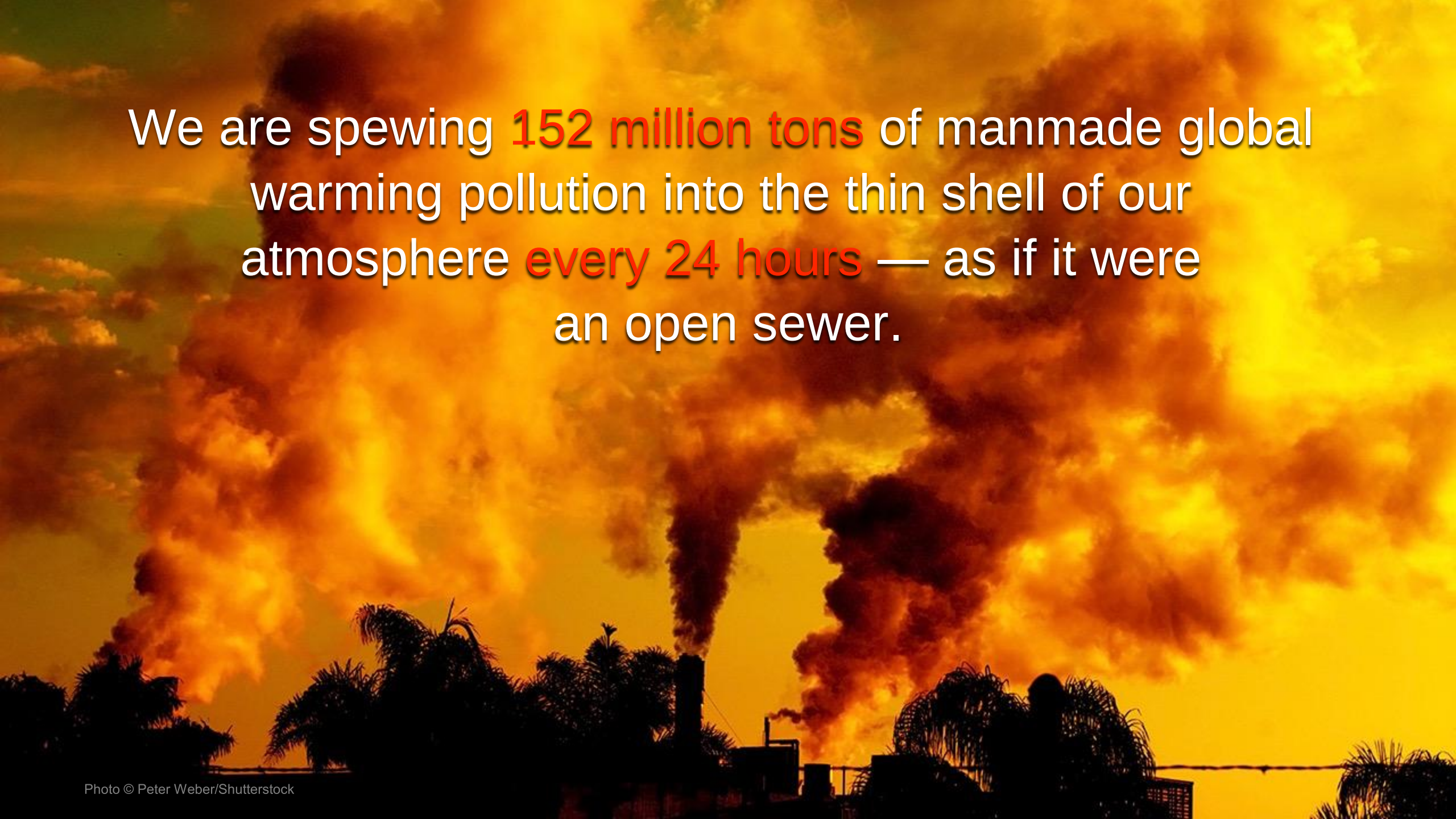
A person born today could live in a **“4°C world”** , that is, several degrees warmer than today, in which **16% of species would be at risk of extinction**; your exposure to heat waves can be up to seven times that of a person born in 1960. Humans have **altered 75% of the planet's land surface, impacted 66% of the ocean area and destroyed (directly or indirectly) 85% of the wetlands**.

The amount of natural resources extracted by humans globally each year has tripled since 1970. **High-income countries have** consumed the most of these resources, with **carbon dioxide consumption footprints that are more than 13 times the level of low-income countries**.

Numbers from 1972 to now

The **funding gap for the Sustainable Development Goals (SDGs) globally has been estimated at €2.3 trillion** by the Organization for Economic Co-operation and Development (OECD)

Currently, **no country** is giving its citizens what they need without transgressing planetary biophysical limits.




AIR TRANSPORT
THAWING PERMAFROST
COAL MINING
OIL PRODUCTION
COAL PLANTS
FERTILIZATION
INDUSTRIAL PROCESSES
LAND TRANSPORT
LANDFILLS
© 2017 Don Foley

The Ten Hottest Years on Record Have Been the Last Ten Years

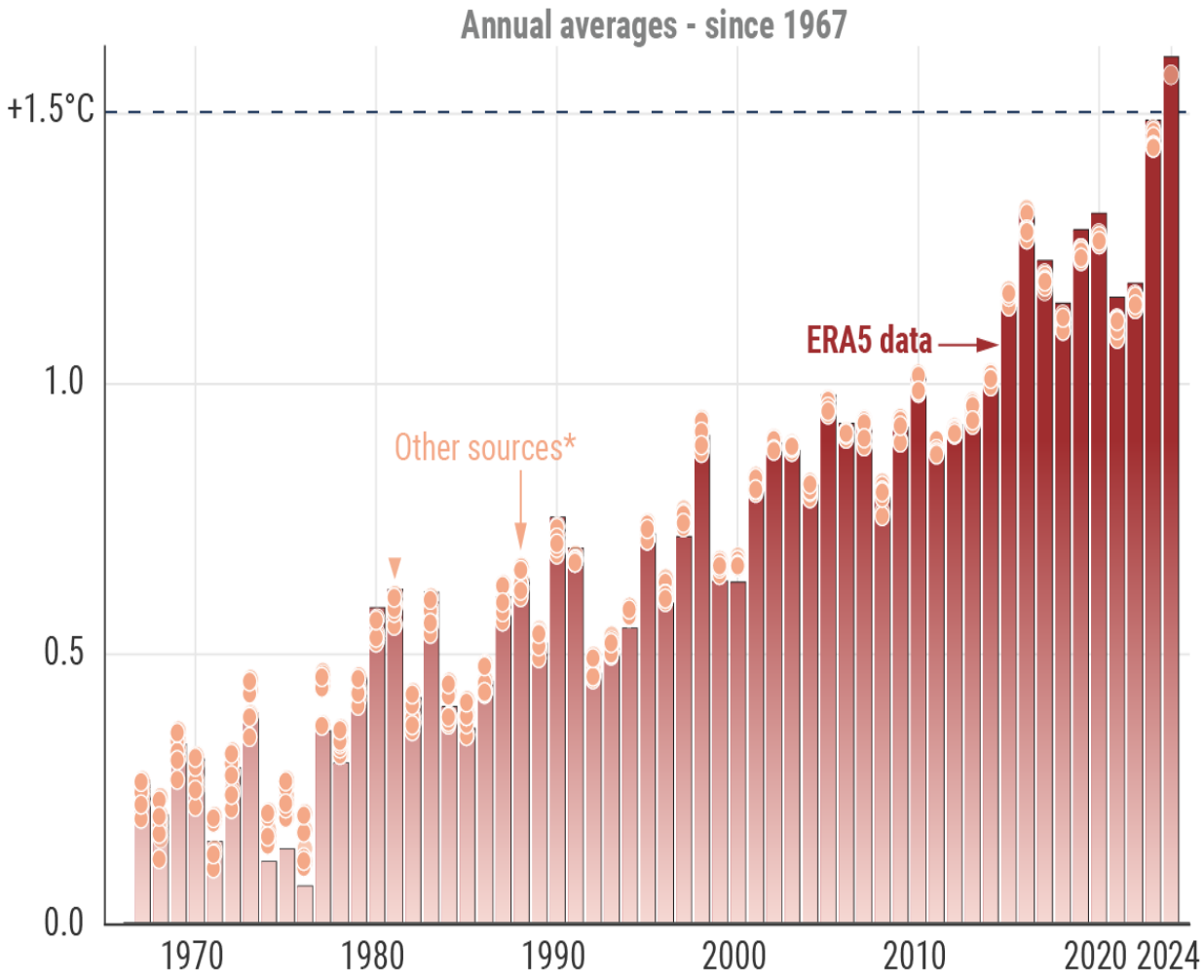
2024 2023 2020 2016 2019

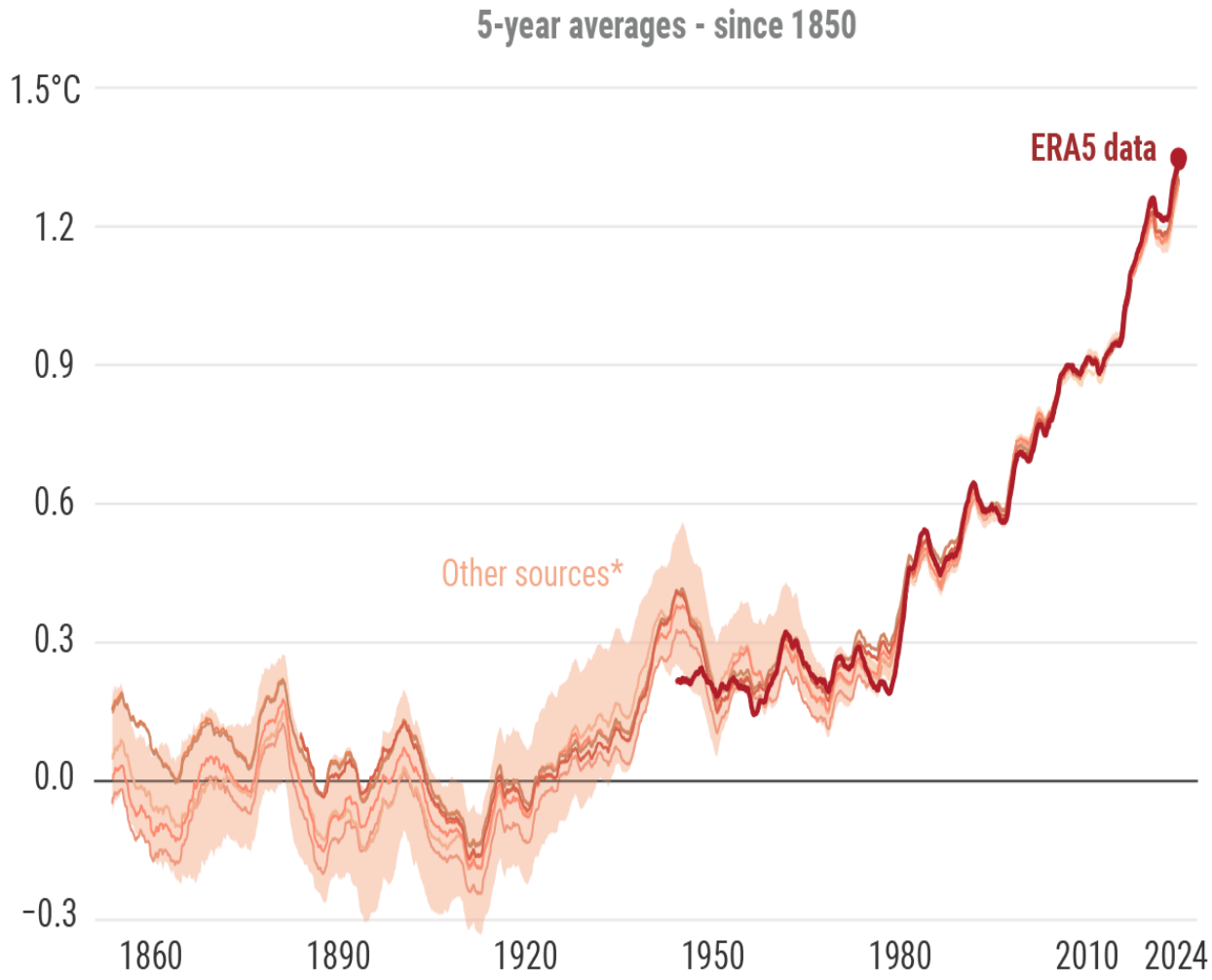
2017 2022 2015 2021 2018

Data: NASA/GISS

Global surface temperature increase above pre-industrial

Reference period: pre-industrial (1850–1900) • Credit: C3S/ECMWF





***Other sources** include JRA-3Q, GISTEMPv4, NOAAGlobalTempv6, Berkeley Earth and the HadCRUT5 ensemble mean. Shading shows the range of the HadCRUT5 ensemble.

PROGRAMME OF THE EUROPEAN UNION
opernicus Europe's eyes on Earth
Climate Change Service climate.copernicus.eu
IMPLEMENTED BY ECMWF

Key temperature statistics for 2024

Region	Anomaly (vs 1991–2020)	Actual temperature	Rank (out of 85 years)
Globe	**+0.72°C** (+1.60°C vs pre-industrial)	15.10°C	**1st highest** 2nd - 2023
Europe	**+1.47°C**	10.69°C	**1st highest** 2nd - 2020
Arctic	**+1.34°C**	-11.37°C	**4th highest** 1st - 2016
Extra-polar ocean	**+0.51°C**	20.87°C	**1st highest** 2nd - 2023

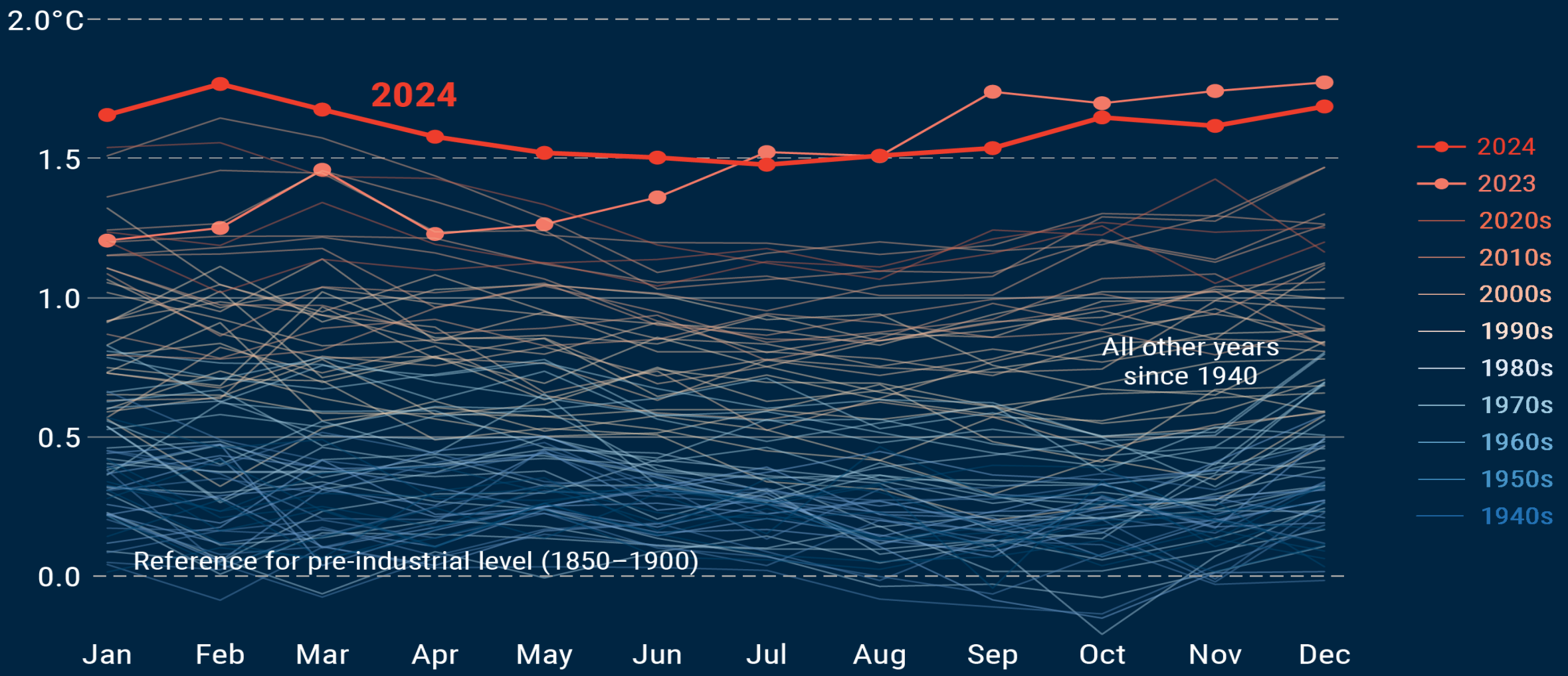
The European region is defined as 25°W-40°E, 34°-72°N. The extra-polar ocean region is defined as 60°N-60°S.
Statistics for *globe*, *Europe* and *the Arctic* refer to surface air temperatures, statistics for *extra-polar ocean* refer to the sea surface temperature. Temperatures for Europe and the Arctic are **over land only**.

Data source: ERA5 • Credit: C3S/ECMWF

PROGRAMME OF THE EUROPEAN UNION
opernicus Europe's eyes on Earth
Climate Change Service climate.copernicus.eu
IMPLEMENTED BY ECMWF

Global surface air temperature increase above pre-industrial

Data: ERA5 • Reference period: pre-industrial (1850–1900) • Credit: C3S/ECMWF



PROGRAMME OF THE EUROPEAN UNION

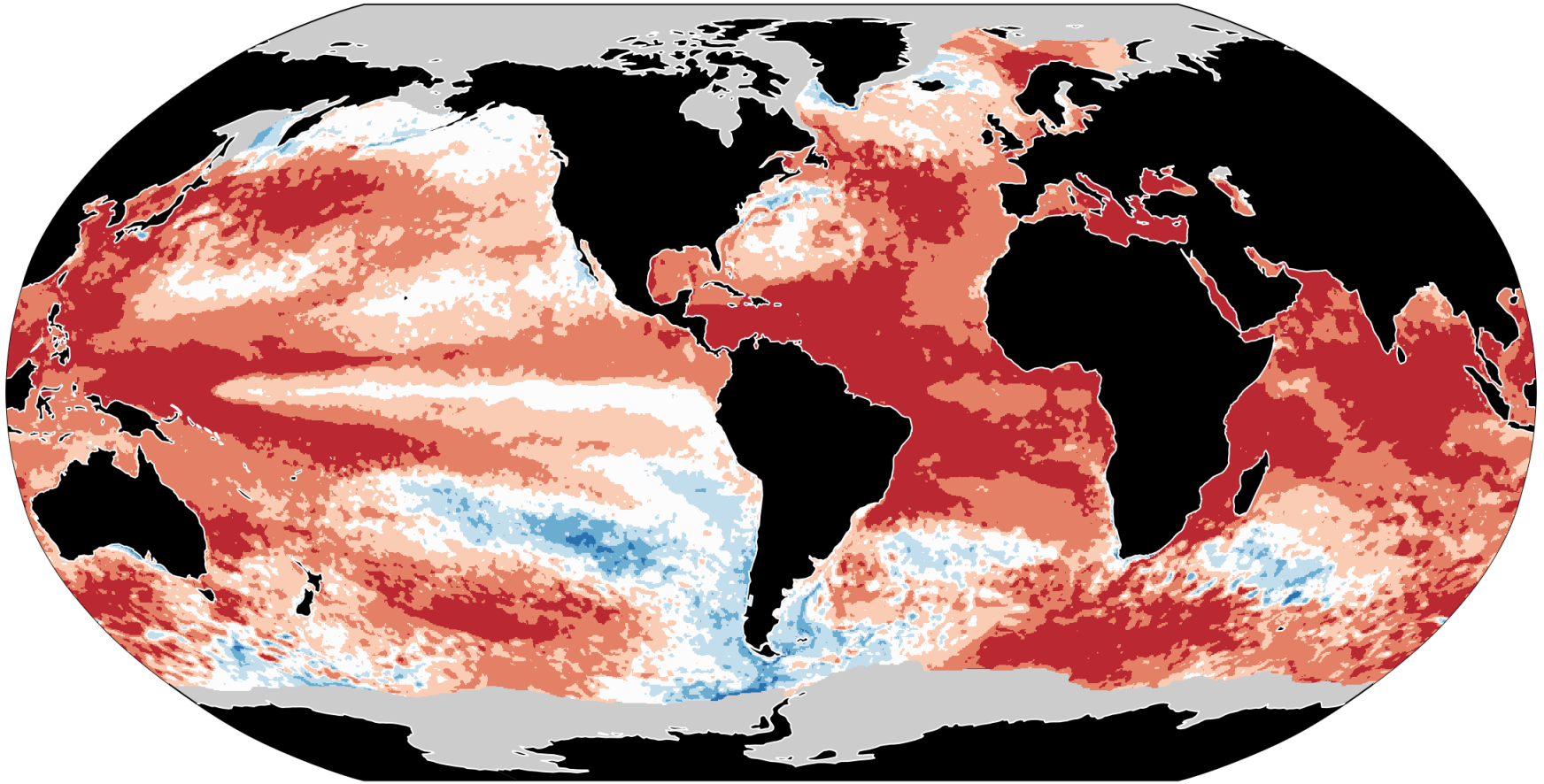
Copernicus Europe's eyes on Earth

Climate Change Service climate.copernicus.eu

IMPLEMENTED BY ECMWF

Anomalies and extremes in sea surface temperature in 2024

Data: ERA5 (1979–2024) • Reference period: 1991–2020 • Credit: C3S/ECMWF



Sea ice & ice shelves | Coolest | Much cooler than average | Cooler than average | Near average | Warmer than average | Much warmer than average | Warmest

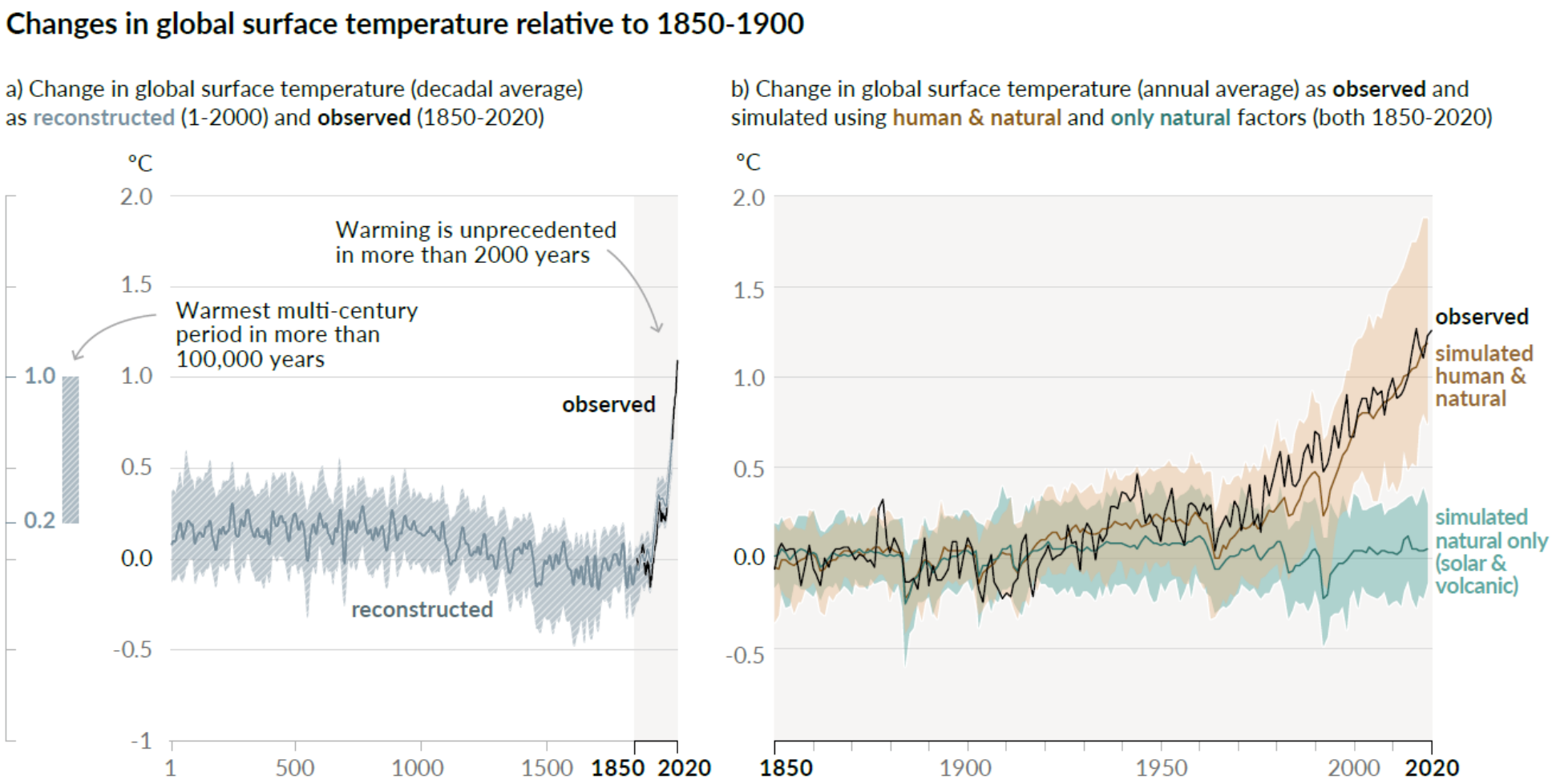
PROGRAMME OF THE EUROPEAN UNION

Copernicus Europe's eyes on Earth

Climate Change Service climate.copernicus.eu

IMPLEMENTED BY ECMWF

A changing climate



IPCC, 2021

A changing climate

Global greenhouse gases emissions are projected to peak between 2020 and at the latest before 2025 in global modelled pathways that limit warming to 1.5°C.

IPCC, 2022


B6

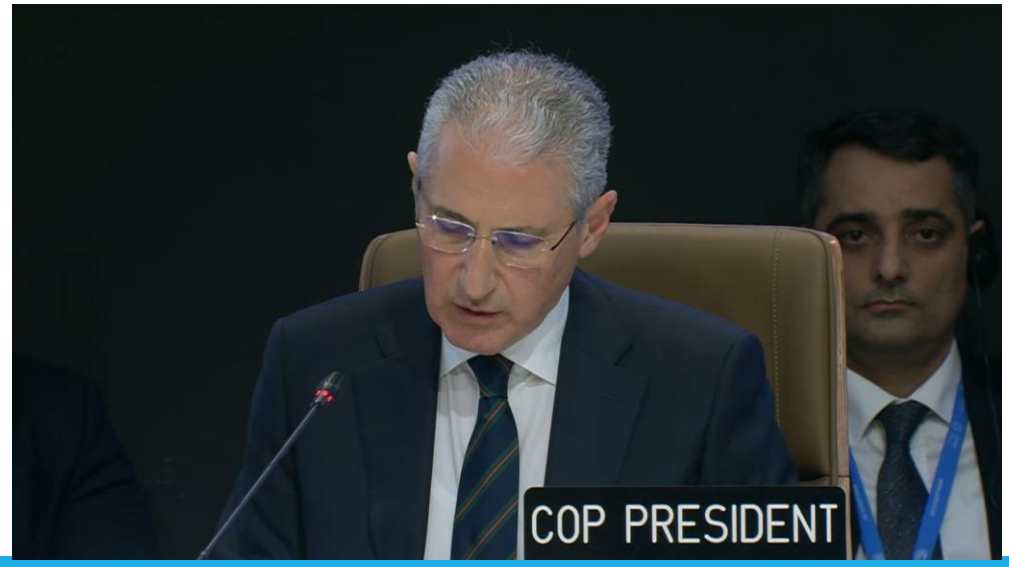

Make Polluters Pay


B6
B5
B3
B2
B4
B7
B8
B1
MEDIA CENTRE
BLUE ZONE ENTRANCE & EXIT
SERVICES


Welcome to COP29
Entrance


In solidarity for a
Green World
Who pays?
Who pay
Global North
PAY UP!
GLOBAL SOUTH
HOLD THE
LINE
PAY UP
SHUT UP
TRILLIONS
NOT
BILLIONS
STAND UP
FOR TRILLIONS
NOT
BILLIONS
STOP
FOSSIL

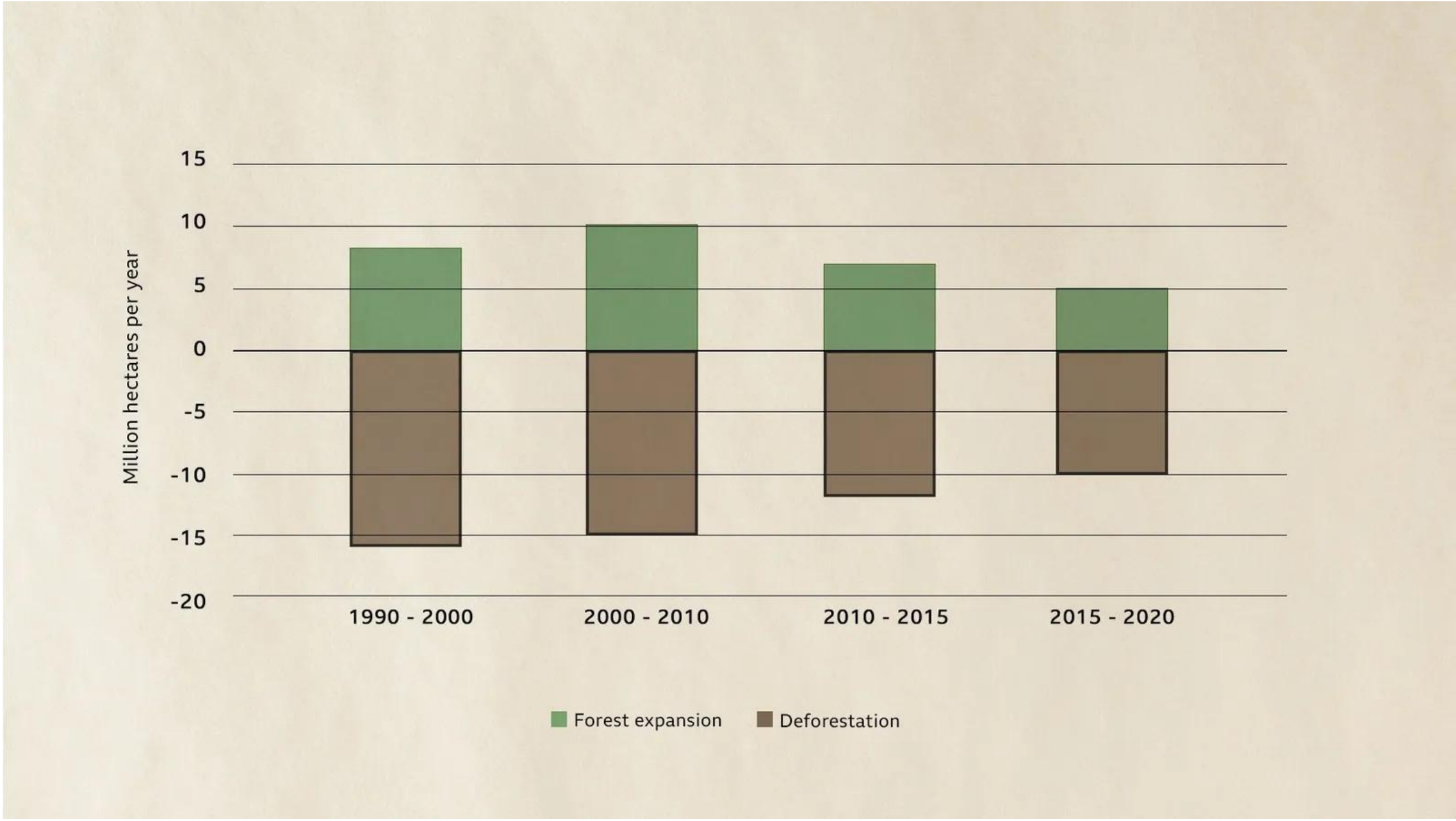

United Nations
Climate Change
COP29
Baku
Azerbaijan
IN SOLIDARITY FOR A GREEN WORLD
Baku, Azerbaijan


COP PRESIDENT

Biodiversity crisis

- Biodiversity is traditionally defined as the variety of life on Earth in all its forms. It comprises the number of species, their genetic variation and the interaction of these life forms in complex ecosystems.

Healthy ecosystems provide us with many essential elements that we consider natural.
Pollinators are essential in plant reproduction, ensuring our food production. Plants and oceans act as major carbon sinks.


15
10
5
0
-5
-10
-15
-20
Million hectares per year
1990 - 2000
2000 - 2010
2010 - 2015
2015 - 2020
Forest expansion
Deforestation

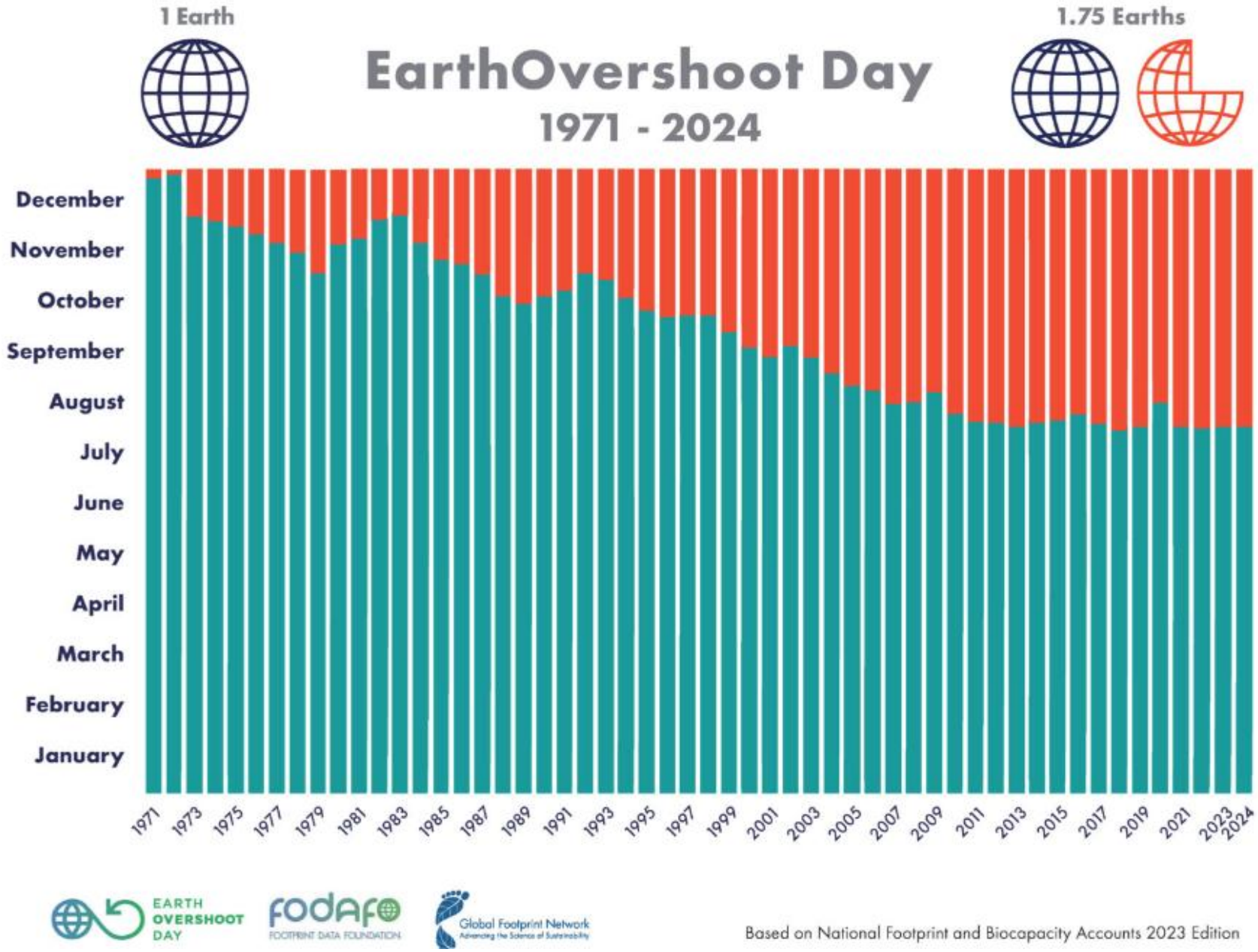
Biodiversity crisis

- In a United Nations report published in 2019, scientists warned that **one million species** – out of an estimated eight million – **are threatened with extinction**, many within the next few decades.
- Some scientists even consider that we are in the middle of the **sixth mass extinction event in Earth's history**.
- Previously known mass extinctions eliminated between 60% and 95% of the total species.
- Biodiversity is traditionally defined as the variety of life on Earth in all its forms. It comprises the number of species, their genetic variation and the interaction of these life forms in complex ecosystems.

Resources crisis

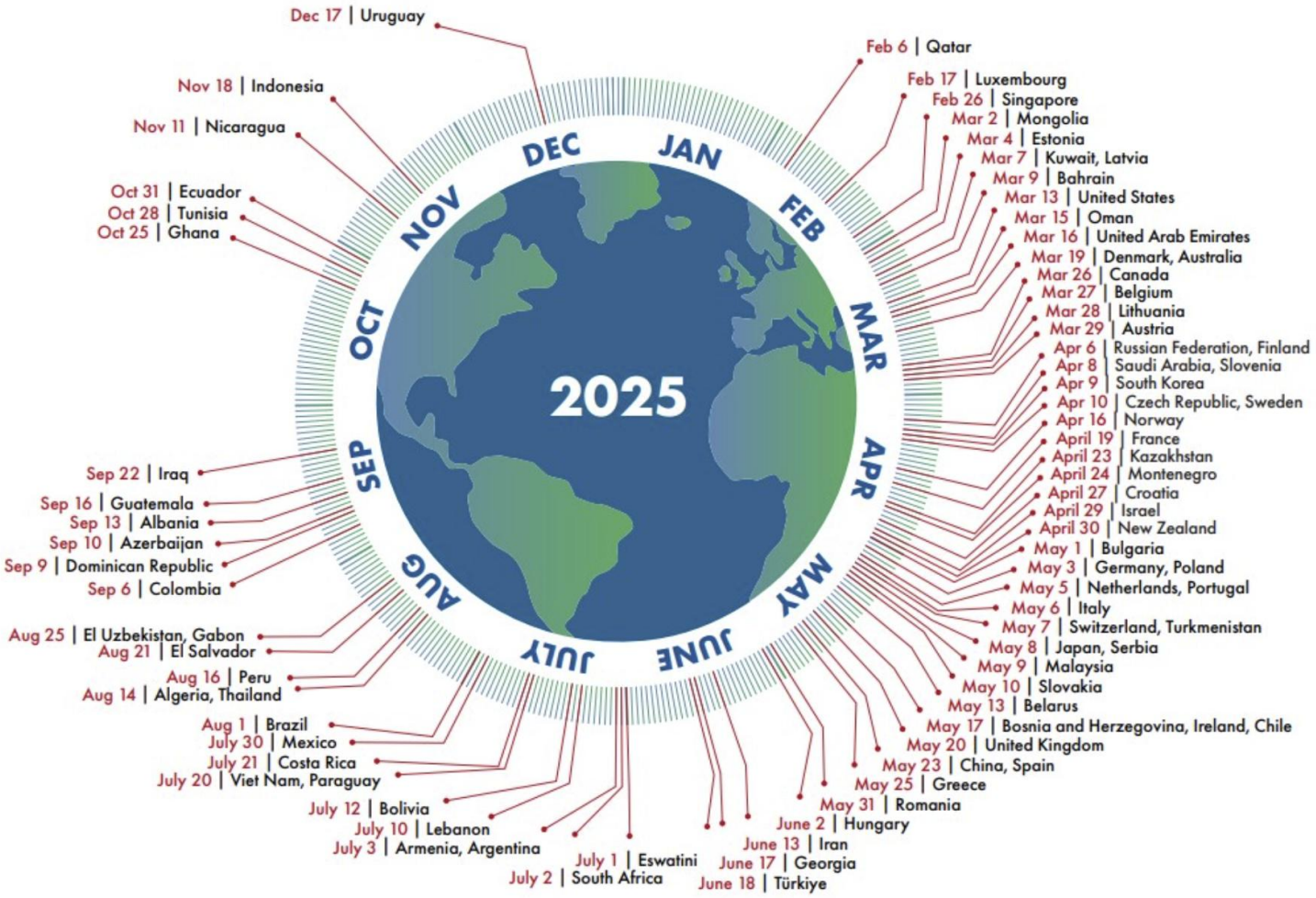
With regard to resources, based on the **calculation of the ecological footprint** carried out by the *Global Footprint Network*

Every year, an estimate is presented on the day when Humanity reaches the limit of the sustainable use of available natural resources for that year, that is, the natural budget, usually referred to as ***Overshoot Day***


1 Earth
1.75 Earths
EarthOvershoot Day
1971 - 2024
December
November
October
September
August
July
June
May
April
March
February
January
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
2023
2024
EARTH OVERSHOOT DAY
FODAFO
FOOTPRINT DATA FOUNDATION
Global Footprint Network
Advancing the Science of Sustainability
Based on National Footprint and Biocapacity Accounts 2023 Edition

Country Overshoot Days 2025

When Earth Overshoot Day would land if all the people around the world lived like...



For more information, visit:
https://overshootday.org/newsroom/country-overshoot-days/

Source: National Footprint and Biocapacity Accounts, preliminary 2025 Edition
York University, FoDaFo, Global Footprint Network, data.footprintnetwork.org

EARTH OVERSHOOT DAY

Global Footprint Network
Advancing the Science of Sustainability

How many Earths would we need
if everyone lived like U.S.A. residents?

U.S.A.	5.1
Australia	4.5
Russia	3.4
Germany	3.0
Japan	2.9
Portugal	2.9
France	2.8
Spain	2.8
Switzerland	2.8
Italy	2.7
U.K.	2.6
China	2.4
Brazil	1.6
India	0.8
World	1.75

Source: National Footprint and Biocapacity Accounts 2022
Additional countries available at overshootday.org/how-many-earths

Group research

Climate change

- Most relevant consequences of climate change in the world in 2024?

Biodiversity

- Current relevant threats to ecossystems (terrestrial and oceanic)?

Resources use and pollution

- Most depleted resources and most relevant forms of pollution at the global level?

"There are two ways to have enough.

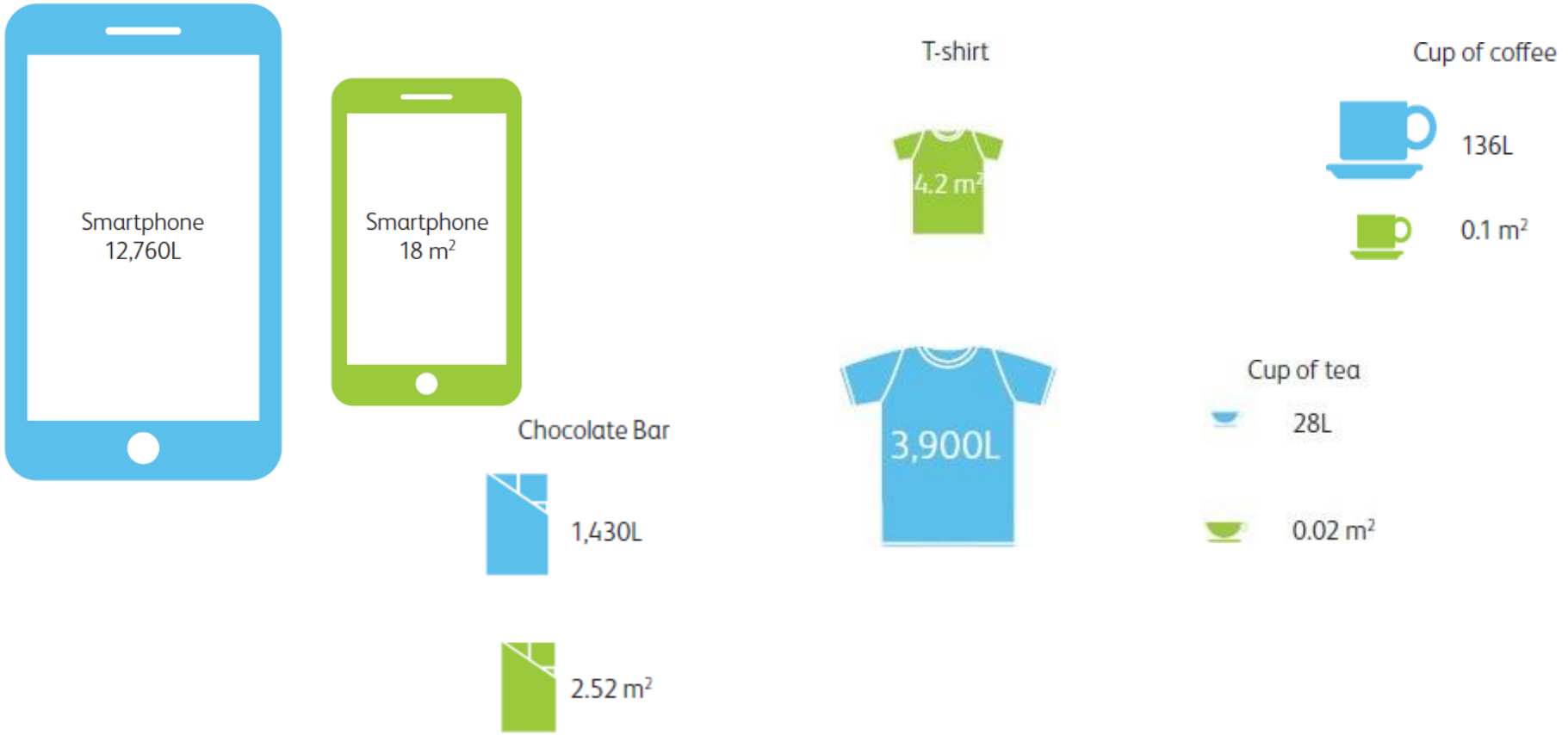
One is to continue to accumulate

more and more.

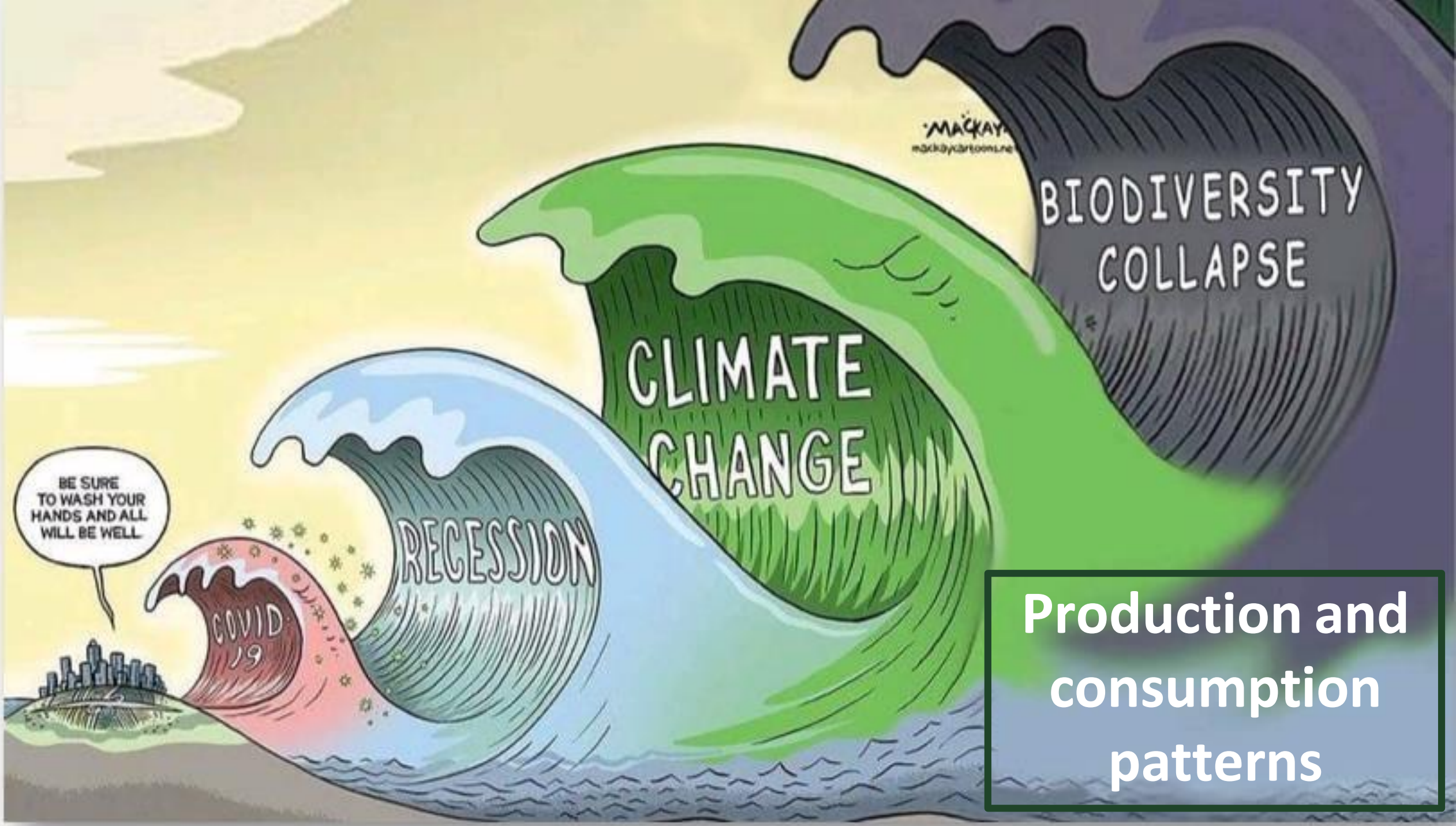
The other is to desire less."

G. K. Chesterton, *All things considered*, 1908

The hiden impact



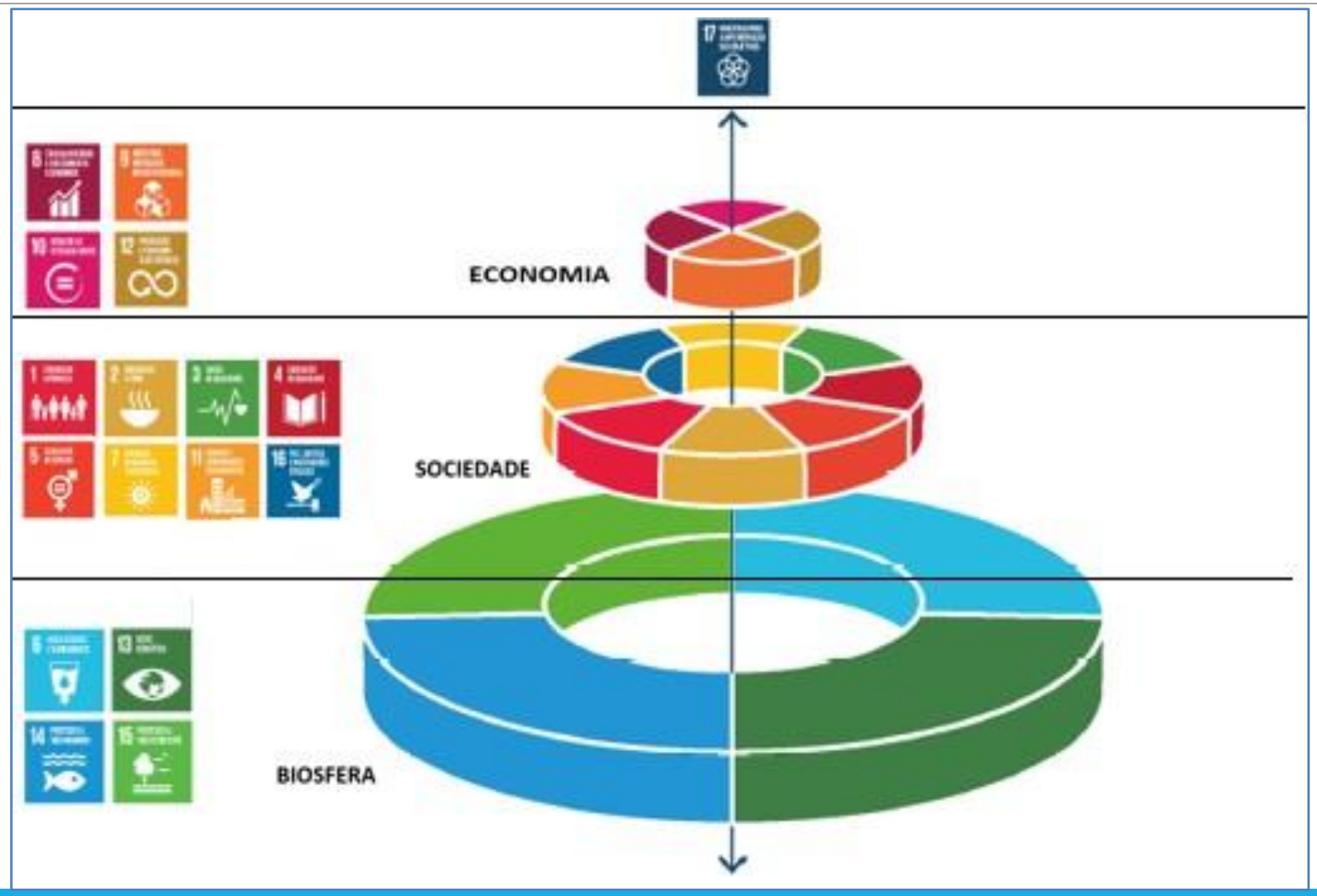
https://www.foe.co.uk/sites/default/files/downloads/mind-your-step-report-76803.pdf


BE SURE TO WASH YOUR HANDS AND ALL WILL BE WELL
COVID 19
RECESSION
CLIMATE CHANGE
BIODIVERSITY COLLAPSE
Production and consumption patterns

The need for a new paradigm


A CONSERVATION INTERNATIONAL FILM
JULIA ROBERTS IS
MOTHER NATURE

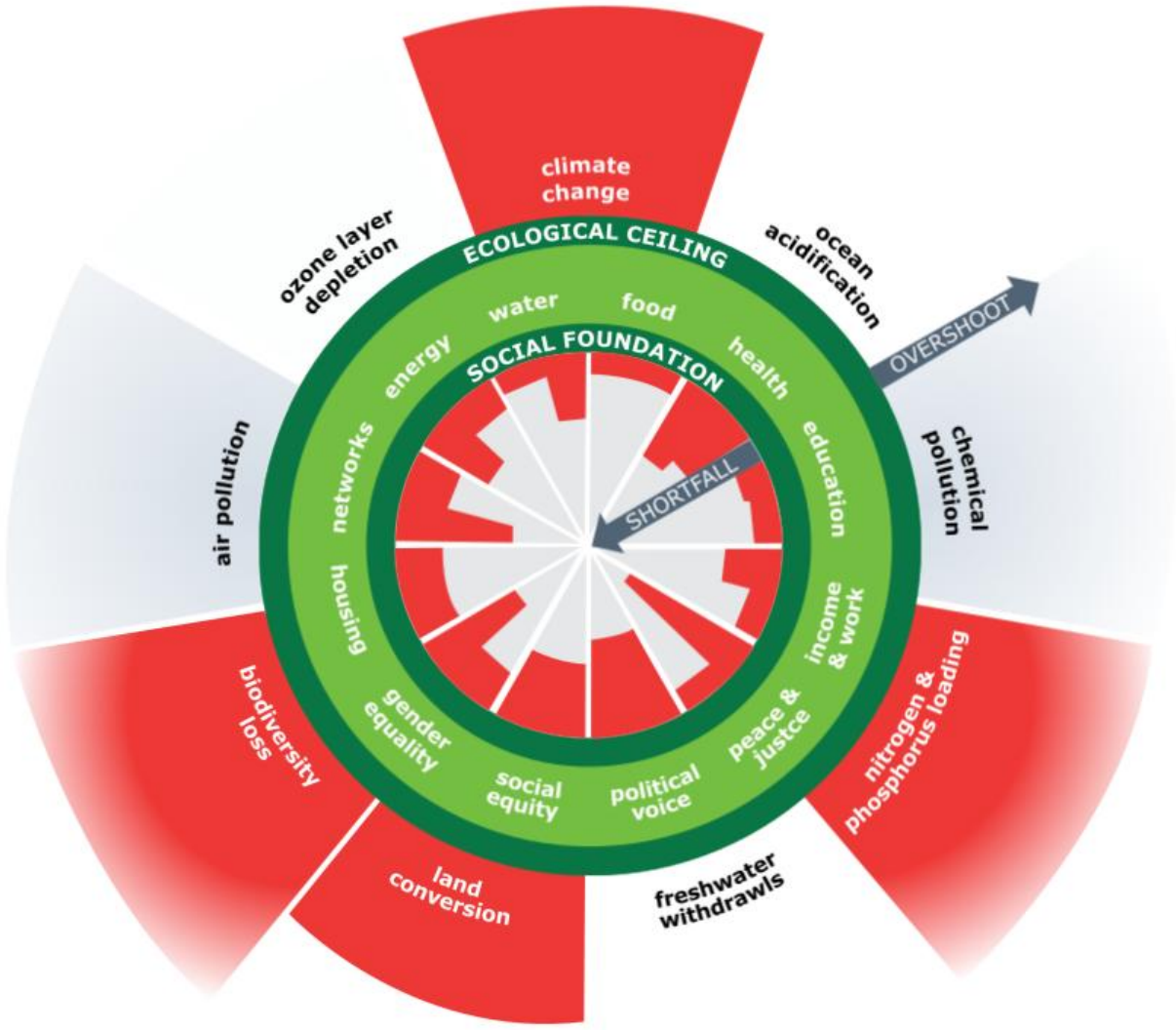
The natural order of things (SDGs)…



https://www.unsdglearn.org/microlearning/understanding-the-dimensions-of-sustainable-development/

The limits of the planet rises a higher conscience on the need to act at different scales (from person to global)

A change of paradigm is crucial



Source: Doughnut Economics Social Lab

DEGENERATIVE

TAKE

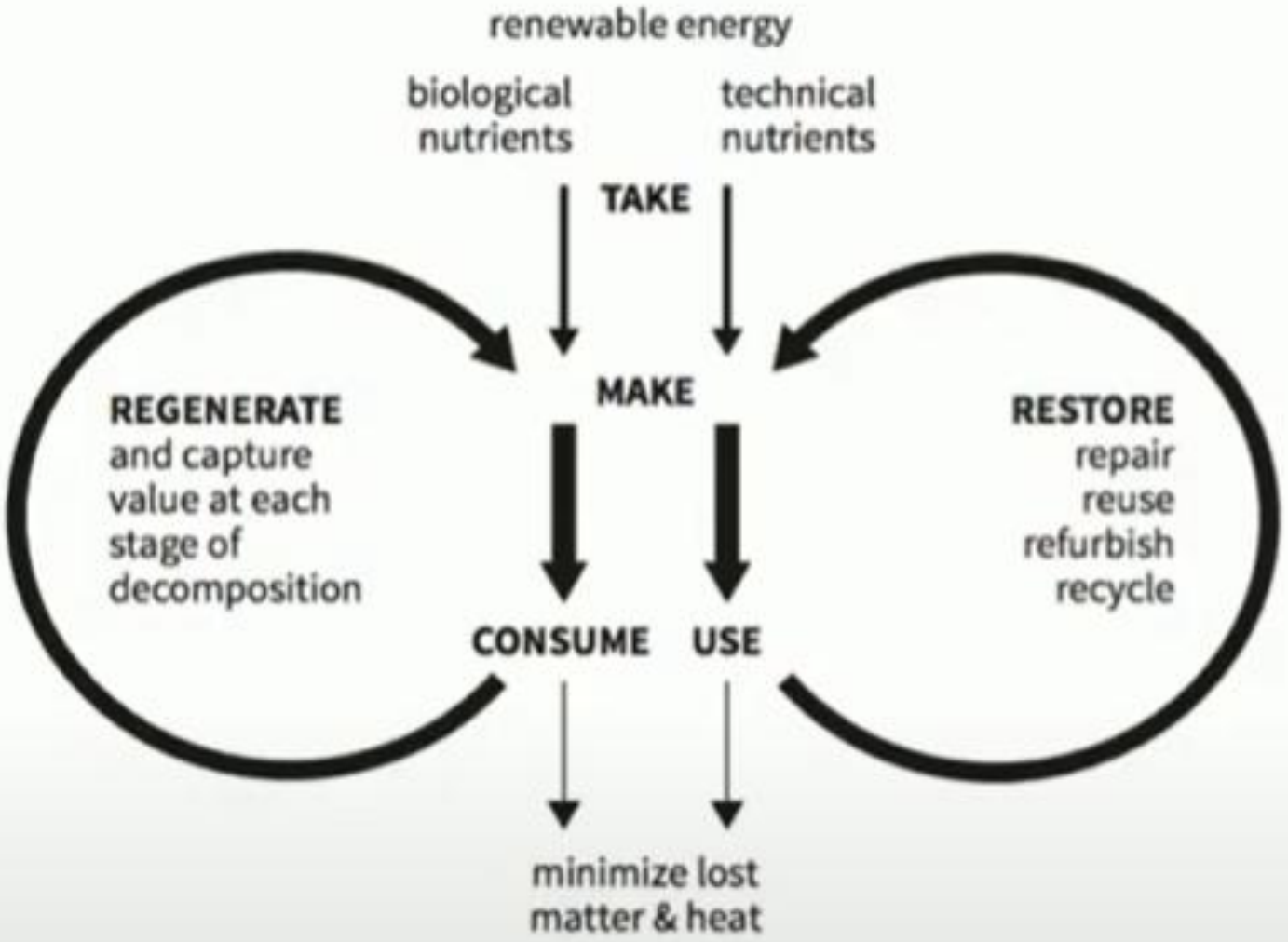
MAKE

USE

LOSE

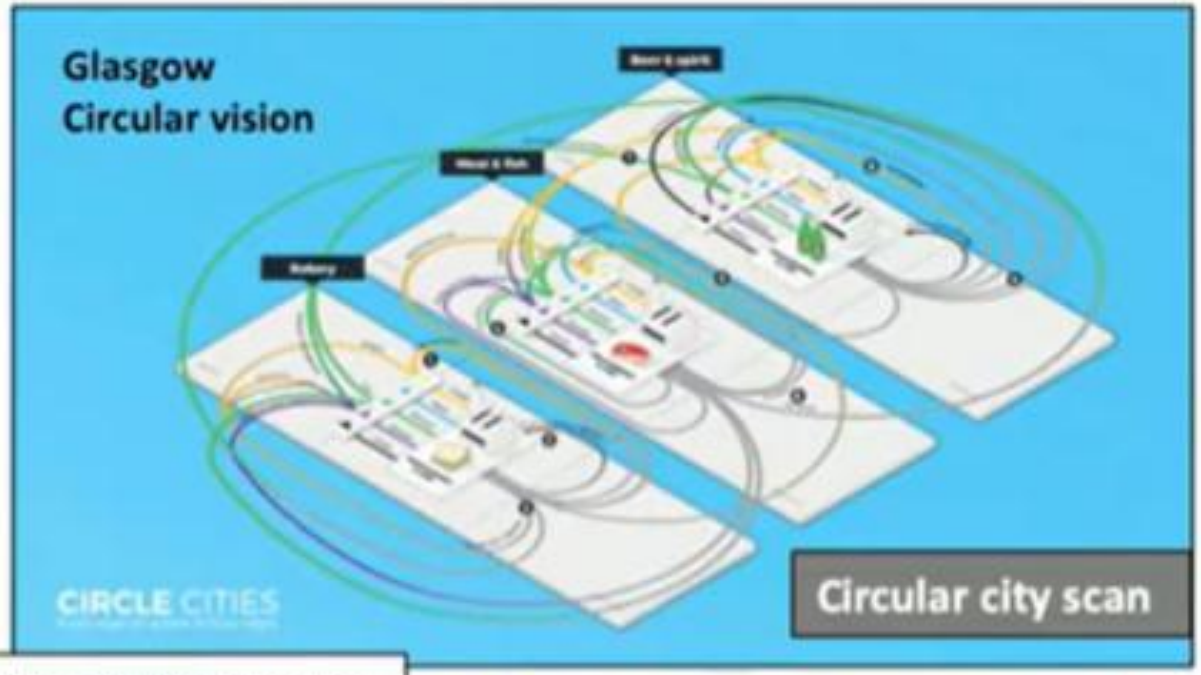
Source: Doughnut Economics Social Lab

REGENERATIVE

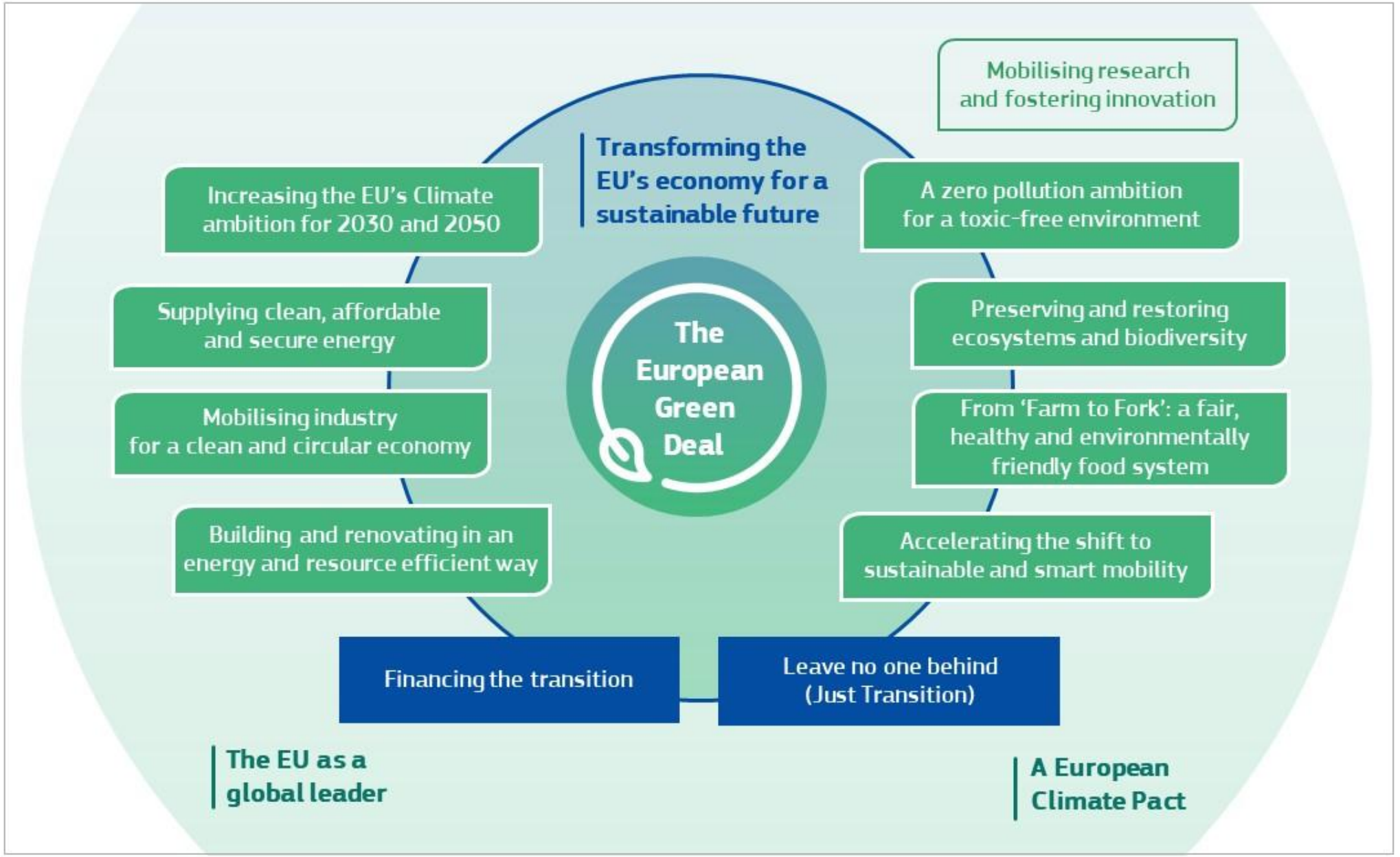


Source: Doughnut Economics Social Lab

TOWARDS ECOSYSTEM CIRCULARITY



Source: Doughnut Economics Social Lab


Mobilising research and fostering innovation
Transforming the EU's economy for a sustainable future
Increasing the EU's Climate ambition for 2030 and 2050
A zero pollution ambition for a toxic-free environment
Supplying clean, affordable and secure energy
Preserving and restoring ecosystems and biodiversity
The European Green Deal
Mobilising industry for a clean and circular economy
From 'Farm to Fork': a fair, healthy and environmentally friendly food system
Building and renovating in an energy and resource efficient way
Accelerating the shift to sustainable and smart mobility
Financing the transition
Leave no one behind (Just Transition)
The EU as a global leader
A European Climate Pact

Action

New way of thinking/acting

Rethink	Connect	Refuse
Reduce	Reuse	Repair
Share	Share knowledge	Recycle

Three keys to unlock the future

1. Redefining the relationship between humans and nature

Integrate nature into cities and urban areas, protect animal welfare by integrating it into sustainable development and governance, expand and invest in nature-based education, recognize local indigenous knowledge and the Rights of Nature.

Three keys to unlock the future

2. Ensure lasting prosperity for all
Make a sustainable lifestyle the easy choice;

Consider the use of products and equipment and not their acquisition;

Making supply chains better for humans and the environment;

Align national statistics with sustainability goals by going beyond GDP as a single metric, and

Adopt indicators that help measure progress towards sustainable development, such as inclusive wealth indicators and indicators that recognize the solidary economy; focus on innovation while respecting the environment.

Three keys to unlock the future

3. Invest in a better future
Recognize and improve public funding of technology innovation and co-development;

Encouraging the active involvement of private finance (private investors are increasingly interested in monitoring the environmental, social and governance (ESG) performance of their investments);

Raising adequate private finance and reducing risks in sustainable investments while increasing risks in unsustainable investments.

Reuse and repair

How to connect reuse with social objectives

1. Procurement policies on Reuse (env and social criteria)	Italy – contracts bellow a certain threshold are awarded to social cooperatives (employing vulnerable people)	Scotland – Reuse projects provide low income families with second hand appliances, furniture, etc. at reduced prices
2. Establishing prevention and reuse targets (cam be set at the municipal level)	Flanders –Reuse target of 7kg per capita/per year	3. Quality collection points
4. Create a reuse culture	Austria – Repair bonus (50% of repair to 100€ per year) or repair voucher	Spain – Repair trucks

JOB CREATION IN THE RE-USE SECTOR: INSIGHTS FROM SOCIAL ENTERPRISES

rreuse

≈70 JOBS CREATED
PER 1,000 TONNES COLLECTED

LOWER BOUND: ≈20 JOBS CREATED PER 1,000 TONNES COLLECTED

UPPER BOUND: ≈140 JOBS CREATED PER 1,000 TONNES COLLECTED

Most organisations create between 40 and 100 jobs per 1,000 tonnes of products collected for re-use oriented activities. This wide range is due to several factors, including labour intensity required for different product categories, workforce composition and policies on work integration.

rreuse

https://www.youtube.com/watch?v=oPoDzam1l-M

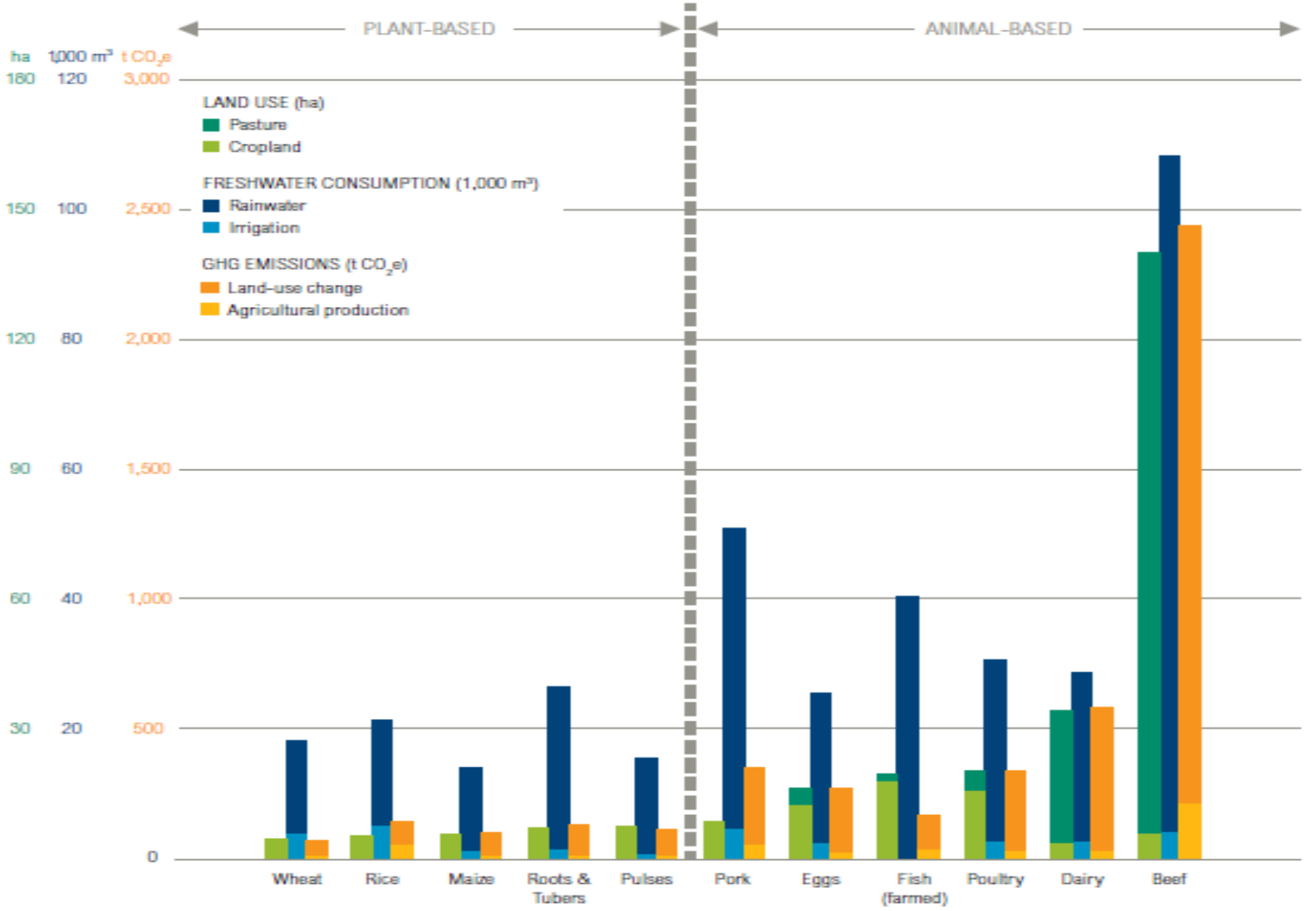
Food

– SOCIAL AND ENVIRONMENTAL ASPECTS

Recommendations vs Portuguese diet

https://ian-af.up.pt/sites/default/files/Relato%CC%81rio%20Resultados%20IAN-AF.pdf

ENVIRONMENTAL IMPACT - TONNE OF PROTEIN



WRI, 2016

Simple steps - food

Less animal protein (particularly beef)

Explore alternatives

More vegetables, fruits, pulses, beans

Look into the cultural eating habits

Organic products

Locally grown/ seasonal (better prices/better nutrition)

Prevent food waste

Capacity building on planning meals/reading lables

Unprocessed foods

Variety

Energy Communities and Energy Poverty

Energy Communities

Energy communities are collaborative initiatives in which individuals, businesses, and local organizations come together to produce, manage, and consume energy. These communities are typically focused on renewable energy sources, particularly solar, and aim to increase energy independence, reduce carbon emissions, and promote local economic benefits.

Key Features of Energy Communities

Local Ownership and Control; Renewable Energy Focus; Collective Decision-Making; Energy Sharing and Trading; Social and Environmental Benefits

Energy Communities

How do Energy Communities interact with energy poverty?

- Coordinated action
- Produce your own energy
- Help fund investment in efficiency measures
- Reduced consumption and lower supply tariffs
- Allows for market participation (and make gains)
- Benefits are for all participants
- Activation of consumers to be also producers
- Reduces to eliminate infrastructural burden

Certification


OEKO-TEX®
CONFIDENCE IN TEXTILES
STANDARD 100


EU
Ecolabel
www.ecolabel.eu


FSC


BLAUER ENGEL
DAS UMWELTZEICHEN


NORDIC SWAN ECOLABEL


FAIRTRADE
INTERNATIONAL

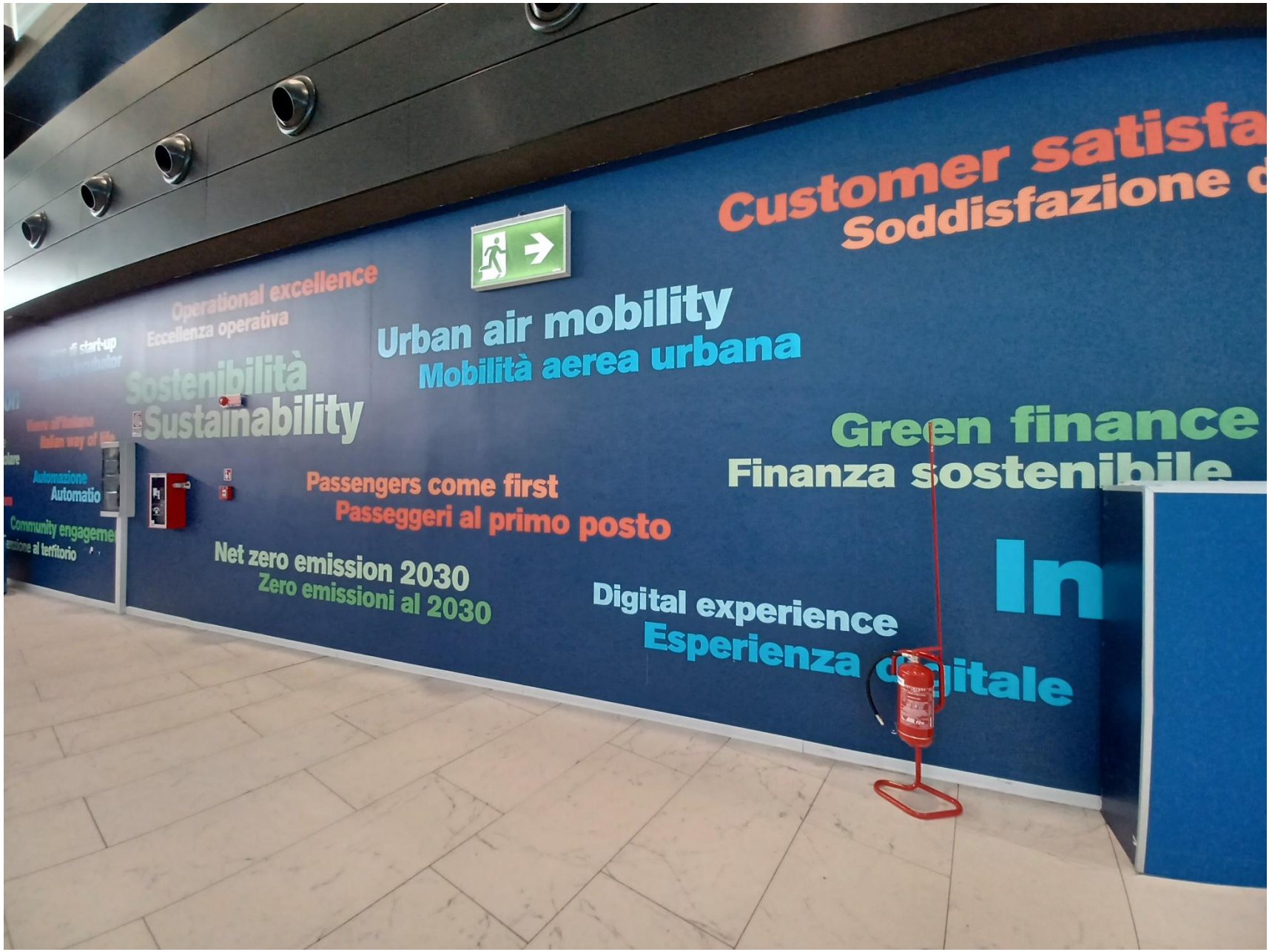

UTZ
CERTIFIED
Good inside


RAINFOREST ALLIANCE
CERTIFIED
EST 1987

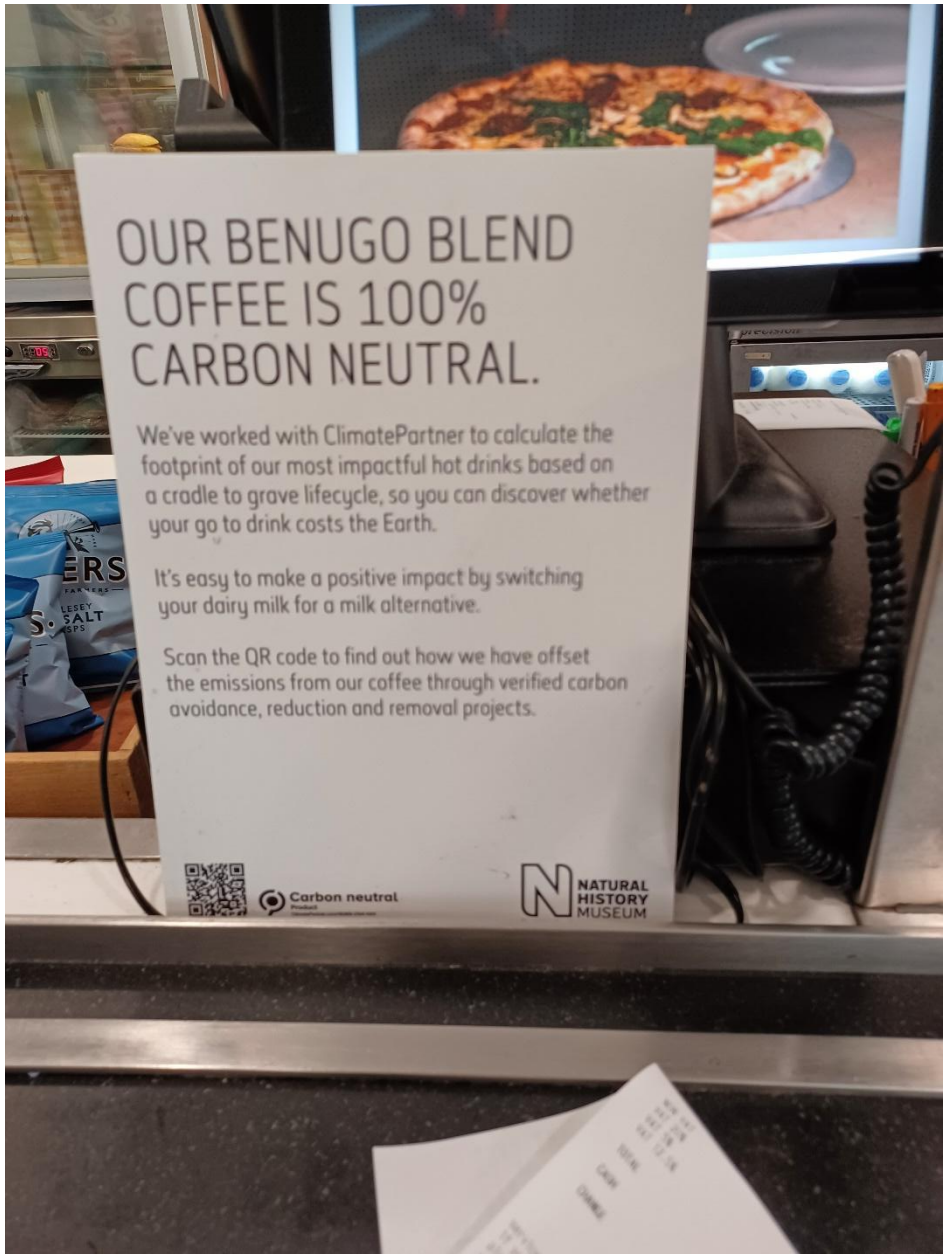

FAIR TRADE
CERTIFIED

The danger of greenwashing

Goals from the beginning
Identify the links
Transparency
Nothing is 100% green


Customer satisfa
Soddisfazione d
Operational excellence
Eccellenza operativa
Urban air mobility
Mobilità aerea urbana
Sostenibilità
Sustainability
Green finance
Finanza sostenibile
Passengers come first
Passeggeri al primo posto
Net zero emission 2030
Zero emissioni al 2030
Digital experience
Esperienza
In


Come in for a cup of our
AWARD-WINNING
CARBON NEUTRAL
COFFEE


OUR BENUGO BLEND
COFFEE IS 100%
CARBON NEUTRAL.
We've worked with ClimatePartner to calculate the footprint of our most impactful hot drinks based on a cradle to grave lifecycle, so you can discover whether your go to drink costs the Earth.
It's easy to make a positive impact by switching your dairy milk for a milk alternative.
Scan the QR code to find out how we have offset the emissions from our coffee through verified carbon avoidance, reduction and removal projects.
Carbon neutral
NATURAL HISTORY MUSEUM


papier
papier
restos

The world depends on you

Photo: NASA