# Climate Change: facts, myths, solutions



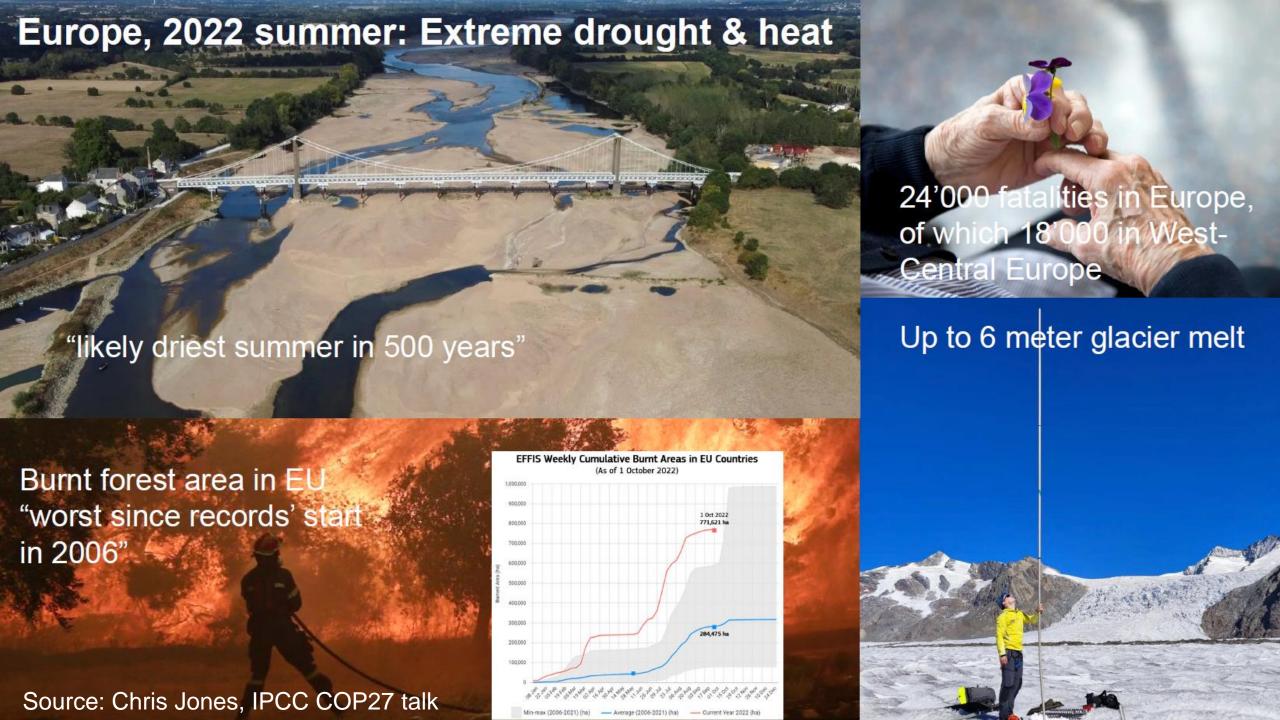




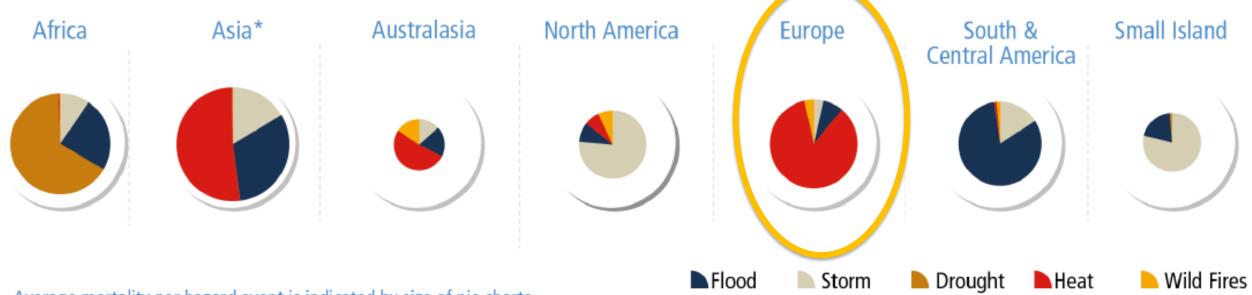








#### c) Average mortality per hazard event per region between 2010 and 2020:



Average mortality per hazard event is indicated by size of pie charts.

The slice of pie chart shows absolute number of deaths from a particular hazard





Working Group II - Impacts, Adaptation and Vulnerability







#### 50-year event

Frequency and increase in intensity of extreme temperature event that occurred **once in 50 years** on average **in a climate without human influence** 

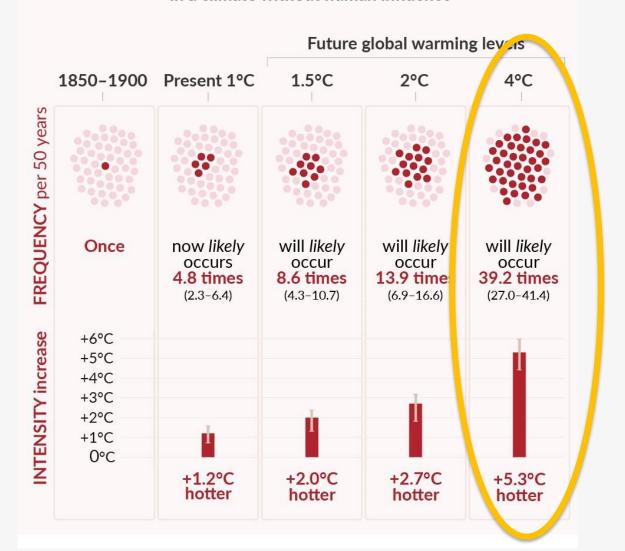
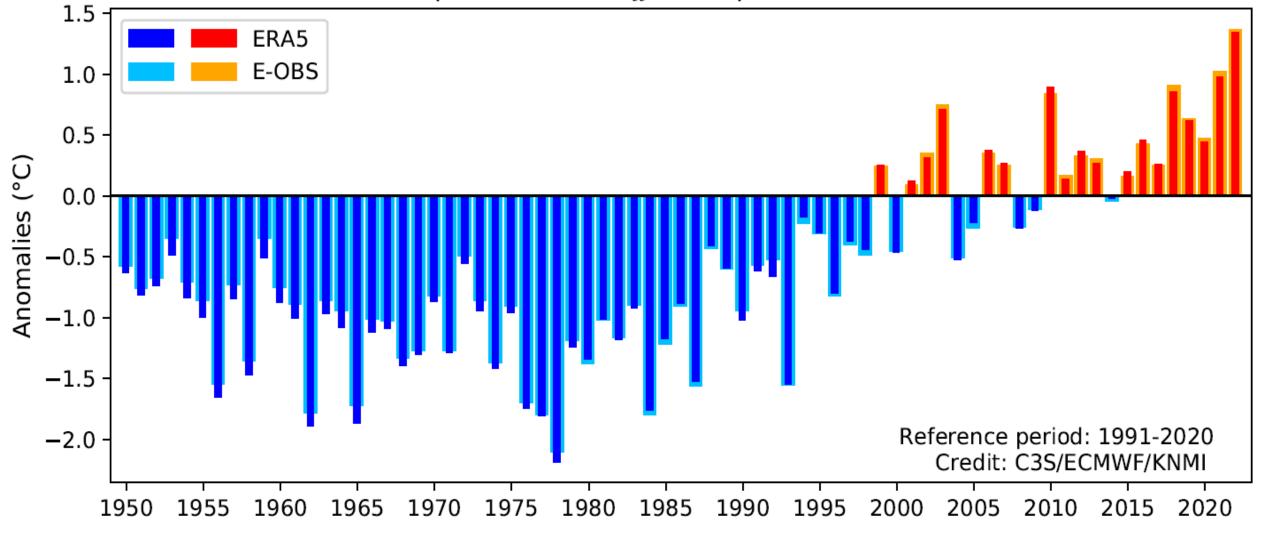


Figure SPM.6





#### European Summer (JJA) temperature anomalies





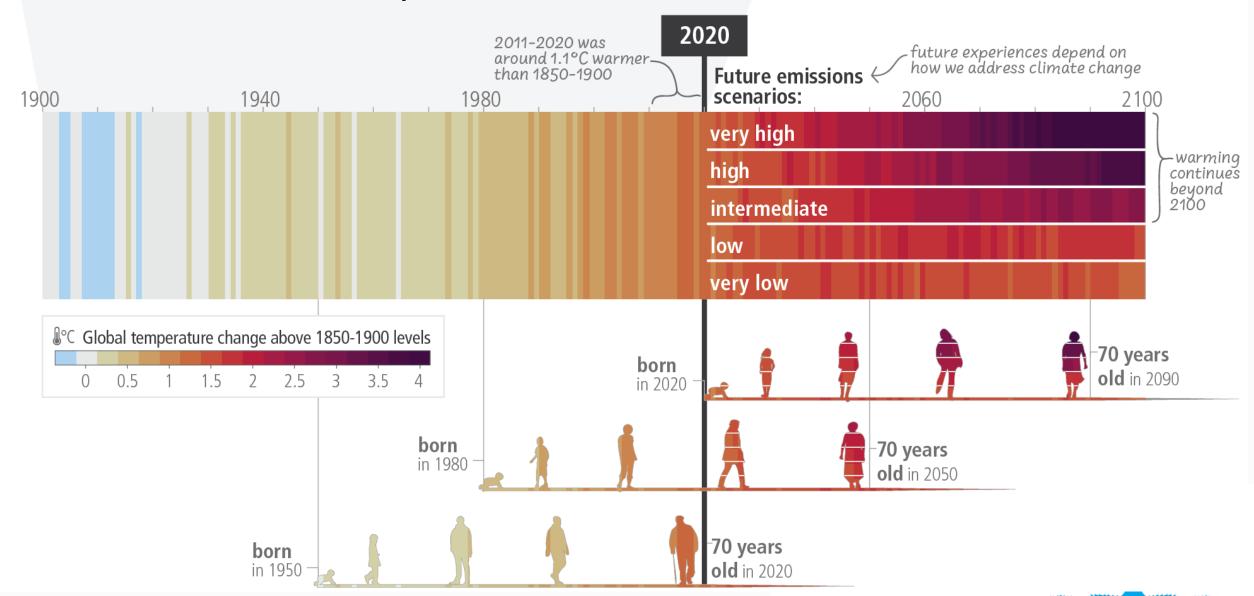


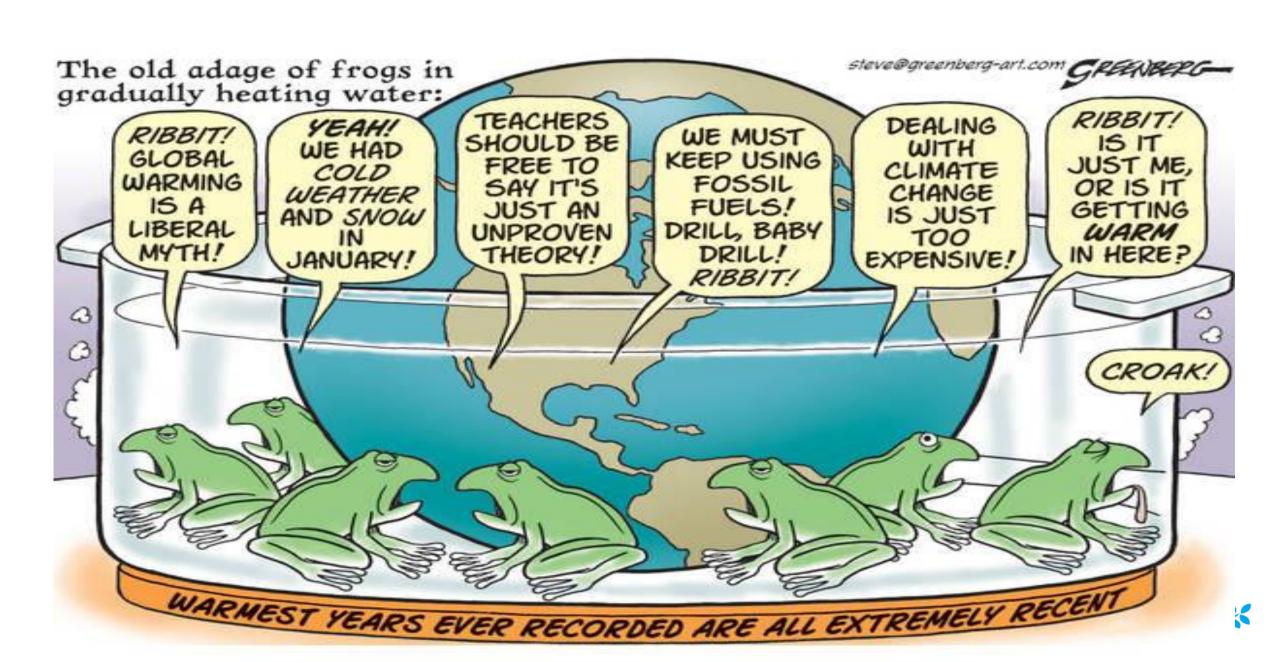


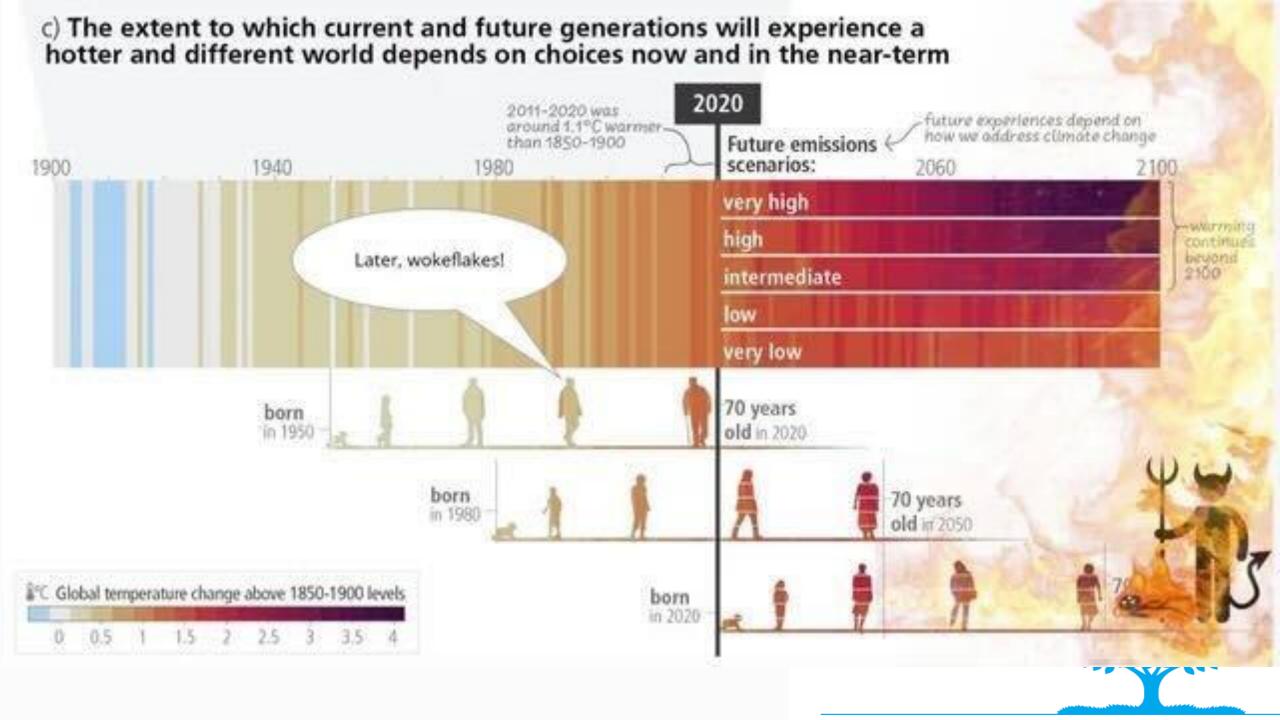




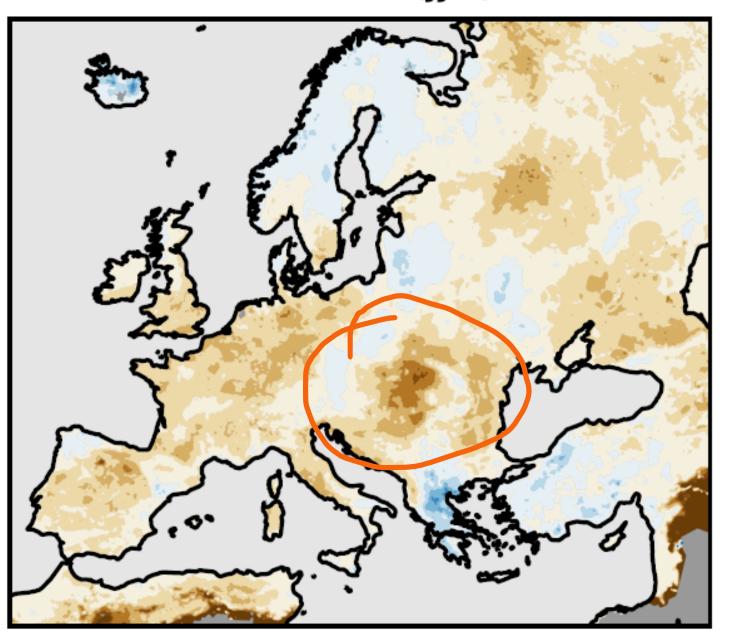
c) The extent to which current and future generations will experience a hotter and different world depends on choices now and in the near-term







## Summer (JJA)



Soil moisture anomaly (%) in the top soil, Summer 2022

as % of seasonal average of 1991-2020

Source: Copernicus State of the European Climate 2022



%

50

40

30

20

10

-10

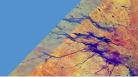
**-**20

**-**30

-40

-50





Multiple extreme events that compound the risks, and may start cascading risks, are more difficult to manage





# Ceres Sütő Update1 toast kenyér 🗢

300 g



Kategóriák: <u>Kenyér</u> > <u>Toast kenyér</u> Származási ország: **Magyarország** 



#### **Food Inflation**

World Europe America Asia Africa Australia G20

Country	Last	Previous	Reference	Unit
Lebanon	261	138	Feb/23	%
Venezuela	158	158	Oct/22	%
Zimbabwe	128	137	Mar/23	%
Argentina	110	103	Mar/23	%
Iran	71.5	70.1	Feb/23	%
Turkey	67.89	69.3	Mar/23	%
Egypt	62.9	61.8	Mar/23	%
Rwanda	62.6	59.7	Mar/23	%
Suriname	58.3	57.8	Feb/23	%
Laos	51	49.33	Mar/23	%
Ghana	50.8	59.1	Mar/23	%
Sierra Leone	50.21	47.51	Feb/23	%
Burundi	48.9	40.9	Mar/23	%
Haiti	48.6	47.7	Jan/23	%
Sri Lanka	47.6	54.4	Mar/23	%
Pakistan	47.15	45.1	Mar/23	%
Hungary	44.8	45.8	Wan-	%
Ethiopia	33.6	22.9	Jan/23	%



# 1990

CHANGE THING



#### 2007

LIKE A BROKEN RECORD



# 1995

CLIMATE CHANGE: DEFINITELY A PROBLEM.



# 2013

WE REALLY HAVE CHECKED AND WE'RE NOT MAKING THIS UP.



TEP, WE SHOULD REALLY BE GETTING ON WITH SORTING THIS OUT PRETTY SOON ...



2001

# 2023

IS THIS THING ON?



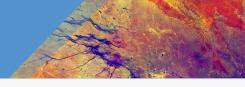
rupa M.



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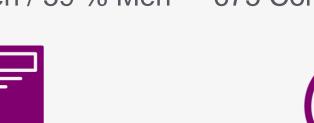
#### Report by numbers



270 Authors



41 % Women / 59 % Men



More than 34,000 scientific papers



67 Countries



675 Contributing authors



62,418 Review comments

## ipcc

INTERGOVERNMENTAL PANEL ON Climate change

#### **Climate Change 2022**

Impacts, Adaptation and Vulnerability

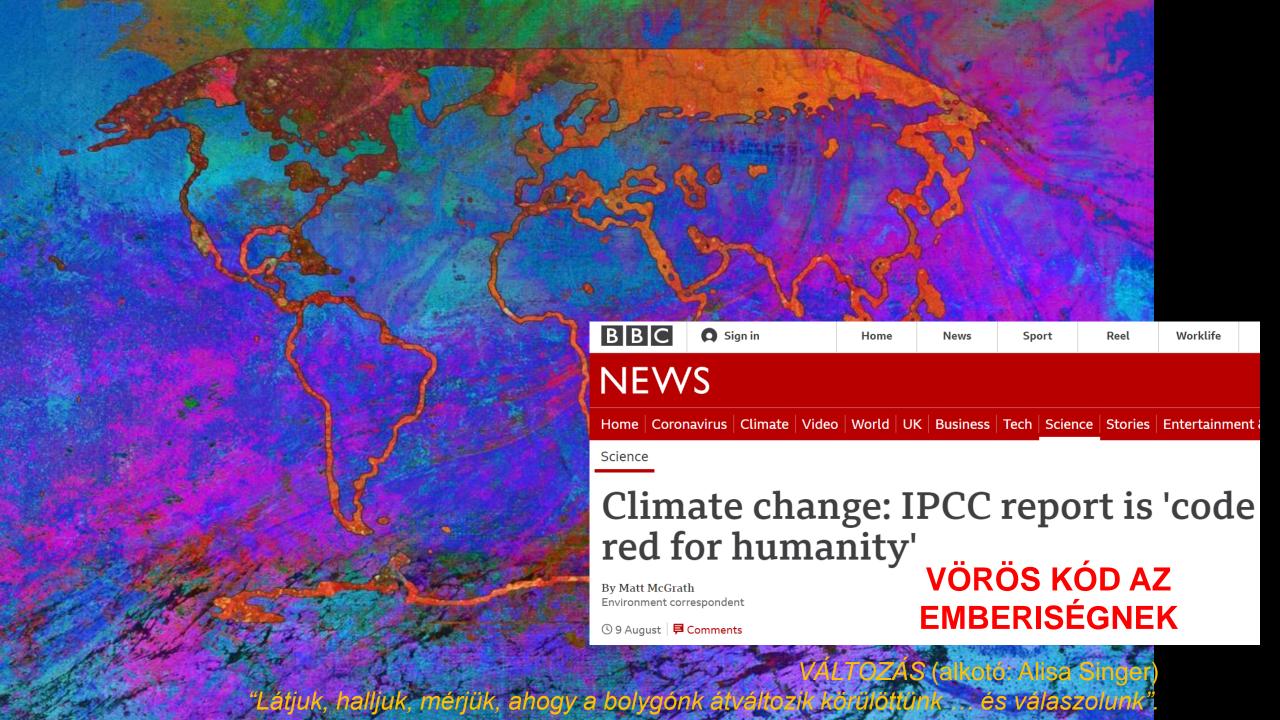




Sixth Assessment Report of the ntergovernmental Panel on Climate Change







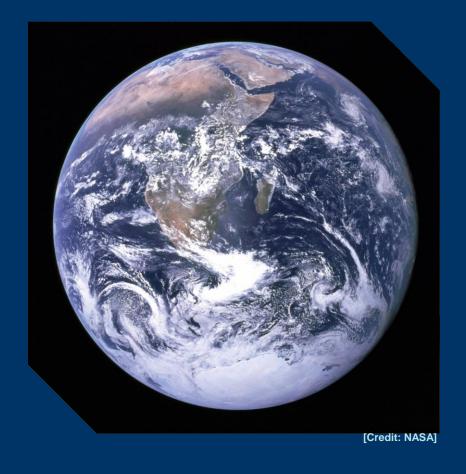




Recent changes in the climate are widespread, rapid, and intensifying, and unprecedented in thousands of years."







- Global average temperature has not been so high for at least 125,000 years
- Atmospheric CO2 concentrations and Ocean surface acidity has not been so high for 2 million years
- global surface temperature has not been sustained at 2.5°C higher for at least 3 million years





# THE ARCTIC IN CRISIS

50% REDUCTION

in thickness of Arctic sea ice since 1970s

50% AREA LOSS

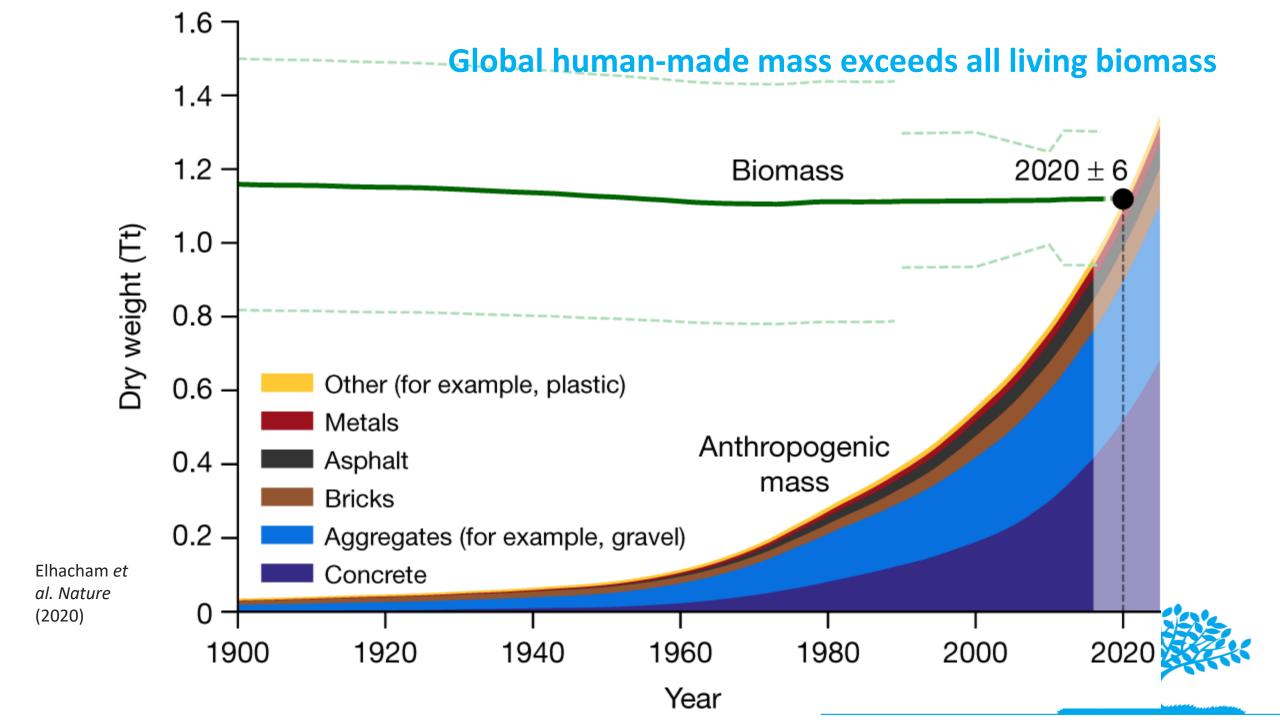
of summer Arctic sea ice, in last 40 years 75% **VOLUME LOSS** 

of summer Arctic sea ice, in last 40 years

Sources: http://nsidc.org/data/seaice\_index/ http://psc.apl.uw.edu/research/projects/arctic-sea-ice-volume-anomaly, https://www.the-cryosphere.net/9/269/2015/tc-9-269-2015.html



@ARCTICBASECAMP



### Bottle-fed babies swallow millions of microplastics a day, study finds

plastic food containers

Exposure is far higher than previously th 
THE CONVERSATION

Academic rigour, journalistic flair



Microplastics in the environment were already known

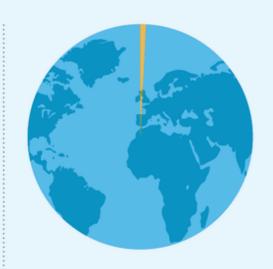


For decades, sperm counts and sperm health have been declining. Carol Yepes/Moment via Getty Images

Q Search analysis, rese

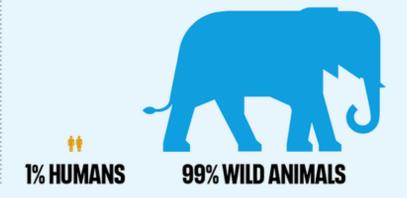
# WEIGHT OF VERTEBRATE LAND ANIMALS

10,000 YEARS AGO





TODAY

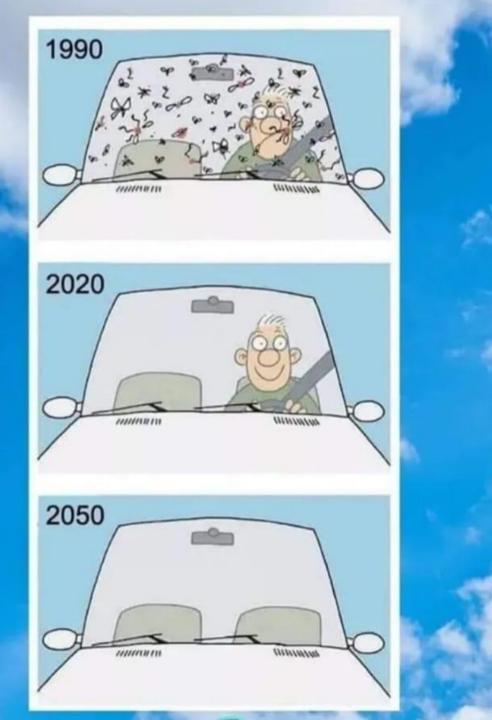




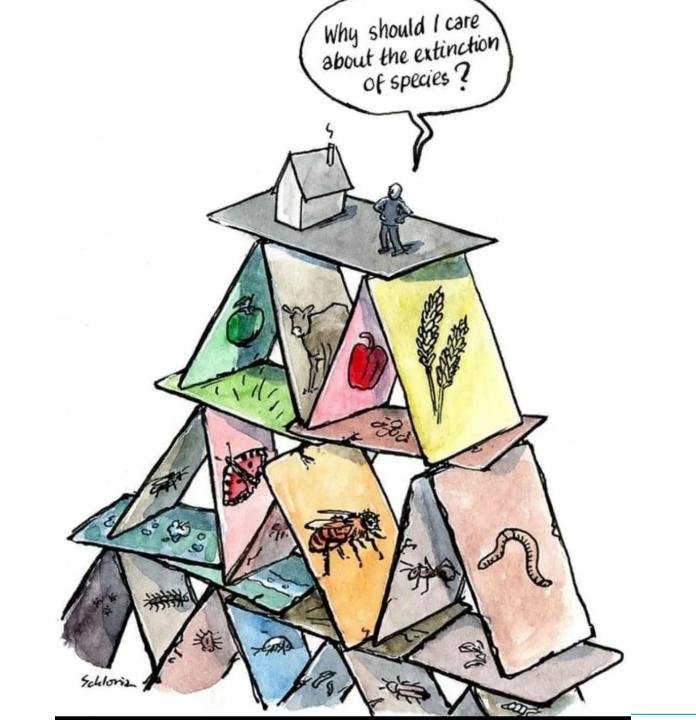




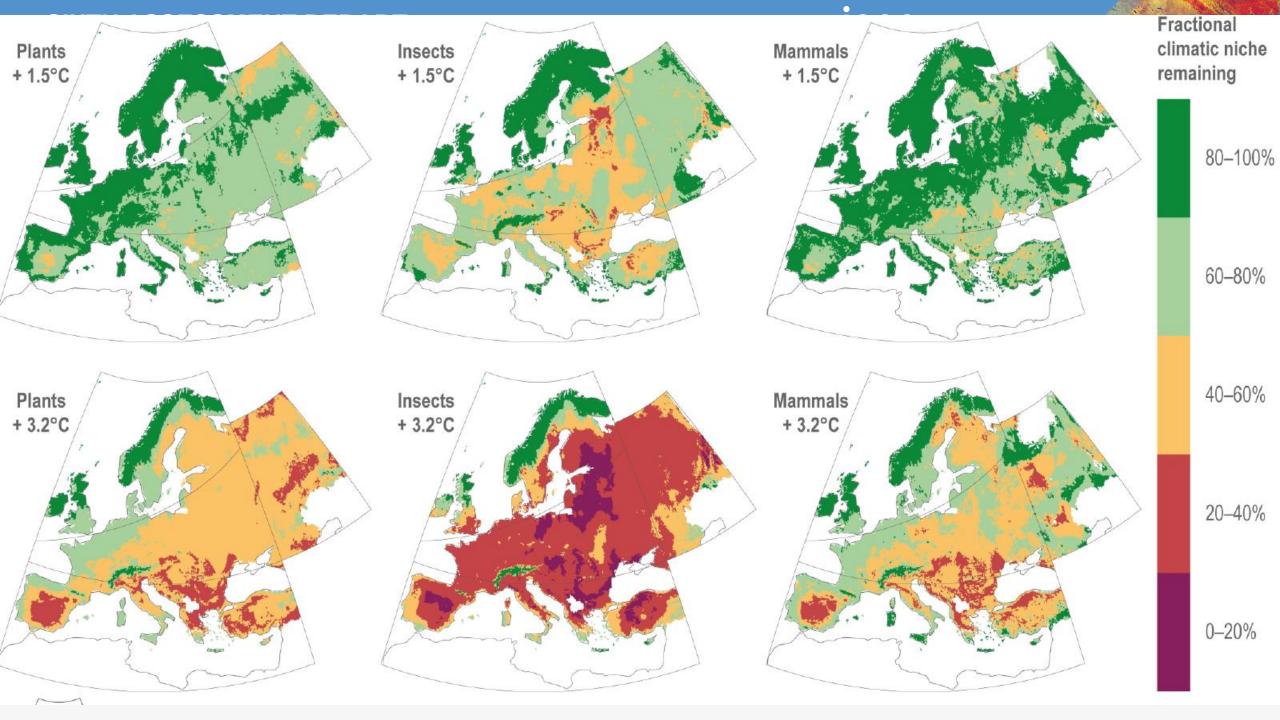














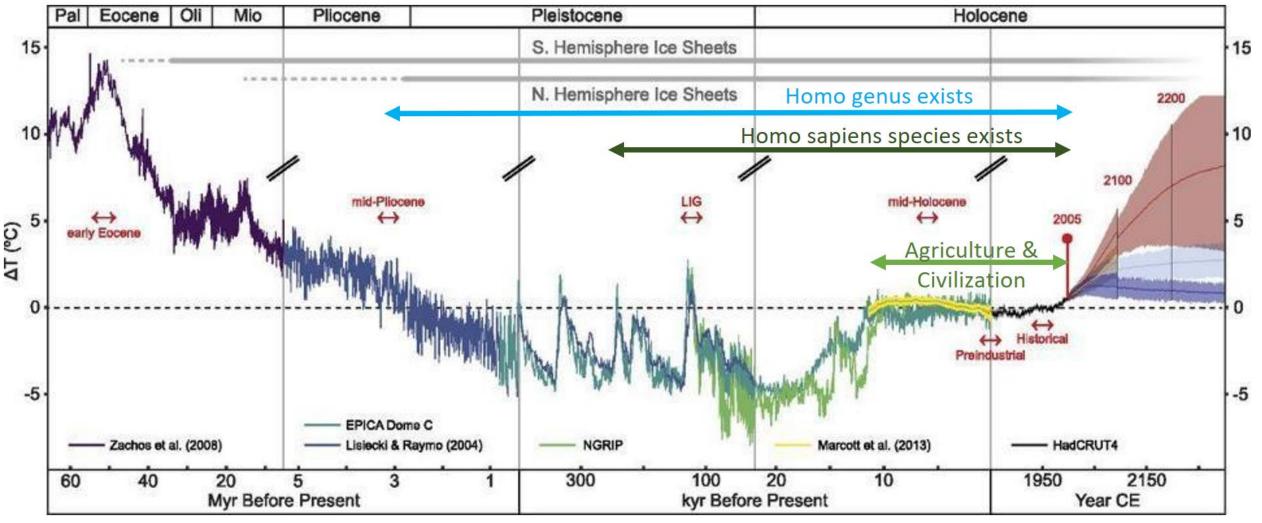




# Know Your Insects Linda Jerry



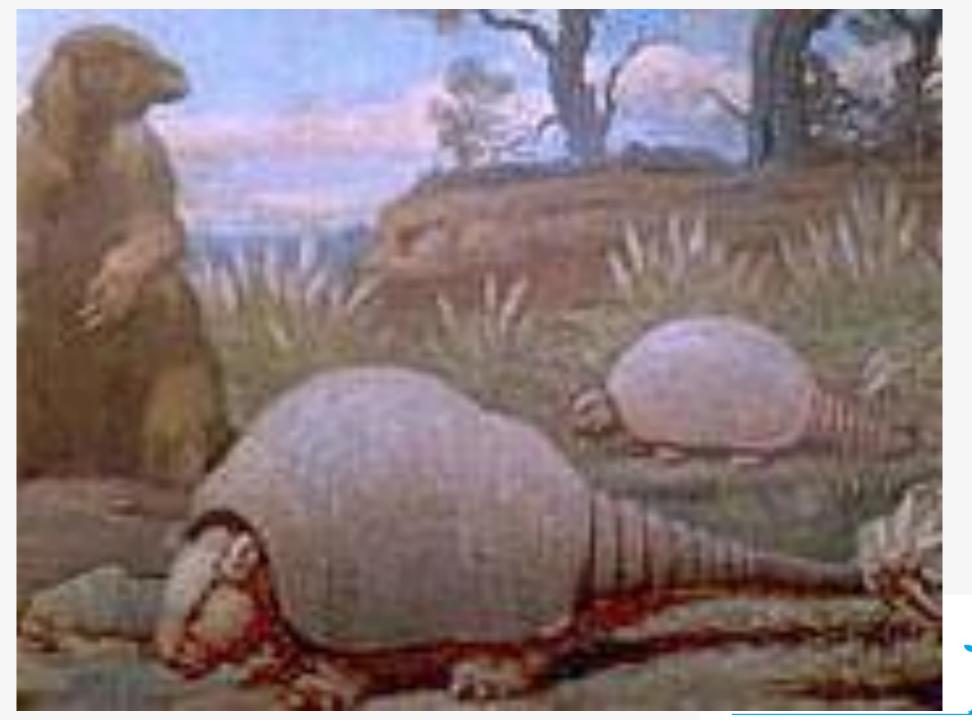
#### Temperature trends for the past 65 Ma and potential geohistorical analogs for future climates





Pliocene and Eocene provide best analogs for near-future climates K. D. Burke, et al PNAS Dec 2018, 115 (52)







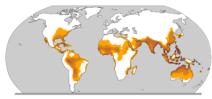




#### SIXTH ASSESSMENT REPORT

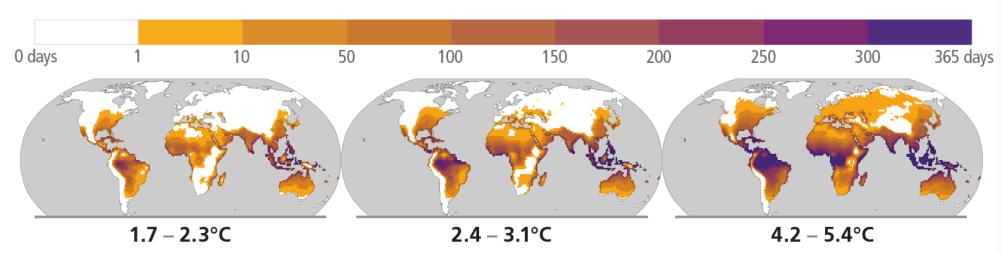






Historical 1991-2005

Days per year where combined temperature and humidity conditions pose a risk of mortality to individuals<sup>3</sup>

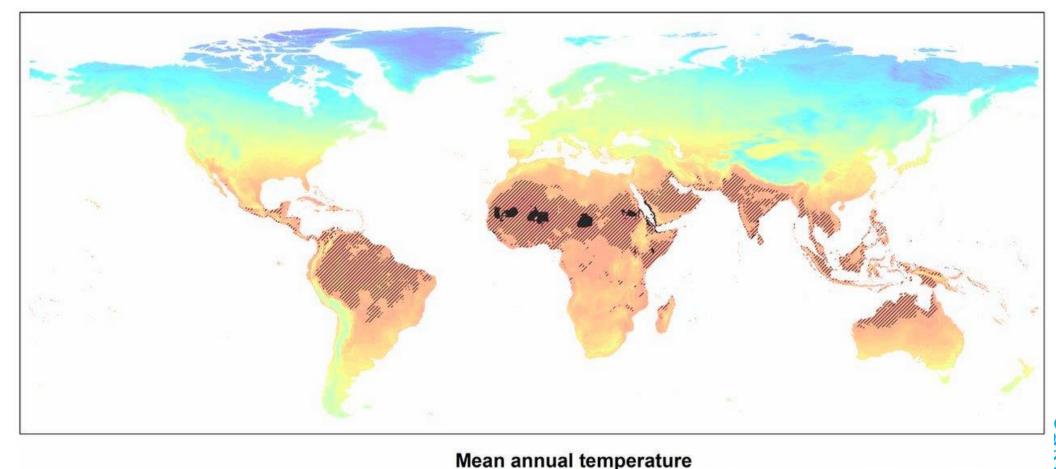


<sup>3</sup>Projected regional impacts utilize a global threshold beyond which daily mean surface air temperature and relative humidity may induce hyperthermia that poses a risk of mortality. The duration and intensity of heatwaves are not presented here. Heat-related health outcomes vary by location and are highly moderated by socio-economic, occupational and other non-climatic determinants of individual health and socio-economic vulnerability. The threshold used in these maps is based on a single study that synthesized data from 783 cases to determine the relationship between heat-humidity conditions and mortality drawn largely from observations in temperate climates.



### The future of the human climate niche

- In a high-emissions scenario, 3.5 bn people on 19% of the globe (shaded area) in 2070 will experience temperatures currently only seen in the Sahara (black zone). Much of humanity's habitable climate will have gone.
- Future of the human climate niche Chi Xu, Timothy A. Kohler, Timothy M. Lenton, Jens-Christian Svenning, Marten Scheffer. Proceedings of the National Academy of Sciences May 2020, 201910114; DOI: 10.1073/pnas.1910114117



-10

10

20



There are already irreversible changes in our climate system...



### Ocean and ice sheets



Ocean temperature raising



Greenland Ice Sheet melting

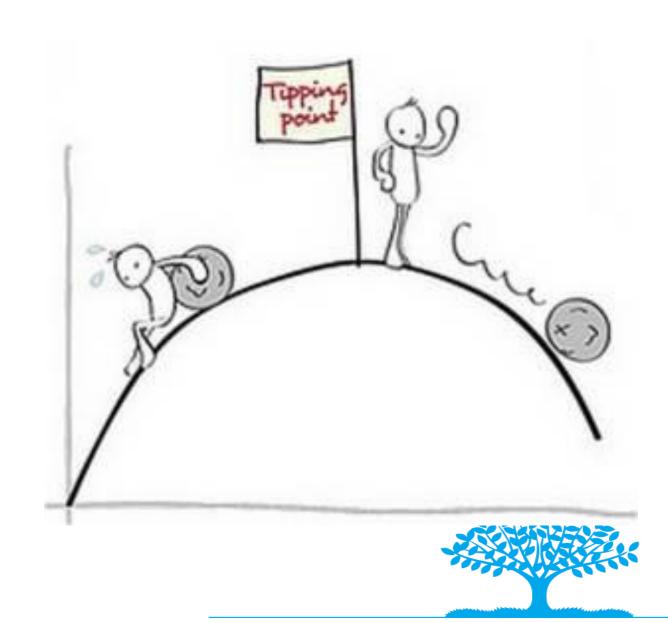


Sea level rising

## **Every tenth of a degree matters**

1. Every action matters

2. Tipping points



Working Group II - Impacts, Adaptation and Vulnerability

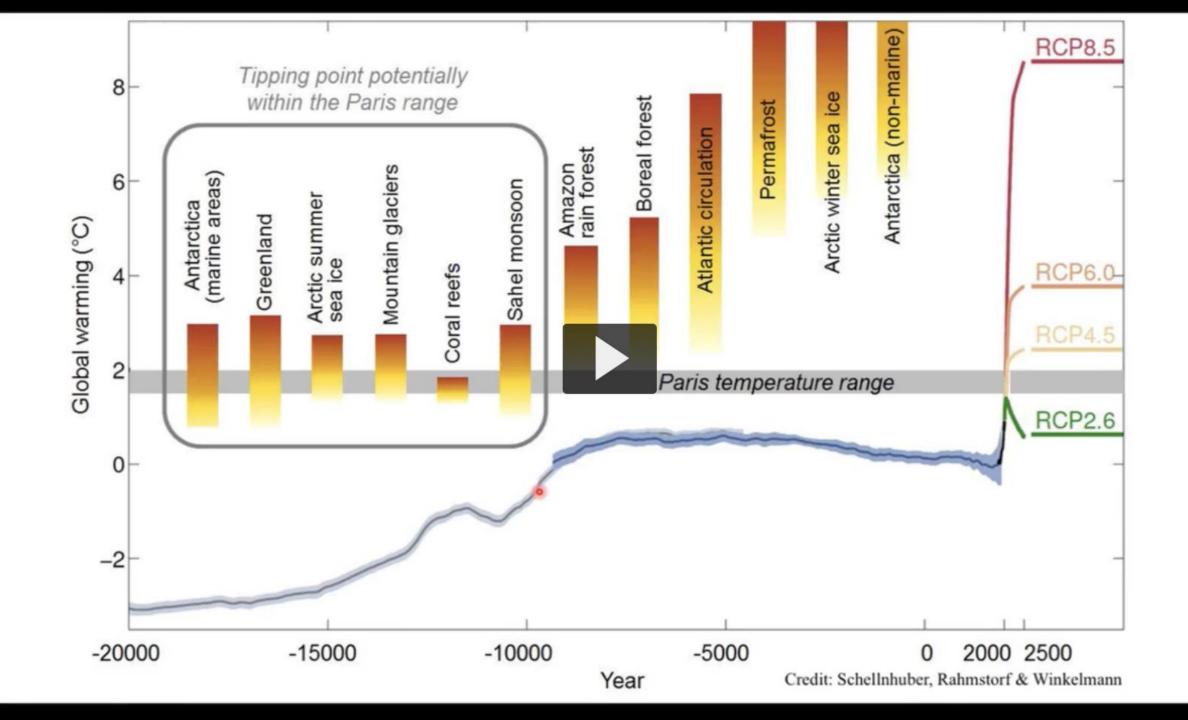






- $\square$ Loss of the Greenland Ice Sheet (2 3C)
- □ Collapse of the West Antarctic Ice Sheet (2) -3C)
- □ Abrupt collapse of the AMOC (Gulf Stream)
- ☐ Forest dieback
- ■Amazon dieback
- ☐Subsea and permafrost gas clathrates (methane)







There's no going back from some changes in the climate system. However, some changes could be slowed and others could be stopped by limiting warming.



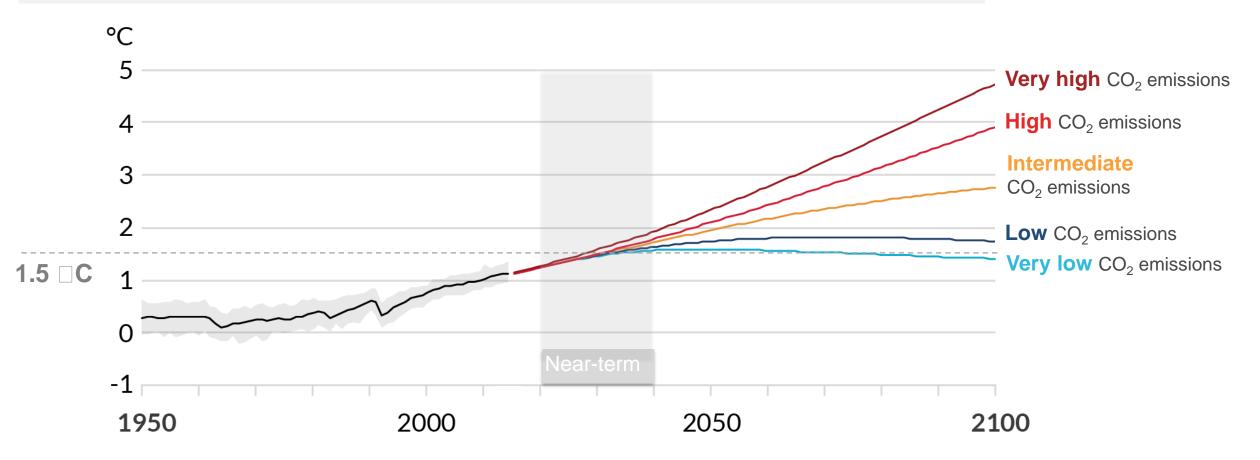
Working Group I – The Physical Science Basis







## The future climate depends on the next decade(s)





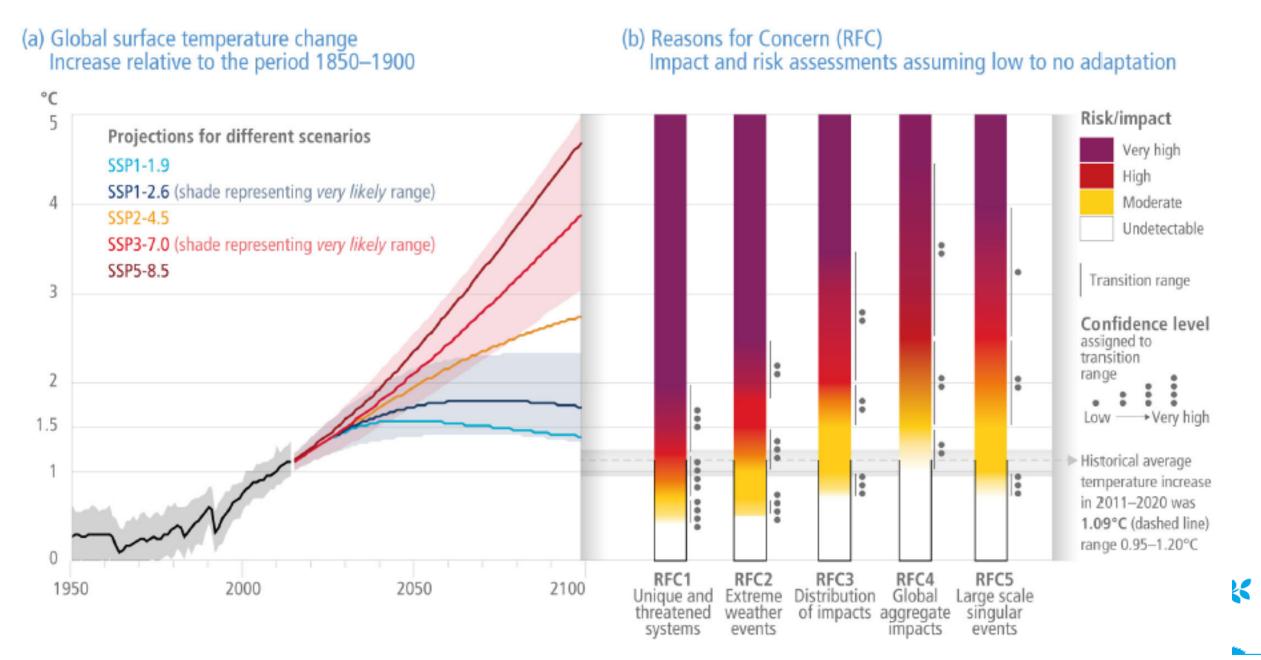
# There is a rapidly narrowing window of opportunity to enable climate resilient development

Multiple interacting choices and actions can shift development pathways towards sustainability

Outcomes characterising development pathways Sustainable Development Goal (SDG) achievement Low emissions System transitions Early action and enabling Transformation conditions create future opportunities for climate Low climate risk resilient development Equity and justice Climate Resilient Development Emissions reductions Adaptation Sustainable Development SDG achievement High emissions **Entrenched systems** Past conditions Adaptation limits (emissions, climate change, development) Maladaptation have increased warming Increasing climate risk and development gaps persist Prospects for climate resilient development will be further limited if global Reduced options for development Ecosystem warming exceeds 1.5°C and degradation if progress towards the SDGs is inadequate 2100 2030 Past Present Illustrative 'shock' that & beyond conditions disrupts development IPCC AR6

IPCC AR6 SYR Figure SPM.2c

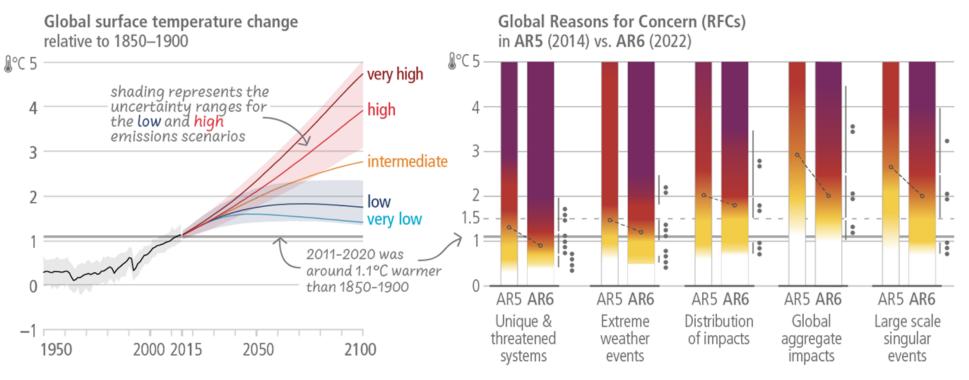
### Global and regional risks for increasing levels of global warming

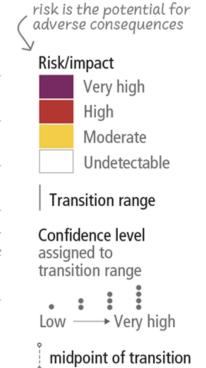




### Risks are increasing with every increment of warming

High risks are now assessed to occur at lower global warming levels







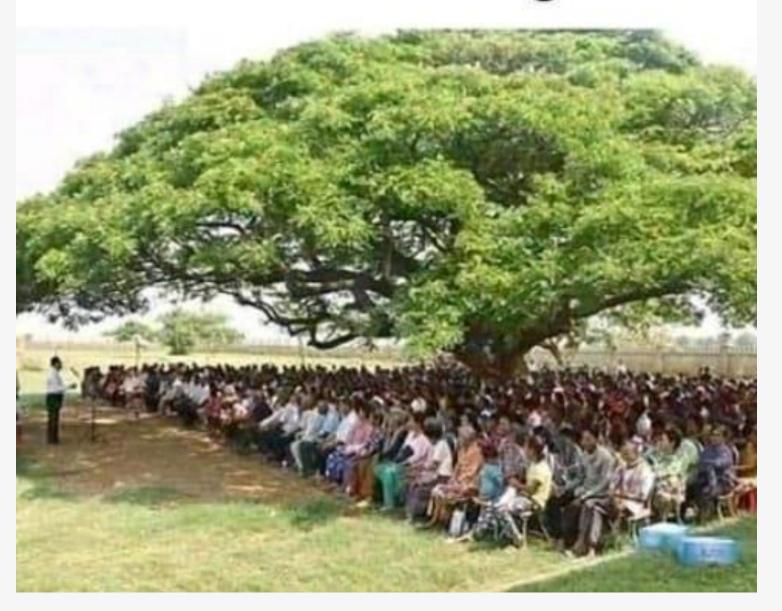




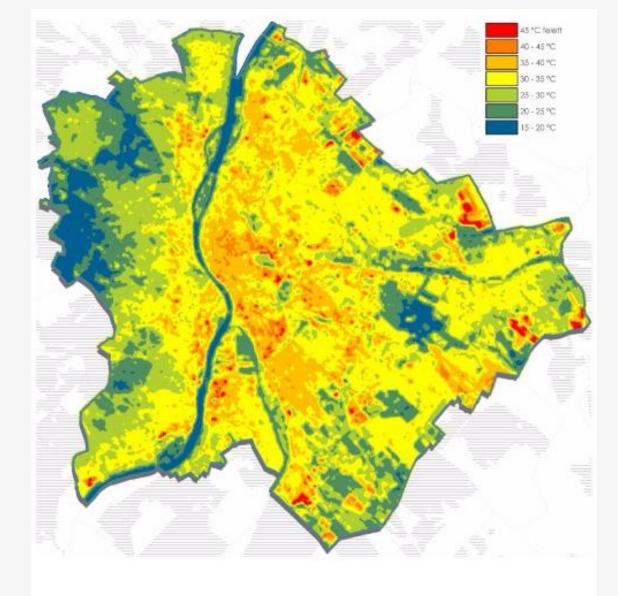
# Key Risk 1: Mortality and morbidity of people and changes in ecosystems due to heat

- The number of deaths and people at risk of heat stress will increase two- to threefold at 3°C compared with 1.5°C GWL
- Above 3°C GWL, there are limits to the adaptation potential of people and existing health systems, particularly in Southern Europe and Eastern Europe and areas where health systems are under pressure
- Thermal comfort hours during summer will decrease significantly, by as much as 74% in Southern Europe at 3°C
- Warming will decrease suitable habitat space for current terrestrial and marine ecosystems and irreversibly change their composition, increasing in severity above 2°C GWL.
- Fire-prone areas are projected to expand across Europe, threatening biodiversity and carbon sinks

## The value of one single tree.

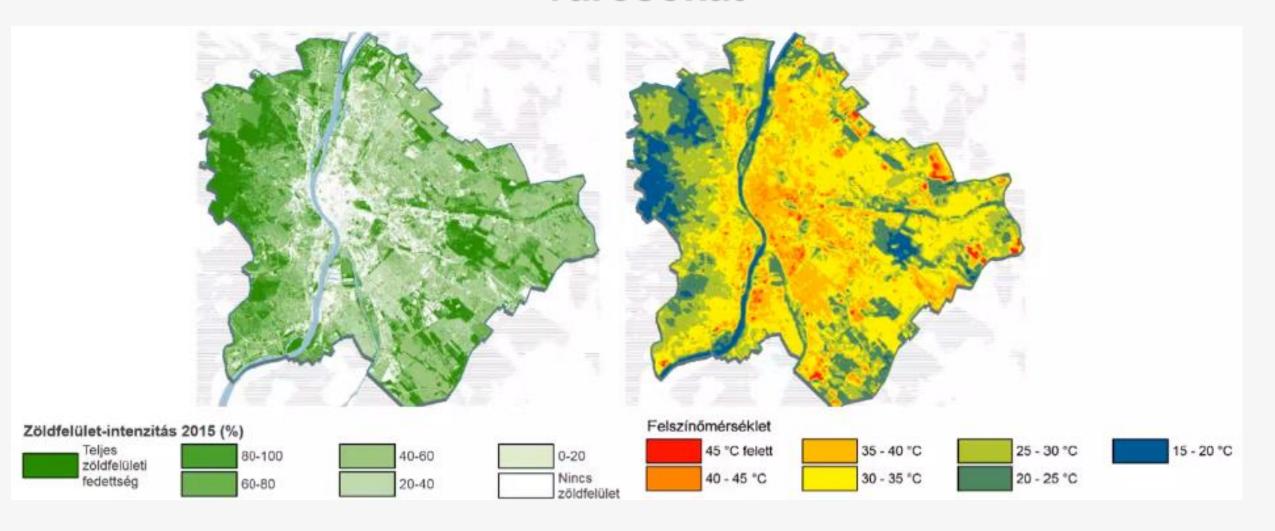


### Hősziget hatás Budapeste n



Budapest felszínhőmérséklet térképe 2016 aug. 31én 11:00 és 12:00 között zavartalan napfényes időszakban (forrás: Budapest Zöldinfrastruktúra Koncepciójának helyzetelemzése)

### A nagy, lombos fák tudják egyedül 'légkondicionálni' a városokat



Working Group II - Impacts, Adaptation and Vulnerability





### Nature's crucial services at risk in a warming world



**Pollination** 



Health



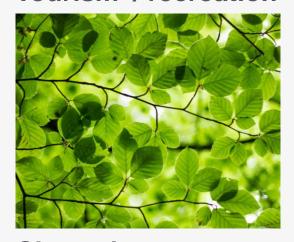
**Coastal protection** 



Water filtration



**Tourism / recreation** 



Clean air



**Food source** 



**Climate regulation** 







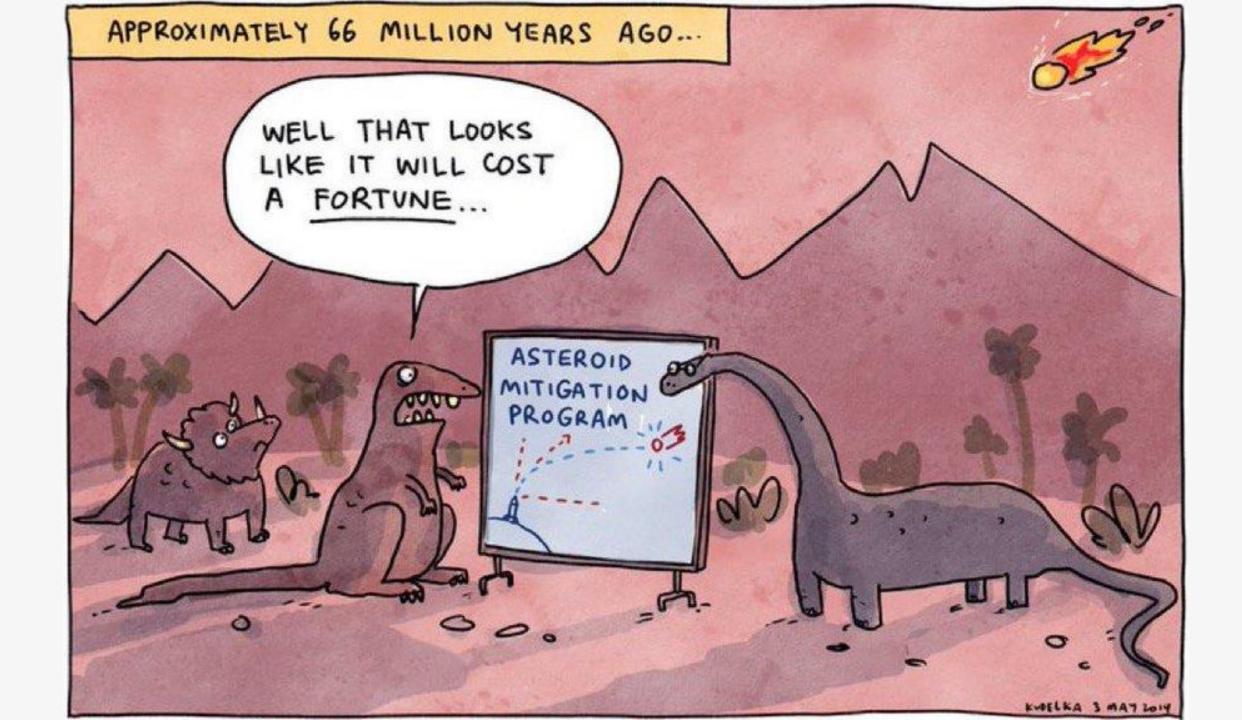
## **Key Risk 3: Water scarcity**

- In Southern Europe, more than a third of the population will be exposed to water scarcity at 2°C GWL; under 3°C GWL, this risk will double, and significant economic losses in water and energy dependent sectors may arise (medium confidence).
- For Western Central and Southern Europe, and for many cities, the risk of water scarcity will increase strongly under 3°C GWL.
- Adaptation becomes increasingly difficult at 3°C GWL and above, due to geophysical and technological limits; hard limits are likely first reached in parts of Southern Europe

Only when the last tree has died and the last river has been poisoned and the last fish been caught will we realize we cannot eat money.

- Indian Proverb





"...a globális átlaghőmérséklet emelkedését jóval az iparosodás előtti átlaghőmérsékletnél 2 °C-kal magasabb hőmérsékletszint alatt tartva; egyúttal arra törekedve, hogy a hőmérsékletemelkedés az iparosodás előtti átlaghőmérséklet feletti 1,5 °C mértékre korlátozódjon"

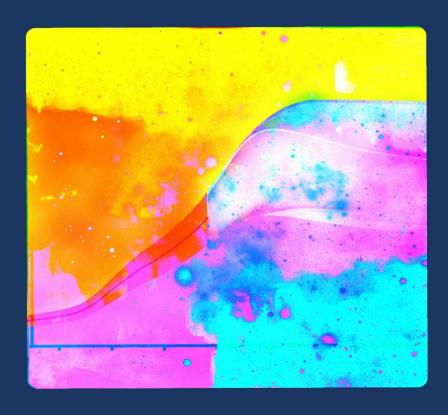






## **Global Warming of 1.5°C**

An IPCC special report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty.







Limiting human-induced global warming to a specific level requires reaching at least net zero CO2 emissions.

Working Group III – Mitigation of Climate Change







# Future emissions cause future additional warming, with total warming dominated by past and future CO<sub>2</sub> emissions

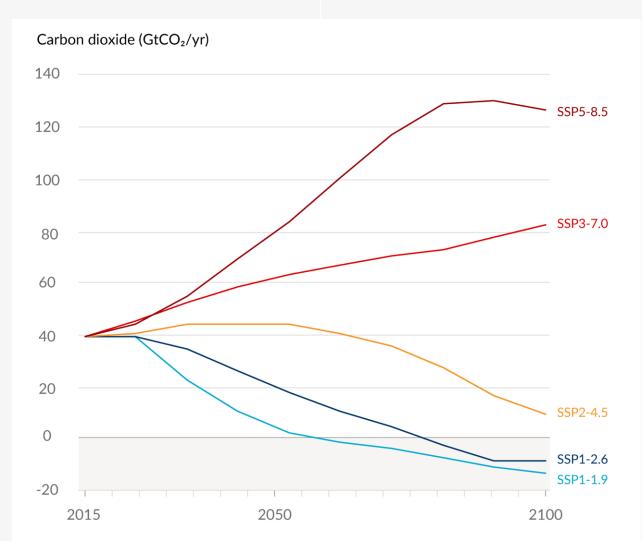
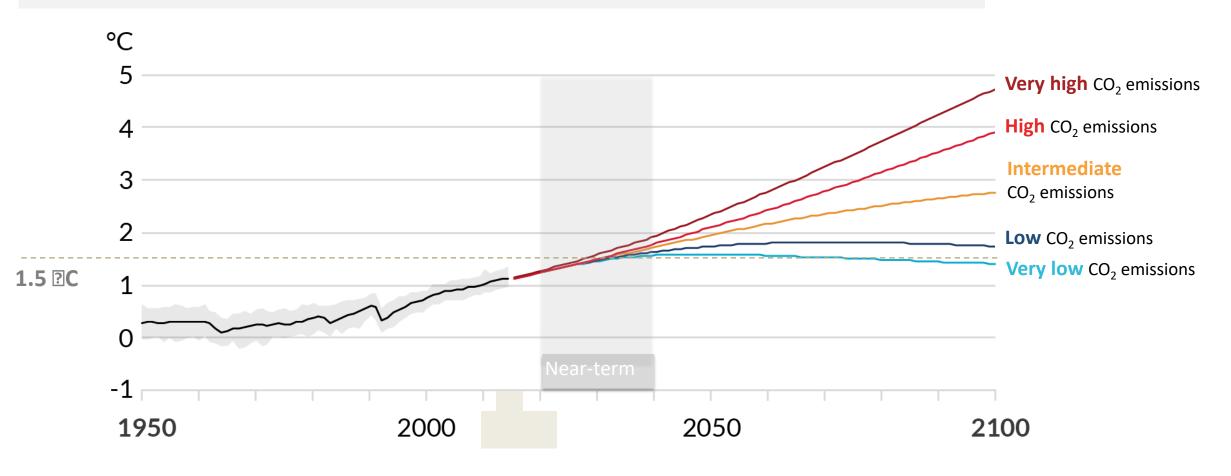


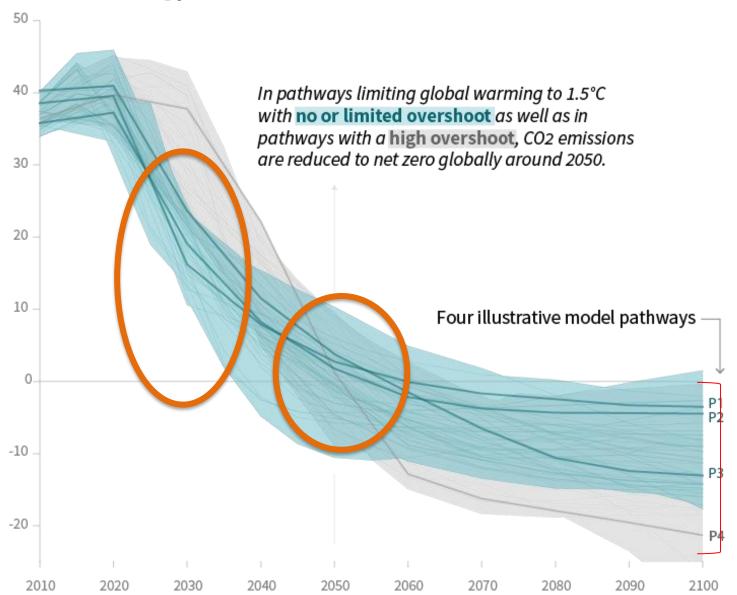
Figure SPM.4

### The future climate depends on the next decade(s)



#### Global total net CO2 emissions

#### Billion tonnes of CO<sub>2</sub>/yr

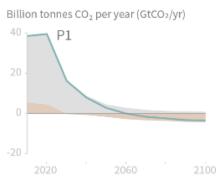




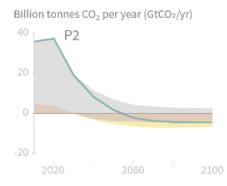
### Characteristics of four illustrative model pathways

#### Breakdown of contributions to global net CO<sub>2</sub> emissions in four illustrative model pathways

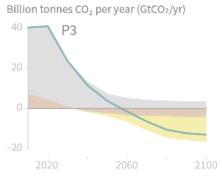




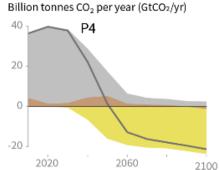
P1: A scenario in which social, business and technological innovations result in lower energy demand up to 2050 while living standards rise, especially in the global South. A downsized energy system enables rapid decarbonization of energy supply. Afforestation is the only CDR option considered; neither fossil fuels with CCS nor BECCS are used.



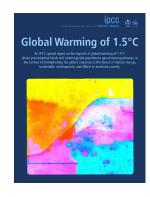
P2: A scenario with a broad focus on sustainability including energy intensity, human development, economic convergence and international cooperation, as well as shifts towards sustainable and healthy consumption patterns, low-carbon technology innovation, and well-managed land systems with limited societal acceptability for BECCS.



P3: A middle-of-the-road scenario in which societal as well as technological development follows historical patterns. Emissions reductions are mainly achieved by changing the way in which energy and products are produced, and to a lesser degree by reductions in demand.



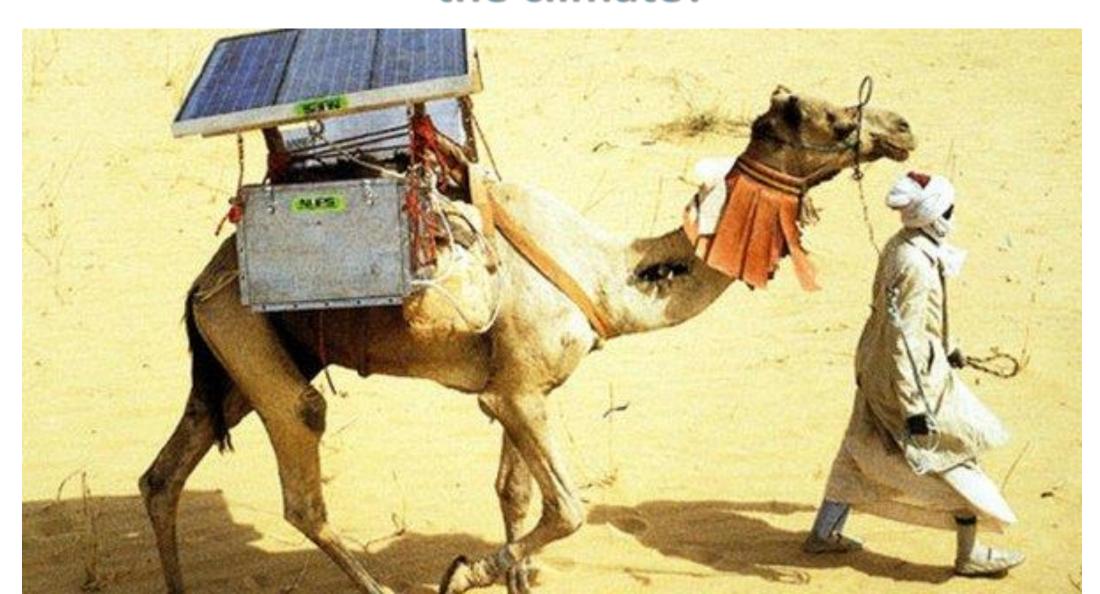
P4: A resource- and energy-intensive scenario in which economic growth and globalization lead to widespread adoption of greenhouse-gas-intensive lifestyles, including high demand for transportation fuels and livestock products. Emissions reductions are mainly achieved through technological means, making strong use of CDR through the deployment of BECCS.





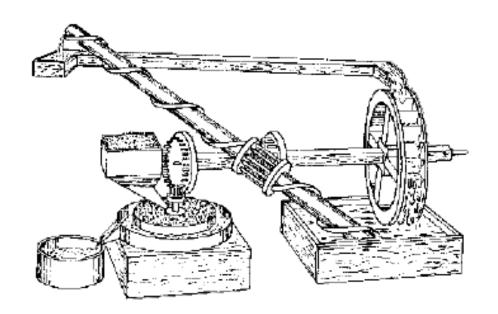


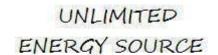
# Human ingenuity will invent the technology to fix the climate?

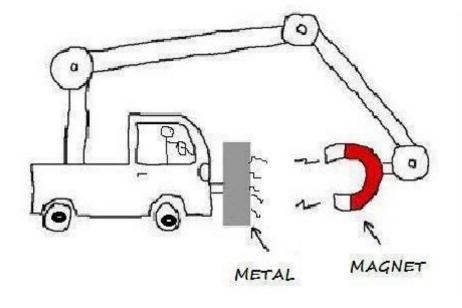


## The magic invention

- **❖** Takes CO₂ out of the atmosphere
- ❖It builds itself
- Its cost nears zero







# The value of one single tree.



# Concerns with BECCS 2.: removing 3.3GtC/yr with BECCS means:

- ❖ between 360 and 2400M ha of marginal lands (~ over three times the world total harvested land for cereal production)
- ❖3600 and 15 700B m³ of water (~ twice the world annual water use for agriculture)
- ❖30 to 360 Gt of nutrients (~ 20 times the US annual nutrient use)
- ❖1.7 to 2.9 TW of installed BECCS capacity (~1.6 times the world total coal-fired power plant capacity)

## Offsets – paying someone else to go on a diet for us?

- The scientific literature raises serious concerns about the effectiveness of offsets:
  - "Only 2% of the projects and 7% of potential CER supply have a high likelihood of ensuring that emission reductions are additional and are not over-estimated."
  - "carbon storage on land as a means to 'offset' CO2 emissions from burning fossil fuels (an idea with wide currency) is scientifically flawed."
- "ethical risk"
- ❖ Negative emissions will be needed even in the most ambitious mitigation scenarios. These need to be kept for offsetting emissions that are impossible or very challenging to mitigate.

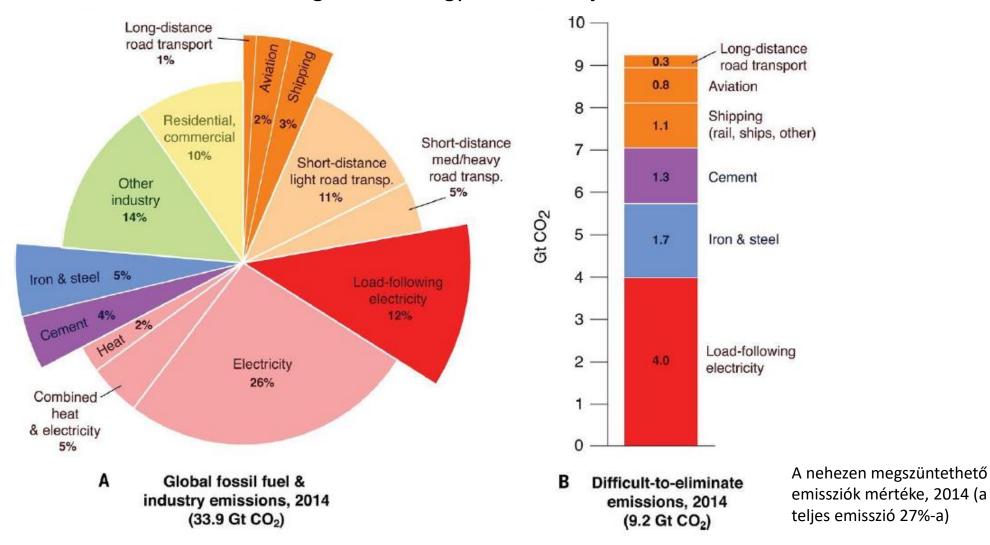
https://www.nature.com/articles/nclimate1804

https://ec.europa.eu/clima/sites/clima/files/ets/docs/clean\_dev\_mechanism\_e



### Can all CO2 emissions be eliminated?

Az energiarendszer néhány elemét különösen nehéz dekarbonizálni. Ilyen a repülés, a távolsági szállítás, az acél és cement előállítás, a kockázatmentes villamosenergia-ellátás nagy terhelés idején



°CICERO

Source: Davis et al (2018)

### THE CONVERSATION

Academic rigour, journalistic fair

COVID-19 Arts + Culture Business + Economy Cities Education Environment + Energy Health + Medicine Politics + Society Science + Technology



dangerous trap

April 22, 2021 5,25am BST

https://theconversation.com/climate-scientists-concept-of-net-zero-is-a-dangerous-trap-157368

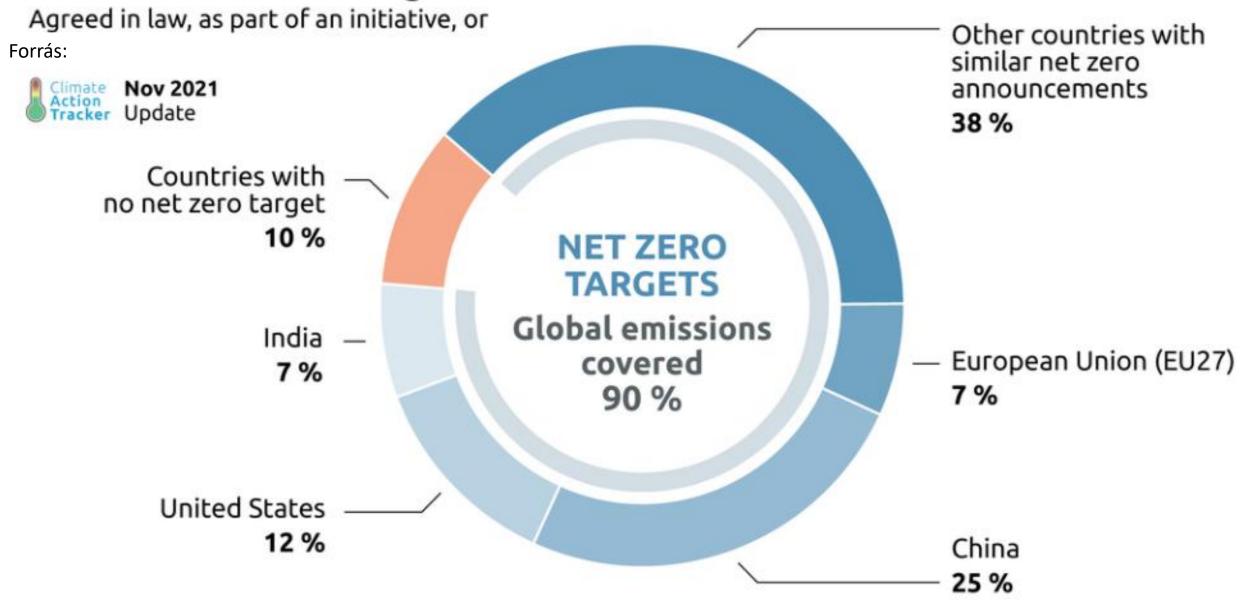


## Will keeping warming (well) under 2C break the bank?

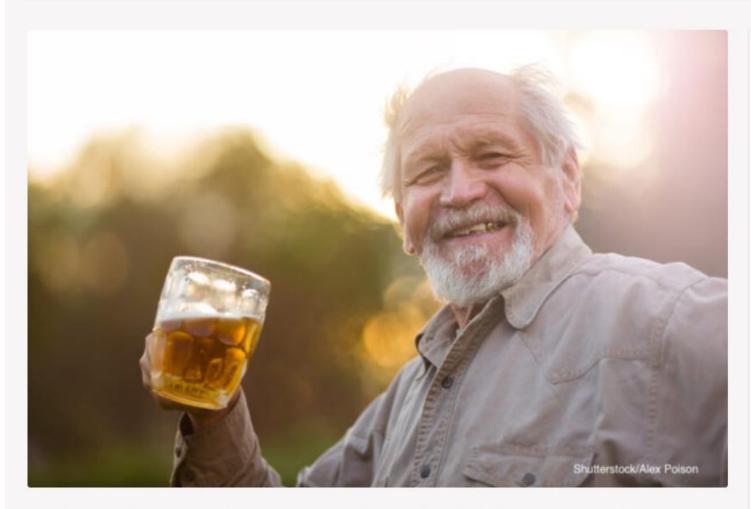


- economy wide costs and benefits of limiting warming to 1.5°C.
  - □ limited number of model studies report economy wide mitigation costs
  - □ Such costs do not include the benefits of reduced climate change as well as synergies and trade-offs of mitigation
- [these model studies project 1.5-2.7% (interquartile range) lower consumption in 2050 compared to 2°C pathways,
  - □ which in turn project 1.4-3.7% lower consumption than in the baseline
- Consumption in the baseline underlying these estimates grows between 270-320% from 2010 to 2050.]

### Net zero emissions target announcements



### Man announces he will quit drinking by 2050



A Sydney man has set an ambitious target to phase out his alcohol consumption within the next 29 years, as part of an impressive plan to improve his health.

The program will see Greg Taylor, 73, continue to drink as normal for the foreseeable future, before reducing consumption in 2049 when he turns 101. He has assured friends it will not affect his drinking plans in the short or medium term.







#### Increased evidence of climate action

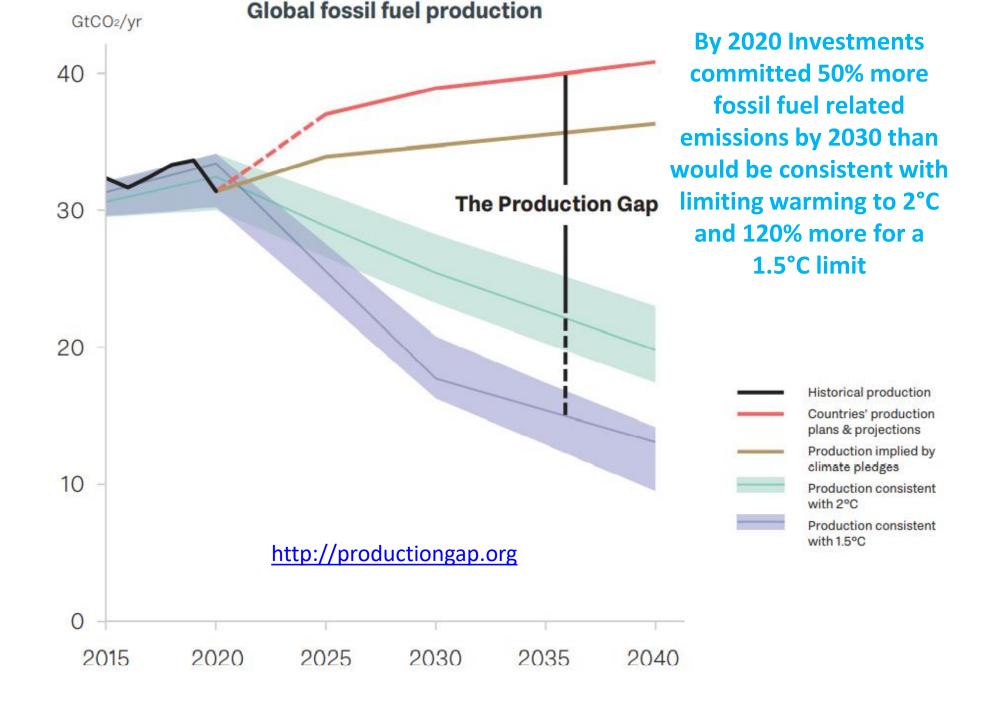
Some countries have achieved a steady decrease in emissions consistent with limiting

warming to 2°C.





Zero emissions targets have been adopted by at least 826 cities and 103 regions



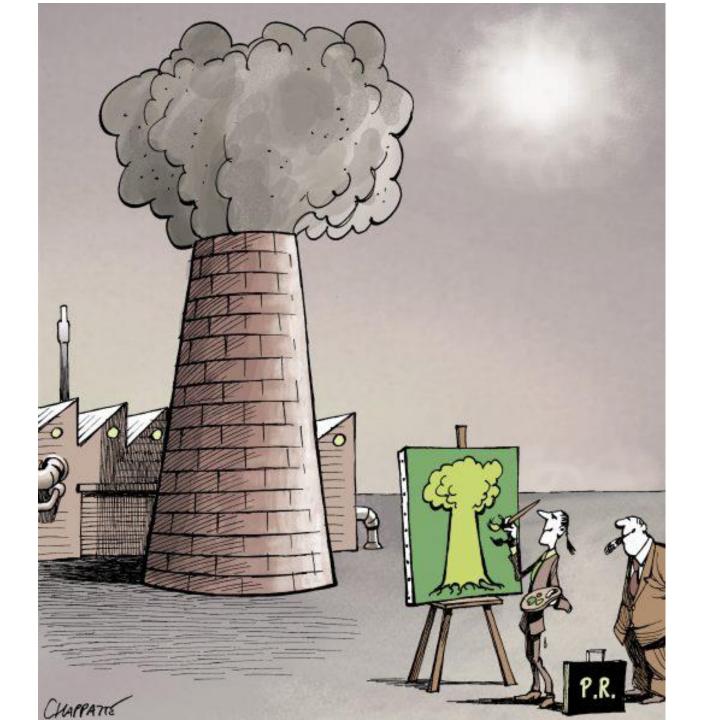


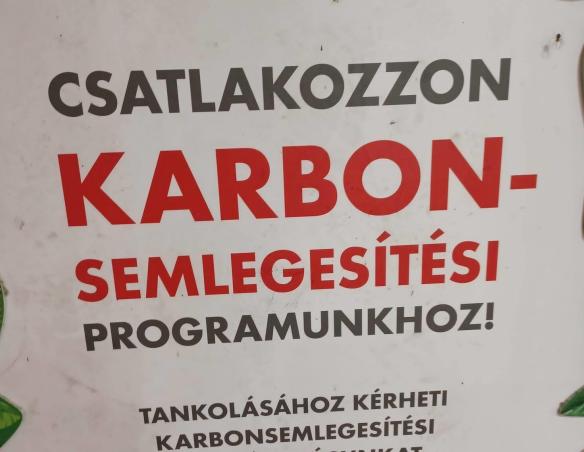




#### **Stranded assets**

- Limiting global warming to 2°C or below will leave a substantial amount of fossil fuels unburned and could strand considerable fossil fuel infrastructure.
- USD11.8 trillion in current assets will need to be stranded by 2050 for 2°C world; further delaying action for another 10 years would result in an additional USD7.7 trillion in stranded assets by 2050
- The loss of wealth from stranded assets would create risks for financial market stability, reduce fiscal revenue for hydrocarbon dependent economies, in turn affecting macroeconomic stability and the prospects for a just transition.
- □ About 30% of oil, 50% of gas, and 80% of coal reserves will remain unburnable if warming is limited to 2°C, and substantially more to 1.5C
- the worldwide fleet of coal and gas power plants would need to retire about 23 and 17 years earlier than expected lifetimes, respectively, in order to limit global warming to 1.5°C and 2°C
- Blast furnaces and cement factories without CCS, new fleets of airplanes and internal combustion engine vehicles and new urban infrastructures adapted to sprawl and motorisation may also be stranded





SZOLGÁLTATÁSUNKAT, LITERENKÉNT 6 FT-ÉRT VAGY 6 CLUBSMART PONTÉRT.\*

\* Az ajánlatot nem veheti igénybe, aki vásárlása ellenértékét euroShell, Esso vagy DKV üzemanyagkártyával fizeti.

# $I = P \times A \times T$

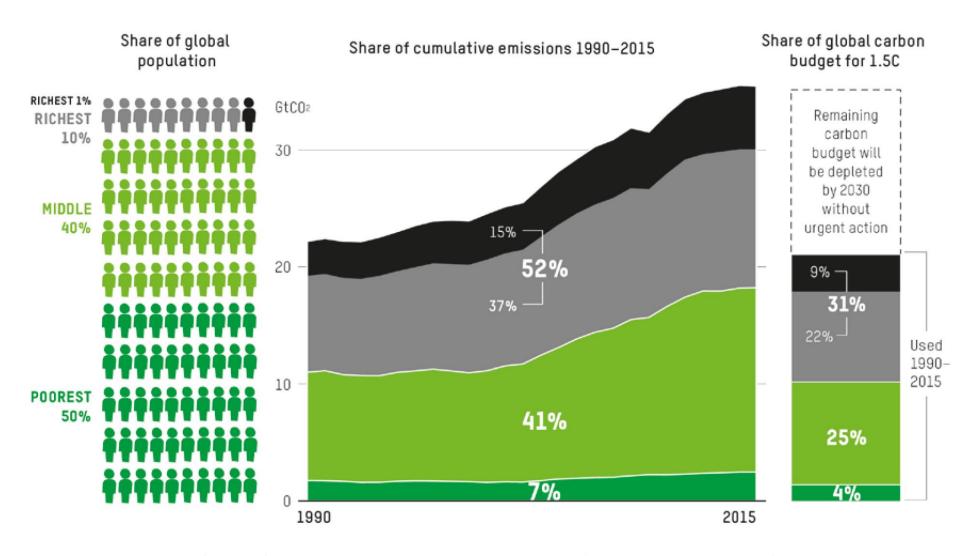
emissions

# of people

consumption person

emissions consumption

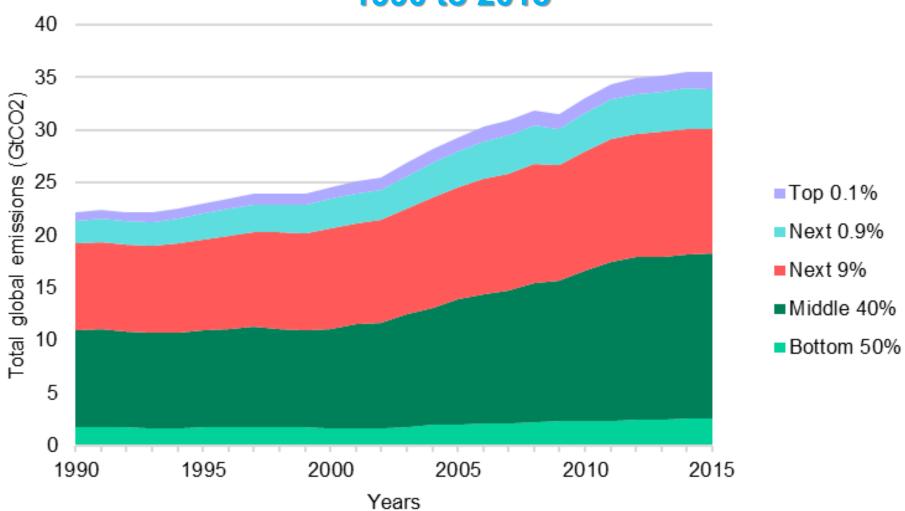
Figure 1: Share of cumulative emissions from 1990 to 2015 and use of the global carbon budget for 1.5C linked to consumption by different global income groups



Per capita income threshold (SPPP2011) of richest 1%: S109k; richest 10%: S38k; middle 40%: \$6k; and bottom 50%: less than \$6k. Global carbon budget from 1990 for 33% risk of exceeding 1.5C: 1,205Gt.

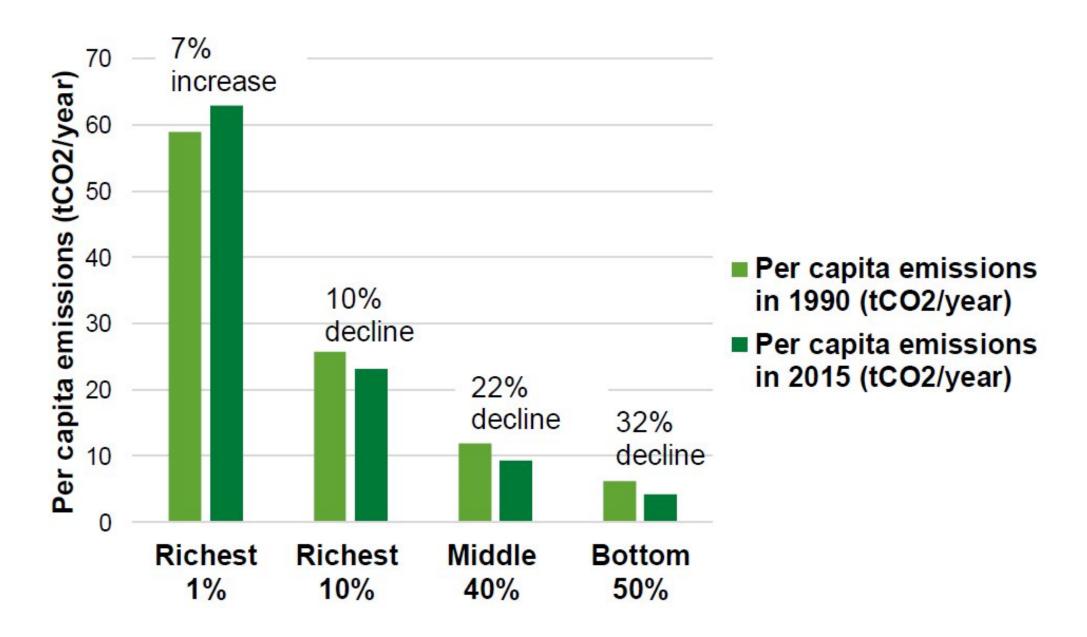
SIVAN KARTHA, ERIC KEMP-BENEDICT, EMILY GHOSH AND ANISHA NAZARETH, TIM GORE: The Carbon Inequality Era, Sept 2020, Stockholm Environment Institute and Oxfam

## Total carbon emissions associated with consumption of individuals in different global income groups from 1990 to 2015



SIVAN KARTHA, ERIC KEMP-BENEDICT, EMILY GHOSH AND ANISHA NAZARETH, TIM GORE: The Carbon Inequality Era, Sept 2020, Stockholm Environment Institute and Oxfam

Figure 3: Per capita consumption emissions (tCO2/year) by EU income group in 1990 and 2015<sup>16</sup>



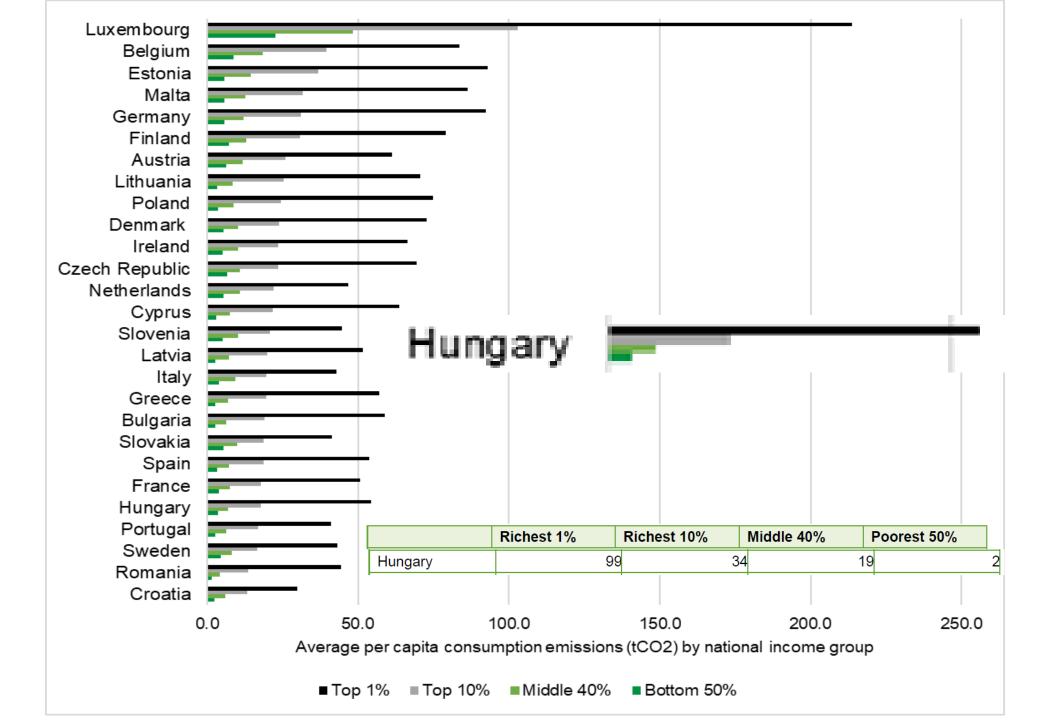
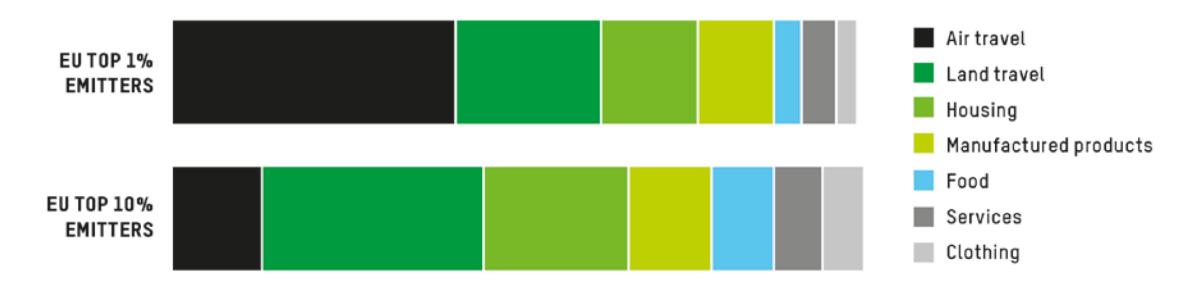








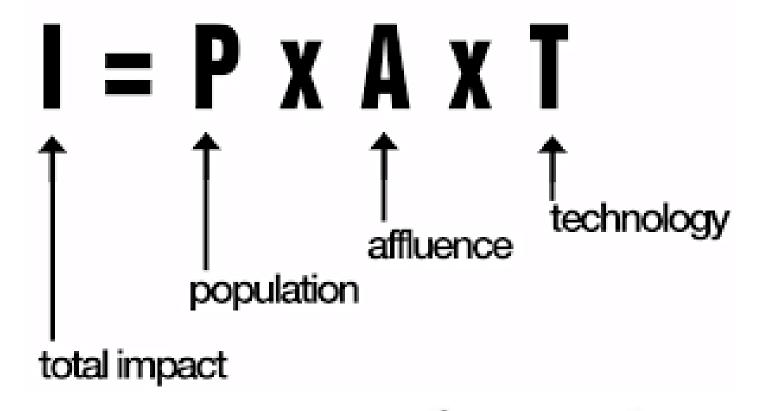
Figure 5: Main categories of consumption among highest emitters in the EU (2010)<sup>30</sup>







IPAT formula





There are options available **now** in every sector that can at least **halve** emissions by 2030

#### **Demand and services**



Energy



Land use



**Industry** 



Urban



**Buildings** 



**Transport** 



#### **Demand and services**

- potential to bring down global emissions by
   40-70% by 2050
- walking and cycling, electrified transport, reducing air travel, and adapting houses make large contributions
- lifestyle changes require systemic changes across all of society
- some people require additional housing,
   energy and resources for human wellbeing



#### SIXTH ASSESSMENT REPORT

Working Group III – Mitigation of Climate Change







- C.4 Reducing GHG emissions across the full energy sector requires major transitions, including a substantial reduction in overall fossil fuel use, the deployment of low-emission energy sources, switching to alternative energy carriers, and energy efficiency and conservation. The
- contin emissi

  C.5 Net-zero CO<sub>2</sub> emissions from the industrial sector are challenging but possible. Reducing industry emissions will entail coordinated action throughout value chains to promote all mitigation options, including demand management, energy and materials efficiency, circular
- C.6 Urban areas can create opportunities to increase resource efficiency and significantly reduce GHG emissions through the systemic transition of infrastructure and urban form through low-emission development pathways towards net-zero emissions. Ambitious mitigation efforts for established, rapidly growing and emerging cities will encompass 1) reducing or changing energy and material consumption, 2) electrification, and 3) enhancing carbon uptake and storage in the urban environment. Cities can achieve net-zero emissions, but only if emissions are reduced most

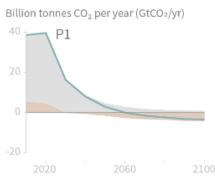
regions. There are many sustainable options for demand management, materials efficiency, and circular material flows that can contribute to reduced emissions, but how these can be applied will vary across

and wou built, are projected to approach net zero GHG emissions in 2050 if policy packages, which technolog combine ambitious sufficiency, efficiency, and renewable energy measures, are effectively implemented and barriers to decarbonisation are removed. Low ambitious policies increase the underestimated compared to bottom-up industry-specific models. (high confidence) {3.4, 5.3, Figure

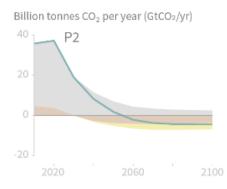
#### Characteristics of four illustrative model pathways

#### Breakdown of contributions to global net CO<sub>2</sub> emissions in four illustrative model pathways

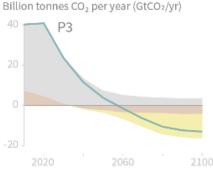




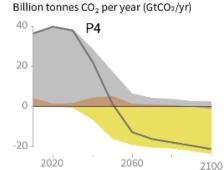
P1: A scenario in which social, business and technological innovations result in lower energy demand up to 2050 while living standards rise, especially in the global South. A downsized energy system enables rapid decarbonization of energy supply. Afforestation is the only CDR option considered; neither fossil fuels with CCS nor BECCS are used.



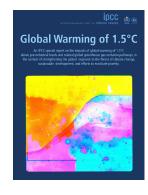
P2: A scenario with a broad focus on sustainability including energy intensity, human development, economic convergence and international cooperation, as well as shifts towards sustainable and healthy consumption patterns, low-carbon technology innovation, and well-managed land systems with limited societal acceptability for BECCS.



P3: A middle-of-the-road scenario in which societal as well as technological development follows historical patterns. Emissions reductions are mainly achieved by changing the way in which energy and products are produced, and to a lesser degree by reductions in demand.



P4: A resource- and energy-intensive scenario in which economic growth and globalization lead to widespread adoption of greenhouse-gas-intensive lifestyles, including high demand for transportation fuels and livestock products. Emissions reductions are mainly achieved through technological means, making strong use of CDR through the deployment of BECCS.

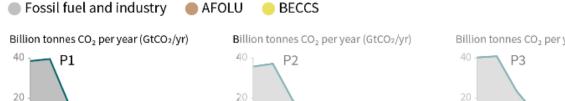


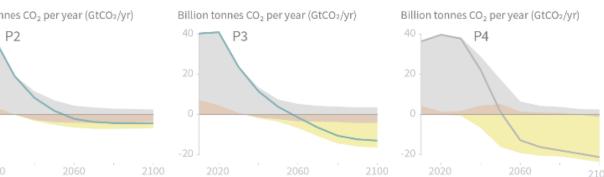


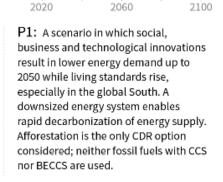


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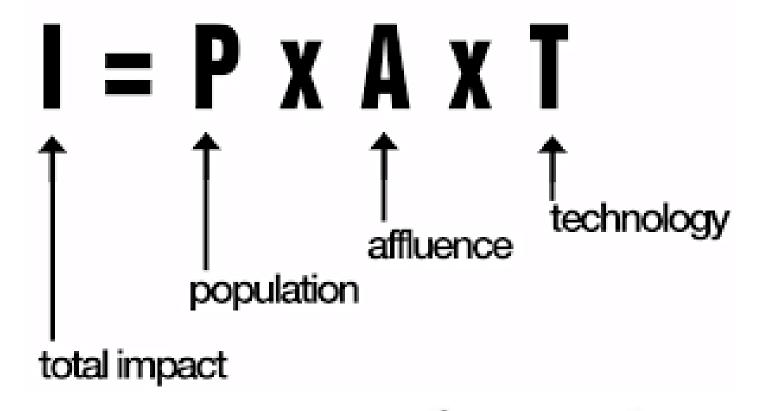




-20 -



IPAT formula

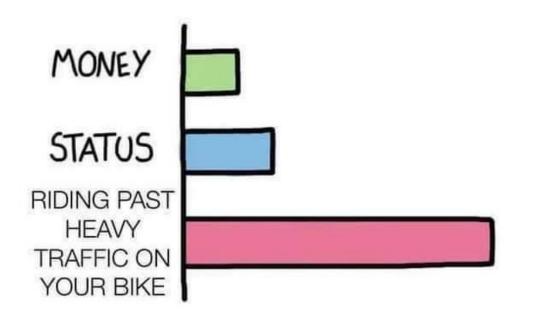






- ❖"If SUVs were an individual country, they would rank 6th in the world for absolute emissions in 2021."
- Laura Cozzi,
  IEA

## WHAT GIVES PEOPLE FEELINGS OF POWER





kcademic rigour, journalistic fla







1970: One more lane will fix it.

1980: One more lane will fix it.

1990: One more lane will fix it.

2000: One more lane will fix it.

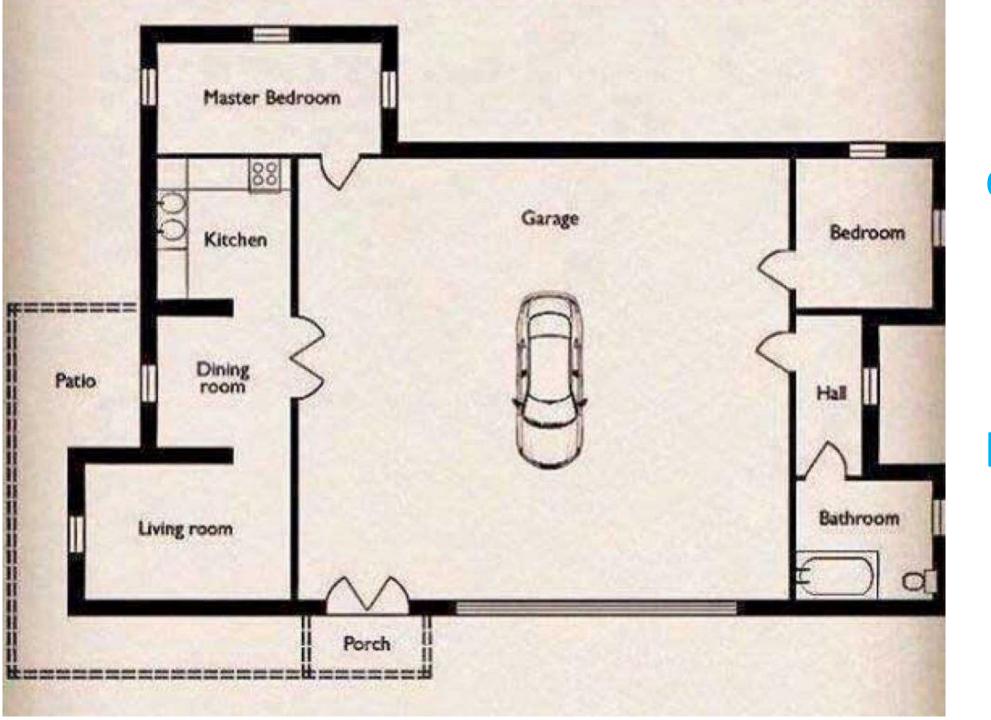
2010: One more lane will fix it.

2020s: This might be the wrong

approach

#### Traduzir Tweet





If an architect were to design your house like this - you'd fire them. Why then do we allow professiona Is to design our cities like this?





## Can we achieve corporate growth/increasing sales in better ways?

- Planned obsolescence
  - □ Poor materials, fast obsolete softwares, no access to codes to enable repair, no access to spare parts, inaccessibility or overpriced repair/servicing, no warranties, etc.
- Fast changing fashion
- Consciously causing addictions
- greenwashing

### **Business can be done better**

## Rethinking corporate strategies moving ESG from an afterthought to the board rooms

- Focus on selling quality vs quantity
- Increase longevity, durability of products (and services)
- Focus on selling services (well-being) rather than materialintensive products
  - ☐ (eg sell mobility service rather than a car)
- Rethink marketing does your planned increase in sales correspond to genuine increase in well-being? Ethical marketing?
- Tap potentials for the re-used and sharing economy rather than new products







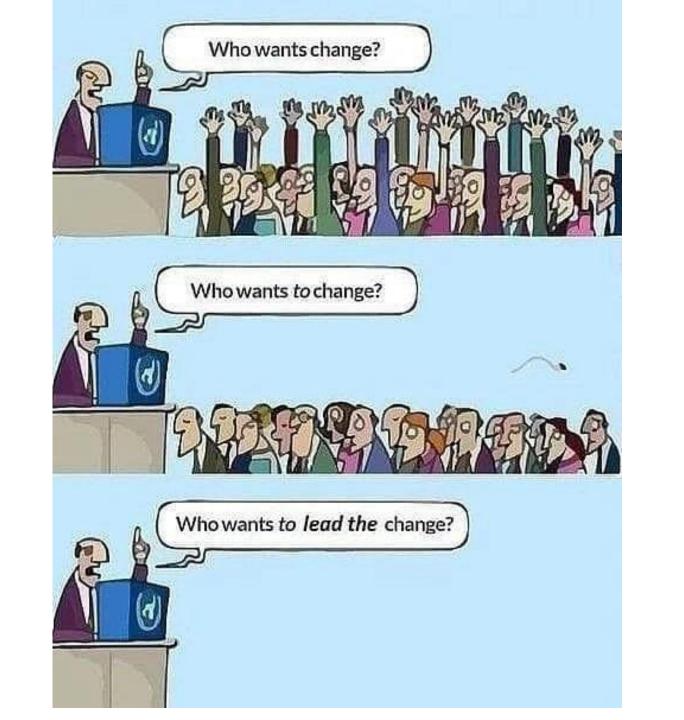


### Irota EcoLodge, Hungary











### THANK YOU FOR YOUR ATTENTION



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