Lidar com as Alterações Climáticas ou a reinvenção da engenharia

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CENSE
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NOVA SCHOOL OF SCIENCE & TECHNOLOGY

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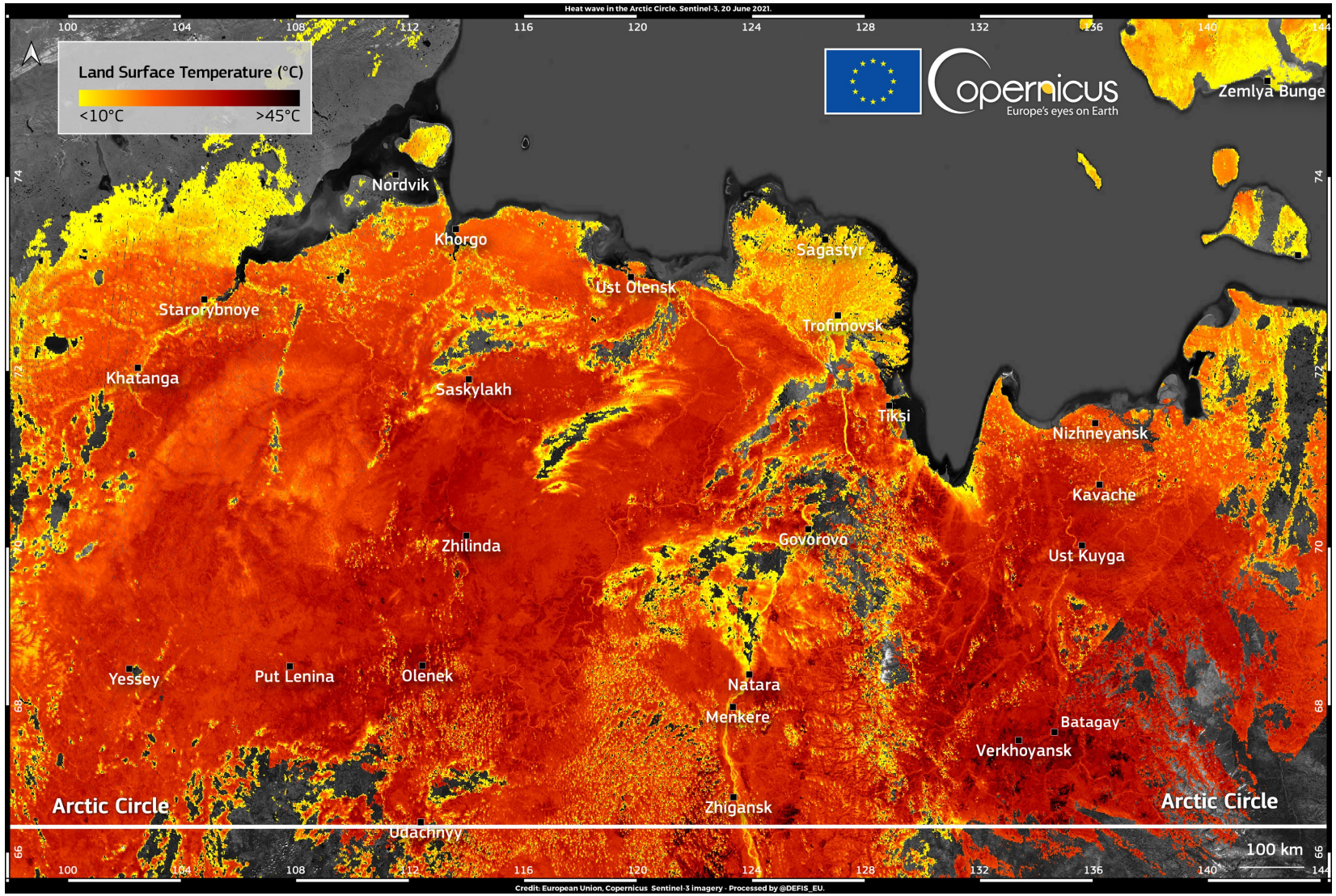
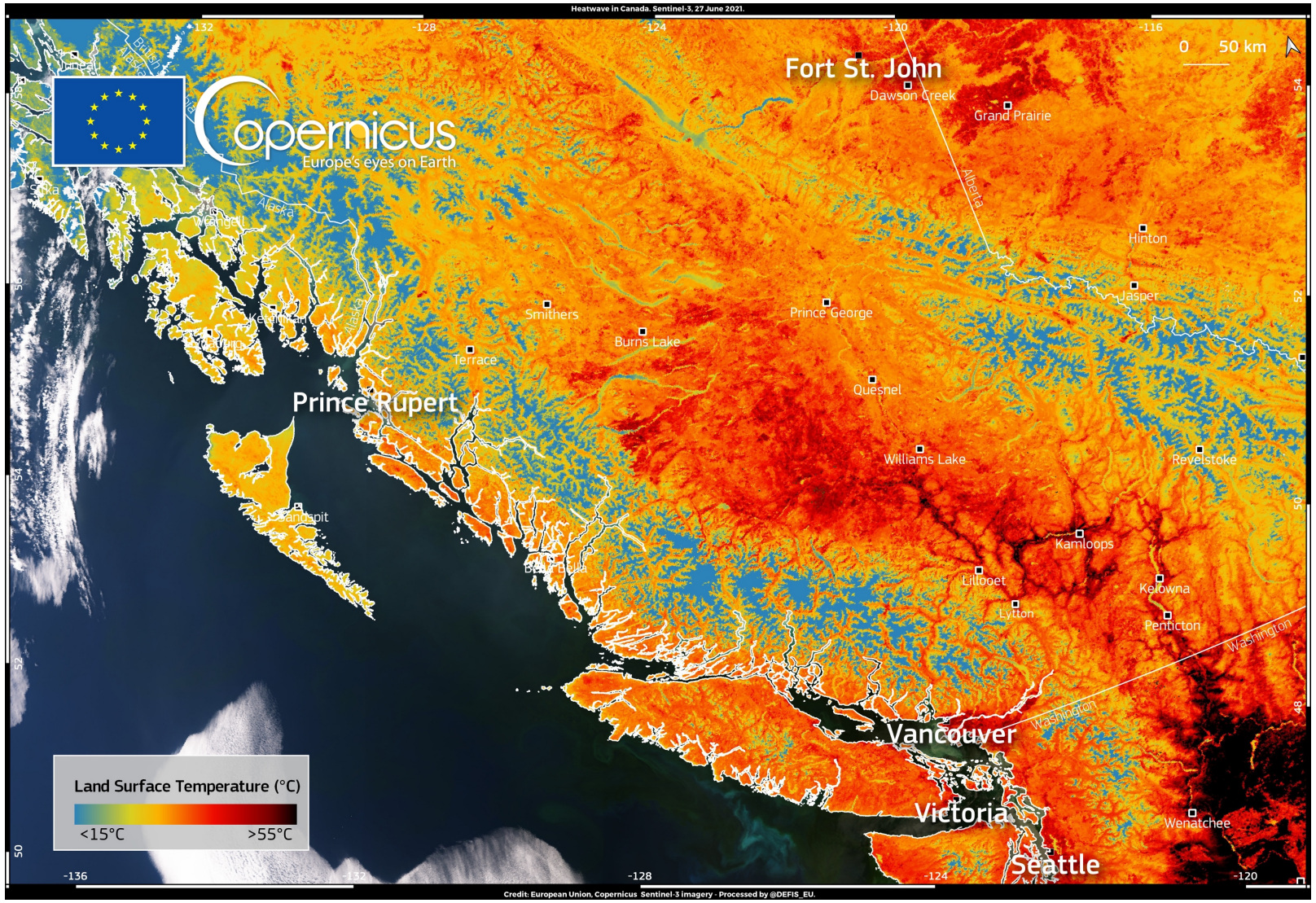
Land Surface Temperature in the Sakha Republic



Land surface temperature has **widely exceeded 35°C** across Siberia, with peaks of 48°C near Verkhojansk, 43°C in Govorovo and 37°C in Saskylah.

Date: 20/06/2021; Location: Russia
Credit: European Union, Copernicus Sentinel-3 imagery

Historical heatwave in Canada and USA



In Lytton (British Columbia), the temperature rose to 46.6°C on 27 June and to 47°C on 28 June, breaking an 84-year-old record.

At 18:53 UTC (11:53 local time) of the 27 June, the land surface temperature (i.e. the temperature of the soil, not to be confused with the temperature of the air at ground level) in the lowlands was above 45 °C in many areas, with peaks of 56°C near Kamloops (located 100 km northeast of Lytton) and 63°C in Wenatchee in the United States.

Date: 27/06/2021; Location: Canada and USA
Credit: European Union, Copernicus Sentinel-3 imagery

Earth is trapping twice as much heat as it did in 2005

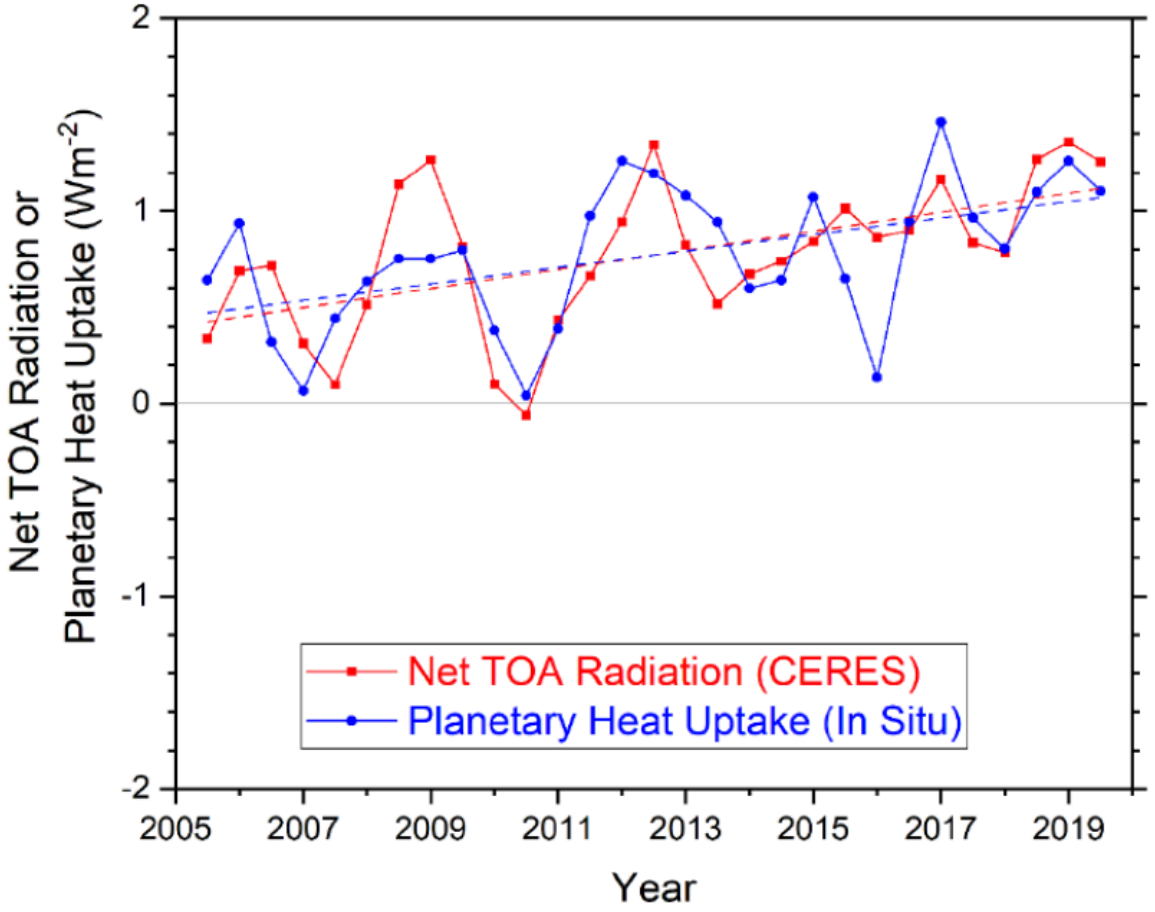
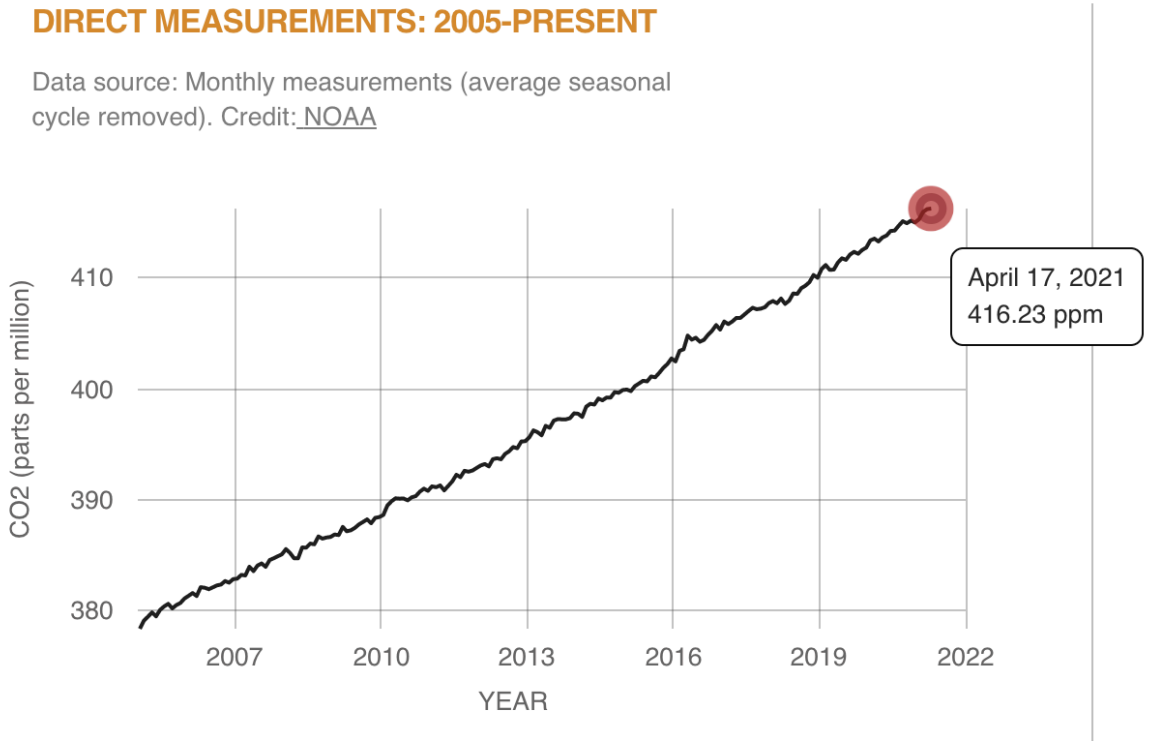


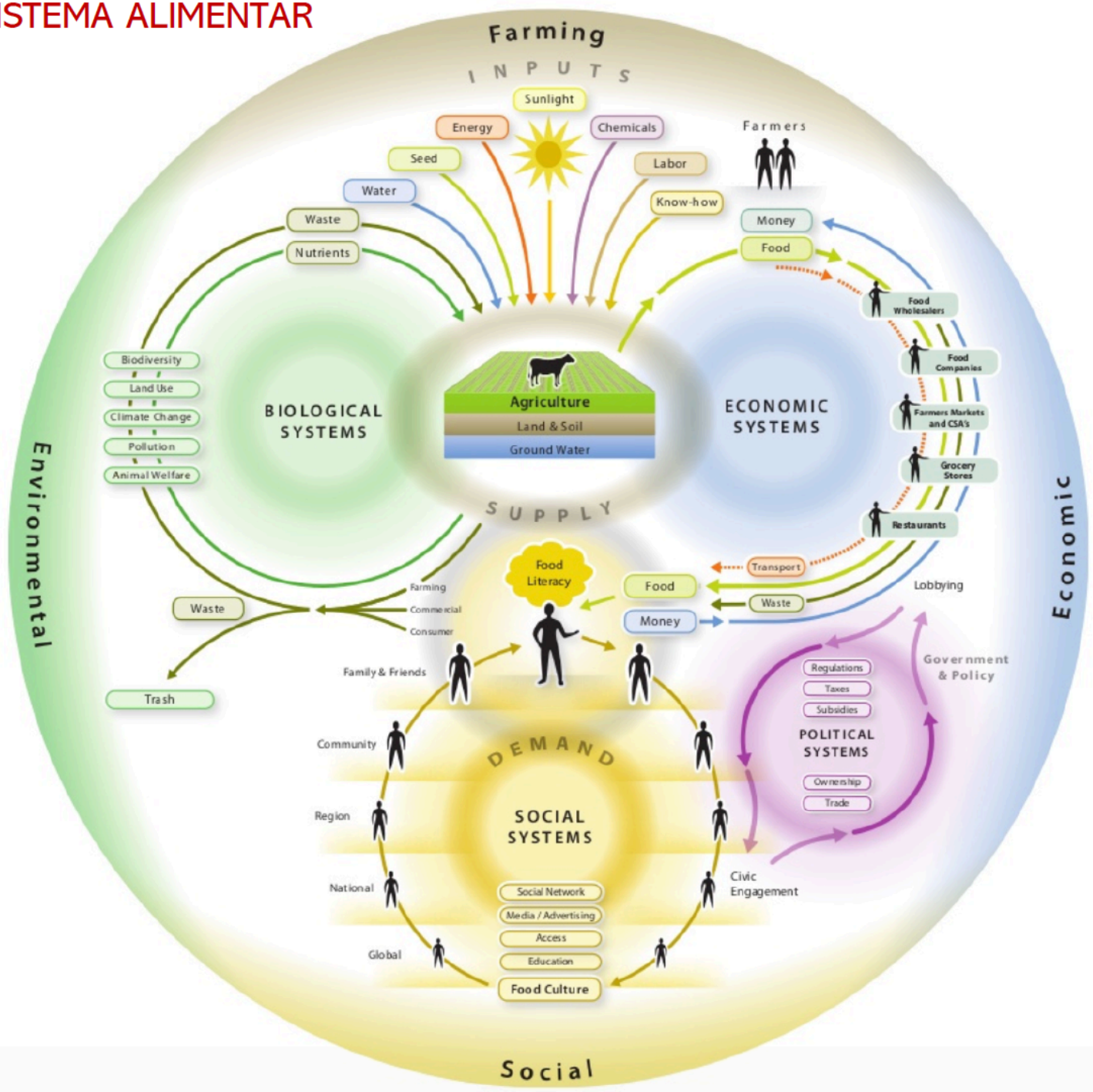
Figure 1 Comparison of overlapping one-year estimates at 6-month intervals of net top-of-the-atmosphere annual energy flux from the CERES EBAF Ed4.1 product (solid red line) and an in situ observational estimate of uptake of energy by Earth climate system (solid blue line). Dashed lines correspond to least squares linear regression fits to the data.
Loeb et al, 2021, *Geophysical Research Letters*

Direct measurement of CO_2 in the atmosphere at Mauna Loa, Hawaii



Pre-industrial: 280 ppm

SISTEMA ALIMENTAR



O sistema alimentar é o principal driver de nossa trajetória terrestre

Rockström *et al*, 2020, Planet-proofing the global food system, *Nature*

O sistema alimentar global é o principal driver da perda de biodiversidade

Benton *et al*, 2021, Chatham House

"Agriculture is the single largest cause of land-use change and habitat destruction, accounting for 80% of all land-use change globally"
"Animal farming now occupies 78% of agricultural land globally"

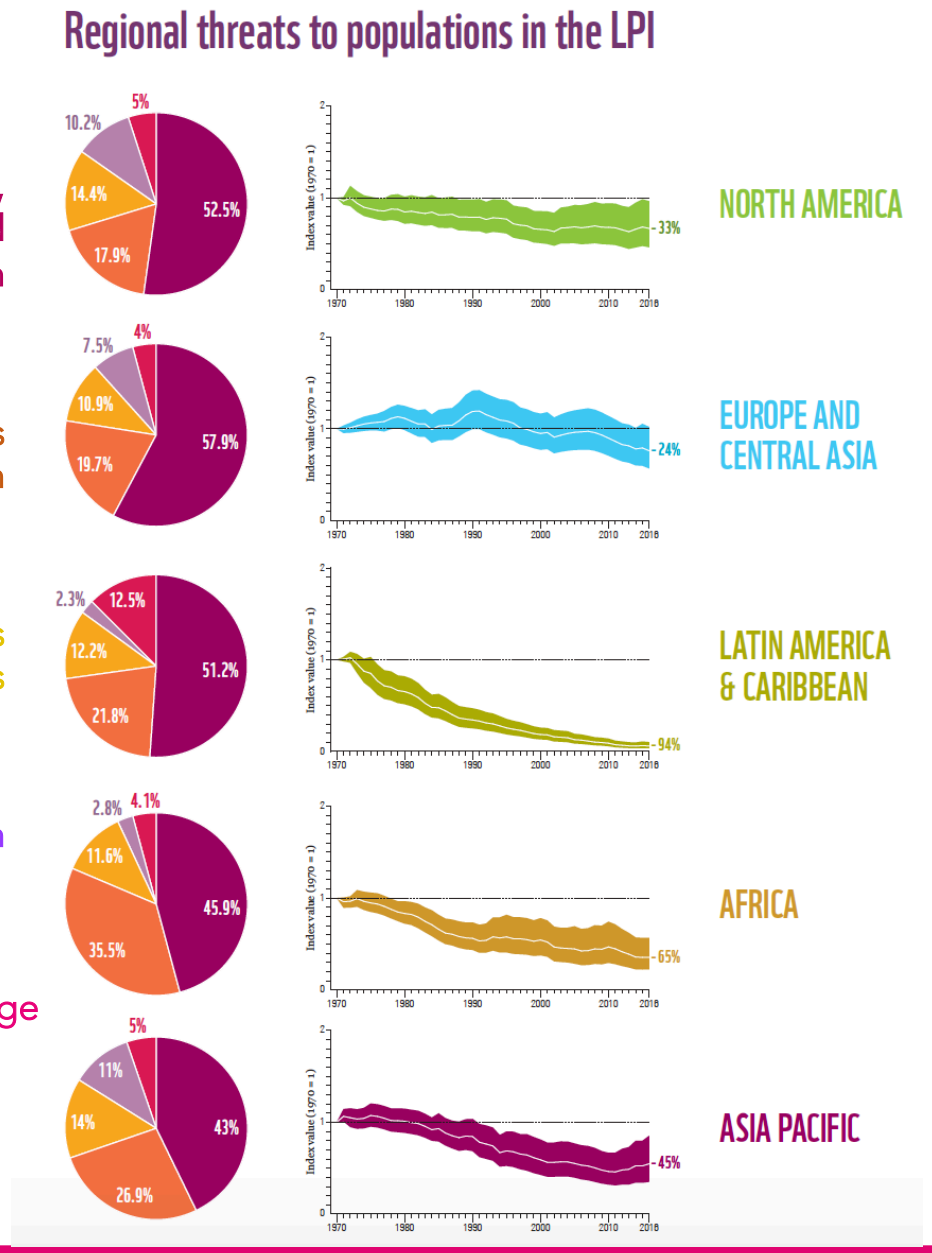
Perda de biodiversidade

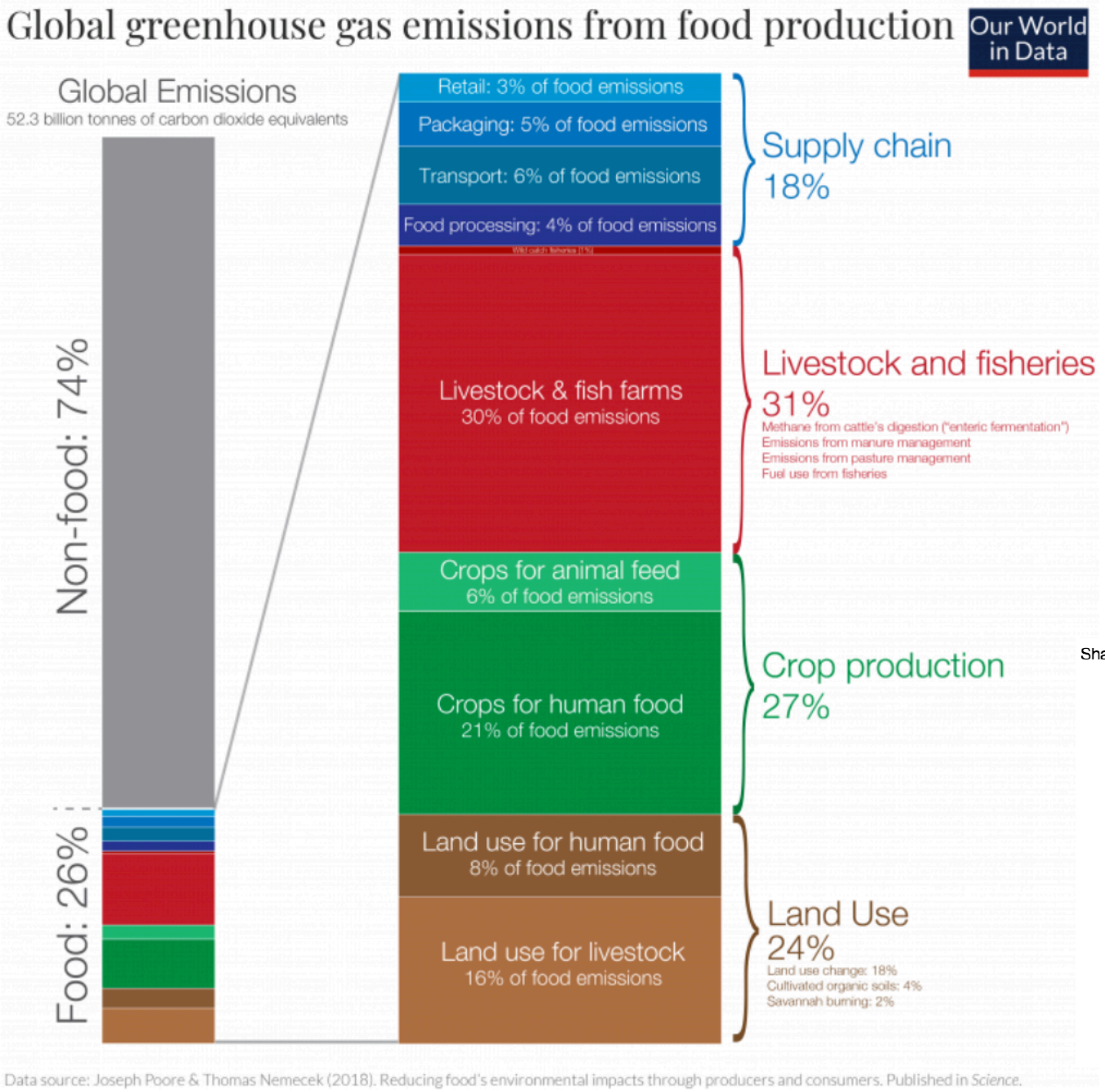
LIVING PLANET REPORT 2020

THIS REPORT HAS BEEN PRODUCED IN COLLABORATION WITH: WWF ZSL LET'S WORK FOR WILDLIFE

Between 1970 and 2016:

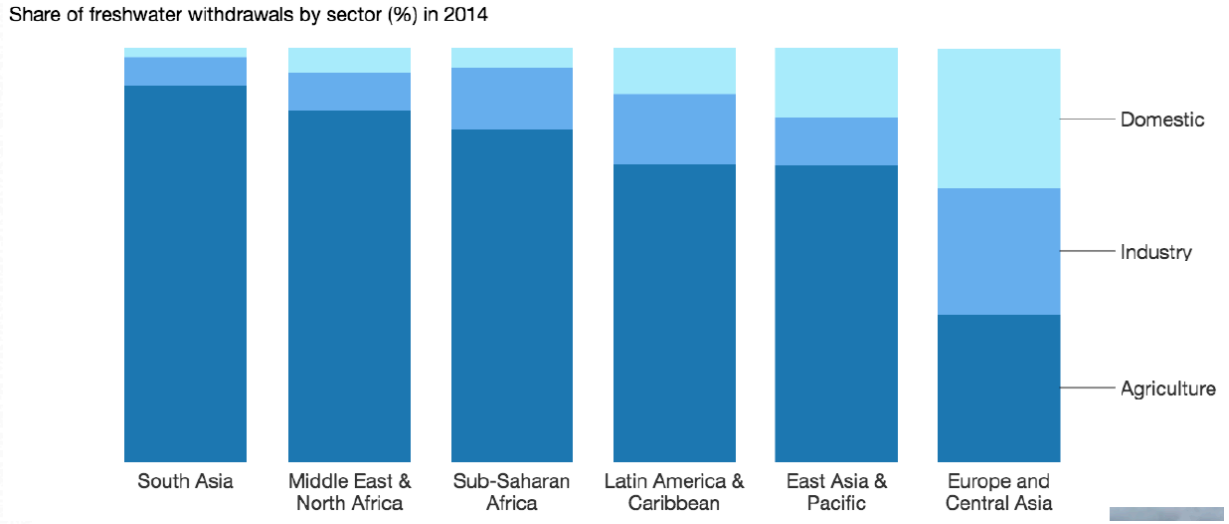
- 68% decline in the population of mammals, birds, amphibians, reptiles and fish
- 94% decline in Living Planet Index in tropical sub-regions of the Americas, the biggest drop observed anywhere in the world.





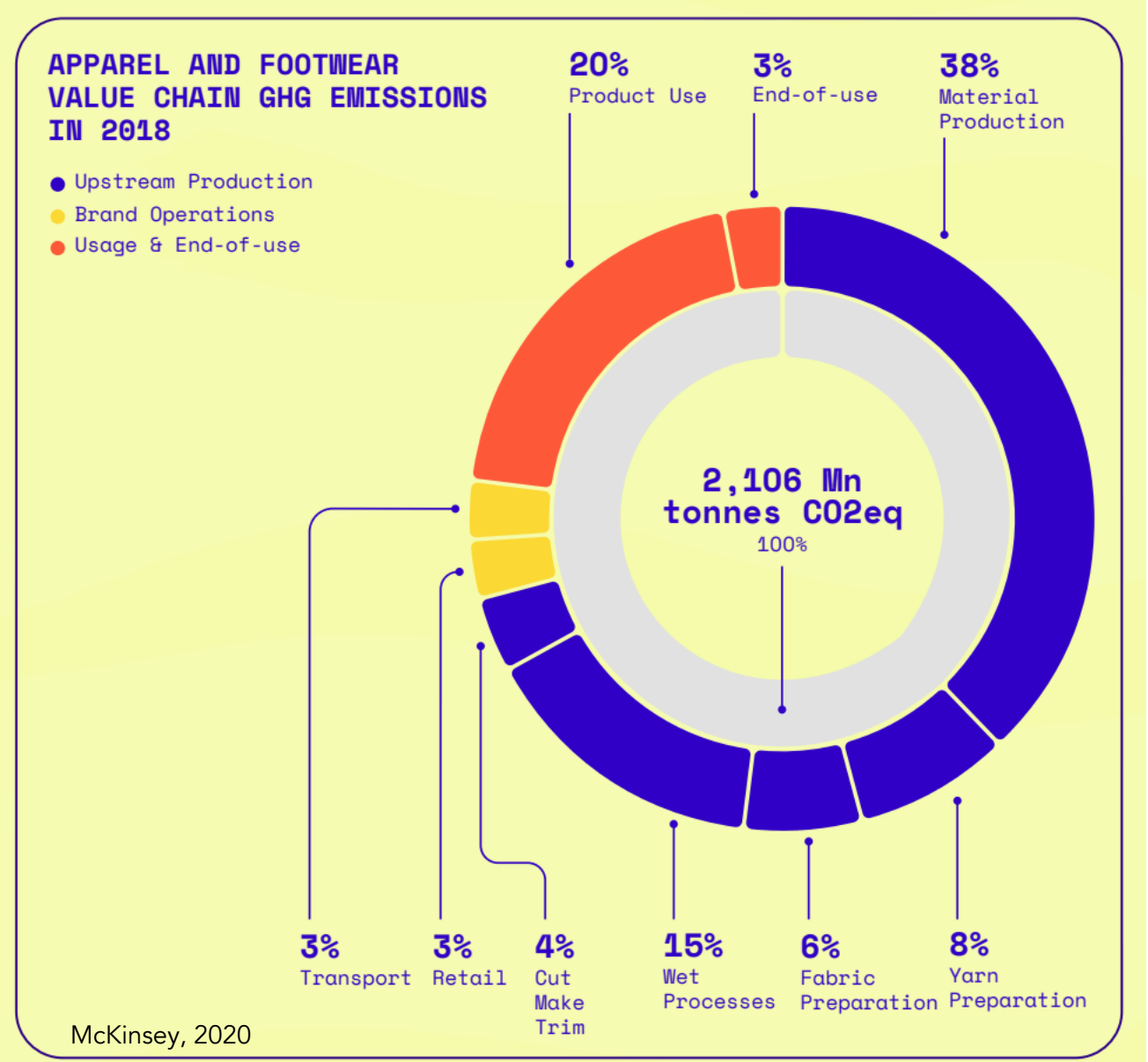
O sistema alimentar global é responsável por 26% das emissões globais de gases com efeito de estufa!

Globally, 70% of freshwtare is used in agriculutre



Fonte: World Bank, World Development indicators

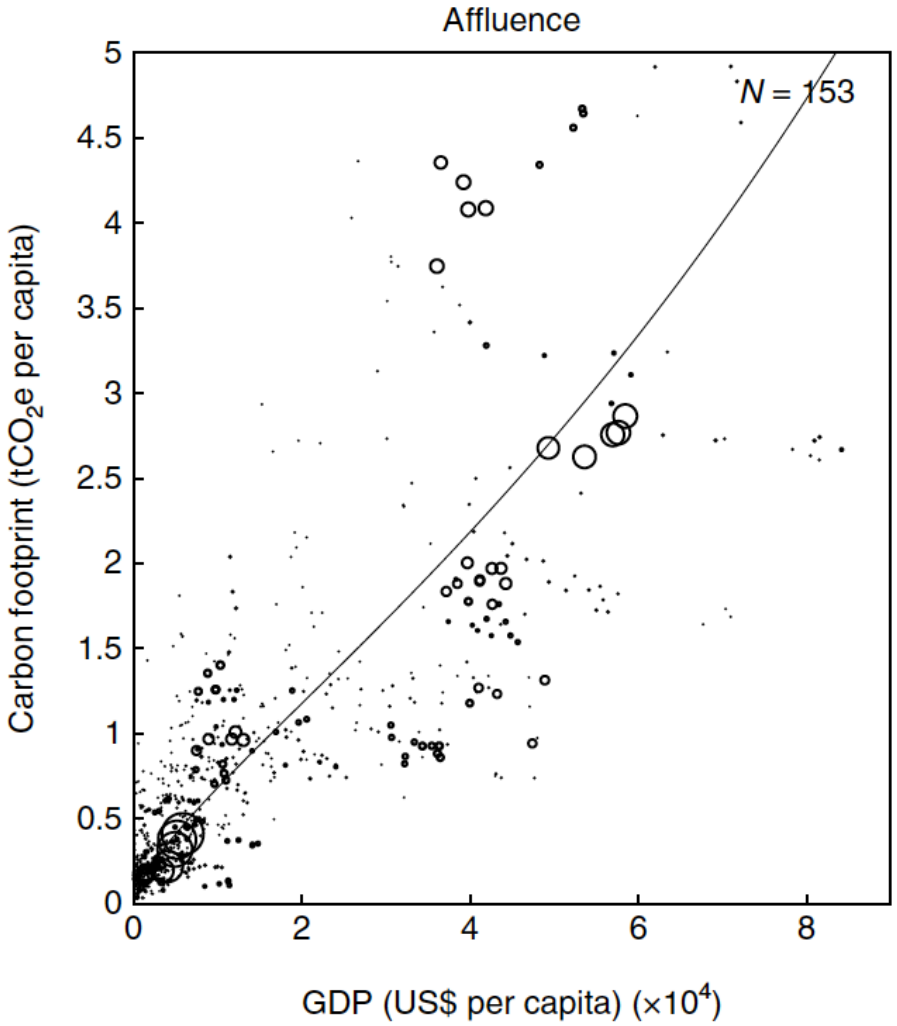
INDÚSTRIA TÊXTIL/MODA



O sistema têxtil/moda global é responsável por 4% das emissões globais de gases com efeito de estufa!

"60% OF THE ACCELERATED ABATEMENT POTENTIAL LIES IN DECARBONISING UPSTREAM OPERATIONS,
20% LIES IN BRANDS' OWN OPERATIONS, AND
20% RELIES ON ENCOURAGING SUSTAINABLE CONSUMER BEHAVIOURS"

"BY 2030, WE NEED TO LIVE IN A WORLD IN WHICH 1 IN 5 GARMENTS ARE TRADED THROUGH CIRCULAR BUSINESS MODELS."



Affluence as driver of the carbon footprint of global tourism for the RBA (Residence-based Accounting) perspective (Lenzen et al., 2018)

O turismo global é responsável por 8% das emissões globais de gases com efeito de estufa!

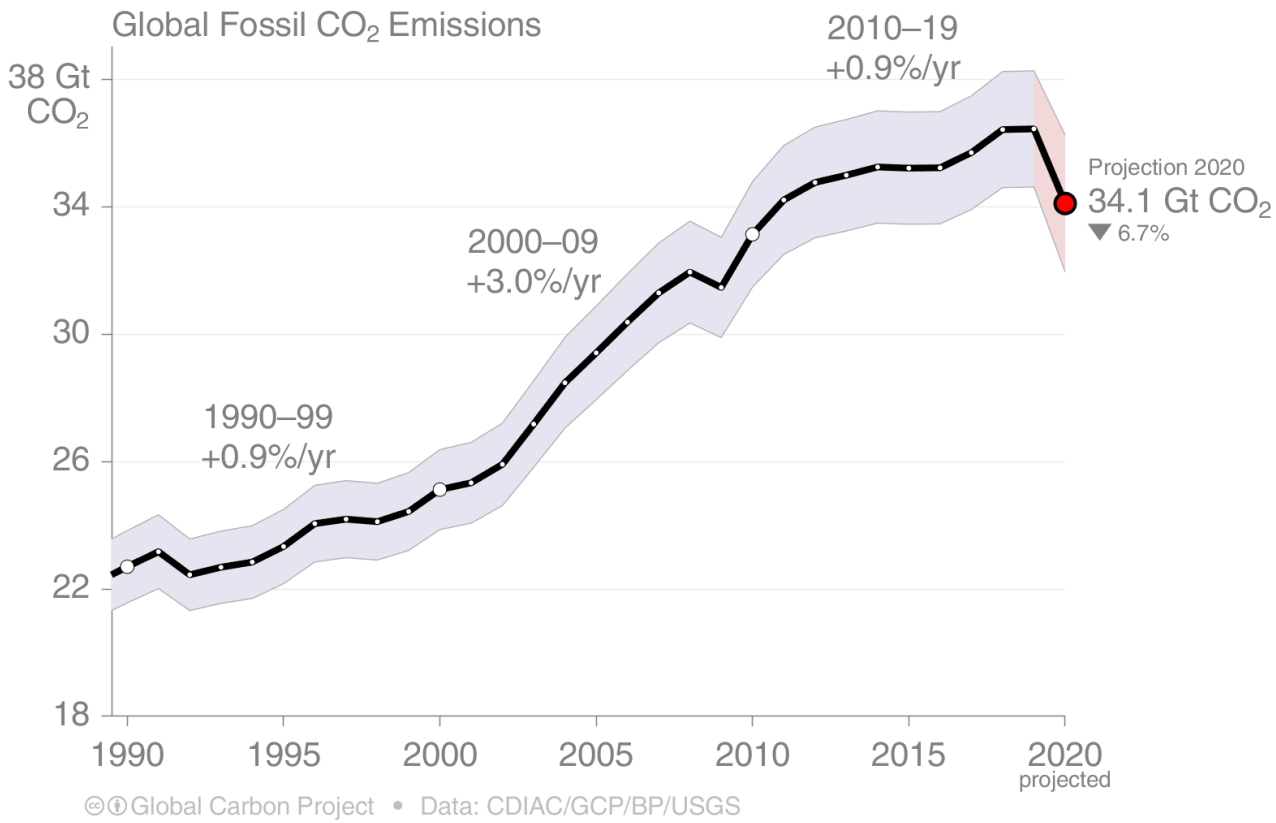
Aviation (40%), transportation (30%) and the consumption of goods and services (30%) including food and accommodation.

Lenzen et al., 2018, The carbon footprint of global tourism. *Nature*.

At affluence levels beyond US$40,000 per capita the GDP relationship becomes so strong that a 10% increase in wealth brings about a carbon footprint increase of up to 13%!

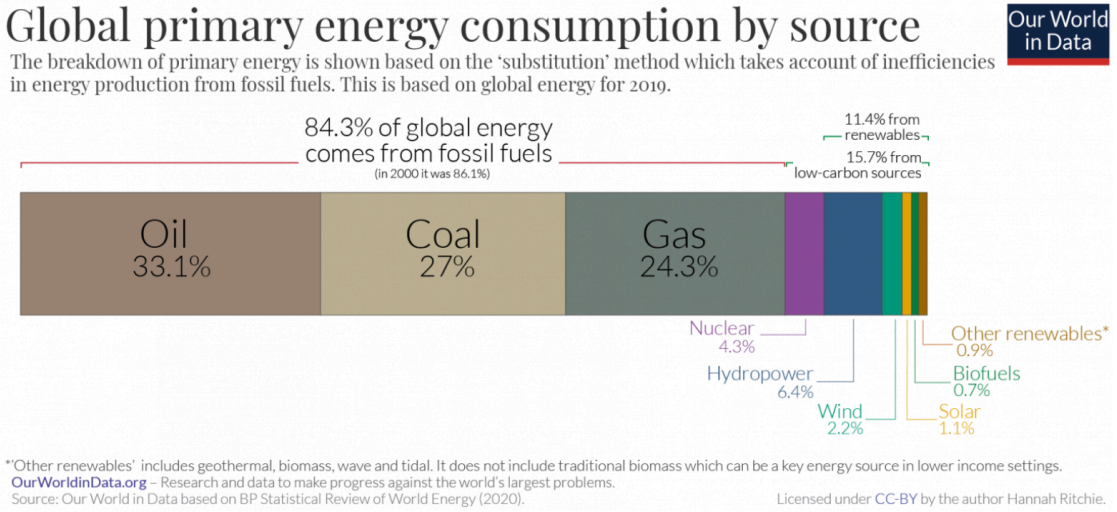
SISTEMA ENERGÉTICO MUNDIAL

Global Fossil CO_2 Emissions 2019 **+61%/1990**



GLOBAL CARBON PROJECT

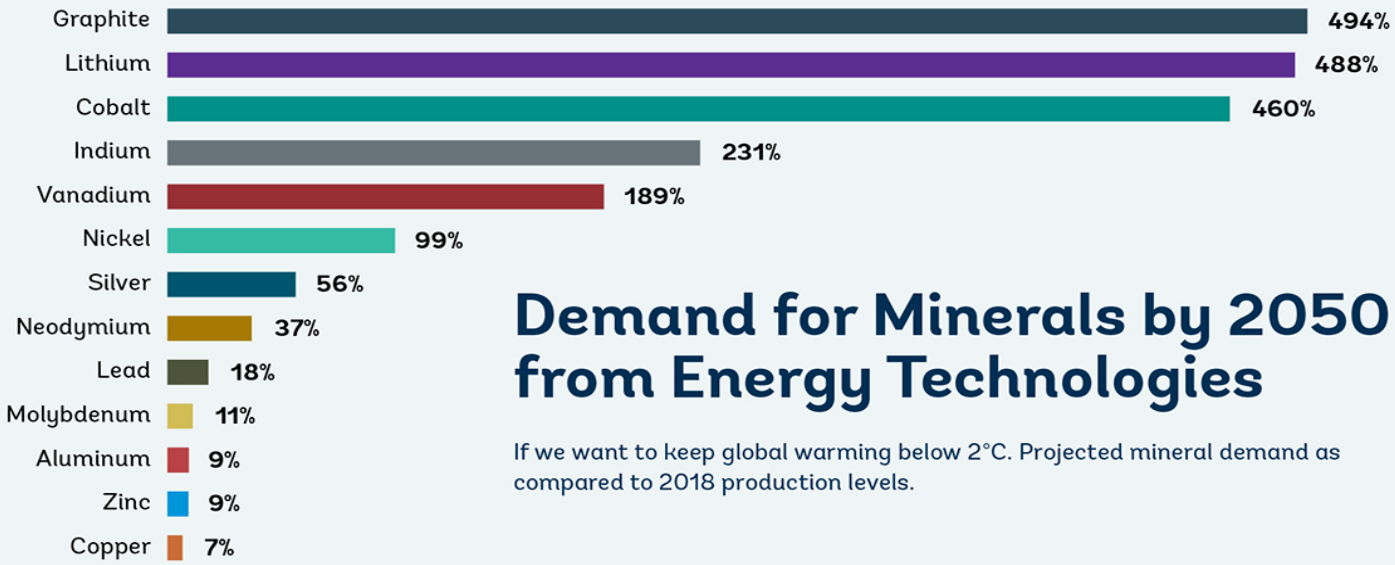
O sistema energético global é responsável por 8% das emissões globais de gases com efeito de estufa!



Uso do solo /fragmentação ecossistemas

Iberdrola has commissioned the largest PV plant in Europe – the 500 MW Núñez de Balboa project (Badajoz)

Uso do solo /fragmentação ecossistemas



Prioridade à reciclagem/recuperação de materiais (modelos tecnológicos e económicos de economia circular), com elevado valor acrescentado.

Intervenção em toda a cadeia de valor, desde o design até ao *end-of-life* dos produtos!

Economic projections indicate that by 2025, 45% of the world's appetite for lithium will be fed by water-intensive mining operations adjacent to fragile eco-hydrological systems in the Atacama—the world's driest desert and one of the busiest mining districts on the planet.

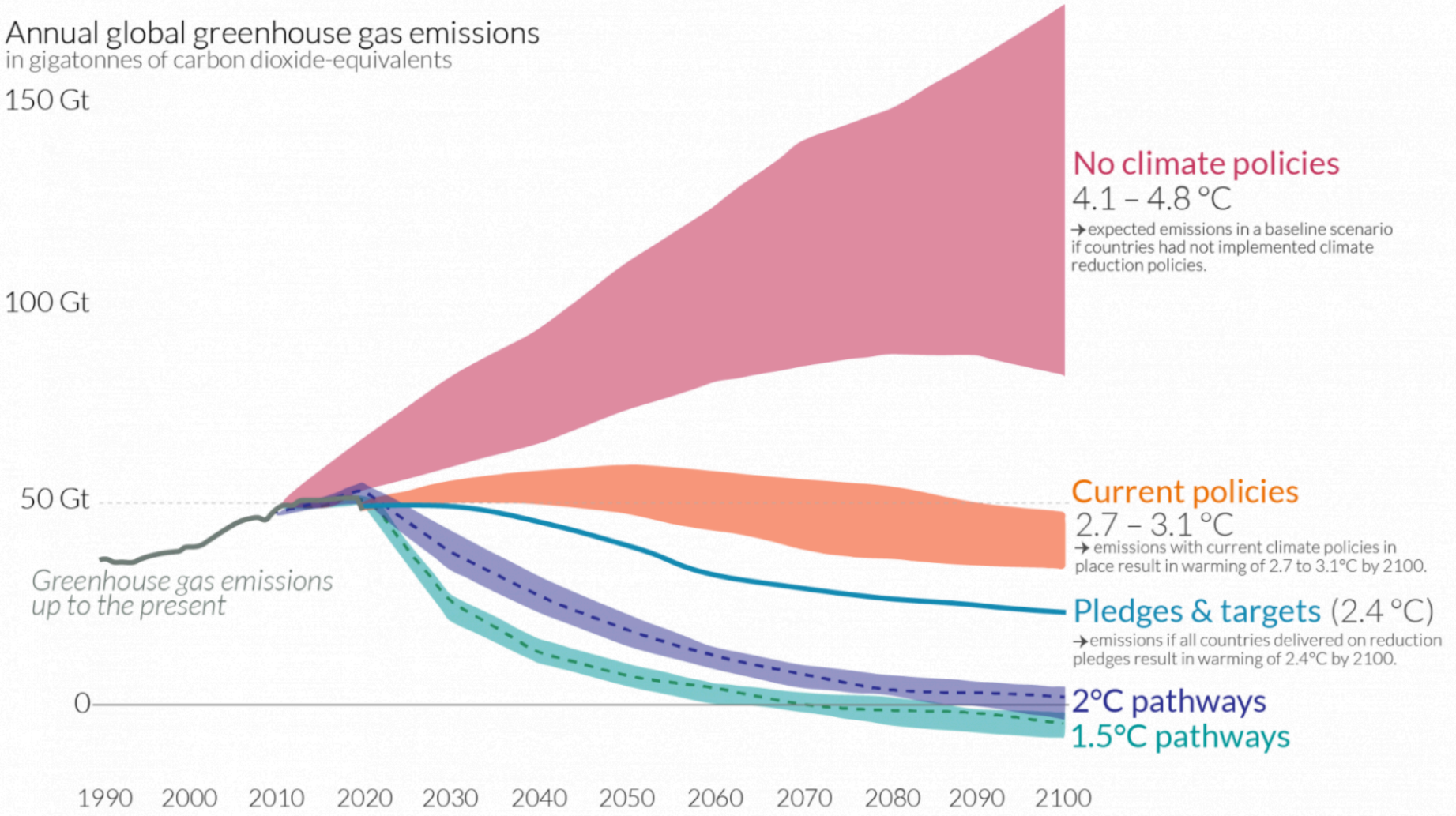
Salar de Atacama Basin:
infrequent rains and highest solar radiation in the planet => high-quality lithium at a low cost
Lithium-rich brines are being unsustainably pumped from underneath the salty plains.

Fragile wetlands and lagoons are drying, protected Andean flamingo populations are declining, and drinking water sources that have sustained local communities for millennia are dwindling.

Global greenhouse gas emissions and warming scenarios

– Each pathway comes with uncertainty, marked by the shading from low to high emissions under each scenario.
– Warming refers to the expected global temperature rise by 2100, relative to pre-industrial temperatures.

Our World in Data



Data source: Climate Action Tracker (based on national policies and pledges as of May 2021).
OurWorldinData.org – Research and data to make progress against the world's largest problems.

Last updated: July 2021.
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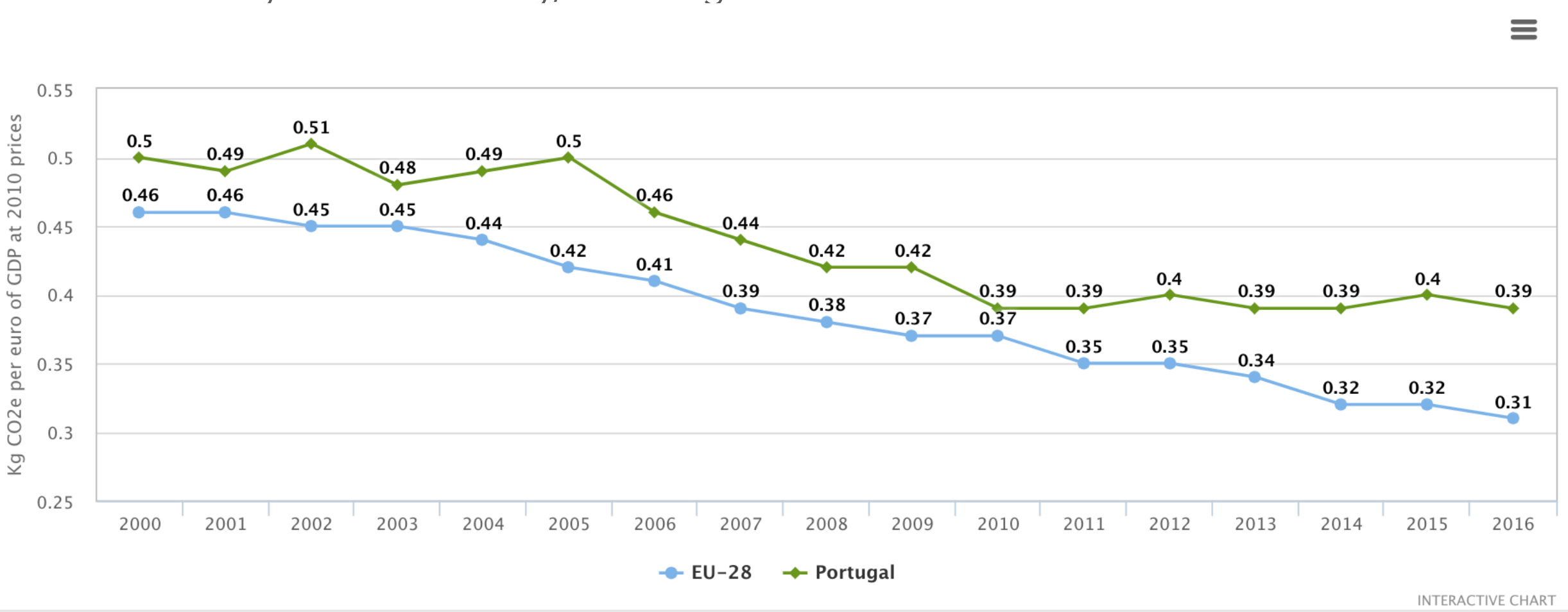
Carbon intensity of the economy, in Portugal and in the EU-28



Source: Eurostat, 2019

Transição climática

Evolução das emissões setoriais para a neutralidade carbónica

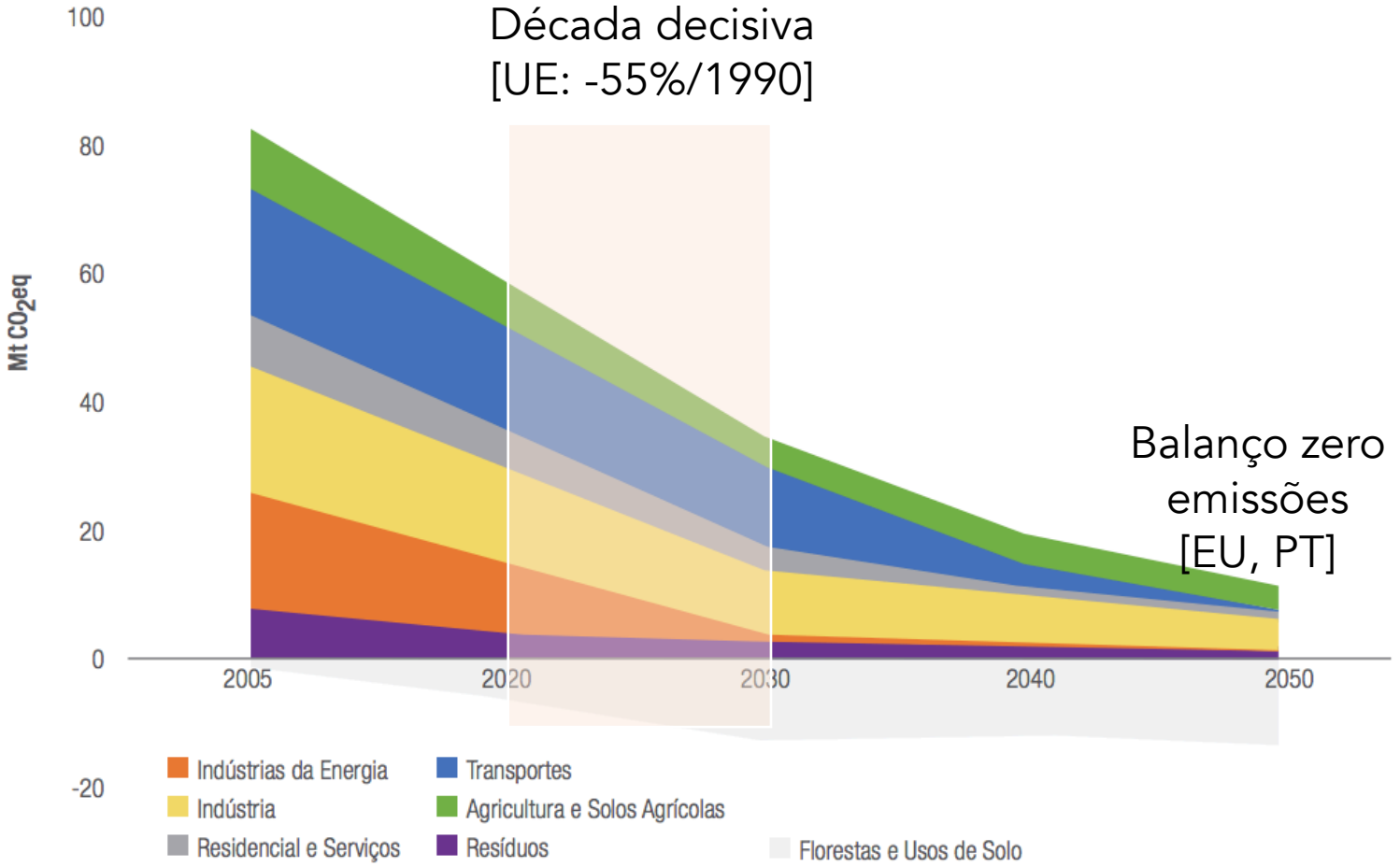


FIGURA 4

Contribuição setorial para a trajetória de redução de emissões de GEE até 2050

Lei Climática Europeia

In addition to the **2050 climate neutrality target**, the deal strengthens the European framework for climate action by introducing the following elements:

- an ambitious **2030 climate target of at least 55% reduction of net emissions as compared to 1990**, with clarity on the contribution of emission reductions and removals;
- recognition of the need to **enhance the EU's carbon sink** through a more ambitious LULUCF regulation, for which the Commission will make proposals in June 2021;
- a process for **setting a 2040 climate target**, taking into account an indicative greenhouse gas budget for 2030-2050 to be published by the Commission;
- a **commitment to negative emissions after 2050**;
- the establishment of **European Scientific Advisory Board** on Climate Change, that will provide independent scientific advice;
- stronger provisions on **adaptation** to climate change;
- strong **coherence across Union policies with the climate neutrality objective**;
- a commitment to engage with sectors to prepare **sector-specific roadmaps** charting the path to climate neutrality in different areas of the economy.

Engenharia e alterações climáticas?

- Agronómica
- Ambiente
- Civil
- Eletrotécnica
- Florestal
- Geográfica
- Geológica e de Minas
- Informática
- Materiais
- Mecânica
- Naval
- Química e Biológica

Transformação da economia a tempo!

Curto-prazo

Profissionais no mercado !

Preparar lideranças para a transformação

Competências e qualificações

- análise sistémica (upstream, downstream)
- interdisciplinaridade

Capacidade para inovar — ecossistema nacional de inovação

Muitos recursos financeiros disponíveis (PRR)

Engenharia e alterações climáticas?

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Transformação da economia a tempo!

Médio, longo-prazo !

Ensino da engenharia

Literacia sobre sustentabilidade

Pensamento sistémico e ferramentas de análise sistémica

- materiais e recursos
- cadeias de abastecimento
- novos modelos de produção (*from design to the end of life*)
- uso e recuperação

Inovação climática

Como a engenharia pode impactar e combater as alterações climáticas?

GERADORA DE EMISSÕES DE GASES COM EFEITO DE ESTUFA

PROMOTORA DE SOLUÇÕES COM ELEVADA PEGADA ECOLÓGICA (MATERIAIS E RECURSOS)

PROMOTORA DA FRAGMENTAÇÃO ECOSSISTEMAS

IMPEDITIVA DA REGENERAÇÃO DOS ECOSSISTEMAS

PROMOTORA DE UM IMPACTO NEUTRO NAS EMISSÕES DE GASES COM EFEITO DE ESTUFA EM TODAS OS PROCESSOS DE ENGENHARIA

INCENTIVAR UMA ABORDAGEM SISTÉMICA AO PROBLEMA DA ENGENHARIA (I.E. INCLUIR TODO O CICLO DE VIDA E CADEIAS DE FORNECIMENTOS)

ADOTAR PERSPETIVA DE LONGO PRAZO NO DESENHO E IMPLEMENTAÇÃO DE SOLUÇÕES EVITANDO POTENCIAIS EFEITOS COLATERAIS FUTUROS

PROMOTORA DE SOLUÇÕES QUE CONDUZAM À REGENERAÇÃO DO CAPITAL NATURAL

PROMOTORA DA RESILIÊNCIA CLIMÁTICA DAS ESTRUTURAS SOCIAIS E ECONÓMICAS

Madagascar is headed toward a climate change-linked famine it did not create

Children attempt to plow a plantation using cattle in Madagascar in May. (Viviane Rakotoarivony/United Nations Office for the Coordination of Humanitarian Affairs/Reuters)

OBRIGADO

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