

Desafios da Ação Climática no Século XXI

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Adaptation and Modelling & CHANGE - Global Change and
Sustainability Institute**

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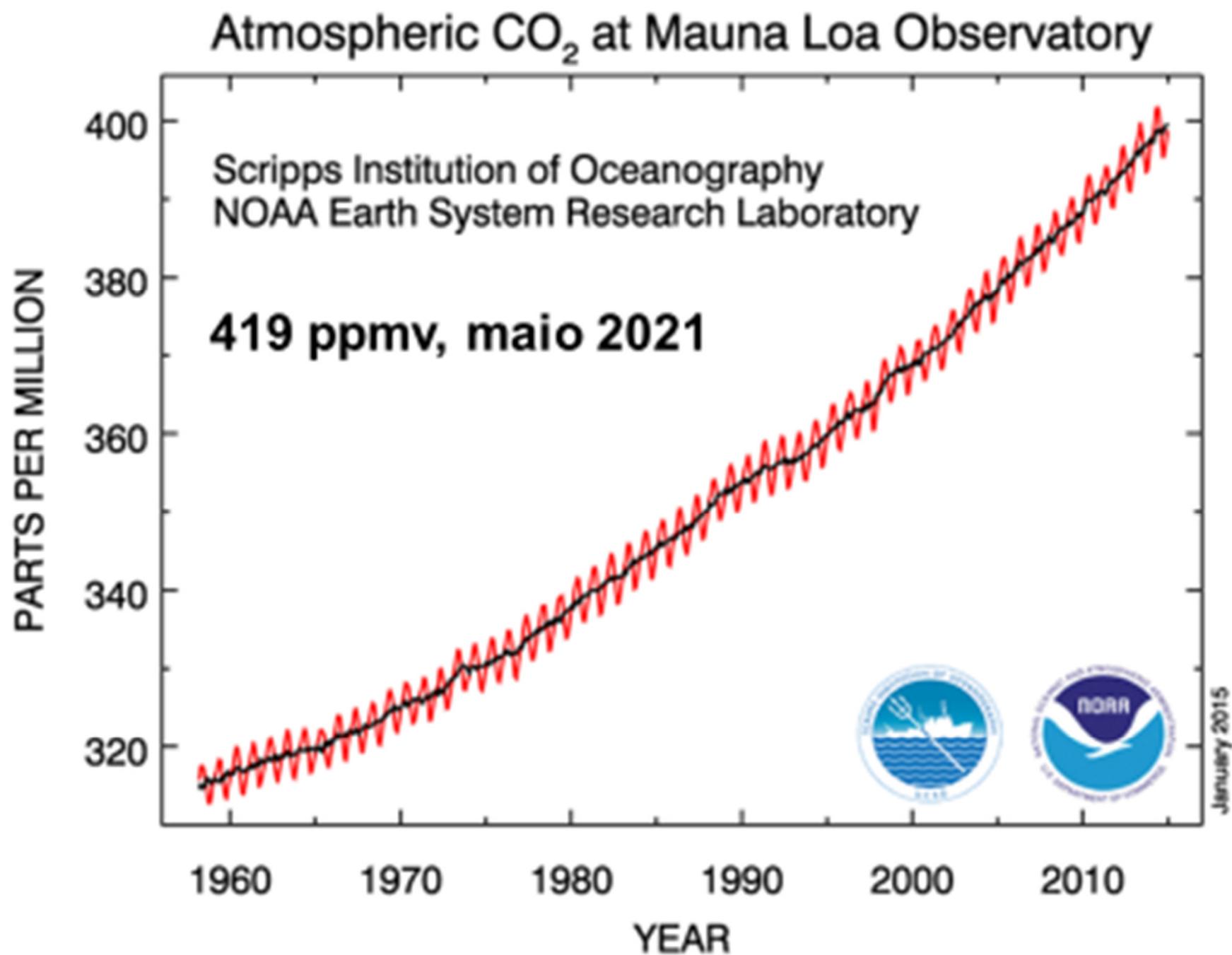
Conselho Nacional do Ambiente e do Desenvolvimento Sustentável

Reunião Plenária da Seção de Municípios para a Ação Climática

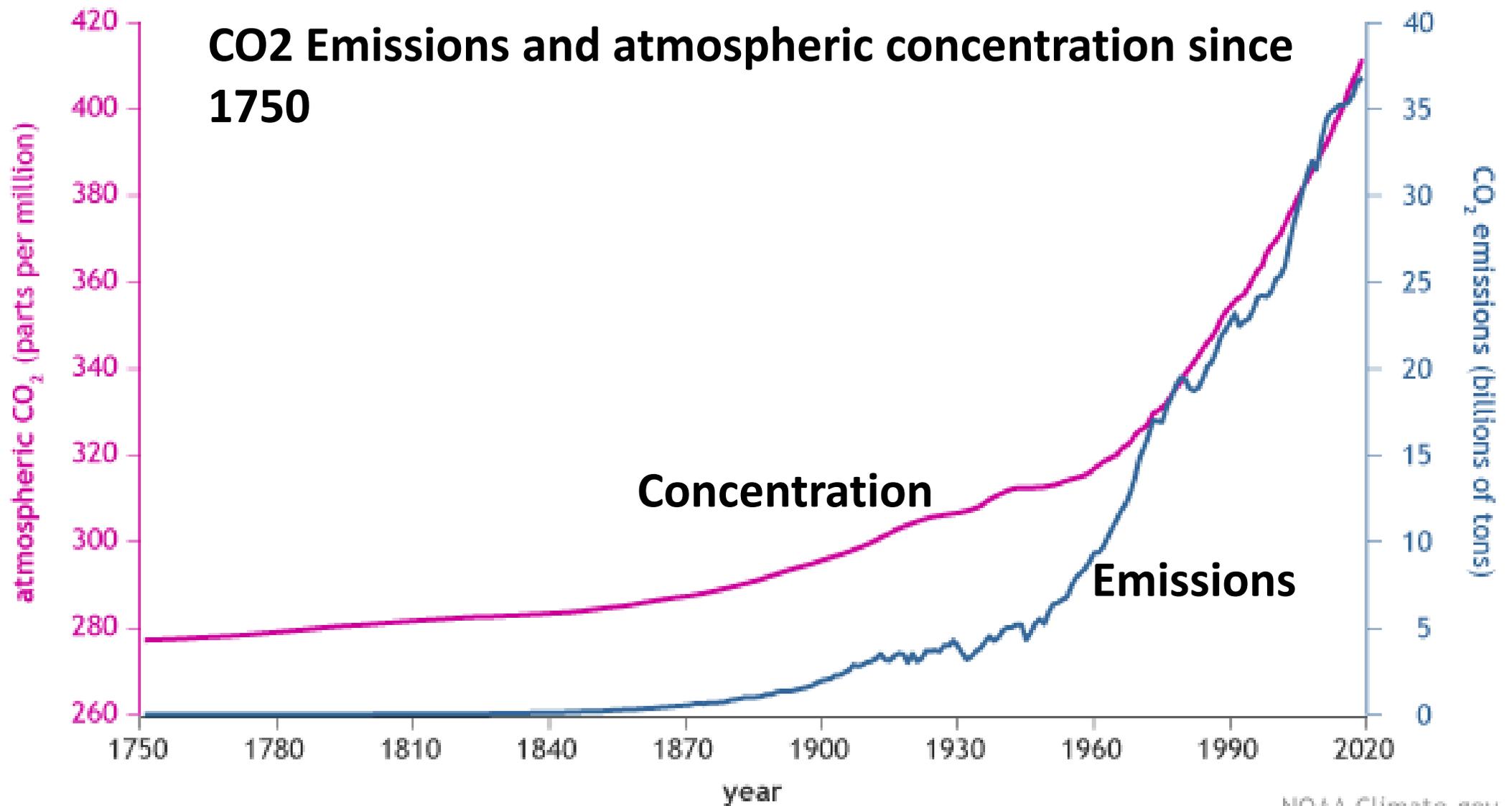
Associação Municipal dos Municípios Portugueses

Coimbra, 11 de julho de 2022

A concentração de dióxido de carbono na atmosfera aumentou 49,6% desde o início da Revolução Industrial



CO₂ in the atmosphere and annual emissions (1750-2019)



NOAA Climate.gov
Data: NOAA, ETHZ, Our World in Data

Methane (CH₄)

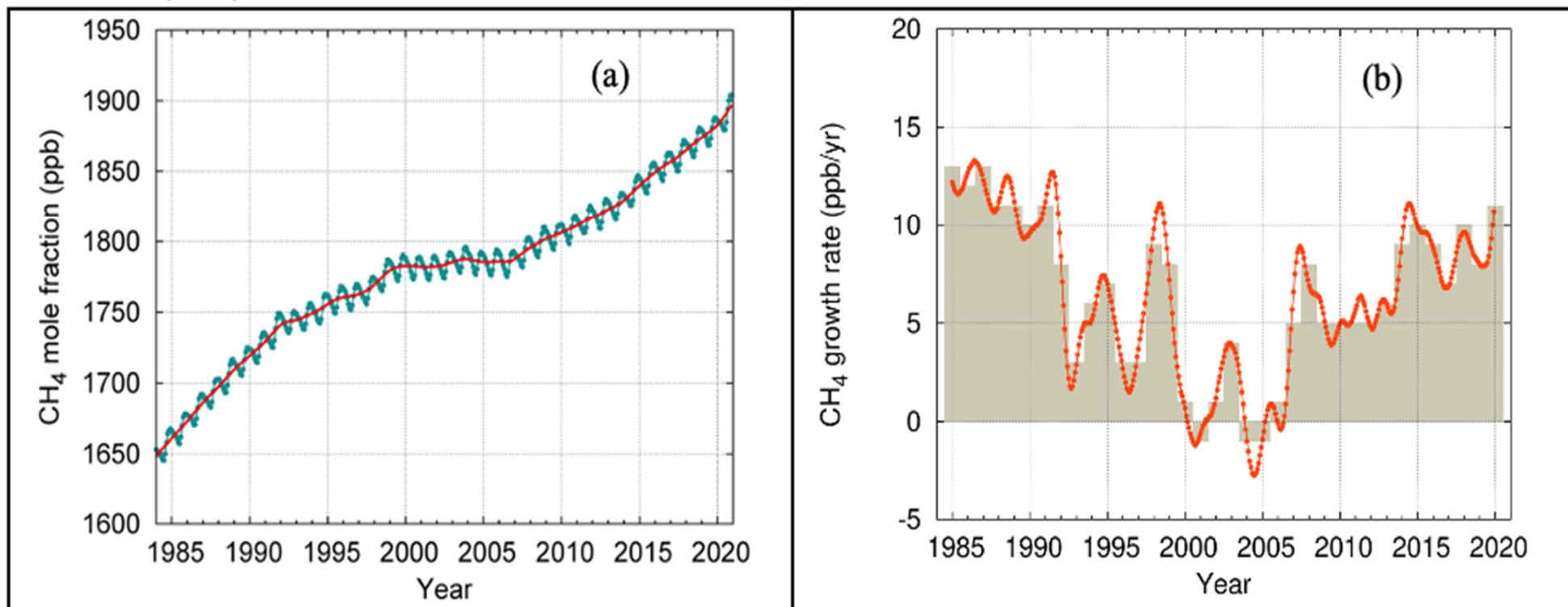


Figure 5. Globally averaged CH₄ mole fraction (a) and its growth rate (b) from 1984 to 2020. Increases in successive annual means are shown as the shaded columns in (b). The red line in (a) is the monthly mean with the seasonal variation removed; the blue dots and blue line in (a) depict the monthly averages. Observations from 138 stations were used for this analysis.

Source: Greenhouse Gas Bulletin: Another Year Another Record, 25 October 2021

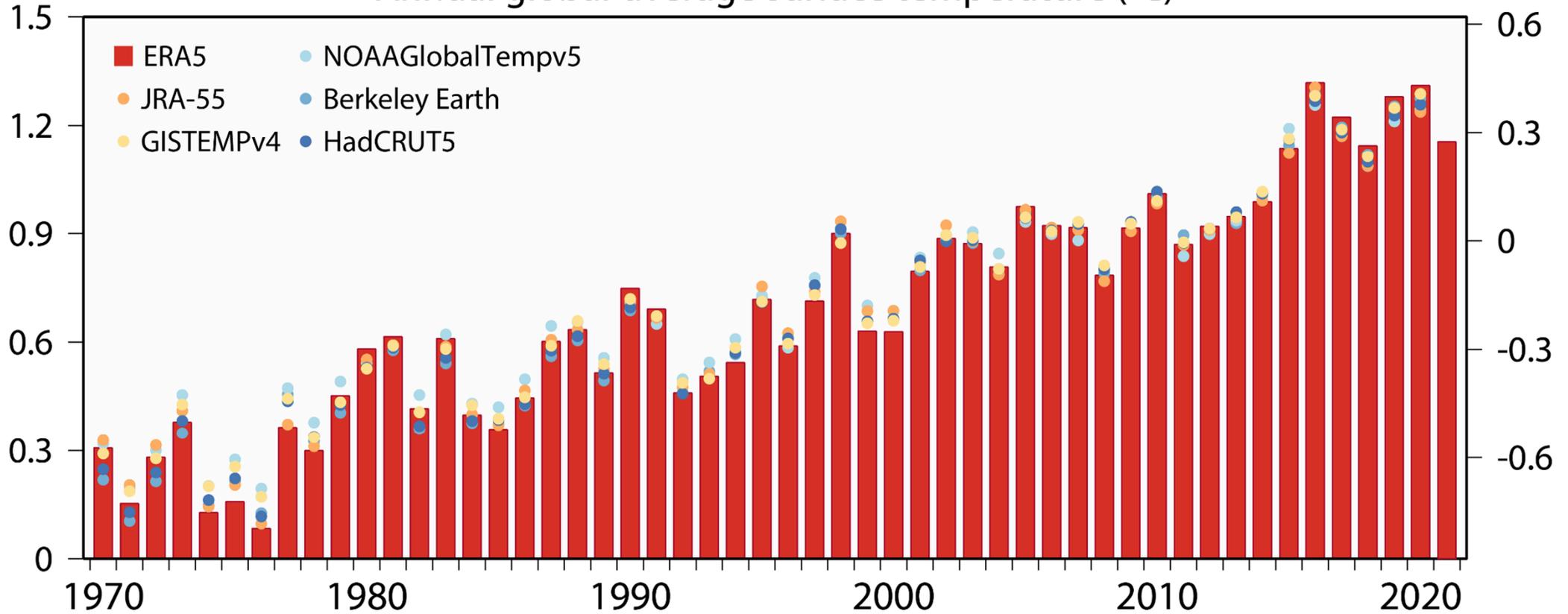
Table 1. Global annual surface mean abundances (2020) and trends of key greenhouse gases from the GAW in-situ observational network for GHG. Units are dry-air mole fractions, and uncertainties are 68% confidence limits. The averaging method is described in GAW Report No. 184 [9].

	CO ₂	CH ₄	N ₂ O
2020 global mean abundance	413.2±0.2 ppm	1889±2 ppb	333.2±0.1 ppb
2020 abundance relative to 1750 ^a	149%	262%	123%
2019–20 absolute increase	2.5 ppm	11 ppb	1.2 ppb
2019–20 relative increase	0.61%	0.59%	0.36%
Mean annual absolute increase over the past 10 years	2.40 ppm yr ⁻¹	8.0 ppb yr ⁻¹	0.99 ppb yr ⁻¹

Increase above
1850-1900
reference level

Relative to
1991-2020

Annual global-average surface temperature (°C)



Fontes:

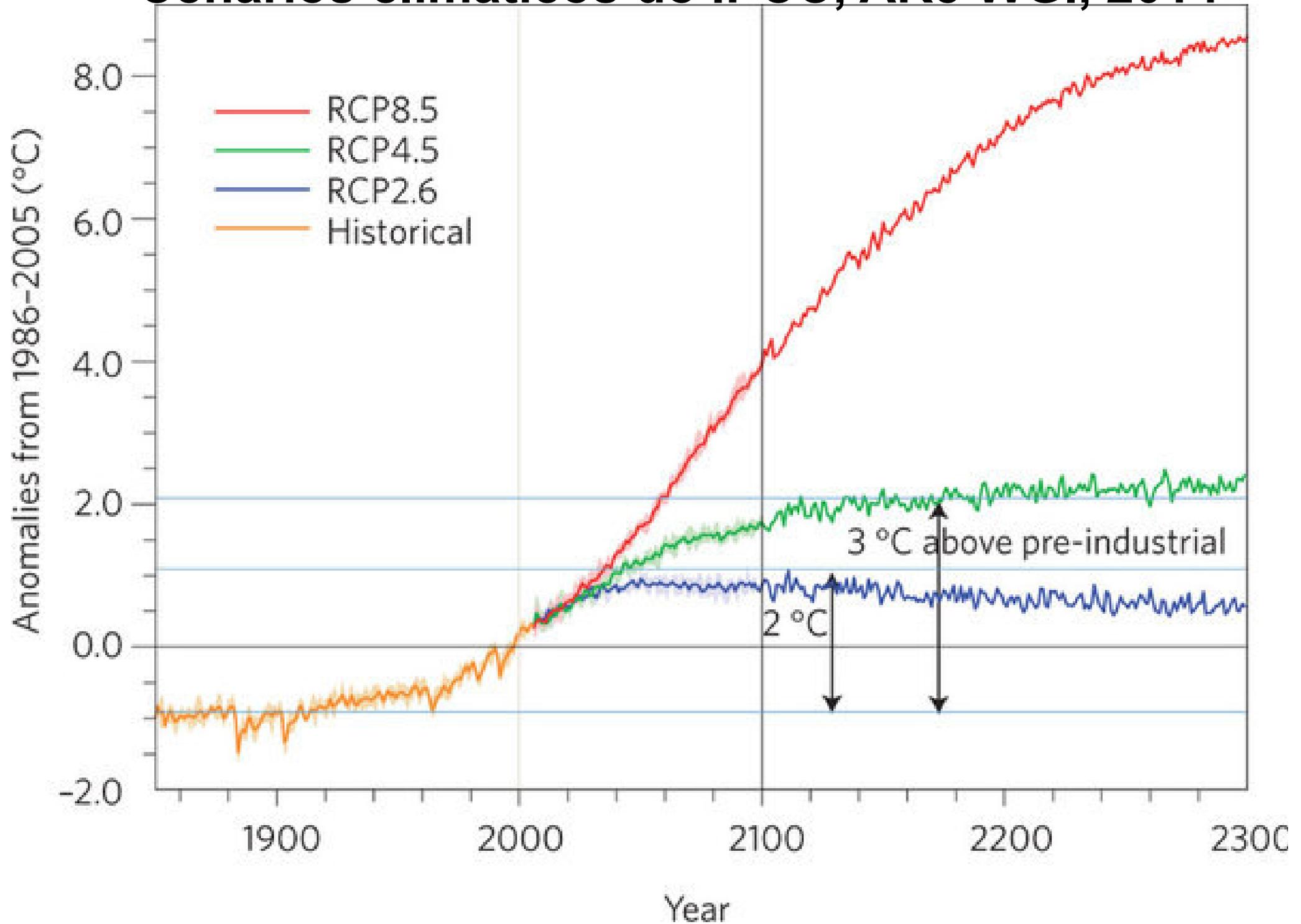


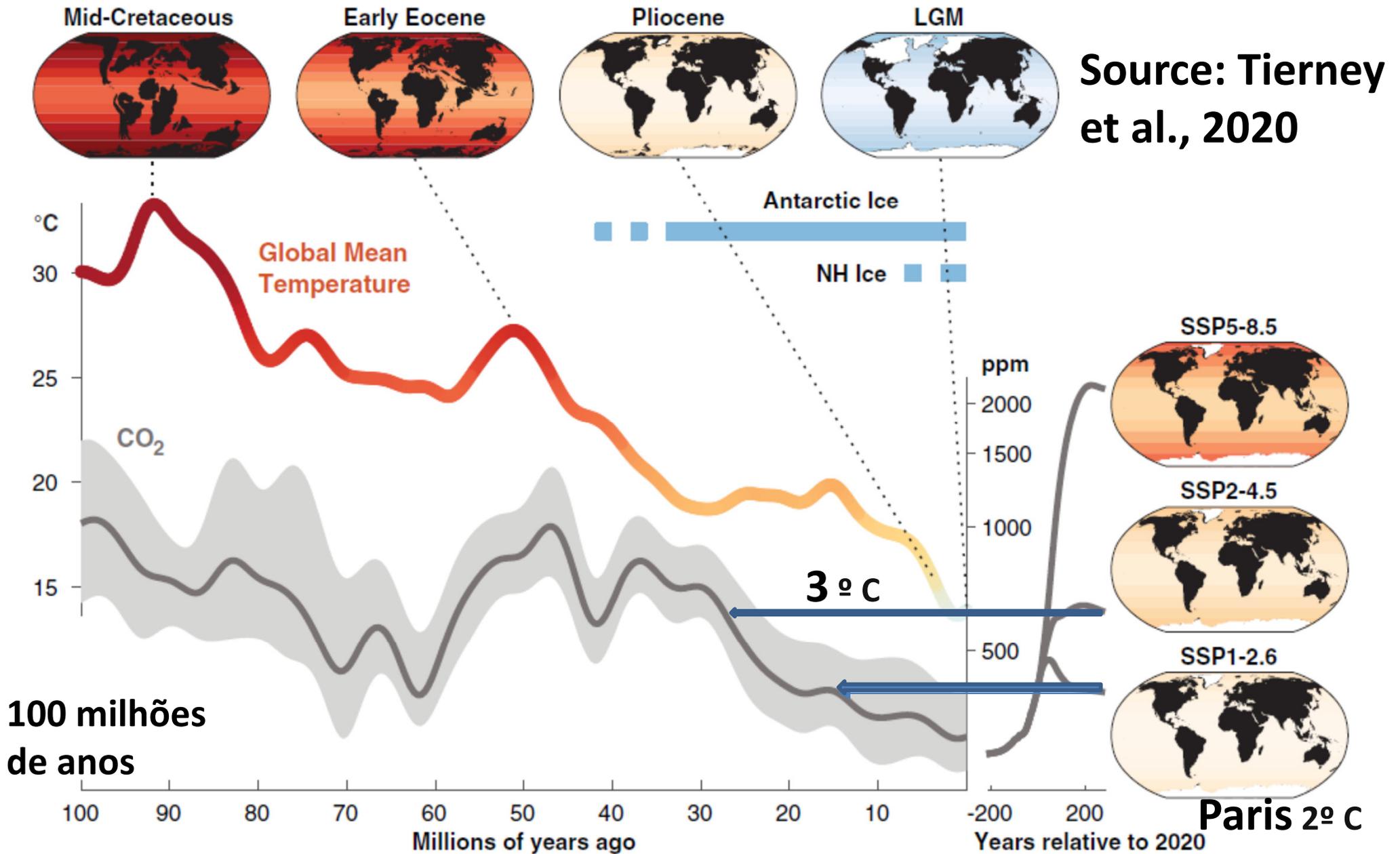
PROGRAMME OF
THE EUROPEAN UNION



Annual averages of global air temperature at a height of two metres estimated change since the pre-industrial period (left-hand axis) and relative to 1991-2020 (right-hand axis) according to different datasets: Red bars: ERA5 (ECMWF Copernicus Climate Change Service, C3S); Dots: GISTEMPv4 (NASA); HadCRUT5 (Met Office Hadley Centre); NOAA GlobalTempv5 (NOAA), JRA-55 (JMA); and Berkeley Earth. Credit: Copernicus Climate Change Service/ECMWF

Cenários climáticos do IPCC, AR5 WGI, 2014

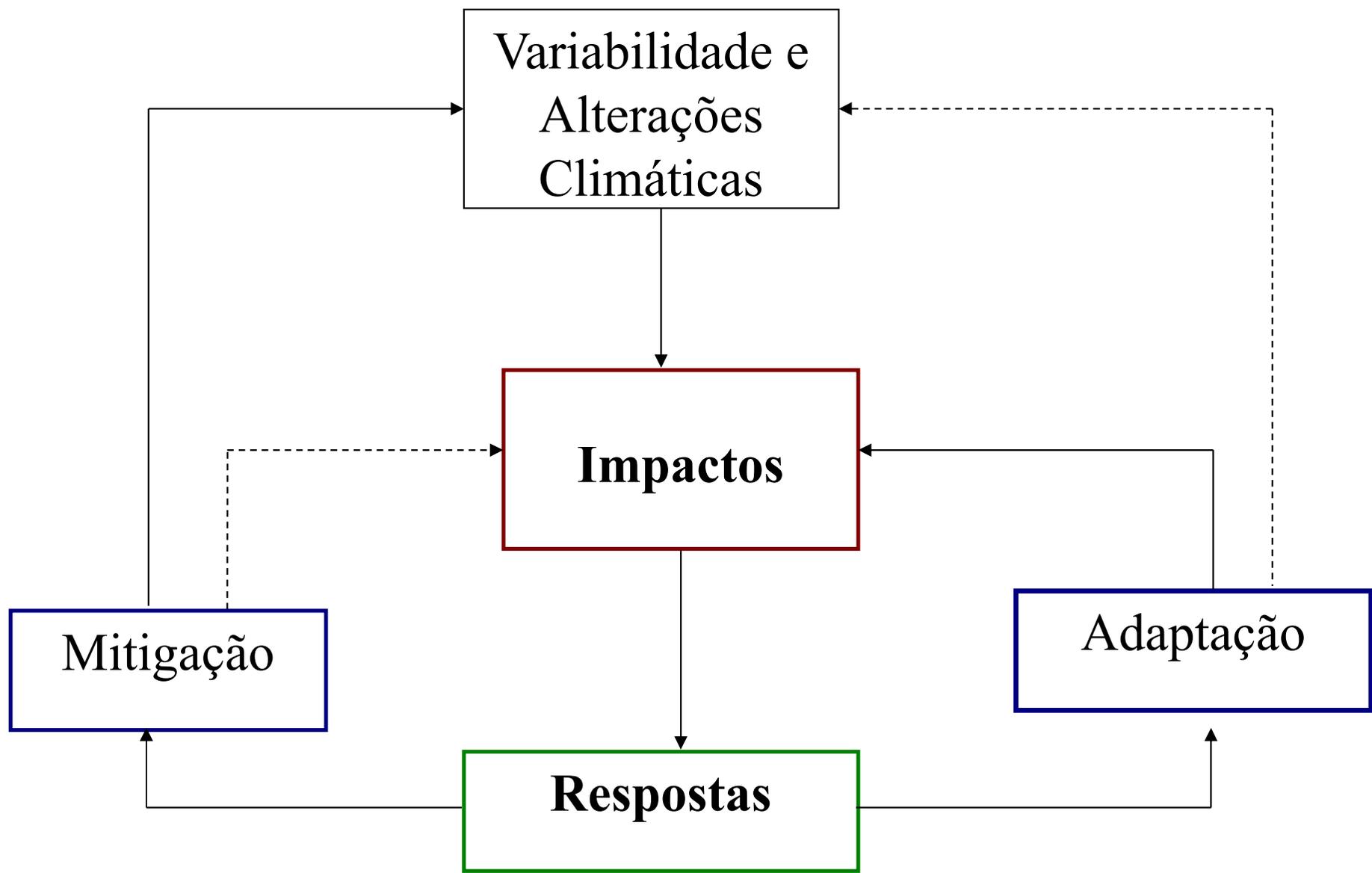




Source: Tierney et al., 2020

Fig. 1. Paleoclimate context for future climate scenarios. Global mean surface temperature for the past 100 million years is estimated from benthic $\delta^{18}\text{O}$ (2, 106) using the method of (104). CO_2 is estimated from the multiproxy dataset compiled by (105) with additional phytane data from (107) and boron data from (108) and (11). Data with unrealistic values (<150 ppm) are excluded. The CO_2 error envelopes represent 1σ uncertainties. Note the logarithmic scale for CO_2 . Gaussian smoothing was applied

to both the temperature and CO_2 curves to emphasize long-term trends. Temperature colors are scaled relative to preindustrial conditions. The maps show simplified representations of surface temperature. Projected CO_2 concentrations are from the extended SSP scenarios (109). Blue bars indicate when there are well-developed ice sheets (solid lines) and intermittent ice sheets (dashed lines), according to previous syntheses (2). NH, Northern Hemisphere.



————— Efeitos directos ou retroacção
..... Efeitos indirectos

PRR – 3 Dimensões estruturantes, 20 componentes:

. Dimensão Estruturante Resiliência

C1. Serviço Nacional de Saúde

C2. Habitação

C3. Respostas Sociais

C4. Cultura

C5. Capitalização e Inovação Empresarial

C6. Qualificação e Competências

C7. Infraestruturas

C8. Florestas

C9. Gestão Hídrica

. Dimensão Estruturante Ação Climática

C10. Mar

C11. Descarbonização da Indústria

C12. Bioeconomia Sustentável

C13. Eficiência Energética em Edifícios

C14. Hidrogénio e Renováveis

C15. Mobilidade sustentável

. Dimensão Estruturante Transição Digital

C16. Empresas 4.0

C17. Qualidade e Sustentabilidade das Finanças Públicas

C18. Justiça Económica e Ambiente de Negócios

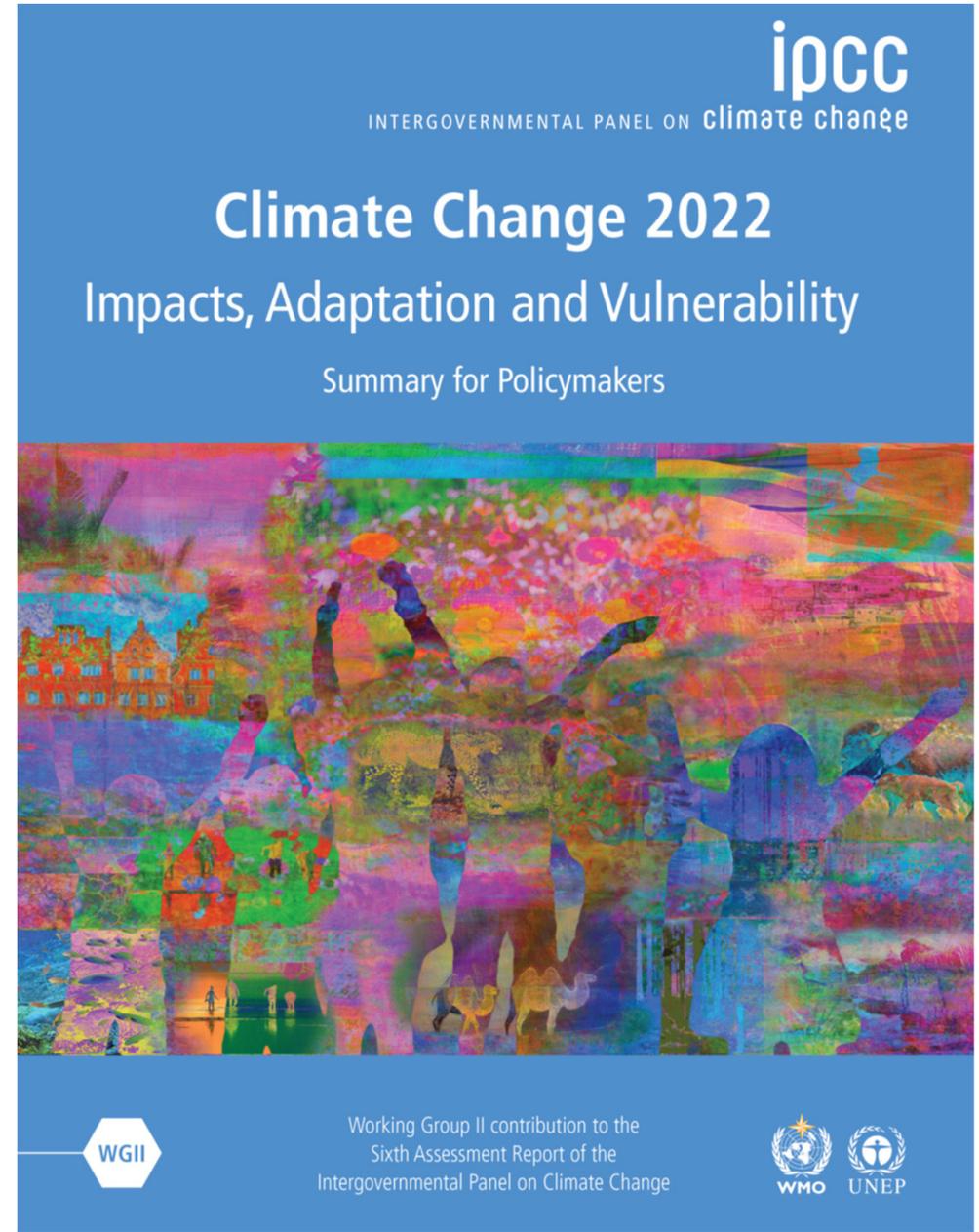
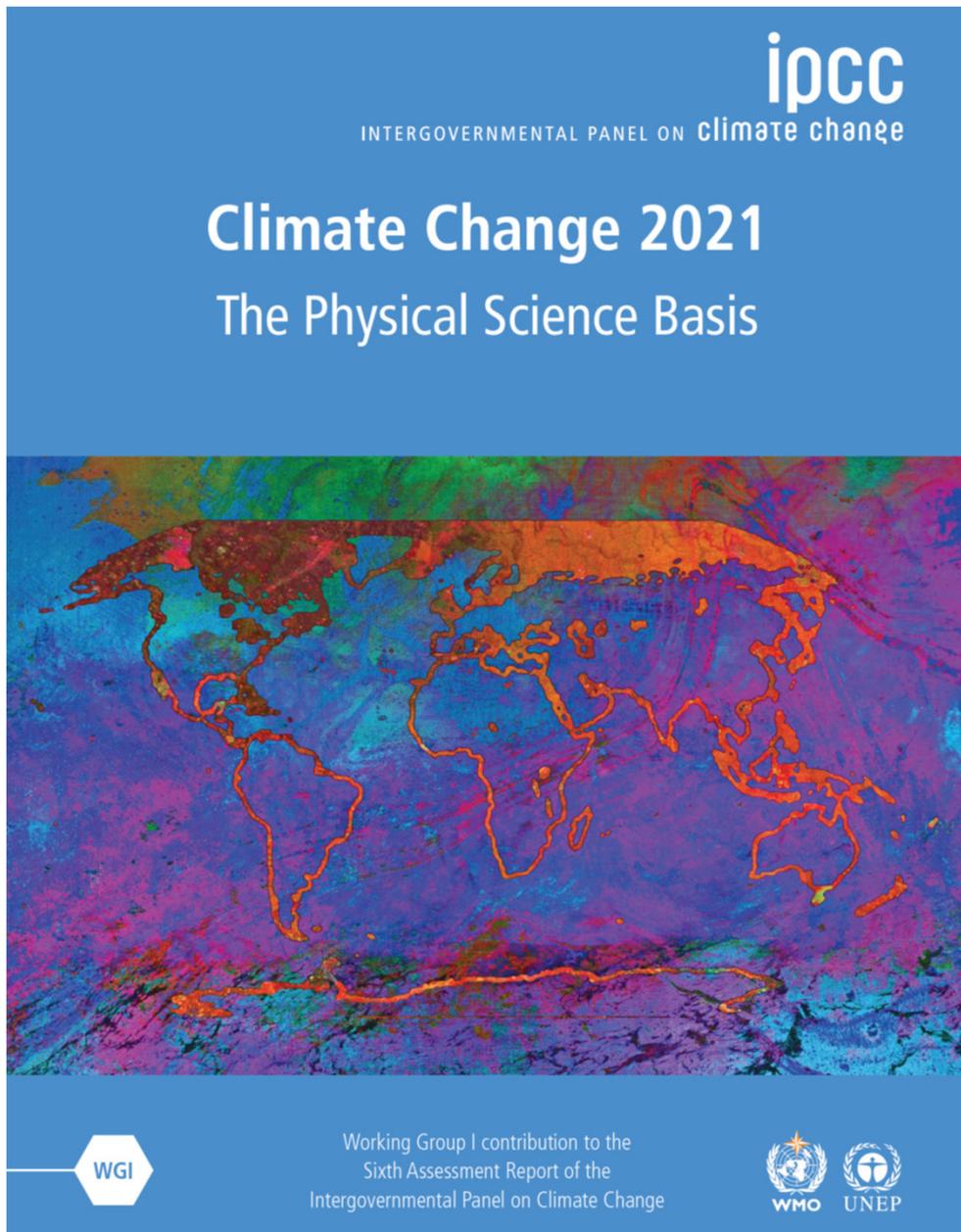
C19. Administração Pública mais Eficiente

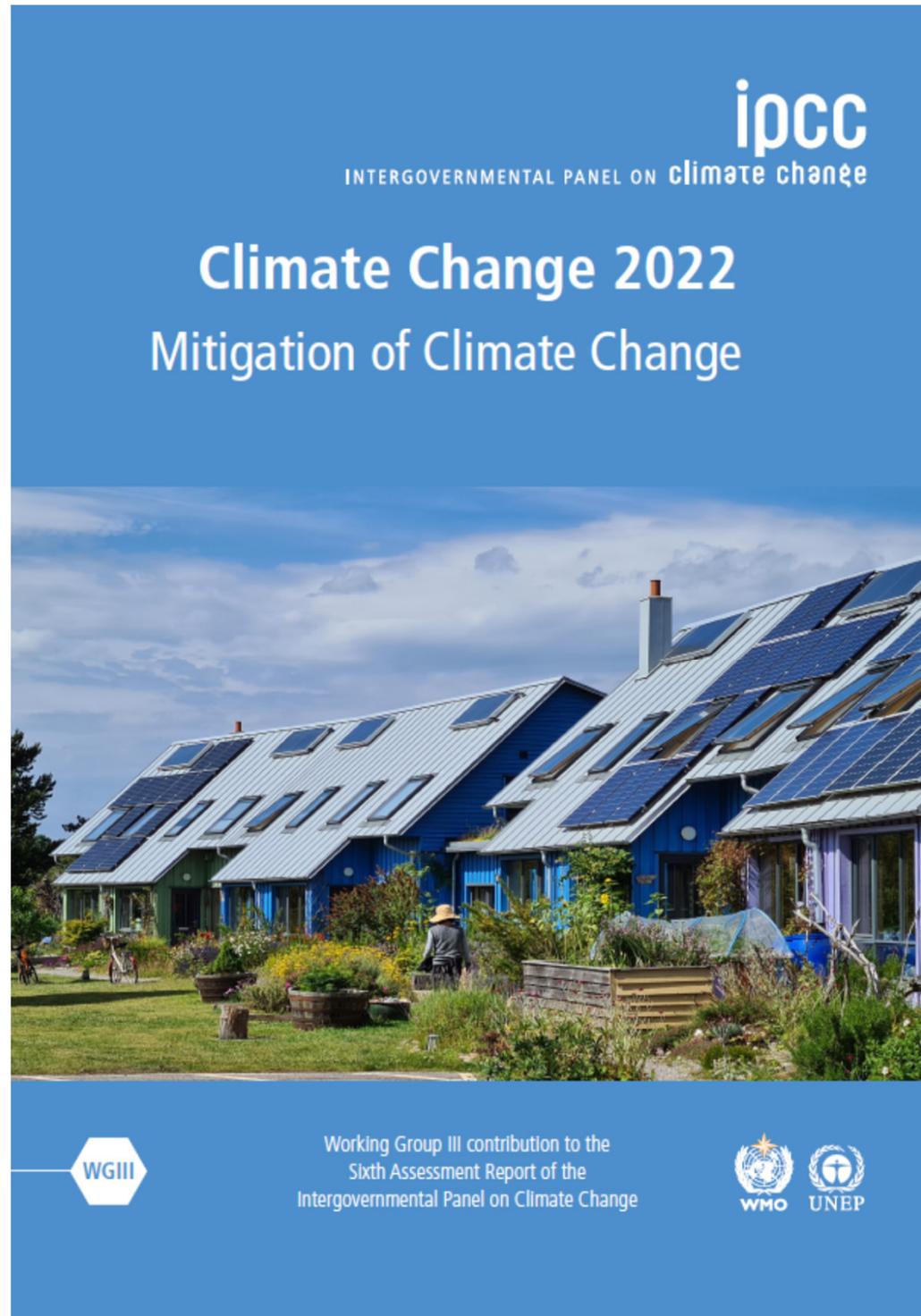
C20. Escola Digital

6º Relatório do IPCC, Grupos de Trabalho I e II

<https://www.ipcc.ch/report/ar6/wg1/>

<https://www.ipcc.ch/report/ar6/wg2/>





ipcc

INTERGOVERNMENTAL PANEL ON climate change

Climate Change 2022

Mitigation of Climate Change

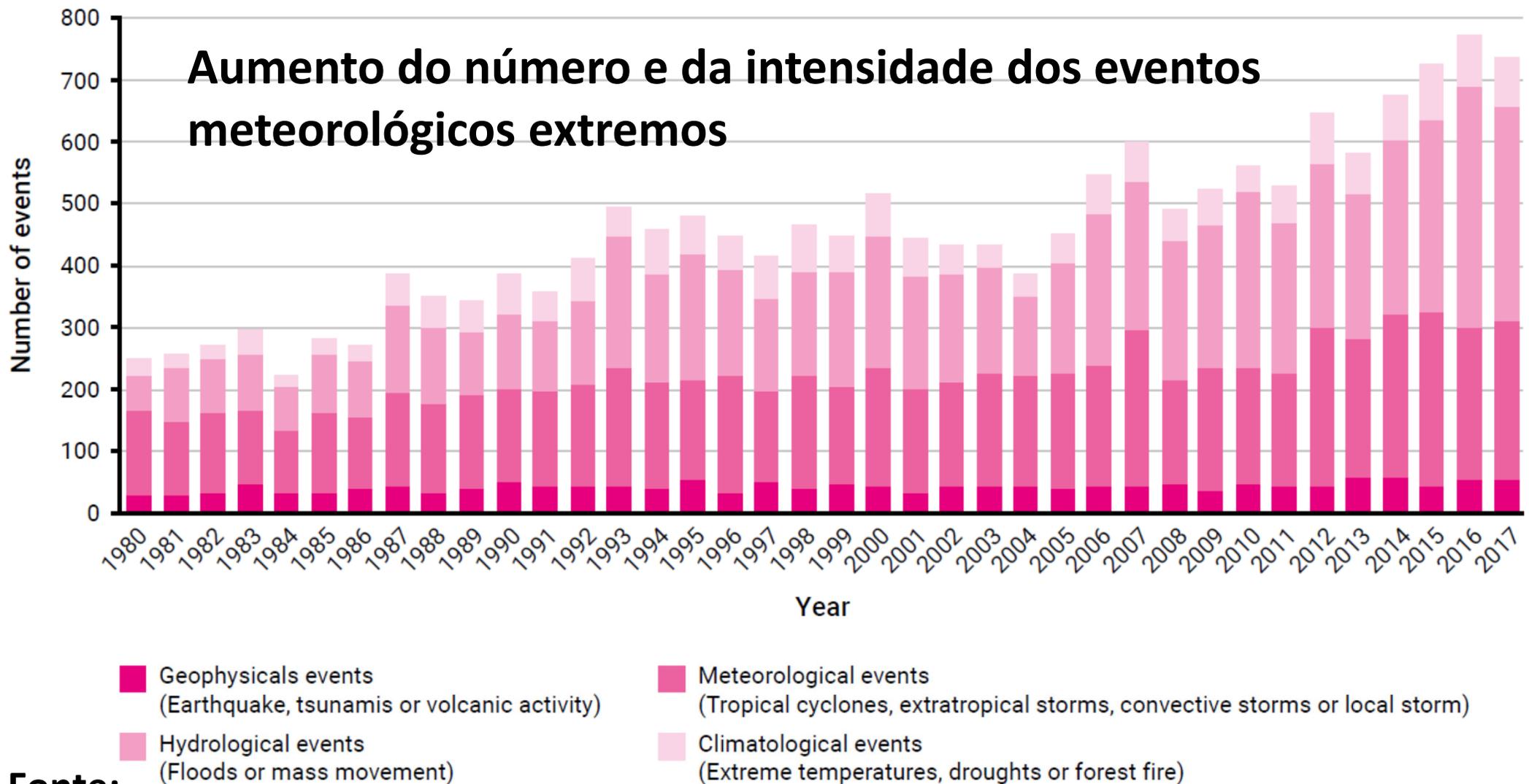


WGIII

Working Group III contribution to the
Sixth Assessment Report of the
Intergovernmental Panel on Climate Change



Figure SPM.7. Trends in numbers of loss-related natural events



Fonte:

Source: Munich Re (2017).

Kiley, Michael T. (2021). "Growth at Risk From Climate Change," Finance and Economics Discussion Series 2021-054. Washington: Board of Governors of the Federal Reserve System, <https://doi.org/10.17016/FEDS.2021.054>.

GLOBAL WATER STRESS HOTSPOTS

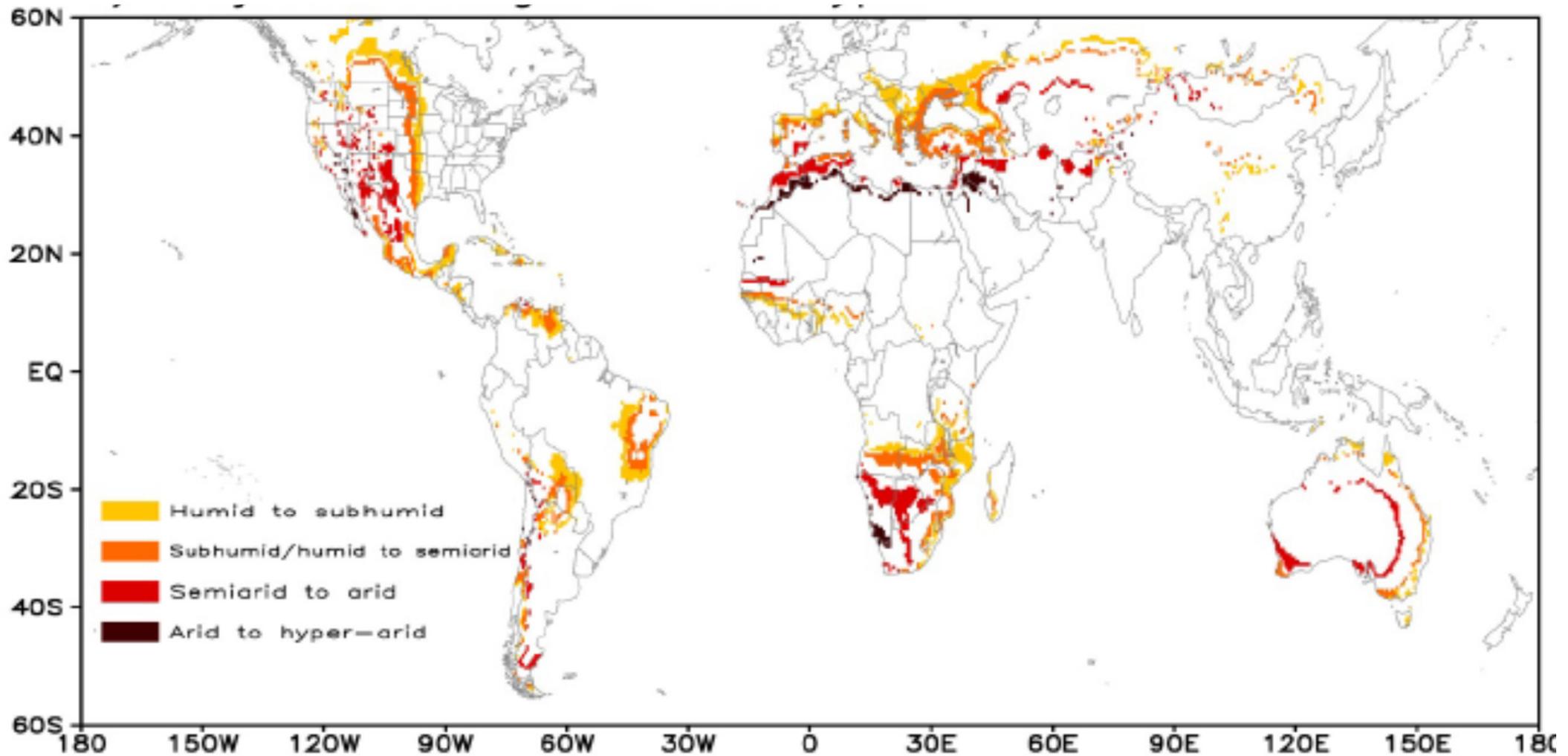


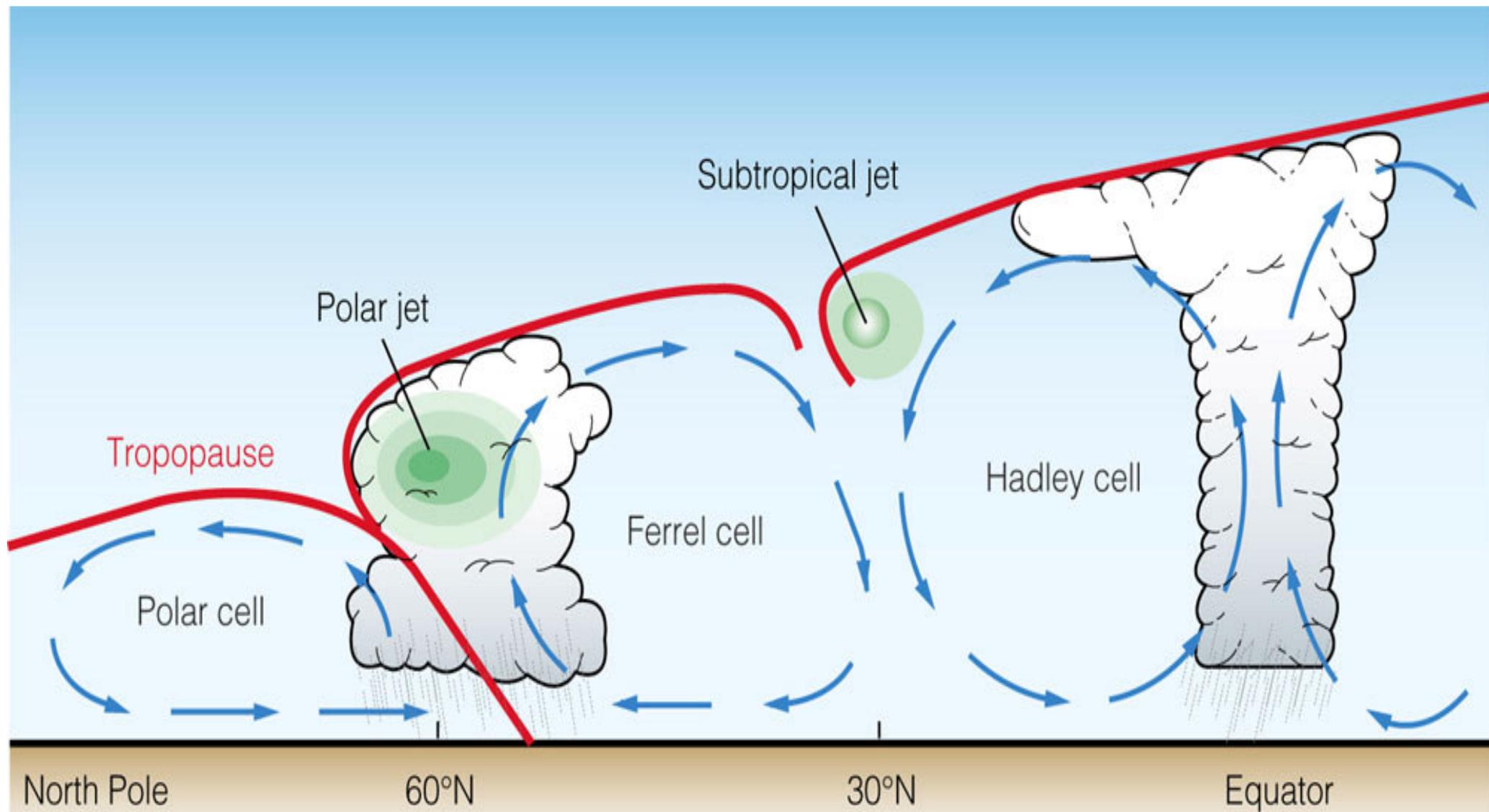
Global Water Stress Hotspot

Fonte: WMO, 2021, State of the Climate Services, Water

World Meteorological Organization 2021
Based on data from the Food and
Agriculture Organization and the World
Resources Institute

Transformação de climas húmidos em sub-húmidos, sub-húmidos em semiáridos, semiáridos em áridos e áridos em hiper-áridos devido às alterações climáticas





← **Banda dos desertos
à volta do globo
desloca-se para as
maiores latitudes**



Peter McBride, The long expanse where the Colorado River has run dry, not reaching the ocean. Not All Rivers Reach the Sea, New York Times, BY RACHEL NUWER NOVEMBER 17, 2011 9:32AM

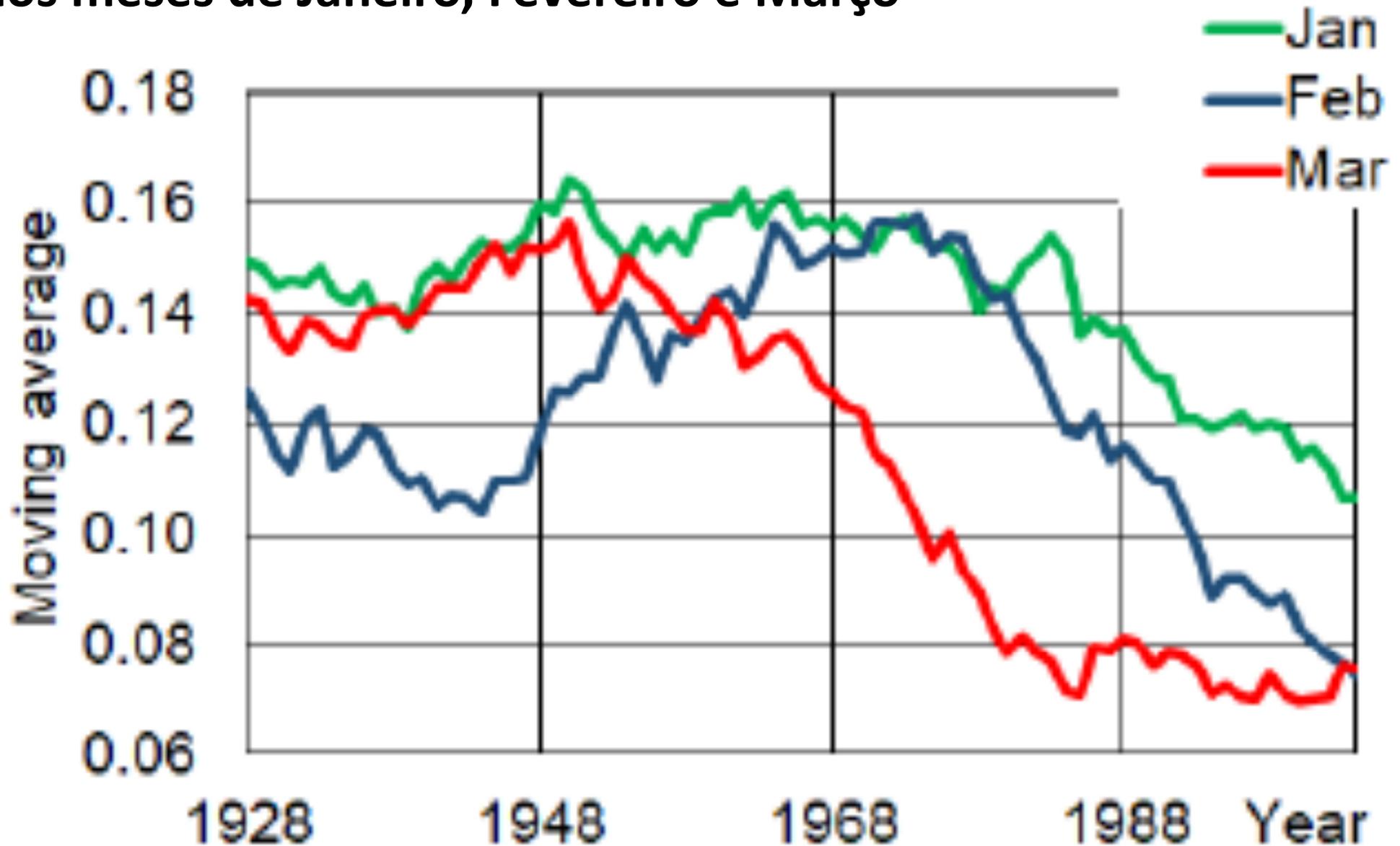


Houseboats float, amid extreme drought, on California's Lake Oroville in October 2021. (David Paul Morris/Bloomberg News)



Um amendoal abandonado em Newman, California, EUA, 2021
Foto de Terry Chea/AP

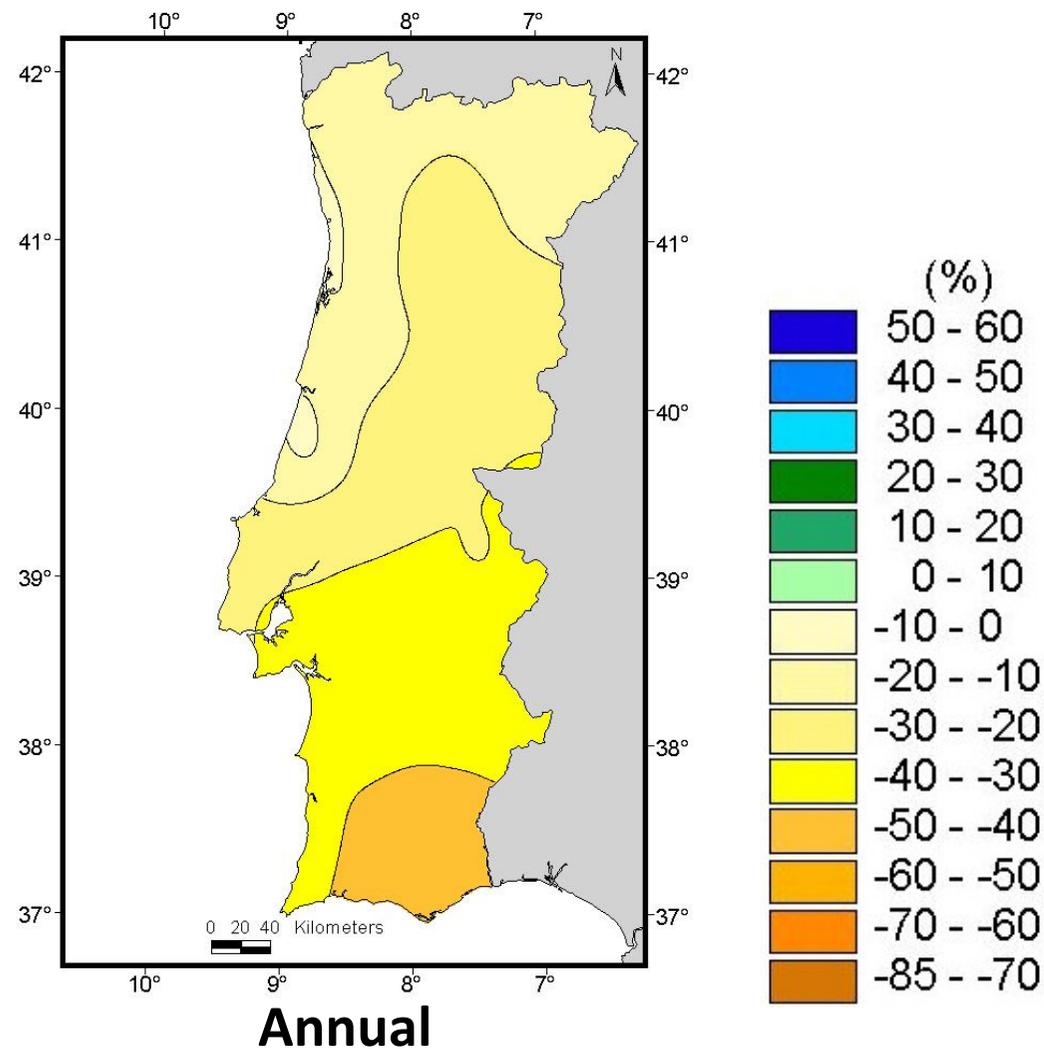
Média móvel de 30 anos de precipitação em Portugal Continental nos meses de Janeiro, Fevereiro e Março



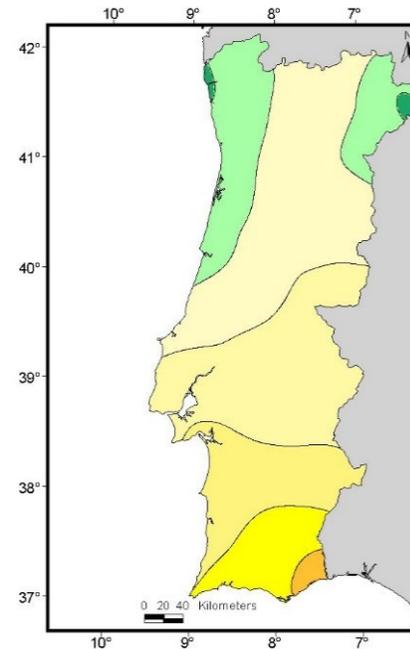
Fonte: Portela et al.,2021Portela, M.M.; Espinosa, L.A.; Zelenakova, M., Long-Term Rainfall Trends and Their Variability in Mainland Portugal in the Last 106 Years. *Climate*, 2020, 8, 146, DOI: 10.3390/cli8120146

Precipitation Anomaly A2 scenario for the period 2071- 2100 relative to 1961-1990, SIAM I Project, 2002

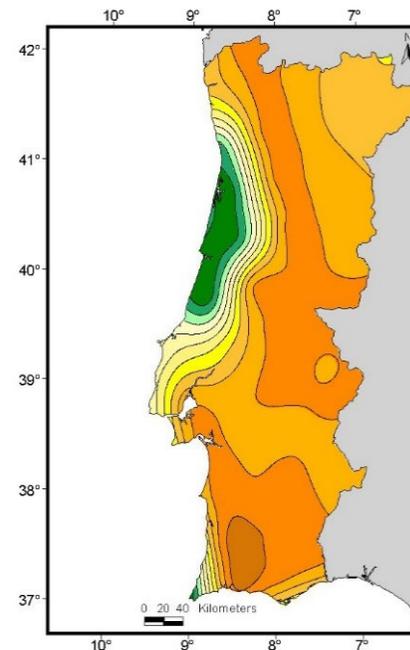
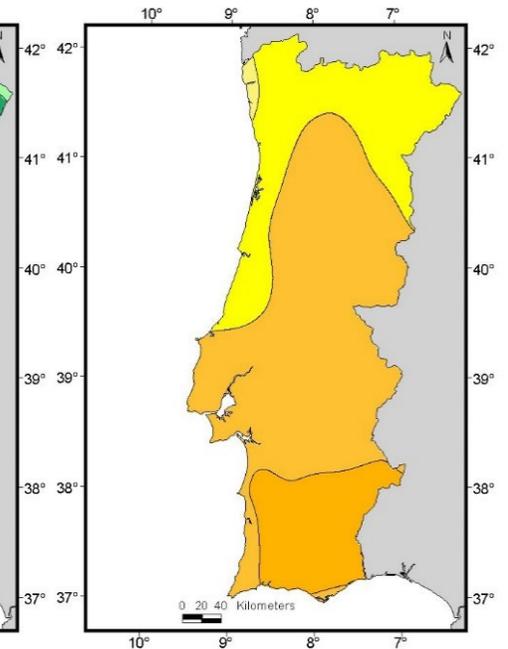
<http://cciam.fc.ul.pt/prj/siam/>



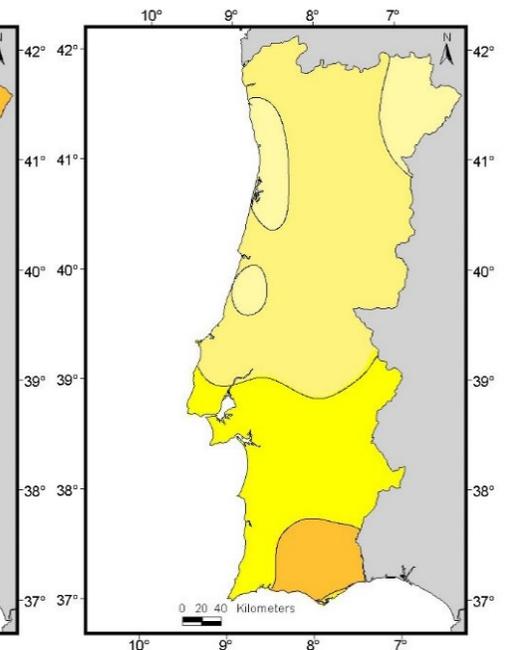
Winter (DJF)



Spring (MAM)



Summer (JJA)

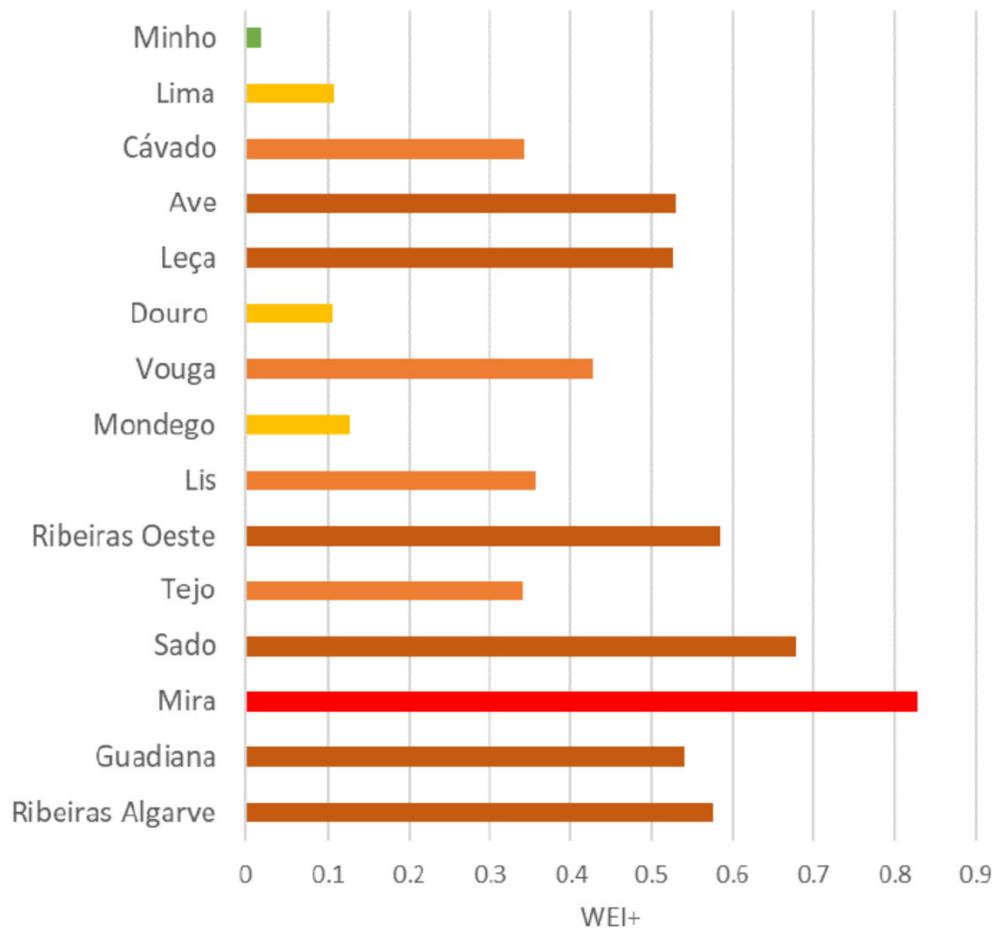


Autumn (SON)

- **Nos últimos 20 anos a precipitação em Portugal e Espanha diminuiu cerca de 15%, prevendo-se que diminua entre 10 a 25% até ao final do século.**
- **Nos últimos 20 anos a disponibilidade de água reduziu-se cerca de 20%.**

Fonte: Avaliação das disponibilidades hídricas atuais e futuras e aplicação do índice de escassez WEI+, APA, Período de consulta pública de 2021-12-11 a 2022-06-30

WEI+ por Região Hidrográfica



- Os valores do WEI+ são genericamente elevados.
- As bacias hidrográficas do Sado e do Mira são aquelas que merecem mais preocupação.
- Localmente, certas sub-bacias apresentam valores mais elevados.

Percentagem de enchimento do conjunto de barragens em Espanha no dia 28 de junho de 2022 nas bacias do:

Guadalquivir 28,60%

Guadiana 29,14%

Variação da precipitação media annual na Europa para aumentos da temperature media global de 1,5°, 2° e 3°

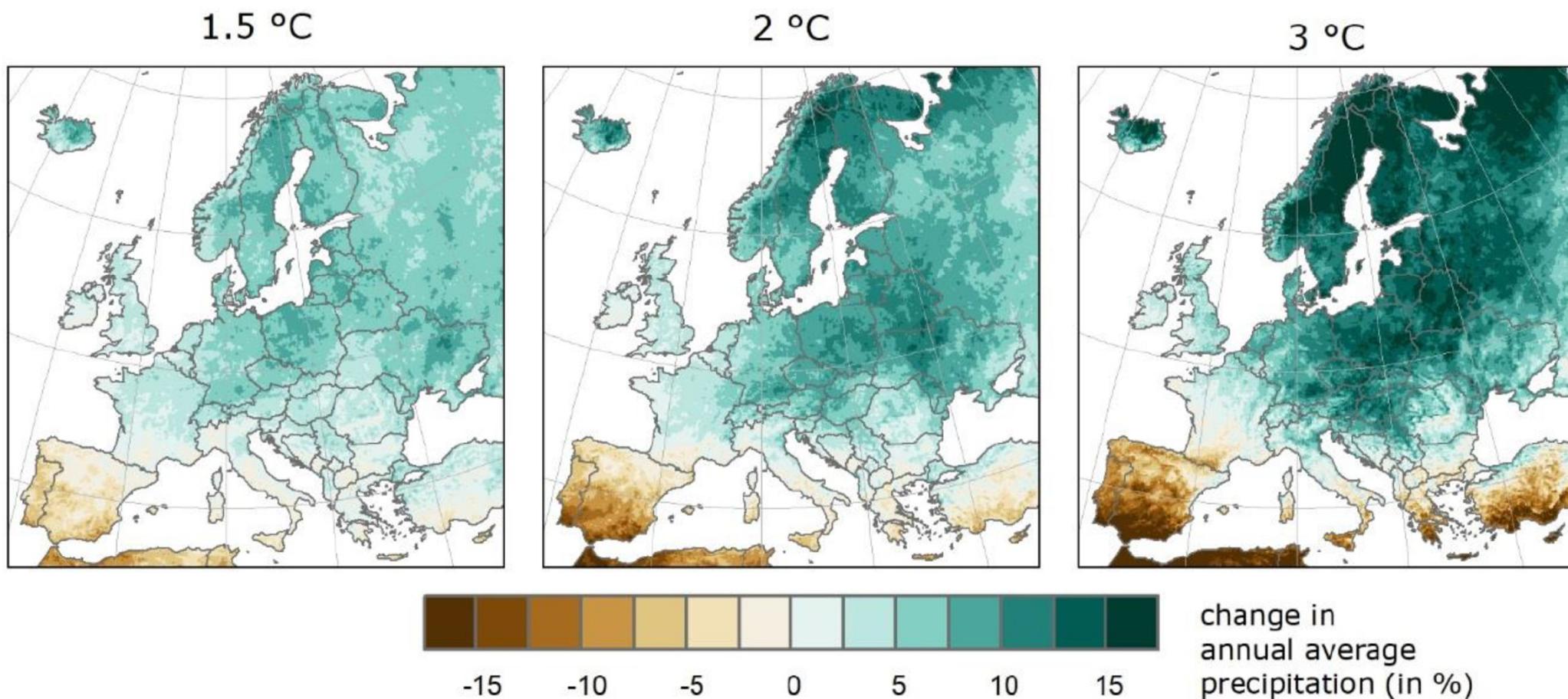


Figure 2. Changes from reference (1981-2010) in annual average temperature (top panels) and precipitation (bottom) for the three global warming scenarios used in PESETA IV (1.5°C, 2°C and 3°C warmer than pre-industrial times).

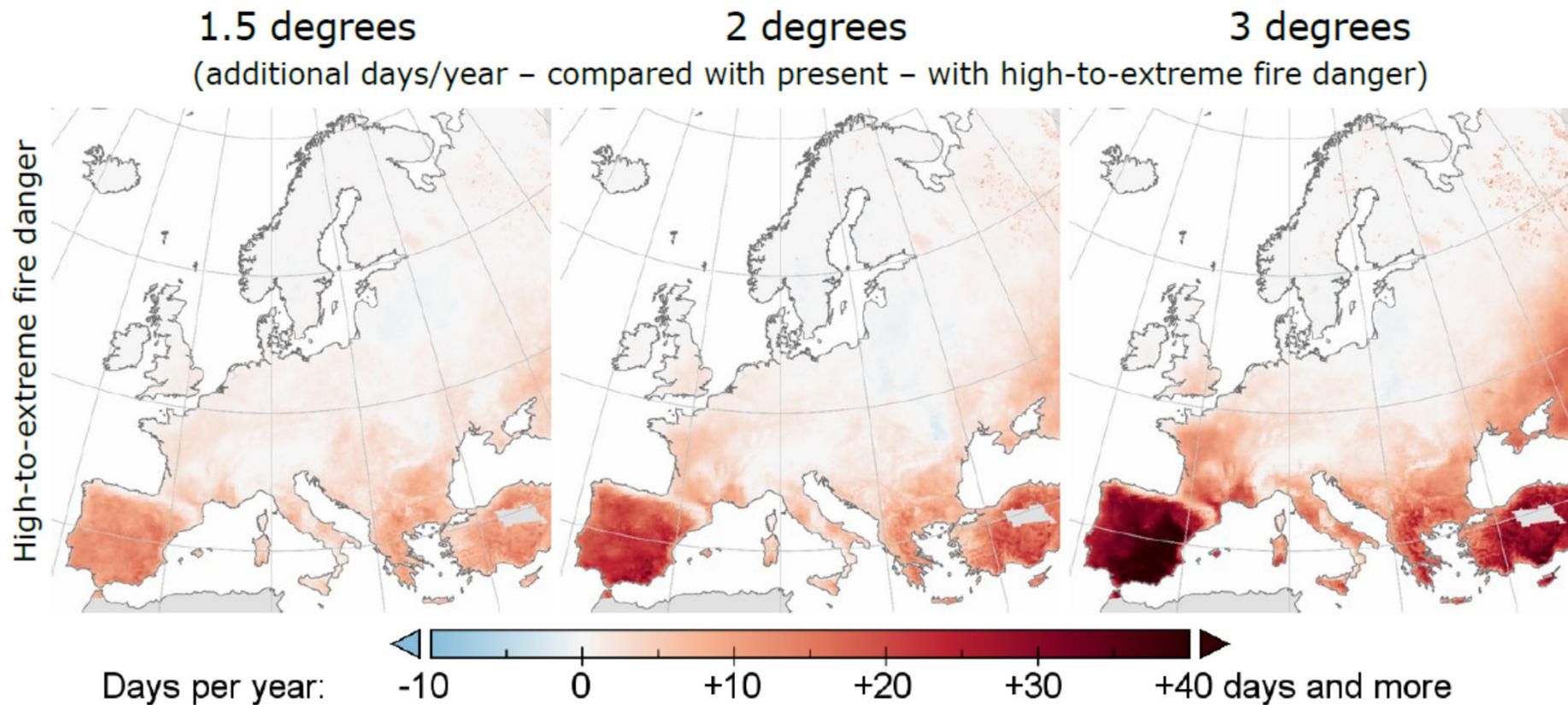
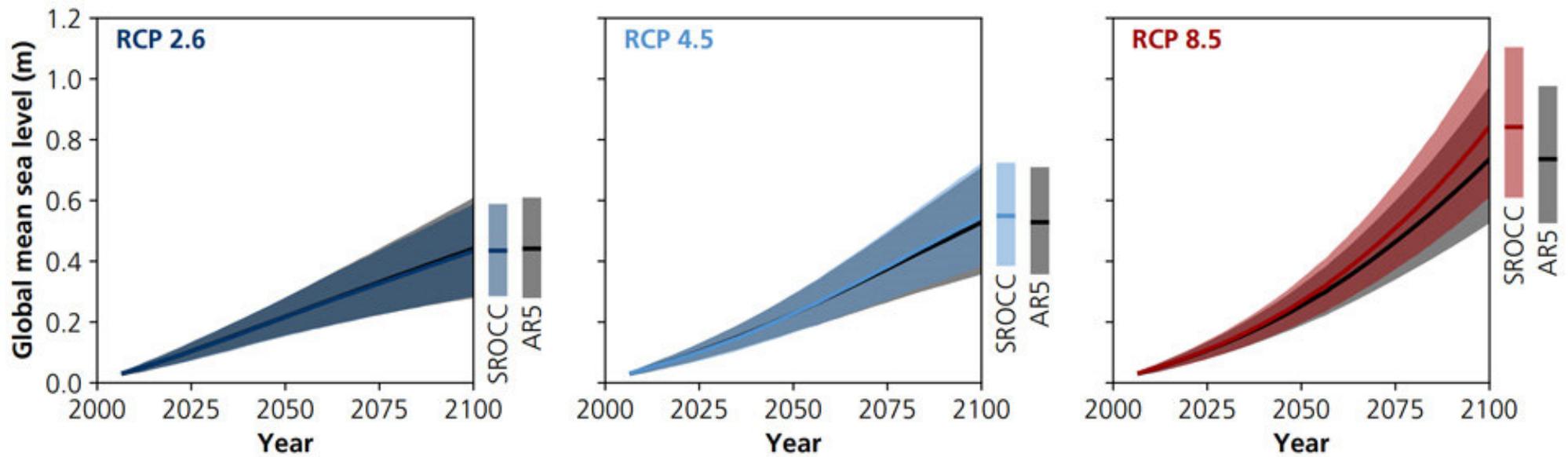


Figure 1: **Number of days per year with high-to-extreme fire danger** (daily **FWI** ≥ 30). Additional days per year with high-to-extreme fire danger, with reference to the situation in the control period 1981-2010, for different levels of global warming. Red shades denote an increment of days, blue shades a decrement. See Figure 10 and Figure 11 for more details.

Número de dias por ano com Índice meteorológico de perigo de incêndio florestal (FWI) muito elevado ou extremo,
Fonte, Projeto PESETA IV, JRC



SROCC - Special Report on the Ocean and Cryosphere in a Changing Climate, IPCC, 2019

Furadouro



Quais os fundos que vão suportar a defesa de todas as povoações costeiras em Portugal construídas em costas arenosas baixas contra a erosão e a subida do nível médio global do mar durante décadas?

Portugal's Adaptation Communication to the United Nations Framework Convention on Climate Change

Adaptation communication, referred to in Article 7, paragraphs 10 and
11 of the Paris Agreement

The guidelines outlined in Annex of Decision 9/CMA.1 have been used
to inform this submission



November 2021

Although there is no exact quantification available to estimate the impacts of extreme weather events and the trends observed in recent years related to climate change, Portugal has estimates of 60-140 million euros in annual costs associated with forest fires, of around 290 million euros associated with the 2005 drought (the most severe this century), and circa 200 million euros from the 2012 drought (mainly in terms of agricultural production losses). Climate change tends to increase or accelerate other risks, where natural and anthropogenic factors combine, for example, in terms of coastal erosion or forest fires.

Embora não haja uma quantificação exata disponível para estimar os impactos de condições meteorológicas extremas e as tendências observadas nos últimos anos relacionadas com as alterações climáticas, Portugal tem estimativas de 60-140 milhões de euros em custos anuais associados aos incêndios florestais, de cerca de 290 milhões de euros associados à seca de 2005 (a mais grave deste século), e cerca de 200 milhões de euros da seca de 2012 (principalmente em termos de perdas de produção agrícola). As alterações climáticas tendem a aumentar ou acelerar outros riscos, onde fatores naturais e antropogénicos se combinam, por exemplo, em termos de erosão costeira ou incêndios florestais.

The policy framework for climate change adaptation is built upon two main strategic instruments – the NAS and the NAP – complemented by subnational and sector-specific policies and plans. The adaptation governance framework and domains addressed are primarily established in the NAS - National Adaptation Strategy (ENAAC 2020). This instrument is complemented by the NAP - National Adaptation Plan (Action Programme for Climate Change Adaptation - P-3AC) that establishes the adaptation action priorities, systematizing many of the adaptation measures defined in the different subnational and sectoral adaptation plans and strategies.

O quadro político para a adaptação às alterações climáticas assenta em duas estratégias principais instrumentos – a ENA e o PNA - complementados por políticas subnacionais e sectoriais específicas e por planos.

O quadro de governação da adaptação e os domínios abordados estão estabelecidos no ENA - Estratégia Nacional de Adaptação (ENAAC 2020). Este instrumento é complementado pelo PNA - Plano Nacional de Adaptação (Programa de Acção para as Alterações Climáticas Adaptação - P-3AC) que estabelece as prioridades das acções de adaptação, sistematizando muitas das medidas de adaptação definidas nos diferentes planos de adaptação subnacionais e sectoriais e estratégias.

Roteiro Nacional de Adaptação 2100

National climate change adaptation planning and strategies

Legal instrument: Regulation on the Governance of the Energy Union and Climate Action

Obligation: National climate change adaptation planning and strategies – GovReg

General information

EU Member State / EEA member country

Portugal

The information in this reporting is updated until (date: YYYY-MM-DD format)

2021-03-12

Is this reporting the mandatory reporting under Art. 19 and Part 1 of Annex VIII of the Governance Regulation and Annex 1 of the Implementing Act?

Yes



SPATIAL ANALYSES

147 LAS

19 EU countries + Norway

Portugal (*n* 28 LAS)

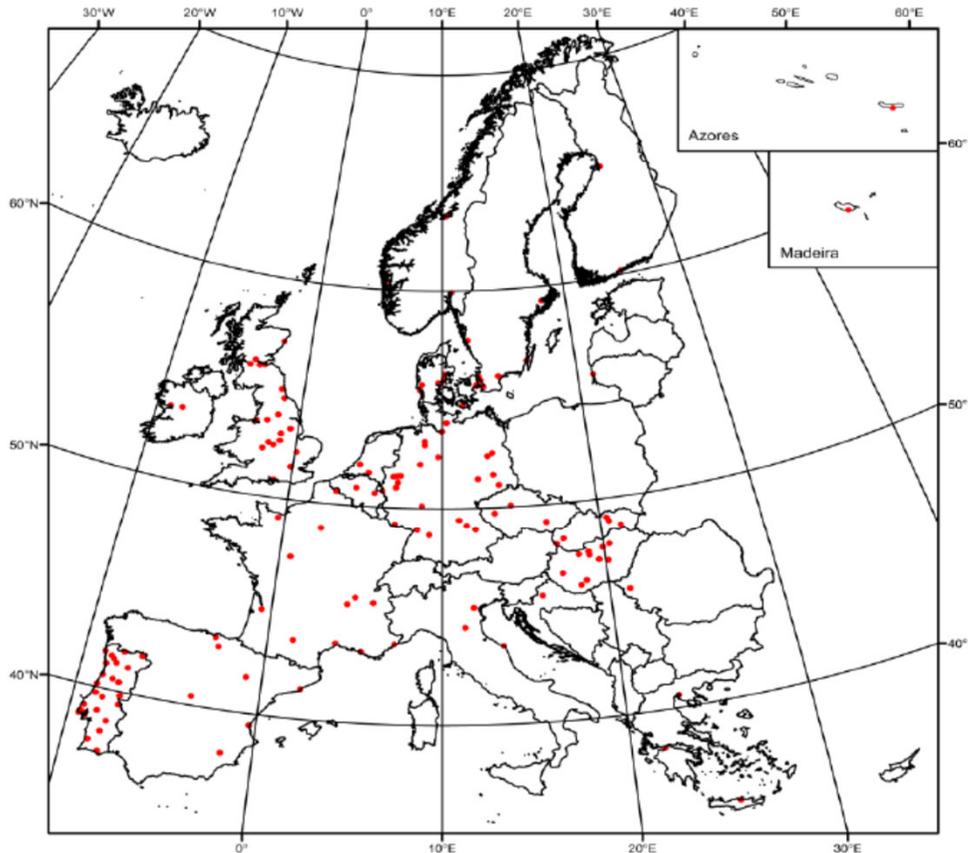
Germany (*n* 24)

UK (*n* 19)

France (*n* 13)

Hungary (*n* 11)

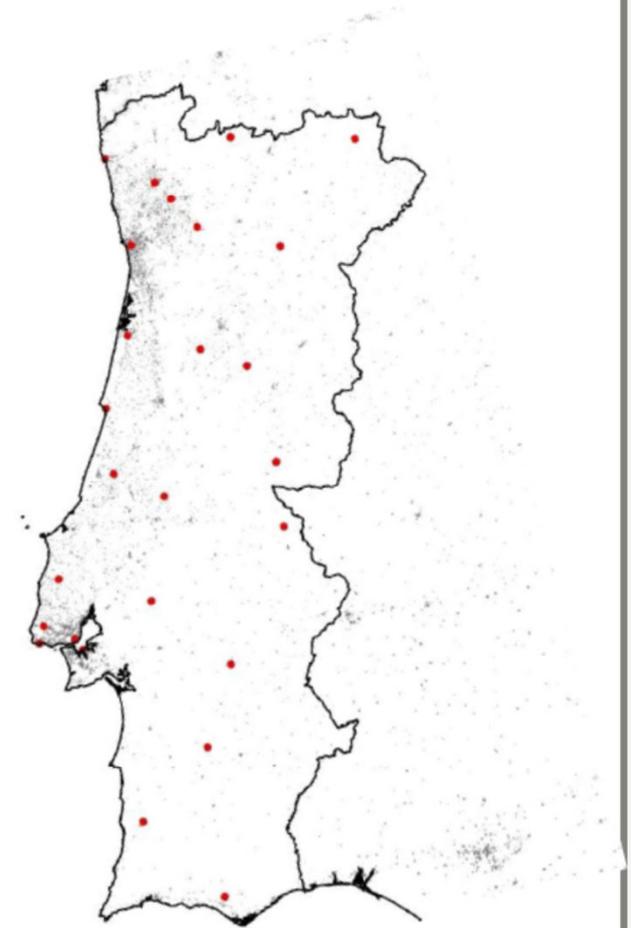
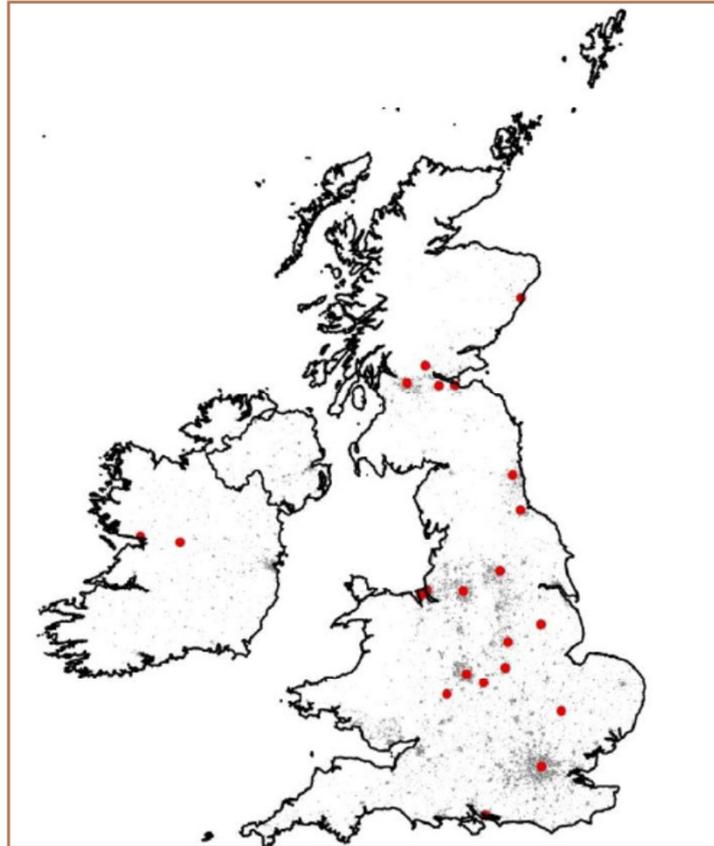
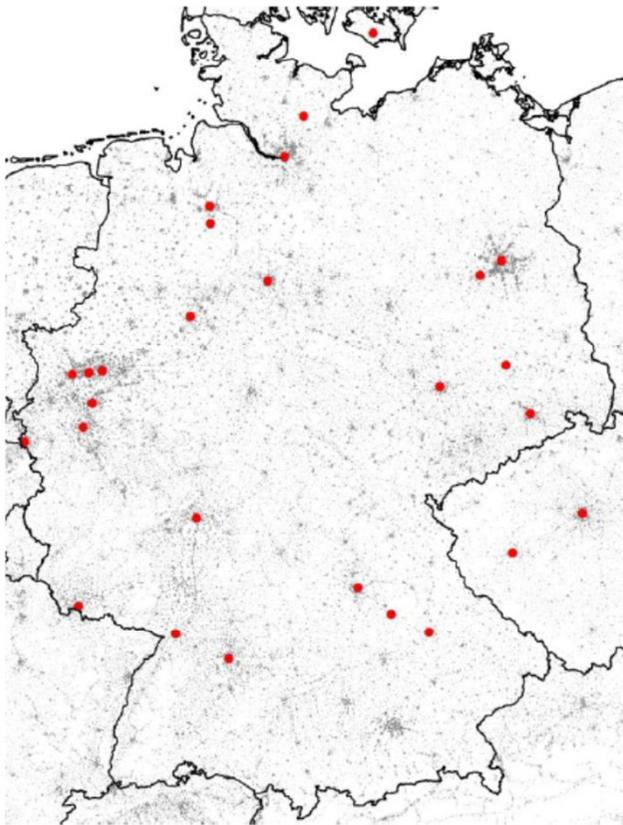
...



Adaptation to climate change at local level in Europe: An overview,
Francisca C. Aguiar, Julia Bentz, João M.N. Silva, Ana L. Fonseca, Rob Swart,
Filipe Duarte Santos, Gil Penha-Lopes, Environmental Science and Policy, 2018,
86, 38-63, <https://doi.org/10.1016/j.envsci.2018.04.010>



SPATIAL ANALYSES



Corine Land Cover map for Europe (Urban land-use)

Aguiar et al., 2018

Recursos Hídricos

Comparando com outros países da UE, Portugal tem:

1 - Uma excelente qualidade de água para consumo humano

2 - Uma percentagem muito elevada de tratamento das águas residuais

3 - Uma das mais baixas percentagens de re-utilização das águas residuais tratadas

Reutilizar as águas residuais urbanas

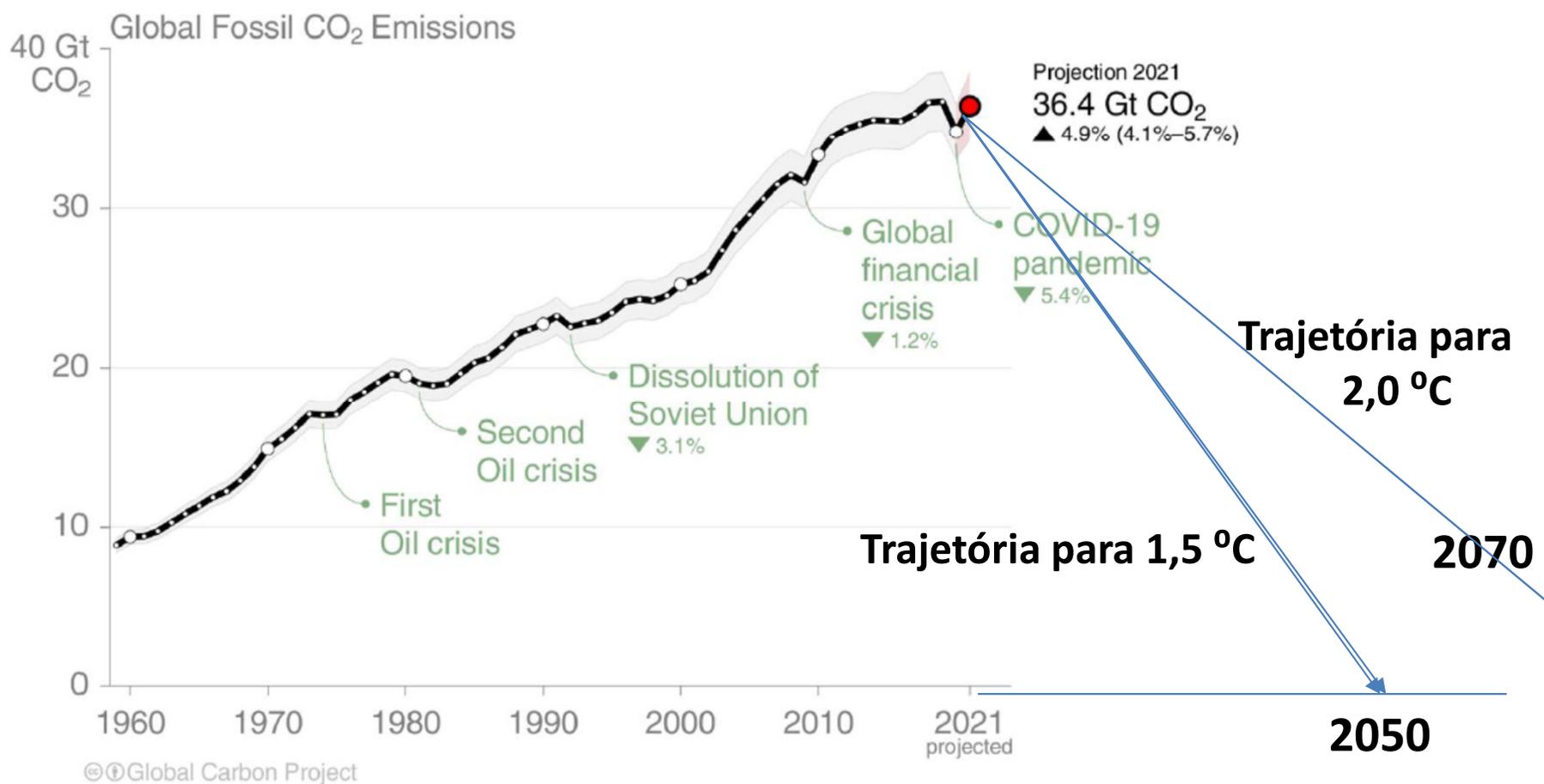
	Wastewater Generated	Wastewater Treated	Wastewater Treated and Used
	km3/ano	km3/ano	km3/ano
Alemanha	6,172	5,123 (83,0%)	0,042 (0,82%)
Espanha	5,204	4,570 (87,8%)	0,487 (10,66%)
Itália	3,926	3,902 (99,4%)	0,233 (5,97%)
França	7,910	6,654 (84,1%)	0,411 (6,17%)
Portugal	0,577	0,561 (97,2%)	0,006 (1,07%)

Fonte: Global, regional, and country level need for data on wastewater generation, treatment, and use, *Agricultural Water Management* 130(2013):1–13

DOI: 10.1016/j.agwat.2013.08.007

Toshio Sato, Manzoor Qadir, Sadahiro Yamamoto et al., 2013

Global fossil CO₂ emissions have risen steadily over the last decades. Emissions in 2021 are set to rebound towards their pre-COVID-19 levels after an unprecedented drop in 2020.



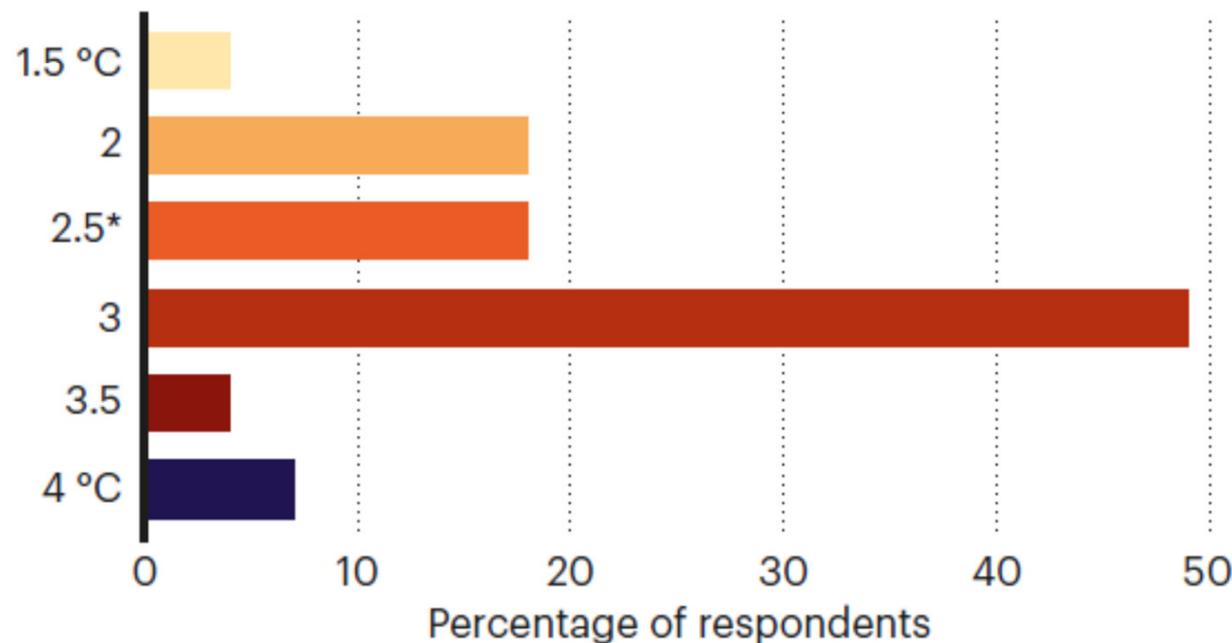
The 2021 projection is based on preliminary data and modelling.

Fonte: Source: [Friedlingstein et al 2021](#); [Global Carbon Project 2021](#)

HOW LEADING SCIENTISTS VIEW CLIMATE CHANGE

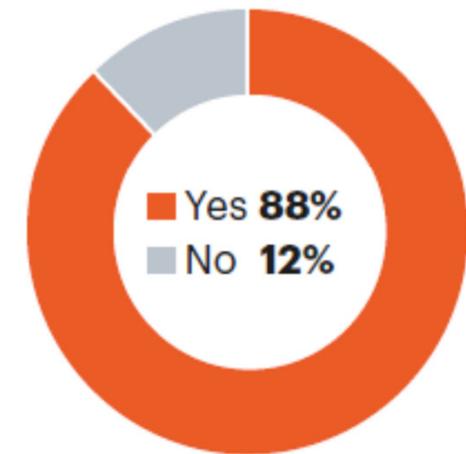
Nature surveyed authors of the latest report by the Intergovernmental Panel on Climate Change (IPCC) about their views on the future. Ninety-two of 233 authors and review editors provided responses.

How much warming above pre-industrial times do you think is likely by 2100?

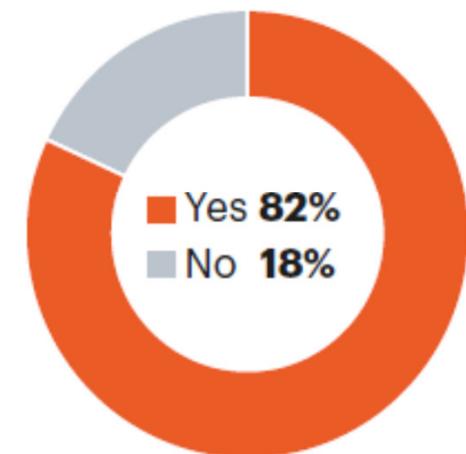


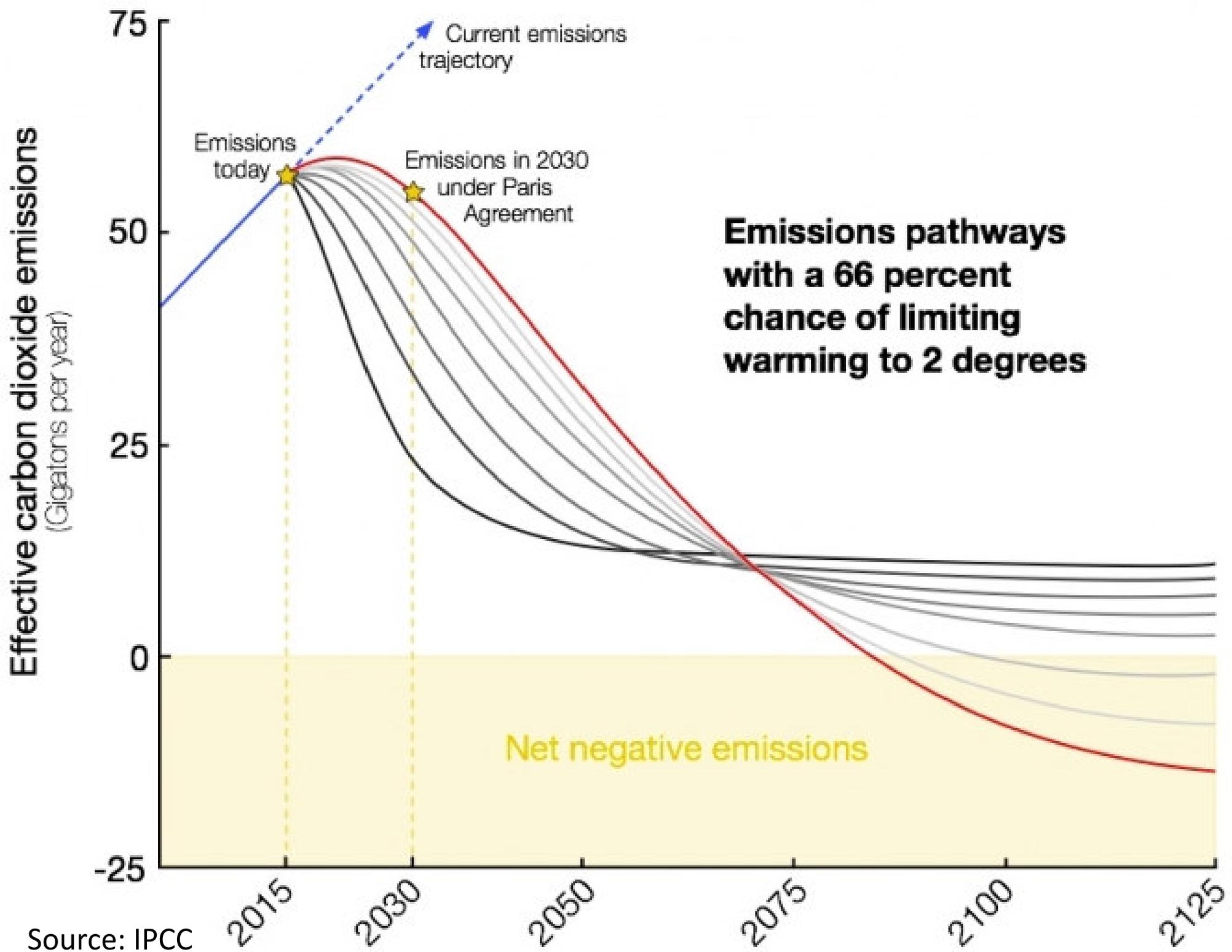
*Includes 2 responses between 2.7 °C and 2.75 °C; 2.5 °C and 3.5 °C were write-in answers.

Do you think the world is experiencing a 'climate crisis'?



Do you think you will see catastrophic impacts of climate change in your lifetime?





Emissions pathways with a 66 percent chance of limiting warming to 2 degrees

Source: IPCC

Dado que se tornou urgente atingir emissões globais líquidas nulas em 2050 vai ser necessário ter emissões negativas de CO₂, ou seja retirar CO₂ da atmosfera por meio do sequestro biológico (florestas e solos), por meio da captura do CO₂ junto às fontes emissoras (por exemplo, em centrais térmicas a carvão) ou por meio do sequestro químico direto do CO₂ da atmosfera (**carbon dioxide removal - CDR**) seguida da sua **utilização** ou armazenamento geológico (**Carbon capture, utilization, and storage – CCUS**).

O orçamento para não ultrapassar 1,5° C é de 460 gigatoneladas de CO₂ e as emissões globais de CO₂ em 2021 foram de 36,3 Gt CO₂, ou seja, restam cerca de 12 anos para se esgotar.

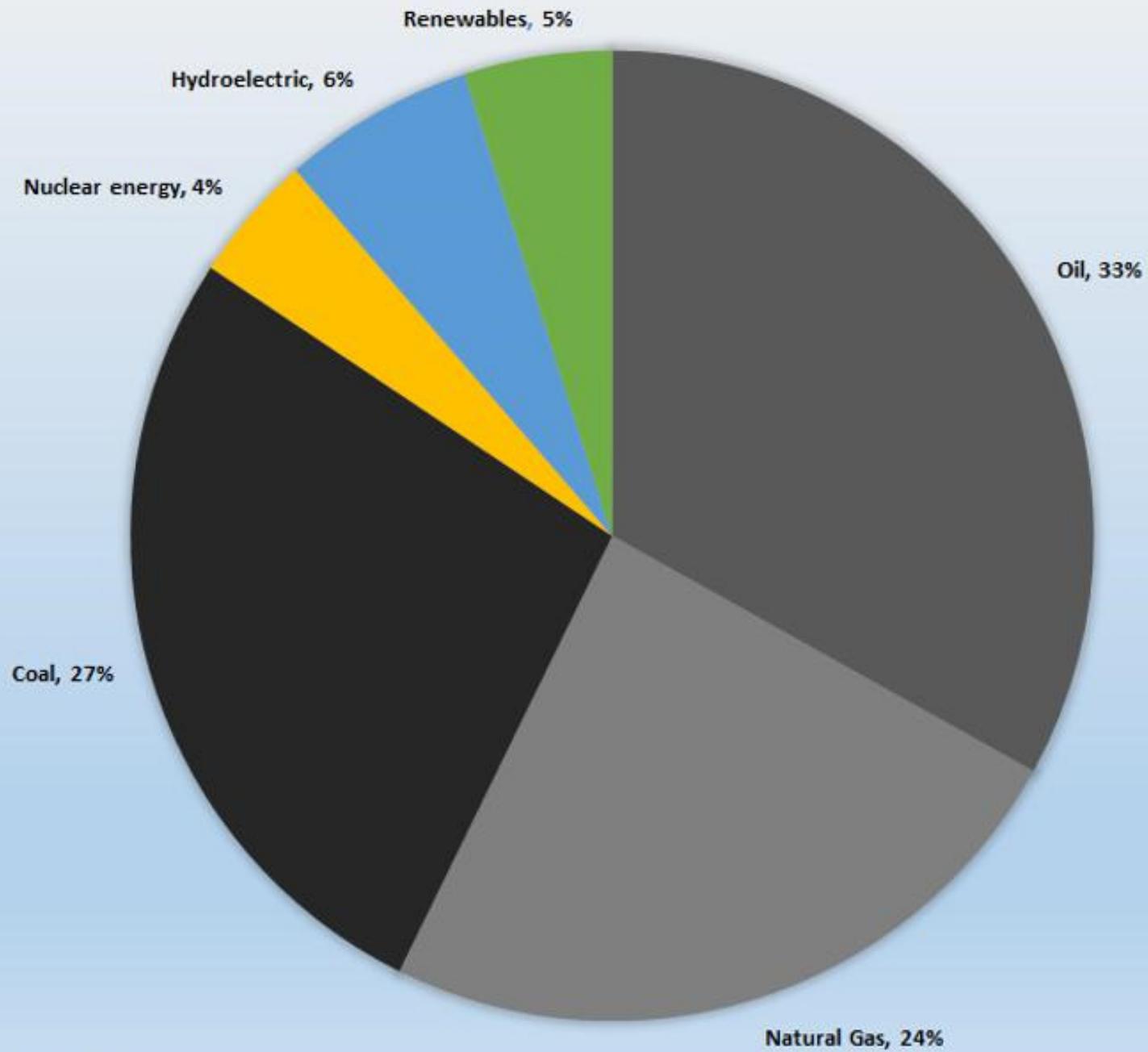


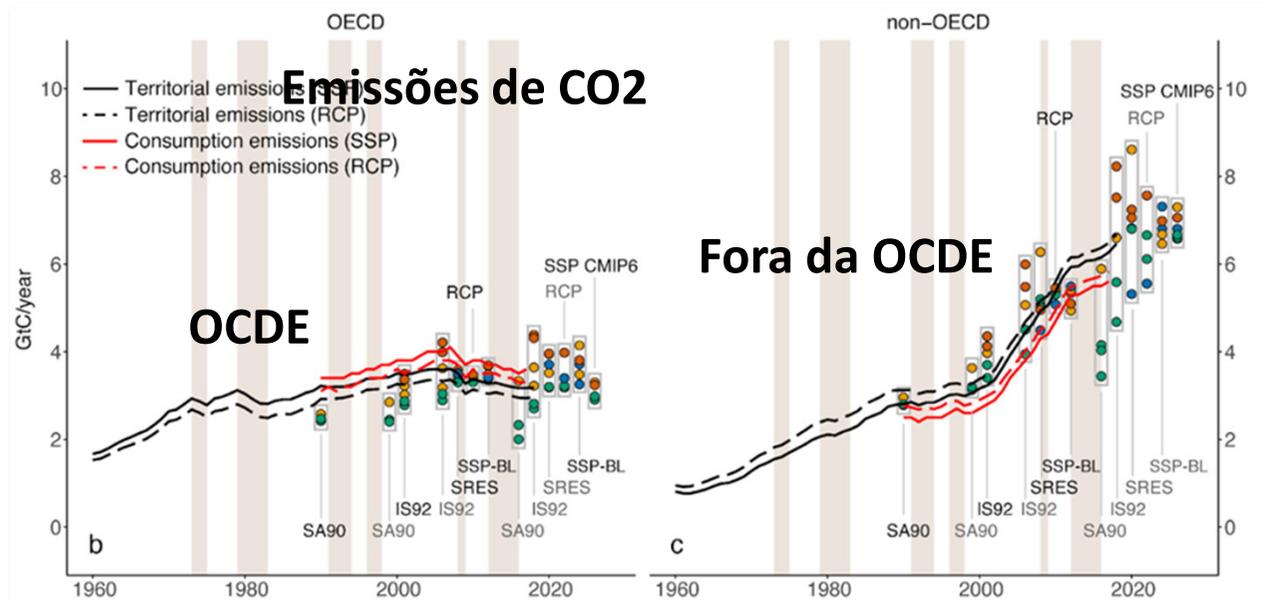
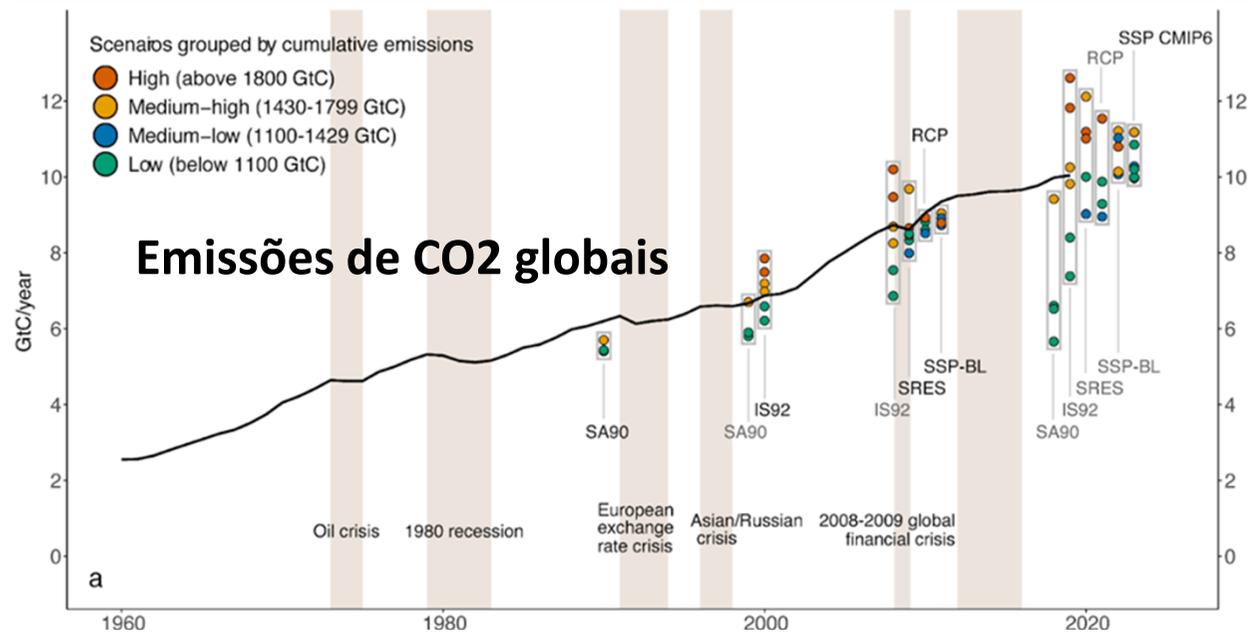
The Tomakomai carbon, capture and storage test site, Hokkaido, Japan, March 2018. Over its three-year lifetime, it's hoped that this demonstrator project will capture an amount of carbon approximately 1/100,000 of current global annual emissions. The captured carbon will be piped into geological deposits deep under the sea bed where it will need to remain for centuries. [REUTERS/Aaron Sheldrick](#)



The Climeworks Gebr. Meier Greenhouse in Hinwil, Zurich. CO2 increases crop yield from direct air capture. Such projects demonstrate exciting possible applications for captured carbon, but there is no prospect they will have any measurable impact on reducing global warming. [Orjan Ellingvag/Alamy](#)

PRIMARY GLOBAL ENERGY CONSUMPTION 2019

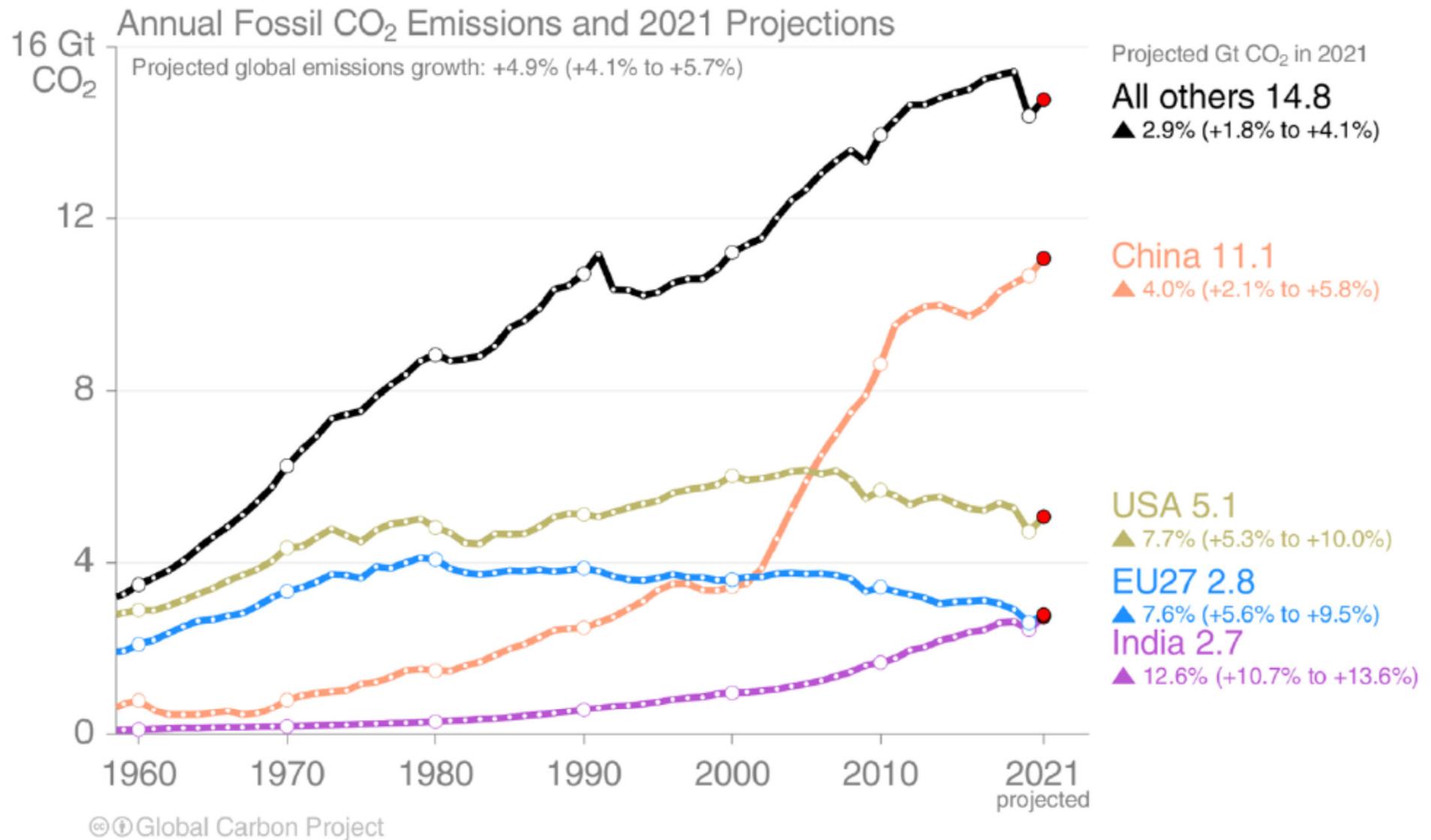




SOURCE: Jiesper Strandsbjerg Tristan Pedersen, Detlef P. van Vuuren, Bruno A. Aparício, Rob Swart, Joyeeta Gupta, Filipe Duarte Santos, 2020, Variability in historical emissions trends suggests a need for a wide range of global scenarios and regional analyses, Communications Earth & Environment – Nature, 1, 41, <https://doi.org/10.1038/s43247-020-00045-y>

Evolução dos 4 maiores emissores de gases com efeito de estufa

Global fossil CO₂ emissions are projected to increase by 4.9% [4.1%–5.7%] in 2021



The 2021 projections are based on preliminary data and modelling.

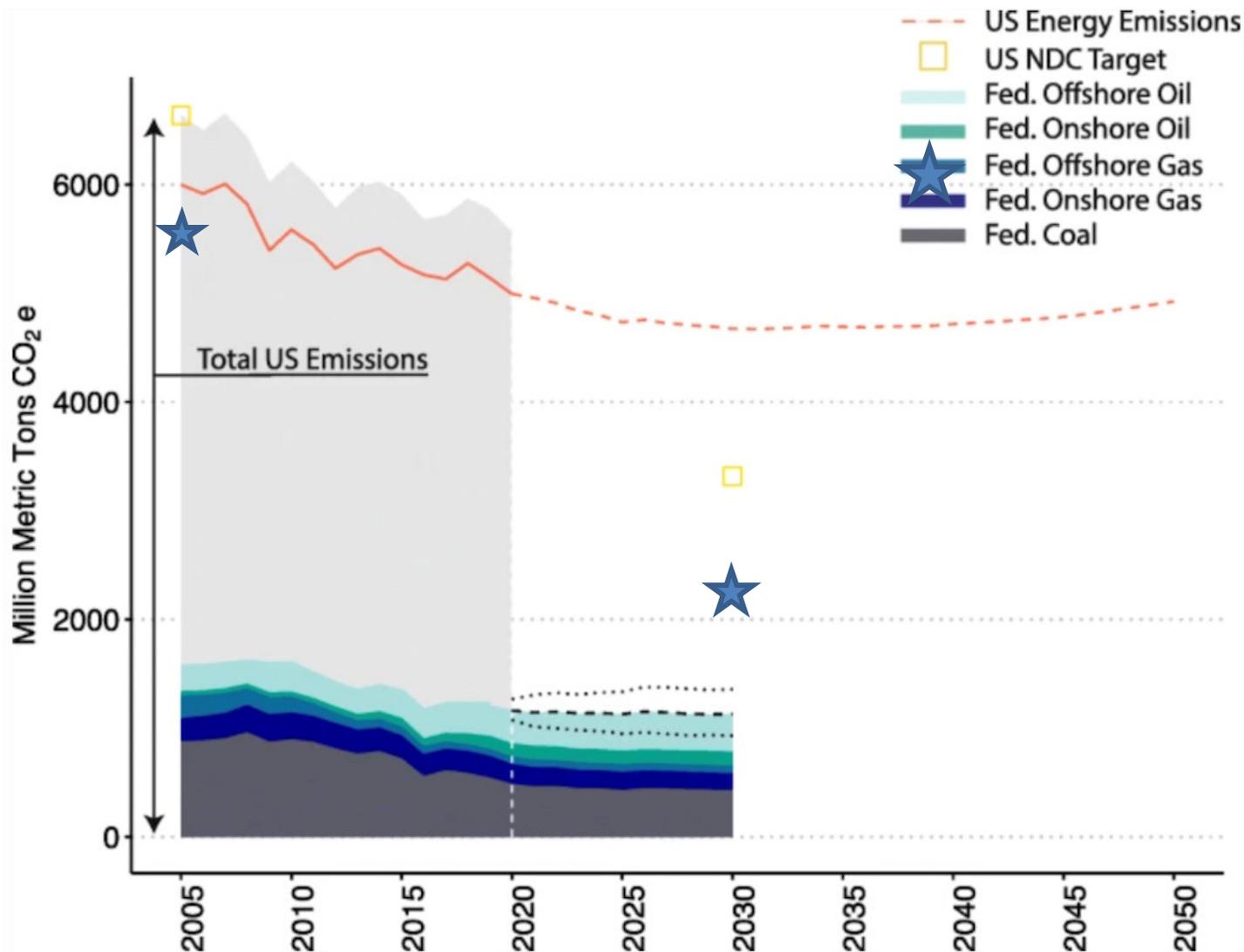
Source: [Friedlingstein et al 2021](#); [Global Carbon Project 2021](#)



Solar panels blanket hills in China in 2019. (Sam McNeil / Associated Press)



Chinese workers check solar photovoltaic modules on a hillside in a village in Chuzhou, in eastern Anhui province © AFP/Getty Images. IEA warns on China's dominance of solar panel supply chain. Financial Times. Shotaro Tani, 7 July 2022. Clean energy is expected to account for 20% of China's total consumption by 2025 Photographer: Qilai Shen/Bloomberg .China is targeting a huge increase in power capacity over the next five years as it tries to ensure energy security while staying on course to reach long-term climate goals



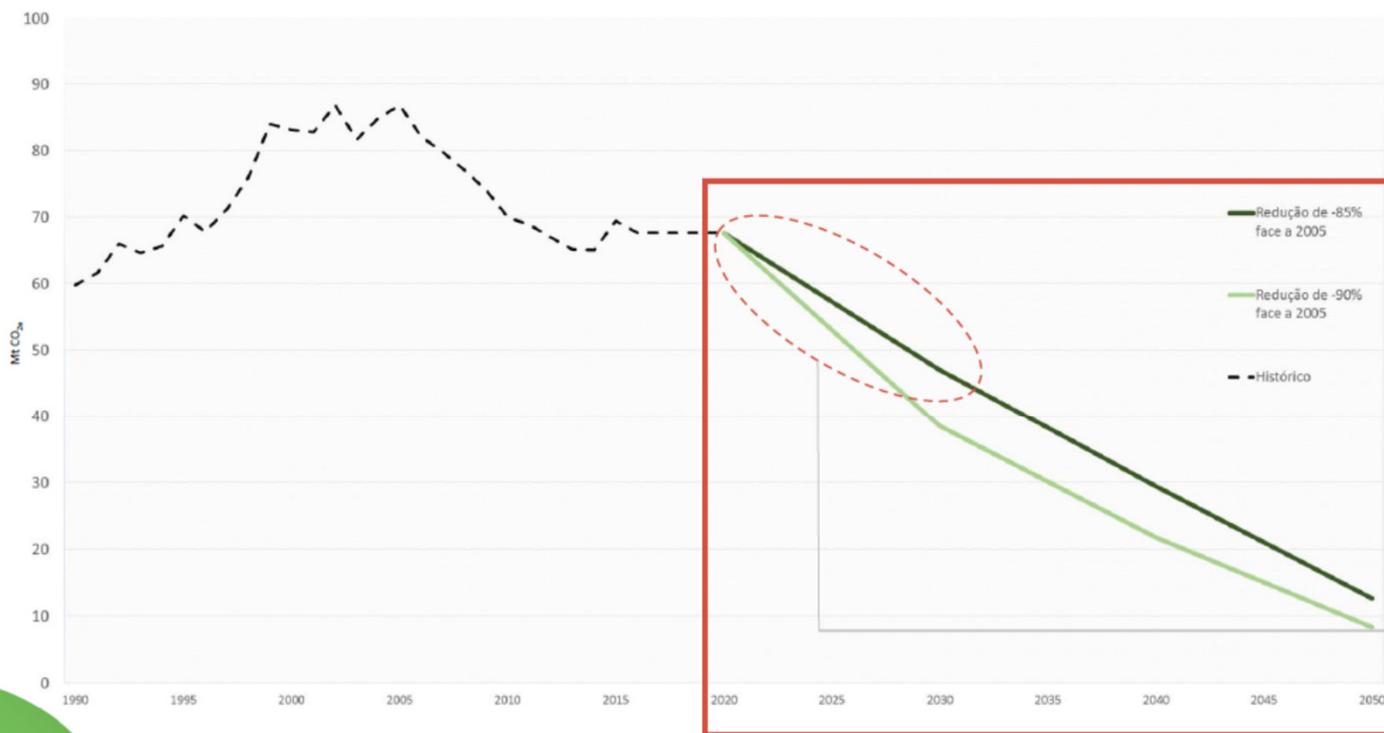
Emissions associated with the extraction and combustion of fossil fuels from US federal lands and waters (green, blue and dark grey area), including central projections out to 2030 (high and low projections indicated by black dotted lines). Total historical US emissions are shown in light grey, the solid red line indicates historical US energy emissions and the dotted red line shows the Energy Information Administration's projections through 2050. Gold squares depict the 2005 reference point and the 2030 target of the US nationally determined contribution (NDC) emissions target. Source: Ratledge et al (2022).

Em 30 de junho de 2022 o Supremo Tribunal federal dos EUA retirou à EPA (Agência federal de Proteção Ambiental) as suas competências para o combate às emissões de gases de efeito de estufa e entregou-as a ela própria em última

Instancia. From Justice Elena Kagan's dissent: *"Whatever else this Court may know about, it does not have a clue about how to address climate change...The Court appoints itself—instead of Congress or the expert agency—the decisionmaker on climate policy. I cannot think of many things more frightening."*

PARA ATINGIR O OBJETIVO DA NEUTRALIDADE CARBÓNICA EM 2050 SERÁ NECESSÁRIO CUMPRIR COM TRAJETÓRIAS QUE CONDUZAM A 85-90% DE REDUÇÃO DE EMISSÕES DE GEE ATÉ 2050

EMISSÕES TOTAIS (Mt CO_{2e})



EMISSÕES DE GEE (sem sumidouros)

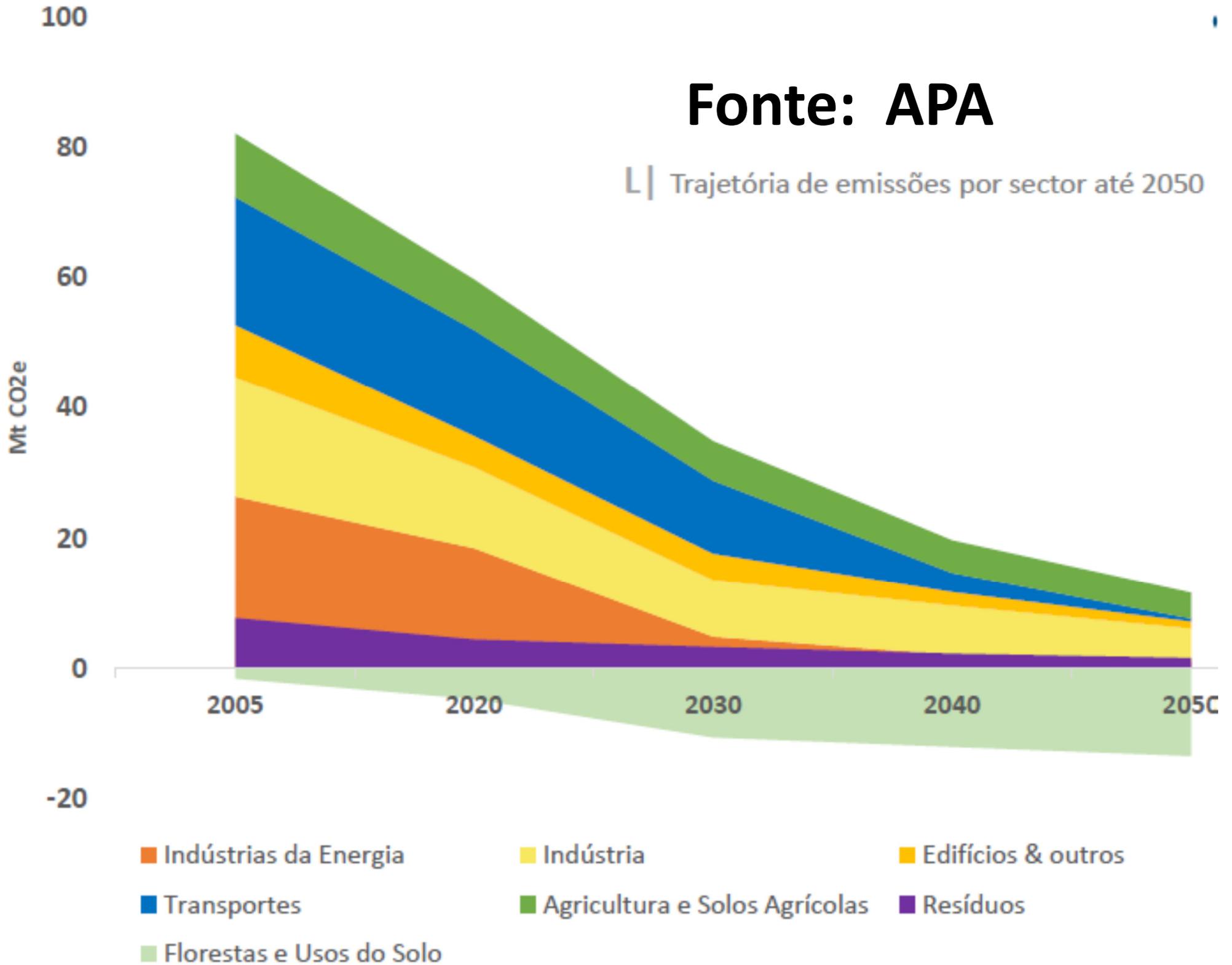
2030	-45% a -55%
2040	-65% a -75%
2050	-85% a -90%

(% face a 2005)

É na década de 2020-2030 que deverá verificar-se uma redução de emissões mais significativa.

Fonte: APA

L | Trajetória de emissões por sector até 2050



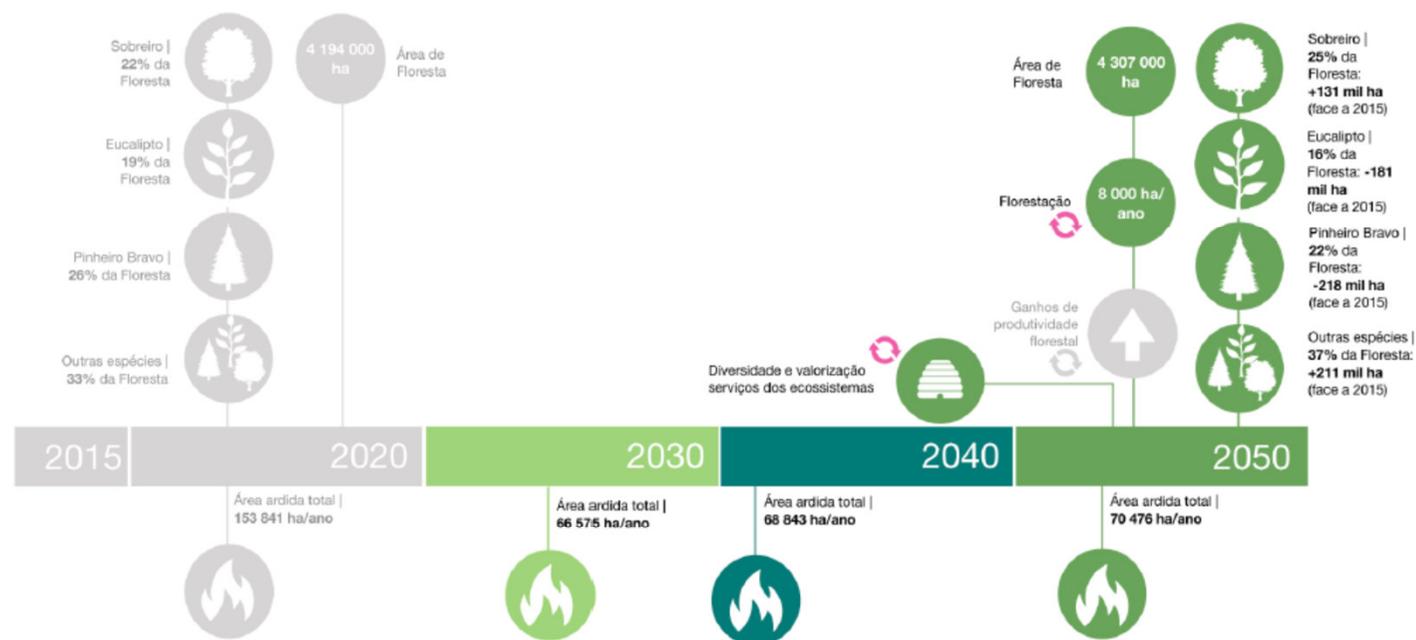
Roteiro para a Neutralidade Carbónica 2050

Identificaram-se:

- Os principais drivers de descarbonização

- Diminuição da área ardida
- Melhorias na gestão e no ordenamento do território
- Melhoria da produtividade florestal

Setor Florestas e Outros Usos do Solo



- 9 Mt

Nota: O valor do sumidouro representado nas figuras não integra a componente de pastagens e outros solos agrícolas.



- 13 Mt

There are six key specific contributions to be addressed in the UNFCCC and implemented by governments to strengthen their national targets and NDCs to achieving the Paris targets:

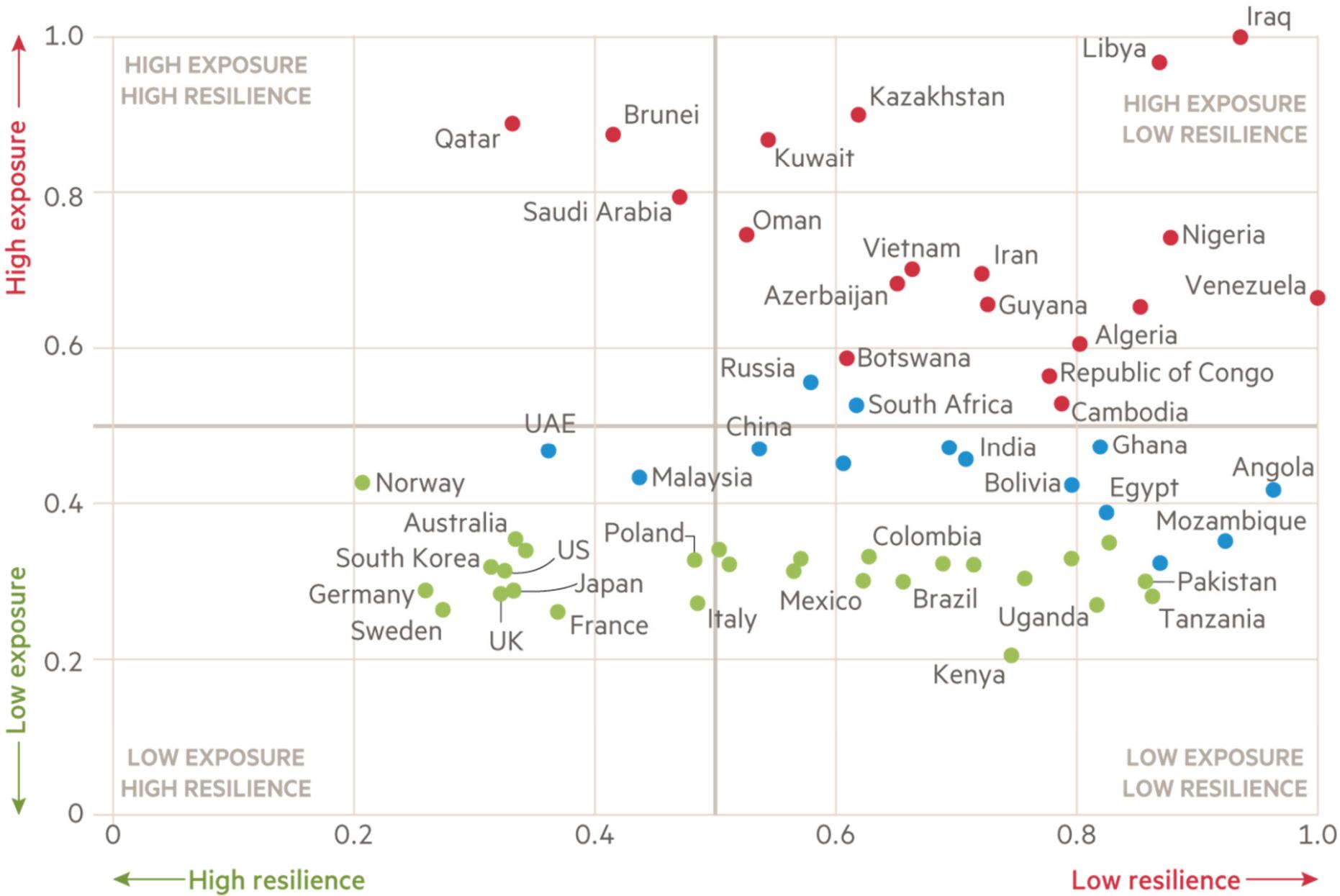
- 1. Include consumption emissions in the National Paris Agreement targets and additionally in the UNFCCC inventories.** This may strengthen and increase the national mitigation approach in OECD countries and support global mitigation, instead of OECD exporting emissions to the non-OECD regions.
- 2. Creation of incentives and information opportunities to start reversing the current increase in beef consumption globally (e.g., by including it in UNFCCC negotiations).** Cows are less efficient than other farm animals in meat production, requiring relatively more water resources and grazing areas, besides being a methane source.

Santos, F.D.; Ferreira, P.L.; Pedersen, J.S.T. The Climate Change Challenge: A Review of the Barriers and Solutions to Deliver a Paris Solution. *Climate* 2022, 10, 75. <https://doi.org/10.3390/cli10050075>

- 3. Initiate a political process to stop natural gas fracking because it produces additional methane emissions (this can be implemented in the UNFCCC to support reaching the Paris Agreement).**
- 4. Initiate a global political and economic process to use CCS in coal power plants and other carbon-intensive energy and industrial infrastructures. It generally makes electricity and consumer goods more expensive, but it is a form of mitigation, and therefore it reduces the economic losses from present and future climate change impacts. The capture and liquefying process increases electricity generation costs in a CCS coal power plant by about 30%. It implies a voter challenge but could be financed by a carbon tax.**
- 5. Stop subsidizing fossil fuels, encourage green technology advances and implementation, and reduce incentives for fossil fuel extraction.**
- 6. UNFCCC negotiations leading to the phasing out of Annex-I energy companies' fossil exploration in non-Annex-I countries.**

Obrigado pela vossa atenção

How prepared are fossil fuel economies for the energy transition?

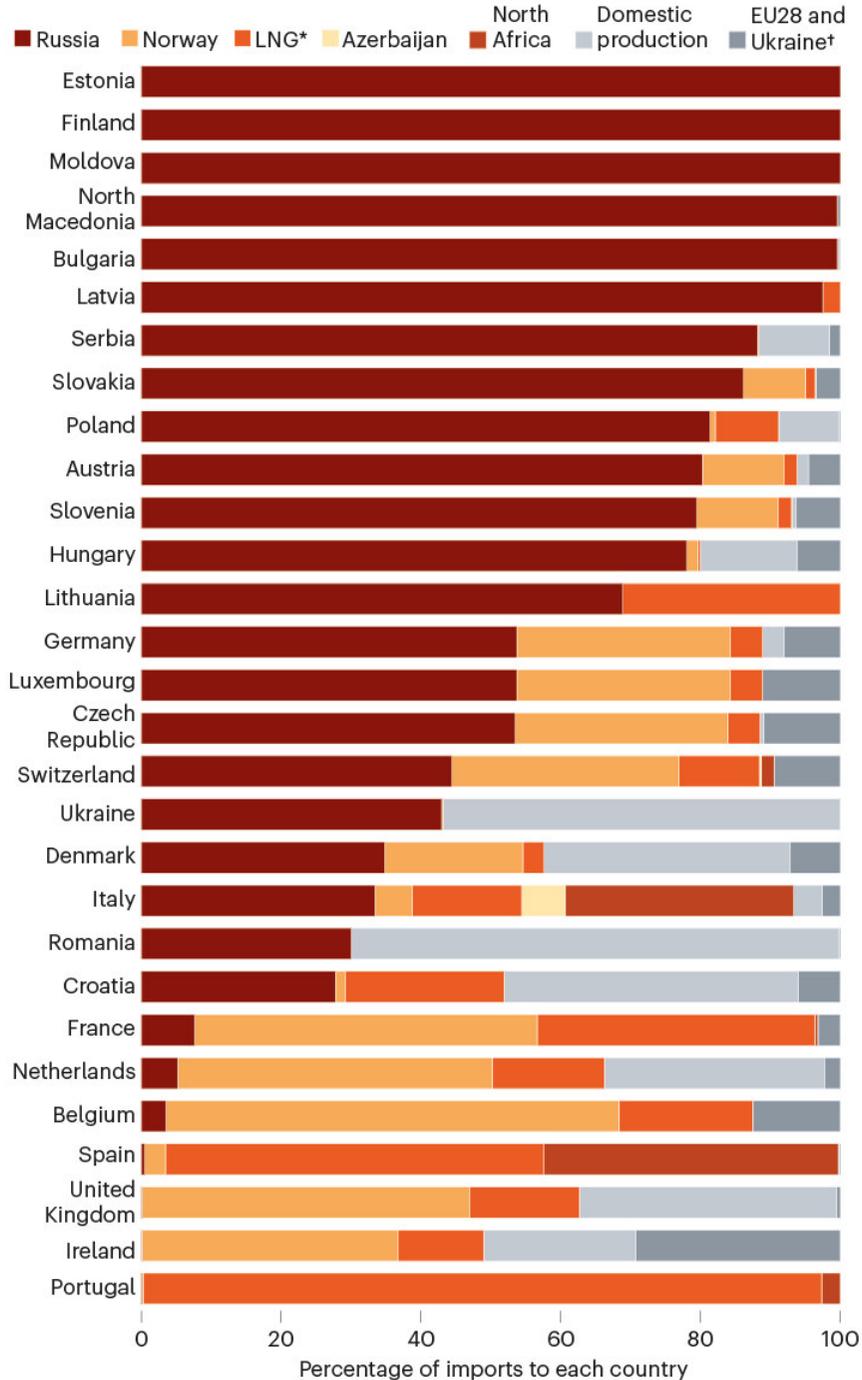


Source: World Bank
© FT

Selected countries

WHERE EUROPE GETS ITS GAS

Russia supplies about 40% of the natural gas to the European Union overall, but many individual countries receive a much higher proportion.



*LNG, liquefied natural gas imports.

*Does not include nation's own production. The UK left the EU28 in January 2020.

Embora a guerra na Ucrânia vá provavelmente acelerar a transição energética na Europa, poderá contudo retardar a transição energética global, aumentando as emissões de gases com efeito de estufa noutras partes do mundo, receia Nikos Tsafos, que acompanha a energia global e a geopolítica no Center for Strategic and International Studies, um grupo de reflexão em Washington DC.

O sudeste asiático, em particular, poderia voltar para o carvão, se a Europa efetivamente necessitar de grande parte do mercado internacional do gás natural liquefeito. A própria Rússia, que foi responsável por quase 5% das emissões globais em 2020 é pouco provável que avance com a descarbonização, na ausência de um compromisso político e económico internacional.

Fonte: Tollefson, 2022, Nature

Outra questão-chave é como o aumento dos preços da energia e a potencial perda de abastecimento de cereais da Ucrânia e da Rússia irão reforçar os efeitos inflacionistas e fazer subir os preços dos alimentos e outras mercadorias. "As reverberações potenciais sobre os preços dos alimentos e, portanto, sobre os conflitos e a política em todo o mundo são vastas", diz Nathaniel Keohane, presidente do Center For Climate and Energy Solutions, um grupo de reflexão ambiental em Arlington, Virgínia.

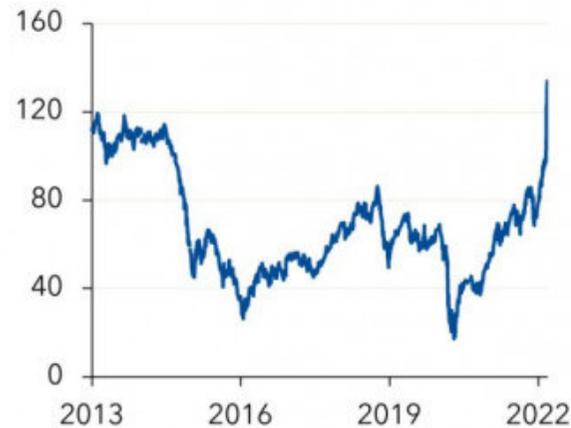
Fonte Tollefson, 2022, Nature

Growing pressures

Prices for energy, grains, and metals soared since the invasion of Ukraine, signaling that inflation rates are poised to accelerate.

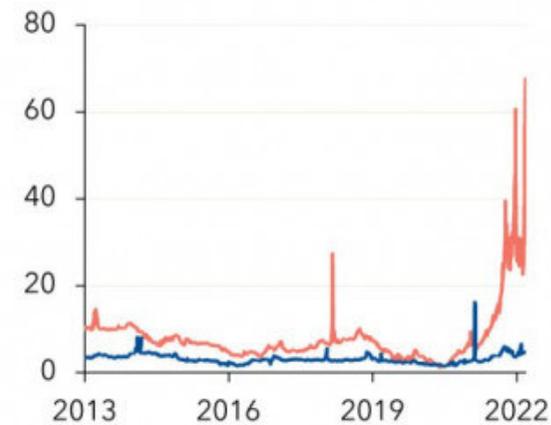
Brent Crude Oil

(\$US/barrel)



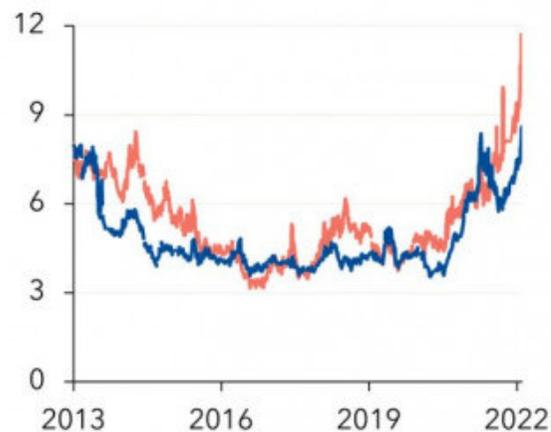
European & US Natural Gas*

(\$US/MMBtu)



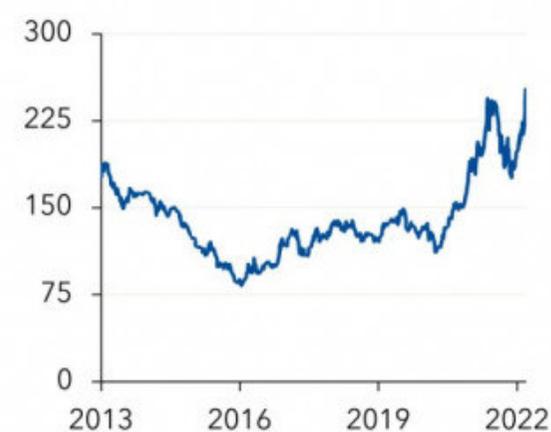
Corn, Wheat

(\$US/bushel)



Metals Index**

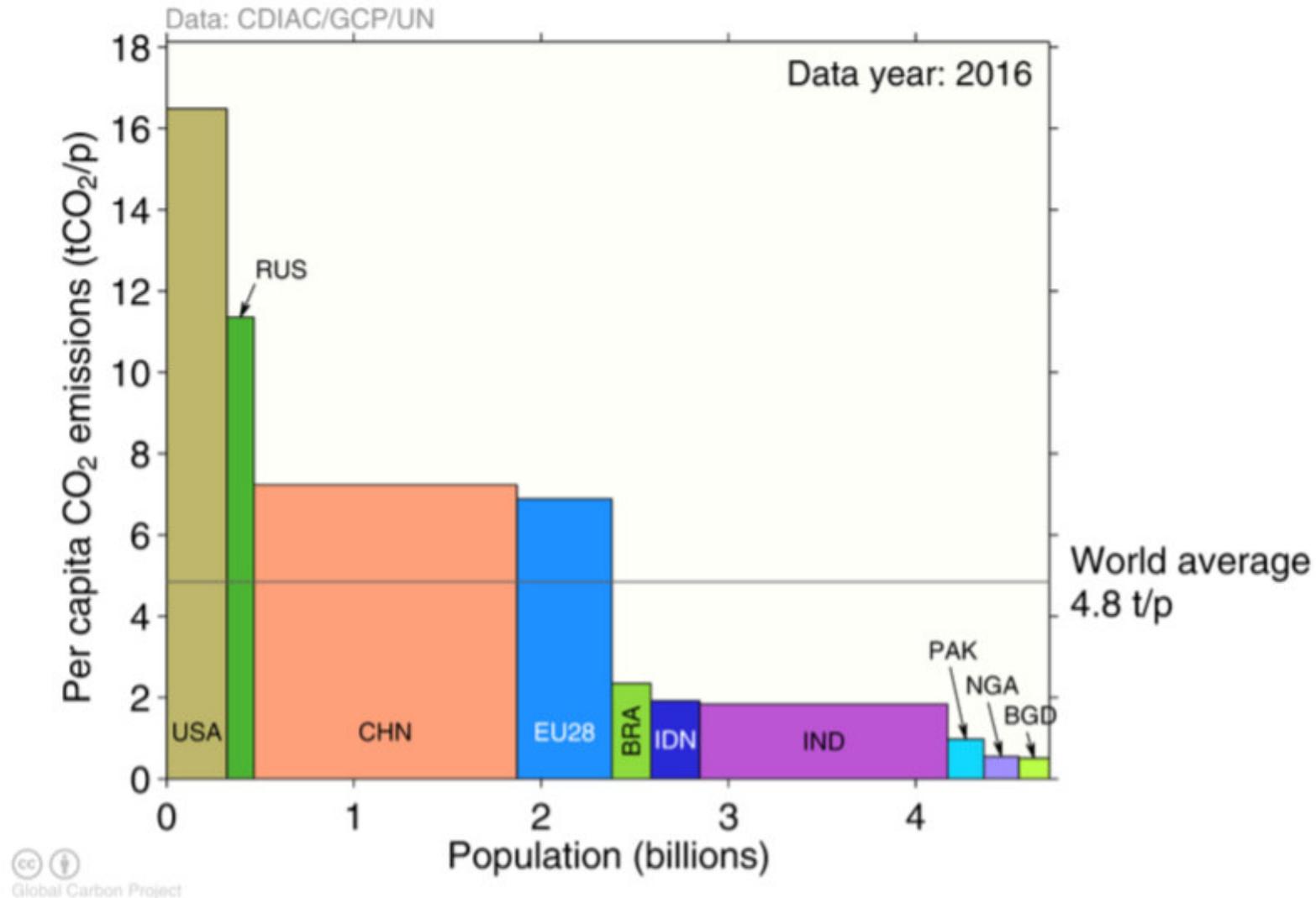
(2016=100)



Source: Bloomberg, USDA, Datastream, and IMF staff calculations.

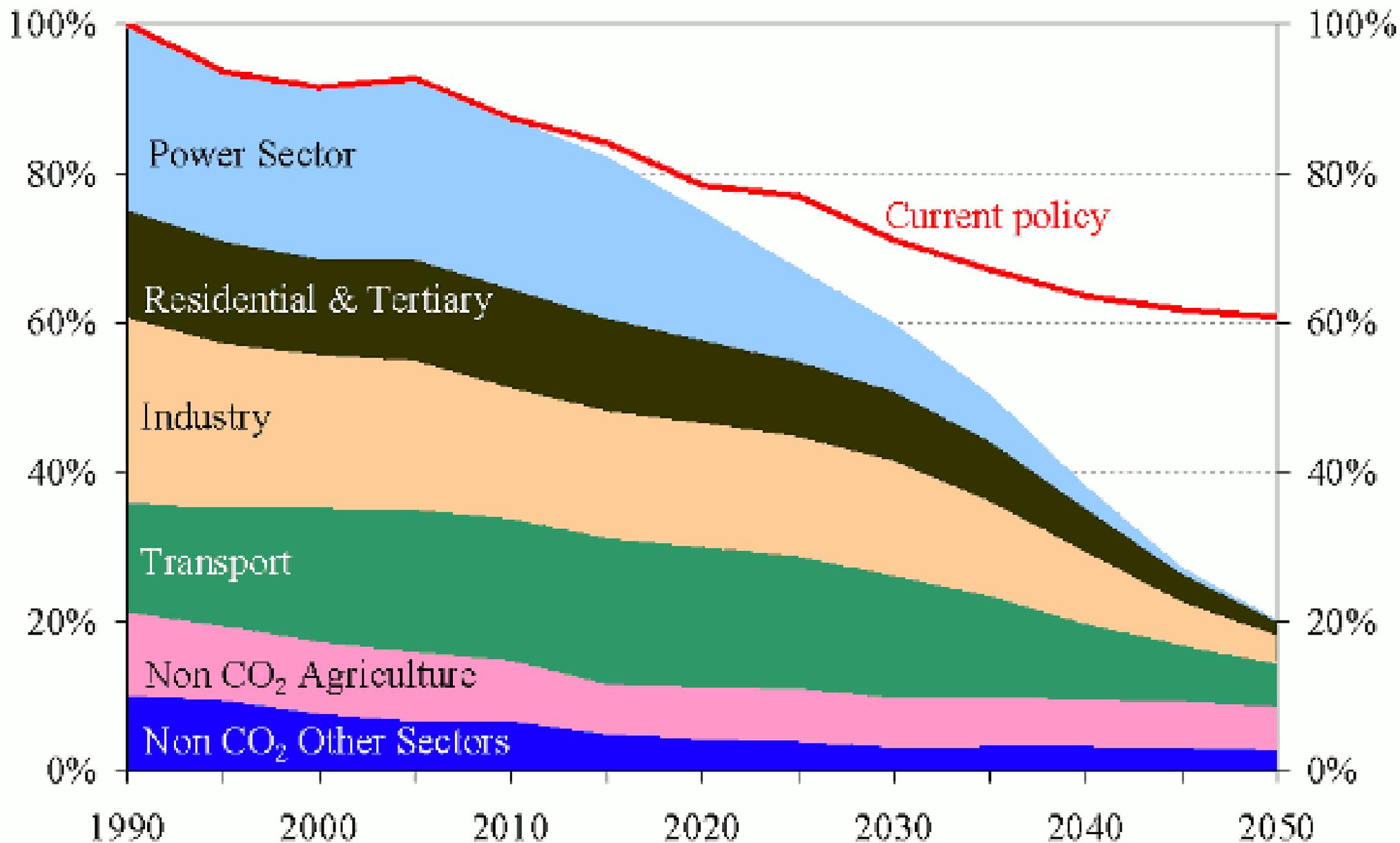
Note: *European & US natural gas prices use the Dutch TTF and Henry Hub as proxies, respectively. **Base Metals Price Index includes aluminum, cobalt, copper, iron ore, lead, molybdenum, nickel, tin, uranium, and zinc.

The 10 most populous countries span a wide range of development and emissions per person

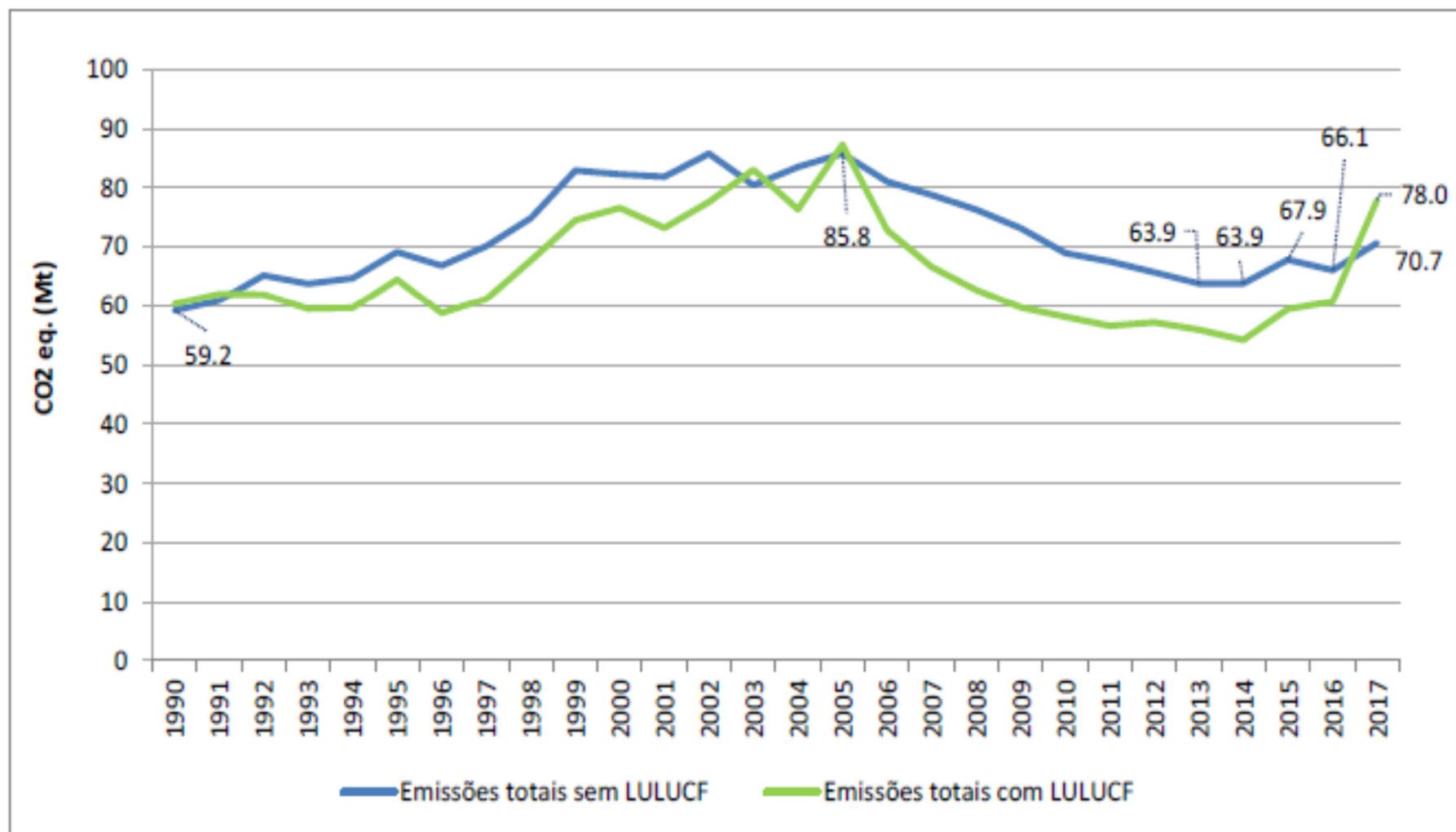


Emission per capita: CO₂ emissions from fossil fuel and industry divided by population

Source: [Global Carbon Budget 2017](#)



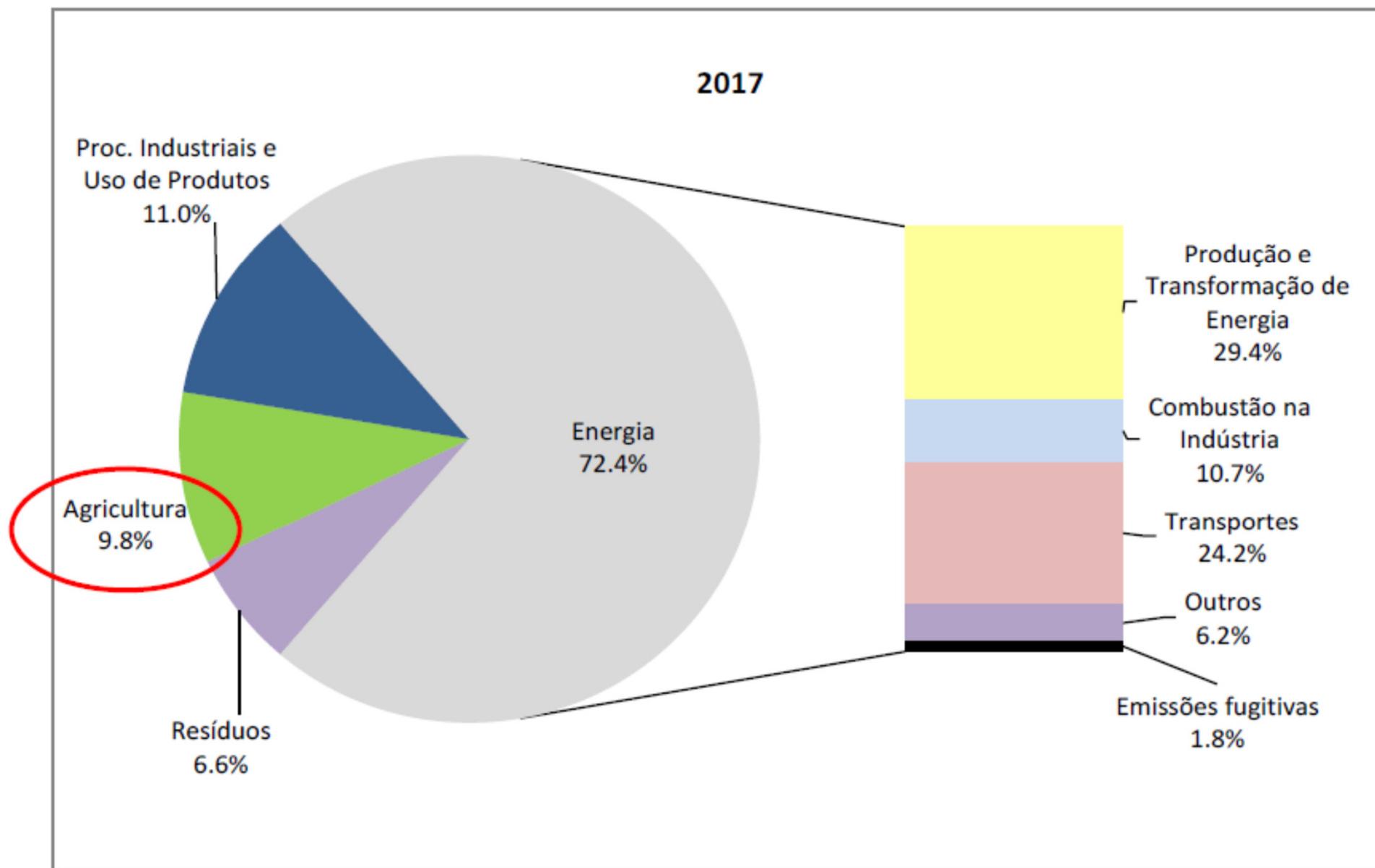
Energy Transition Roadmap EU, 2050, UE



Fonte. APA

Fatores de evolução:

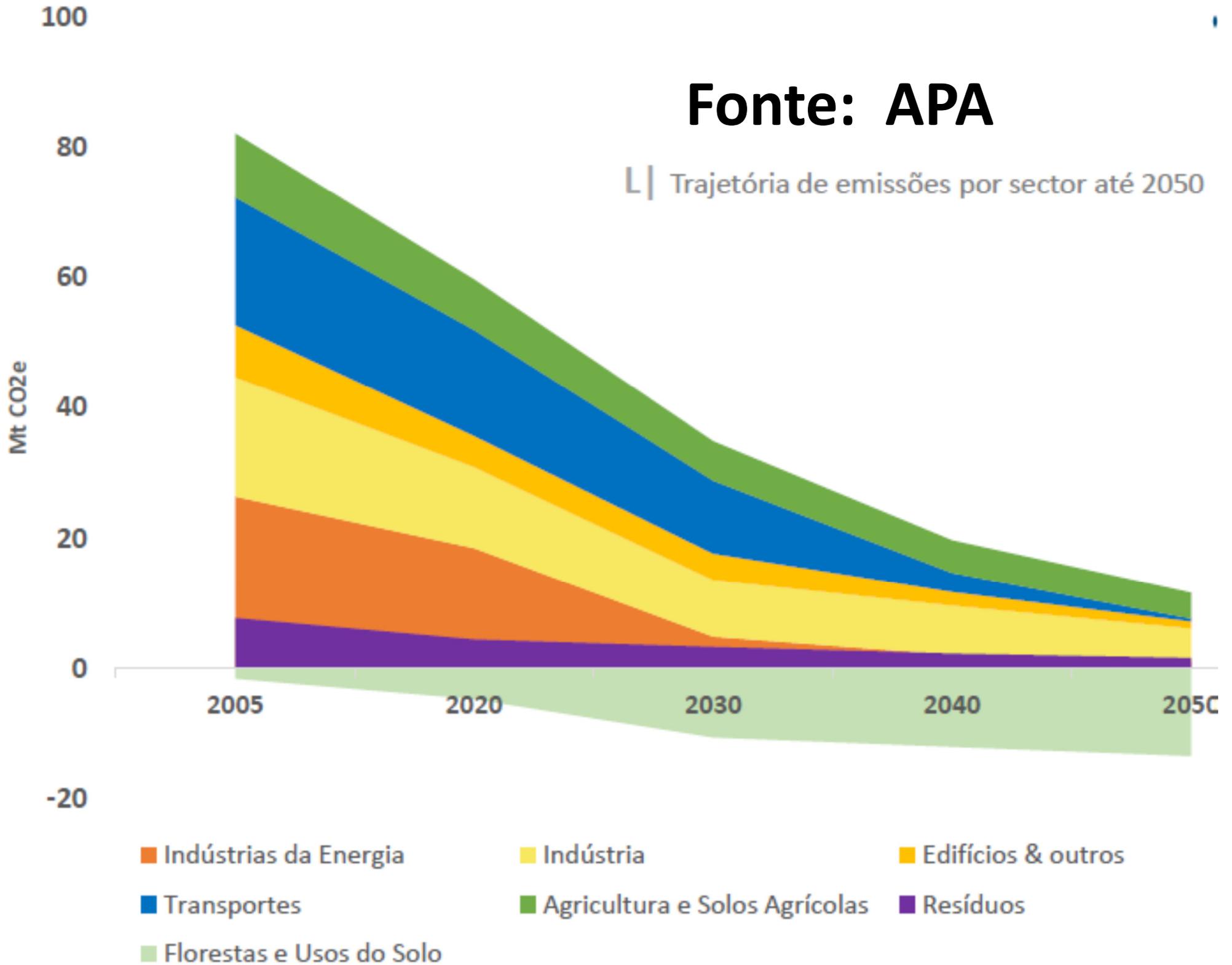
- Aumento de emissões até 2005, motivado por crescimento económico
- A partir de 2005 introdução de renováveis e gás natural, melhorias na eficiência e a partir de 2010 crise económica
- De 2013 em diante voltam a crescer emissões, onde as secas foram um dos fatores causadores (menos hídrica, mais carvão para produzir eletricidade)



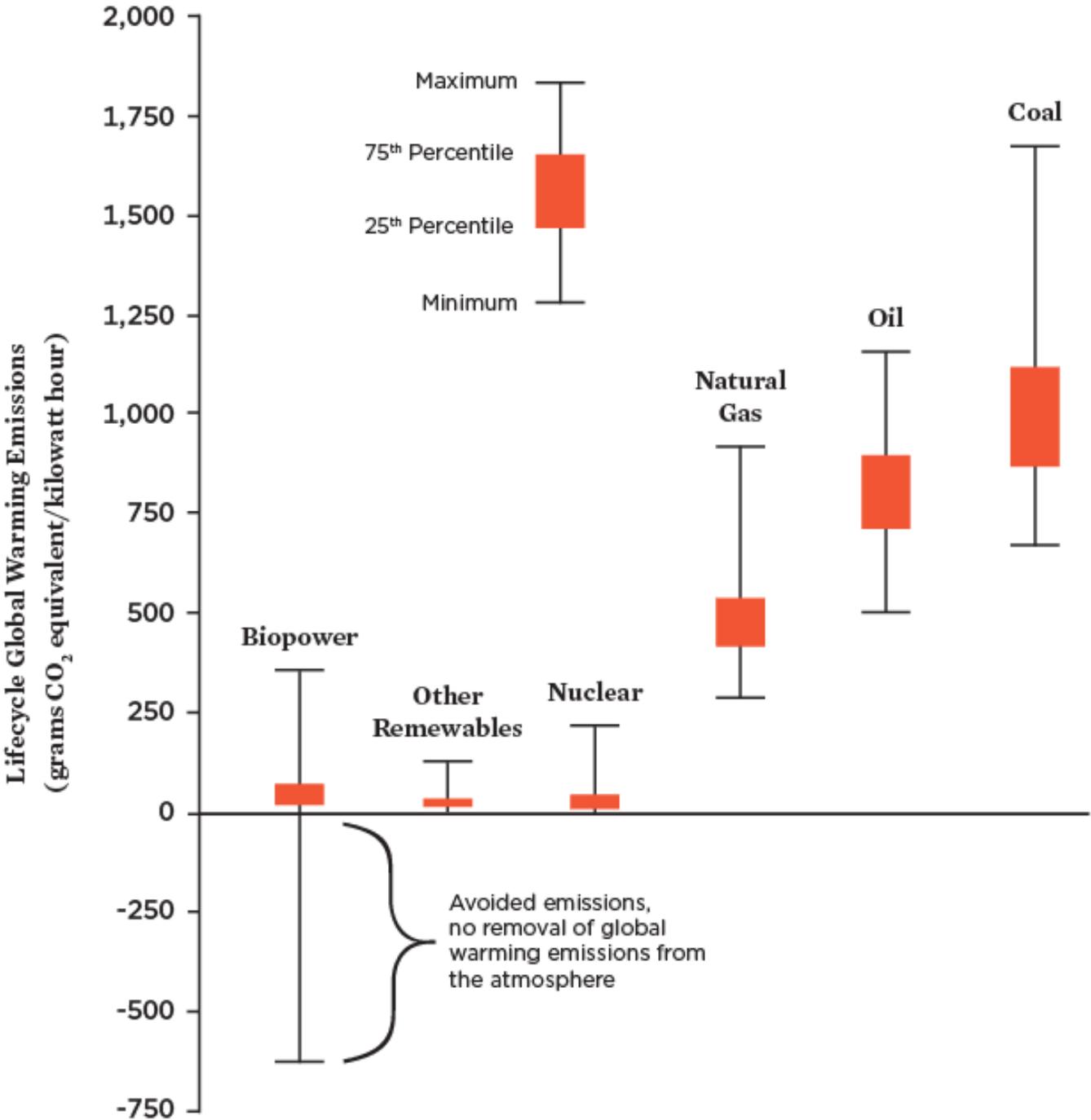
As emissões associadas ao uso dos combustíveis fósseis, contabilizadas no setor Energia, são responsáveis por mais de 70% das emissões nacionais

Fonte: APA

L | Trajetória de emissões por sector até 2050



Comparing Global Warming Emissions of Energy Sources



World GDP Depends on Energy Consumption

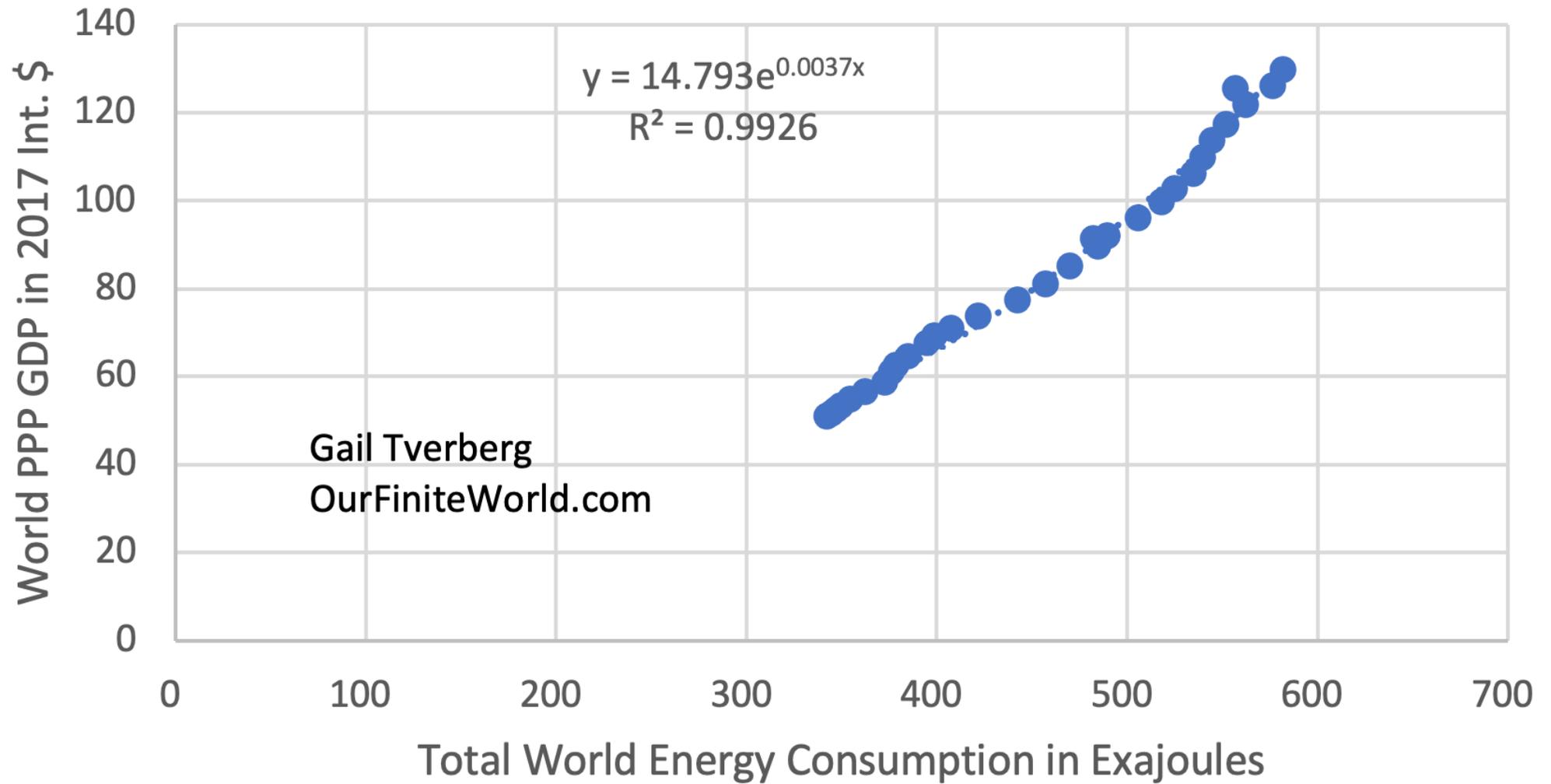


Figure 3. X,Y graph of world energy consumption for the period 1990 to 2020, based on energy data from BP's 2021 Statistical Review of World Energy and world Purchasing Power Parity GDP in 2017 International Dollars, as published by the World Bank.

- 1 -A Agência Internacional de Energia projeta um aumento de quase 50% no consumo mundial de energia até 2050, liderado pelo aumento da procura na Ásia.**
- 2 - A eficiência energética é cada vez mais imprescindível**
- 3 - Desde 1970 os combustíveis fósseis constituem cerca de 80% das fontes primárias globais de energia.**
- 4 - Como efetuar a descarbonização face a uma procura crescente de energia, cujo preço aumentou devido à guerra na Europa e às sanções?**
- 5 - O Presidente Joe Biden deu o seu mais forte apoio ao petróleo e ao gás natural em 31 de março, ordenando uma libertação de um milhão de barris de petróleo por dia das reservas estratégicas dos EUA até um total de 180 milhões de barris e aumentando as exportações de gás natural proveniente do fracking – fraturamento hidráulico para a Europa.**
- 6 - Biden implorou às companhias petrolíferas que repudiassem as exigências de Wall Street (e da Arábia Saudita, UAE e outros) de lucros recordes e, em vez disso, cumprissem a sua "obrigação" de aumentar a produção de crude. Porém, sem resultado! Recentes decisões do Supremo Tribunal de Justiça dos EUA sobre GEE.**

■ United States ■ China ■ No data

2000†



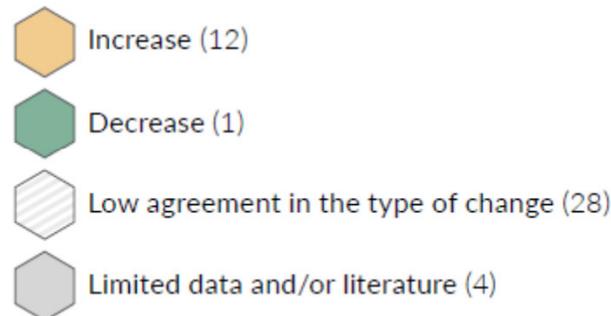
2020†



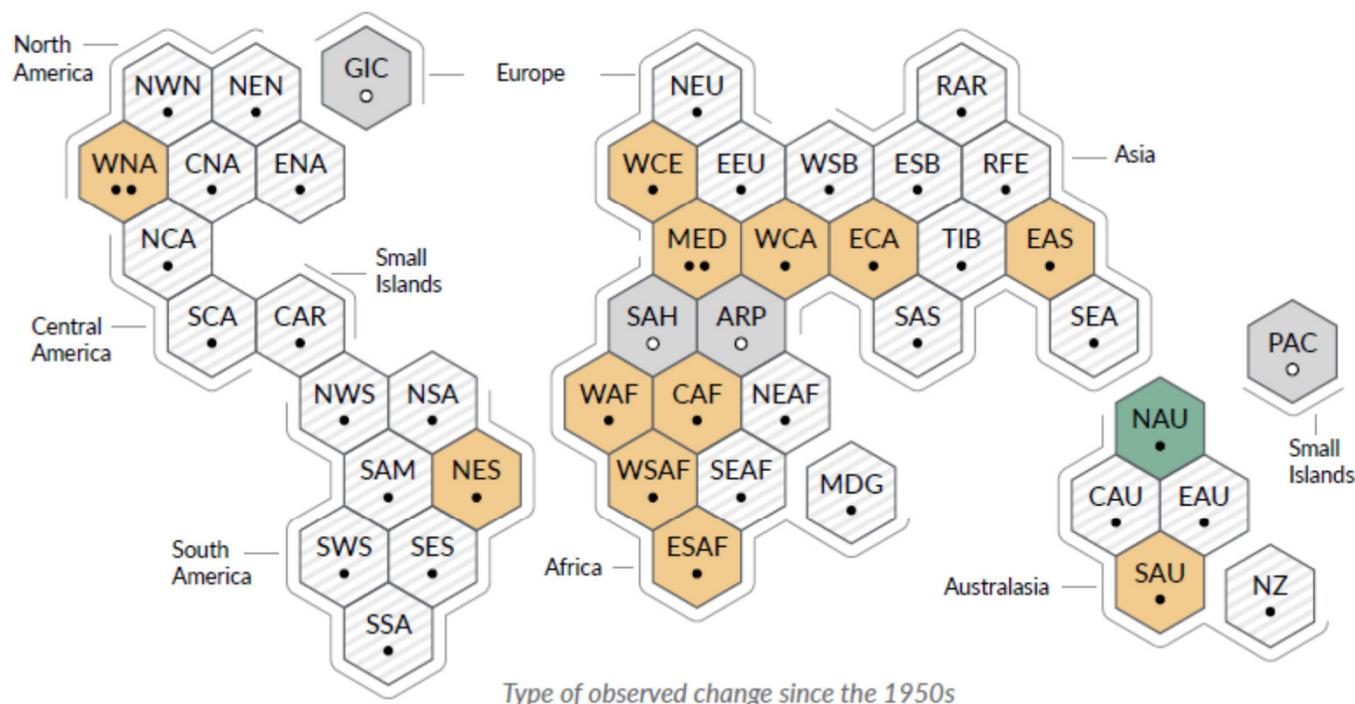
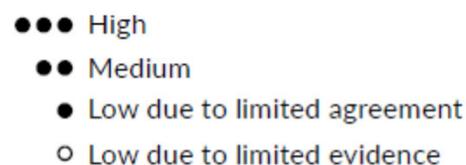
Em azul, os países do mundo que têm os Estados Unidos como principal parceiro comercial. Em laranja, os que têm a China. Na foto acima: ano 2000 e a de baixo: 2020.
Fonte: The Economist.

c) Synthesis of assessment of observed change in agricultural and ecological drought and confidence in human contribution to the observed changes in the world's regions

Type of observed change in agricultural and ecological drought



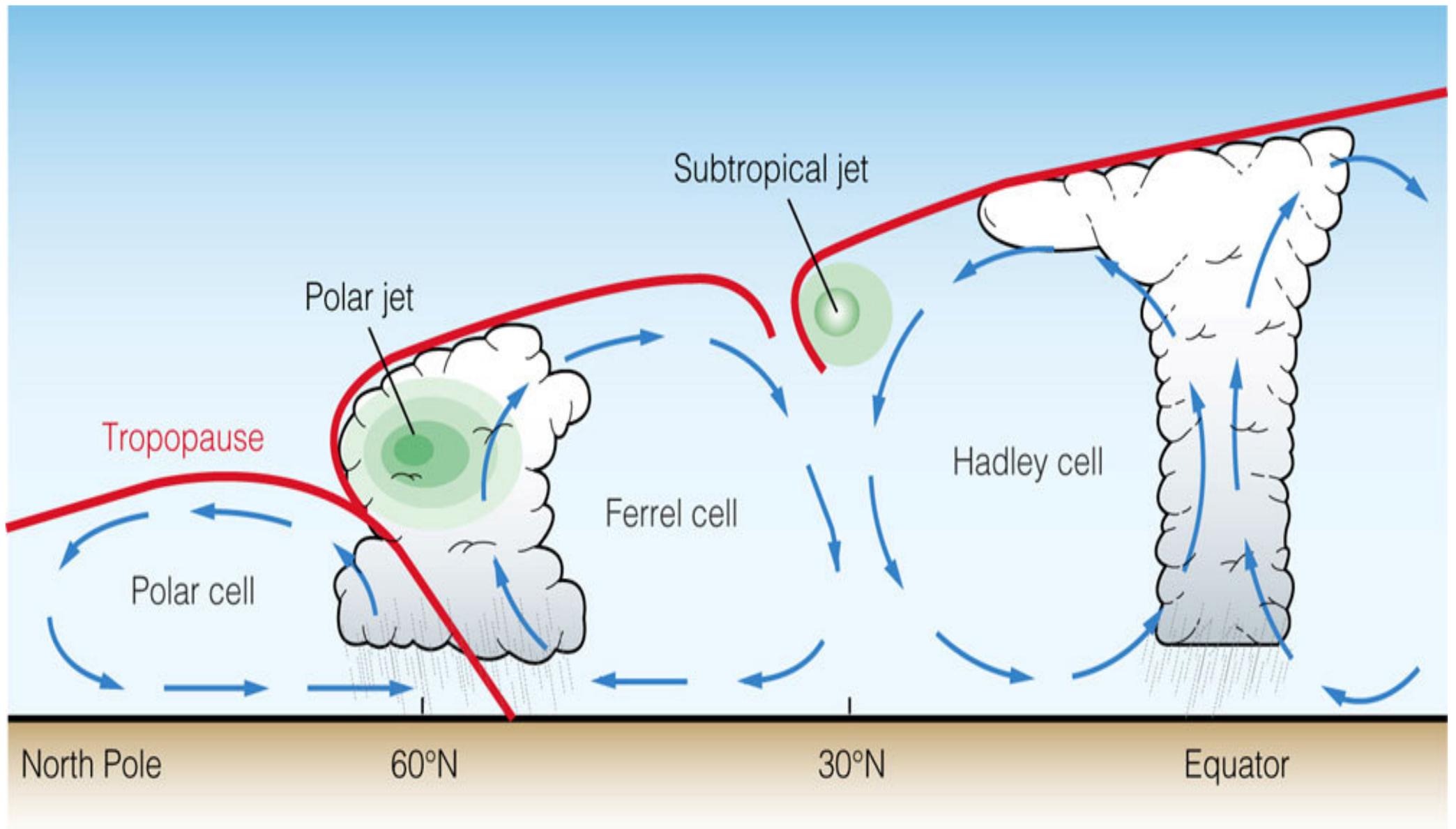
Confidence in human contribution to the observed change



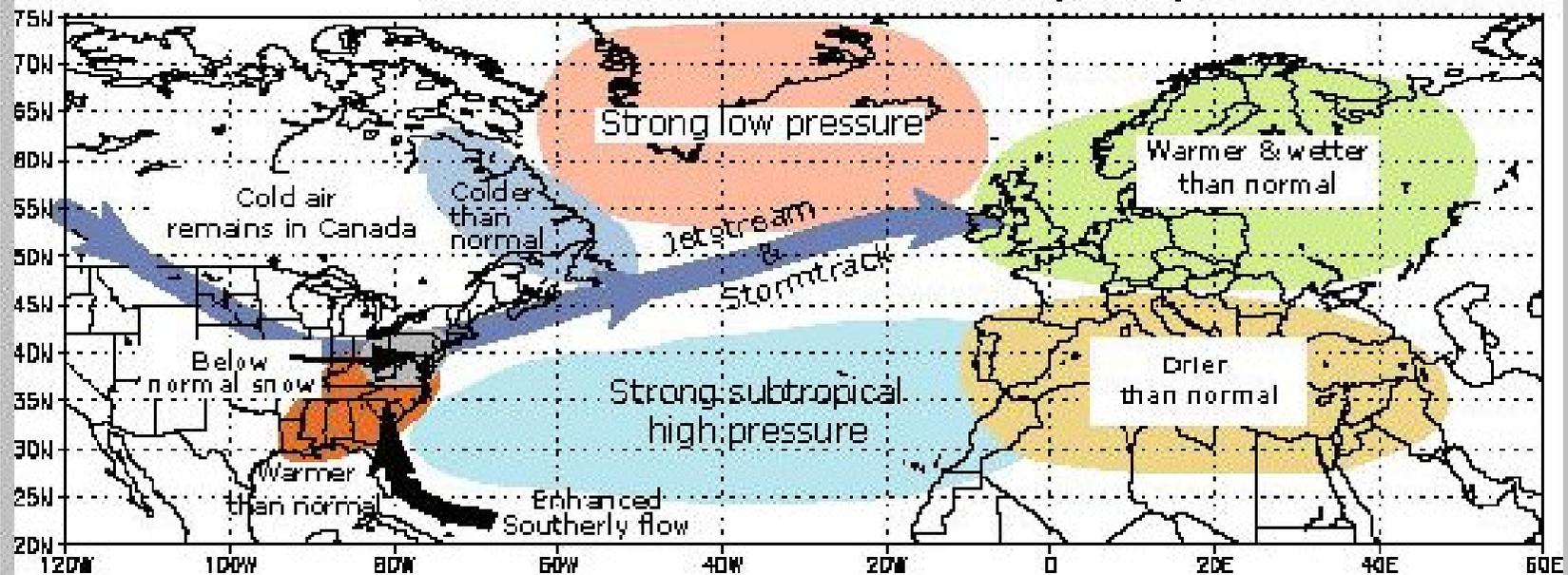
Each hexagon corresponds to one of the IPCC AR6 WGI reference regions



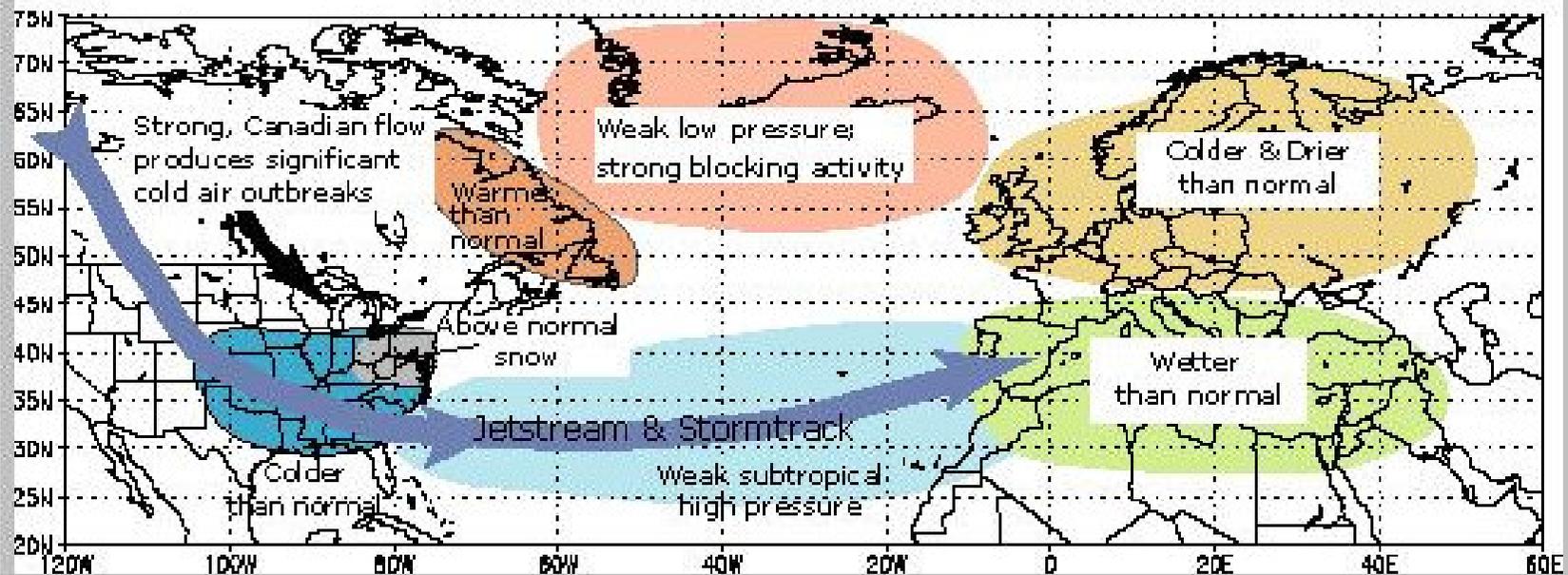
IPCC AR6 WGI reference regions: **North America:** **NWN** (North-Western North America), **NEN** (North-Eastern North America), **WNA** (Western North America), **CNA** (Central North America), **ENA** (Eastern North America), **Central America:** **NCA** (Northern Central America), **SCA** (Southern Central America), **CAR** (Caribbean), **South America:** **NWS** (North-Western South America), **NSA** (Northern South America), **NES** (North-Eastern South America), **SAM** (South American Monsoon), **SWS** (South-Western South America), **SES** (South-Eastern South America), **SSA** (Southern South America), **Europe:** **GIC** (Greenland/Iceland), **NEU** (Northern Europe), **WCE** (Western and Central Europe), **EEU** (Eastern Europe), **MED** (Mediterranean), **Africa:** **MED** (Mediterranean), **SAH** (Sahara), **WAF** (Western Africa), **CAF** (Central Africa), **NEAF** (North Eastern Africa), **SEAF** (South Eastern Africa), **WSAF** (West Southern Africa), **ESAF** (East Southern Africa), **MDG** (Madagascar), **Asia:** **RAR** (Russian Arctic), **WSB** (West Siberia), **ESB** (East Siberia), **RFE** (Russian Far East), **WCA** (West Central Asia), **ECA** (East Central Asia), **TIB** (Tibetan Plateau), **EAS** (East Asia), **ARP** (Arabian Peninsula), **SAS** (South Asia), **SEA** (South East Asia), **Australasia:** **NAU** (Northern Australia), **CAU** (Central Australia), **EAU** (Eastern Australia), **SAU** (Southern Australia), **NZ** (New Zealand), **Small Islands:** **CAR** (Caribbean), **PAC** (Pacific Small Islands)



Positive Phase of the Wintertime North Atlantic Oscillation (NAO)



Negative Phase of the Wintertime North Atlantic Oscillation (NAO)



Número de vítimas e perdas provocadas por inundações no período de 1970-2019

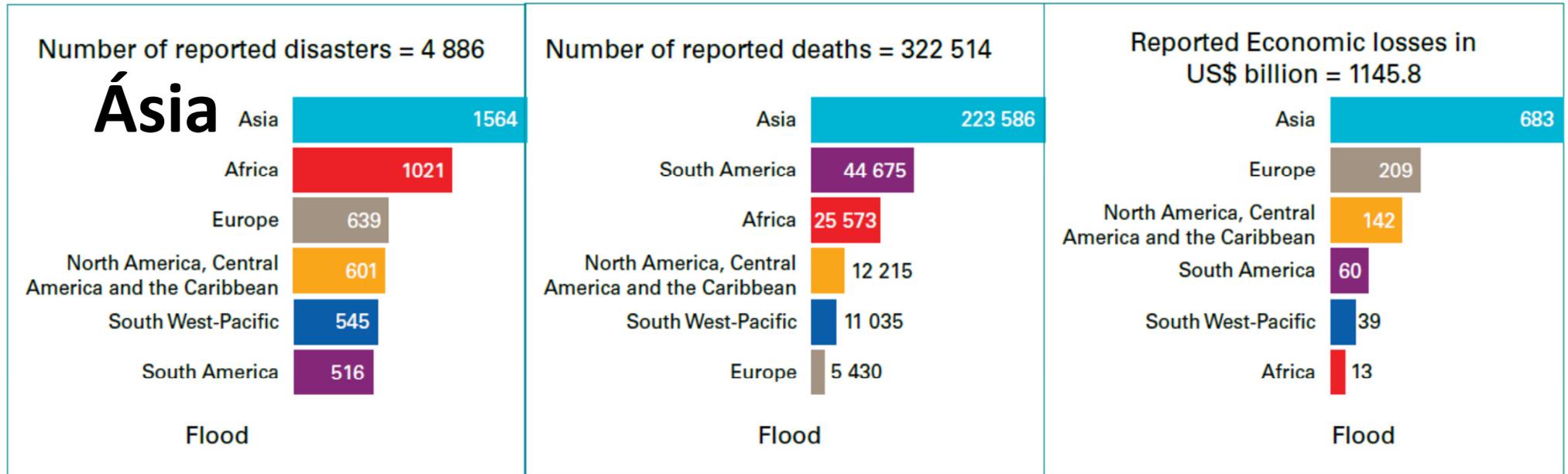


Figure 3: Distributions of flood-related disasters and related losses by region, 1970-2019.³⁹

Fonte: WMO, 2021, State of the Climate Services, Water

Número de vítimas e perdas provocadas por secas no período de 1970-2019

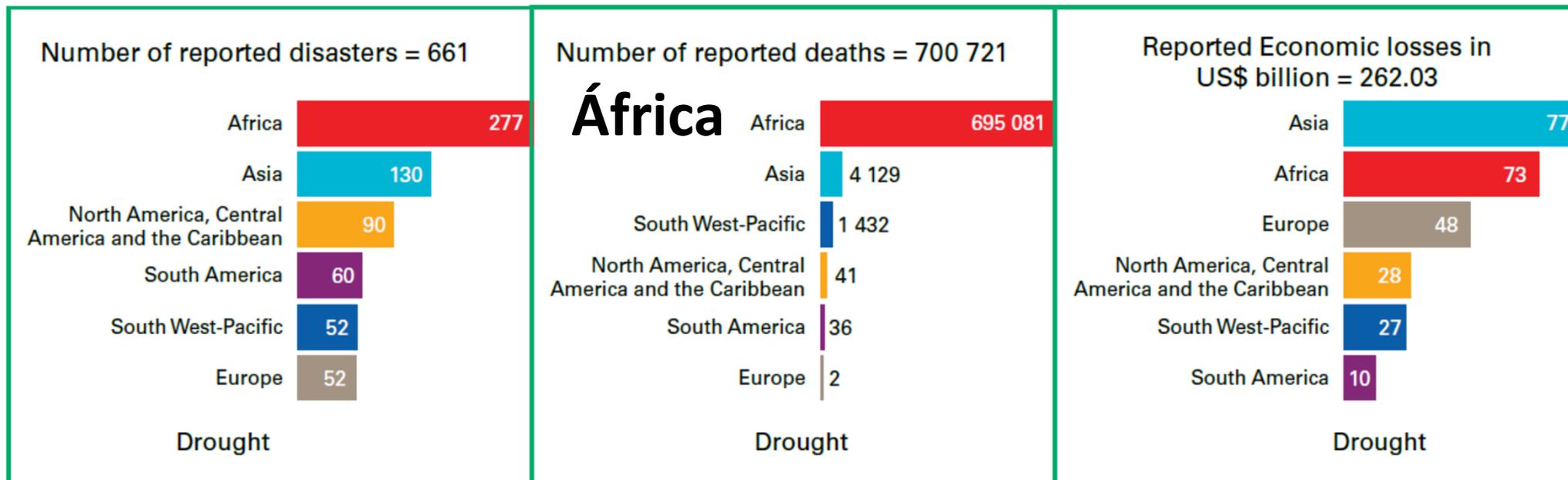


Figure 4: Distributions of drought-related disasters and related losses by region, 1970-2019.⁴⁰

Fonte: WMO, 2021, State of the Climate Services, Water

“Temos a eletricidade ‘verde’ mais barata da Europa, assim a saibamos aproveitar”, realçou Jorge Vasconcelos, lembrando que os custos do quilowatt-hora fotovoltaico na Península Ibérica são cerca de metade dos do norte da Europa.