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Digitalization, climate change and justice

Elena Verdolini, PhD.

Università degli Studi di Brescia
RFF-CMCC European Institute on Economics and the Environment,
Centro Euro-Mediterraneo sui Cambiamenti Climatici

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RFF CMCC European Institute on Economics and the Environment

AdJUST Towards a just energy transition

erc European Research Council Established by the European Commission

2D4D Disruptive Digitalization for Decarbonization

UNIVERSITÀ DEGLI STUDI DI BRESCIA

This research has received funding from the European Union's research and innovation programmes Horizon Europe (G.A. 101069880) and Horizon2020 (G.A. 853487) and the Italian PRIN2020 (Code 2020HKPNPL)

Outline

- Climate change
- Key messages from AR6
- What role for digitalization?
- And what about justice?

Climate change

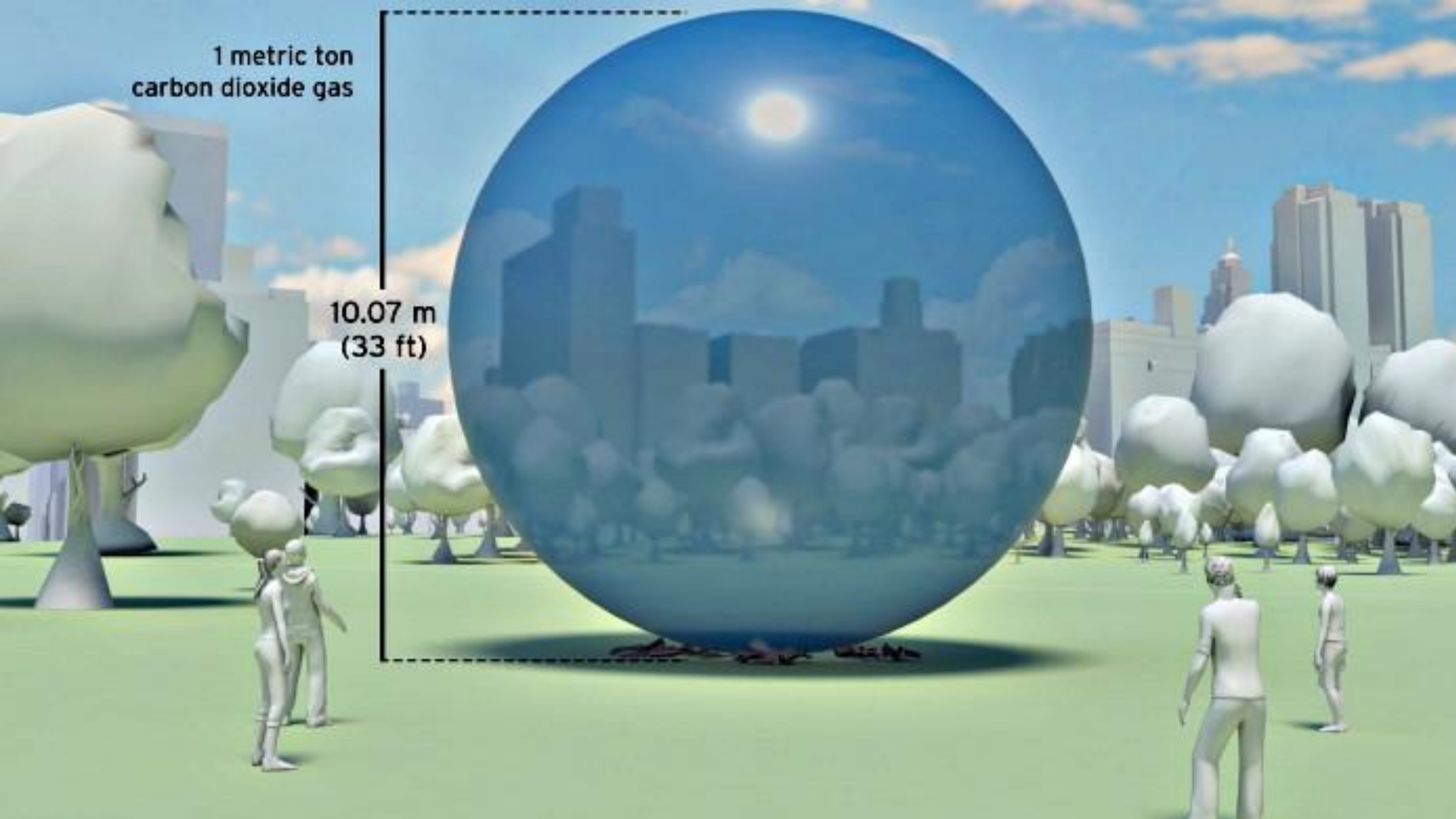
The problem

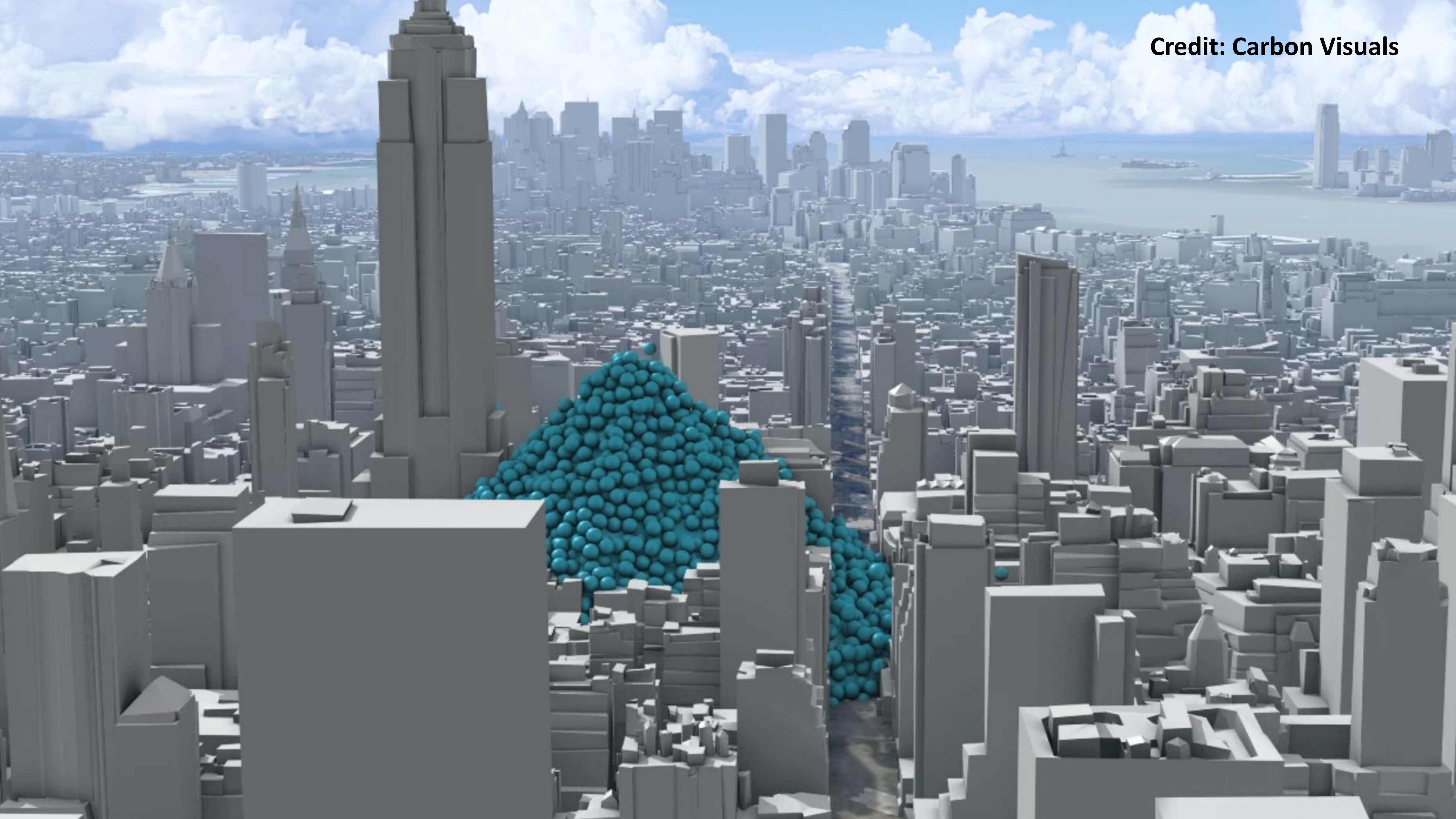
Climate change

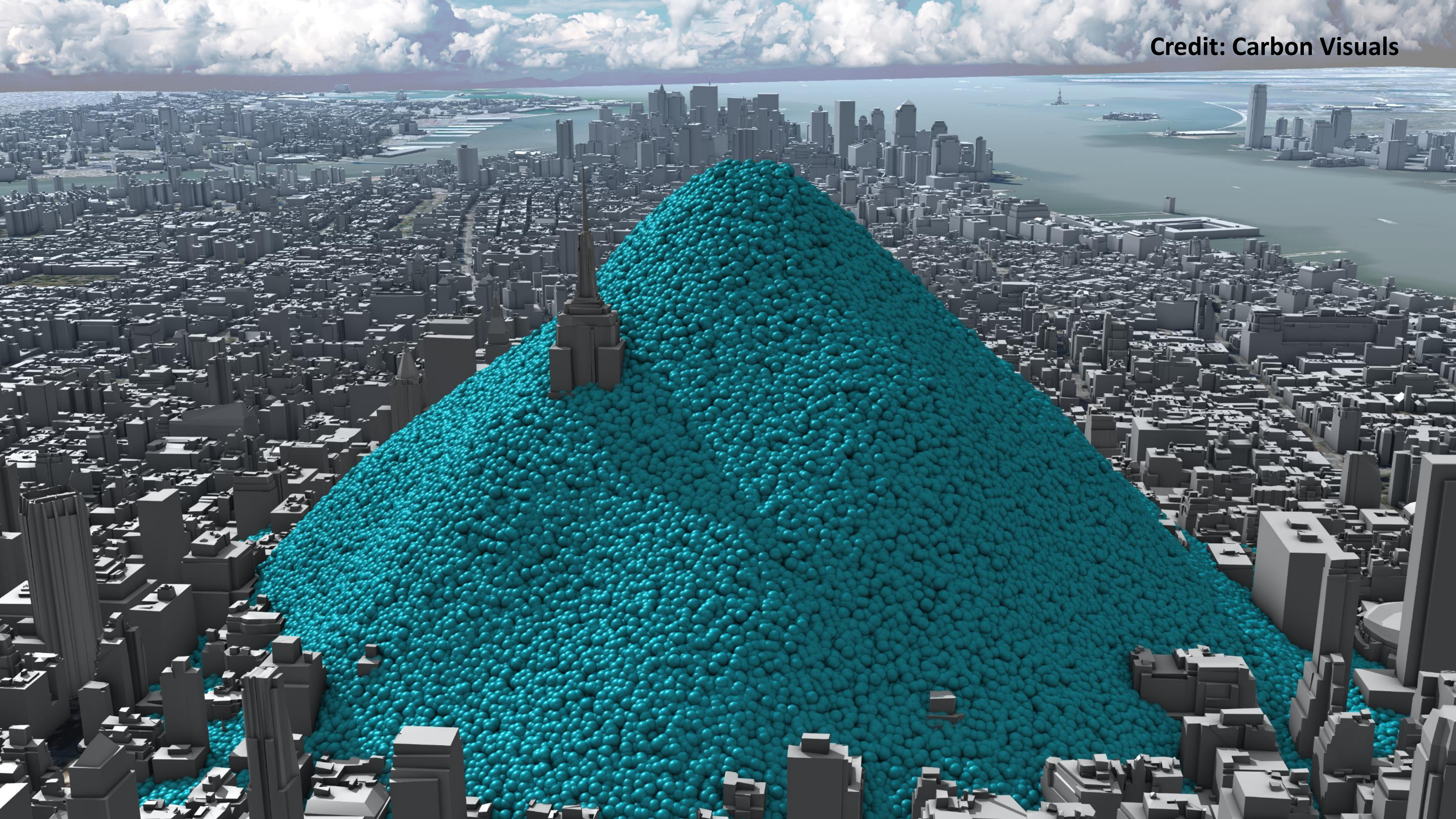
Framework Convention on Climate Change (UNFCCC), art. 1

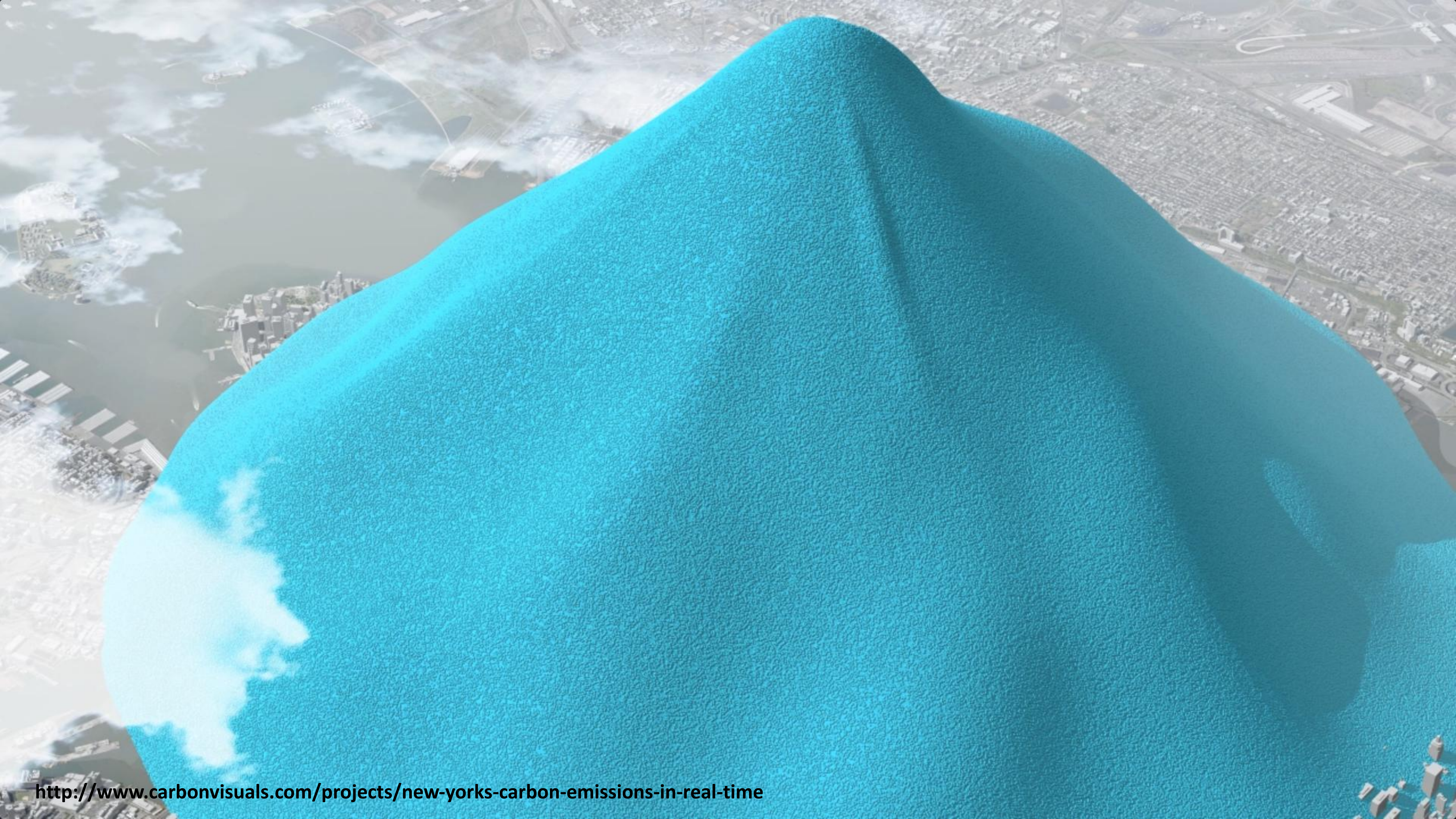
‘a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere, and which is in addition to natural climate variability observed over comparable time periods.’

Climate change is due to an increase in GHG concentrations in the atmosphere due to anthropogenic emissions


1 metric ton
carbon dioxide gas
10.07 m
(33 ft)

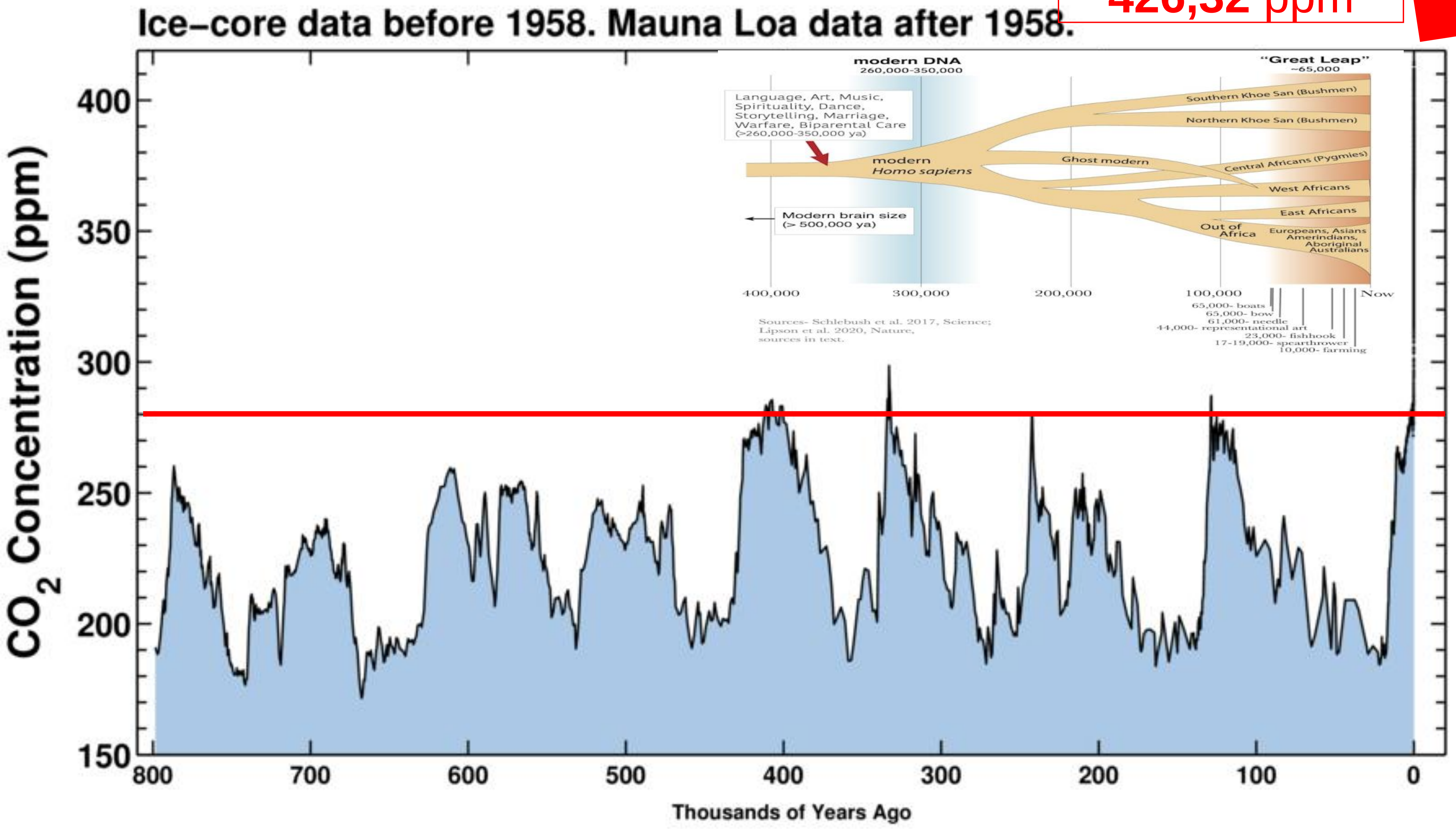

Credit: Carbon Visuals


Credit: Carbon Visuals



http://www.carbonvisuals.com/projects/new-yorks-carbon-emissions-in-real-time

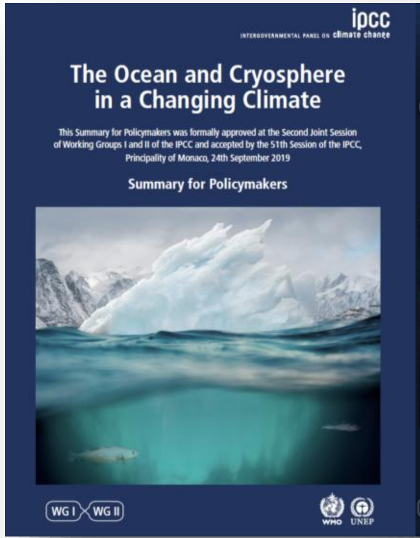
Jan 27th, 2025
426,32 ppm



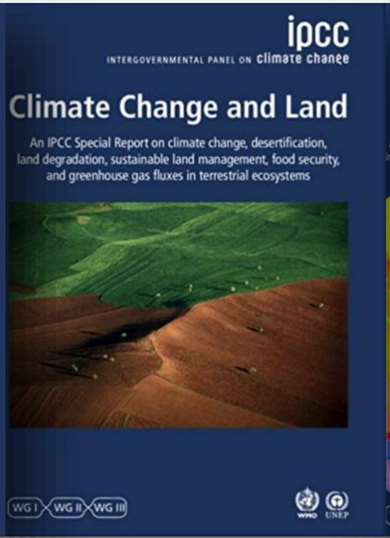
Key messages from AR6

Food for through

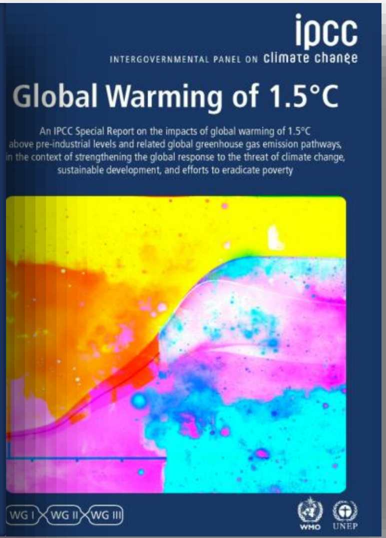
Special Reports



Ocean and Cryosphere in a Changing Climate

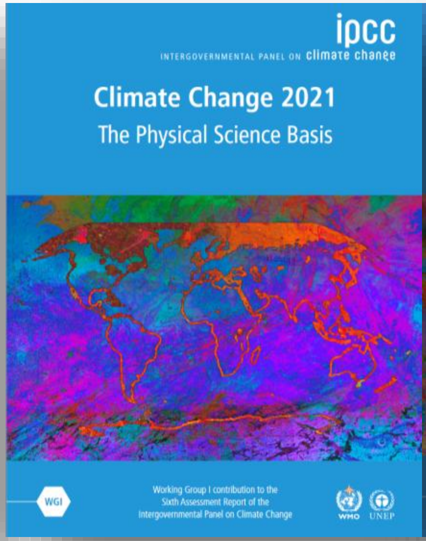


Climate Change and Land

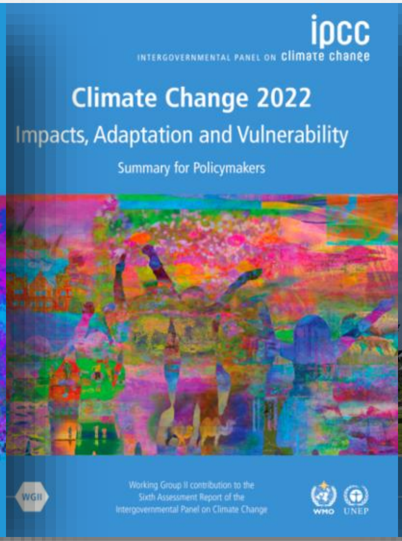


Global Warming of 1.5 ºC

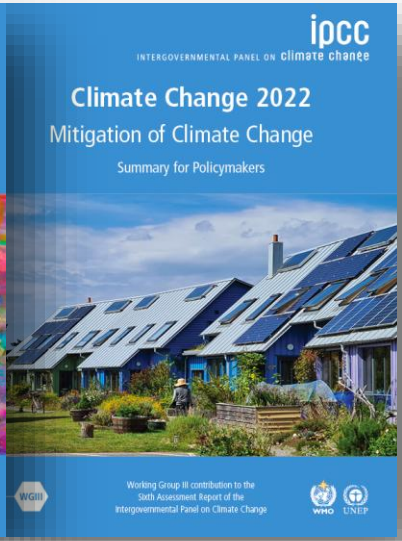
WGI



WGII



WGIII



Key messages from AR6

Food for through

IPCC (2022). “Summary for Policymakers. In: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change” [P.R. Shukla, J. Skea, R. Slade, A. Al Khourdajie, R. van Diemen, D. McCollum, M. Pathak, S. Some, P. Vyas, R. Fradera, M. Belkacemi, A. Hasija, G. Lisboa, S. Luz, J. Malley, (eds.); E. Verdolini as one of the drafting authors]. Cambridge University Press, Cambridge, UK and New York, NY, USA. (doi: 10.1017/9781009157926.001)

Blanco, G., H. de Coninck, L. Agbemabiese, E. H. Mbaye Diagne, L. Diaz Anadon, Y. S. Lim, W.A. Pengue, A.D. Sagar, T. Sugiyama, K. Tanaka, E. Verdolini, J. Witajewski-Baltvilks (2022). “Innovation, technology development and transfer”. In IPCC, 2022: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [P.R. Shukla, J. Skea, R. Slade, A. Al Khourdajie, R. van Diemen, D. McCollum, M. Pathak, S. Some, P. Vyas, R. Fradera, M. Belkacemi, A. Hasija, G. Lisboa, S. Luz, J. Malley, (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA. (doi.org/10.1017/9781009157926.018)

The climate has already changed; risks are high

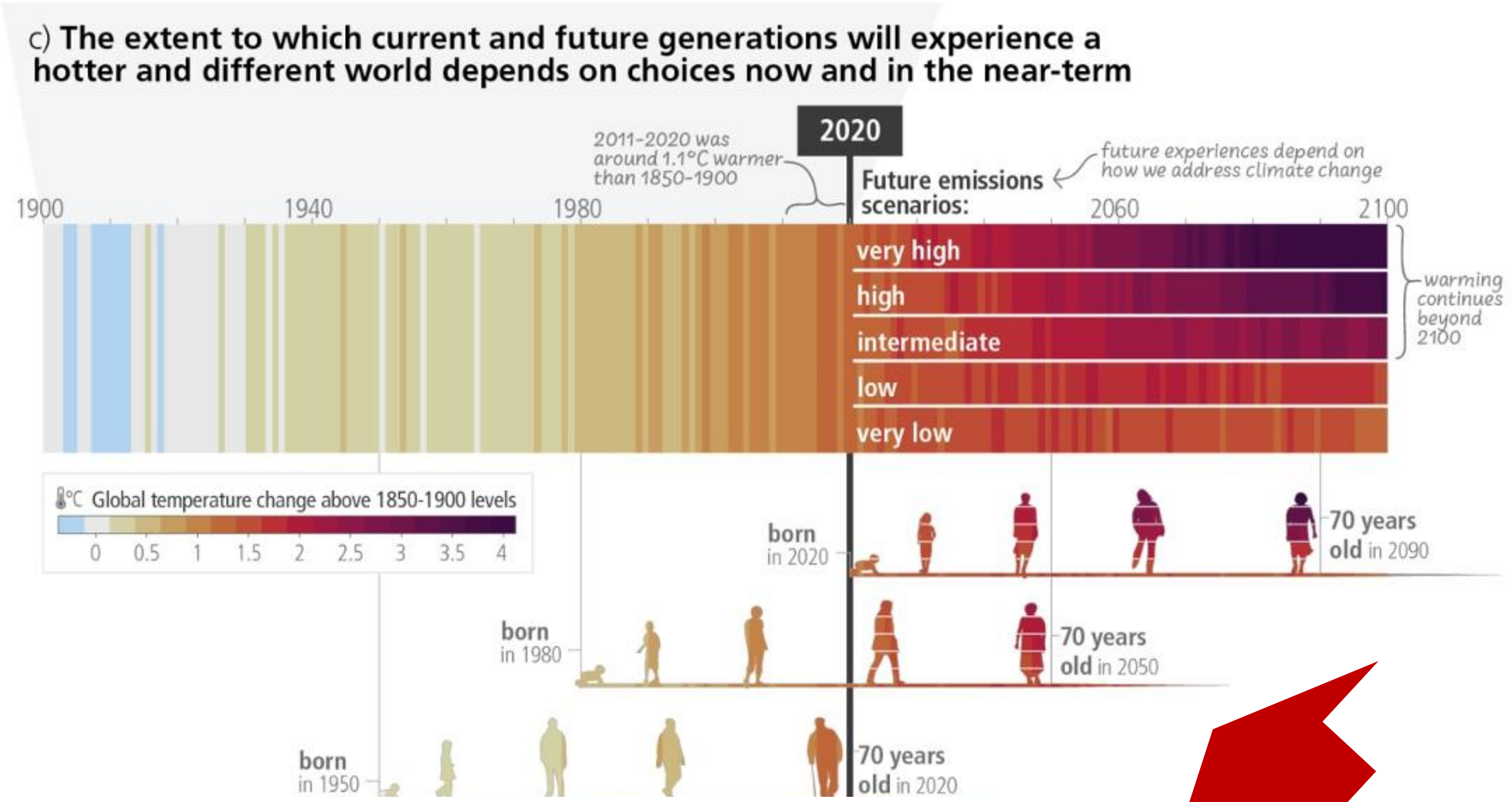
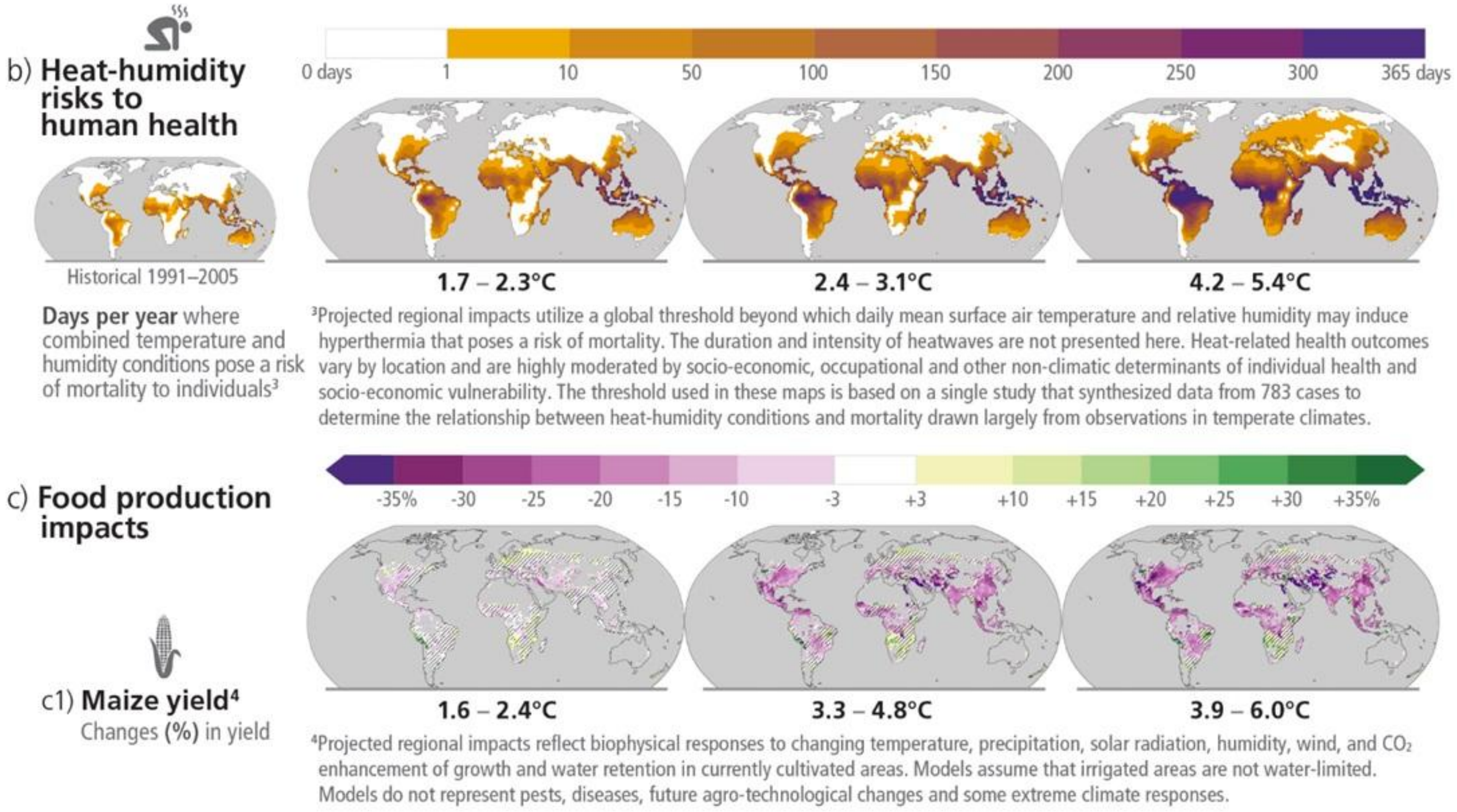


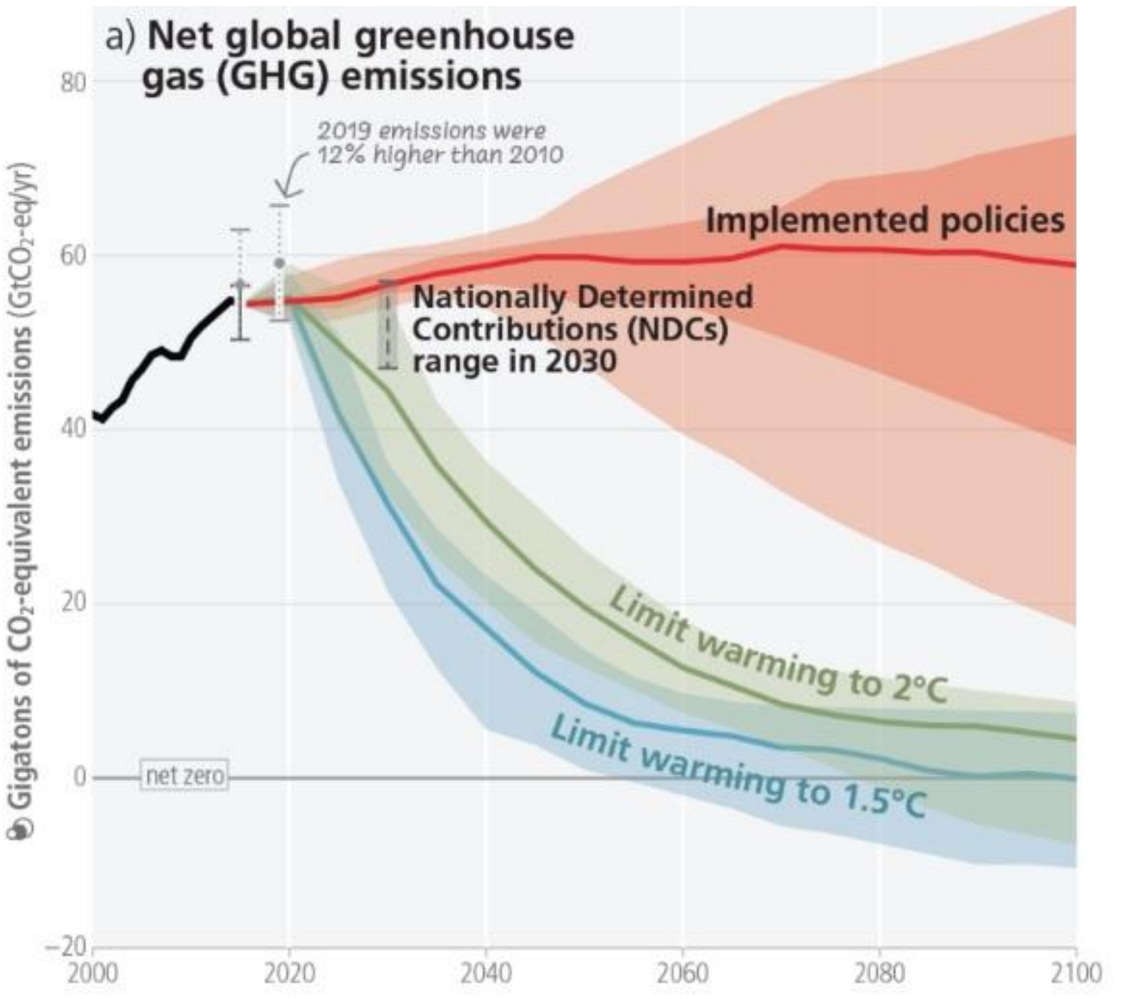
Figure SPM.1: (a) IPCC 2023 SYR

The climate has already changed; risks are high

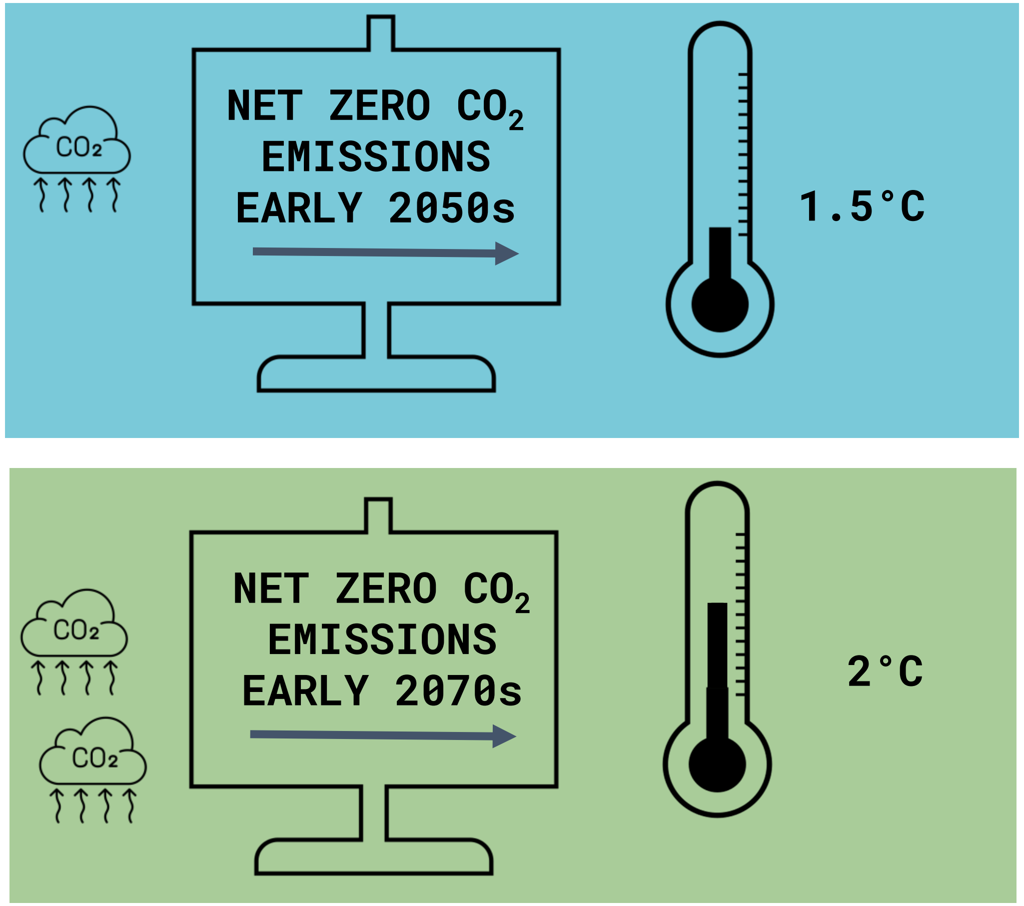


IPCC SYR SPM Figure 3

Net-zero! But we are not in line....

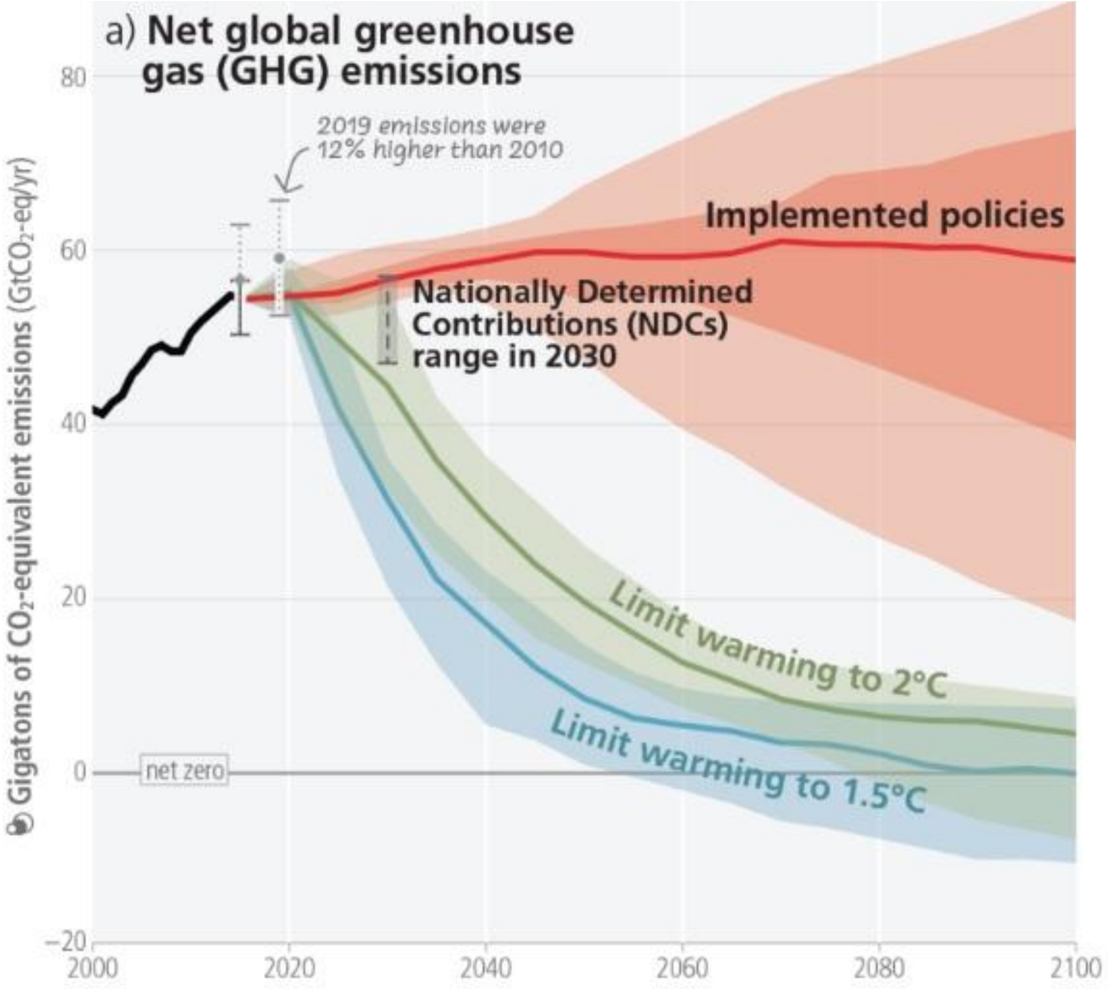


Source: IPCC SYR SPM Figure 5



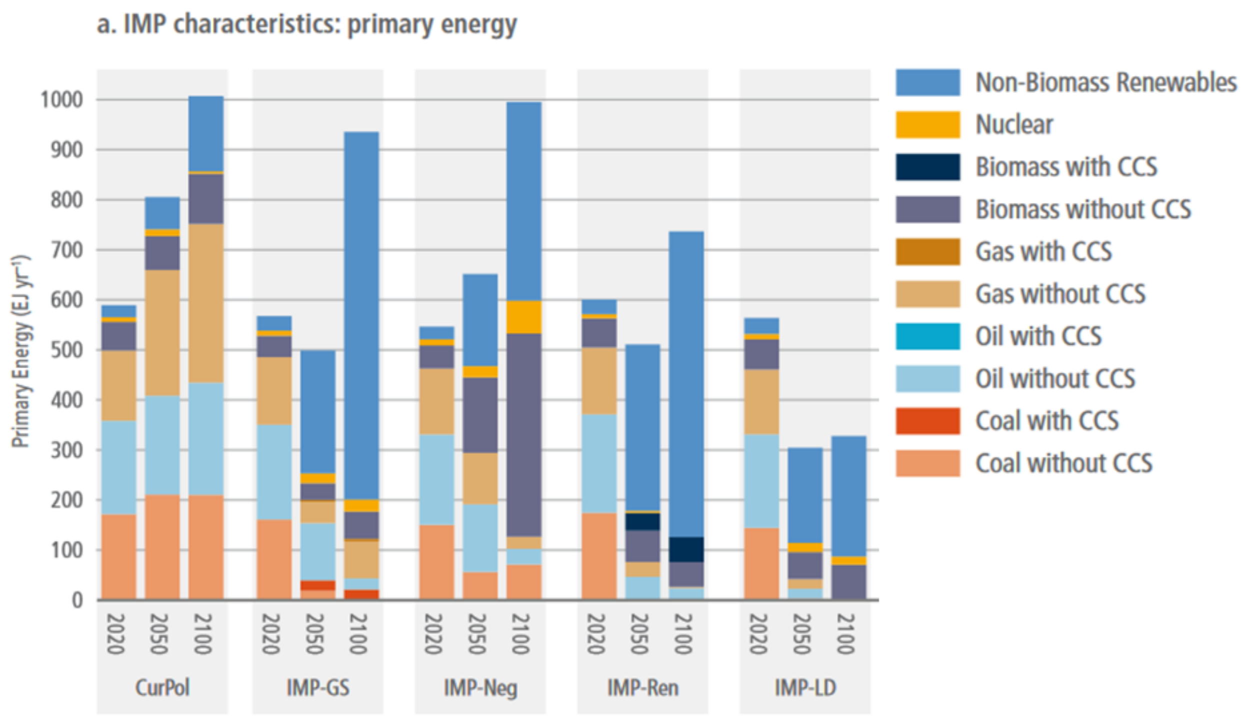
(based on IPCC-assessed scenarios)

Silver lining?



Source: IPCC SYR SPM Figure 5

Many possibilities!



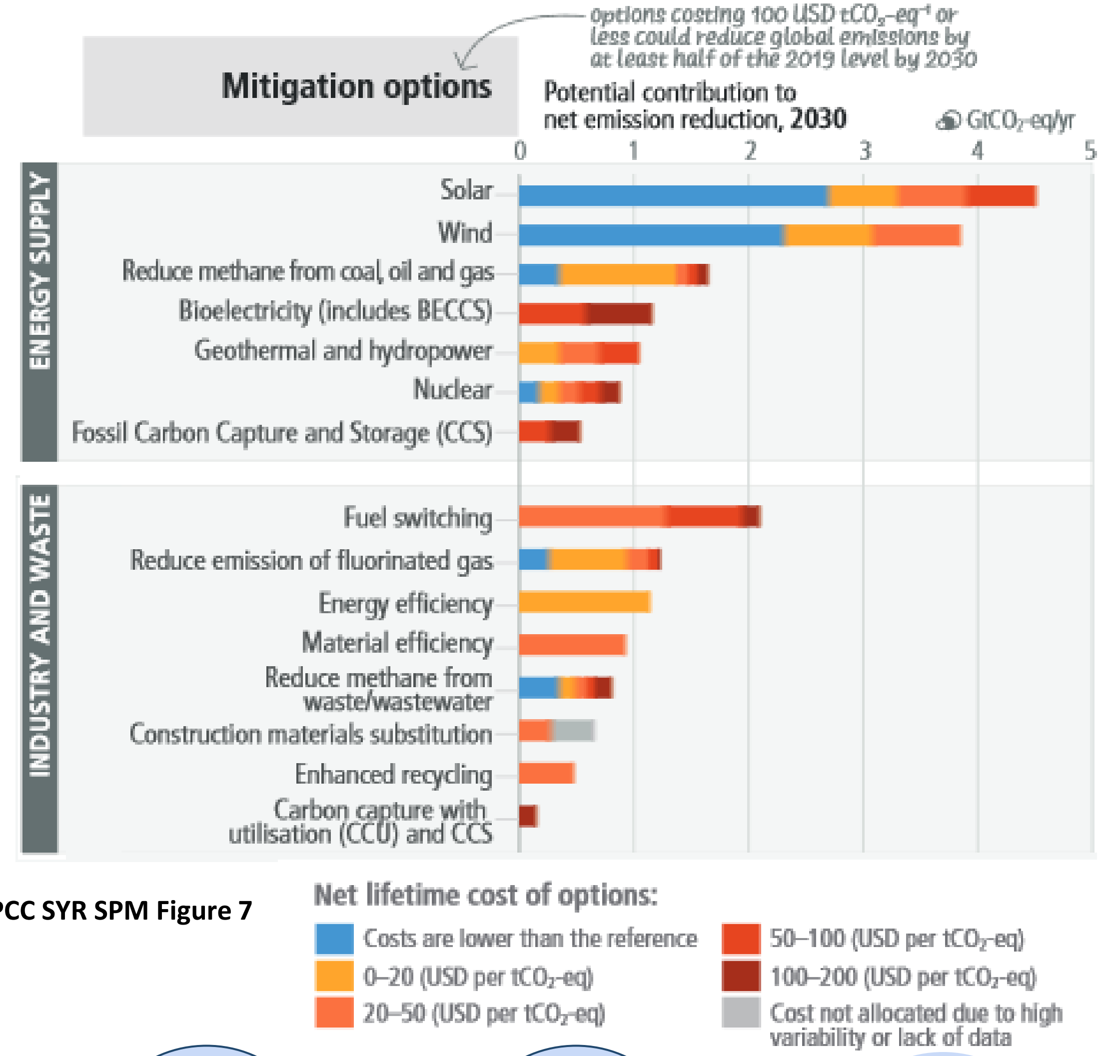
Source: IPCC AR6 WGIII Figure 3.6

How much?

Estimated mitigation cost and potential vary greatly by technology and sector.

Half of the emission reductions needed by 2030 cost <100$/tCO2…

….yet cost-competitive technologies still face (non technological) barriers to widespread diffusion!



IPCC SYR SPM Figure 7

Energy **Land use** **Industry** **Urban** **Buildings** **Transport** **Demand/services**

What works?

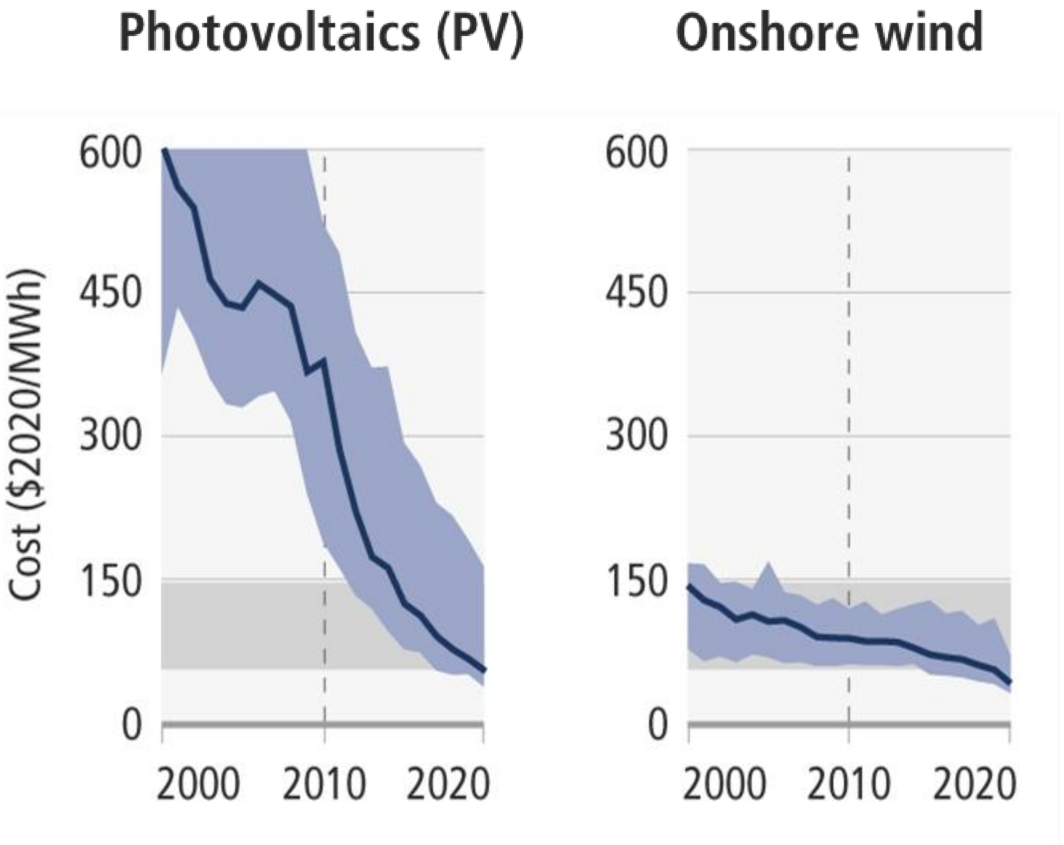
Investment and policies provided stimulus and direction for low emission innovation, particularly in the energy sector

No regret options (a.k.a. “no brainers”): electrification, energy efficiency and sufficiency

Technological challenges remain in key sectors – need for innovation, e.g., sustainable hydrogen and biofuels

Effective decision-making requires assessing benefits, barriers and risks at the local level: no one-size-fits-all

Investment gap needs to be close: divestment is as important as green investment.



IPCC WGIII SPM Figure 3

What role for digitalization?

Disruptive Digitalization for Decarbonization

All ongoing work under the 2D4D project – Disruptive Digitalization for Decarbonization, H2020 ERC Starting Grant

Creutzig, F., D. Acemoglu, X. Bai, P. N. Edwards, M. J. Hintz, L. H. Kaack, S. Kilkis, S. Kunkel, A. Luers, N. Milojevic-Dupont, D. Rejeski, J. Renn, D. Rolnick, C. Rosol, D. Russ, T. Turnbull, E. Verdolini, F. Wagner, C. Wilson, A. Zekar, M. Zumwald (2022) "Digitalization and the Anthropocene", Annual Review of Environment and Resources 2022 47:1, 479-509. (doi: 10.1146/annurev-environ-120920-100056)

Alacevic, C., Verdolini, E. (in progress). "Digitalization for decarbonization and the future of work "

Fontanelli, L., F. Calvino, C. Criscuolo, L. Nesta, E. Verdolini (in progress). "The human capital of firms using AI"

Fontanelli, L., L. Nesta, E. Verdolini (in progress). "The rebound effects of ICT: evidence from French manufacturing firms"

Belpietro, C., E. Verdolini (in progress): "Digital divide and energy poverty"

And what about justice?

The economics of a Just Twin Transition

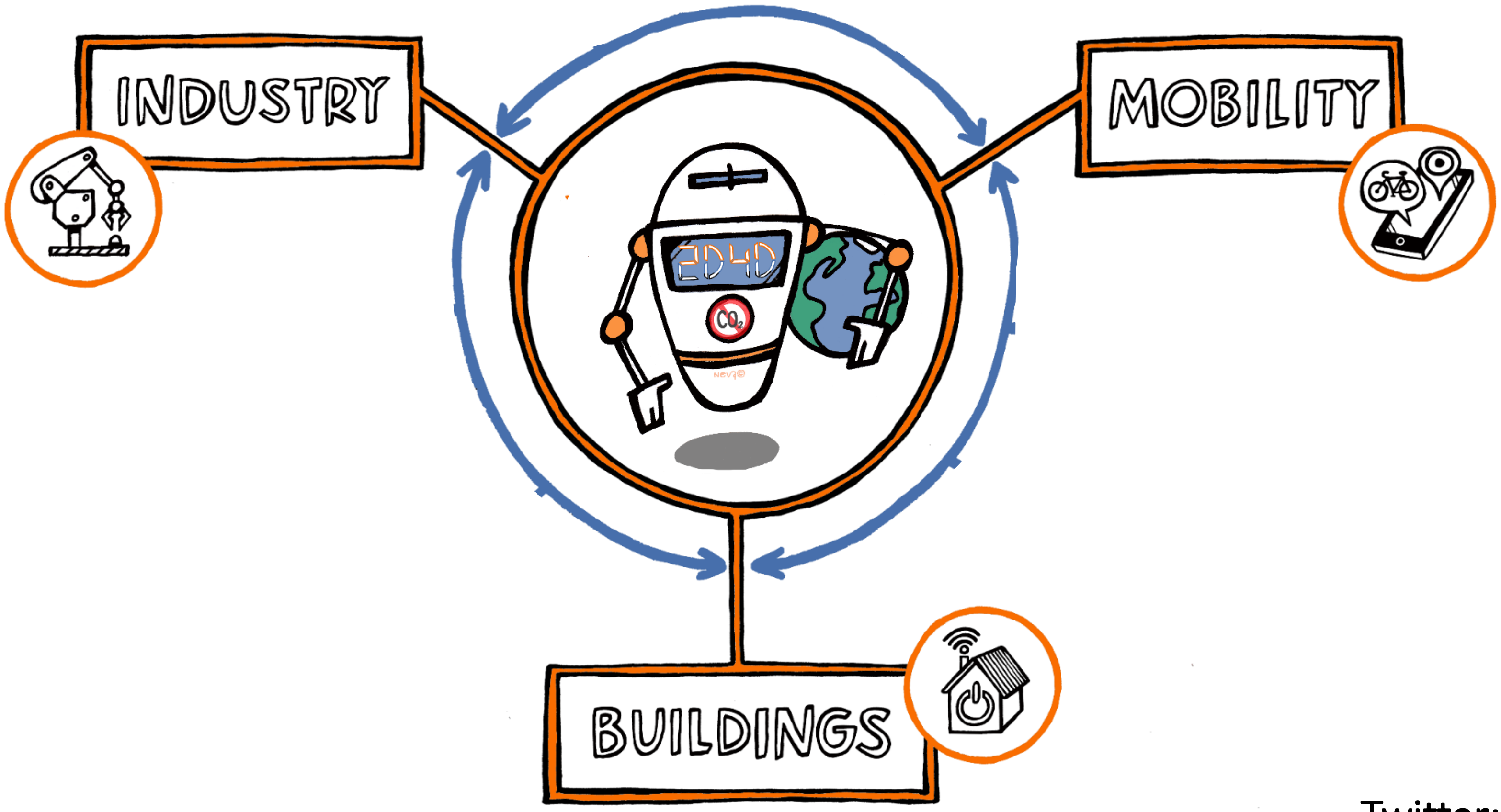
Verdolini, E. (2023) Interlinkages between the just ecological transition and the digital transformation, European Trade Union Institute Working paper, ISSN PDF 1994-4454, https://www.etui.org/publications/interlinkages-between-just-ecological-transition-and-digital-transformation.

Hernandez Carballo, I., E. Verdolini, J. C. Steckel, M. Tavoni, F. Vona (in progress) The Economics of a Just Transition

Verdolini, E., F. Vona (2022). "Lavoro e Transizione Energetica". In XXIV Rapporto Mercato del Lavoro e Contrattazione Collettiva, CNEL – Consiglio Nazione Economia e Lavoro.

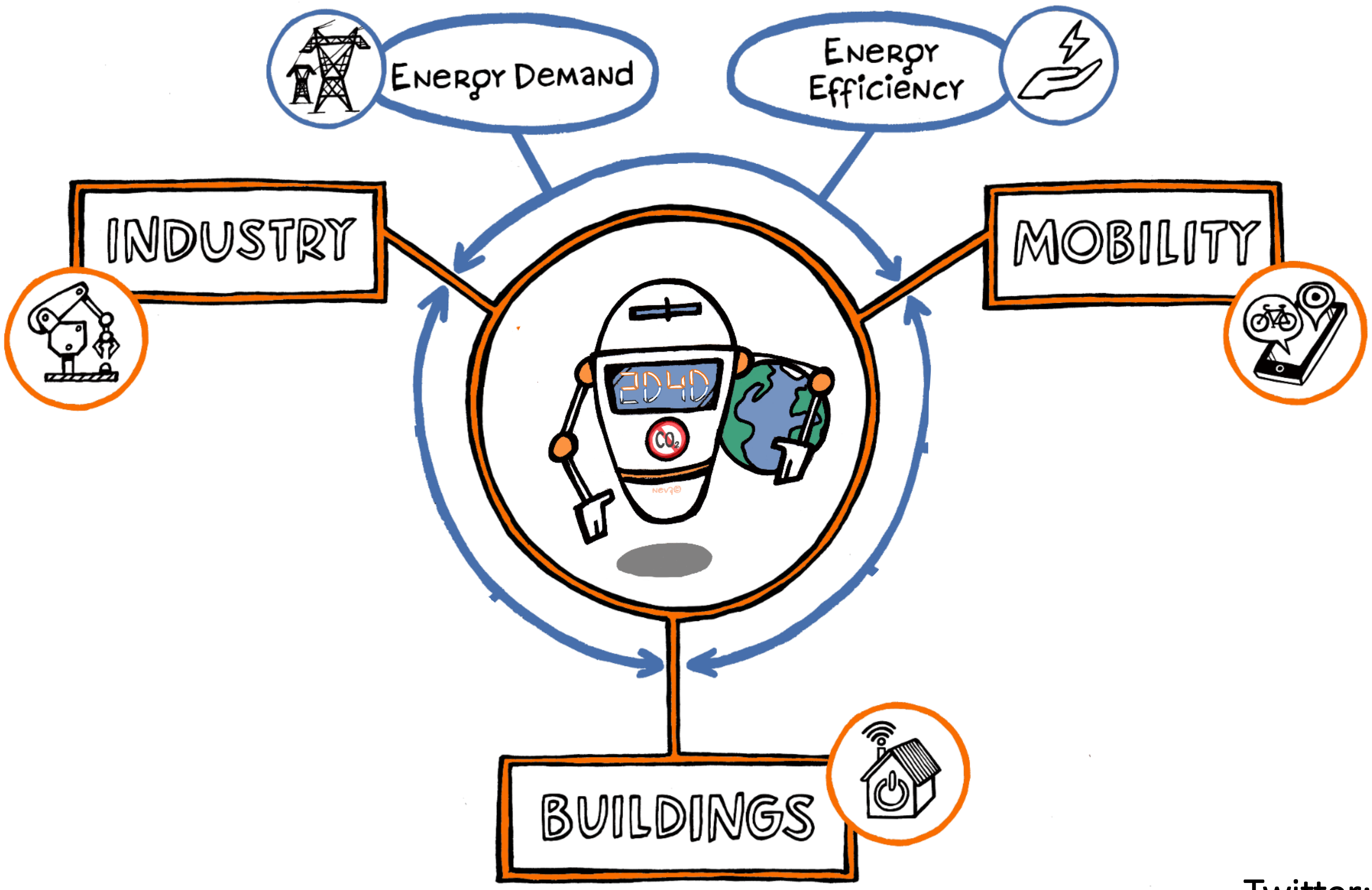
Work carried out within the AdJUST project "ADVANCING THE UNDERSTANDING OF CHALLENGES, POLICY OPTIONS AND MEASURES TO ACHIEVE A JUST EU ENERGY TRANSITION", HEU, https://www.eiee.org/project/adjust/

Disruptive digitalization for decarbonization



Twitter: @2D4D_ERC

Disruptive digitalization for decarbonization



Twitter: @2D4D_ERC

Disruptive digitalization for decarbonization

Energy efficiency

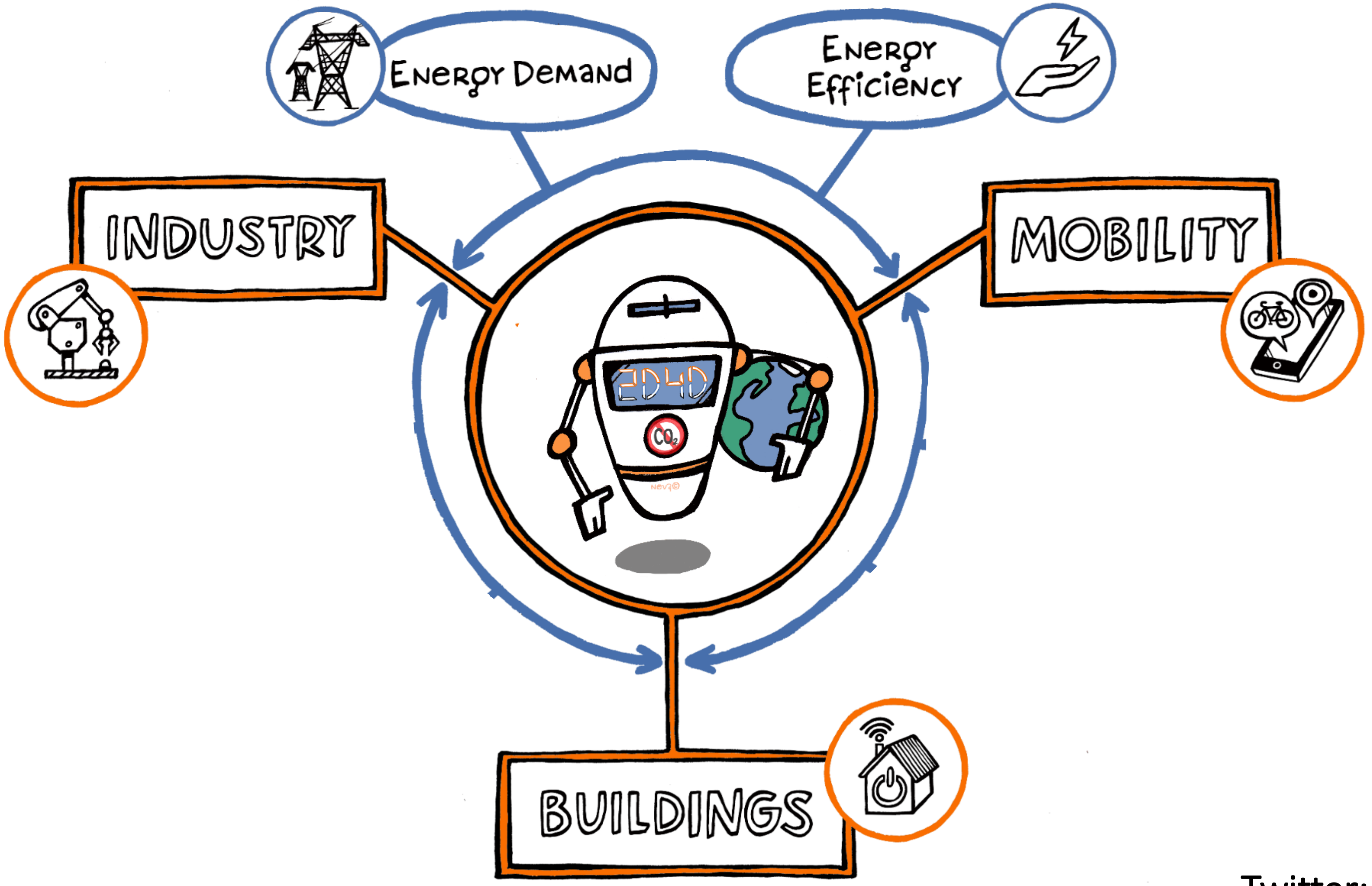
Energy demand

The debate on which of these channels will prevail is fierce. Answers differ by digital technology (e.g., robots vs AI) and often little consideration for economic aspects

Assumptions about demand play a key role

Energy and emissions are NOT the only concern (e.g., materials)

Disruptive digitalization for decarbonization



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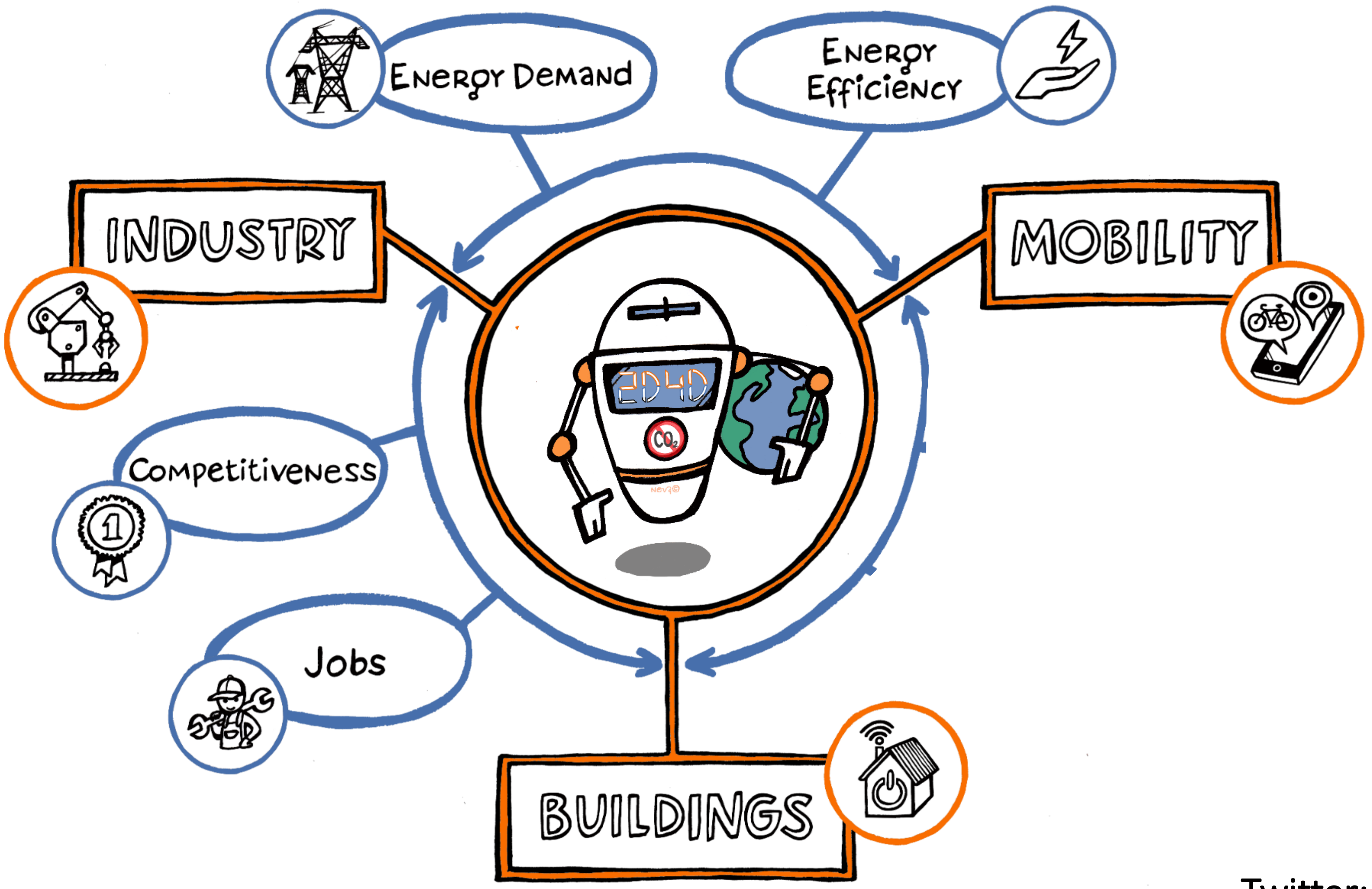

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Disruptive digitalization for decarbonization

Competitiveness

- Digitalization increases firm's productivity and profitability differently by sector and firm characteristics
- gives rise to new opportunity and business models, but not only in the green sector
- Indeed, AI is used to locate new fossil reservoirs and to increase the attractiveness of fossil-based options (role for standards and code of conducts)

Disruptive digitalization for decarbonization

Competitiveness

Jobs

- Digitalization increases firm’s productivity and profitability differently by sector and firm characteristics
- gives rise to new opportunity and business models, but not only in the green sector
- Indeed, AI is used to locate new fossil reservoirs and to increase the attractiveness of fossil-based options (role for standards and code of conducts)

- Economic theory highlights displacement effects, productivity effect, reinstatement effect, but no consideration for climate impacts nor the low-carbon transition (see Acemoglu and co-authors)
- Work on green labor focuses on green jobs, green skills and green competences, but does not focus on digital skills (see Vona and co-authors)

Disruptive digitalization for decarbonization

Competitiveness

Jobs

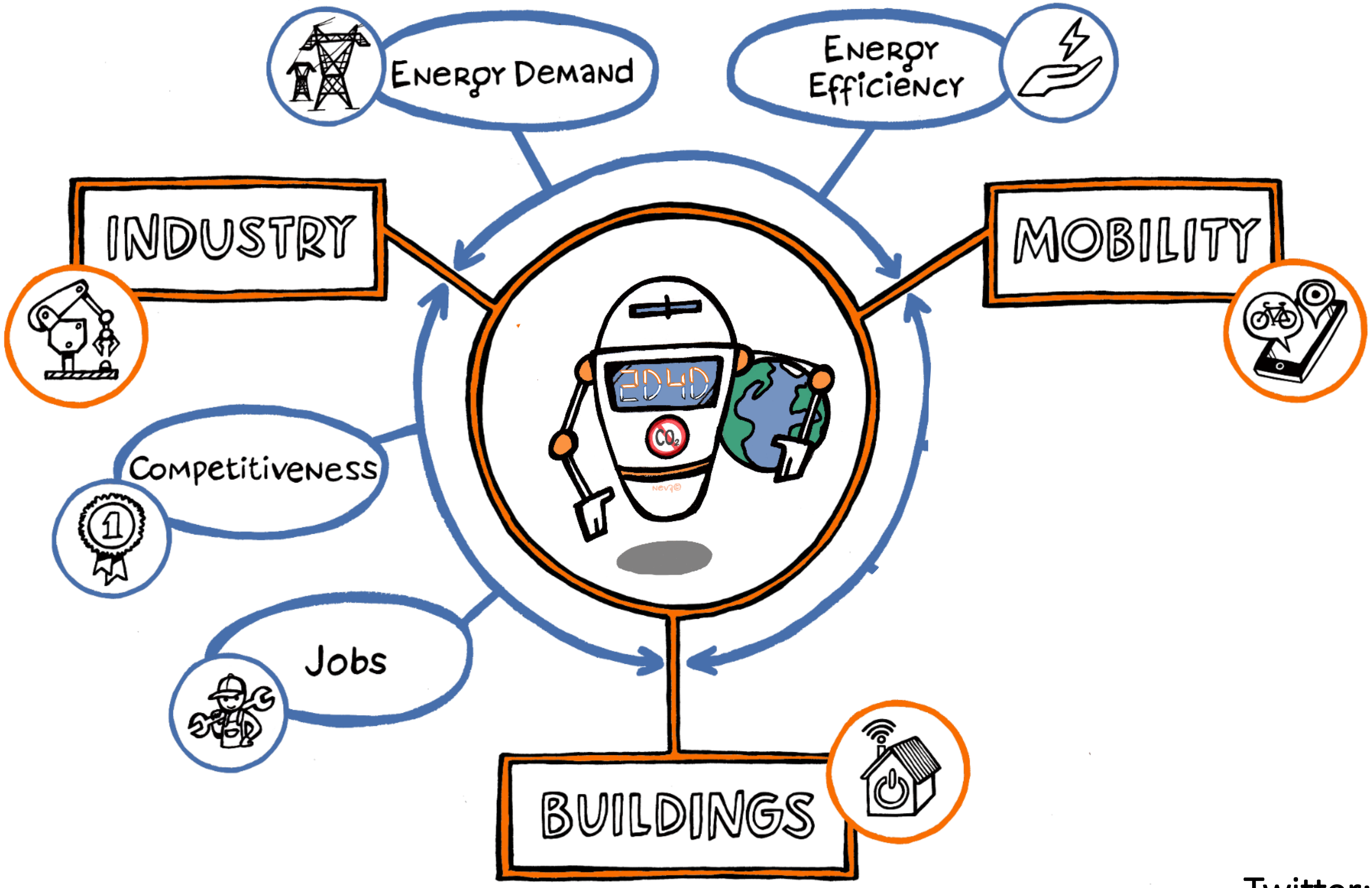
Net effect often negligible. What ultimately matters is that ***the displacement effect hurts some specific workers and sectors, while the productivity effect generally benefits others***.

→Key role of upskilling or reskilling programs and time considerations

Labour market institutions mediate the effects of digitalisation on the labour market.

→ Dauth et al. (2021): automation does not affect employment. It displaces and reallocates across occupations, heterogeneously across sectors. Relatively strong labour protection shifts the incidence onto young workers and labour market entrants. Incumbent workers switch to job of (likely) higher quality. Skills upgrading allows to adapt

Disruptive digitalization for decarbonization



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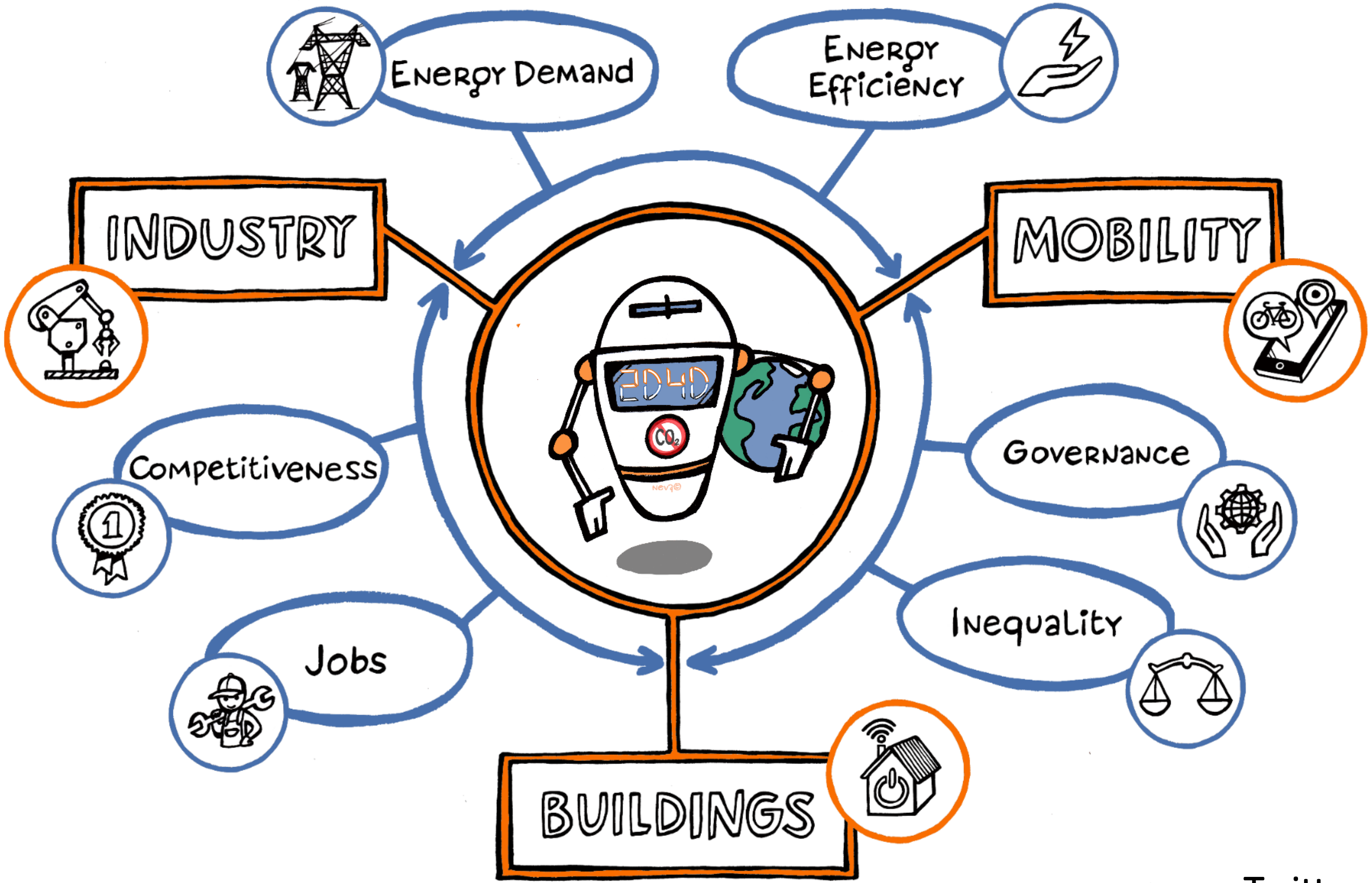

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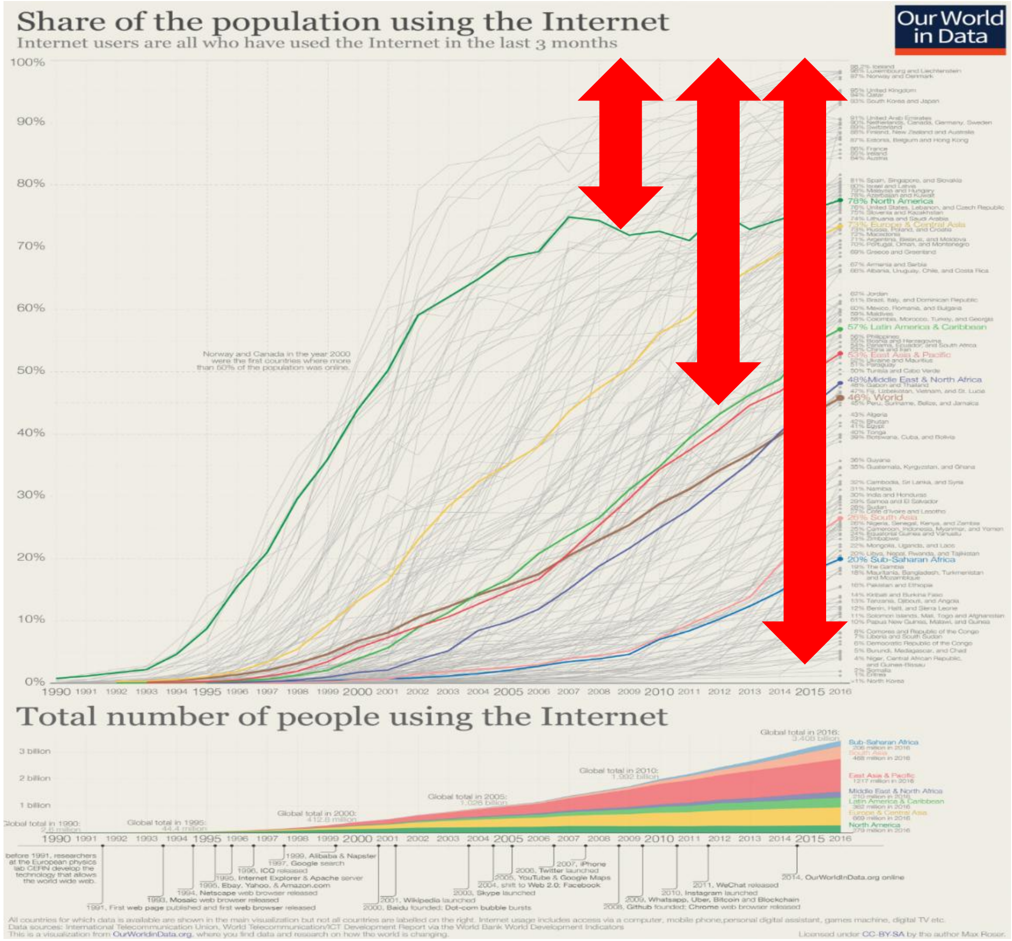
Disruptive digitalization for decarbonization

Equity

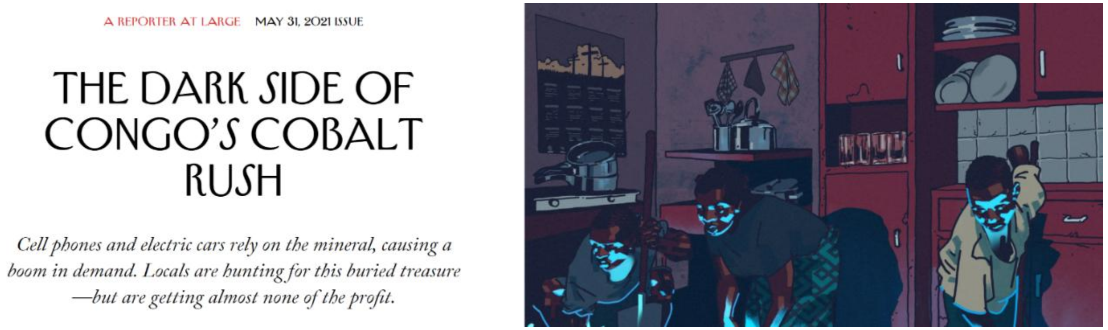
- (Sociology) Three levels of digital divide: technologies, skills and purpose
- Quality of jobs and quality of life in digital economy



Disruptive digitalization for decarbonization

Equity

- (Sociology) Three levels of digital divide: technologies, skills and purpose
- Quality of jobs and quality of life in digital economy
- Broader environmental impacts of digital technologies
- Justice can be assessed along several dimensions (Hernandez et al., in progress): distributional justice, restorative justice, procedural or participatory justice and recognition justice.


A REPORTER AT LARGE MAY 31, 2021 ISSUE

THE DARK SIDE OF CONGO'S COBALT RUSH

Cell phones and electric cars rely on the mineral, causing a boom in demand. Locals are hunting for this buried treasure —but are getting almost none of the profit.

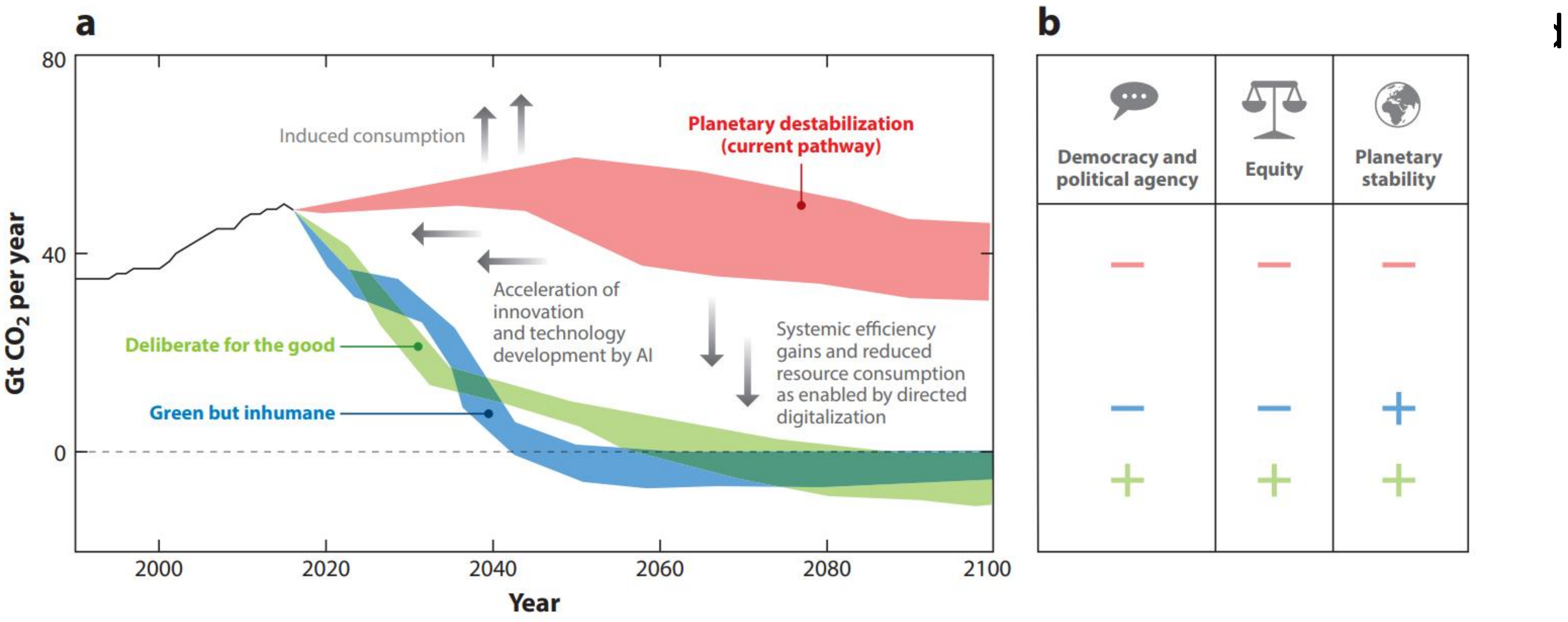
Disruptive digitalization for decarbonization

Equity

Governance

- Ungoverned digitalisation will have similar, albeit arguably more disruptive, effects compared to other previous instances of industrial revolutions
- Debate narrowly focused around technological and economic aspects, not enough is said about the purpose for which digital technologies are used.
- Digital technologies require <u>**governance for the public purpose**</u>

Disruptive digitalization for decarbonization



Creutzig et al 2021, Digitalization and the Anthropocene

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Thank you!

elena.verdolini@unibs.it

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2D4D Disruptive Digitalization For Decarbonization

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Relevant projects

- 2D4D "Disruptive Digitalization for Decarbonization" (EU H2020 European Research Council Starting Grant). www.2D4D.eu
- AdJUST "ADVANCING THE UNDERSTANDING OF CHALLENGES, POLICY OPTIONS AND MEASURES TO ACHIEVE A JUST EU ENERGY TRANSITION" https://www.eiee.org/project/adjust/
- DIGITA – "DIGitalization for climate-resilient households. Advancing empirical evidence of home energy innovation in ITAly" Project code 2020HKPNPL
- CircEUlar "Developing circular pathways for a EU low-carbon transition" https://circeular.org/
- EDITS2 "Energy Demand changes Induced by Technological and Social innovations - Low energy demand empirical and modeling work in a post pandemic world" https://iiasa.ac.at/projects/edits