

# Energy Transformation for a Sustainable and Beautiful Future

“Energy transition for all” - How much energy for a net zero economy?

**Nebojsa Nakicenovic**

**Group of Chief Scientific Advisers**

**Former Deputy Director General**

**Former Tenured Professor**



# Four Raiders of the Apocalypse

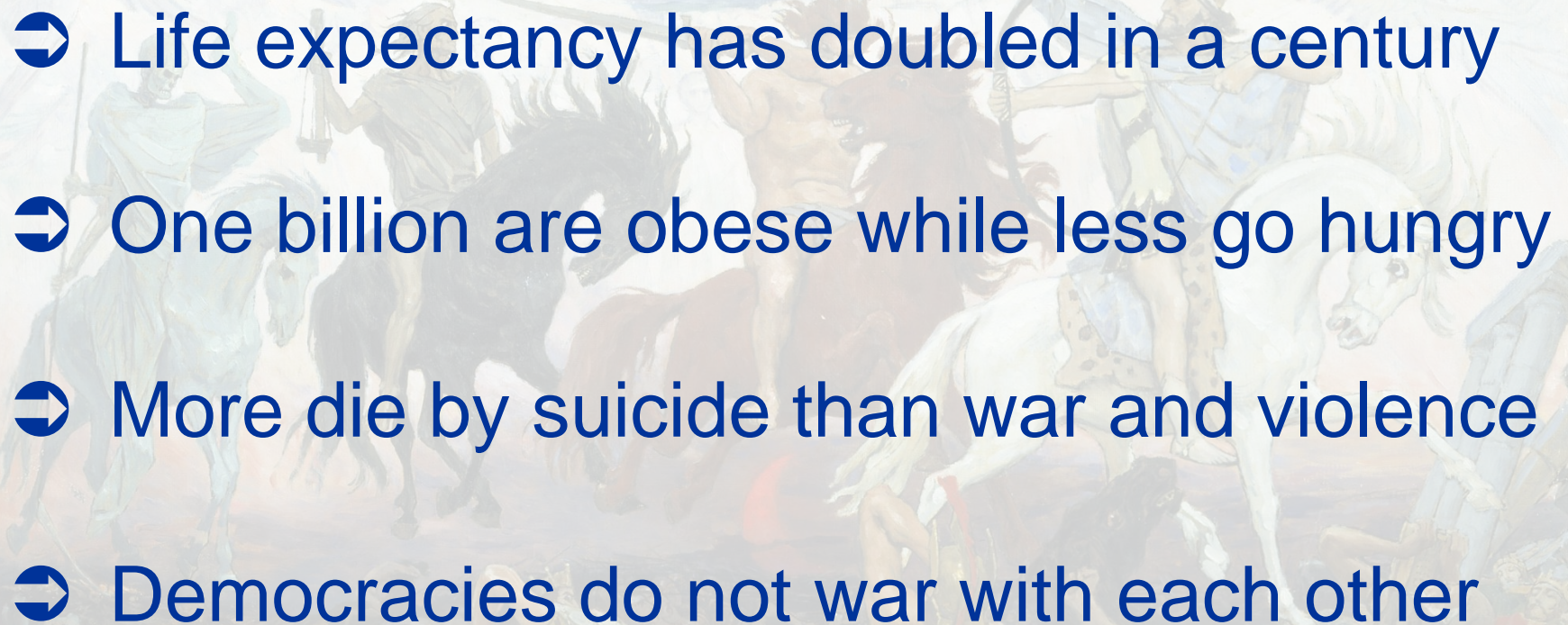
## Death, Famine, War and Conquest



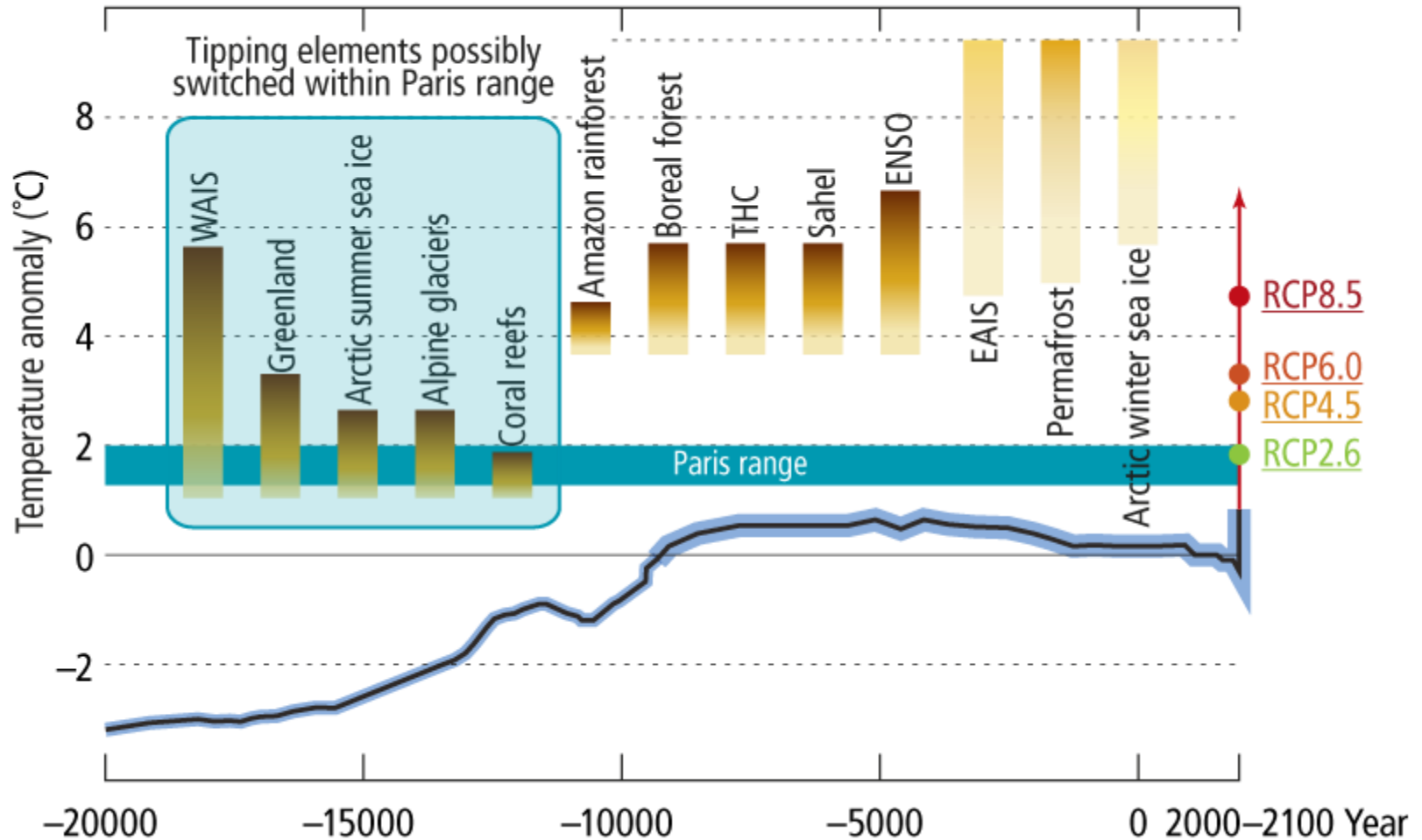


# Aleviating Raiders of the Apocalypse

## Death, Famine, War and Conquest

- 
- ➔ Life expectancy has doubled in a century
  - ➔ One billion are obese while less go hungry
  - ➔ More die by suicide than war and violence
  - ➔ Democracies do not war with each other

# From Holocene to Earth-Systems Tipping



# The Limits to Growth

## Paradigm change at the onset of the Anthropocene

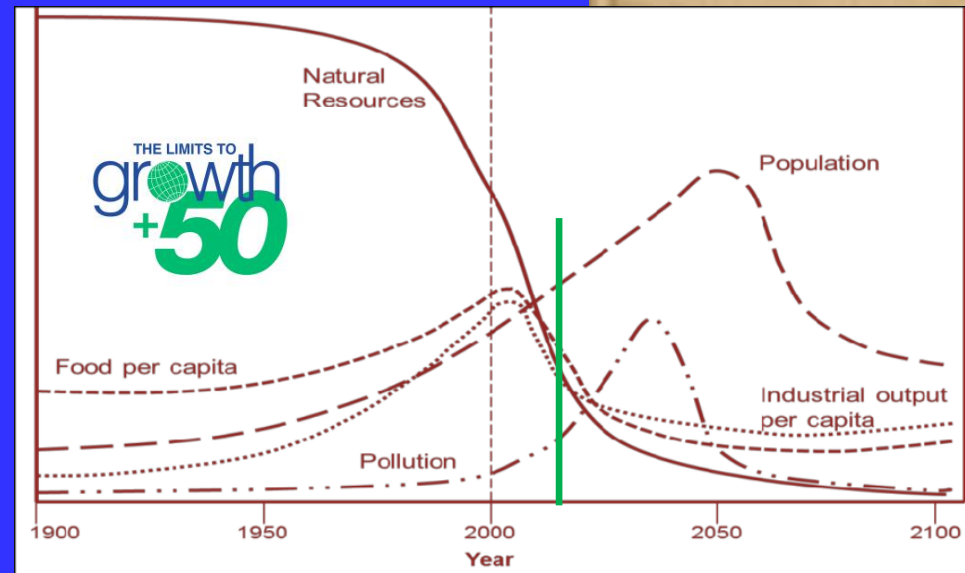
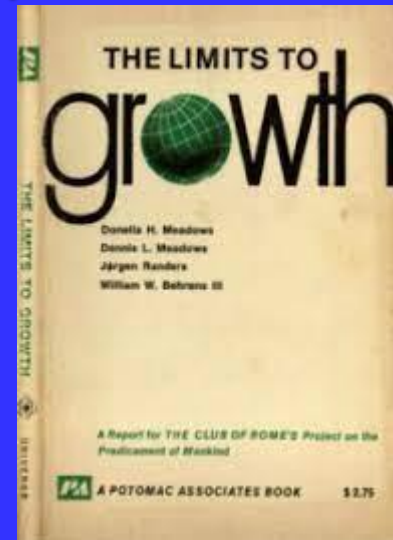
Dear Folks, Tomorrow I leave for a month in Vienna. I'll be working there at the International Institute for Applied Systems Analysis (IIASA), which many of you know about because Dennis and I work there often. It's an East-West institute, co-founded by the Americans and the Russians, and despite the Reagan administration's best efforts to kill it off, it still is limping along. I love to go there because it's a place to work

with my friends from Hungary, Poland, Russia, and other East-bloc countries.....I'm sure there's more news, but what I really have to do now is start packing.

Love, Dana

February 12, 1987, Source:  
<https://donellameadows.org/archives/page/203/>

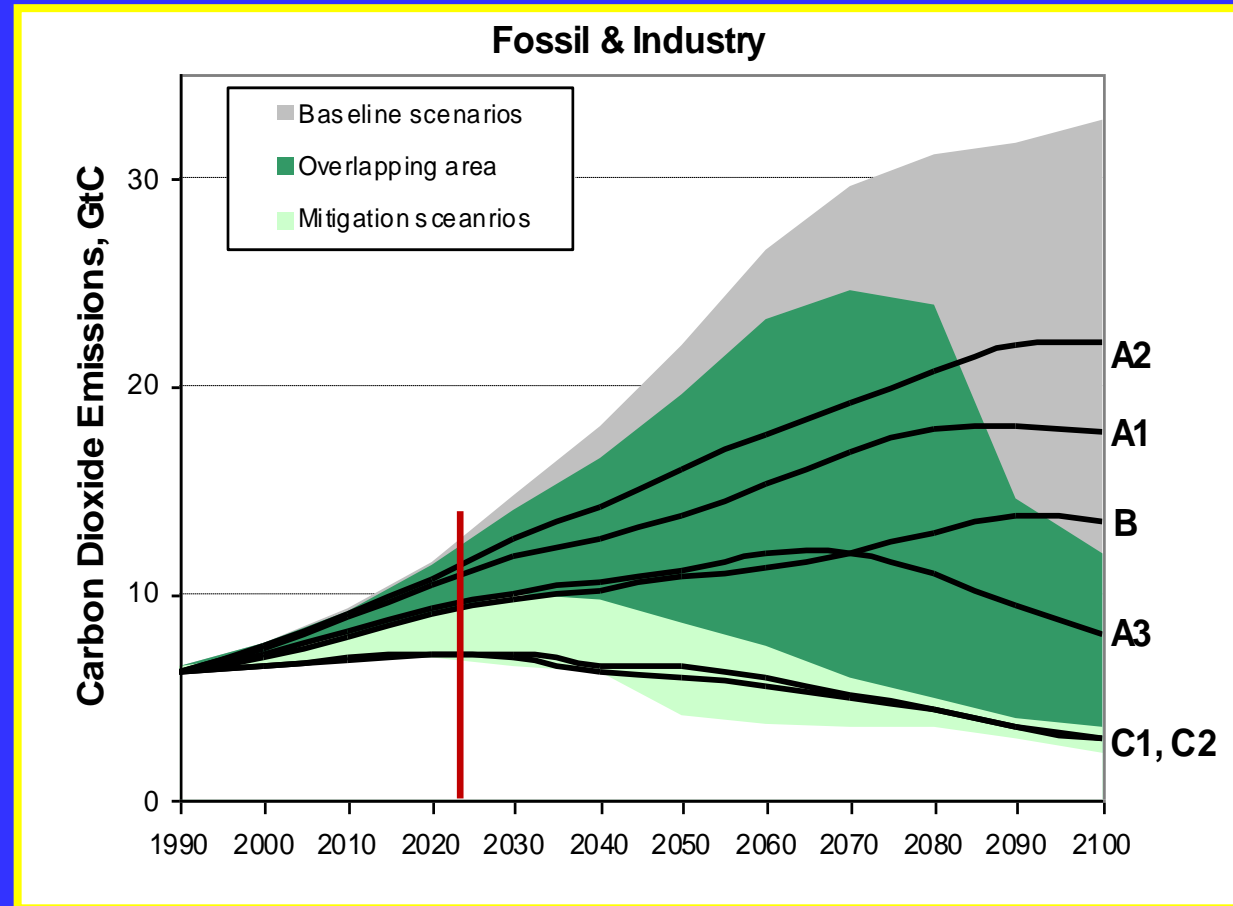
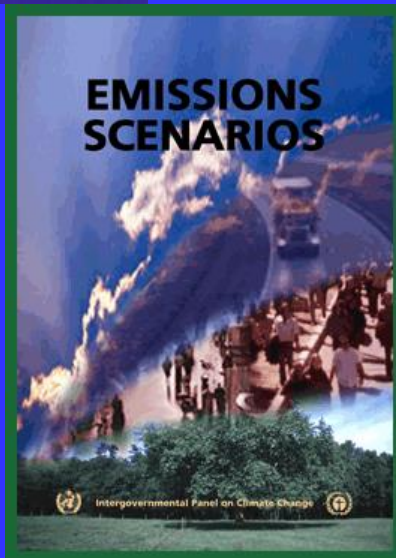
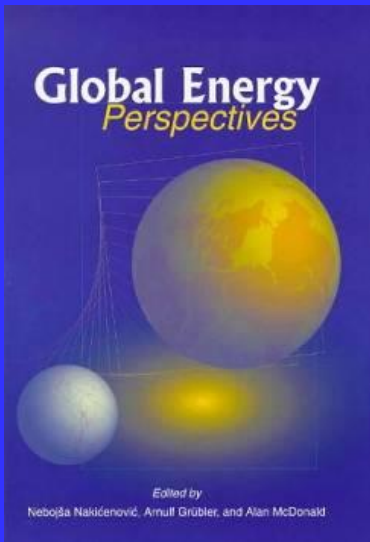
Nakicenovic



2022

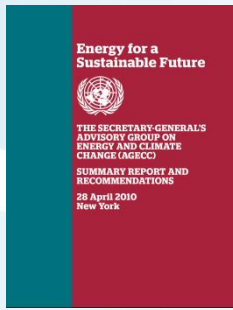
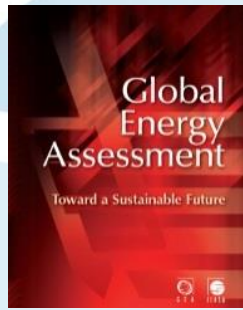
# Carbon Dioxide Emissions

## of the IIASA-WEC and IPCC SRES Scenarios









## SUSTAINABLE ENERGY FOR ALL



### 2030 GEA Goals and SDG7

- Universal Access to Modern Energy
- Double Energy Efficiency Improvement
- Double Renewable Share in Final Energy

Aspirational & Ambitious but Achievable





UN DESA and UNFCCC conference on synergies between the SDGs and the Paris Agreement – 1-3 April 2019 Copenhagen.



# Six Major Transformations (TWI2050.org)



**Digital  
Revolution**



**Human capacity  
Demography &  
Health**



**Smart Cities  
& Mobility**



**SDGs:  
Prosperity  
Social Inclusion  
Sustainability**



**Consumption  
& Production**



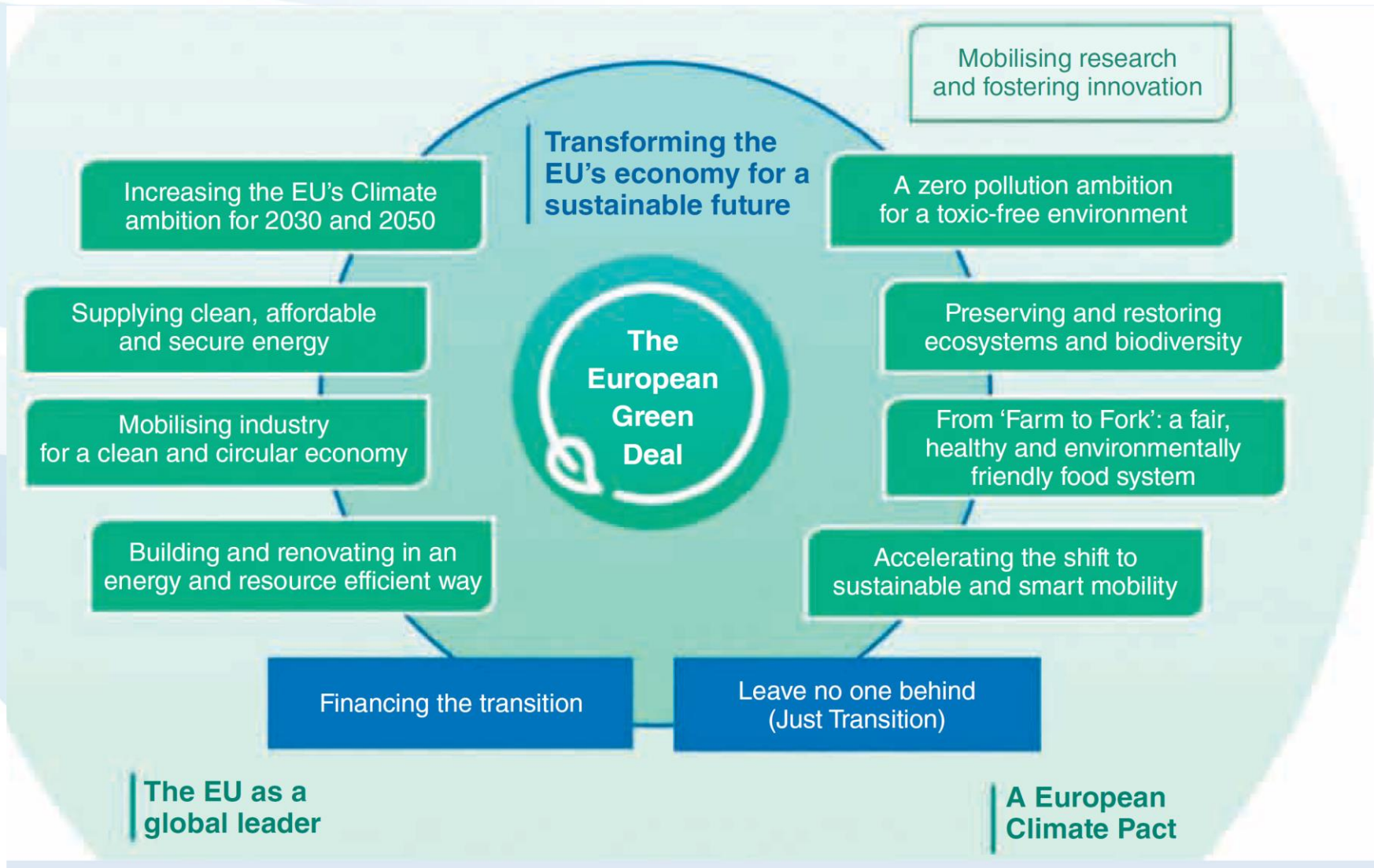
**Food, Biosphere  
& Water**



**Decarbonization  
& Energy**

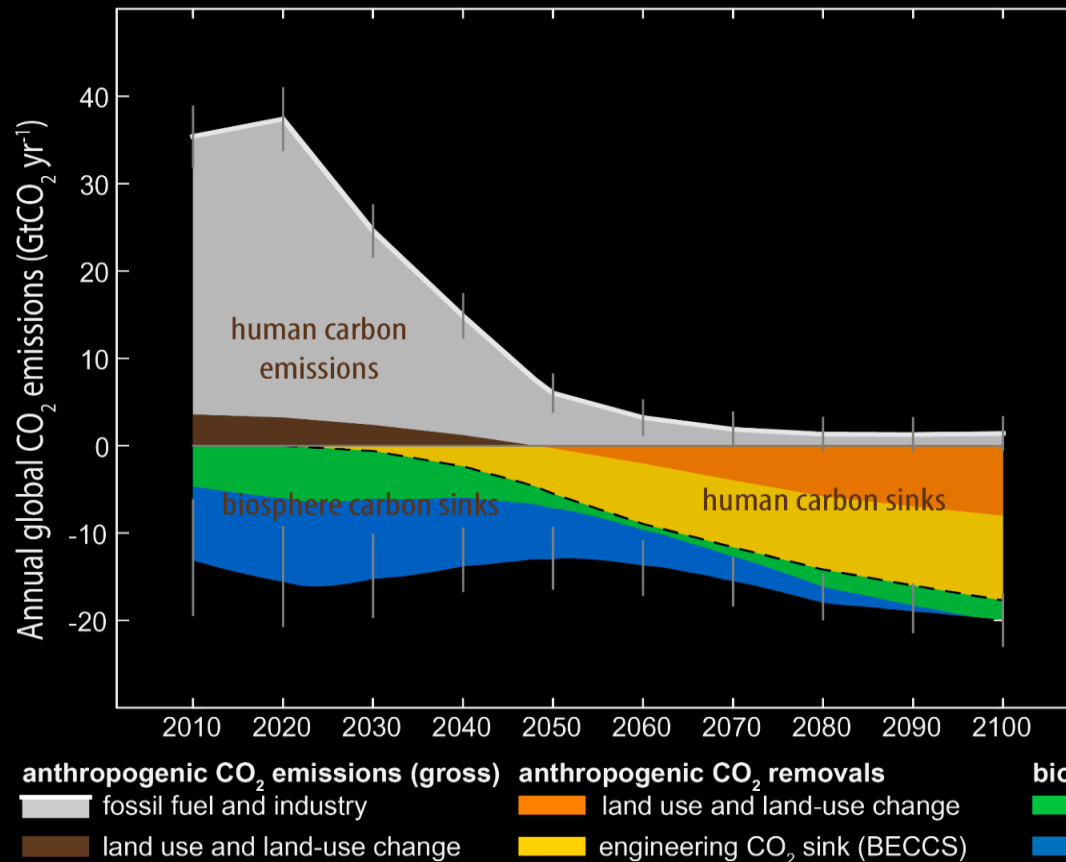


# The European Green Deal





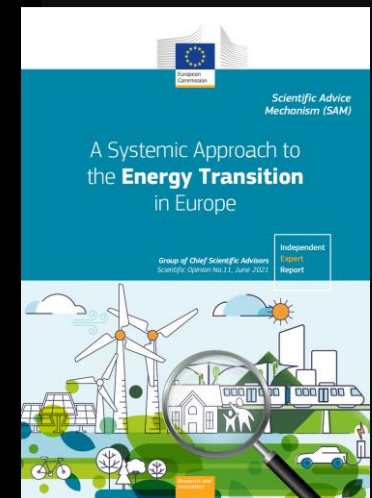
# “Carbon Law”



Source: Rockström, Gaffney, Rogelj, Meinshausen, Nakicenovic, Schellnhuber. *Science* 24 March 2017



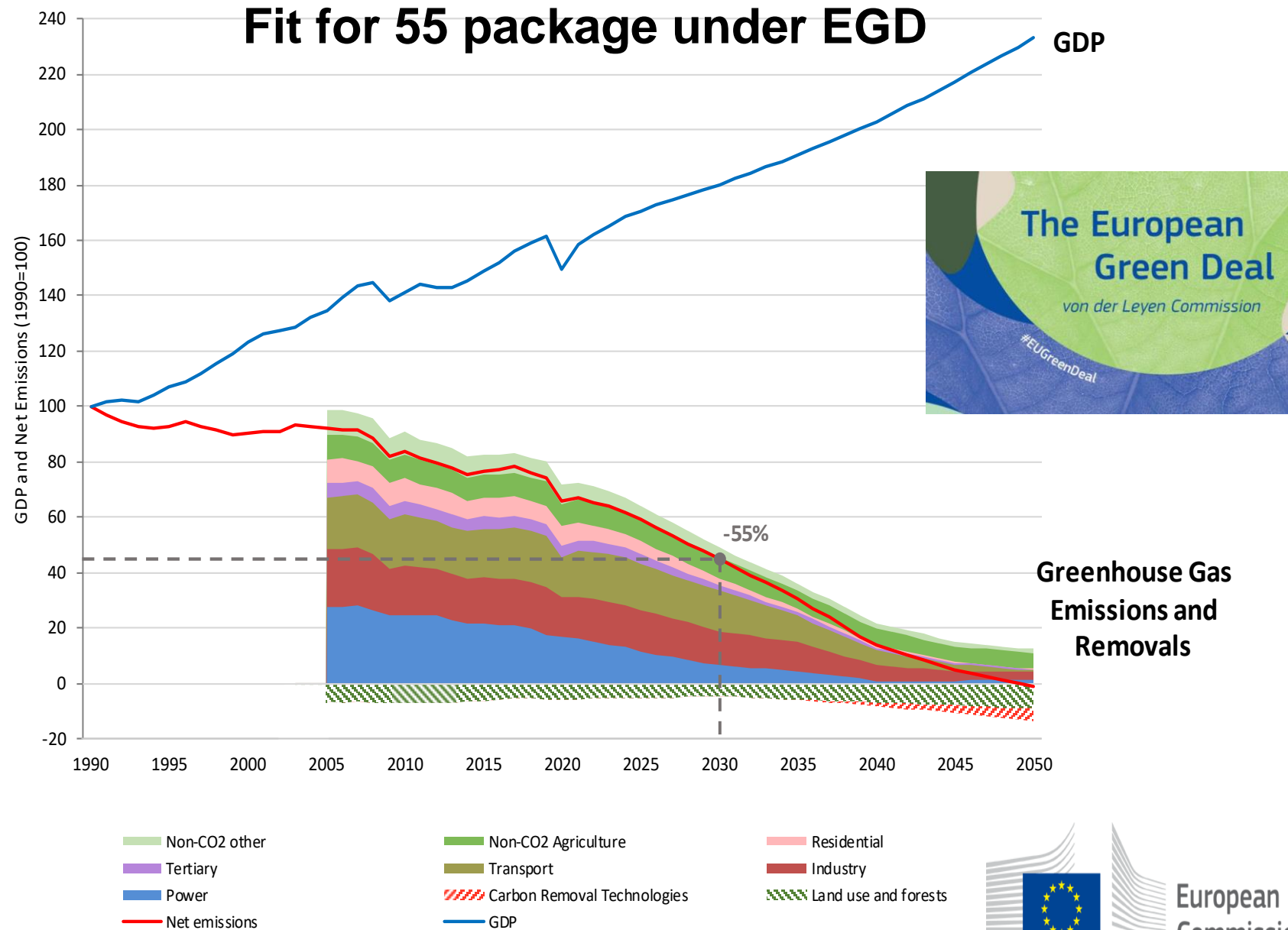
Source:



1. Develop **flexible, efficient, and resilient EU energy systems** for delivering clean, accessible, and affordable energy services by integrating decarbonised energy sources, electrification and the use of blue and green hydrogen.
2. Recognise the roles of all actors and stakeholders in **creating an inclusive and participatory environment** that incentivises and supports low-carbon energy choices.
3. Support a coordinated combination of policies, measures and instruments, including carbon pricing as a driving force, to **shape an effective, consistent and just regulatory system.**



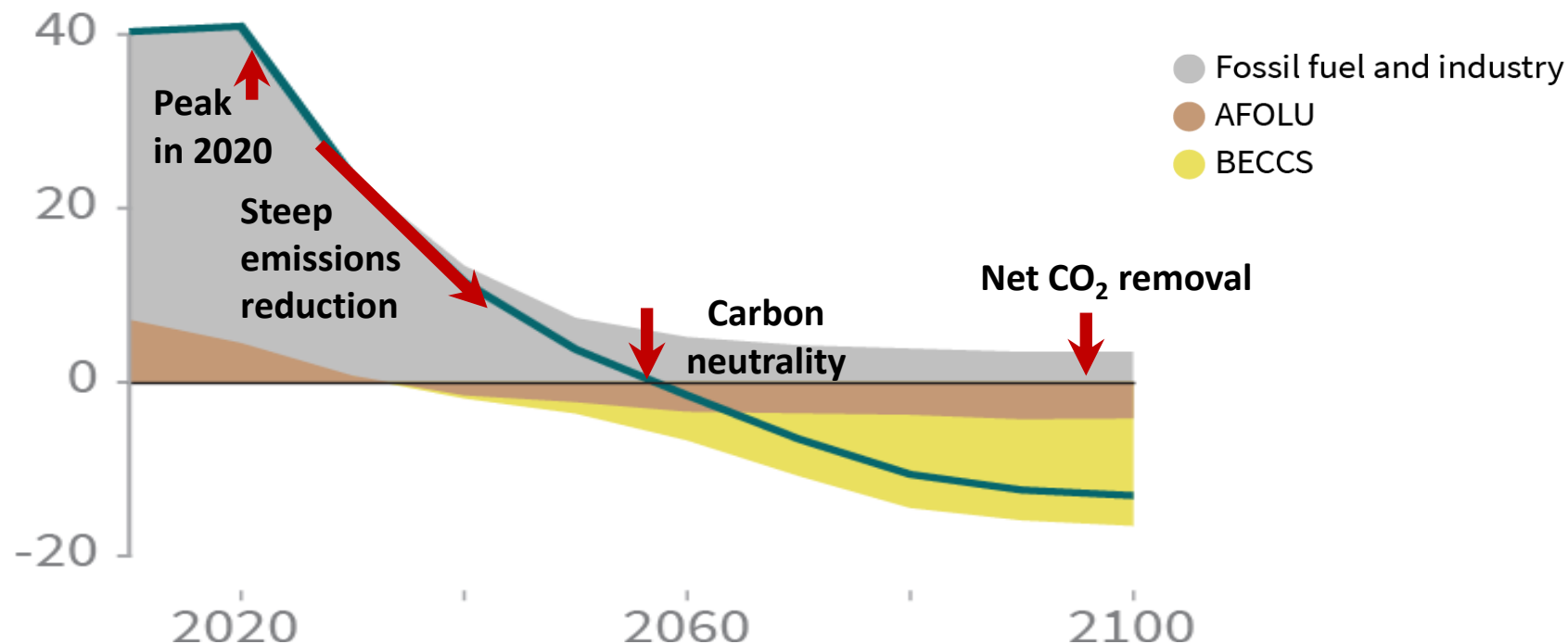
# EU pathway to prosperity & climate neutrality





# Sequence of Systems Transition

Billion tonnes CO<sub>2</sub> per year (GtCO<sub>2</sub>/yr)



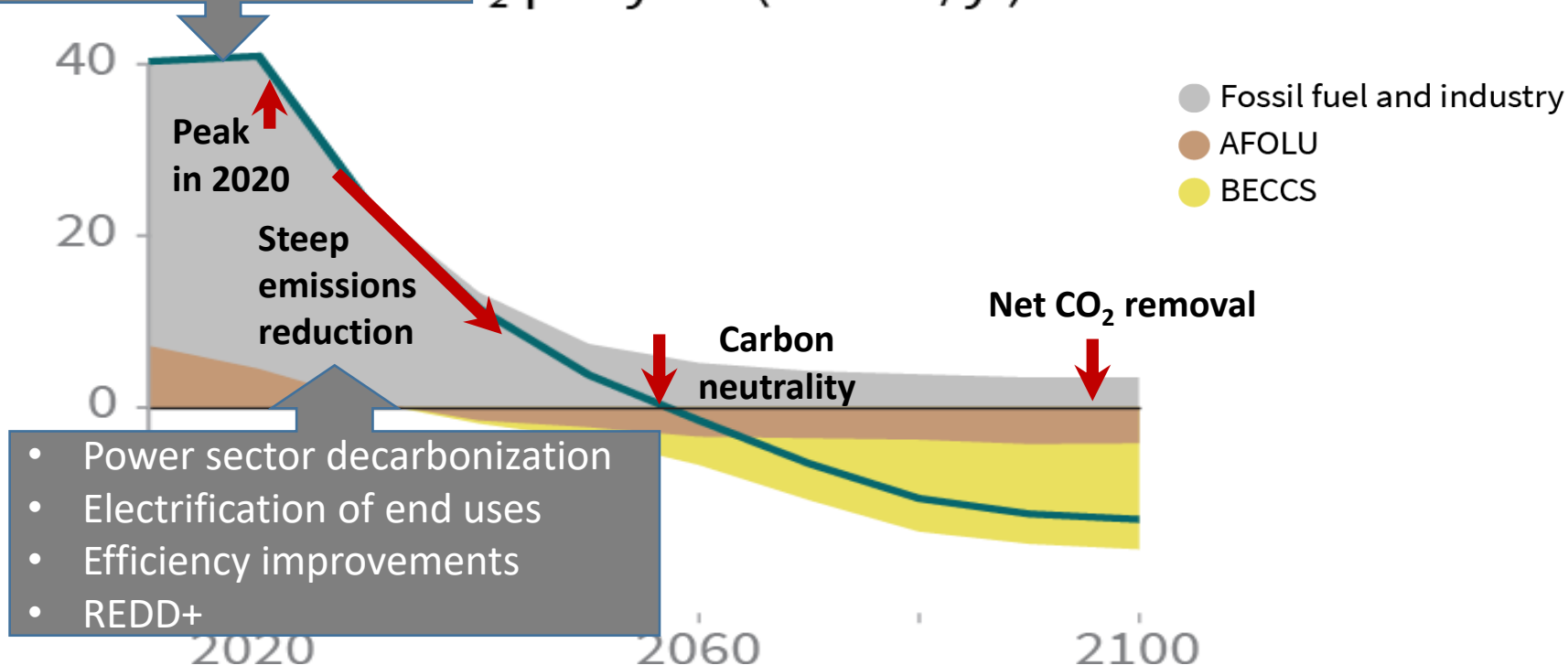
IPCC, SR1.5 Fig. SPM3b P3 scenario with historical dynamics.

Source: IPCC 1.5SR, 2019 and Kriegler, 2019

Re-directing investments from fossils to low carbon and efficiency solutions

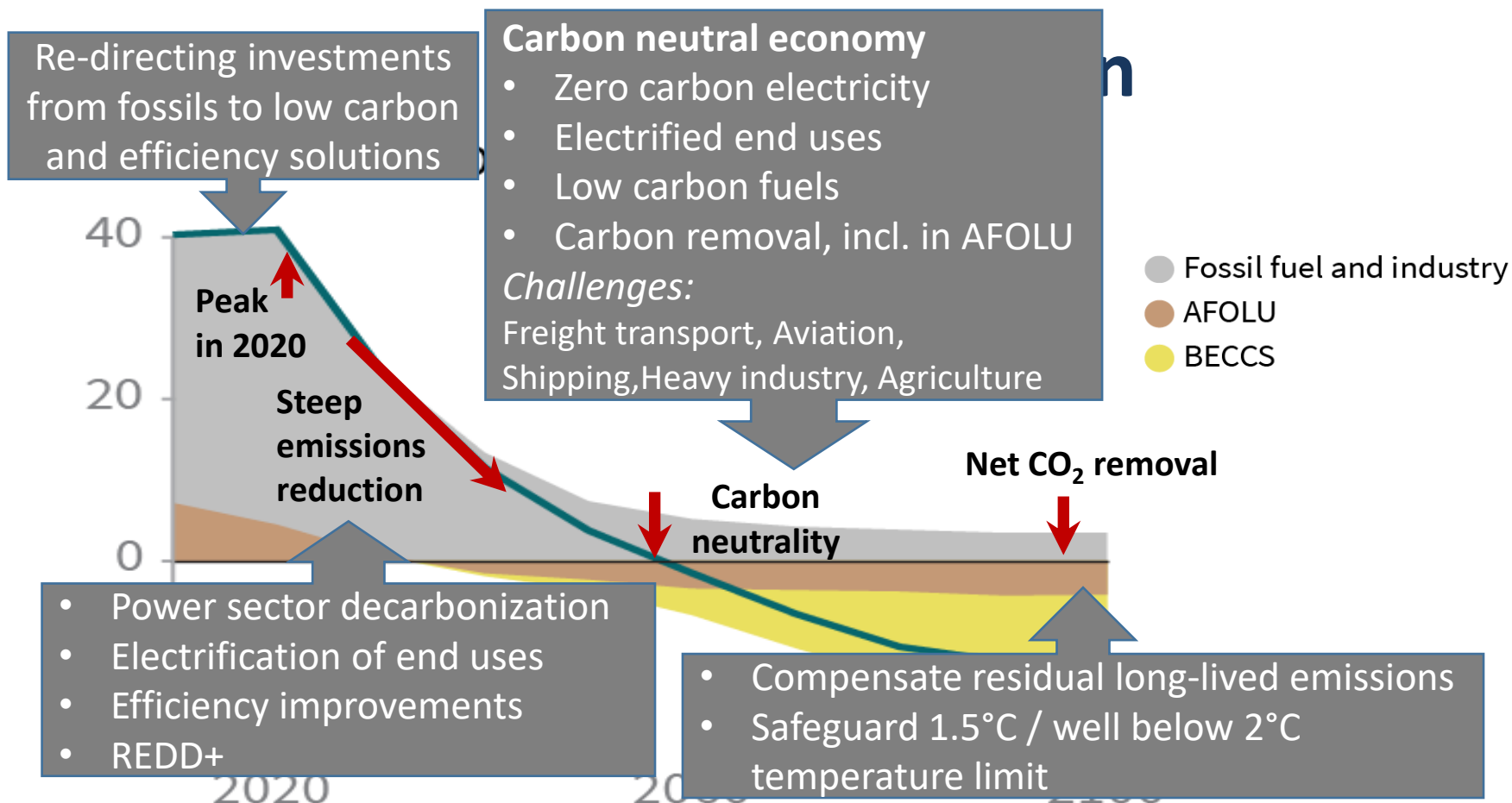
# Systems Transition

CO<sub>2</sub> per year (GtCO<sub>2</sub>/yr)



IPCC, SR1.5 Fig. SPM3b P3 scenario with historical dynamics.

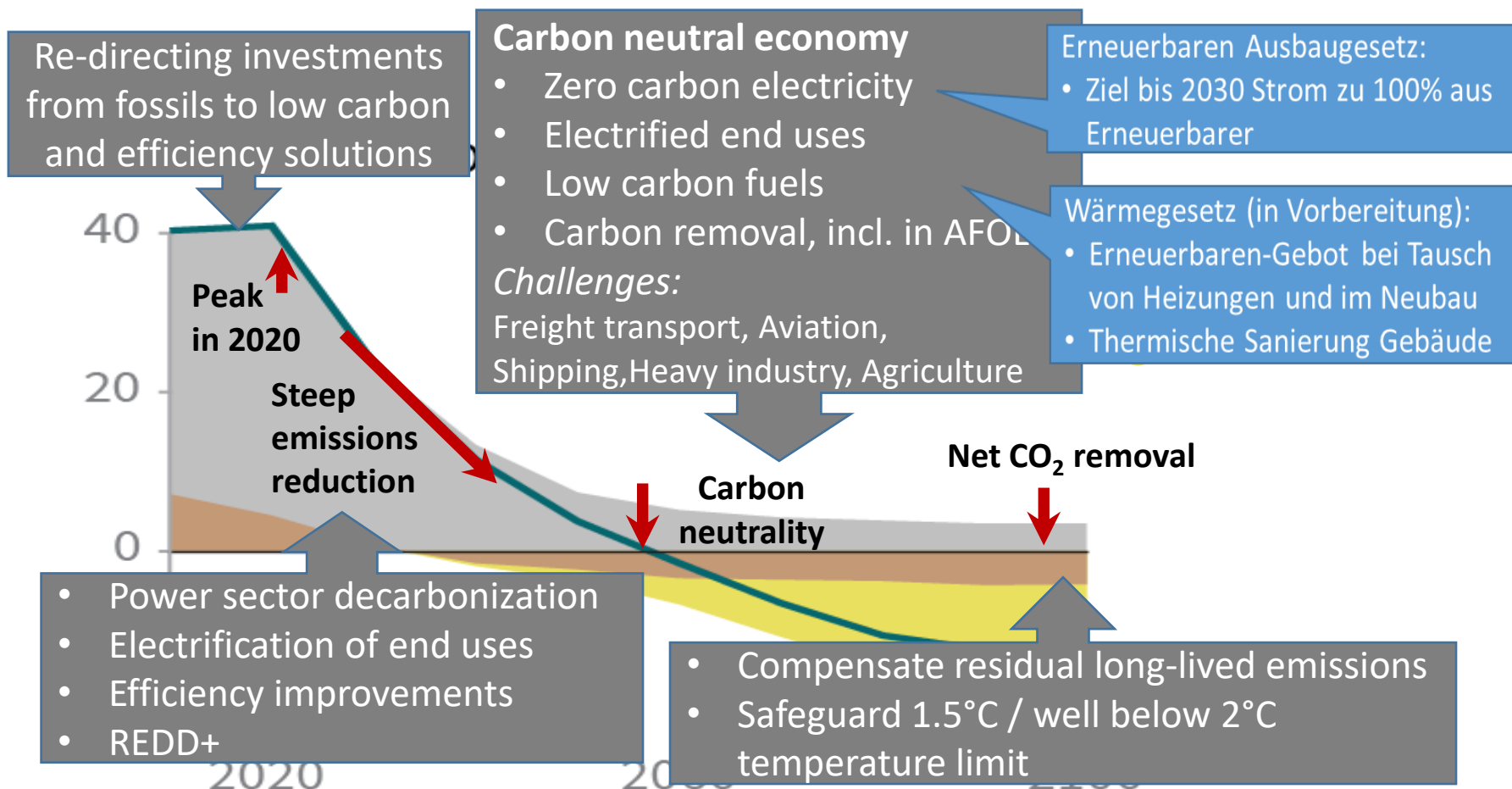
Source: IPCC 1.5SR, 2019 and Kriegler, 2019



IPCC, SR1.5 Fig. SPM3b P3 scenario with historical dynamics.

Source: IPCC 1.5SR, 2019 and Kriegler, 2019

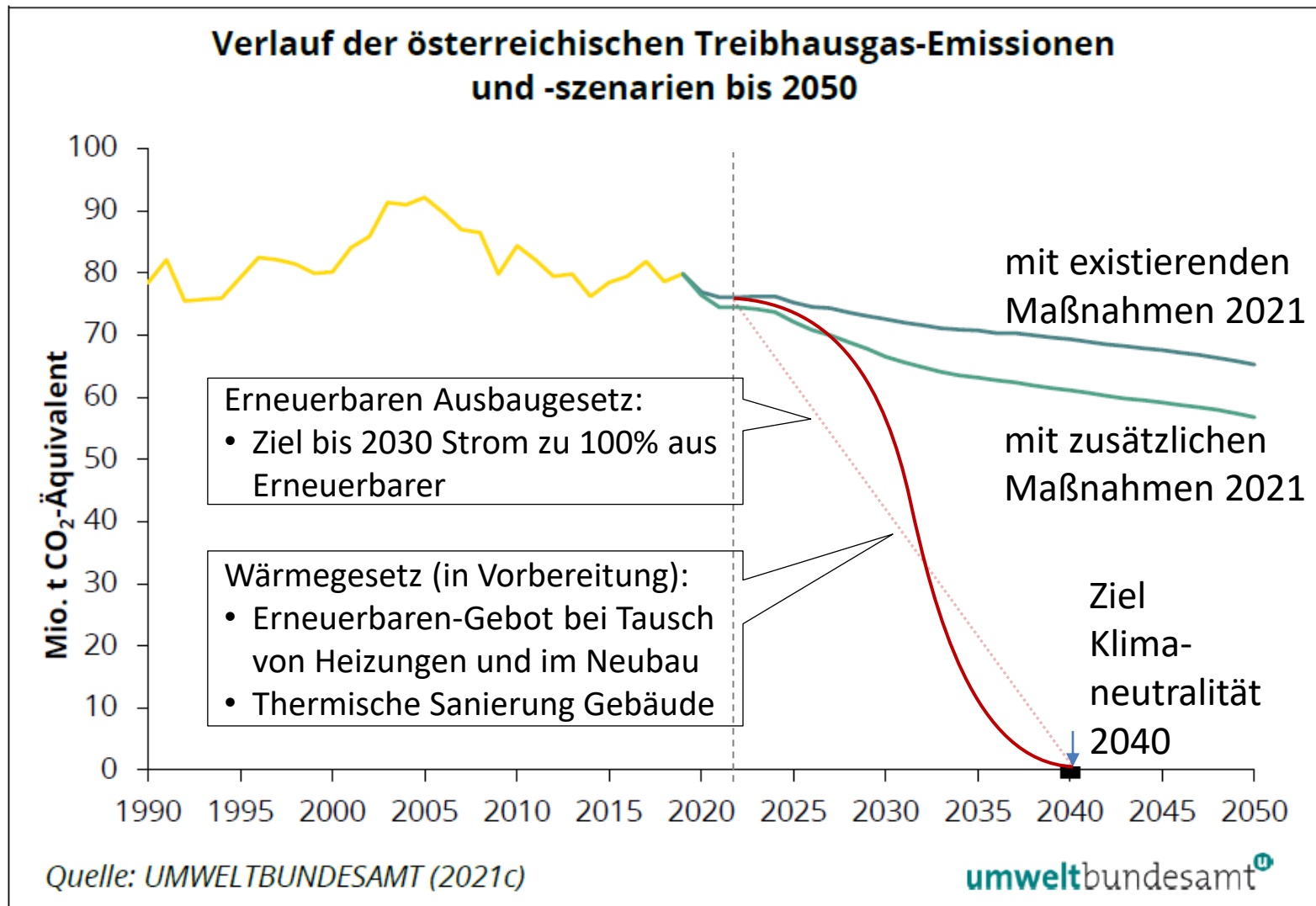




IPCC, SR1.5 Fig. SPM3b P3 scenario with historical dynamics.

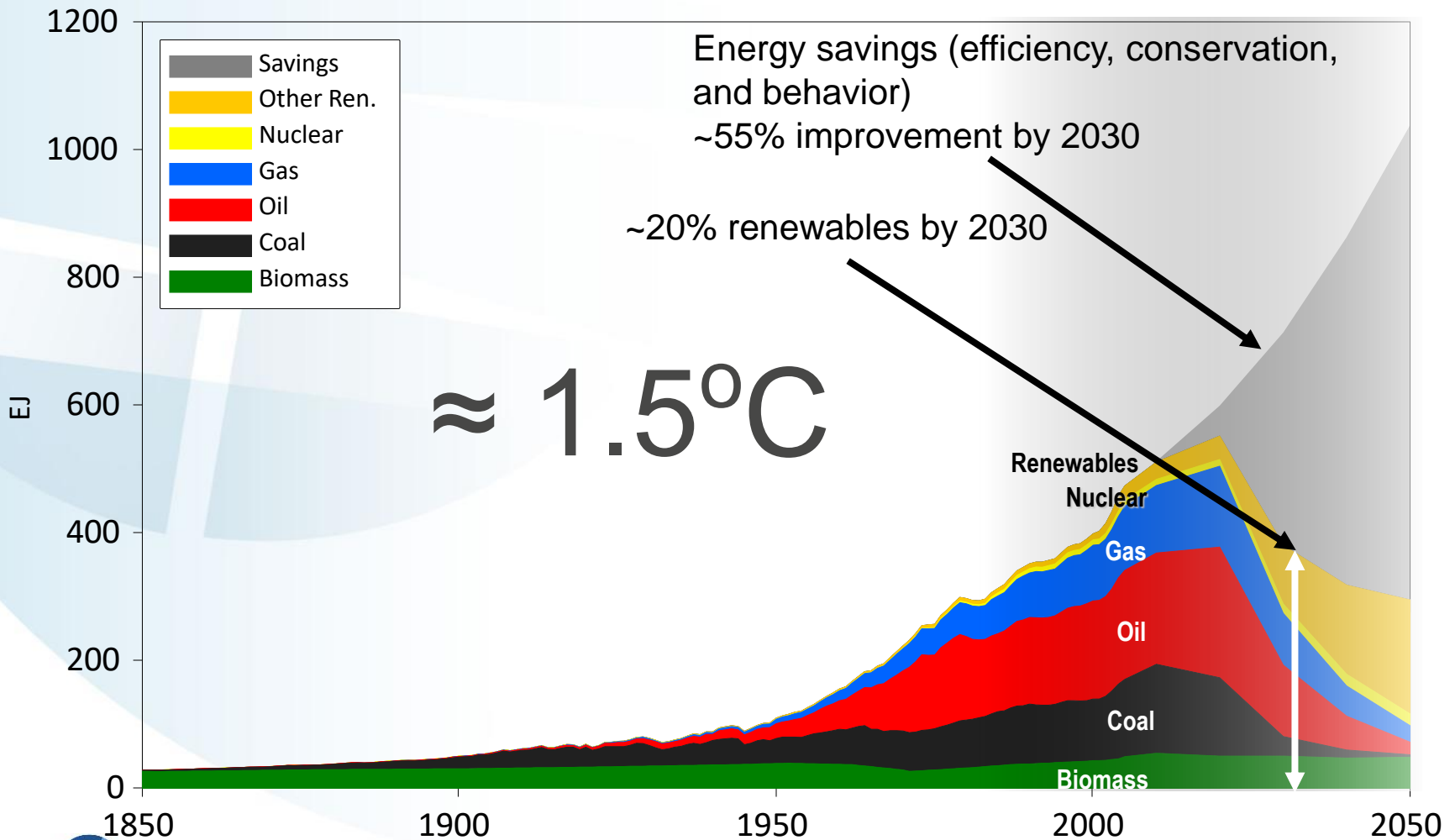
Source: IPCC 1.5SR, 2019 and Kriegler, 2019

# Wo steht Österreich? Aktuelle Emissionen und Ziele



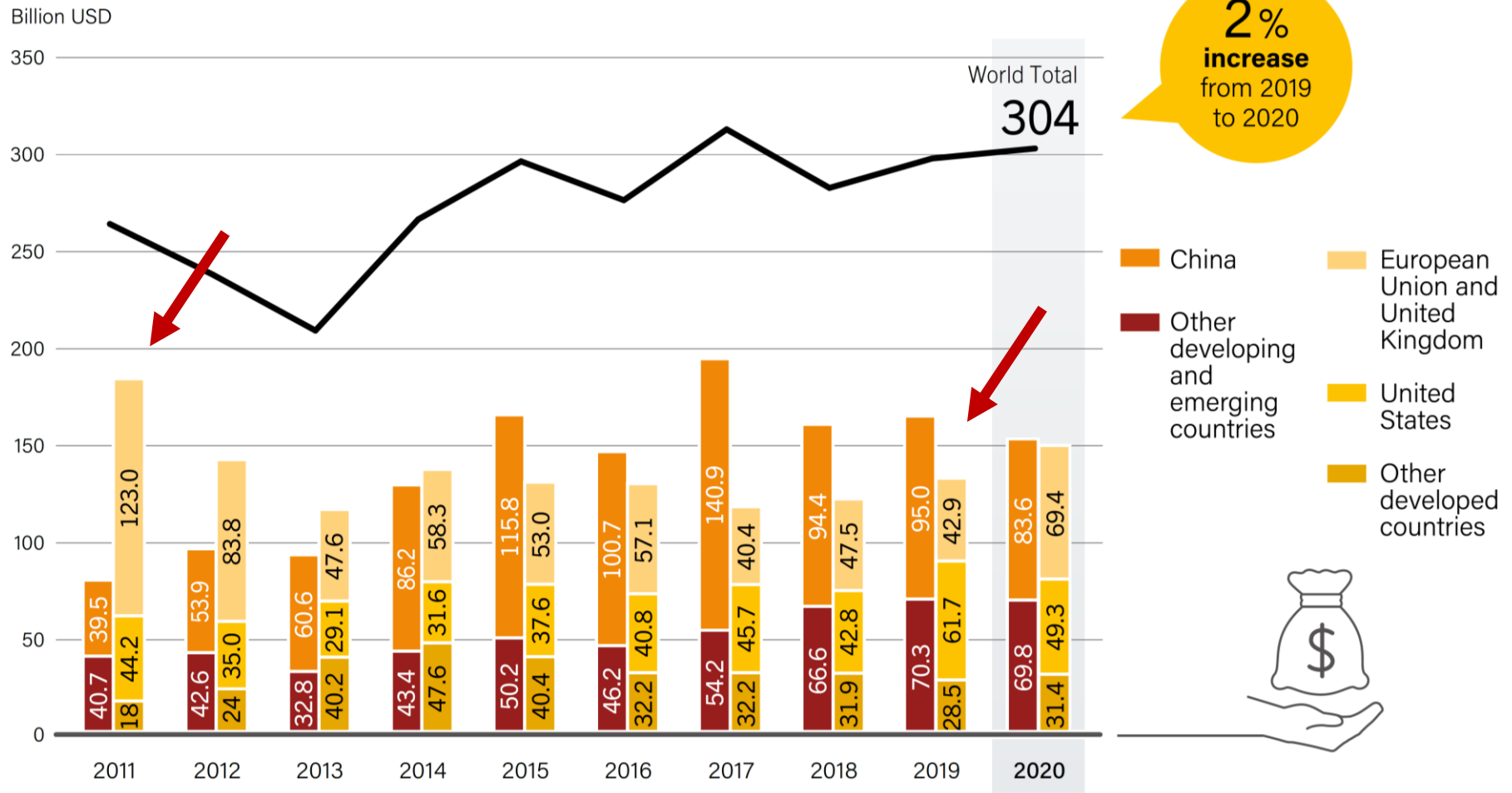
# Global Primary Energy

## Low Energy Demand (LED)

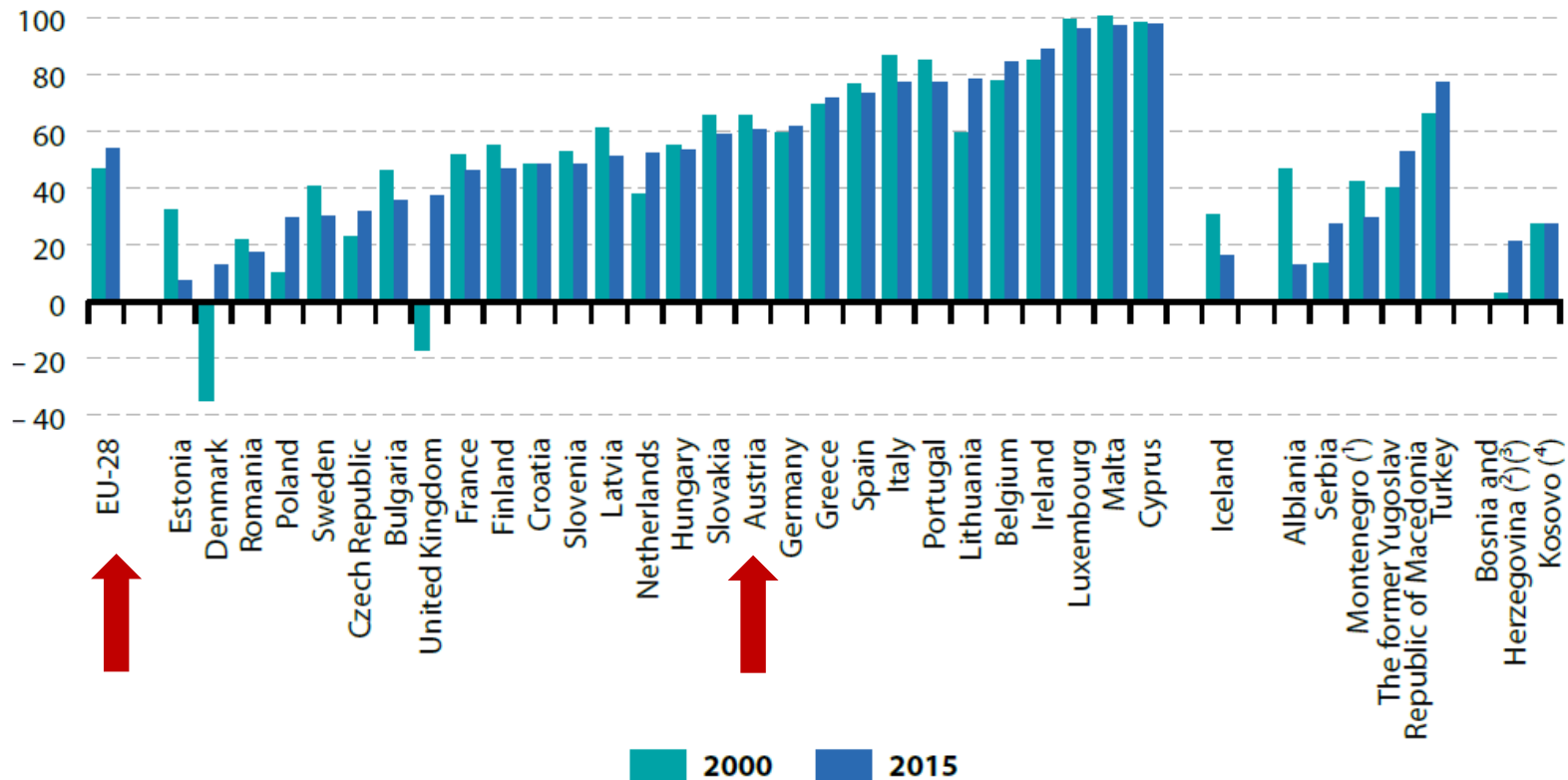




# Global Investments in Renewables



# Energy Import Dependence



Note: Norway is not displayed in this graph as it is a large net exporter of energy (2000: - 733.1 % and 2015: - 585.9%)

<sup>(1)</sup> 2005 data (instead of 2000).

<sup>(2)</sup> 2014 data (instead of 2015).

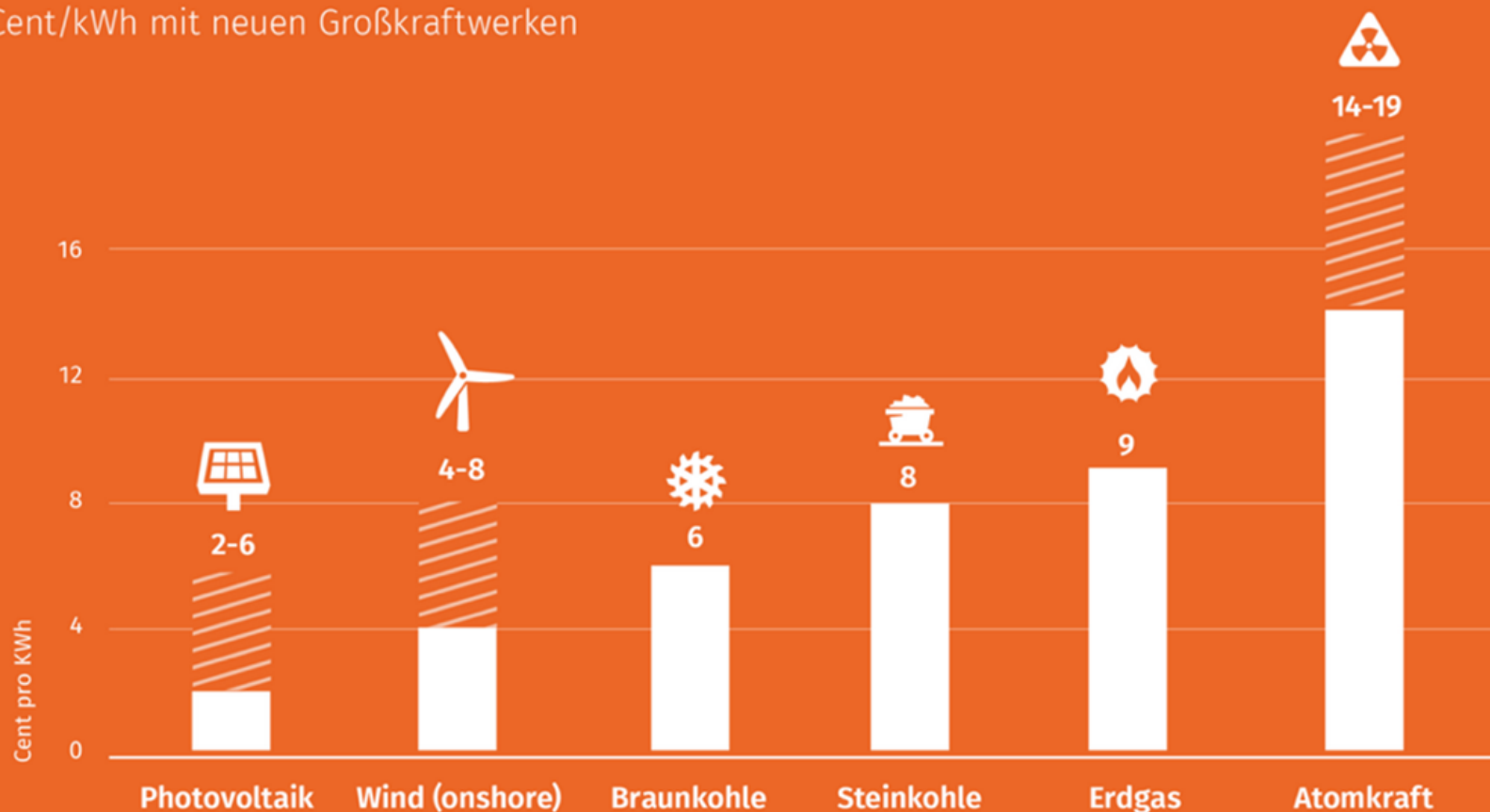
<sup>(3)</sup> Provisional data.

<sup>(4)</sup> This designation is without prejudice to positions on status, and is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo Declaration of Independence.

Source: Eurostat (online data code: [sdg\\_07\\_50](#))

# Kosten der Stromerzeugung in der EU

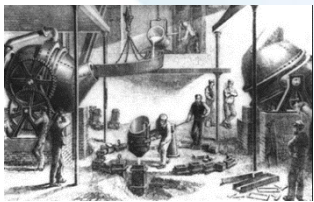
in Cent/kWh mit neuen Großkraftwerken



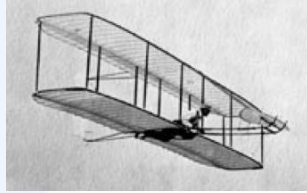
Quelle: Fraunhofer ISE, SolarPower Europe, DIW, 2020

# Transformational Change

1850



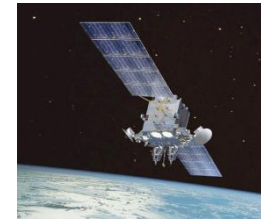
1900



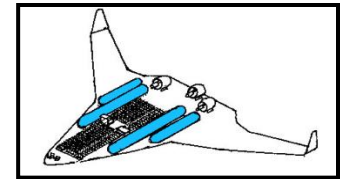
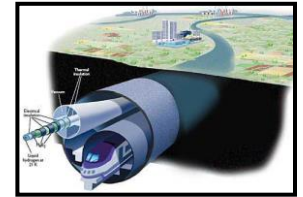
1950



2000



2050



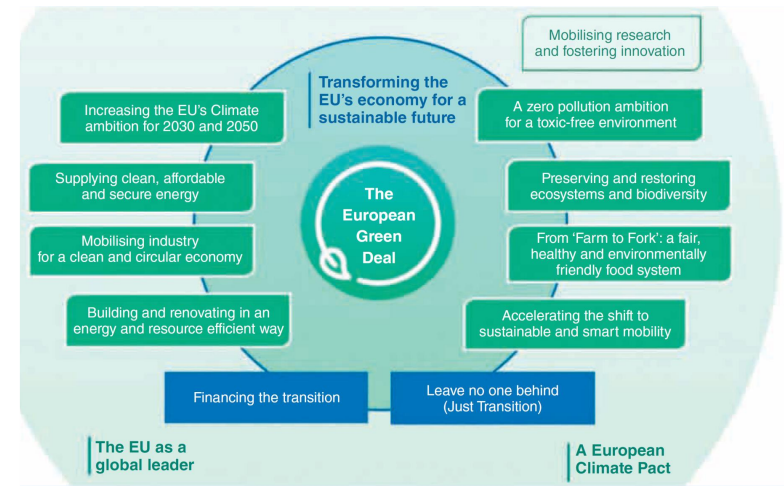
Source: After Granger Morgan, 2013

2022 #24



# The New European Bauhaus initiative

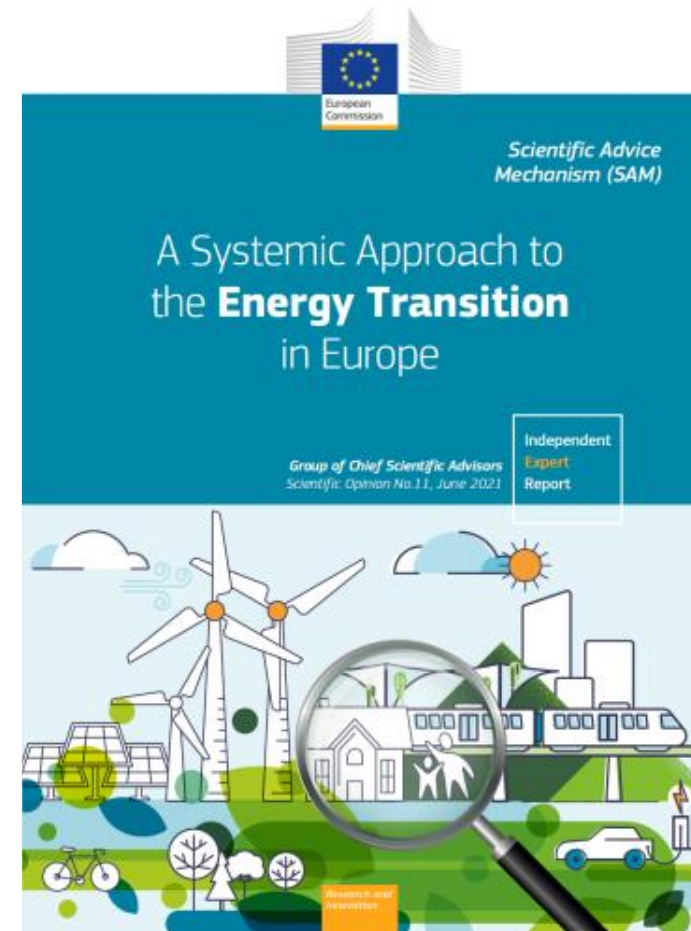
- The **New European Bauhaus** translates the **European Green Deal** into a **tangible, positive experience** in which all Europeans can participate and progress together.
- It **inspires a movement** to facilitate and steer the transformation of our societies along **three inseparable values**:



- **Sustainability**, from climate goals, to circularity, zero pollution, and biodiversity
- **Inclusion**, (together) from valorising diversity, to securing accessibility and affordability
- **Beauty**, esthetics beyond quality of experience and style, beyond functionality

- The initiative's **approach** is **multi-level** from global to local, **participatory** and **transdisciplinary**.

# THANK YOU



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