BANCA D'ITALIA
EUROSISTEMA

Le sfide della transizione ecologica

Il cambiamento climatico e gli effetti economici sul sistema finanziario

Luciano Lavecchia

Banca d'Italia e OIPE

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Le opinioni espresse sono personali e non rappresentano necessariamente le istituzioni di appartenenza

Sommario

1. Cos'è il cambiamento climatico
2. Gli effetti economici e i canali di trasmissione
3. Il finanziamento della transizione
4. Gli effetti distributivi delle politiche climatiche

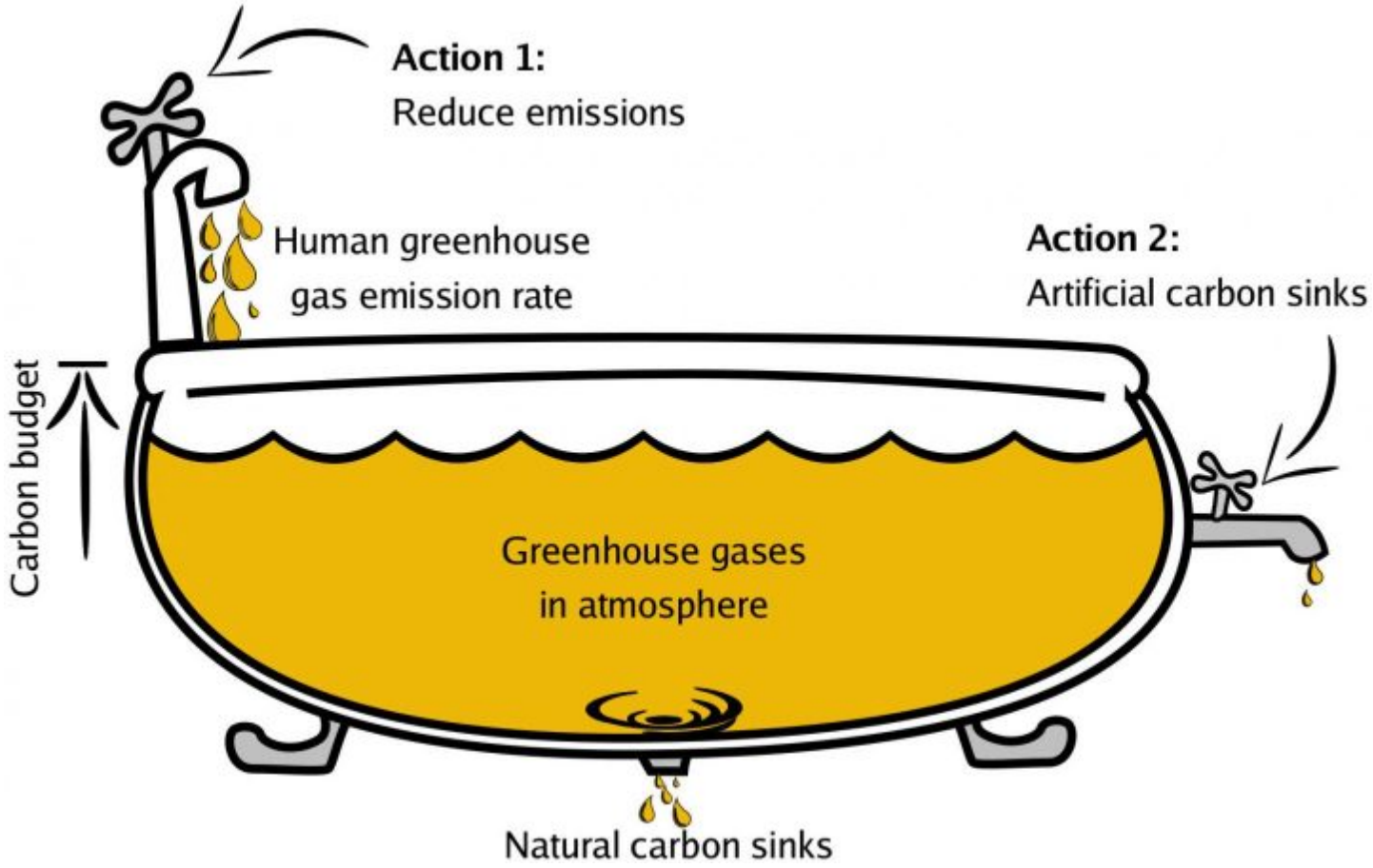
1. Cos’è il cambiamento climatico

I gas a effetto serra (GHG) hanno permesso la vita sulla terra (senza, temp = **-18°C**)

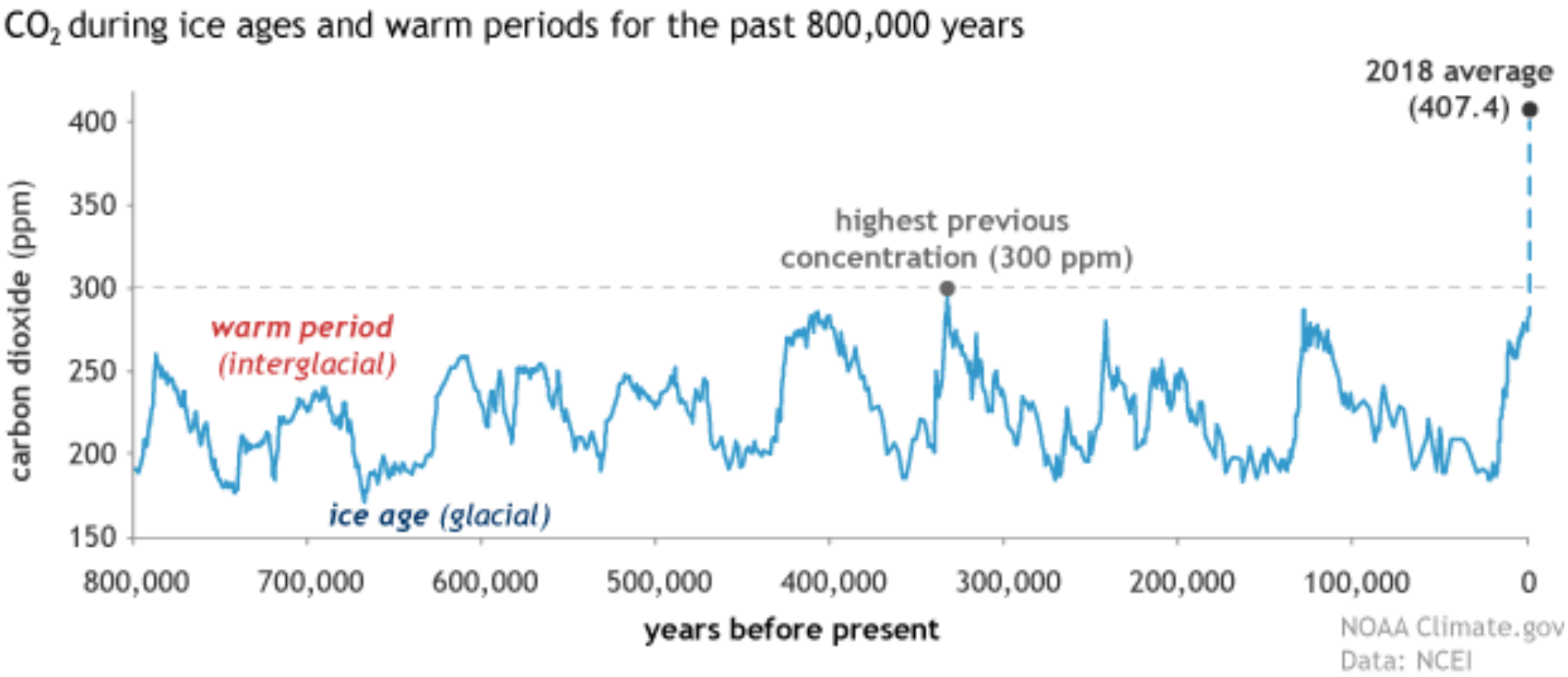
Quando bruciamo idrocarburi (energia solare immagazzinata) emettiamo "troppi" gas serra

La concentrazione di GHG nell'atmosfera aumenta la temperatura del pianeta

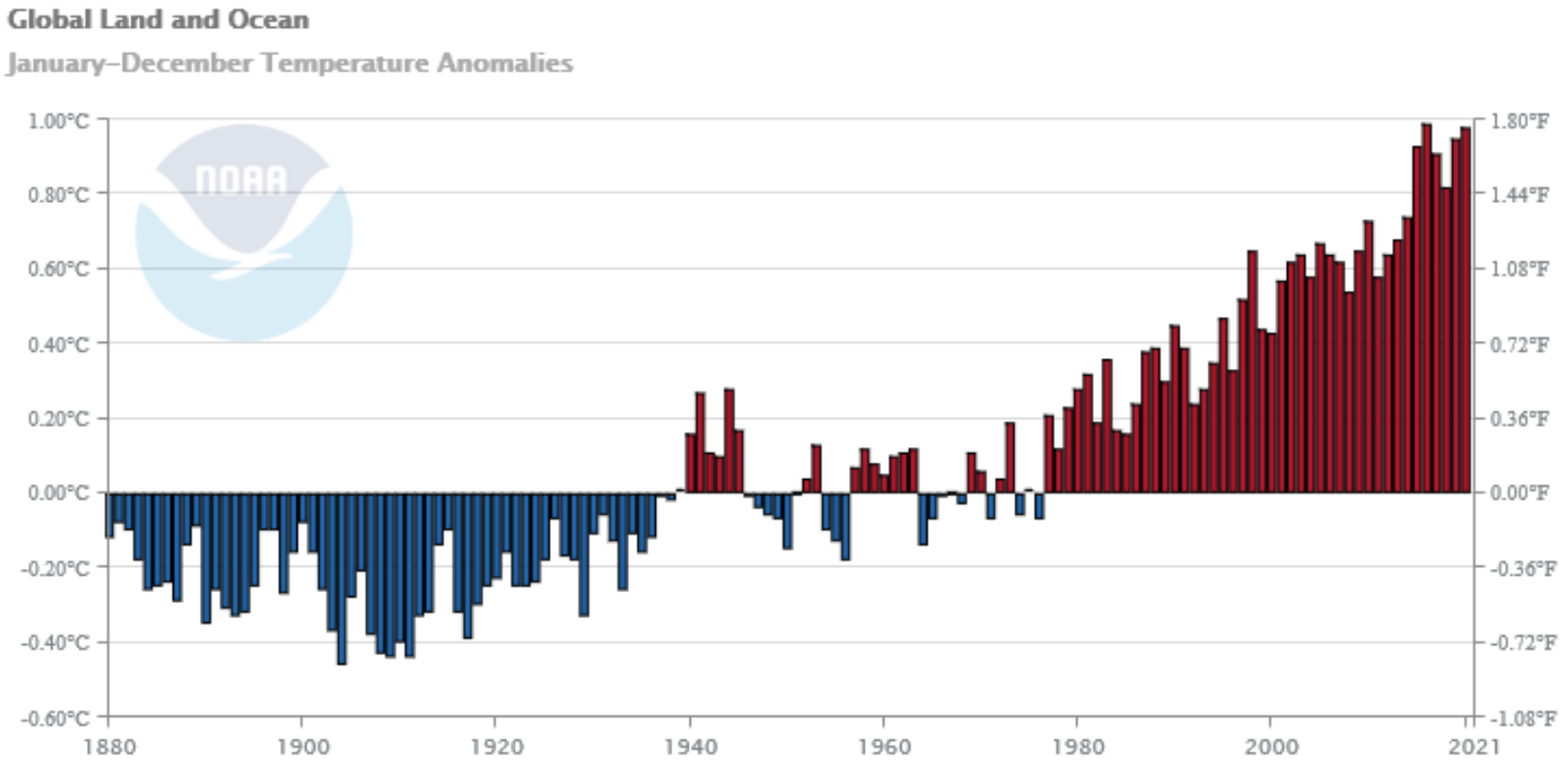
I «serbatoi» di carbonio



La concentrazione di CO2 è su livelli storicamente elevati…



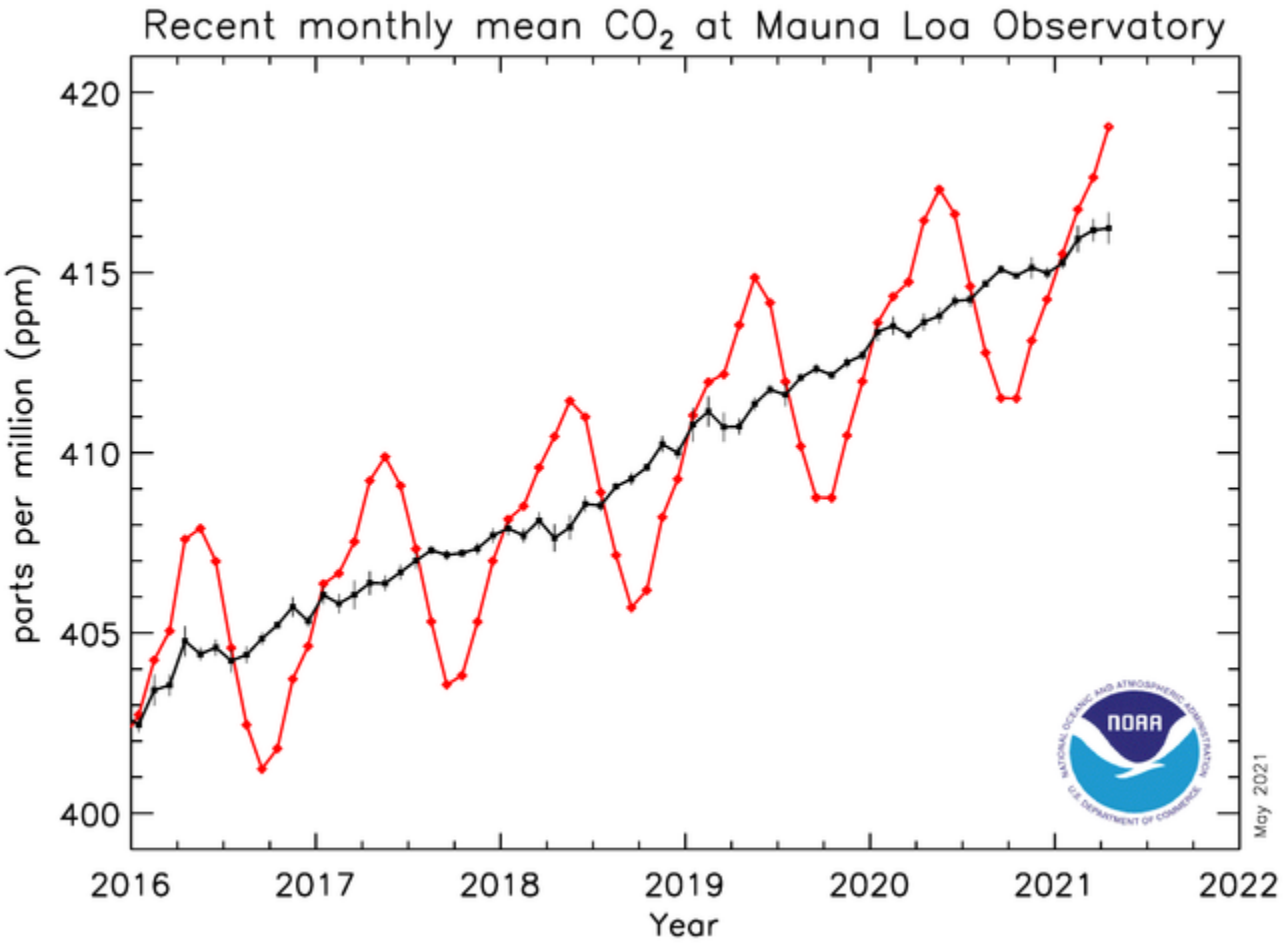
.. e le anomalie nella temperatura globale aumentano



Deviazione della temperatura globale rispetto alla media del 20 esimo secolo (1901-2000)

Fonte: NOAA, 2021

… nonostante il coronavirus…



April 2021: **419.05 ppm**

April 2020: **416.45 ppm**

… e un cigno nero è sempre in agguato..

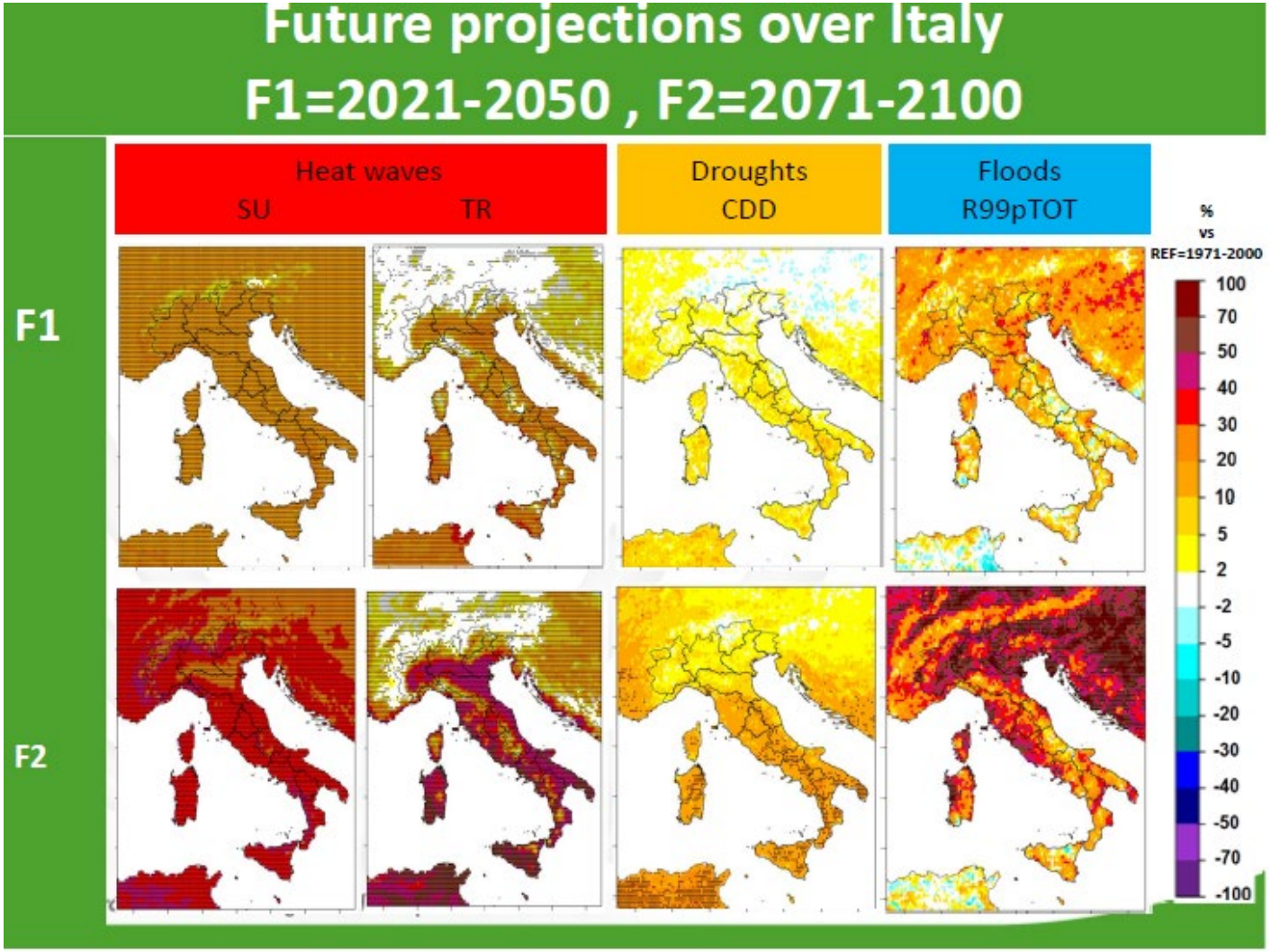
CO2 conc. (*ppm*)	400	450	500	550	600	650	700	750	800
Median temp increase (C°)	1,3	1,8	2,2	2,5	2,7	3,2	3,4	3,7	3,9
Prob temp > 6°C	0,04%	0,3%	1,2%	3%	5%	8%	11%	14%	17%

Concentrazione pre rivoluzione industriale: 260 ppm

Fonte: Wagner e Weitzman (2015)

2. Gli effetti economici e i canali di trasmissione

Gli effetti attesi del cambiamento climatico in Italia

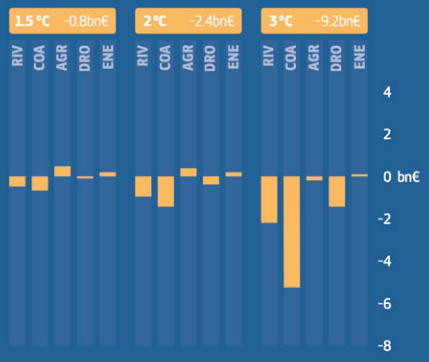


Source: RSE, progetto CLIMED

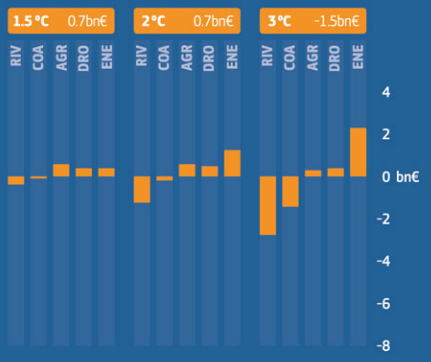
Welfare loss from climate change impacts

JRC PESETA IV conducted an economic analysis of climate change impacts on river and coastal flooding, agriculture, droughts and energy supply.
Welfare impacts are estimated as if the future climate affects the economy of nowadays.

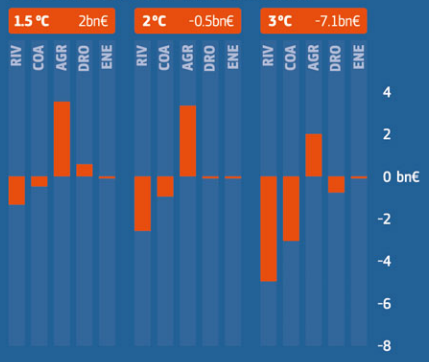
UK & IRELAND



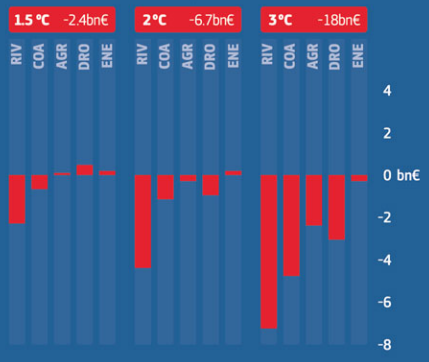
NORTHERN EUROPE



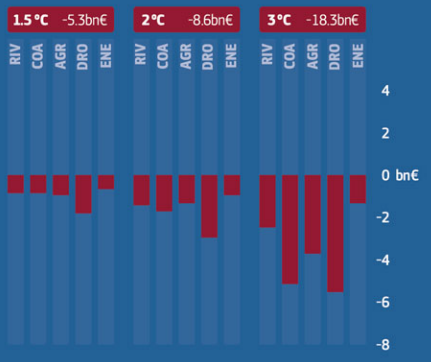
CENTRAL EUROPE (NORTHERN)



CENTRAL EUROPE (SOUTHERN)



SOUTHERN EUROPE



The assessment does not evaluate the full economic impacts of climate change in Europe as not all possible climate impacts were analysed.

Far greater impact on southern Europe

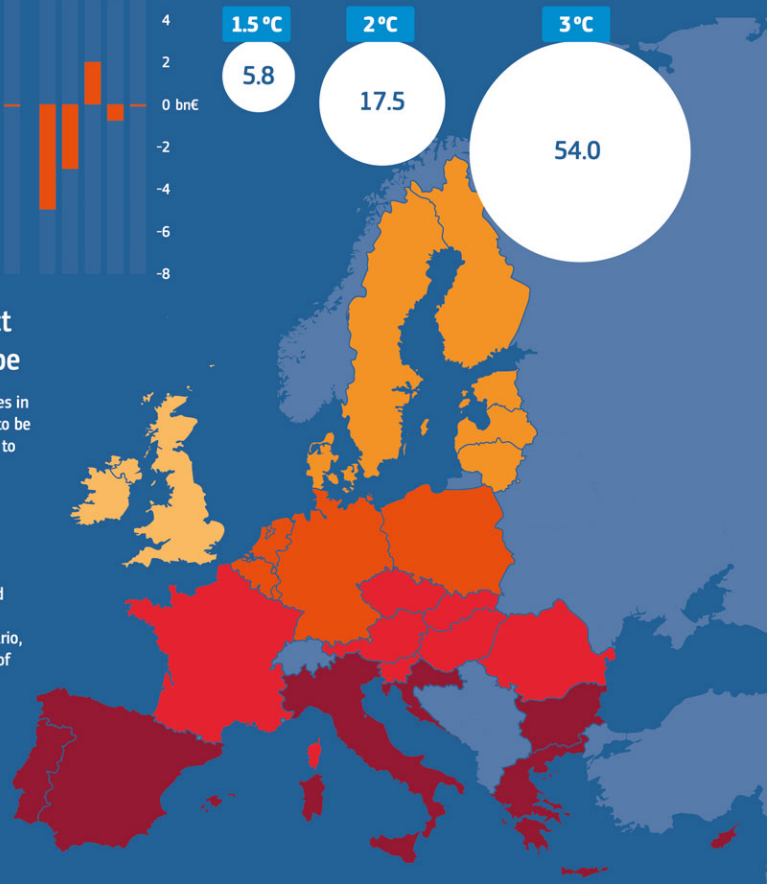
The magnitude of welfare losses in southern regions is estimated to be several times larger compared to northern regions.

Mitigation makes a difference

Limiting warming to 2 °C would reduce the welfare losses by 70% compared to a 3 °C scenario, while achieving the Paris goal of 1.5 °C would lower the welfare losses by 90%

Welfare losses in EU & UK (bn€)

If human mortality impacts were included, the estimated welfare losses in EU & UK would become much larger for all scenarios (an increase to 41.9€bn at 1.5 °C, 82.6€bn at 2 °C and 175.9€bn at 3 °C)



For more information, including assumptions of the modelling framework used, see: JRC PESETA IV project https://ec.europa.eu/jrc/en/peseta-iv

European Commission

Drought in a changing climate

A **first-ever** pan-European quantitative assessment of the economic impacts of drought in Europe.

EU & UK DROUGHT LOSSES PER YEAR

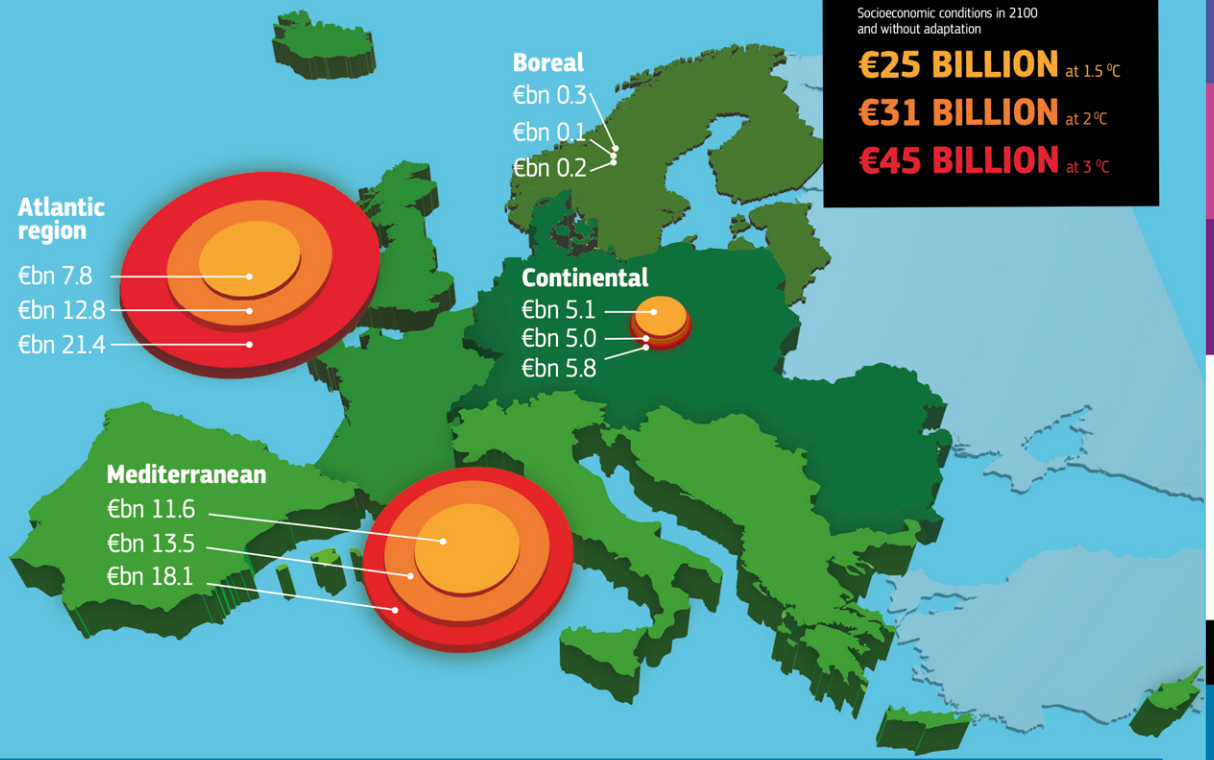
€9 BILLION present (1981 - 2010)

Socioeconomic conditions in 2100 and without adaptation

€25 BILLION at 1.5 °C

€31 BILLION at 2 °C

€45 BILLION at 3 °C



Modelled expected annual losses (billion €) for the present (1981 - 2010)

Mediterranean	Atlantic region	Continental	Boreal
3.6	2.5	2.6	0.3

Projected expected annual damages (billion €) based on socioeconomic conditions in 2100 and without adaptation, at:

1.5 °C 2 °C 3 °C

For more information, including assumptions of the modelling framework used, see: JRC PESETA IV project https://ec.europa.eu/jrc/en/peseta-iv

IMPACT ON SECTORS CONSIDERED

Agriculture
- Damages to crops and livestock losses
- Irrigation restrictions due to water scarcity

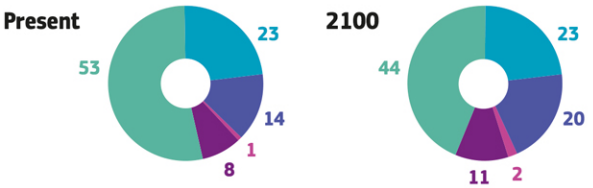
Power generation
- Reduction in hydroelectricity production
- Reduced capacity of cooling systems
- Possible shutdown of thermal and nuclear power plants

Public water supply
- Decreasing water availability
- Increasing competition amongst different sectors

Commercial shipping
- Interruption of navigation
- Reduction in cargo maximum capacity
- Transfer to other means of transportation

Buildings and infrastructure
- Damages due to soil subsidence
- Aquifer over-exploitation may aggravate damage to buildings from subsidence

Share of drought losses per socioeconomic sector (%)



KEY SUMMARY

- Drought will be more severe and persistant in southern and western Europe, whereas it will become less intense in northern and eastern Europe.
- Mediterranean and Atlantic regions are already contributing to about 68% of present losses, and this share will become 87% at 3 °C.
- Agriculture sector is most affected now and in the future, even if its economic importance is reduced in future European economies.

European Commission

Perdite economiche da eventi climatici estremi in Europa

Tra il 1980 e il 2019, eventi climatici estremi* hanno provocato in Europa (EEA-33):

- 92 mila morti
- danni per 446 miliardi di euro (36% coperti da assicurazione)
- 3% eventi responsabile 60% perdite
- Media perdite annue in crescita: 6,6 mld nel 1980-89, 12,3 nel 1990-99, 13,2 nel 2000-09, 12.5 nel 2010-19
- Per Italia:
  - danni per 72,5 miliardi, di cui solo 2,9 coperti da assicurazioni e 20.735 morti

Source: EEA (2021), Economic losses from climate-related extremes in Europe

***la quota riferita a eventi geofisici (terremoti, eruzioni, tsunami) è del 20%**

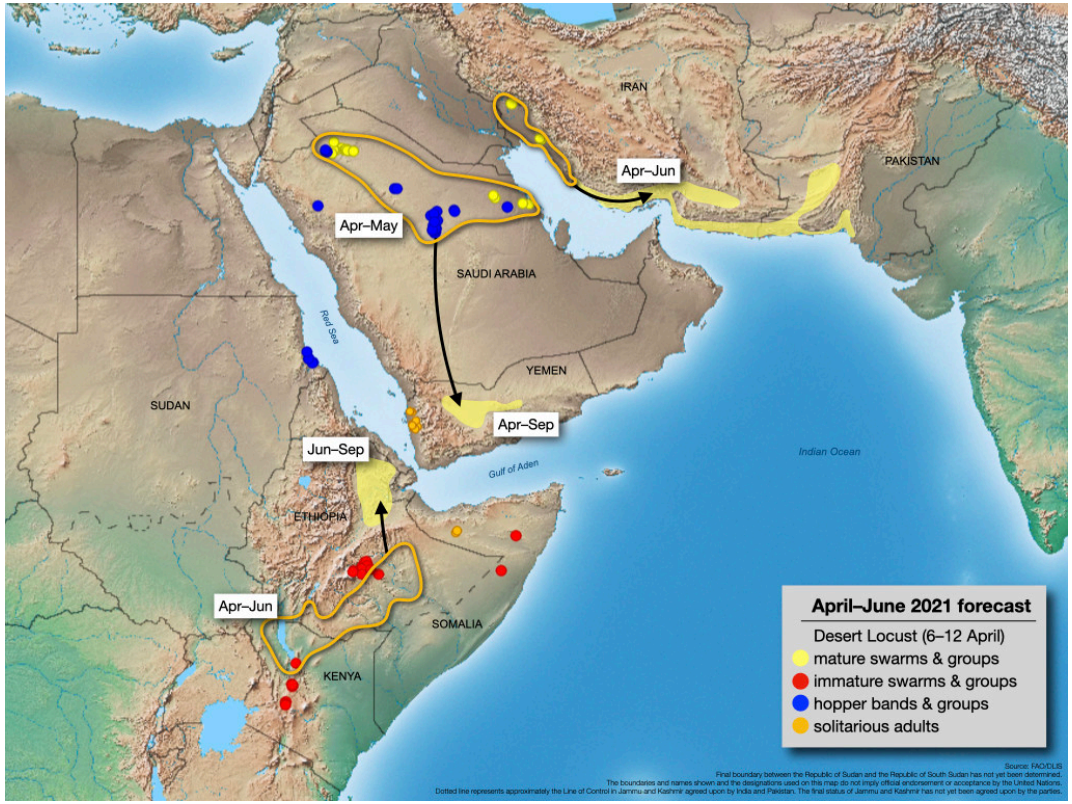
Il cambiamento è in corso (1): il permafrost si sta sciogliendo

Arctic Circle oil spill prompts Putin to declare state of emergency

4 June 2020 Share

The leaked diesel oil drifted some 12km (7.5 miles) from the site of the accident

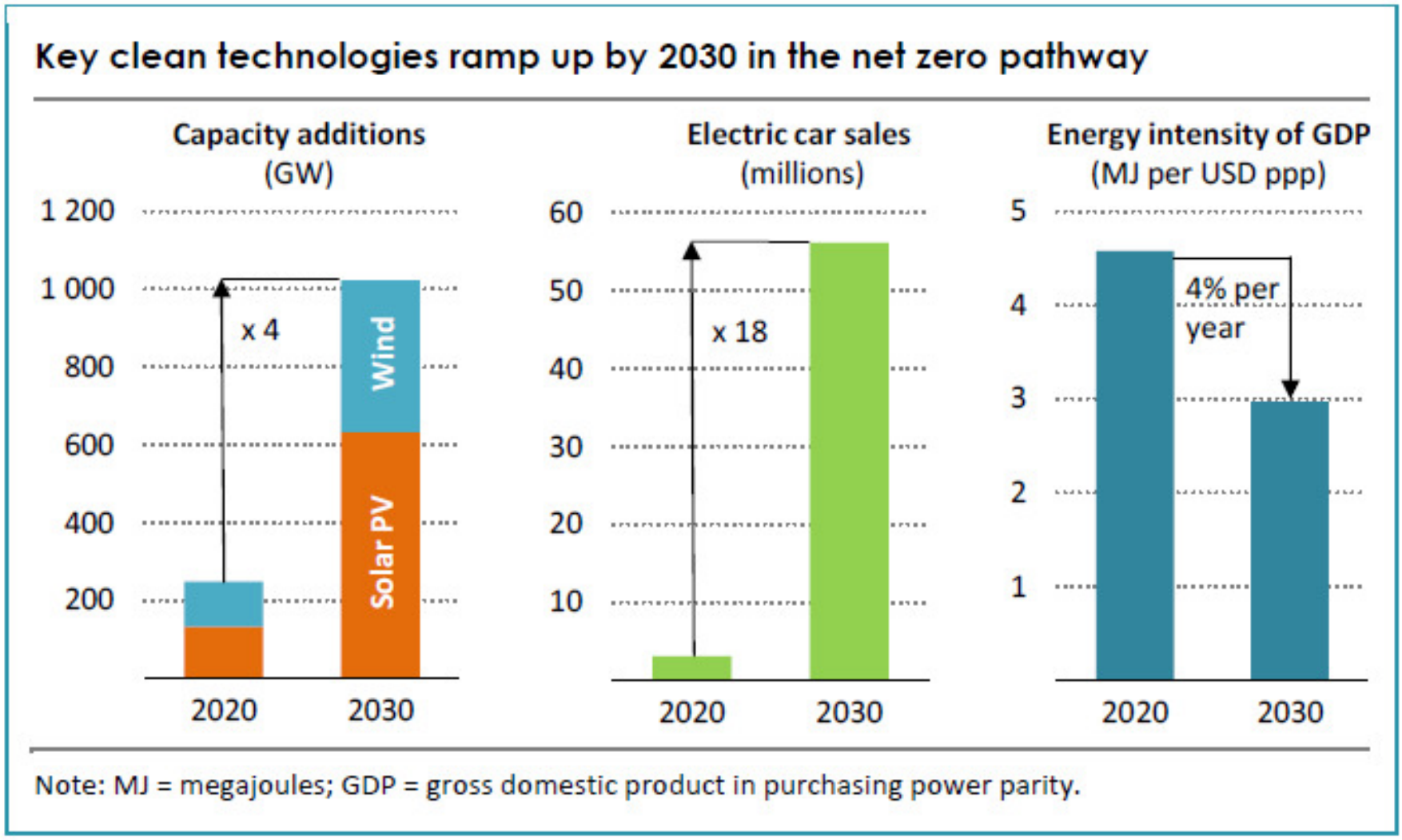
Il cambiamento è in corso (2): invasione di locuste in Africa orientale e M.O.



Il cambiamento è in corso (3): incendi eccezionali in Australia

3. Il finanziamento della transizione

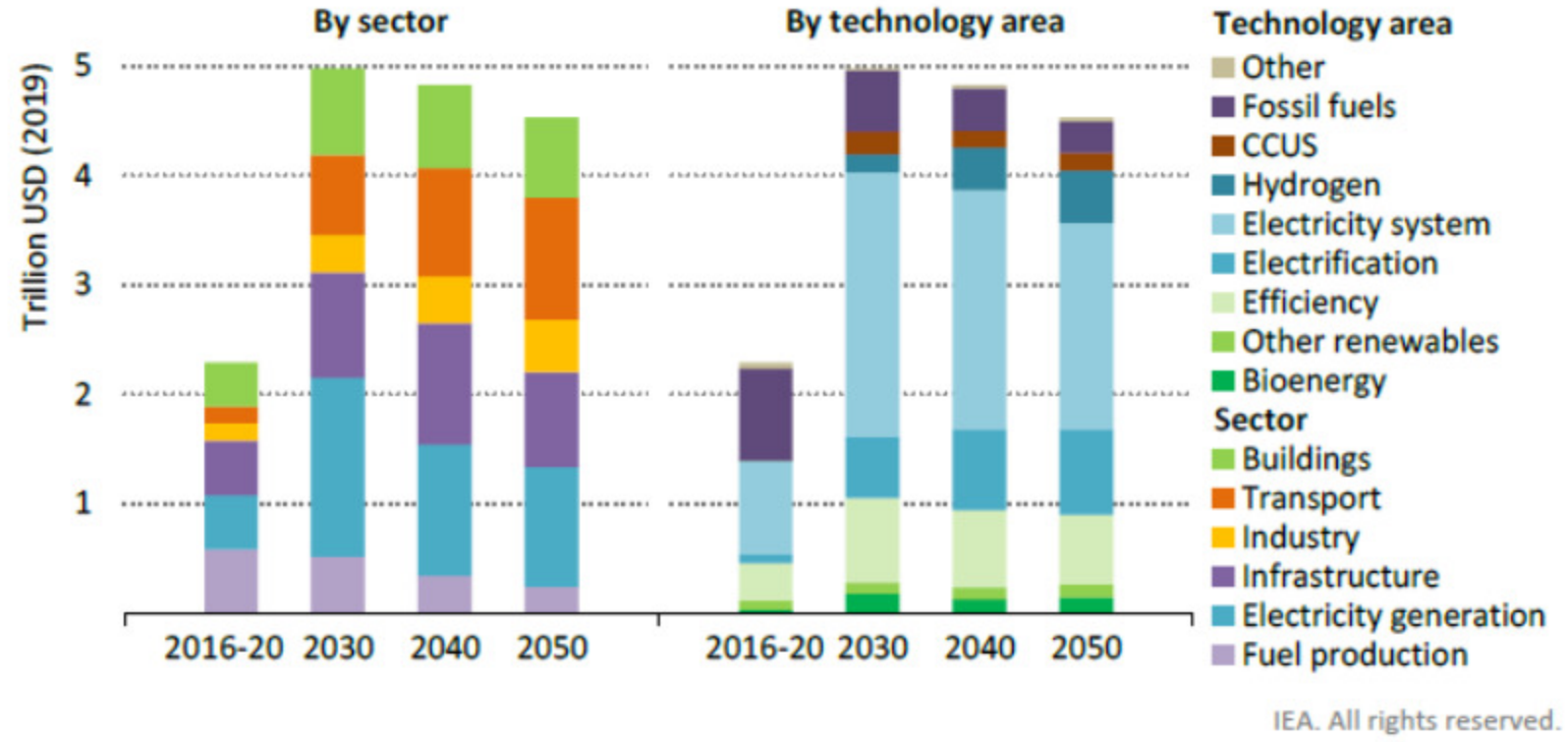
La Transizione non è un pranzo di gala (1)



Fonte: IEA, 2021

La Transizione non è un pranzo di gala (2)

Figure 2.22 ▷ Annual average capital investment in the NZE



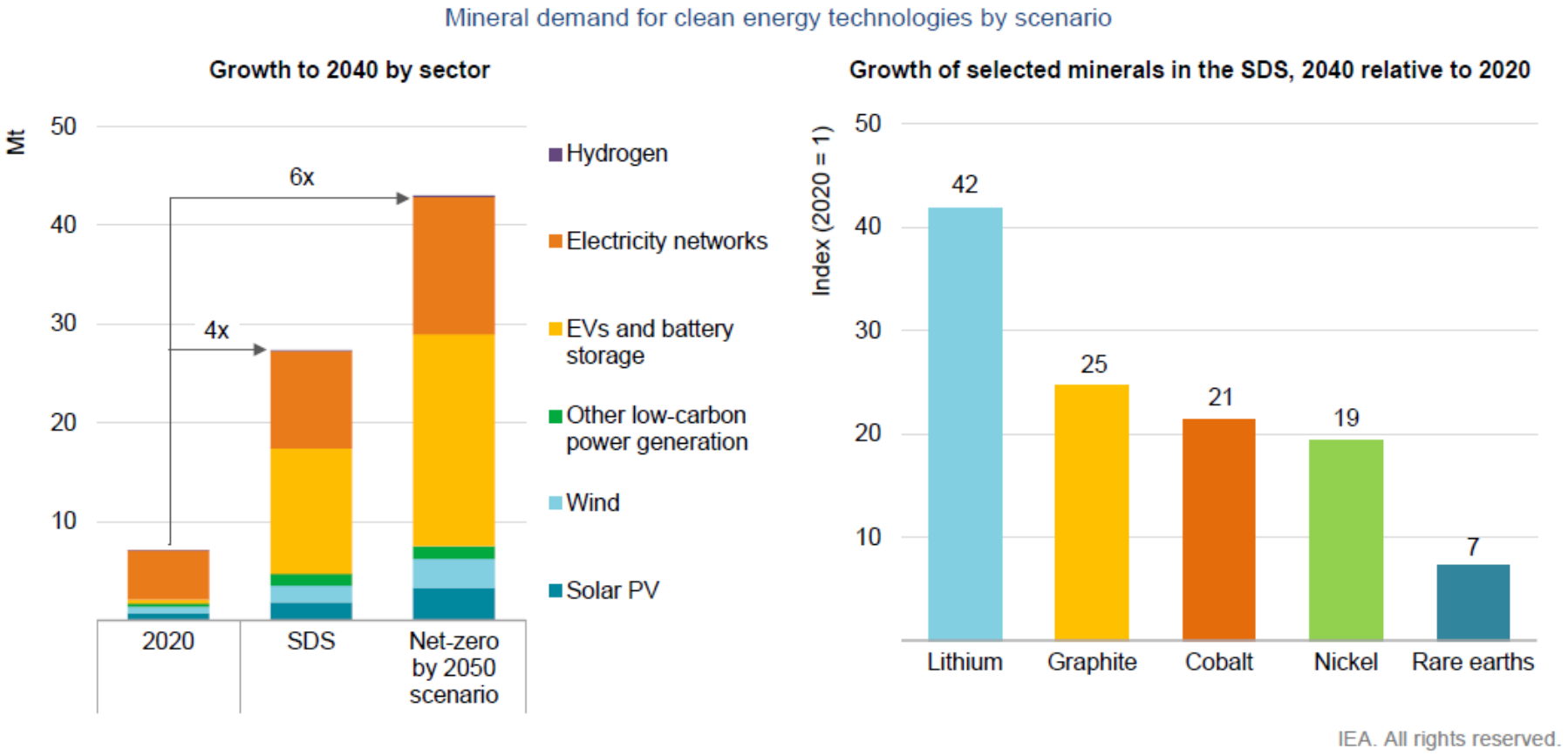
Capital investment in energy rises from 2.5% of GDP in recent years to 4.5% by 2030; the majority is spent on electricity generation, networks and electric end-user equipment

Fonte: IEA, 2021

nuclear energy is the elephant in the living room.....

La domanda di minerali sarà cruciale…

Mineral demand for clean energy technologies would rise by at least four times by 2040 to meet climate goals, with particularly high growth for EV-related minerals

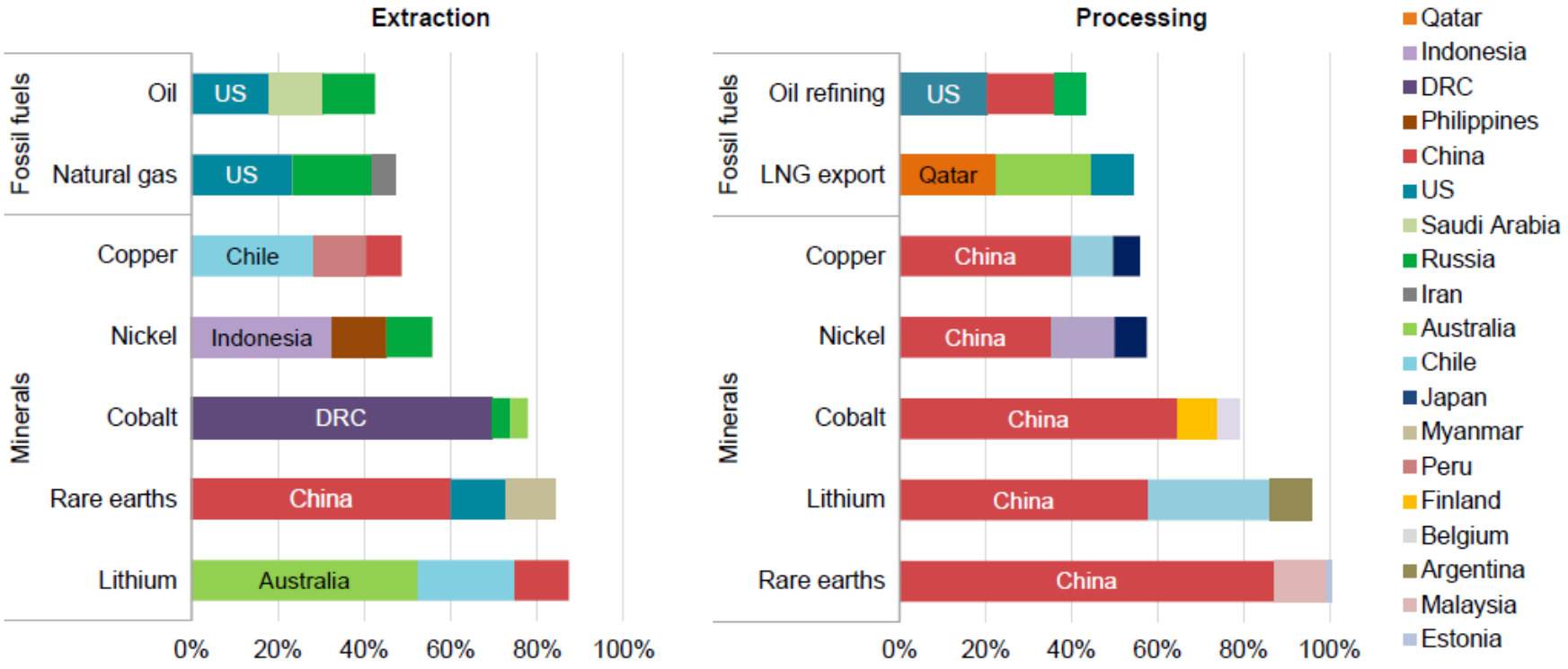


Fonte: IEA, 2021

… e pone delle sfide geopolitiche rilevanti

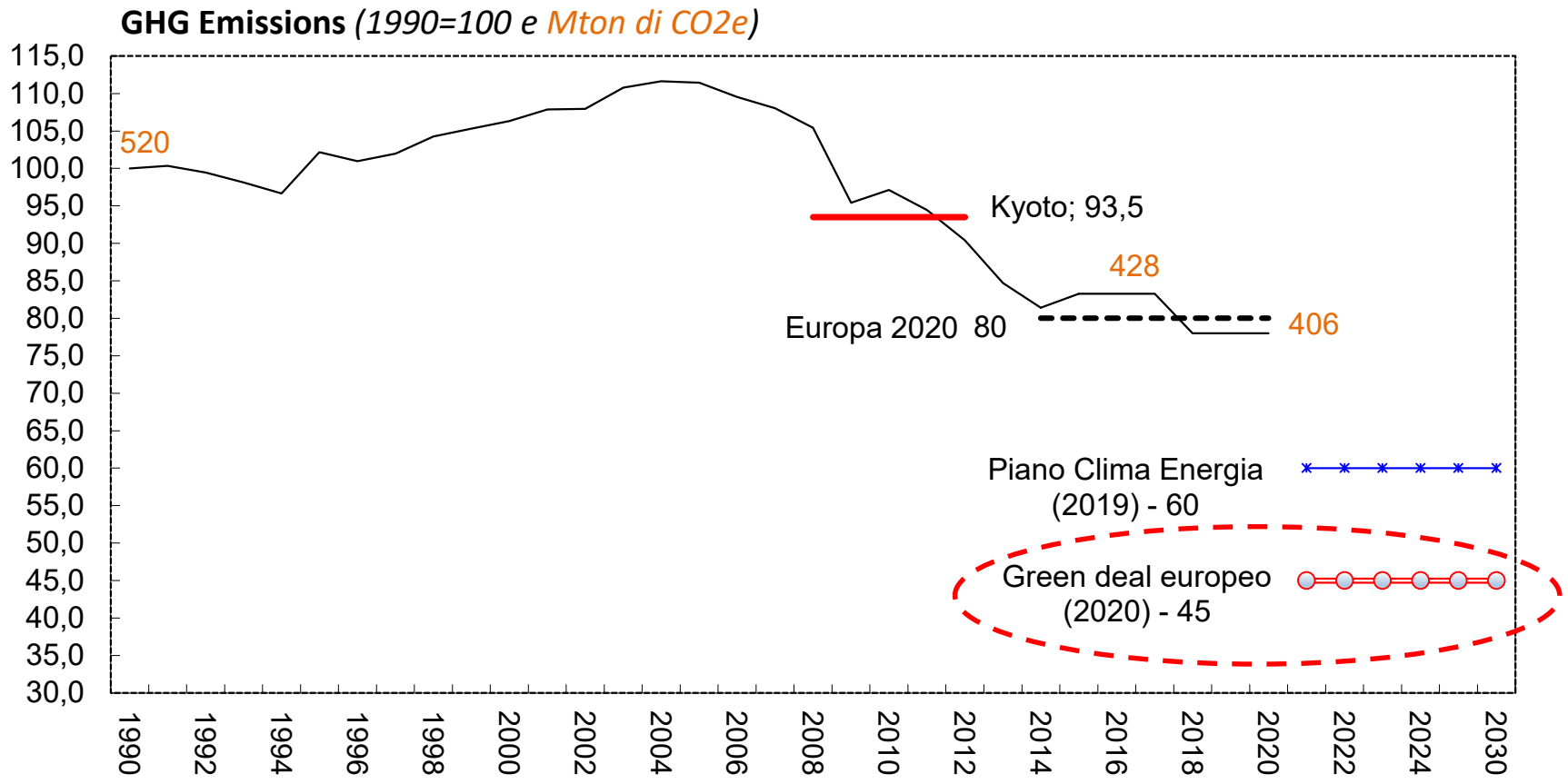
Production of many energy transition minerals today is more geographically concentrated than that of oil or natural gas

Share of top three producing countries in production of selected minerals and fossil fuels, 2019

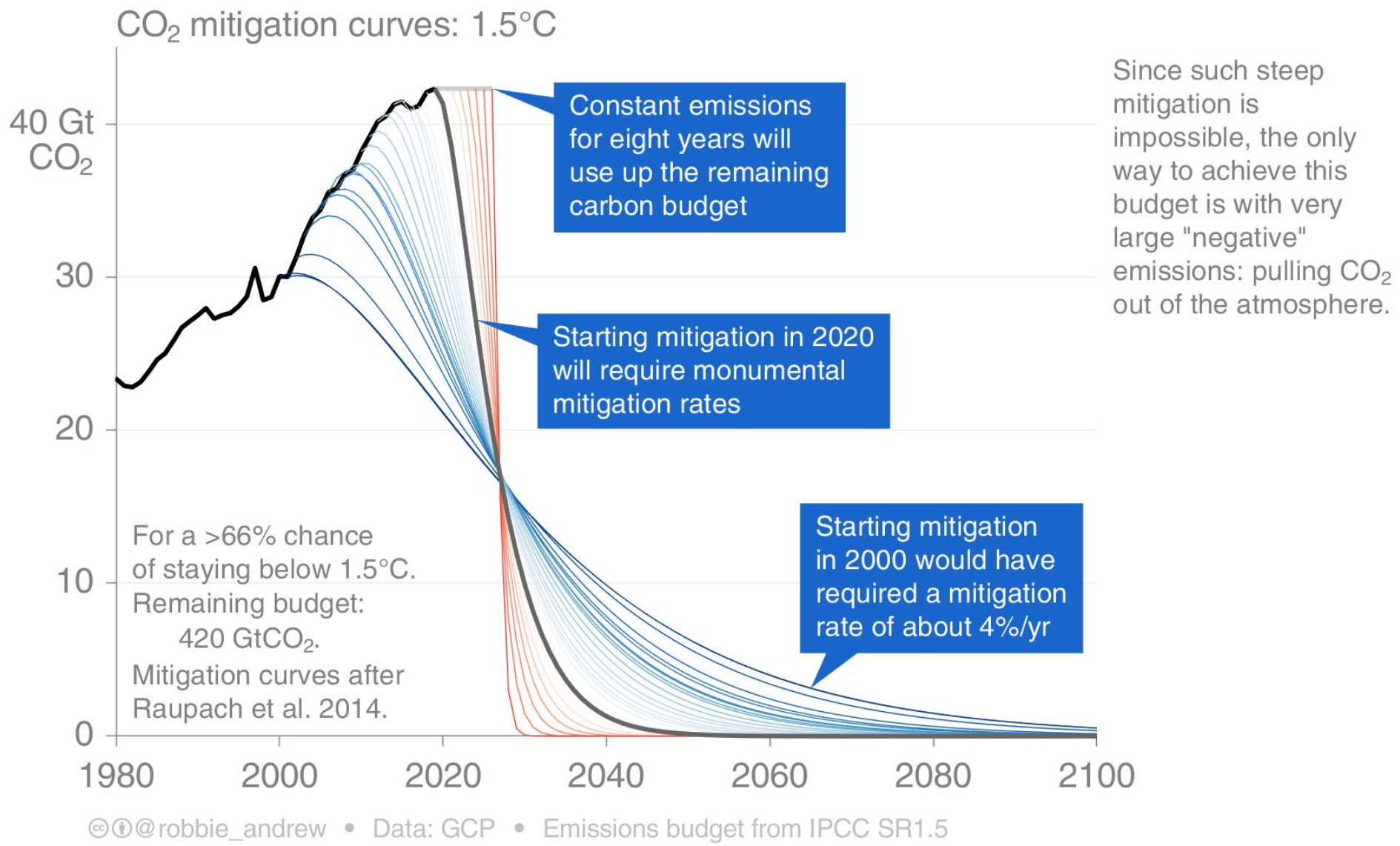


Fonte: IEA, 2021

Andamento delle emissioni in Italia in base agli impegni presi



… e più aspettiamo, più la transizione sarà drastica …



Since such steep mitigation is impossible, the only way to achieve this budget is with very large "negative" emissions: pulling CO_2 out of the atmosphere.

I rischi finanziari indotti dal cambiamento climatico (CRFR)

Due tipi di climate related financial risks (CRFRs)

Physical risk refers to the financial impact of a changing climate, including more frequent **extreme weather events and gradual changes in climate**, as well as of environmental degradation, such as air, water and land pollution, water stress, biodiversity loss and deforestation. **PIU DIFFICILE DA MISURARE, LONG TERM, GRANDE INCERTEZZA SU SCIENZA**

Transition risk refers to an institution's financial loss that can result, directly or indirectly, from the **process of adjustment towards a lower-carbon** and more environmentally sustainable economy. This could be triggered, for example, by a relatively **abrupt** adoption of climate and environmental policies, technological progress or changes in market sentiment and preferences. **PIU FACILE DA MISURARE (ES TRAMITE CARBON PRICE SHOCK)**

Guide on climate-related and environmental risks (SSM, Nov. 2020)

The transition to net zero emissions won't be easy

- IEA (2021), Net zero emissions (NZE) by 2050:
  - 2020-2030 is the crucial decade;
  - 2030 targets: all the required technologies are already available;
  - 2050 targets: half of the technologies are still prototype or unknown (especially heavy industries and long-distance transport);
  - Decarbonization is a massive process (involving a lot of resources)

How to channel private sector money?

1. Increase sustainability disclosure
2. Classification of investments (taxonomies) to avoid greenwashing

Increase sustainability disclosure

1. Data demand for sustainable pieces of information is growing but lack of standardized and comparable data/auditing and verification process;
   -> IFRS Foundation is working on an International Sustainability Standards Board (ISSB)
2. Few reports and:
   - datapoints from private data provider are uncorrelated (especially scope 3 - Busch et al. 2020);
   - advanced methods such as ML still require underlying microdata (e.g. energy demand (Nyugen et al. 2021)

   -> Mandatory reporting (e.g. EU Corporate Sustainability Reporting Directive)
3. Grant data access to increase transparency (e.g. the forthcoming European single access point - ESAP) using common identifiers (e.g. LEI for companies, ISIN for securities);
4. Data gaps: forward-looking data (e.g. targets/emissions pathways) and granularity (assets geographical location or economics)

Classification of sustainable activities/investments

Objective: avoid greenwashing and foster consistent (and comparable) data collection

- Existing classifications (OECD, 2020):
  - Netherlands' "Green funds" scheme (1995)
  - France's "Greenfin" label (2015)
  - China's *Green Bond Endorsed Projects Catalogue (2015, new 2020 Edition)*
  - Japan's green bond guidelines (2017)
  - Climate Policy Relevant Sectors (CPRS; Battiston et al. 2017)
  - EU Taxonomy for sustainable activities (2020)
  - Climate bond standards and ICMA Green bond principles (GBPs)
- Prospective: EU-Green bond standards (EU-GBS)
- Open issues:
  - green vs. brown taxonomy (e.g. CCrS);
  - economic activities vs. financial products
  - updates; data availability; usability vs. coherence;
  - minimally accepted global taxonomy (IPSF and G20-SFWG)

The EU taxonomy for sustainable activities

Uses and users of the Taxonomy		
	Disclosure obligations	**Optional additional uses**

Pensions and Asset Management	• UCITS funds:
	  • equity funds;
	  • exchange-traded funds (ETFs);
	  • bond funds
	• Alternative Investment Funds (AIFs):
	  • fund of funds;
	  • real estate funds;
	  • private equity or SME loan funds;
	  • venture capital funds;
	  • infrastructure funds;
	• Portfolio management.	

Insurance	• Insurance-based investment products (IBIP)	• Insurance
Corporate & Investment Banking	• Securitisation funds* • Venture capital and private equity funds • Portfolio Management • Indices funds	• Securitisation • Venture capital and private equity • Indices • Project finance and corporate financing
Retail banking		• Mortgages • Commercial building loans • Car loans • Home equity loans

Characteristics:

- green taxonomy;
- static;
- granular (singola attività);
- Financial investments;
- binary;
- 6 environmental objectives

Sustainable activity if:

1. contributes substantially to at least one of the six environmental objectives;
2. does not significantly harm (DNSH);
3. compliance with the minimum safeguards;
4. it complies with technical screening criteria (TSC).

4. Gli effetti distributivi delle politiche climatiche

Carbon pricing as an optimal tool

- A global carbon price is the economists' recommended choice to tackle climate change (Tirole, 2017);
- carbon pricing should reflect the global social cost of carbon (SCC), i.e the monetary value caused by an additional ton of greenhouse gas emitted (Tol 2019);
- thou there are several methodological issues on identifying the "right" price" (see Pindyck 2013 and 2017; Cortes et al. 2020);
- two types of carbon pricing: set Q (ETS) or P (carbon tax);
- currently 64 carbon pricing initiatives in place, either ETS (29 initiatives, 16% world GHG covered) or carbon tax (35 initiatives, 5.5% GHG - World Bank, 2021);
- In EU-27 + Iceland, Liechtenstein and Norway, the EU-ETS covers 45% of all the GHG emissions; local schemes (e.g. Sweden carbon tax) exist in half of the member states.

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A carbon tax in Italy

- Italy belongs to the EU-ETS; currently, there is no national carbon pricing scheme;
- we choose to focus on 4 possible CTs: €50 (current EU-ETS), €100 (COP21 compliant), €200 and €800 (peak values *orderly* and *disorderly* NGFS scenarios);
- we use the specific carbon emission factors from official sources for each fuel to estimate the impact of each carbon tax on final energy prices;

carbon emission factors per fuel

ton CO2 per GJ

Electricity	Heating	Petrol	Diesel
0.078167	0.055820	0.067903	0.068301

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Effects of the CT on final energy prices

	Carbon taxes			
€ per ton of CO2	50	100	200	800
Price variation				
Electricity	+6.3	+12.6	+25.2	+100.8
Heating	+11.8	+23.6	+47.2	+188.7
Transport fuels	+7.9	+15.9	+31.8	+127.2
% change compared with the baseline year (2018)				

Using 2018 prices as baseline, the introduction of a carbon tax of e50 per ton, is equivalent to add: e0.014 to each kWh of electricity (+6 per cent); e2.8 to each GJ of gas (+12 per cent) and e0.12 to each litre of gasoline or gasoil (+8 per cent).

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Results of the simulations (1 out of 2)

	Carbon taxes			
€ per ton of CO2	50	100	200	800
Energy demanded				
Electricity	-1.7	-3.4	-6.3	-19.6
Heating	-5.1	-9.7	-17.7	-48.1
Transport fuels	-2.6	-5.1	-9.5	-28.3
Total energy demand	-4.2	-7.7	-13.8	-38.0
Expenditure				
Electricity	+4.5	+8.9	+17.3	+61.6
Heating	+6.6	+12.6	+22.9	+54.1
Transport fuels	+5.1	+10.0	+19.2	+62.6
Total energy expenditure	+5.4	+10.6	+20.0	+59.8
Total expenditure	+0.5	+1.0	+2.0	+5.9

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Results of the simulations (2 out of 2)

	Carbon taxes			
€ per ton of CO2	50	100	200	800
Effect on inflation (2018)*	+0.7	+1.4	+2.8	+11.3
CO2 Emissions and revenues				
% var	-3.7	-7.0	-12.9	-36.4
Emissions (ΔMtCO2e)	-4.8	-9.3	-17.0	-48.0
Revenues (billion of €)	+4.2	+8.2	+15.5	+42.1

* Additional percentage points to the Italian consumer price index (NIC).

(Total GHG emissions in 2018: 438 MtCO2eq - 112 from HHs)

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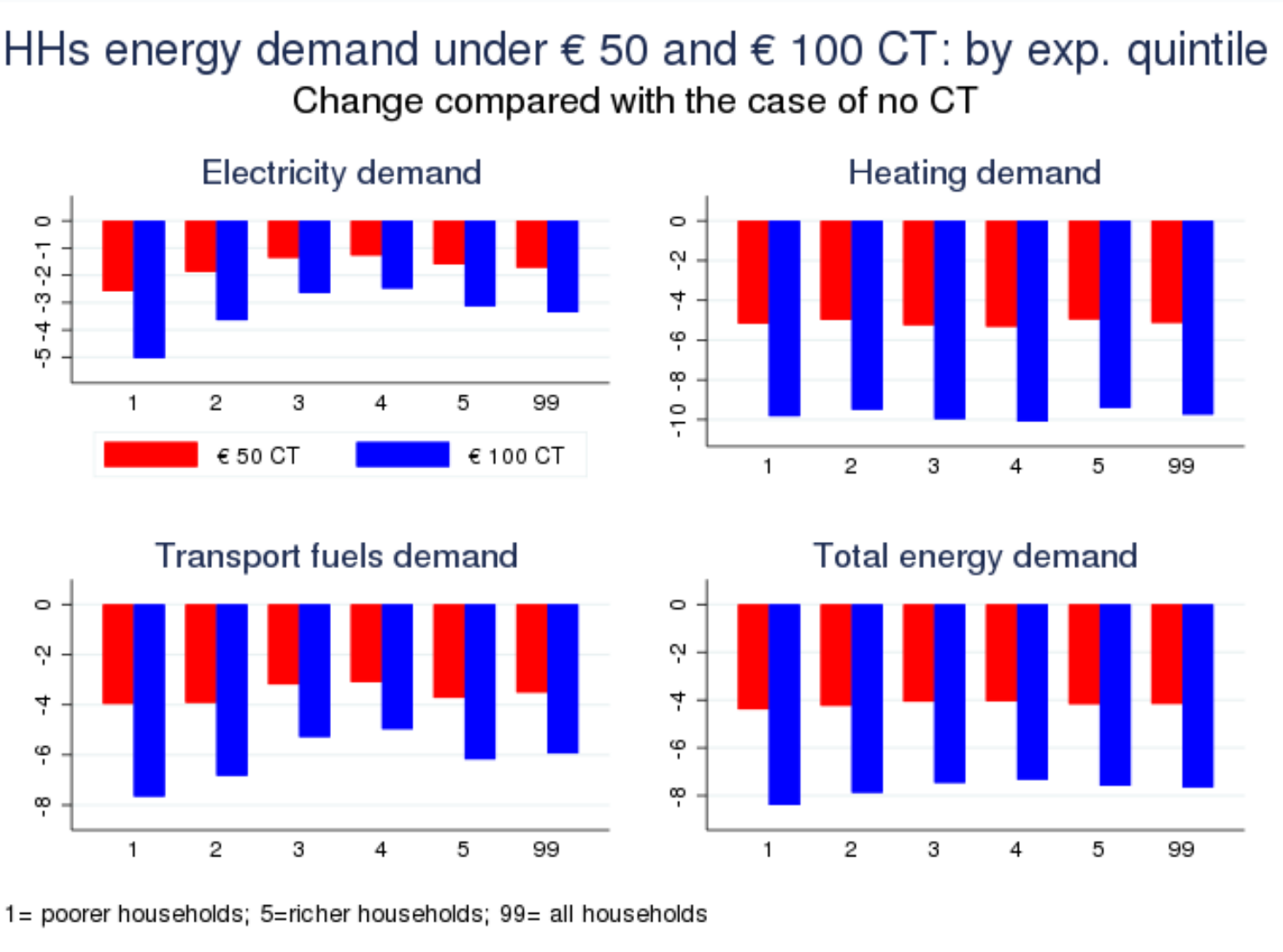
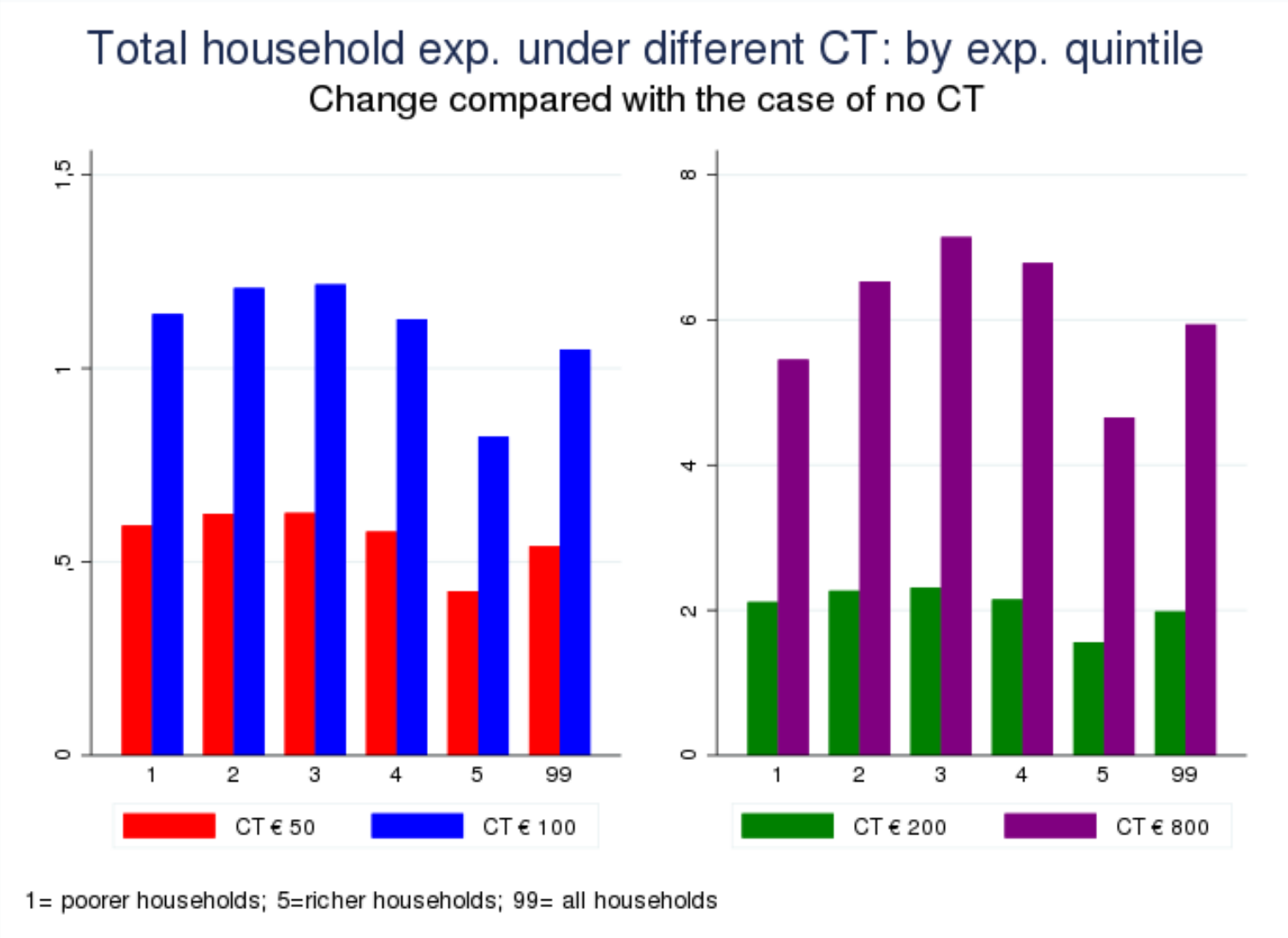
Greater reduction in energy demand for poorer households



Carbon tax would be regressive



Conclusions

- we develop a microsimulation model for energy demand in Italy;
- short run demand is inelastic; long run demand is elastic;
- a carbon tax will significantly affects HHs, especially energy poor, abate up to 13% of total emissions and raise up to €15.5 billion;
- revenue-recycling to mitigate effects on more vulnerable households (and increase policy acceptance).

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Grazie per l’attenzione

Luciano.lavecchia@bancaditalia.it

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