



Putting a price on carbon: seven questions

JVI Presentation, June 10, 2021

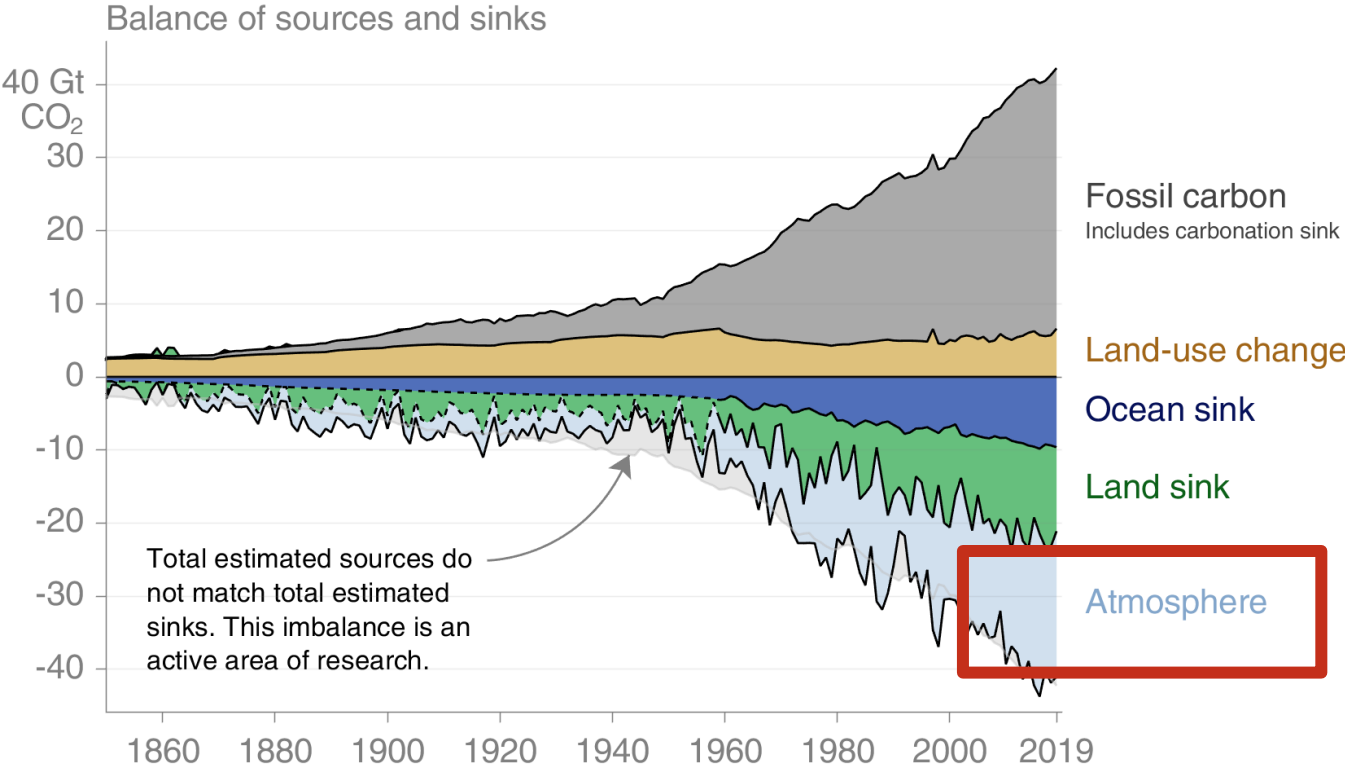
Simon Black – Economist
Fiscal Affairs Department, IMF

Seven questions

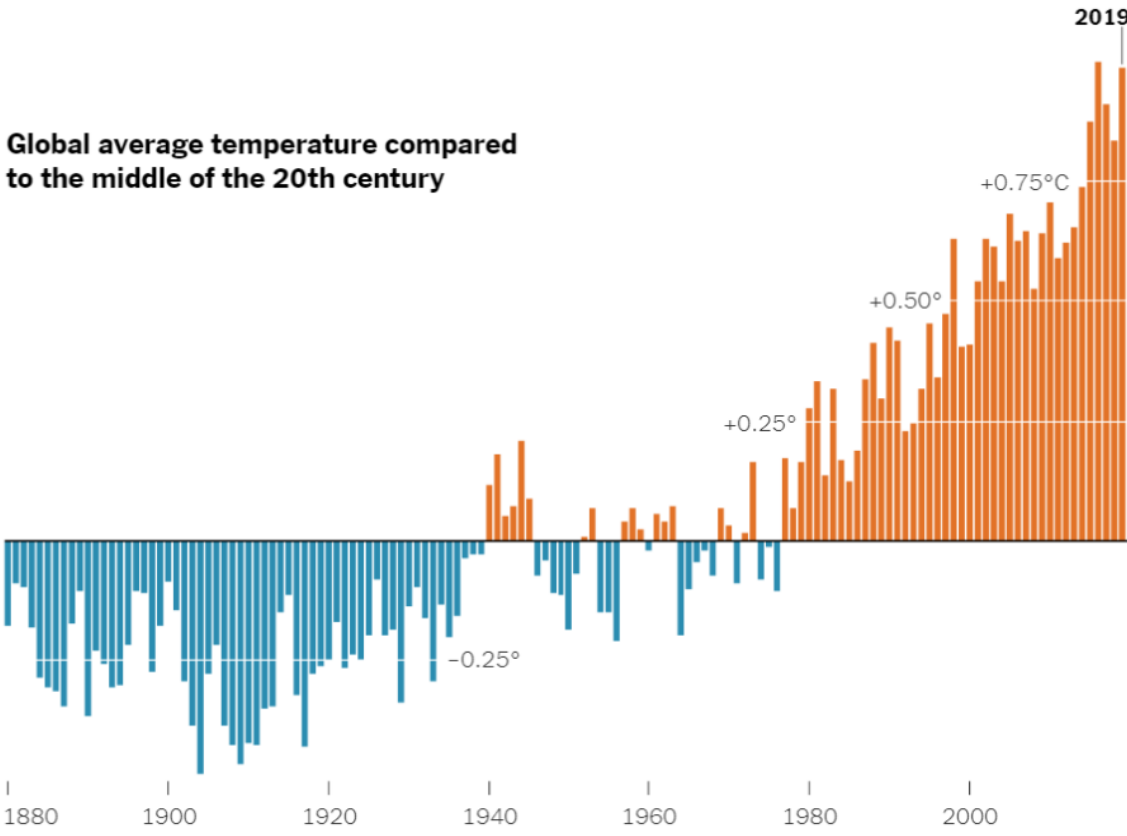
1. What's at stake?
2. Why carbon pricing?
3. Which carbon pricing instrument?
4. What should I do with the revenues?
5. What about fossil fuel subsidies?
6. Is there a need for international cooperation?
7. What about border carbon adjustments and 'carbon leakage'?

What's at stake?

Motivation

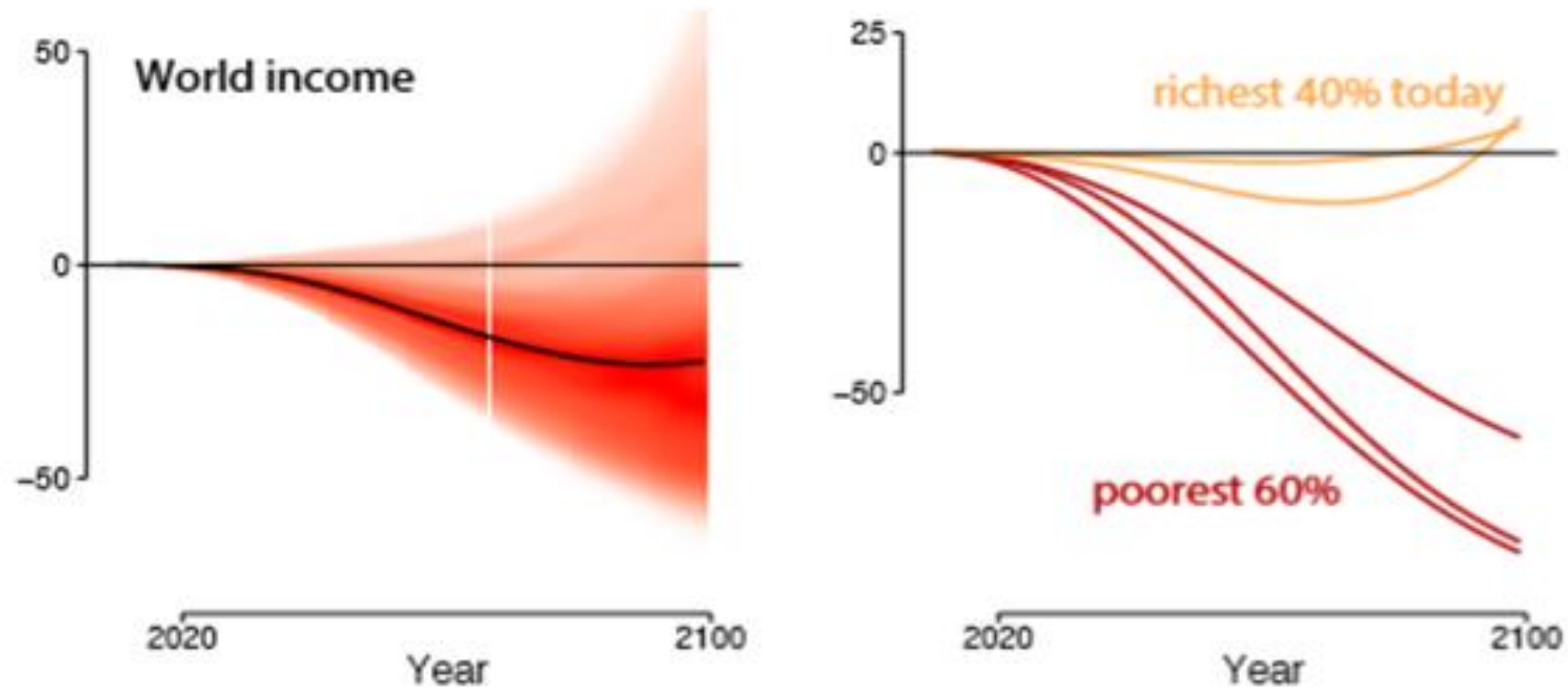


Source: GCP 2020



Motivation

Impact of Unconstrained Warming on Per-Capita Income by 2100 (Impact relative to baseline, 3.5°C average warming)



Source: Burke, Hsiang, and Miguel (2015)



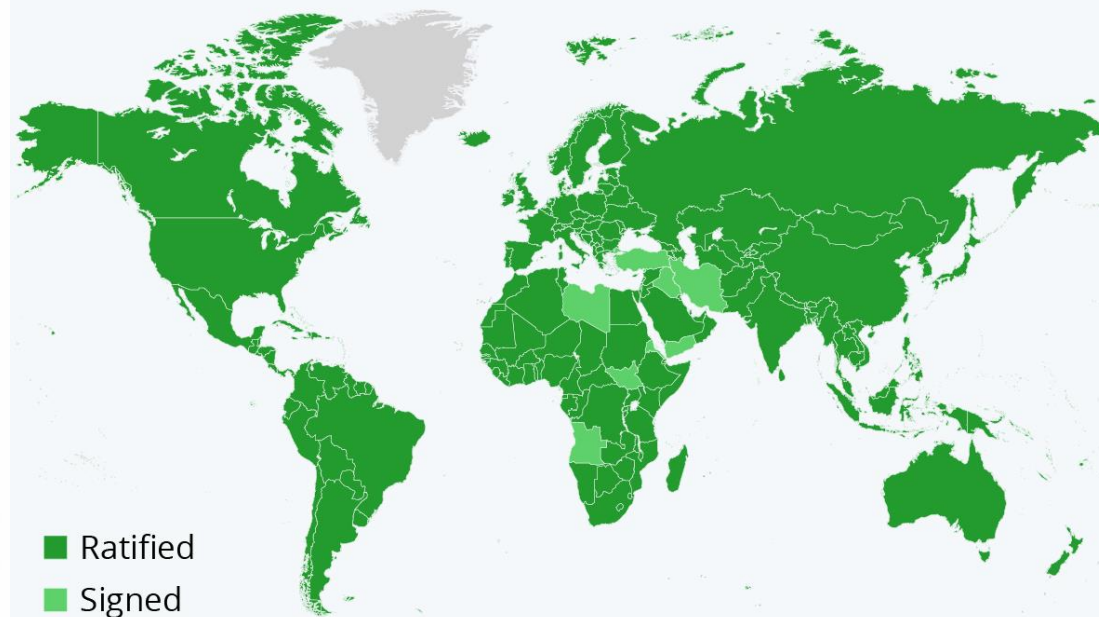
Article 2

1. This Agreement, in enhancing the implementation of the Convention, including its objective, aims to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, including by:

(a) Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change;

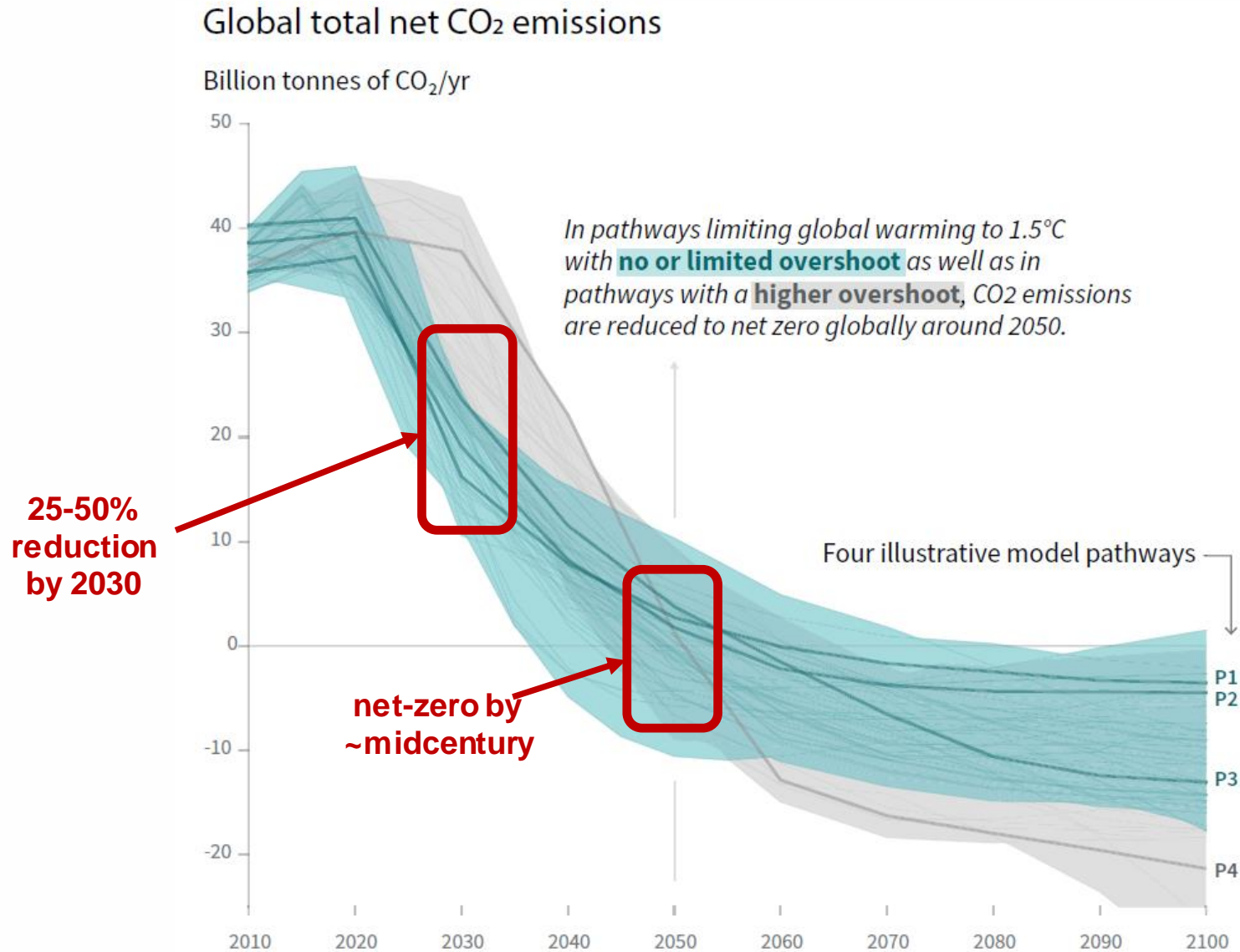
The State of the Paris Agreement

Countries by their participation in the Paris Agreement
(as of April 21, 2021)



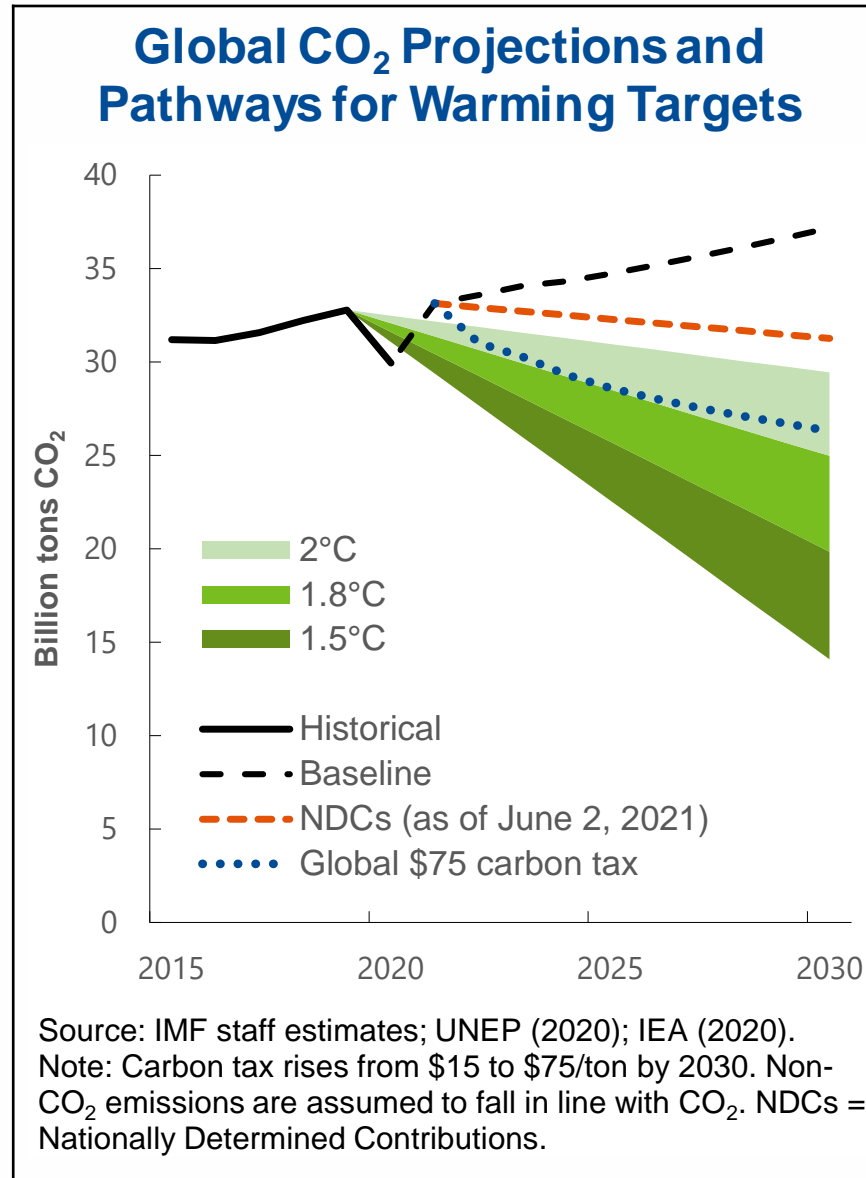
Source: UNFCC

We need cut emissions rapidly in this decade...

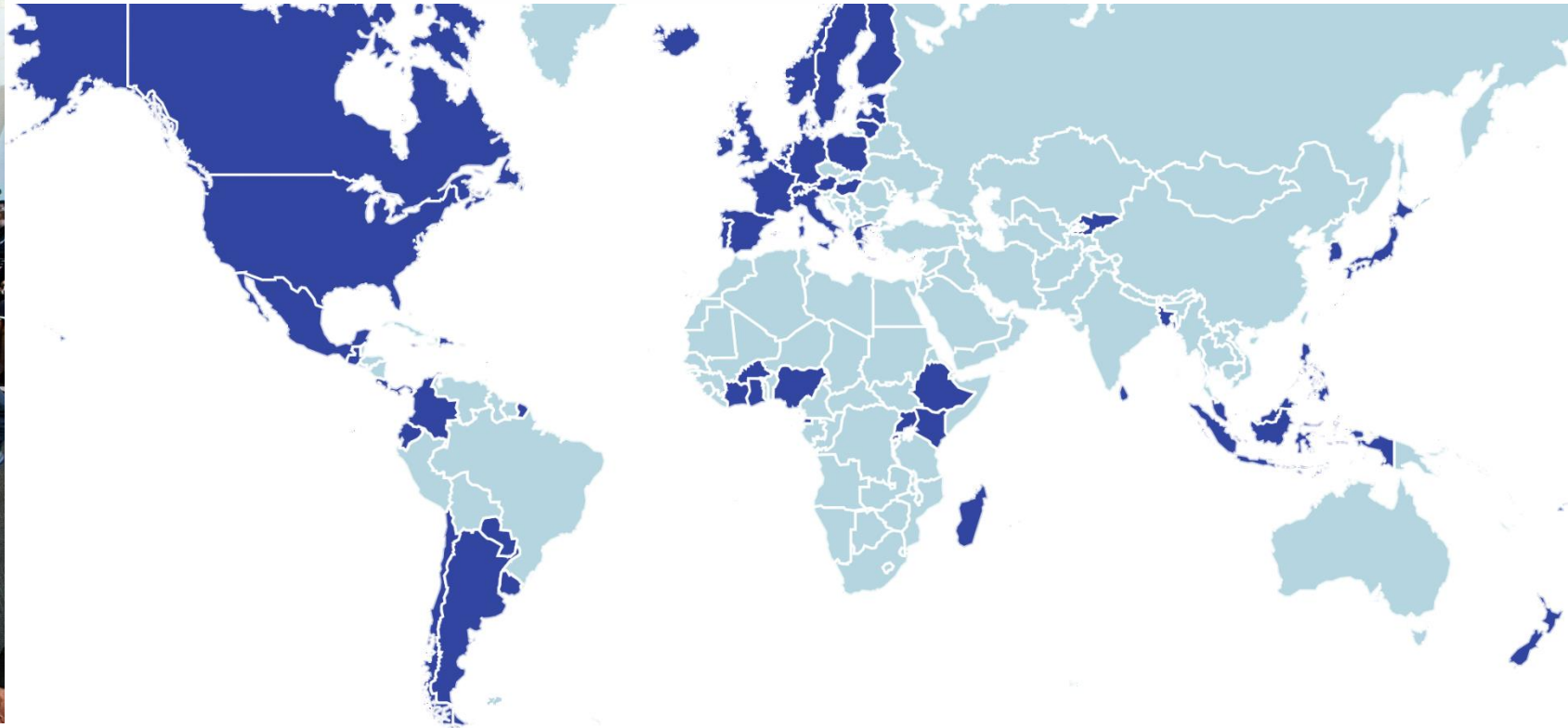


Source: IPCC. 2018. <https://www.ipcc.ch/sr15/chapter/spm/>.

...requiring a global carbon price of \$75 per ton by 2030...

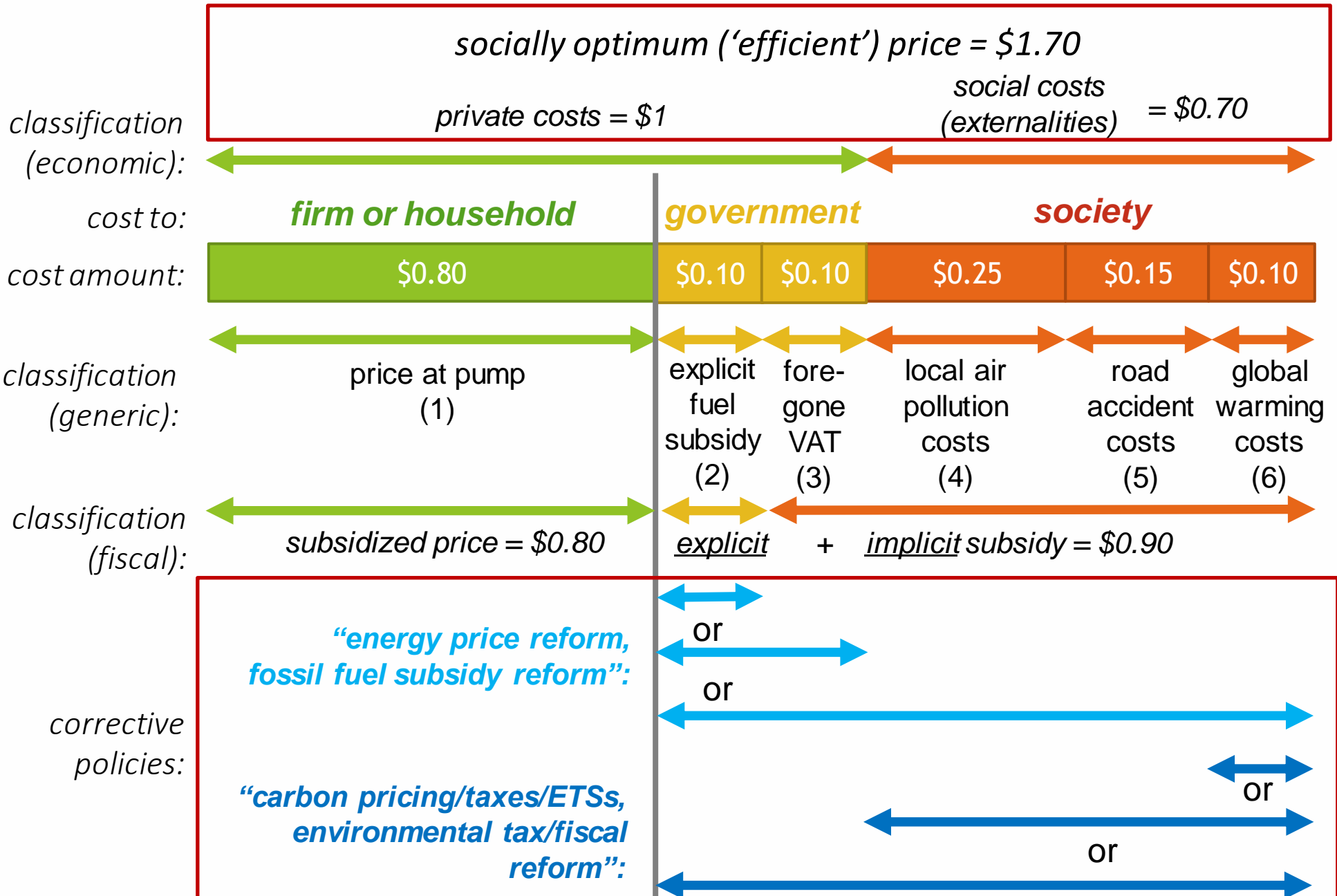
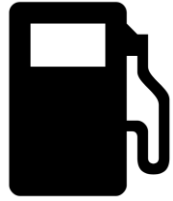


...so 62 countries have committed to work towards 'effective carbon pricing'



Why carbon pricing?

Carbon pricing demystified – an illustrative example



Broad consensus around carbon pricing

Economists' Statement on Carbon Dividends

The Largest Public Statement of Economists in History

SIGNATORIES INCLUDE

3589

U.S. Economists

4

Former Chairs of the Federal Reserve

28

Nobel Laureate Economists

15

Former Chairs of the Council of Economic Advisers

As appeared in

THE WALL STREET JOURNAL.

THURSDAY, JANUARY 17, 2019

Economists' Statement on Carbon Dividends

Global climate change is a serious problem calling for immediate national action. Guided by sound economic principles, we are united in the following policy recommendations.

- I. A carbon tax offers the most cost-effective lever to reduce carbon emissions at the scale and speed that is necessary. By correcting a well-known market failure, a carbon tax will send a powerful price signal that harnesses the invisible hand of the marketplace to steer economic actors towards a low-carbon future.

Broad consensus around carbon pricing

Central role in mitigation policy

- Across-the-board incentives, cost-effective price signal to shift private investment
- Raises significant revenue for e.g. health expenditures, investment, labor tax reductions, per-capita transfers
- Reaps domestic environmental co-benefits
- Administratively straightforward

Types of carbon pricing:

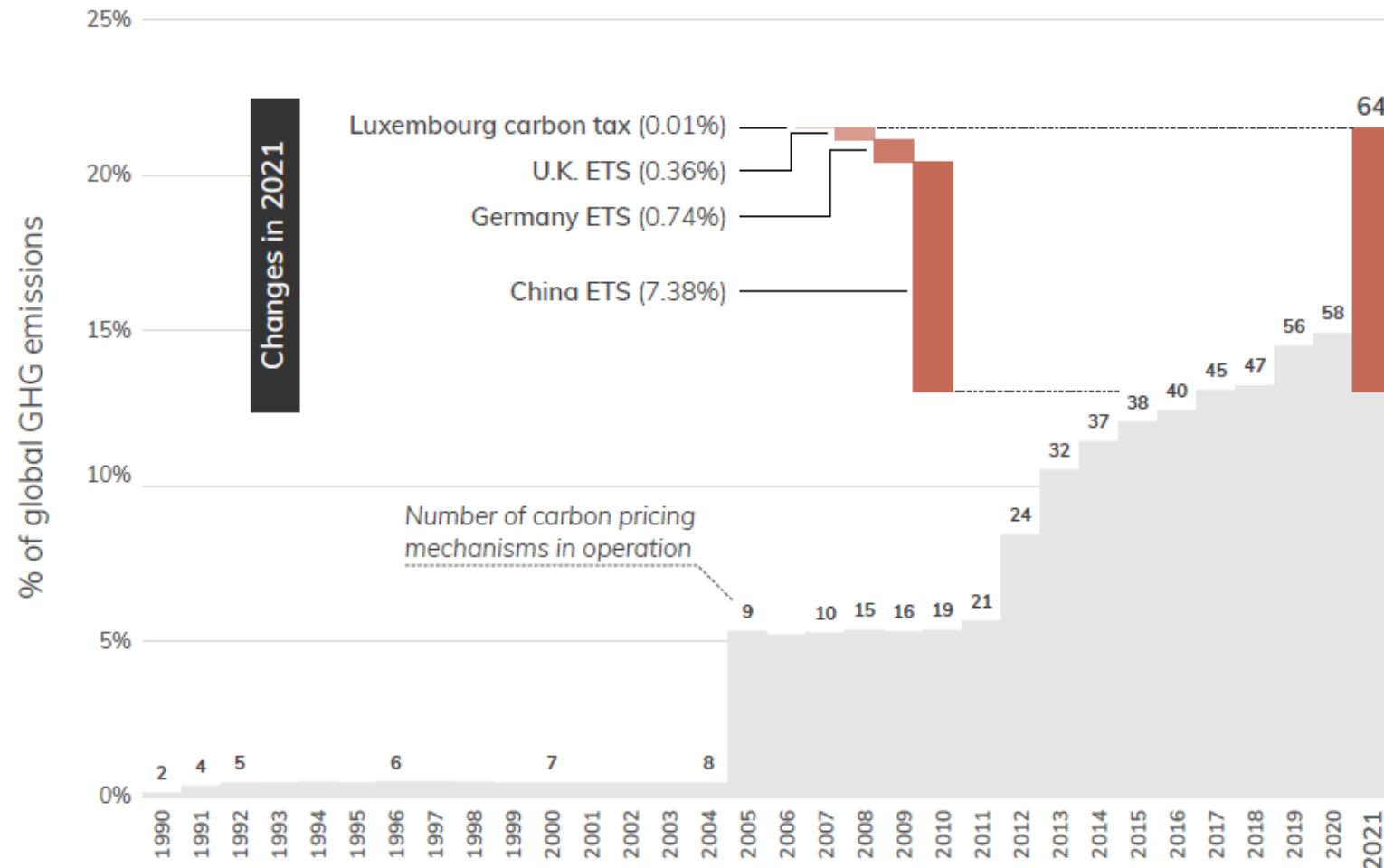
- ETS – aka cap-and-trade ‘quantity instrument’
- Carbon taxes generally preferred to ETS – price certainty, revenues to the government, build off fuel tax collection (though trading can be augmented via floors)

Basic design details are critical

- Cover power, industry, transport, buildings
- Predictable and gradually rising price
- Use revenues productively

There is growing momentum for carbon pricing...

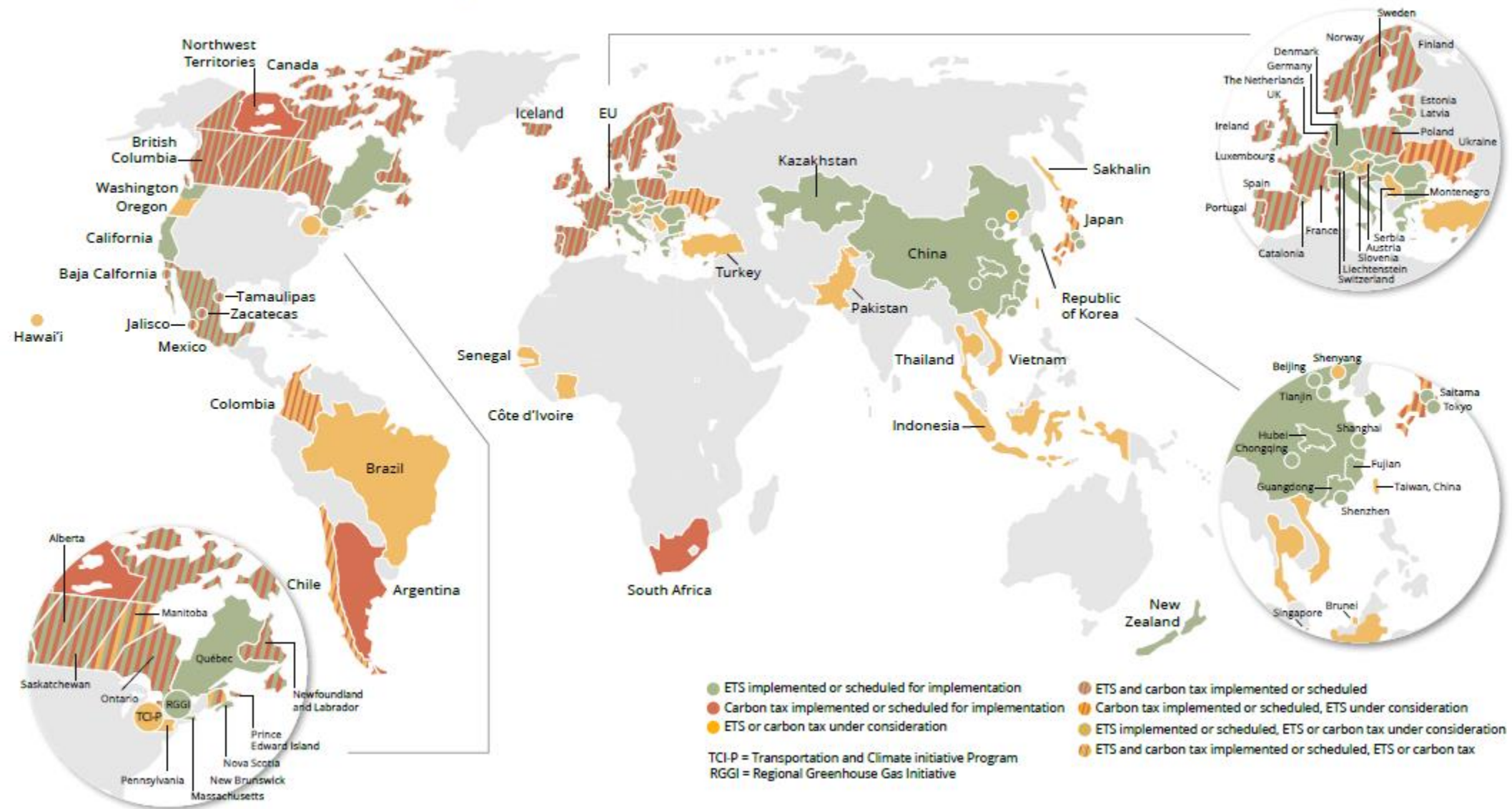
Share of global greenhouse gas emissions covered by carbon taxes and emissions trading systems



Source: World Bank. 2021. *State and Trends of Carbon Pricing 2021*. Washington, DC. <https://openknowledge.worldbank.org/handle/10986/35620>.

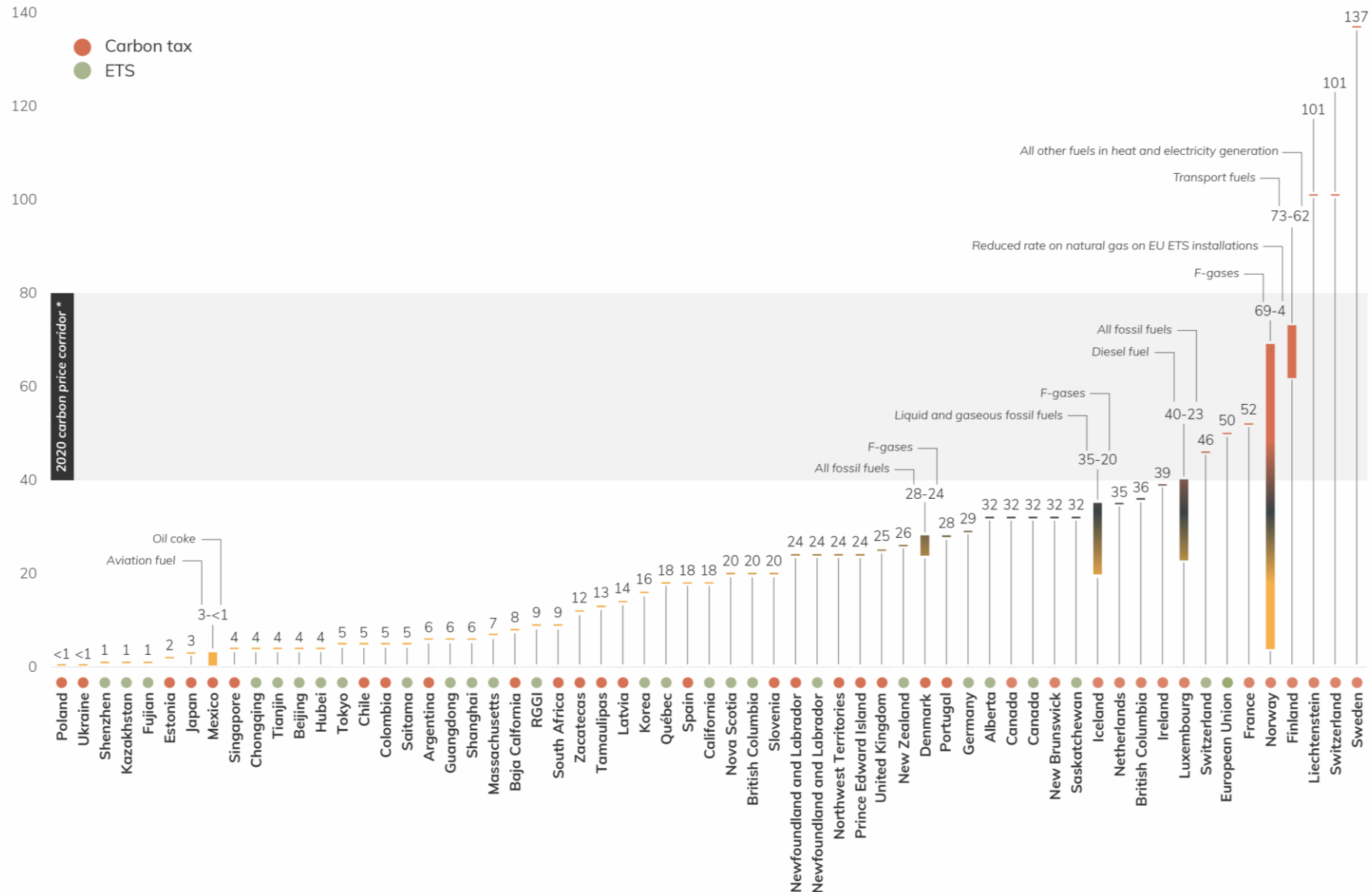
...carbon pricing used across all continents...

Map of carbon taxes and emissions trading systems



Source: World Bank. 2021. *State and Trends of Carbon Pricing 2021*. Washington, DC. <https://openknowledge.worldbank.org/handle/10986/35620>.

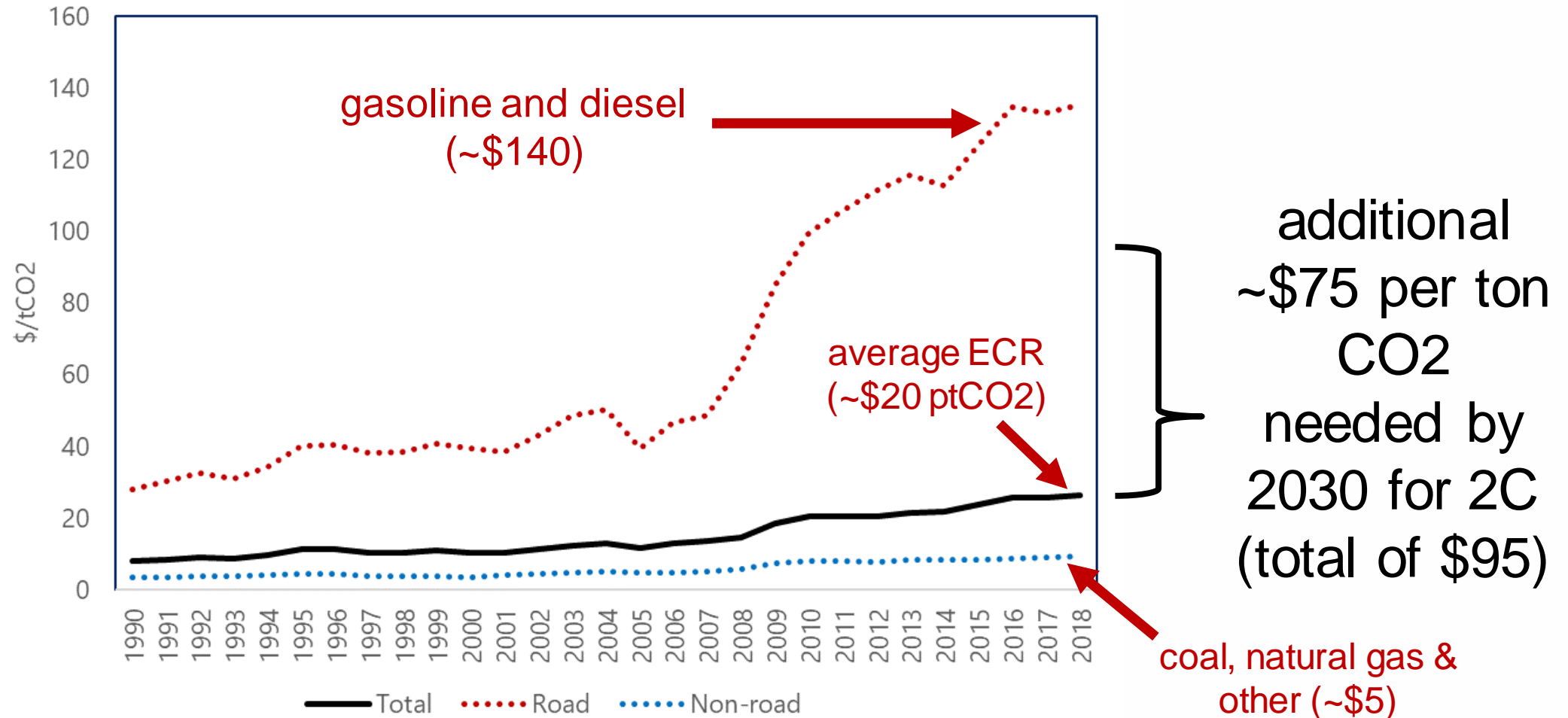
...but pricing varies dramatically and most are below needed \$75 by 2030...



Source: World Bank, 2021. *State and Trends of Carbon Pricing 2021*. Washington, DC. <https://openknowledge.worldbank.org/handle/10986/35620>.

...and even including non-carbon pricing instruments (effective carbon rates) incentives remain weak...

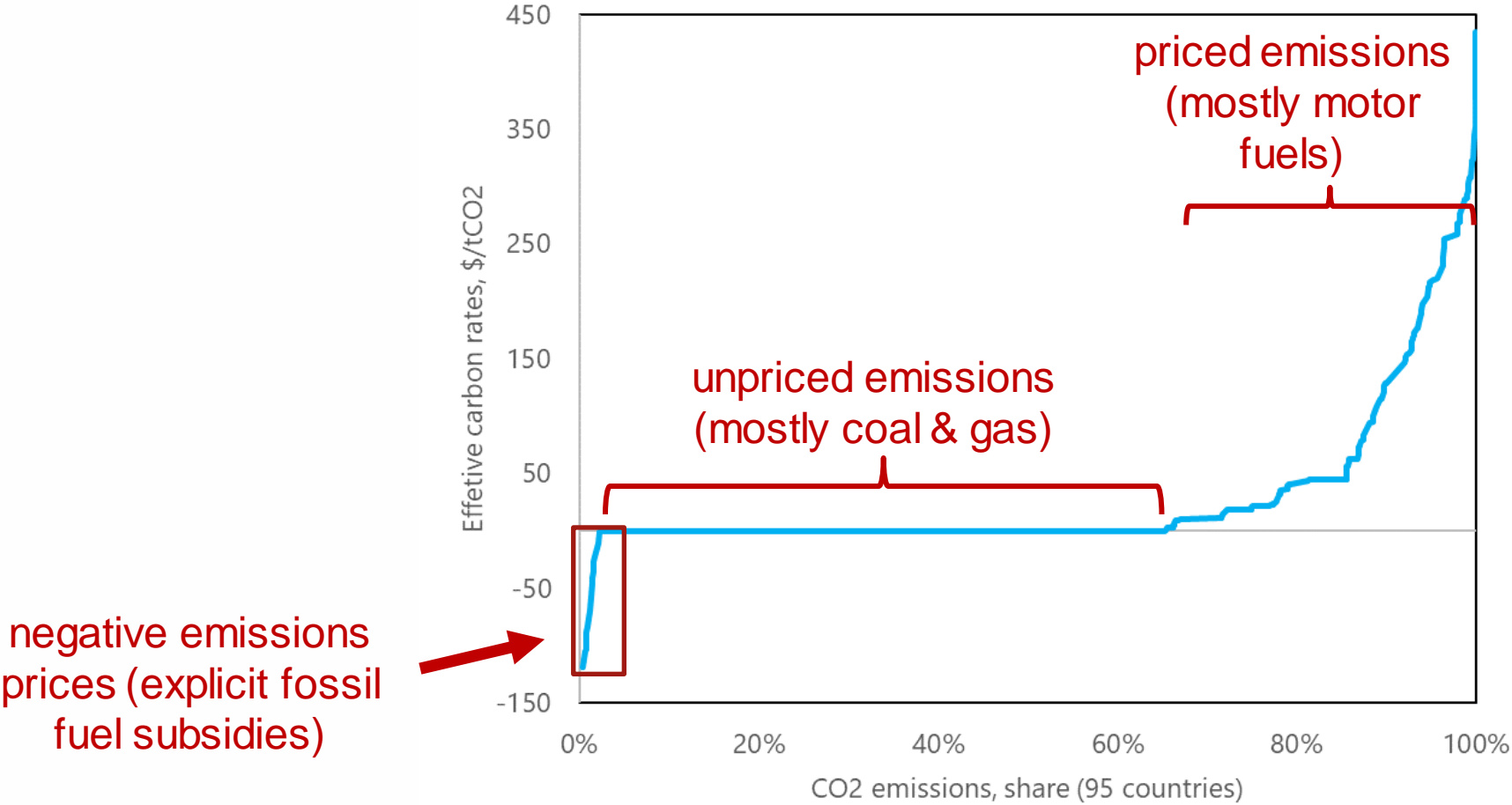
Effective carbon rates (ECR) across countries and time (95 countries)



Source: IMF staff estimates, forthcoming; covers countries accounting for 95% emissions

...and distorted...

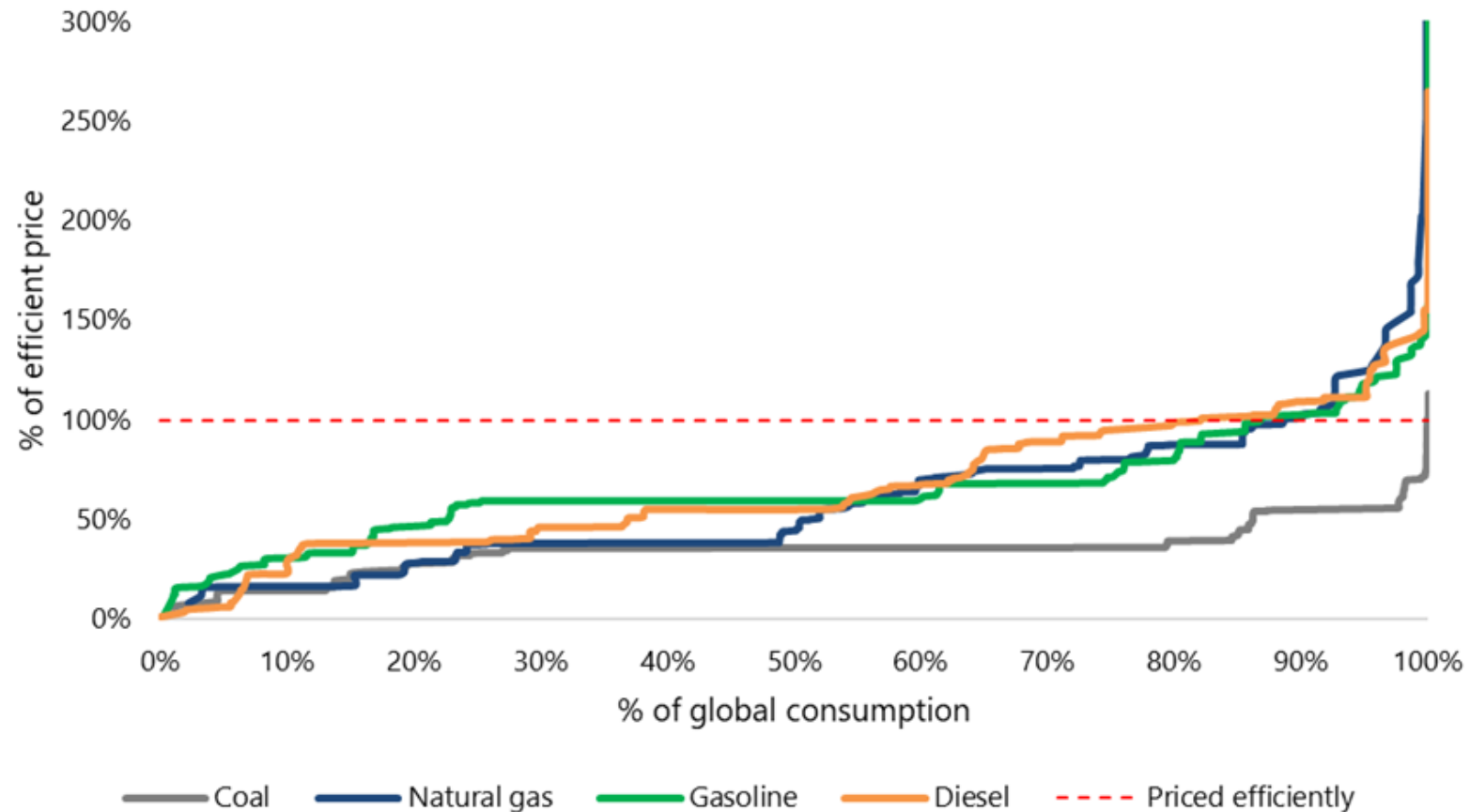
Effective carbon rates (ECR) on emissions across countries (2020)



Source: forthcoming

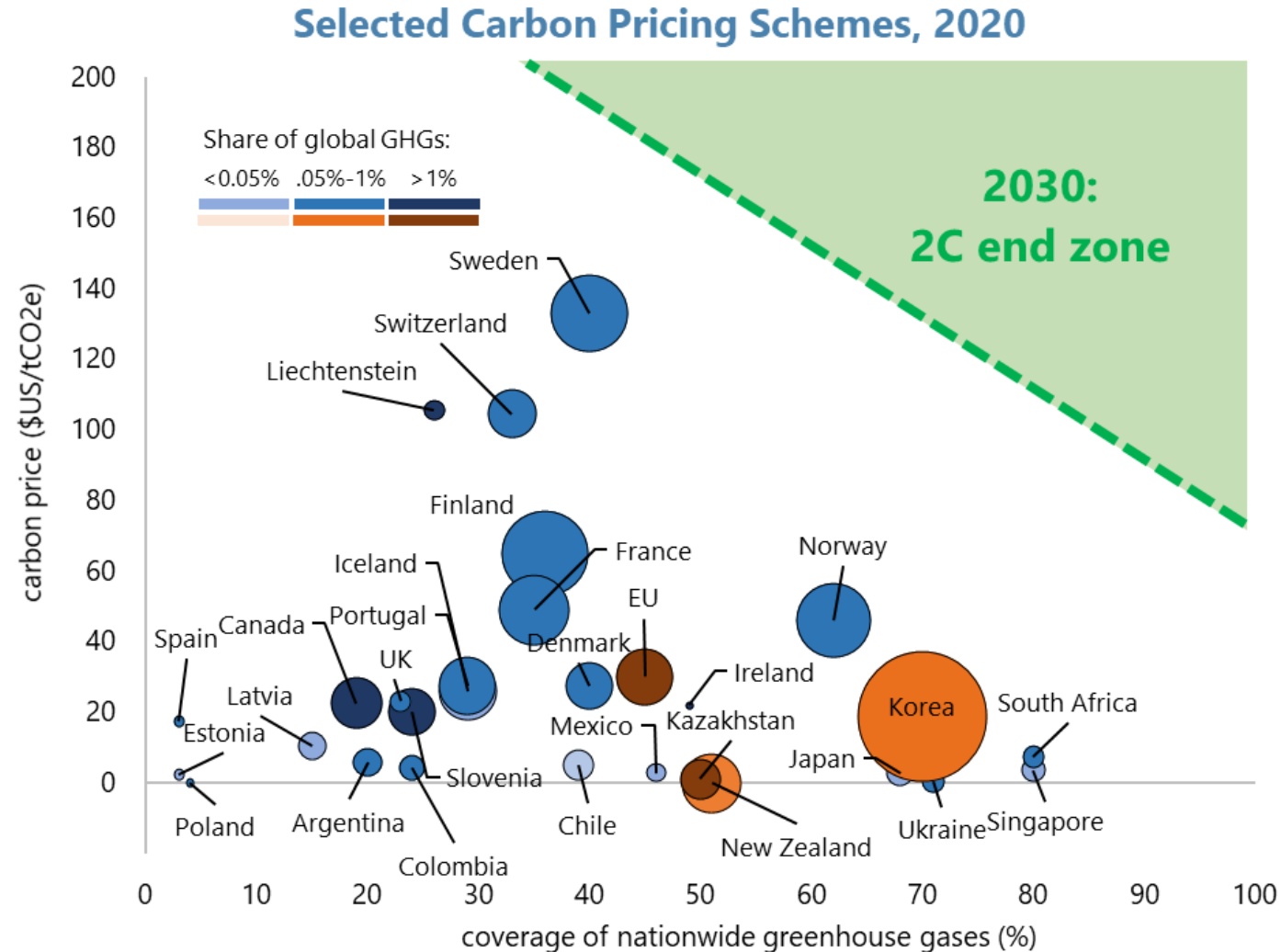
...and the picture is even worse from an efficient pricing perspective (preliminary)

Fossil Fuel Pricing and Consumption Relative to Efficient Prices



Source: forthcoming

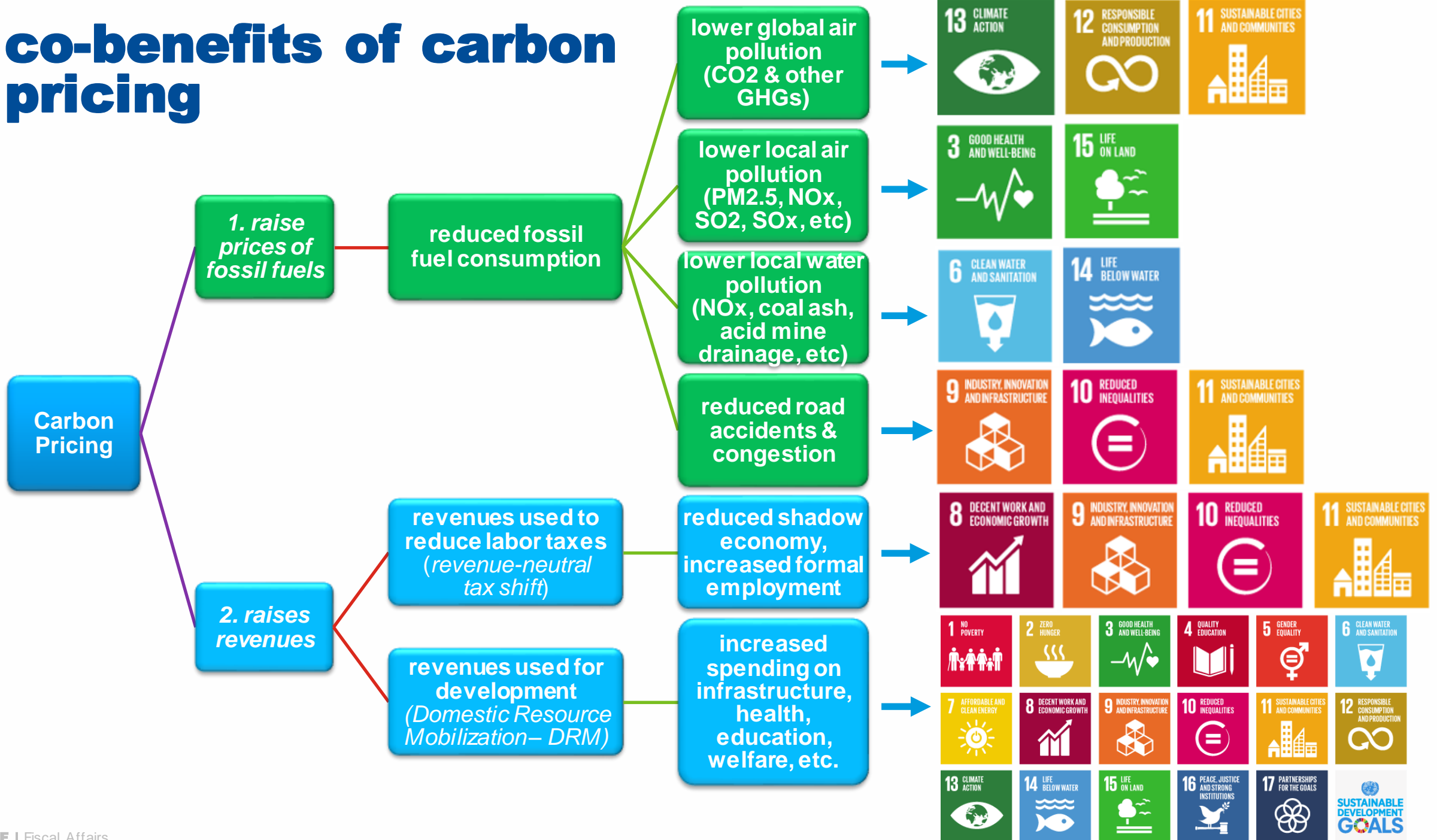
...so we need to get carbon pricing instruments into the 2C endzone (75 per ton by 2030)



Source: WB, CW, and IMF Staff estimates.

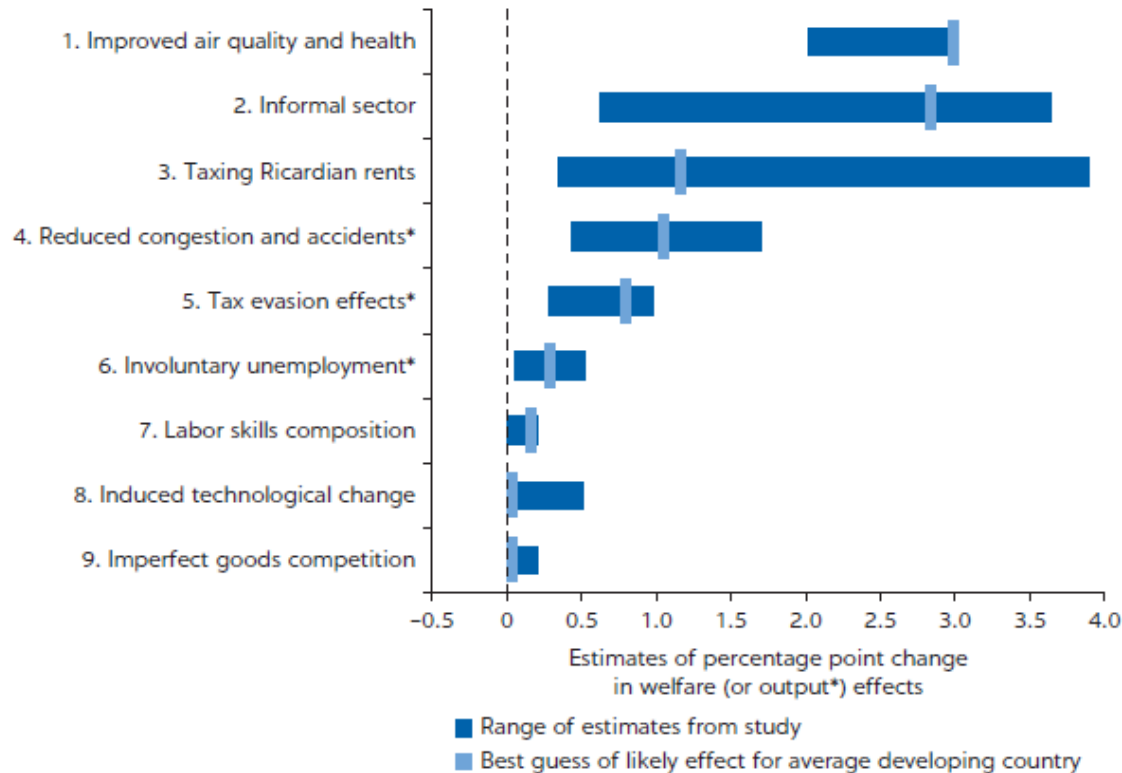
Note. Updated as of Nov. 2020. GHGs from 2017. EU includes Norway, Iceland, Liechtenstein. Values less

co-benefits of carbon pricing

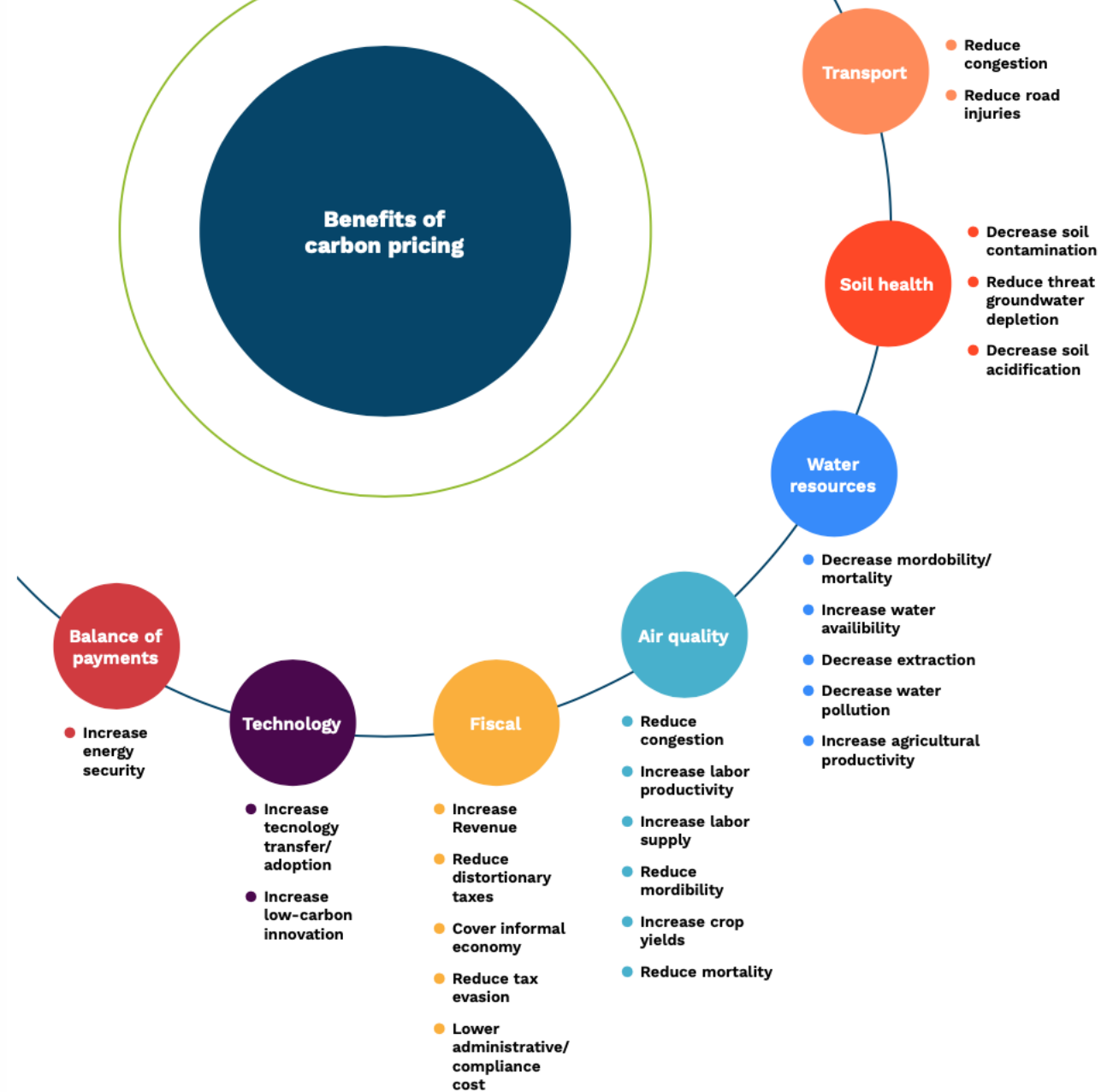


And if we did, countries would reap substantial welfare co-benefits

Channels that impact estimated welfare effects of ETR: Range of estimates from studies and possible effects for developing countries

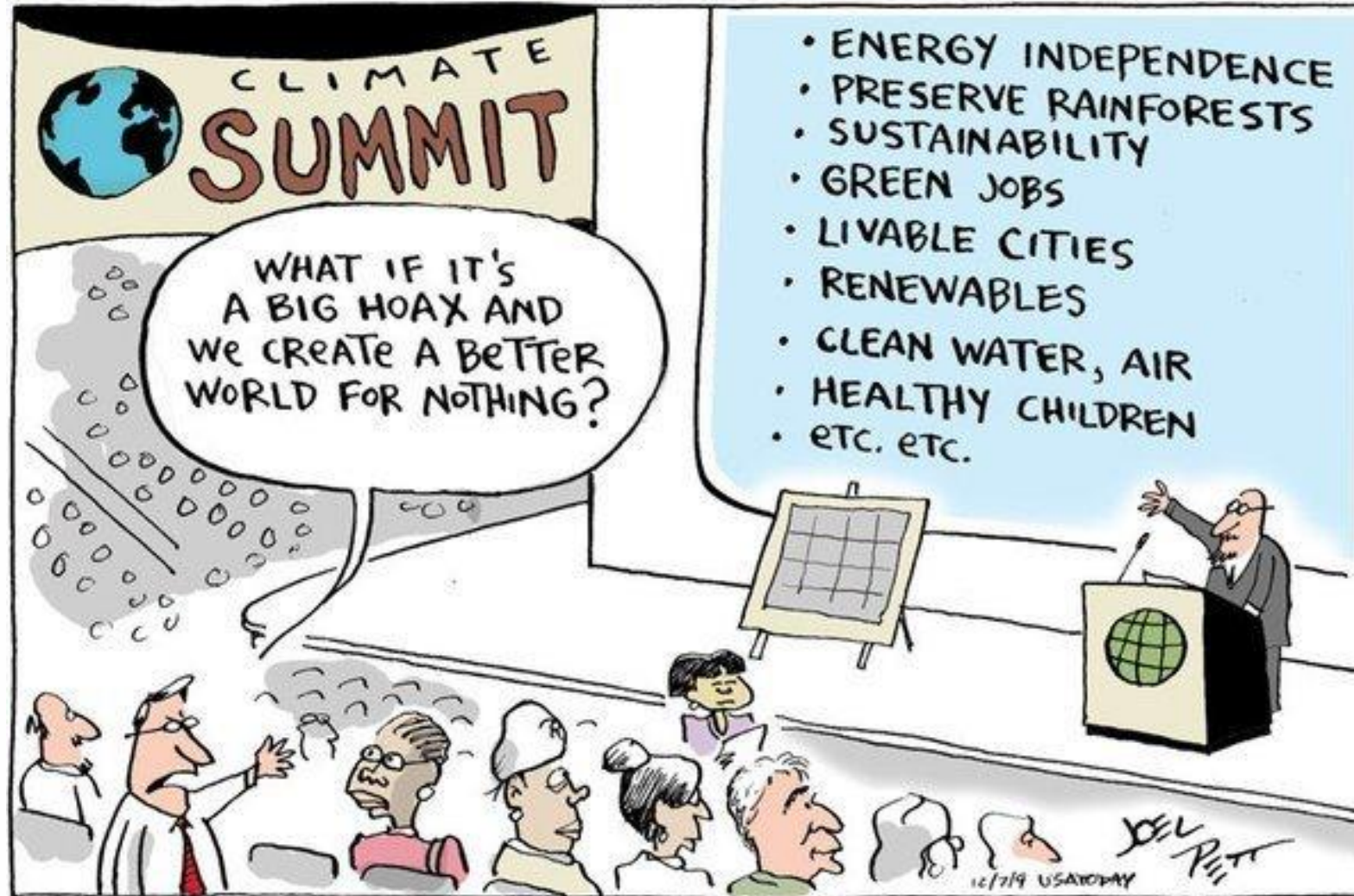


Heine, Dirk, and Simon J. Black. 2019. "Benefits Beyond Climate: Environmental Tax Reform in Developing Countries." In *Fiscal Policies for Development and Climate Action*, edited by Miria A. Pigato, 1–56. Washington DC. <https://doi.org/10.13140/RG.2.2.13910.88646>.



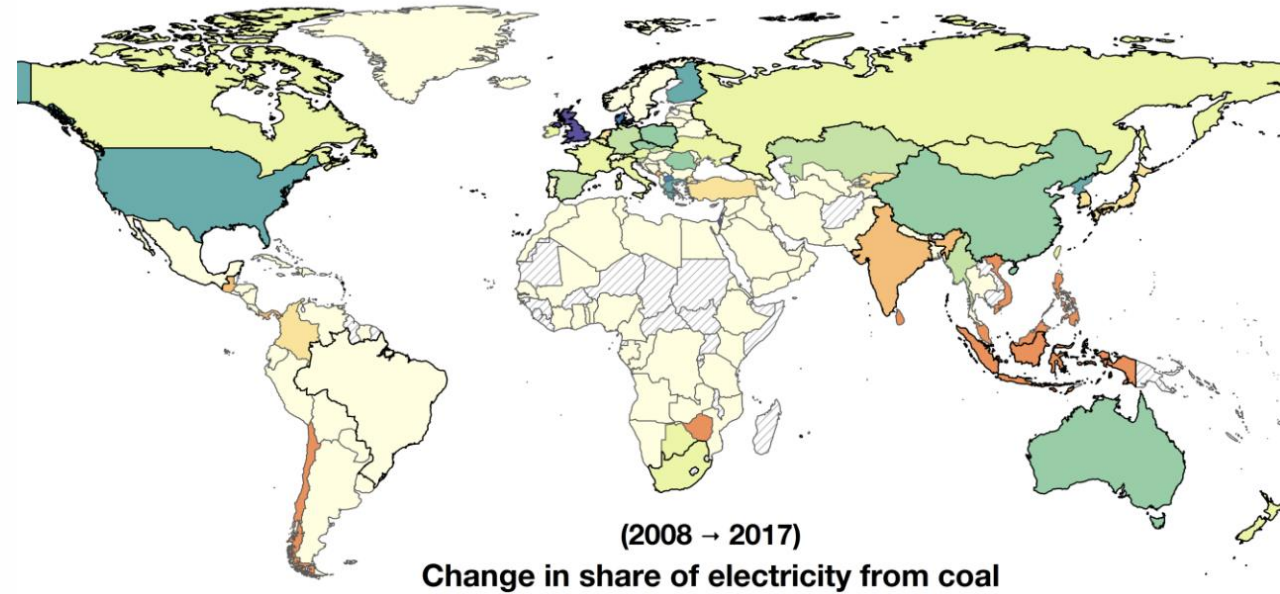
Source: PMR. 2021. *Beyond Mitigation: Quantifying the Development Benefits of Carbon Pricing*. World Bank. <https://doi.org/10.1596/35624>.

Co-benefits of carbon pricing

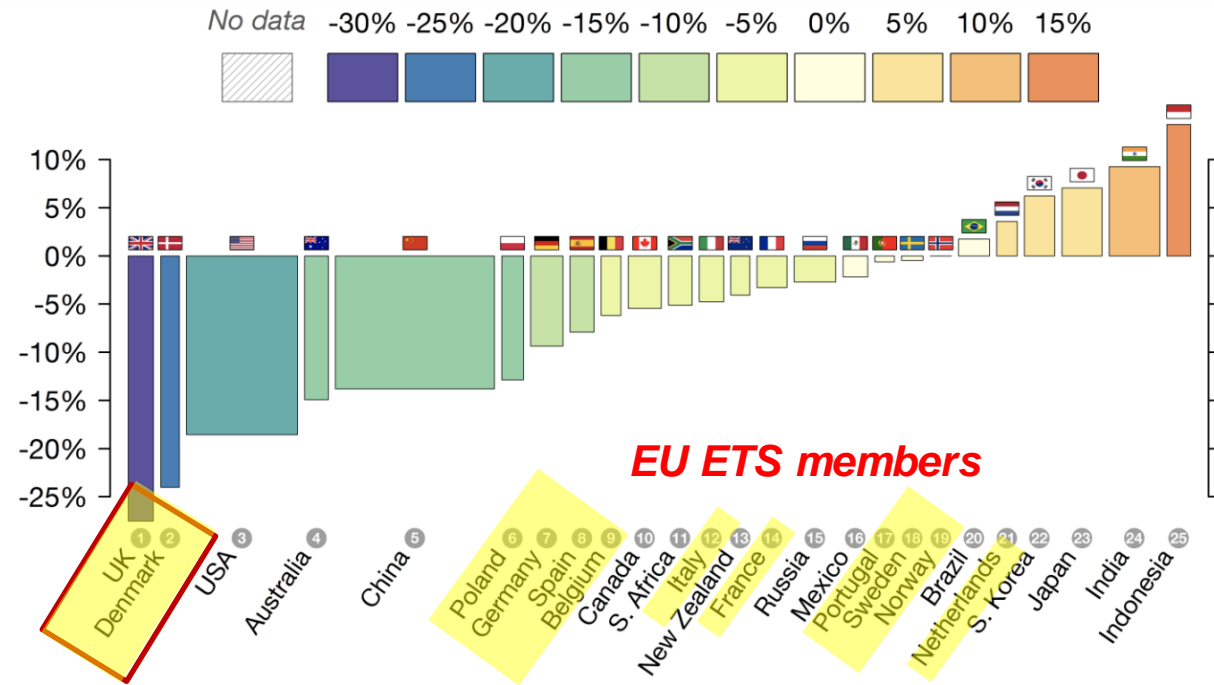


Which carbon pricing instrument?

Carbon taxes generally preferred to ETSs: an example



(2008 → 2017)
Change in share of electricity from coal

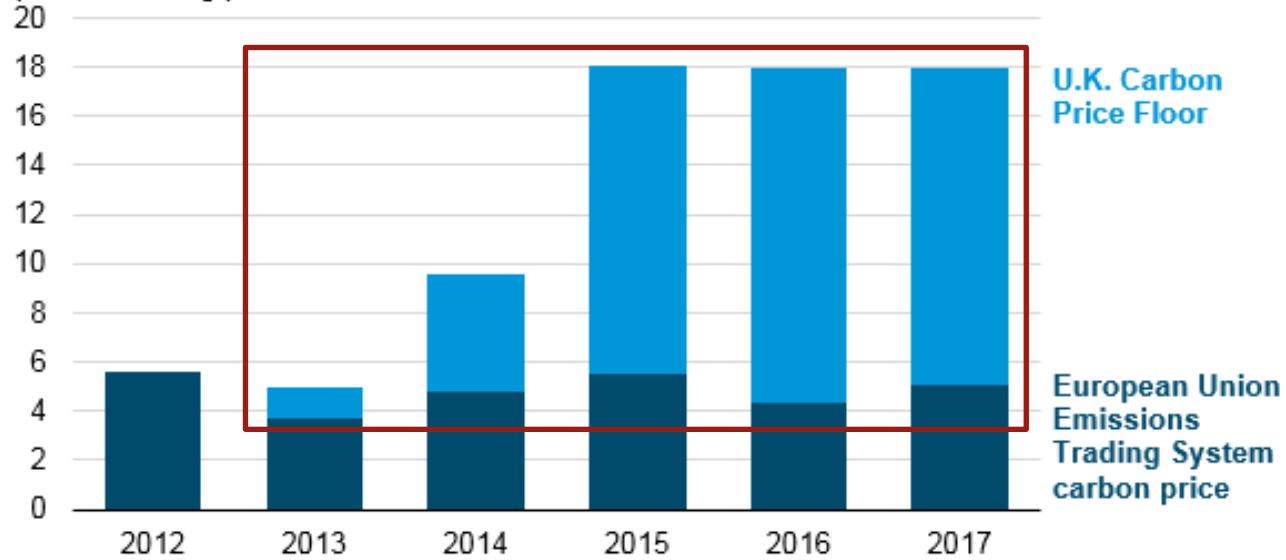


EU ETS members with a carbon tax/price floor

Source: [Drax](#), 2018

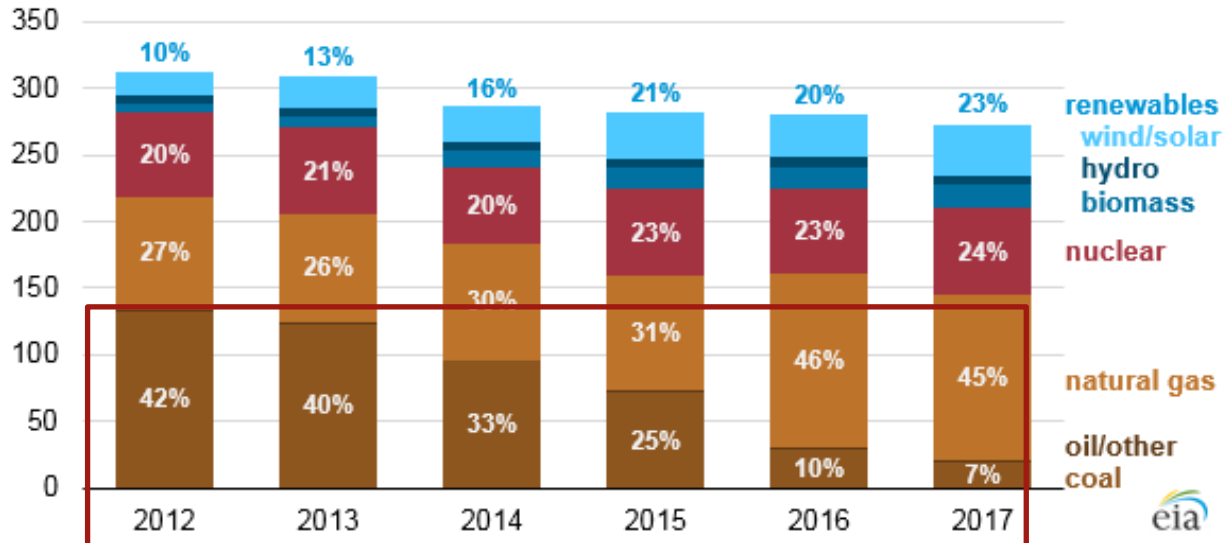
United Kingdom carbon prices (fiscal years 2012-2017)

pounds sterling per metric ton carbon dioxide



United Kingdom electricity generation by fuel (2012-2017)

billion kilowatthours

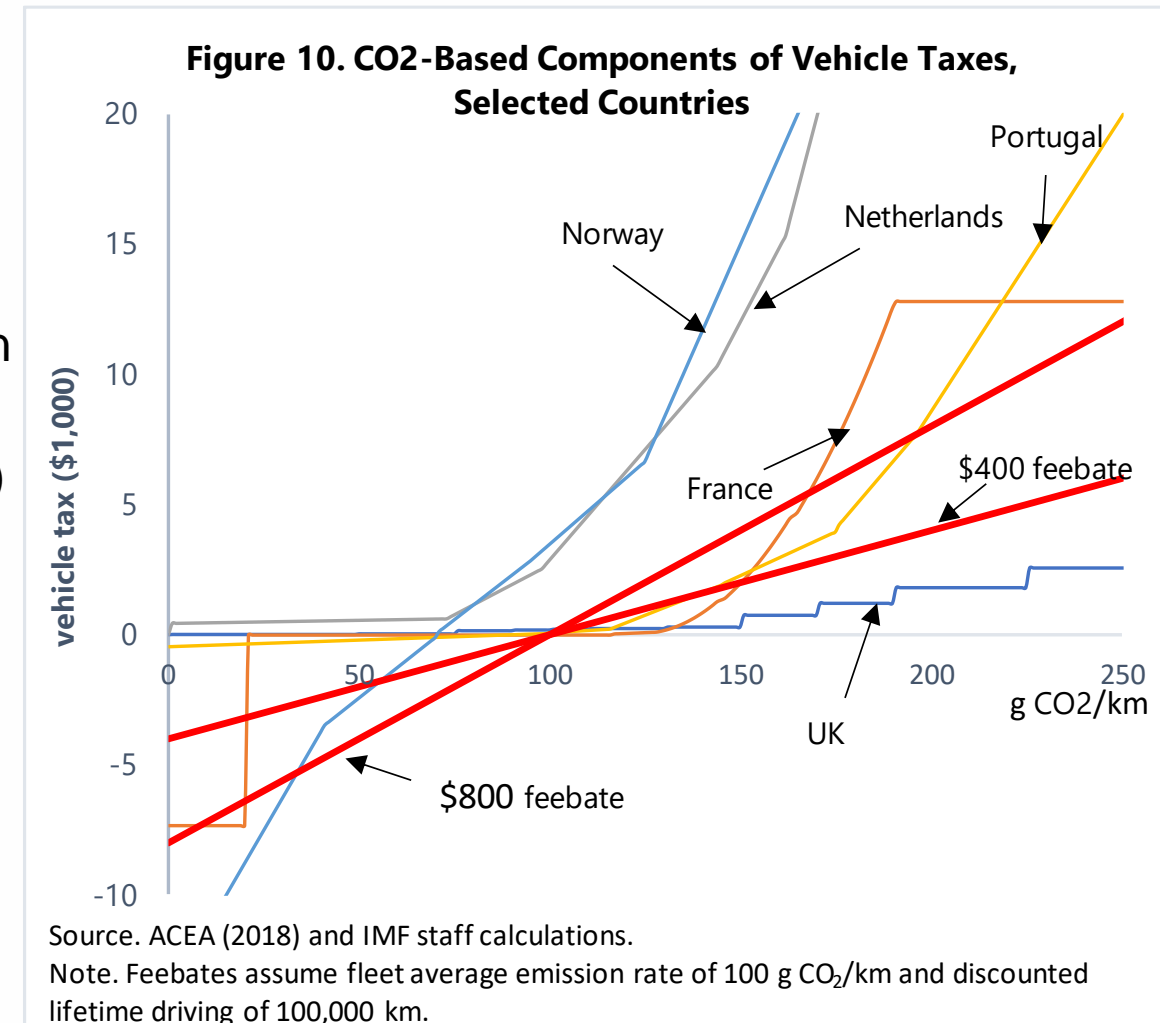


Source: <https://www.eia.gov/todayinenergy/detail.php?id=35912>,
<https://www.eia.gov/todayinenergy/detail.php?id=35912>



...but do whatever works!

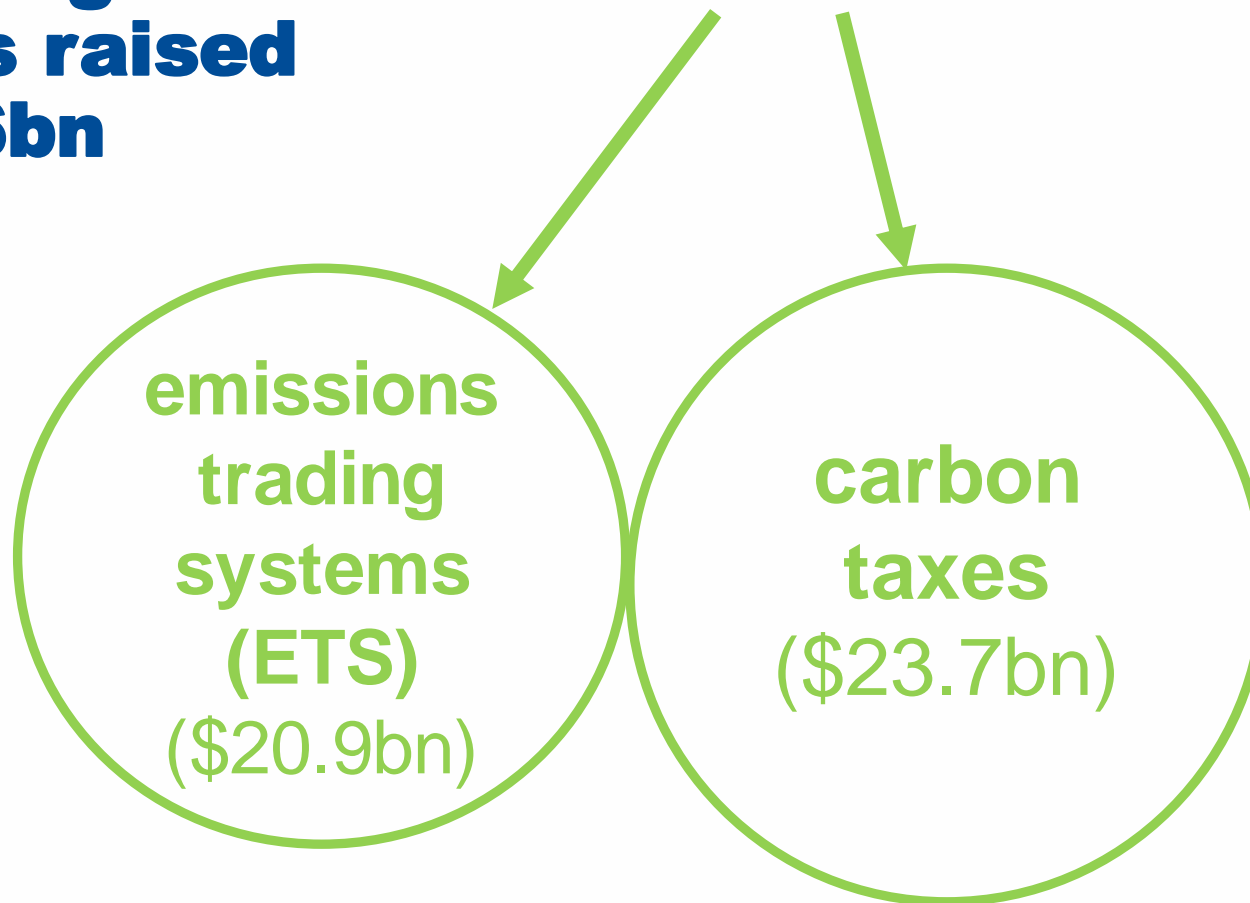
- Some governments may prefer ETSs for greenwashing reasons ('Potempkin markets' and 'isomorphic mimicry')
- But some governments favor ETSs for good reasons :
 - ◆ EU ETS – lack of fiscal union
 - ◆ Germany – constitutional limits on implementing carbon taxes
 - ◆ UK – constitutional issue with carbon taxes (devolution)
 - ◆ Canada – different regional systems, with a federal backstop
- ETS can mimic carbon taxes (price floors, full auctioning)
- Sectoral approaches to pricing are available
 - ▣ e.g. transportation feebates: sliding scales of fees and rebates on cars based on efficiency; countries with strongest feebates (Norway/Netherlands) diffusing EVs fastest
- Key thing is to focus on adding an additional and certain price



What about the revenues?

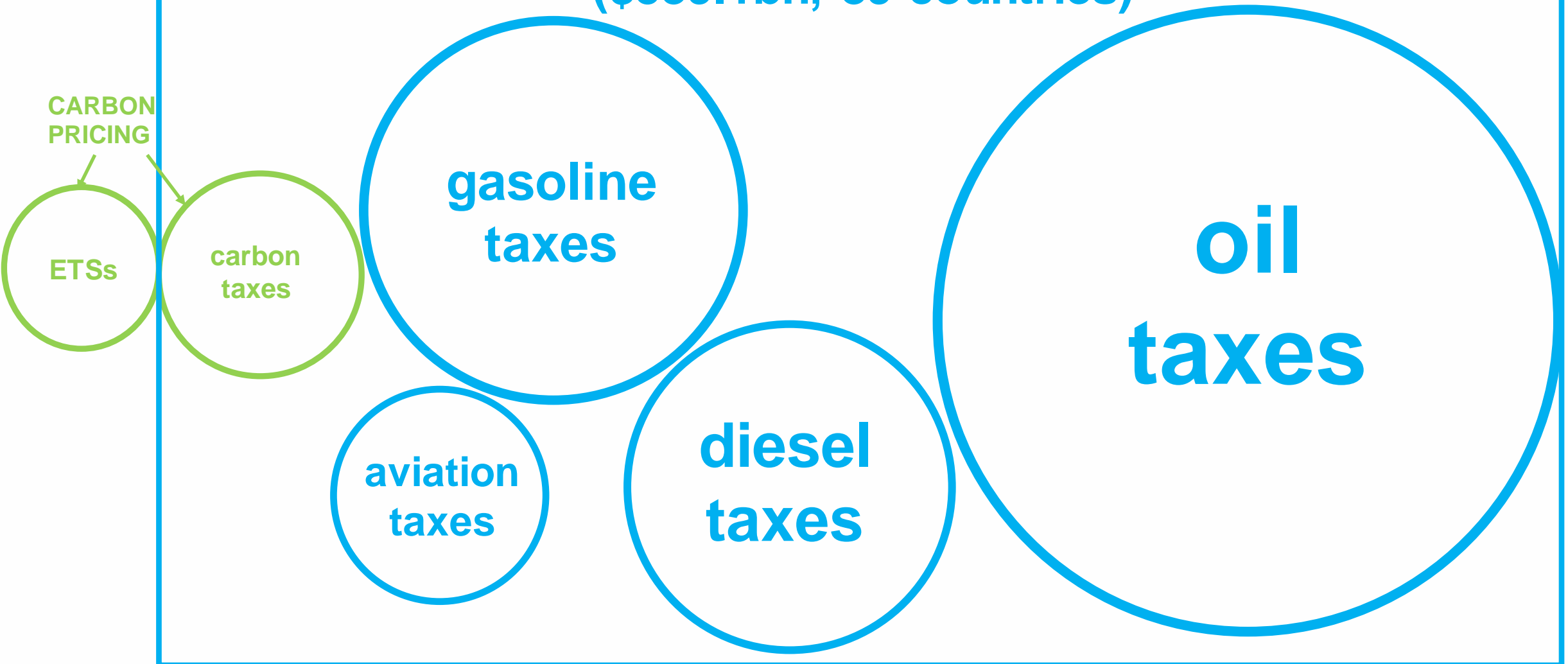
**Revenue – in 2018
carbon pricing
instruments raised
about \$44.6bn**

CARBON PRICING
(\$44.6bn in 2018, global)



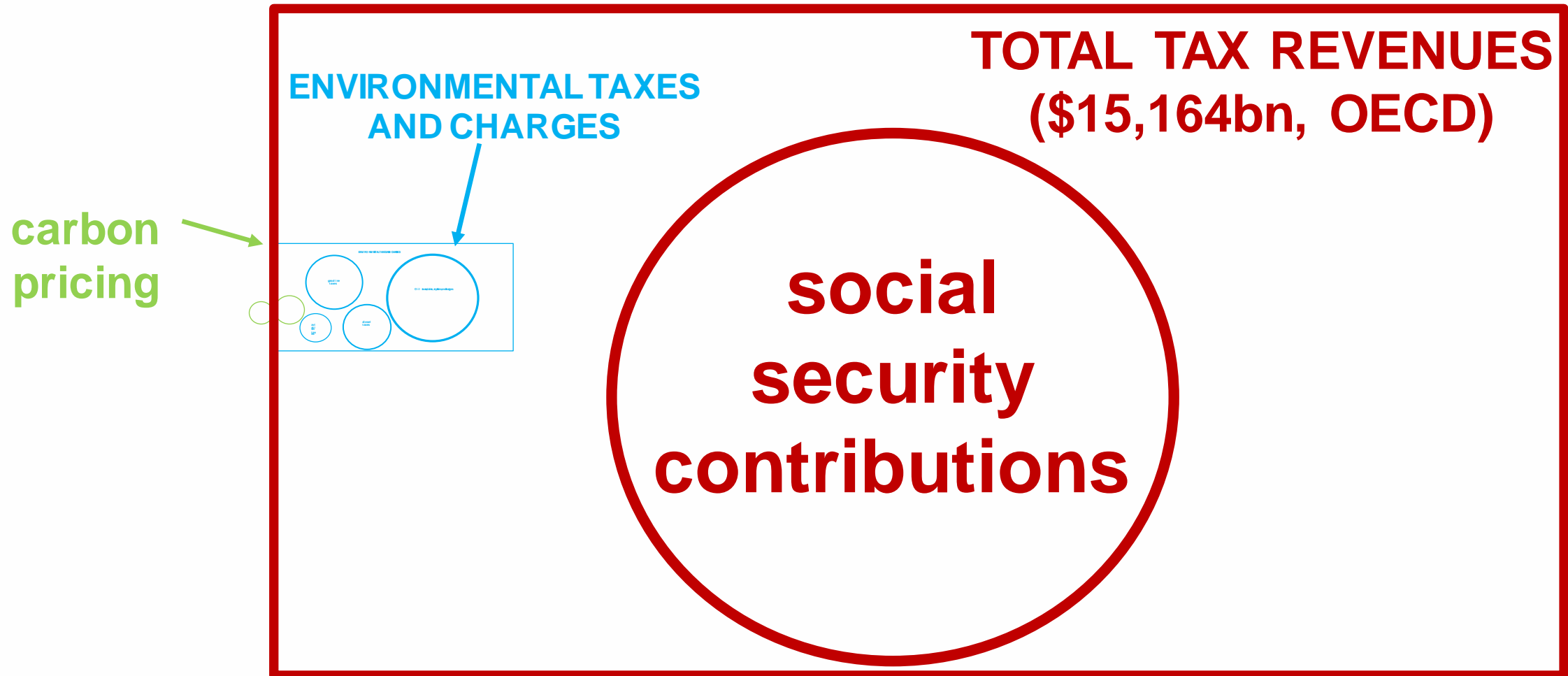
Notes: ETS raised \$6.57bn in public revenue and carbon tax systems raised \$21.7bn in 2016 (Source: [Carl, Jeremy, and David Fedor. 2016](#))

ENVIRONMENTAL TAXES AND CHARGES (\$539.1bn, 89 countries)



Notes: ETS raised \$6.57bn in public revenue and carbon tax systems raised \$21.7bn in 2016 (Source: [Carl, Jeremy, and David Fedor. 2016](#)); total environmental taxes + charges for OECD and non-OECD countries raised \$539.1bn that year, other taxes included on: gasoline (\$55.6bn), diesel (\$40.7bn), oil (\$149.5bn - OECD [PINE database](#))

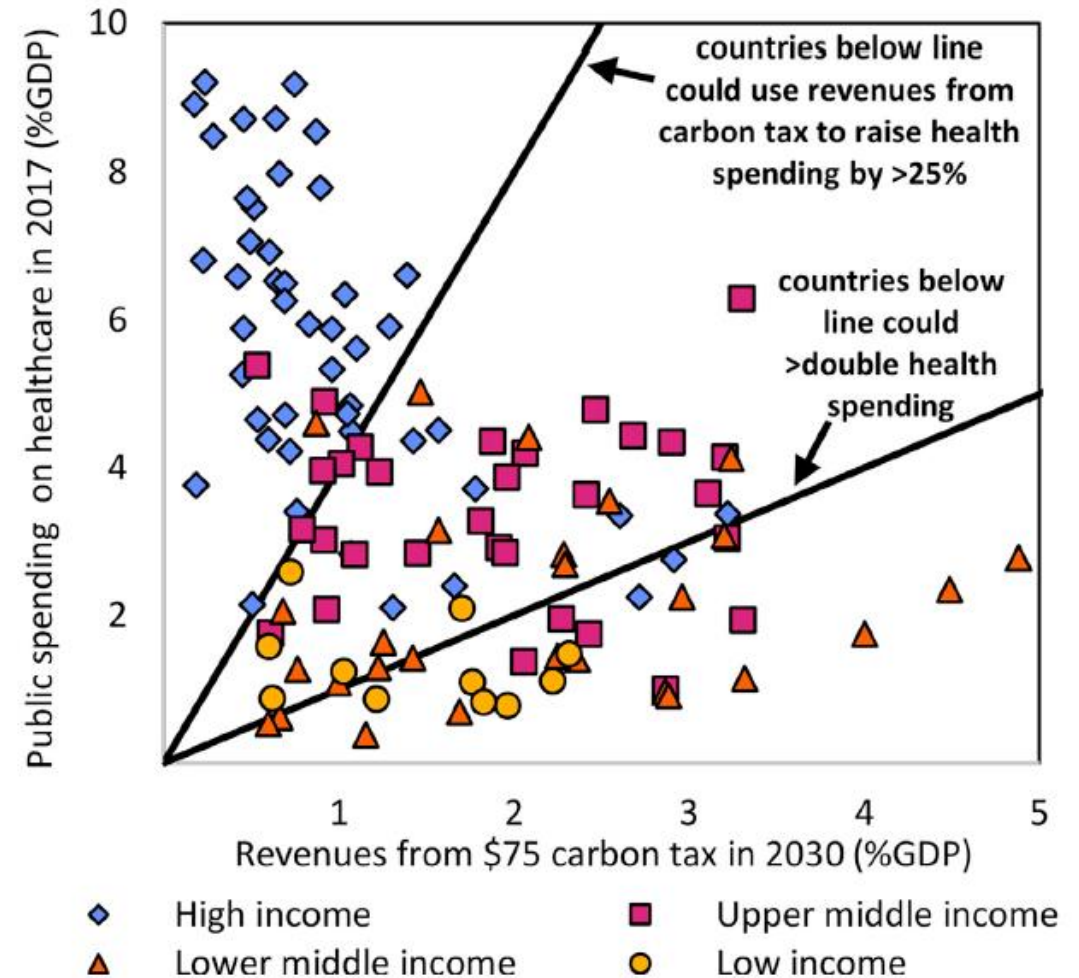
But this is a tiny fraction of global tax revenues



Notes: ETS raised \$6.57bn in public revenue and carbon tax systems raised \$21.7bn in 2016 (Source: [Carl, Jeremy, and David Fedor, 2016](#)); total environmental taxes + charges for OECD and non-OECD countries raised \$539.1bn that year, other taxes included on: gasoline (\$55.6bn), diesel (\$40.7bn), oil (\$149.5bn – OECD [PINE database](#) & [data](#))

Potential revenues from carbon pricing are significant

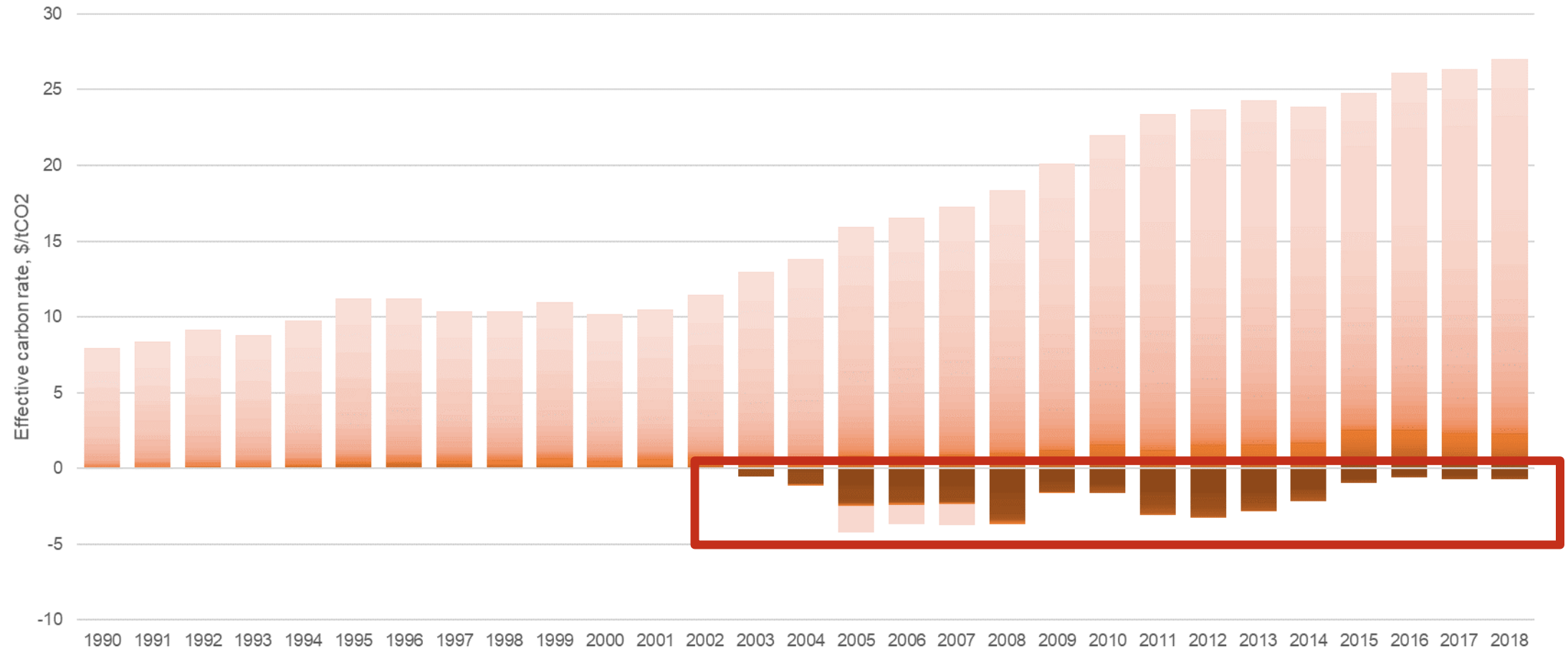
- Raises significant revenue for e.g. health expenditures, investment, labor tax reductions, per-capita transfers
- Tradeoffs among objectives:
 - ▶ Efficiency – labor tax & capital tax reductions
 - ▶ Equity & political support – cash transfers (targeted & untargeted), social assistance
 - ▶ Environmental effectiveness & political support – green public expenditures
- Recommend mixing revenues based on goals:
 - ▶ Efficiency/equity – raise labor tax thresholds (mostly developed countries)
 - ▶ Equity & political support – targeted transfers & pro-poor expenditures (developing countries)
 - ▶ Environmental effectiveness – some for green public expenditures (all countries)



Source: author

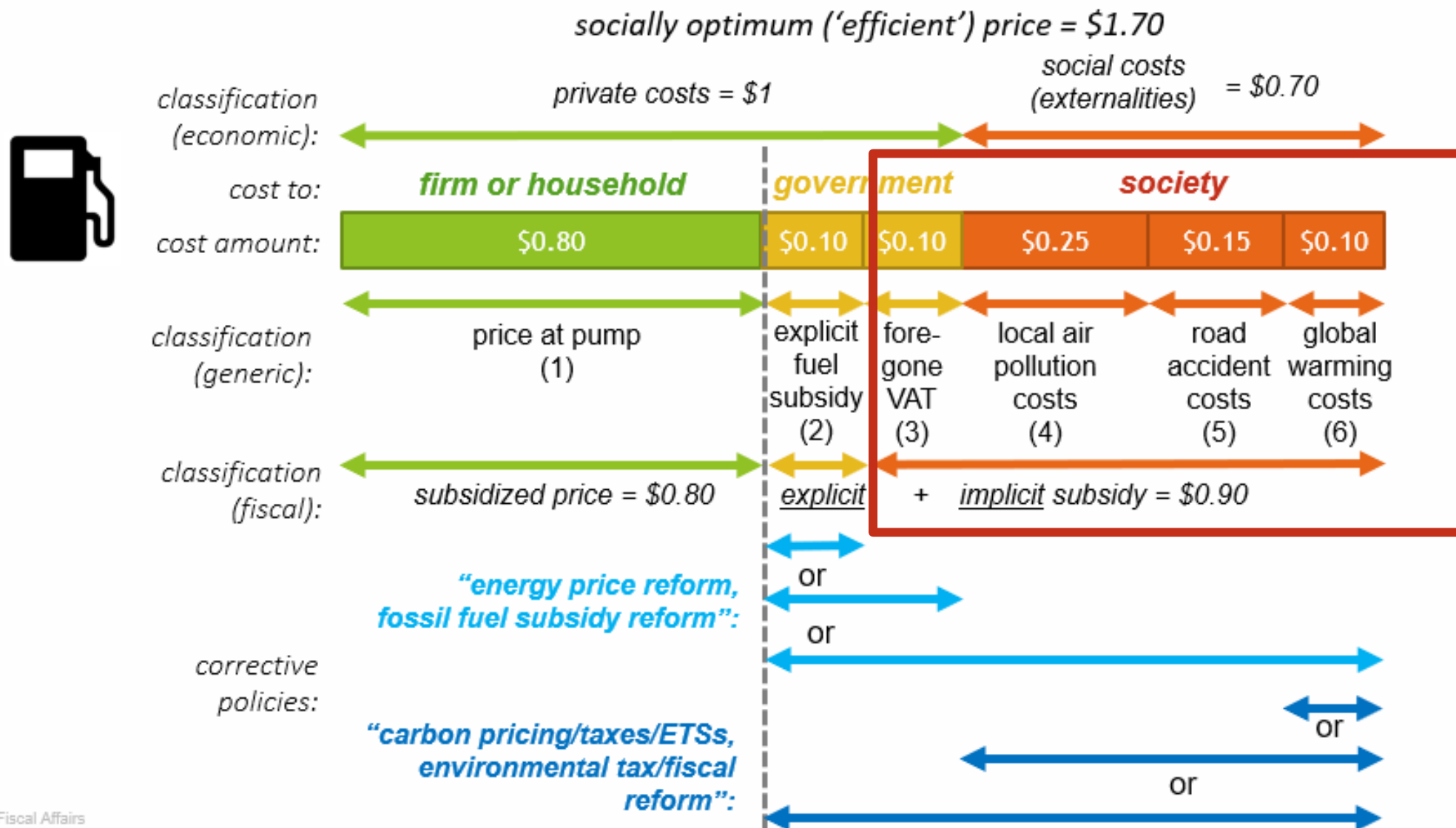
What about fossil fuel subsidies?

One drag on decarbonization is negative carbon prices i.e. explicit subsidies...

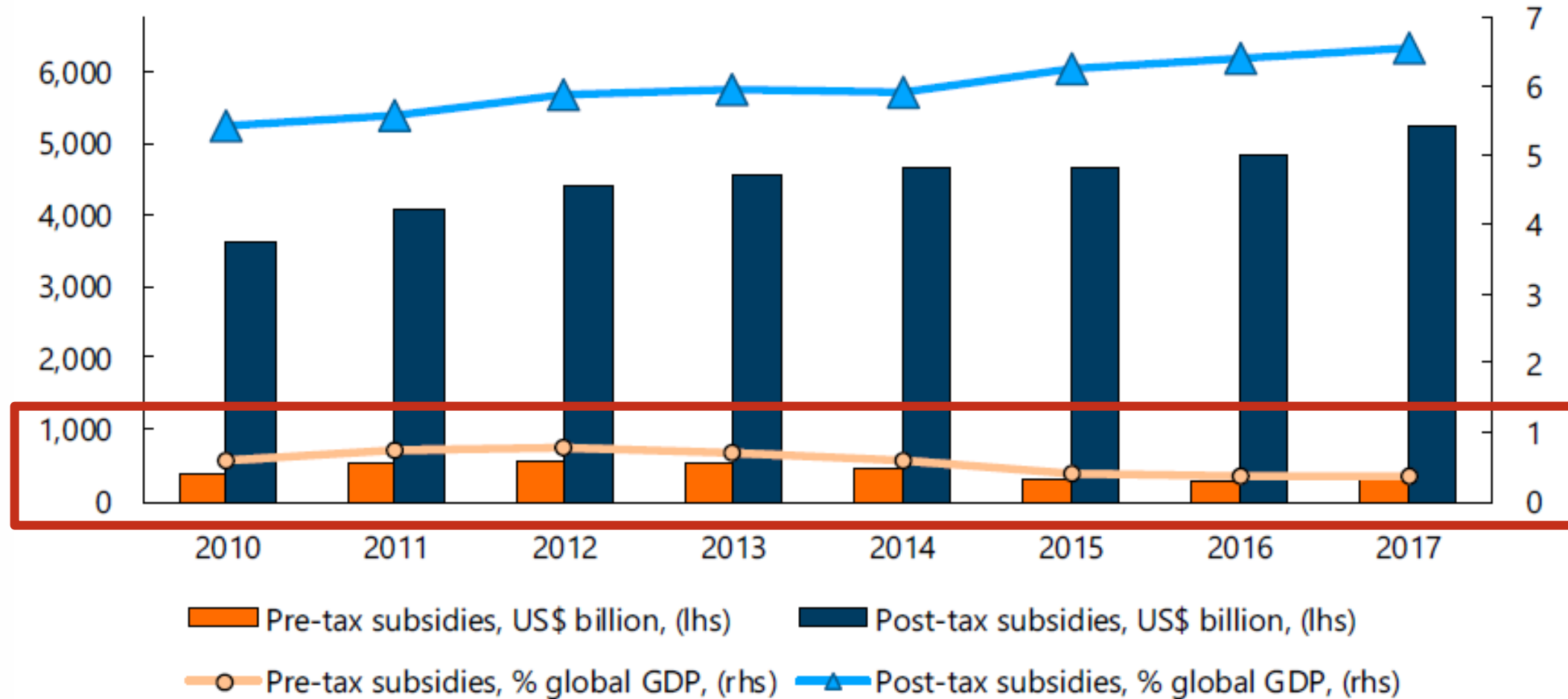


Source: IMF staff estimates, forthcoming; covers countries accounting for 95% emissions

...but there are also implicit subsidies...



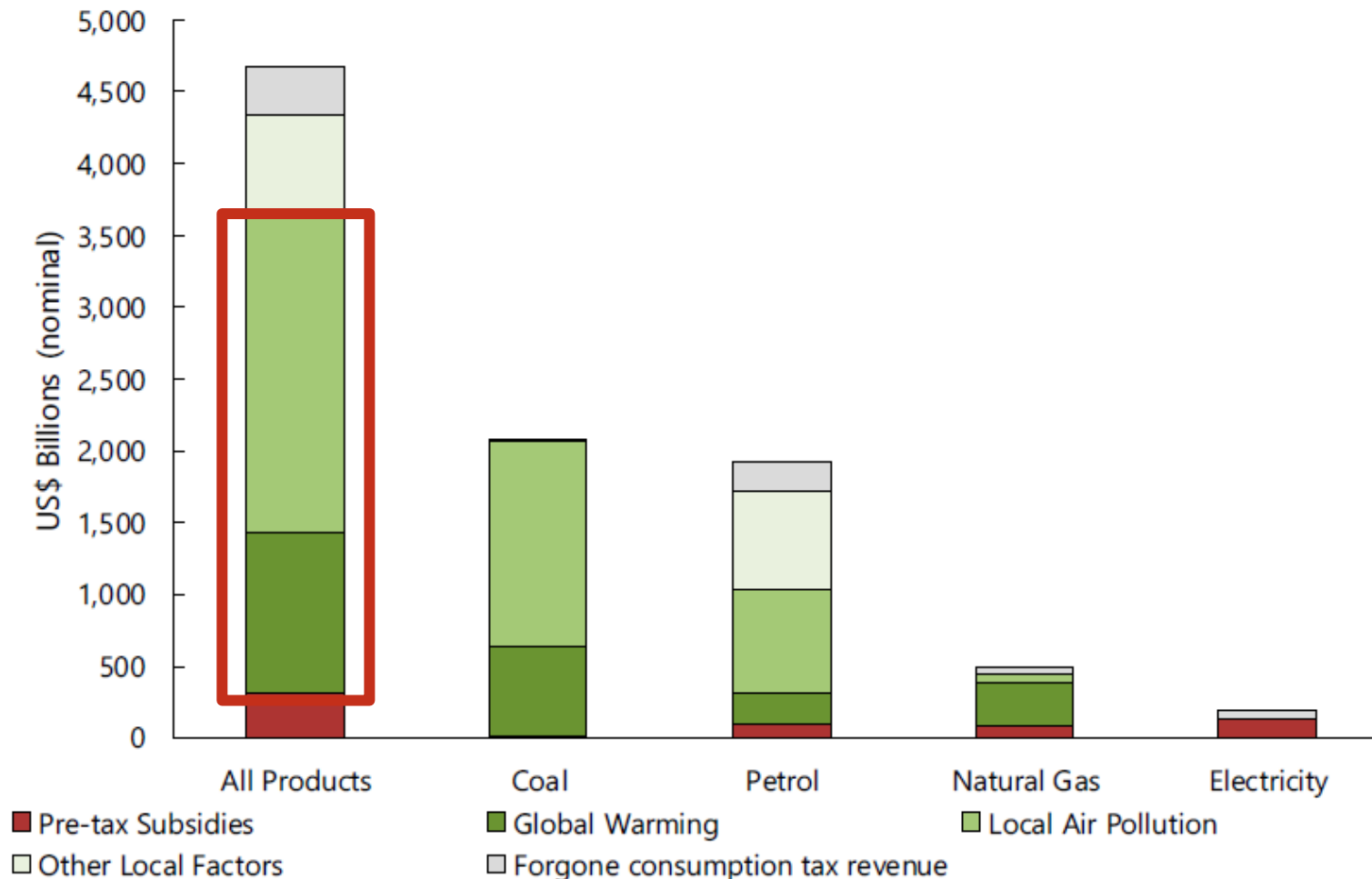
...hence total fossil fuel subsidies are very large (~\$350bn explicit, ~\$5tn implicit)



Source: Coady, David, Ian Parry, Nghia-Piotr Le, and Baoping Shang. 2019. "Global Fossil Fuel Subsidies Remain Large: An Update Based on Country-Level Estimates IMF Working Paper Fiscal Affairs Department Global Fossil Fuel Subsidies Remain Large: An Update Based on Country-Level Estimates."

<https://www.imf.org/en/Publications/WP/Issues/2019/05/02/Global-Fossil-Fuel-Subsidies-Remain-Large-An-Update-Based-on-Country-Level-Estimates-46509>.

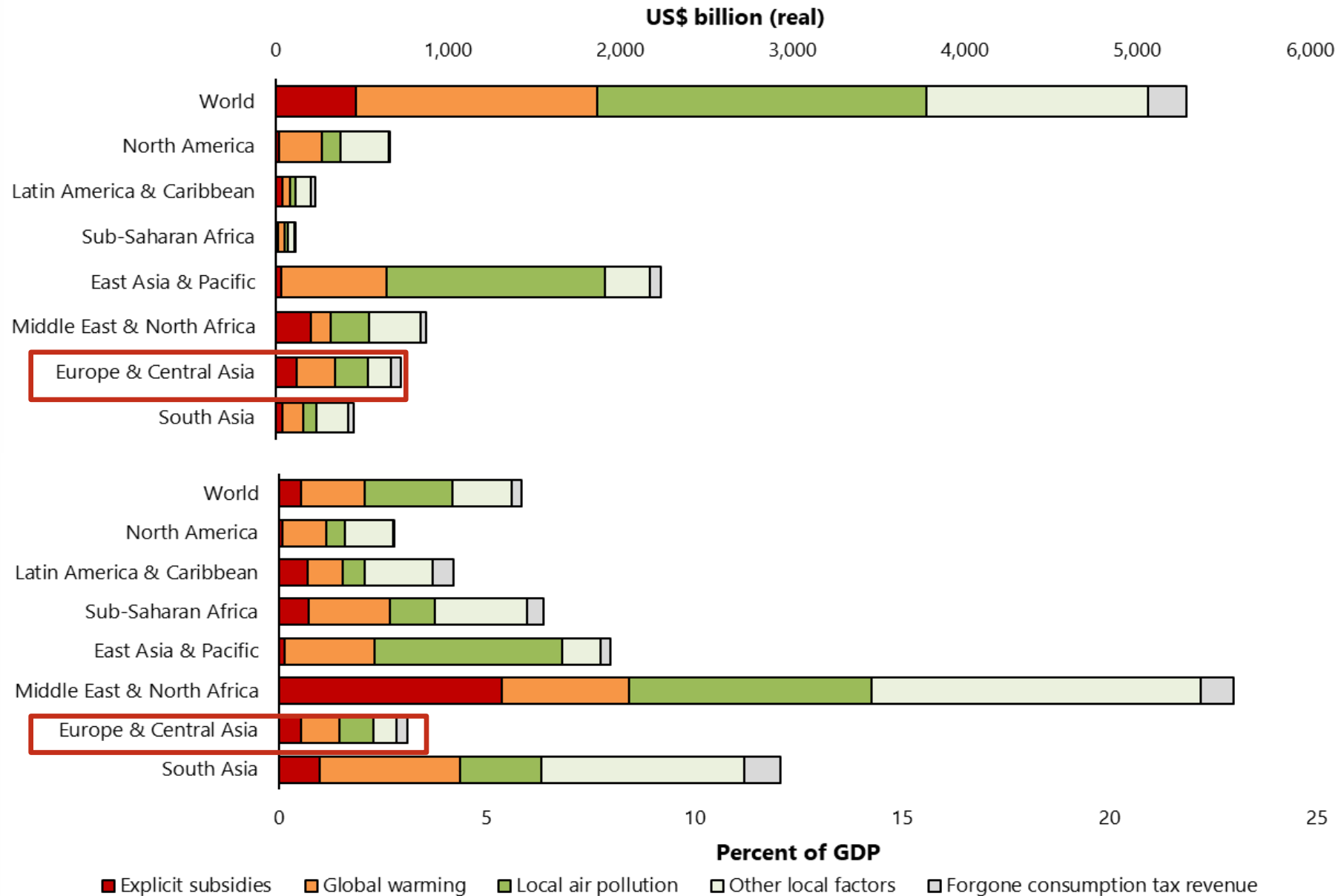
...they are mostly externalities, especially costs of air pollution and climate ...



Source: Coady, David, Ian Parry, Nghia-Piotr Le, and Baoping Shang. 2019. "Global Fossil Fuel Subsidies Remain Large: An Update Based on Country-Level Estimates IMF Working Paper Fiscal Affairs Department Global Fossil Fuel Subsidies Remain Large: An Update Based on Country-Level Estimates."

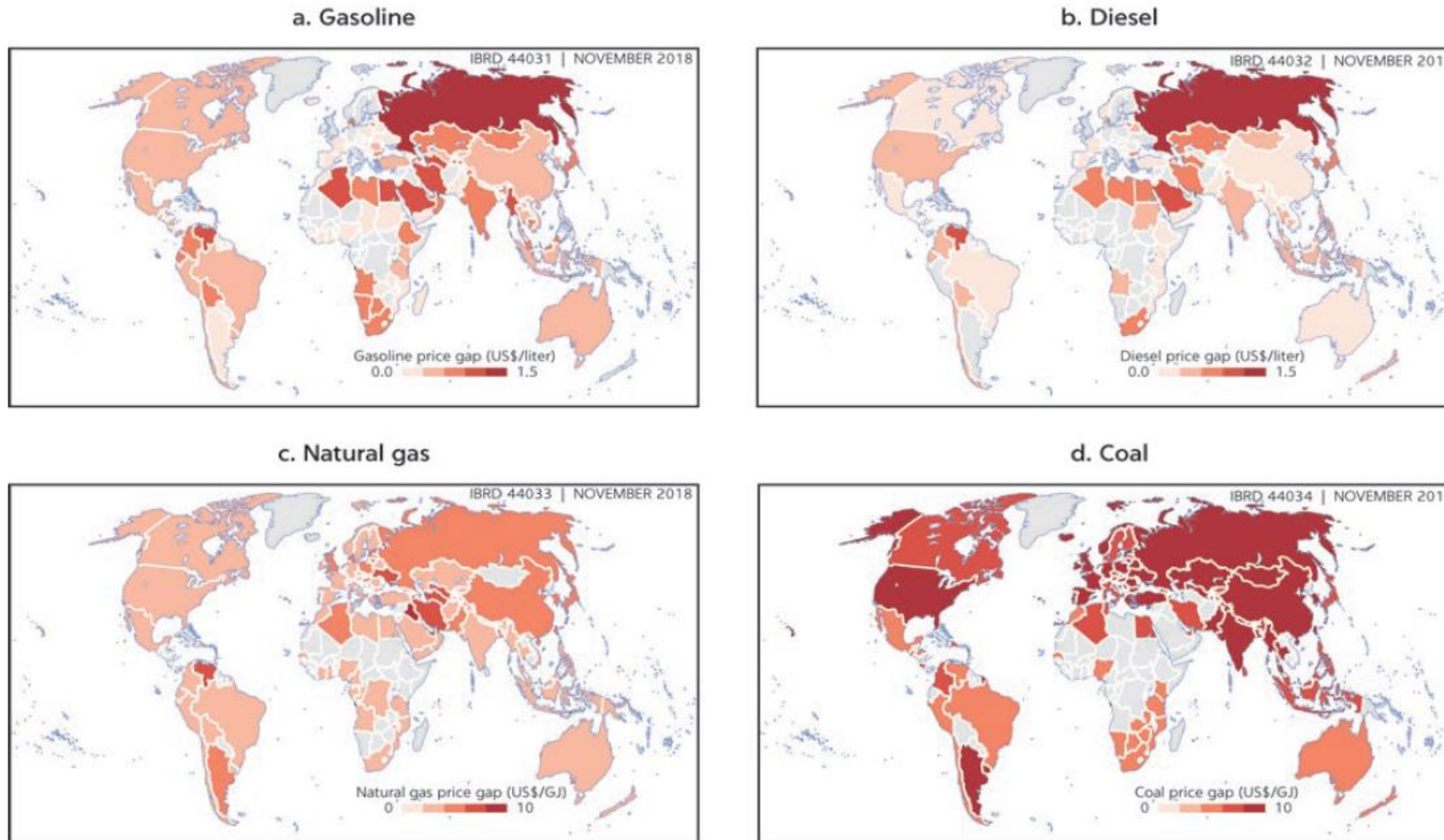
<https://www.imf.org/en/Publications/WP/Issues/2019/05/02/Global-Fossil-Fuel-Subsidies-Remain-Large-An-Update-Based-on-Country-Level-Estimates-46509>.

...a lot of regional variation, high in ECA (preliminary)



Source: IMF staff estimates, forthcoming

...meaning large environmental tax gaps



Sources: Created using data from Coady et al. 2017.

Note: Map shows that gaps exist between consumer prices and lower-bounds estimates for efficient energy prices implied by external costs (including local pollution, traffic congestion and road accidents, and climate change). It shows only countries where consumer prices were below efficient prices in 2015. Countries not shown had either negative price gaps (for example, much of Europe with diesel) or missing data (parts of Africa on diesel and coal). Price gaps on gasoline and diesel are expressed in US\$/liter, with the dark red (1.5) group including all countries with gaps greater than US\$1.5/liter. Gaps for natural gas and coal are expressed in US\$ per Gigajoule (GJ) energy produced, with the dark red (10) group including all countries with gaps greater than US\$10/GJ.

Recommendations

Start by estimating explicit subsidies

- Retail prices < supply costs for fuels

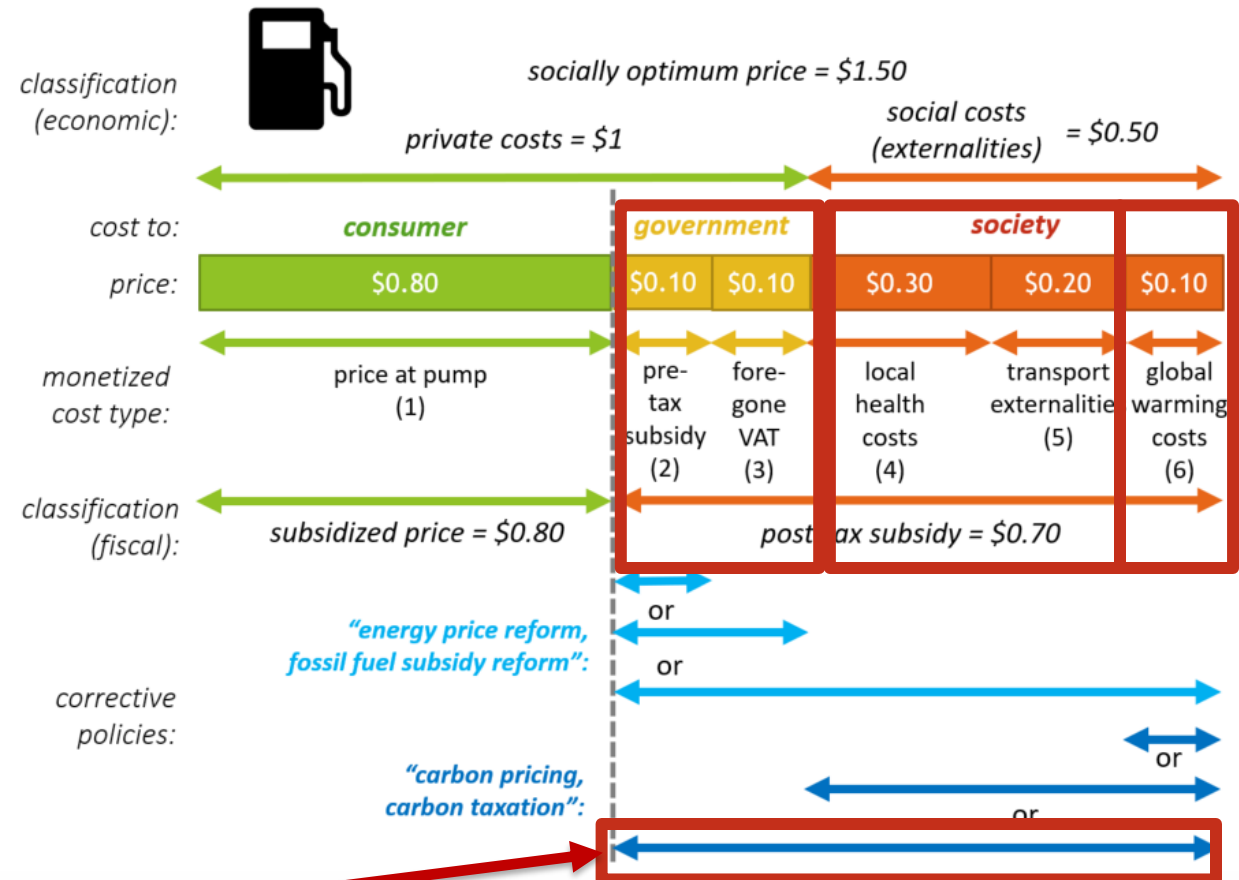
Then estimate implicit subsidies

- Foregone consumption tax
- Externalities

Remove all pre- and post-tax subsidies

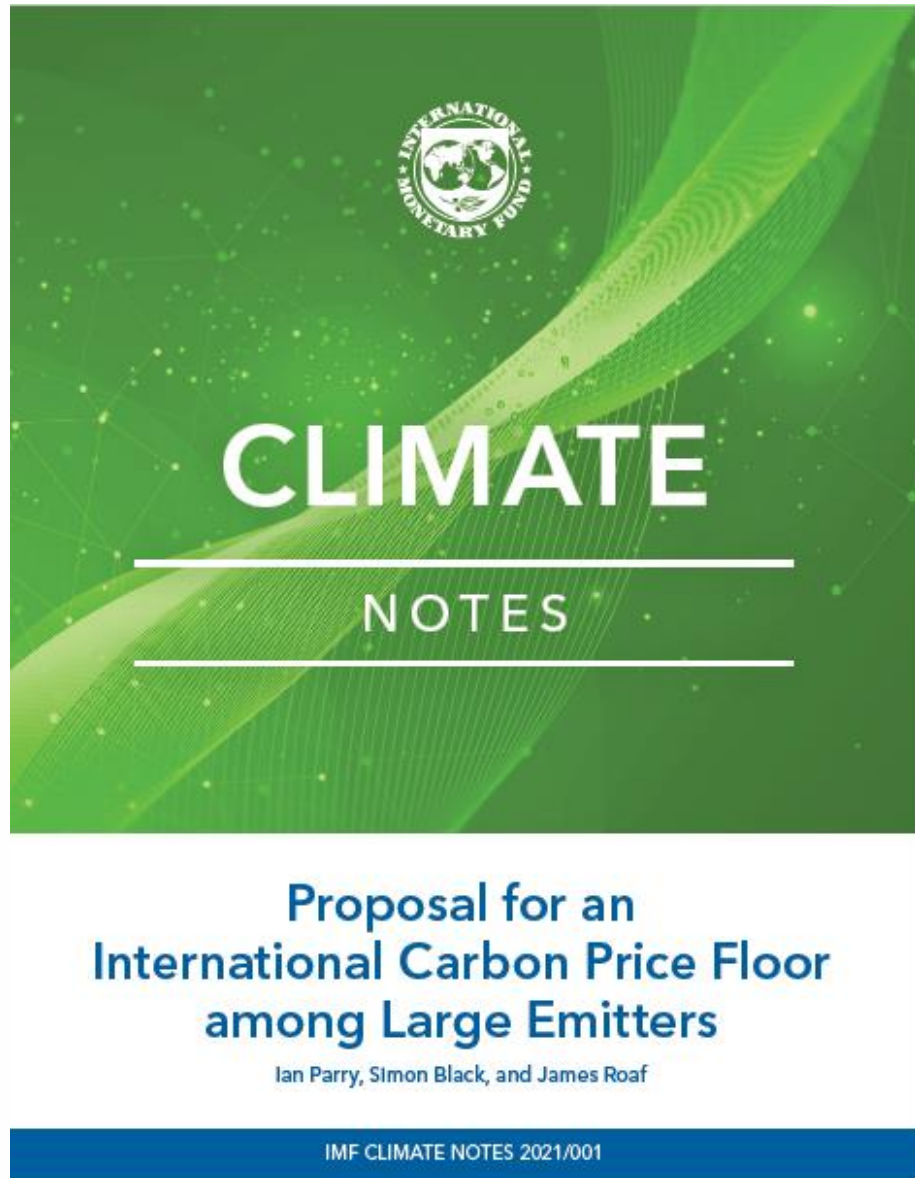
- Remove fossil fuel subsidies
- Implement carbon taxes & other environmental taxes

Fully close the gap to get energy prices right!



**Is there a need for international
cooperation?**

IMF International Carbon Price Floor Proposal (forthcoming)



- Need to accelerate decarbonization this decade
- Carbon pricing as central decarbonization instrument
- ICPF as complement to Paris Agreement – Paris Agreement vital for global ambition, but near-term pledges fall short
- Pragmatic carbon price floor agreement among smaller group of large emitters would supplement Paris and kick-start near-term emissions reductions
- Without ICPF, environmental/competitiveness concerns raise pressure for border carbon adjustments (far less effective than ICPF, though “devil is in the detail”: design choices make all the difference)

The need to complement the Paris Agreement

Paris Agreement is working to catalyze global ambition...

- 60 countries have committed 'net-zero' emission pledges for midcentury (more expected)

...but needs reinforcing to achieve required emissions reductions for 2030

- Current pledges for 2030 fall short of needed reductions for 2°C
- No mechanism for ensuring pledges achieved or link to policies

Under Paris approach two key obstacles to scaling up global mitigation

- *Ambition*: Too many parties (195) and parameters (one pledge per party)
- *Unilateral policy action*: competitiveness, uncertainty about whether others will act

The reinforcing mechanism should:

- *Facilitate negotiation* (i.e., small number of countries/transparent parameters)
- *Be effective* (i.e., contain a concrete plan to deliver emissions reductions)

IMF Carbon Price Floor proposal – two key elements

1. Focus on key emitters

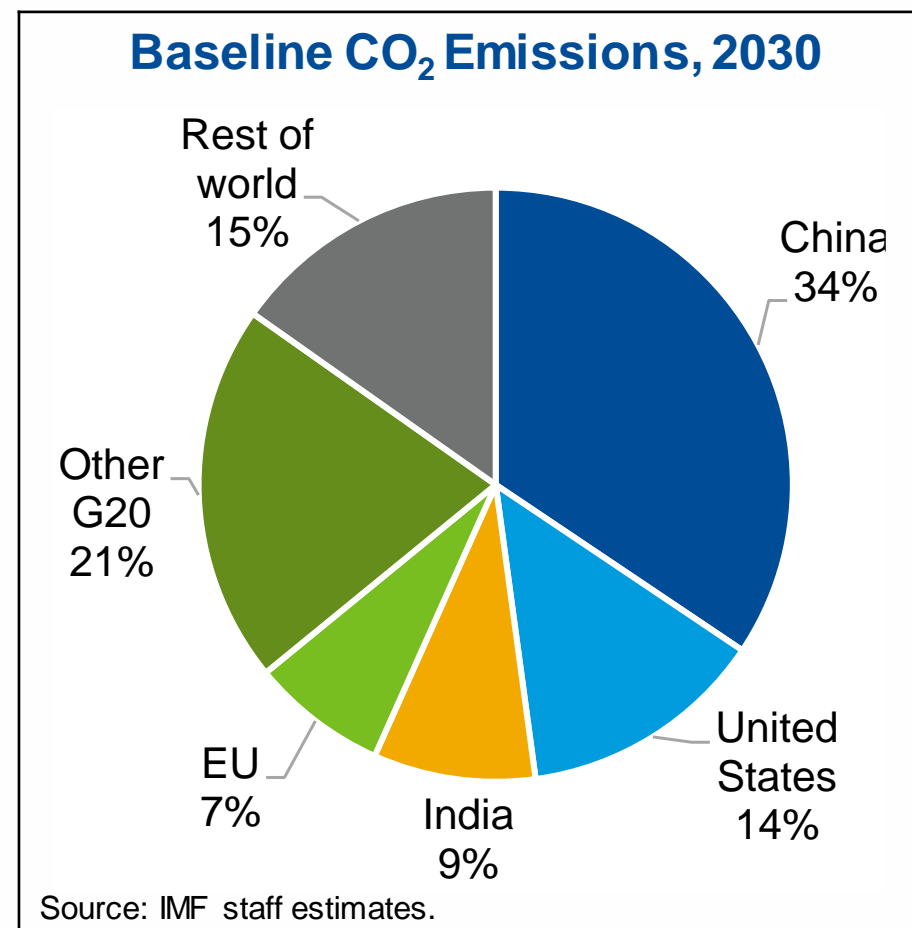
- e.g. China, US, India, EU, Canada, UK

2. Focus on minimum carbon price

- Efficient and easily understood parameter
- Joint action addresses competitiveness concerns and policy uncertainty
- Countries can set higher prices if needed

But pragmatic design needed

- *Equity*: differentiated price floors/simple transfer mechanism
- *Flexibility*: allow alternative policies with equivalent outcomes
- Other issues include emissions sources, monitoring



Effectiveness of an ICPF: example with six countries

G20 CO₂ Outcomes Under Alternative ICPF

Percent reduction in G20 CO₂ emissions below baseline, 2030

Minimum emissions reductions required for temperature goals¹:

2°C	20.8
1.8°C	32.8
1.5°C	46.6

China, US, India, EU, Canada, UK All G20 Countries

NDCs Only	10.8	14.0
NDCs+\$50 Floor	23.4	25.3
NDCs+Differentiated Floor \$75/50/25 ²	22.6	24.6

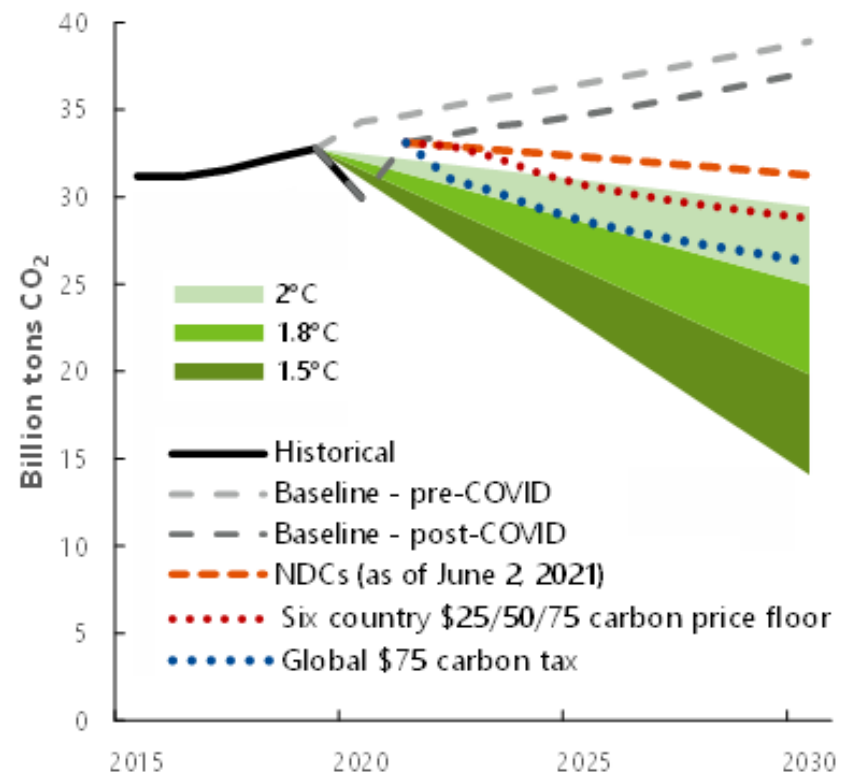
Source: NDCs from June 2, 2021; and IMF staff calculations.

Note: G20 - Group of Twenty; GHGs - greenhouse gases; NDC - nationally determined contributions.

¹ Assumes energy-related national CO₂ emissions need to reduce in proportion to total GHGs.

² Higher/middle/lower price for advanced/high income emerging market/low income emerging market economies.

Global CO₂ Projections and Pathways for Warming Targets



Source: IMF staff estimates using UNEP (2020) & IEA (2020). Note: \$25/50/75 carbon price floor is for China, US, India, EU, Canada, UK - conditional on achieving NDCs. Global \$75 carbon tax starts at \$15/ton, rising steadily from 2022 to 2030. Pathways assume energy-related national CO₂ emissions are reduced in proportion to total greenhouse gas emissions. COVID = coronavirus; NDCs = nationally determined contributions.

What about border carbon adjustments and carbon leakage?

What about border carbon adjustments (BCAs)?

Some policymakers fear that higher carbon prices than in trading partners create a trade distortion, leading to:

1. **Concerns about jobs and growth**

- Production and investment could shift to lower carbon tax jurisdictions
- Especially relevant for energy-intensive, trade-exposed (EITE) industries

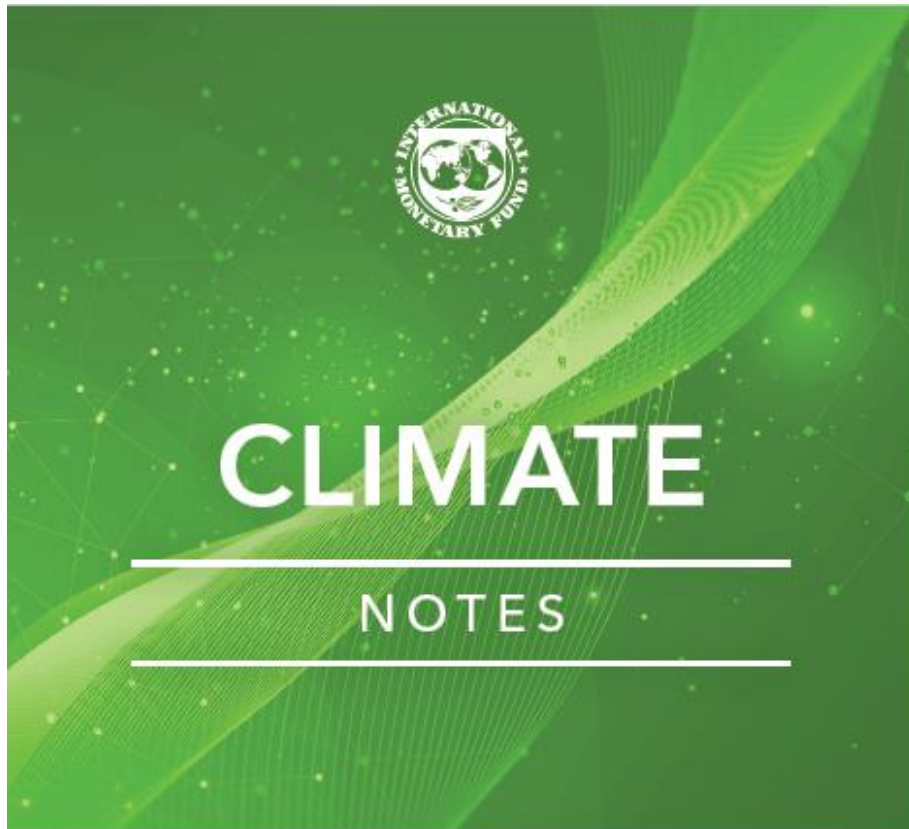
2. **Environmental** concerns

- “Carbon leakage” is when production shifting abroad raises foreign emissions, offsetting the domestic emissions reduction from carbon pricing

- BCAs could help address both concerns – charging for the CO₂ “embodied” in imports (and probably rebating for exports). Provides an alternative to existing EITE industry support mechanisms such as free allowances.
- BCAs may also encourage carbon pricing abroad
- **But international cooperation on carbon pricing is superior to BCAs, notably in cutting global emissions**

ICPFs compared with BCA and existing domestic alternatives

	International cooperation	Domestic policy instruments for defending competitiveness				
Mechanism → Metric ↓	Coordinated carbon prices (e.g. ICPF)	Border Carbon Adjustments (BCAs)	Carbon tax exemptions	Free allowances under ETS	Tradable emissions standards	Output-based rebates
Reduction in global emissions	Potentially large reduction	Always small reduction	Increases emissions	Increases emissions	Increases emissions	Increases emissions
Preserve EITE competitiveness	Yes (extent depends on design)	Yes (extent depends on design)	Less effective if indirect emissions not covered	Partially	Partially	Partially
Limit carbon leakage	Yes (extent depends on design)	Yes (extent depends on design)	Less effective if indirect emissions not covered	Partially	Partially	Partially
Revenue implications	Preserves carbon pricing revenue	Preserves carbon pricing revenue	Loses some carbon pricing revenue	Loses some carbon pricing revenue	Forgoes carbon pricing revenue	Forgoes carbon pricing revenue (approx.)
Administrative burden	Low	Depends on design	Modest	Modest	Modest	Modest
Risk of WTO challenge	No	Depends on design	No	Potential challenge as subsidy?	No	No



**Proposal for an
International Carbon Price Floor
among Large Emitters**

Ian Parry, Simon Black, and James Roaf

IMF CLIMATE NOTES 2021/001

Conclusion

- We are in a climate emergency
- Need to cut emissions rapidly in this decade
- Carbon pricing is a central decarbonization instrument
- ICPF can complement Paris Agreement – ratcheting up ambition with direct link to policy
- Pragmatic carbon price floor agreement among smaller group of large emitters would supplement Paris and kick-start near-term emissions reductions
- ICPFs are superior to BCAs

***The race to net-zero will be fueled by carbon pricing.
An international carbon price floor could fire the
starting gun!”***



Thank you.
sblack@imf.org