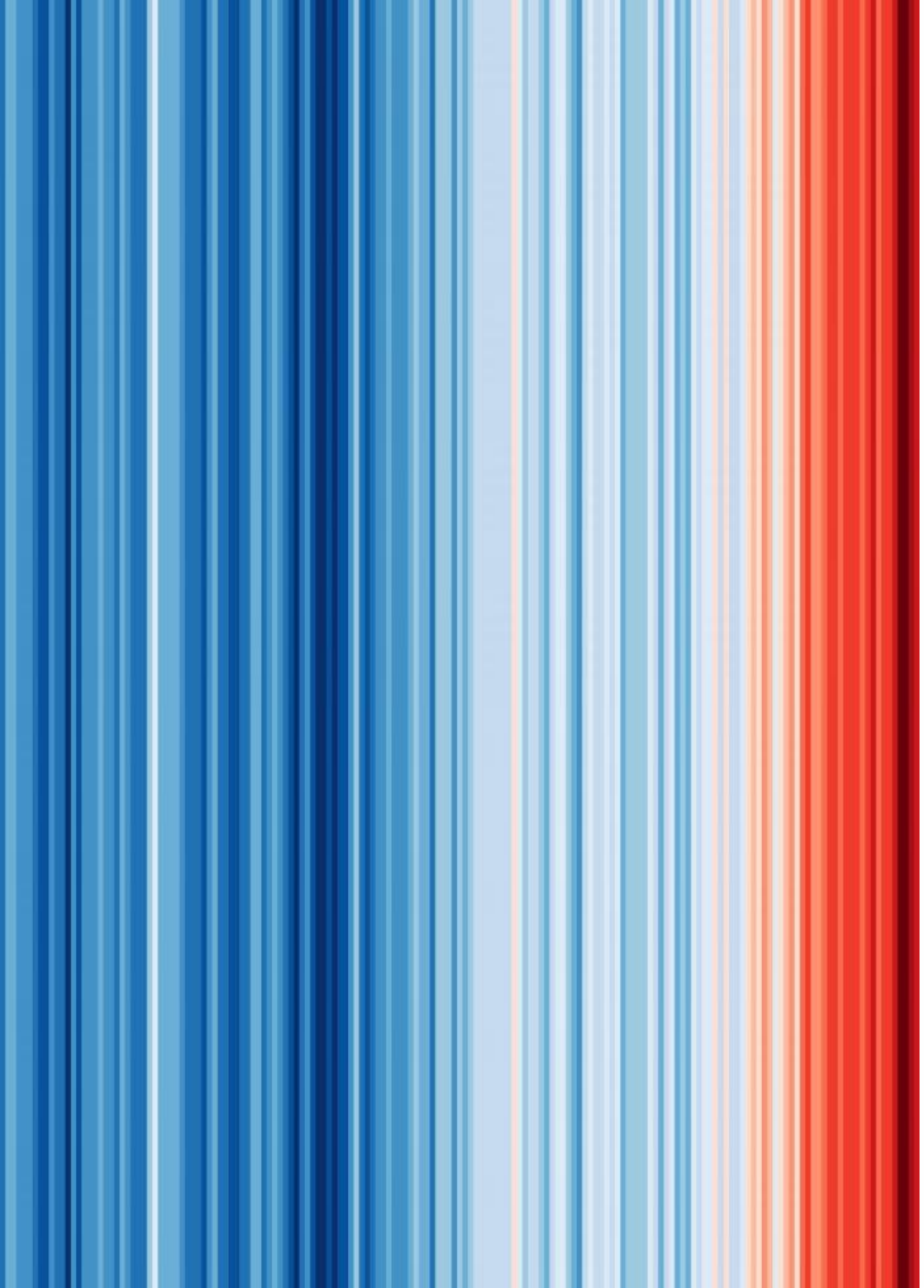


Carbon Taxes and Levies: Scaling Up Domestic Action to Achieve Net-Zero

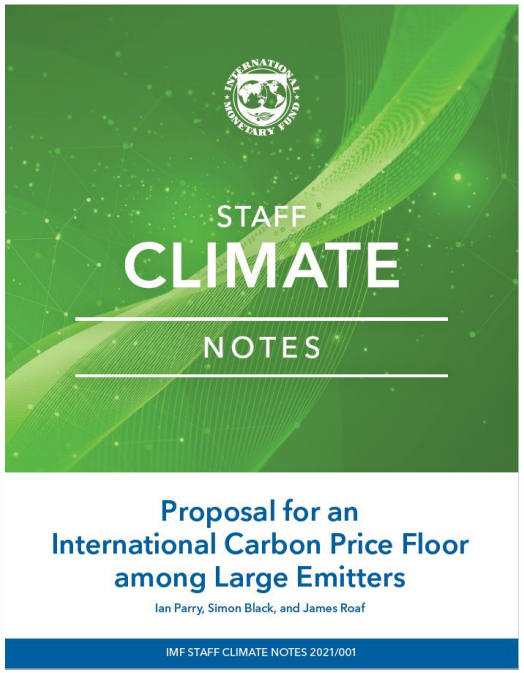
Presentation at PMIF Global Knowledge Forum, May 22, 2023

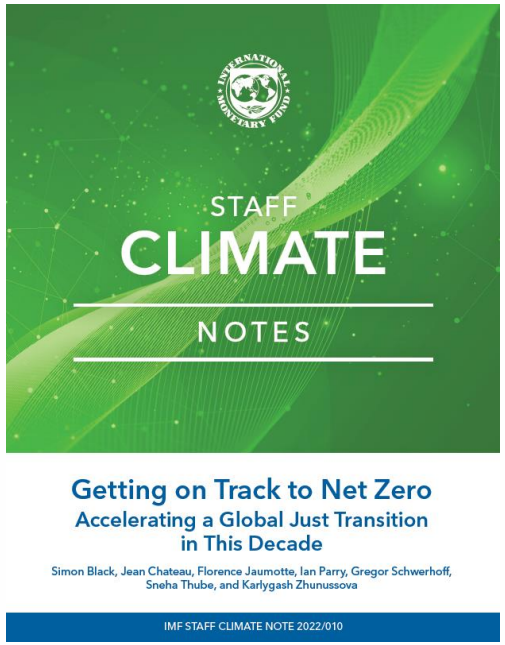
Simon Black – Fiscal Affairs Department, IMF

Structure

- Urgent need for global action
- Pricing carbon domestically: carbon taxes and ETSs
- Pricing carbon internationally: BCAs & ICPFs

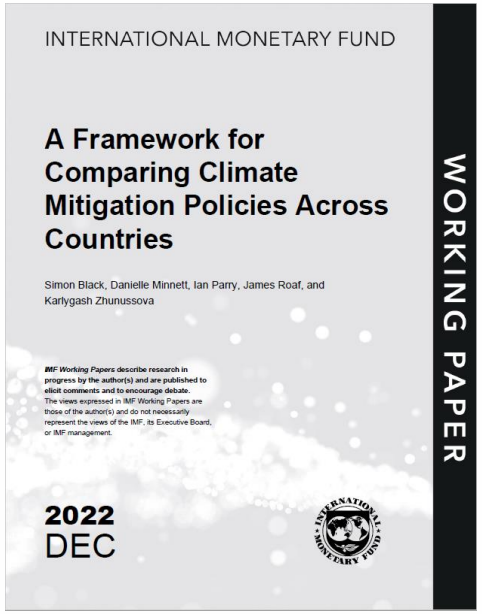
Ian Parry, Simon Black, and James Roaf. 2021. “Proposal for an International Carbon Price Floor among Large Emitters,” IMF Staff Climate Notes, no. 2021/001. https://www.imf.org/en/Publications/staff-climate-notes/Issues/2021/06/15/Proposal-for-an-International-Carbon-Price-Floor-Among-Large-Emitters-460468.

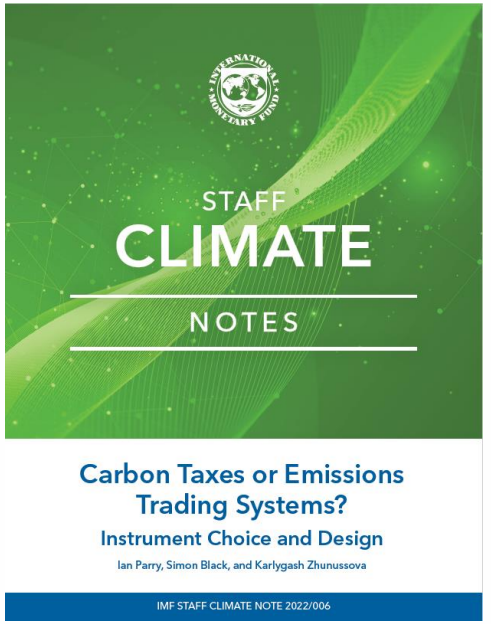




Black, Simon, Jean Chateau, Florence Jaumotte, Ian Parry, Gregor Schwerhoff, Sneha Thube, and Karlygash Zhunussova. “Getting on Track to Net Zero: Accelerating a Global Just Transition in This Decade.” IMF Staff Climate Note No 2022/010, 2022. https://www.imf.org/en/Publications/staff-climate-notes/Issues/2022/10/31/Getting-on-Track-to-Net-Zero-Accelerating-a-Global-Just-Transition-in-This-Decade-525242.

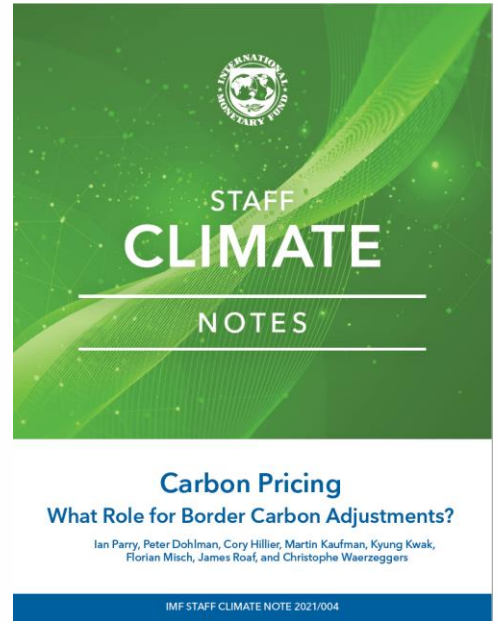
Black, Simon, Danielle Minnett, Ian Parry, James Roaf, and Karlygash Zhunussova. “A Framework for Comparing Climate Mitigation Policies Across Countries.” *IMF Working Papers*, Working Paper No. 2022/254, 2022. https://www.imf.org/en/Publications/WP/Issues/2022/12/16/A-Framework-for-Comparing-Climate-Mitigation-Policies-Across-Countries-527049.





Ian Parry, Simon Black, and Karlygash Zhunussova. 2022. “Carbon Taxes or Emissions Trading Systems? Instrument Choice and Design,” IMF Staff Climate Notes, No 2022/006. https://www.imf.org/en/Publications/staff-climate-notes/Issues/2022/07/14/Carbon-Taxes-or-Emissions-Trading-Systems-Instrument-Choice-and-Design-519101.

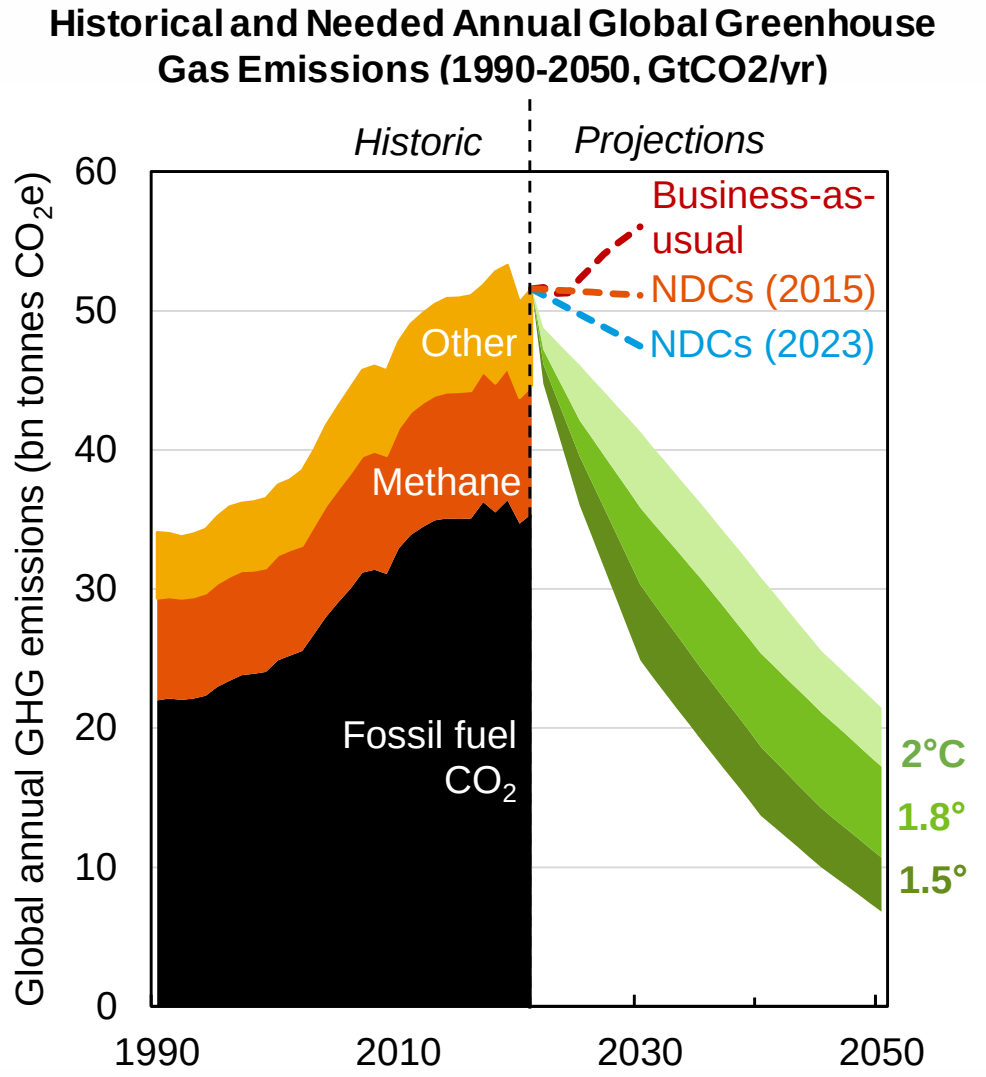
Ian Parry, Christophe Waerzeggers, Cory Hillier, James Roaf, Florian Misch, Martin Kaufman, and Kyung Kwak. 2021. “Carbon Pricing: What Role for Border Carbon Adjustments?,” IMF Staff Climate Note 2021/004, International Monetary Fund, Washington, DC., . https://www.imf.org/en/Publications/staff-climate-notes/Issues/2021/09/24/Carbon-Pricing-What-Role-for-Border-Carbon-Adjustments-464805.



The urgent need for global action

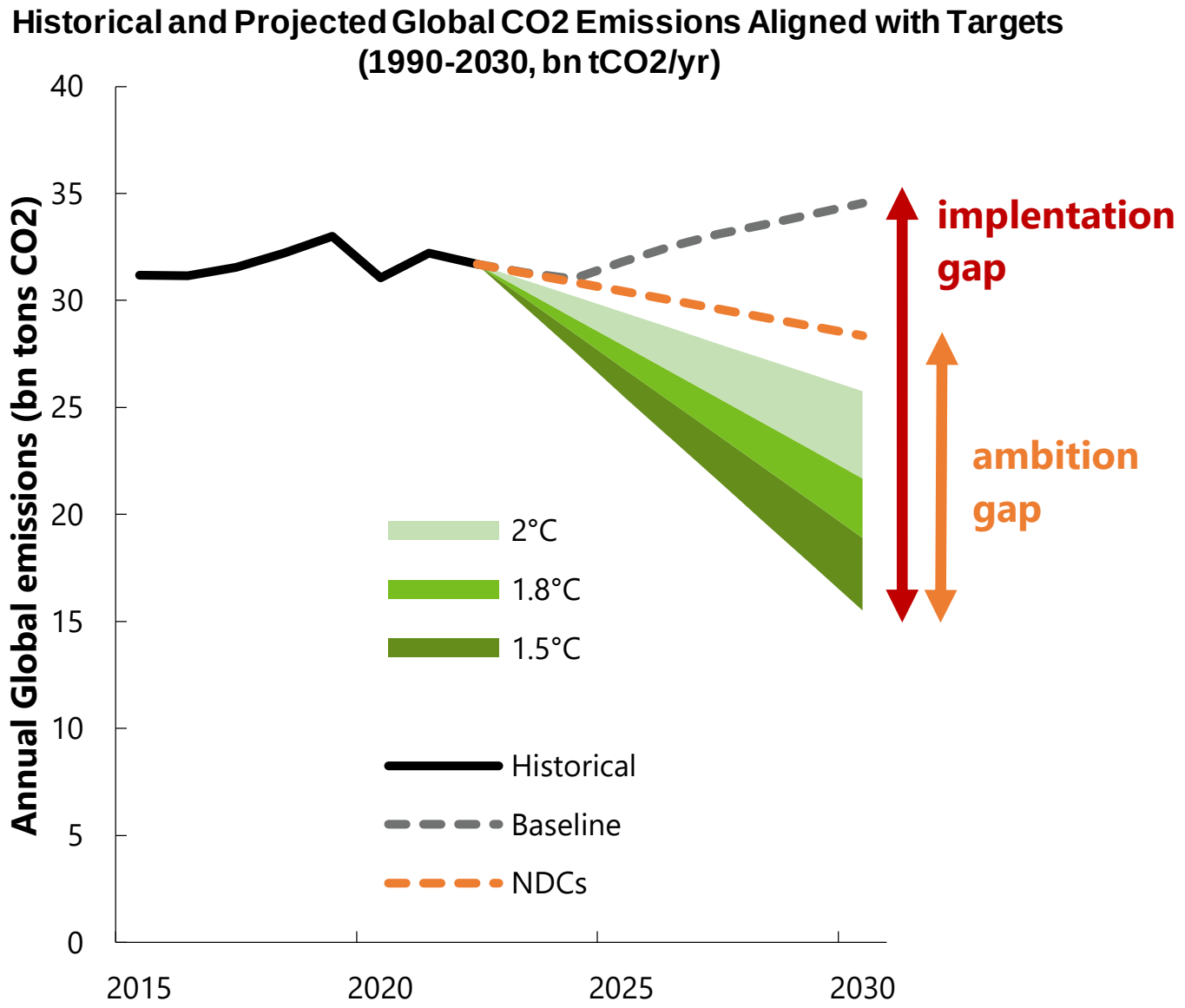
Problem: we need to cut global GHG emissions drastically to mitigate climate change

- Limiting global warming to **2°C or 1.5°C** requires cutting global carbon dioxide (CO_2) and other greenhouse gases (GHGs) **25 or 50 percent** below 2019 levels by 2030 (followed by a rapid decline to **net zero**)
- NDCs only cut emissions by **about 11 percent** by 2030
- Without additional policies globally, **BAU emissions expected to rise**



Source: IMF Staff using CPAT, IPCC (2022). NDC = nationally determined contribution (country emissions targets); BAU = business-as-usual.

For this decade, two gaps in mitigation policy persist



Source: IMF staff.

Ambition gap

Last window to keep alive 1.5-2°C is about to close:

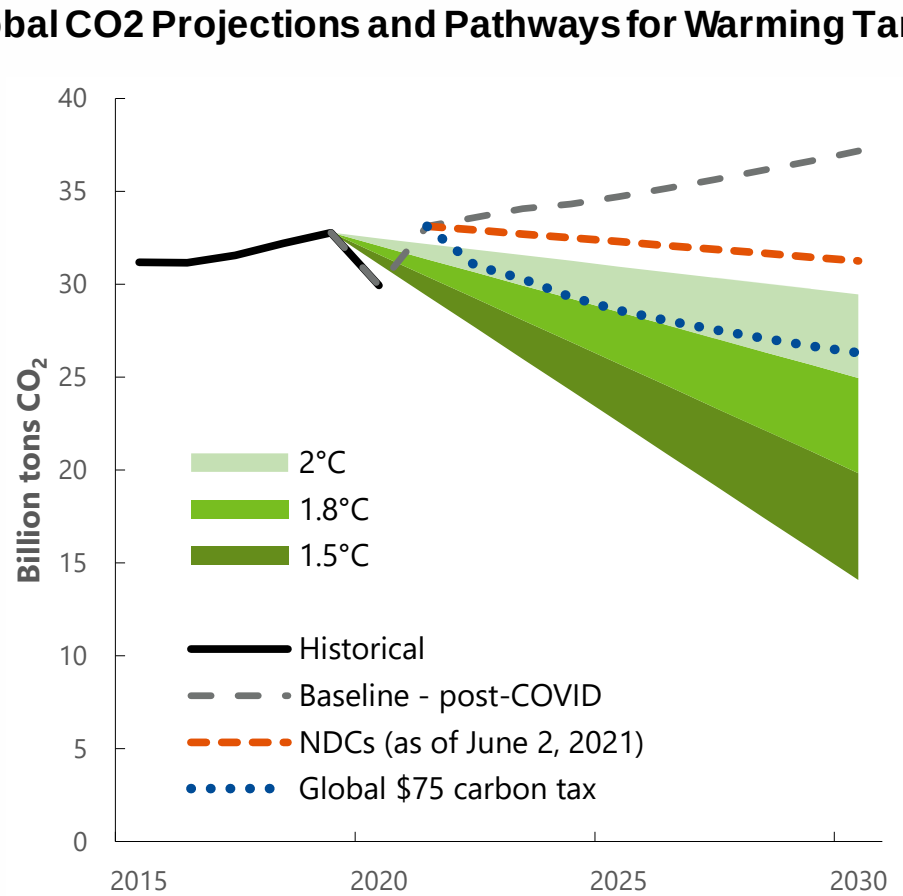
- 140 countries have committed 'net-zero' by ~middle of the century
- But we need huge cuts this decade: 25-50% cut below 2019 levels by 2030
- Current pledges for 2030 would cut emissions by 2/3rds needed for 2C and 1/3 needed for 1.5C (ambition gap)
- Narrowing the ambition gap is needed and can be done equitably (current work)

Implementation gap

Even if targets in NDCs were sufficient, current policies do not yet achieve them:

- Fossil fuels are globally underpriced – explicit financial subsidies and failing to tax their many externalities inc climate = amounts to **$5.7 trillion in 2020** in implicit and explicit support
- Achieving the 25-50% cut requires measures equivalent to >$75/ton global CO_2 price (current price $4/ton)

To Get 'Well Below' 2C We Need A Global Carbon Price Of About $75

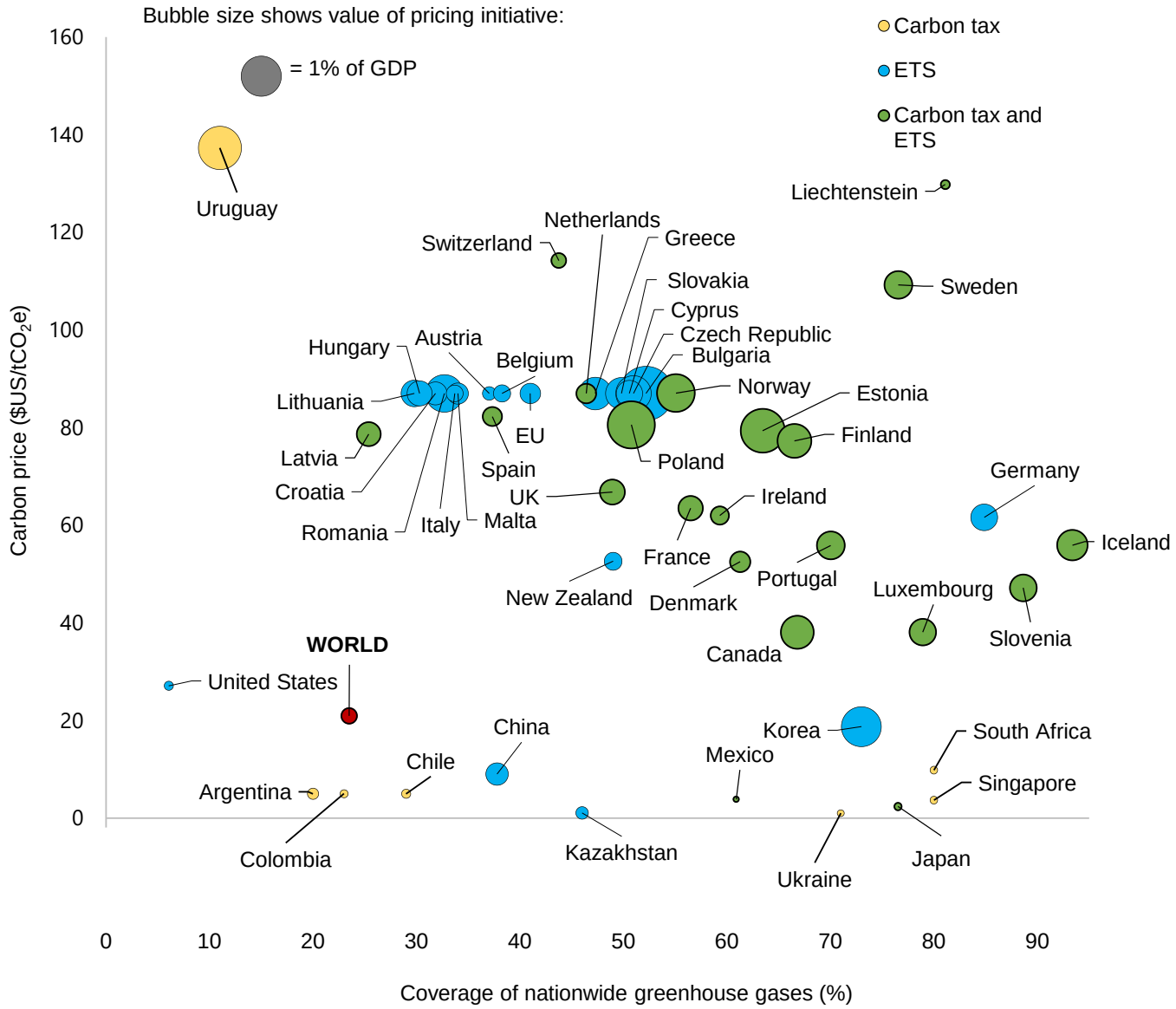


Source: IMF staff estimates using UNEP (2020) & IEA (2020).
Note: Global $75 carbon tax starts at $15 per ton, rising steadily thereafter 2022 to 2030. Warming pathways assume energy-related national CO_2 emissions are reduced in proportion to total greenhouse gas emissions. COVD = coronavirus disease; NDCs = nationally determined contributions.

Source: IMF (2021), Proposal for an International Carbon Price Floor Among Large Emitters

Carbon Pricing is Proliferating…

Explicit carbon pricing schemes (2022, national only)



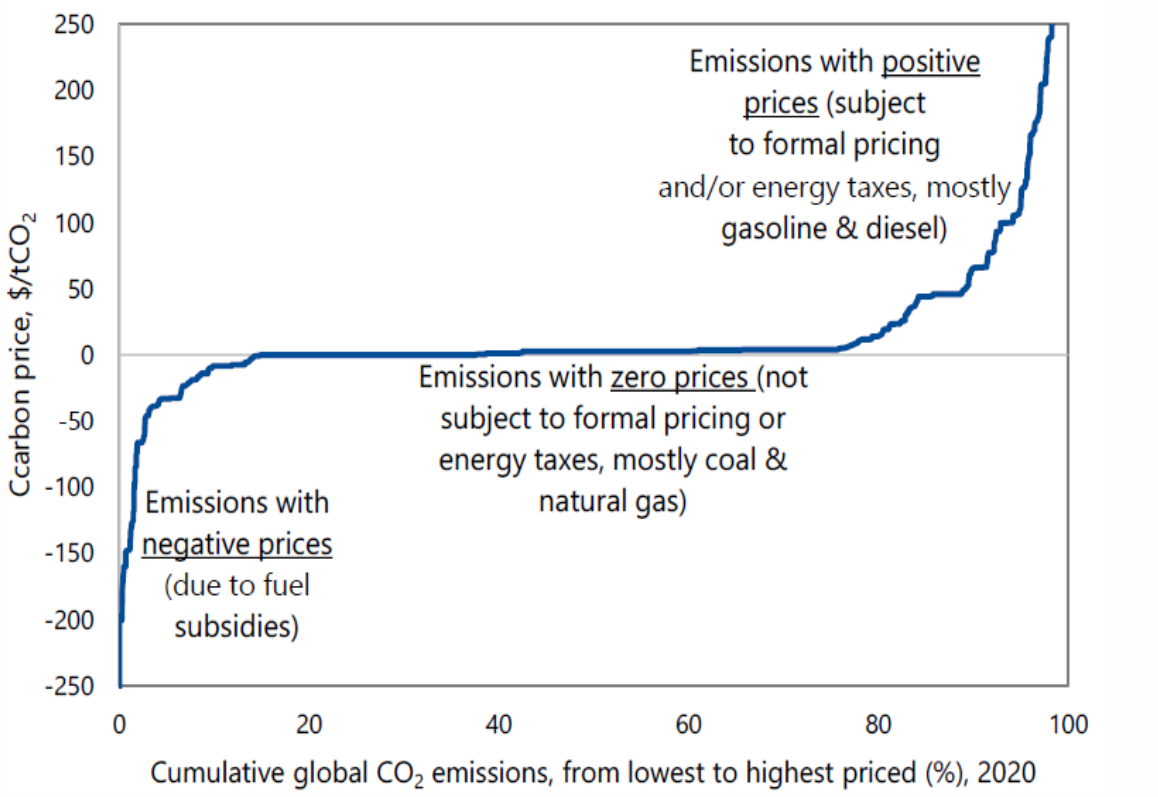
ETS under consideration:
- Malaysia
- Vietnam
- Thailand
- Philippines

Carbon tax under consideration:
- Botswana
- Senegal

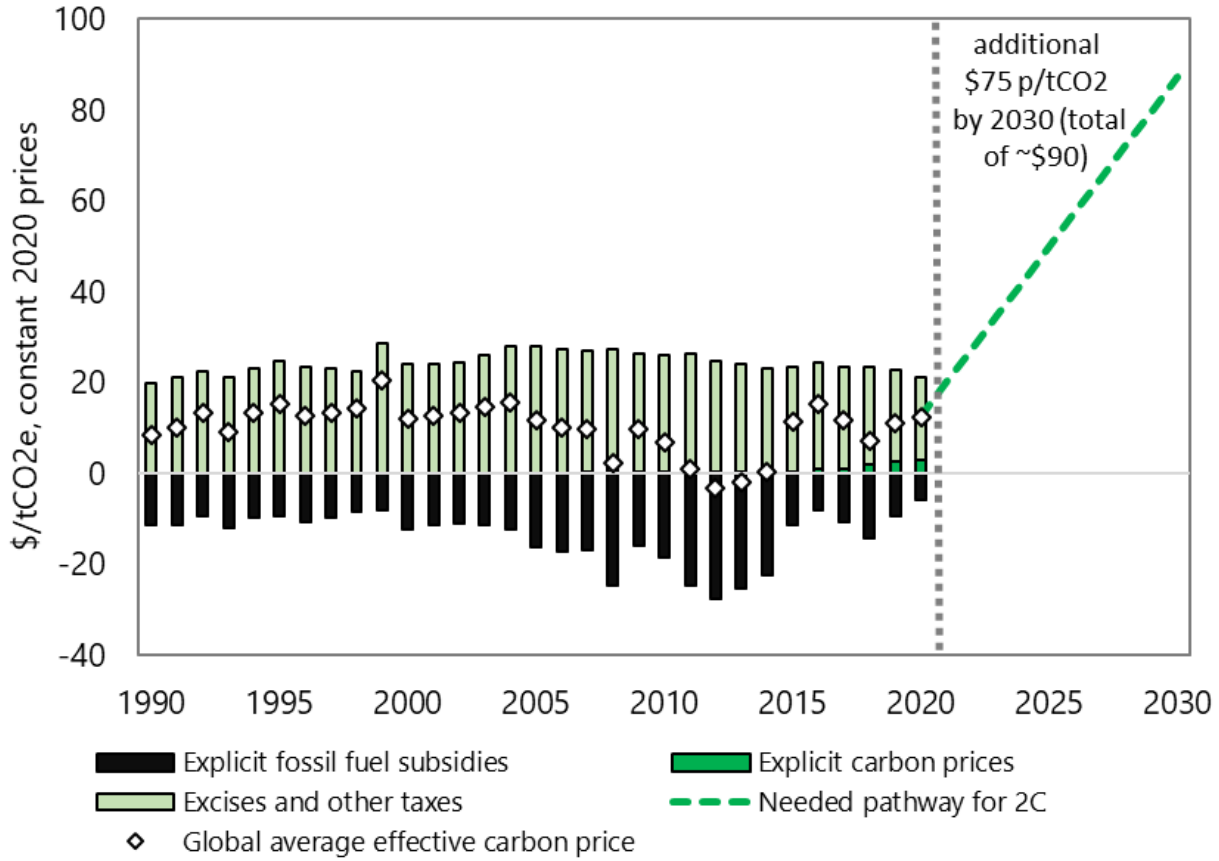
Sources: WBG (2022); IMF staff calculations; National sources.

...But Global Incentives To Cut Fossil Fuel Consumption Remain Weak And Skewed

Carbon Prices Across Cumulative CO2 emissions, 2020



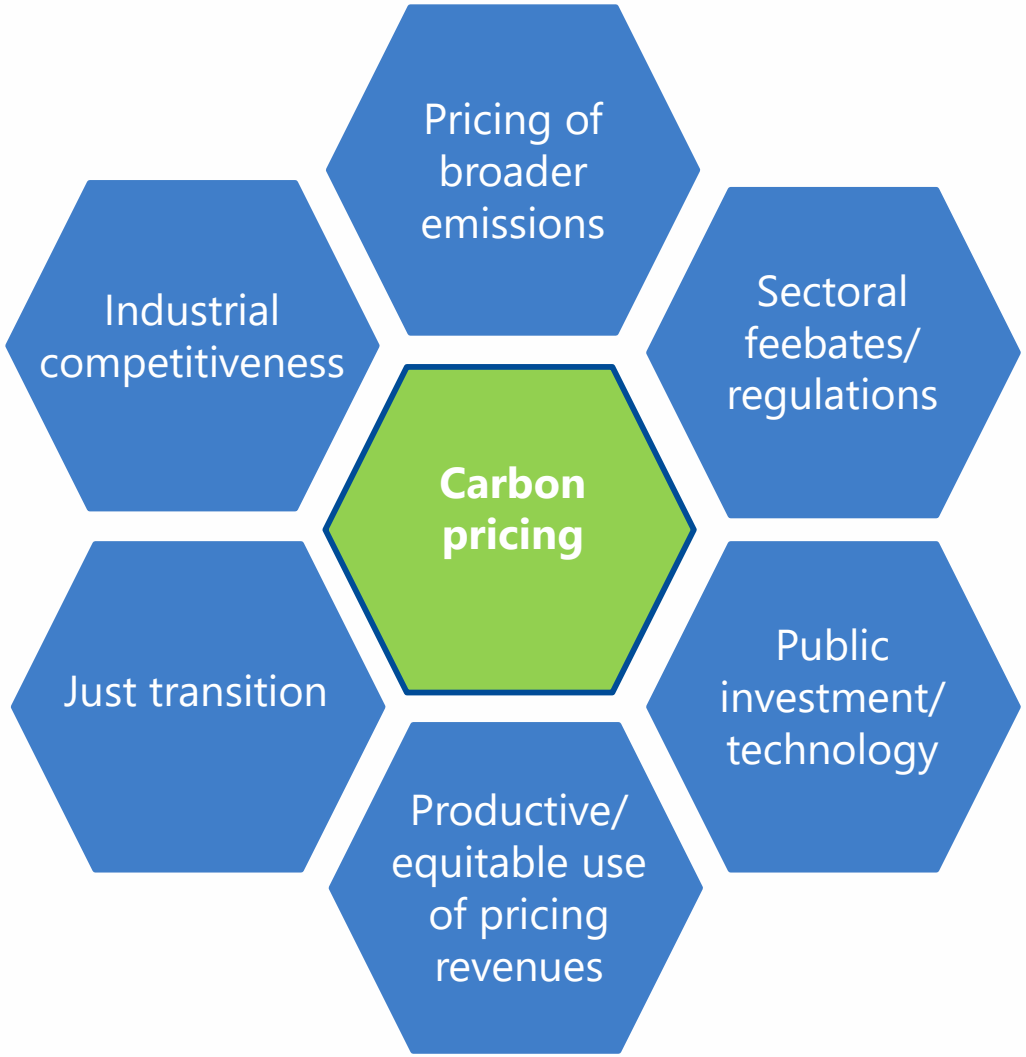
Global Average Carbon Prices across Countries



Source: IMF Staff

Pricing carbon domestically: carbon taxes and ETSs

Supporting Policies Needed to Enhance Effectiveness and Acceptability of Mitigation Strategy



Broad consensus around carbon pricing

Economists' Statement on Carbon Dividends

The Largest Public Statement of Economists in History

SIGNATORIES INCLUDE

3589	4	28	15
U.S. Economists	Former Chairs of the Federal Reserve	Nobel Laureate Economists	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.

Carbon Pricing at Domestic Level

Central role in mitigation policy

- Across-the-board incentives, cost-effective, revenue, co-benefits
- Basic design details critical

Carbon taxes are a natural pricing instrument

- Build off fuel tax collection
- Trading systems similar benefits if they include price floors, allowance auctions
  - Not always practical (e.g., limited capacity or trading markets)

Carbon pricing cuts emissions through many behavioral responses

Behavioral Responses Promoted by Alternative CO2 Mitigation Policies

	Behavioral responses by sector											
	Power generation			Industry			Transport			Buildings		
Policies ↓	fuel switching: coal to gas	shift coal/gas to solar/wind/ hydro[a]	reduce power demand	reduce CO2 intensity (CO2/ output)[b]	reduce electricity intensity (electricty/ output)	reduce output	more efficient gasoline/ diesel vehicles	shift to Evs	reduce km travelled by existing vehicles	reduce CO2 intensity (CO2/sq. ft)	reduce electricity intensity (kwh/sq. ft)	reduce energy demand in existing buildings
Explicit carbon pricing												
Economy-wide	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Power/industry	✓	✓	✓	✓	✓	✓					✓	✓
Transport/buildings							✓	✓	✓	✓		✓
Power generation												
Renewables subsidy		✓										
Coal phaseout	✓	✓*										
CO_2/kWh standard or feebate	✓	✓										
Industry												
CO_2/output standard or feebate				✓								
Transport												
CO_2/km standard or feebate							(✓)	(✓)				
EV sales share target (new vehicles)								(✓)*				
Buildings												
Standards for new buildings (CO2/electricity, energy efficiency)										(✓)	(✓)	
Feebates (energy-consuming capital goods)												(✓)
Fuel taxes												
Coal	✓	(✓)	✓	(✓)	(✓)	(✓)						
Natural gas	x	(✓)	✓	(✓)	(✓)	(✓)				(✓)		(✓)
Road fuels							✓	✓	✓			

Source: IMF staff.

Notes: ✓ and (✓) indicate policy promotes a full, immediate response and a gradual response over time respectively.

Source: IMF staff. Notes: ✓ and (✓) indicate where policy promotes a full and a partial response respectively, * indicates an enhanced response, and × a response in the wrong direction. [a] The analysis assumes capacity for hydroelectric and nuclear power are given (for the former, viable sites have largely been exploited already and for the latter safety concerns, public opposition, and protracted permitting procedures can deter investment). [b] CO2 intensity would be measured in CO2/output for industry or CO2/sq. ft for buildings. Broadly speaking, options include improving the efficiency of processes using fossil fuels, adopting carbon capture technologies, and electrifying processes traditionally using fossil fuels for industry. For buildings, options can include shifting from gas-/oil-based heating and cooking to electric heat pumps and stoves, installing solar panels, insulation, more efficient space heating. [c] For buildings some options include insulation, more efficient appliances and space heating (carbon pricing could increase electricity use on net if it promotes shifting to electric heat pumps). [d] Other vehicles include trucks, domestic aviation and maritime. [e] For buildings the category is reduced energy demand in existing buildings. For example, conserving on the use of lighting, space heating/cooling, higher urban density. For power, the category is reduced power demand, and for transport, the category implies reduced km travelled by existing vehicles. Explicit Carbon Pricing (Carbon Taxes and ETSs).

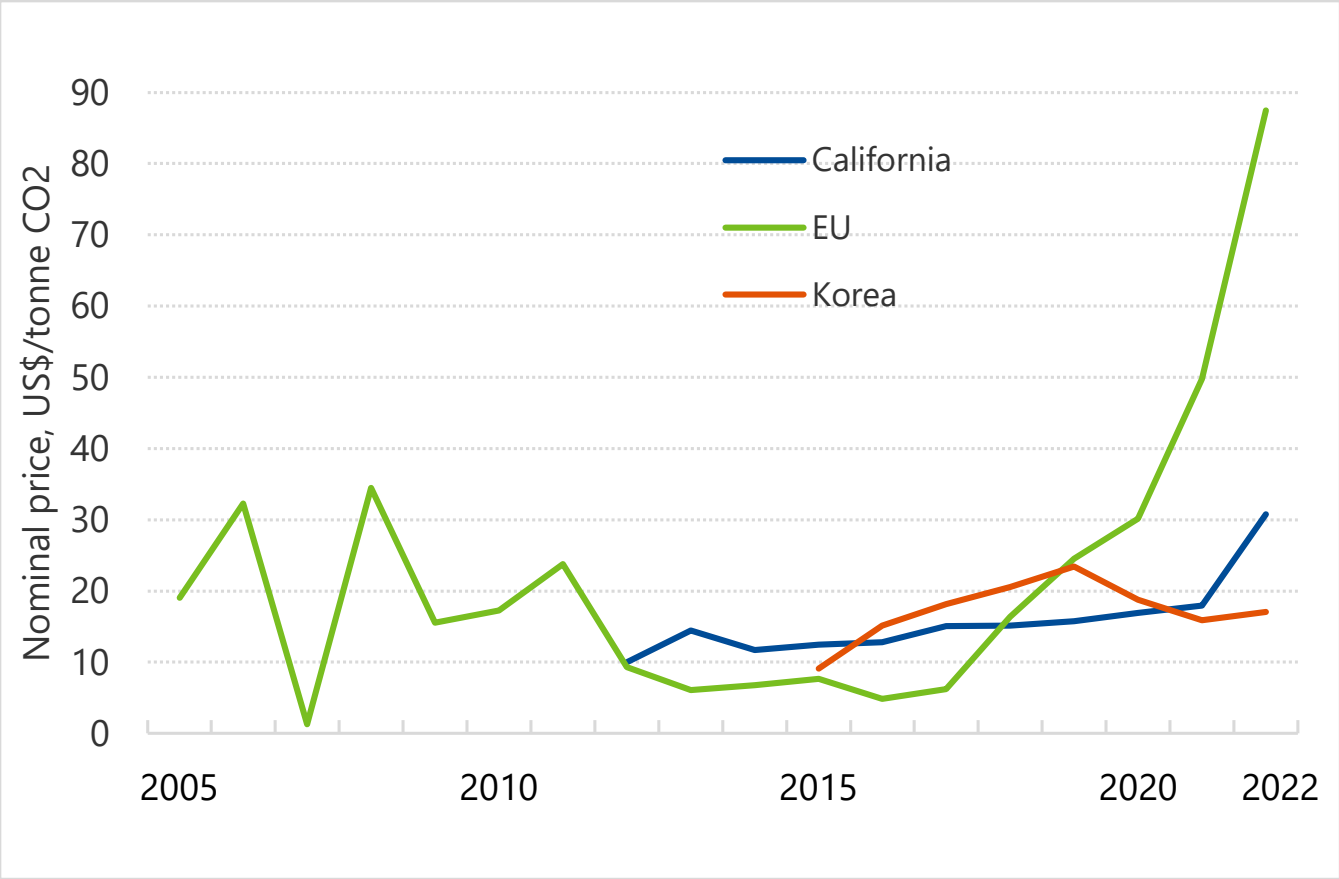
Carbon Taxes vs. Emissions Trading Systems (ETS)

Design issue	Instrument	
	Carbon tax	ETS
Administration	Administration is more straightforward (for example, as extension of fuel taxes)	May not be practical for capacity constrained countries
Uncertainty: price	Price certainty can promote clean technology innovation and adoption	Price volatility can be problematic; price floors, and cap adjustments can limit price volatility
Uncertainty: emissions	Emissions uncertain but tax rate can be periodically adjusted	Certainty over emissions levels
Revenue: efficiency	Revenue usually accrues to finance ministry for general purposes (for example, cutting other taxes, general investment)	Free permit allocation may help with acceptability but lowers revenue; tendency for auctioned revenues to be earmarked
Revenue: distribution	Revenues can be recycled to make overall policy distribution neutral or progressive	Free allowance allocation or earmarking may limit opportunity for desirable distributional outcomes
Political economy	Can be politically challenging to implement new taxes; use of revenues and communications critical	Can be more politically acceptable than taxes, especially under free allocation
Competitiveness	Border carbon adjustment more robust than other measures (for example, threshold exemptions, output-based rebates)	Free allowances effective at modest abatement level; border adjustments (especially export rebate) subject to greater legal uncertainty
Price level and emissions alignment	Need to be estimated and adjusted periodically to align with emissions goals	Alignment of prices with targets is automatic if emissions caps consistent with mitigation goals
Compatibility with other instruments	Compatible with overlapping instruments (emissions decrease more with more policies)	Overlapping instruments reduce emissions price without affecting emissions though caps can be set or adjusted accordingly
Pricing broader GHGs	Amenable to tax or proxy taxes building off business tax regimes; feebate variants are sometimes appropriate (for example, forestry,	Less amenable to ETS; incorporating other sectors through offsets may increase emissions and is not cost effective
Global coordination regimes	Most natural instrument for international carbon price floor	Can comply with international price floor; mutually advantageous trades from linking ETSs but does not meet global emissions requirements

Source. IMF staff.
Note: Green indicates an advantage of the instrument; orange indicates neither an advantage nor disadvantage; red indicates a disadvantage of the instrument.

Uncertainty

Allowance Price Volatility in ETSs



Sources: WBG (2022), https://carboncredits.com/carbon-prices-today, http://data.krx.co.kr/contents/MDC/MDI/mdiLoader/index.cmd?menuId=MDC0201060301

- Emissions certainty helps meet annual target, but price volatility deters investment
- ETSs can be combined with price floors
- ➢ Price floors also improve compatibility with overlapping instruments
- Carbon tax trajectories can be adjusted periodically to stay aligned with emissions targets

Administration

- **Carbon taxes (implemented by MOFs) are easy to administer**
  - *Midstream*: integrate into fuel tax collection
  - *Upstream*: integrated into fiscal regimes for extractives (charges/rebates for imports/exports)
  - Revenues accrue for general purposes

- **ETSs (implemented by environment ministries)**
  - Usually apply downstream to power/industry
  - Requires new capacity for monitoring emissions/trading markets → may not be not viable where limited capacity/too few firms
  - General revenues often limited by free allocation/earmarking

- **ETSs sometimes chosen over taxes for constitutional/legal reasons**
  - E.g., EU, California, Germany, UK

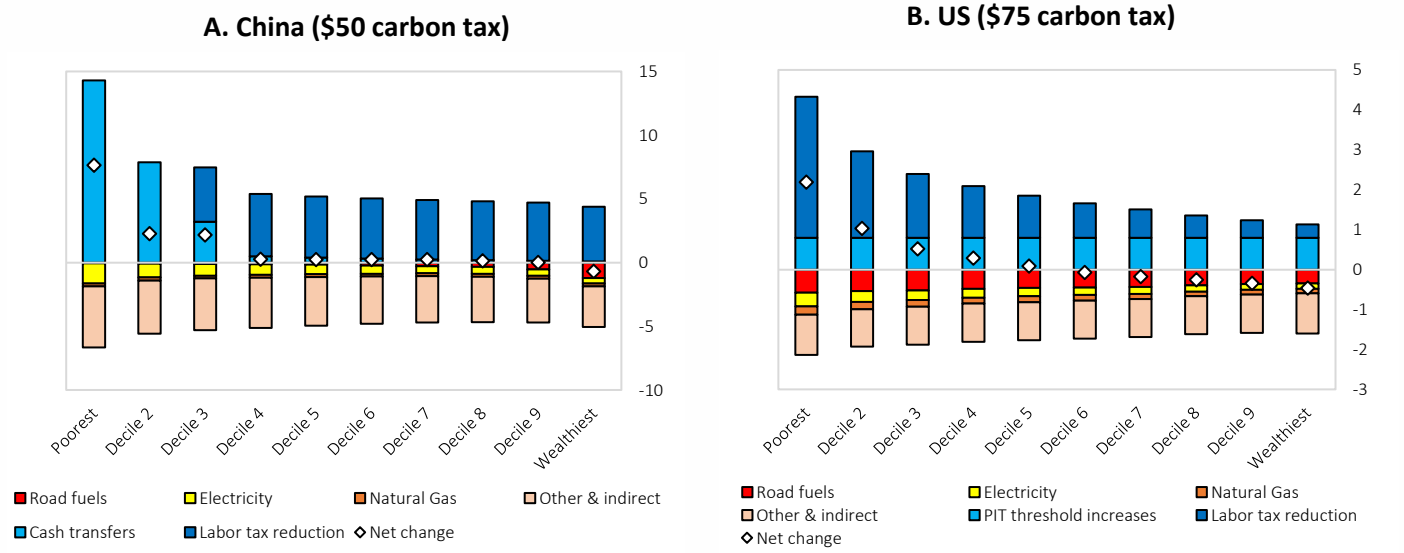
Allocation of Policy Revenues

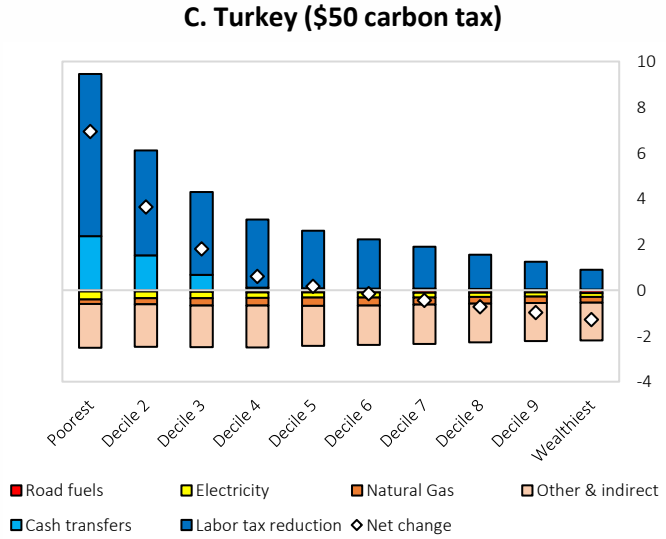
Options for Use of Carbon Tax Revenues

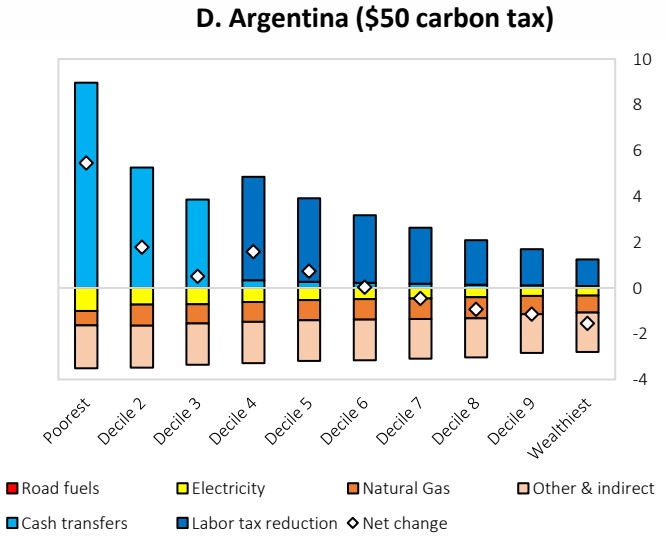
Instrument		Metric			
		Impact on Economic Efficiency	Impacts on Income Distribution	Administrative Burden	Political Feasibility
General Revenue Uses	Public investment	Potentially significant (high fiscal multipliers, especially for low-carbon investments)	Can disproportionately benefit low-income households (e.g., if provides basic education, health, infrastructure), but depends on implementation	Modest; requires strong public investment management	Can be popular, with green investment especially favoured in climate-concerned countries
	Tax reductions	Can improve incentives for work effort and investment and reduce incentives for the black economy and tax evasion	Can be designed to be progressive (e.g. via increases in personal income tax thresholds)	Minimal	Popular with beneficiaries (e.g. households for personal cuts, firms for corproate income tax cuts)
	Deficit reduction	Lowers future tax burdens and macro-financial risk	Depends on country circumstances	Minimal	Does not garner politcal support
Assistance to Households	Universal lump-sum transfers	Forgoes efficiency benefits (e.g., no enhanced incentive for work effort)	Progressive (disproportionately benefits the poor)	New capacity may be needed (but should be manageable)	Mixed, with some households/firms favouring or disliking lump-sum transfers
	Means-tested cash transfers or social assistance	Forgoes efficiency benefits, but typically requires only a small share of revenues	Effective at helping low-income groups if transfers are well targeted or if social safety nets are comprehensive	Low if builds on existing capacity, otherwise significant	Generally popular
	Direct assistance for household energy bills	Forgoes efficiency benefits; reduction in environmental effectiveness depending on design	Provides partial relief for households (but does not help with indirect pricing burden)	Low if builds on existing capacity, otherwise significant	Generally popular

Allocation of Policy Revenues/Rents: Distributional

Household Burdens from Carbon Pricing 2030, % Consumption







- Carbon tax revenues can be recycled to make reform distribution neutral/progressive.
- ETS does not provide the same opportunities if allowances free/auction revenues earmarked

Source. IMF staff using CPAT.
Notes. Burden is the loss in consumer surplus from higher prices less the benefit from recycling revenue in labor tax reductions and cash transfers divided by total consumption. For the US, 50 percent of revenues are used for increasing personal income tax thresholds and 50 percent for a general labor tax reduction (proportionate to pre-policy tax burden). For China, 85 percent of revenues are used for a proportionate reduction in labor taxes (proportionate to pre-policy consumption) and 15 percent for a targeted transfer for the poorest 25 percent of households. For Turkey, 85 percent of revenues are used for labor tax transfers and 15 percent for a targeted transfer for the poorest 25 percent of households. For Argentina, 75 percent of revenues are used for labor tax reductions, and 25 percent for targeted transfers to bottom 30 percent of households. In China and Argentina bottom income deciles do not pay labor income tax.

Pricing carbon internationally: BCAs, ICPFs, and carbon price equivalence policies

Rationale for 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 CO_2 "embodied" in imports (and probably rebating for exports). Provides an alternative to existing EITE industry support mechanisms such as free allowances.

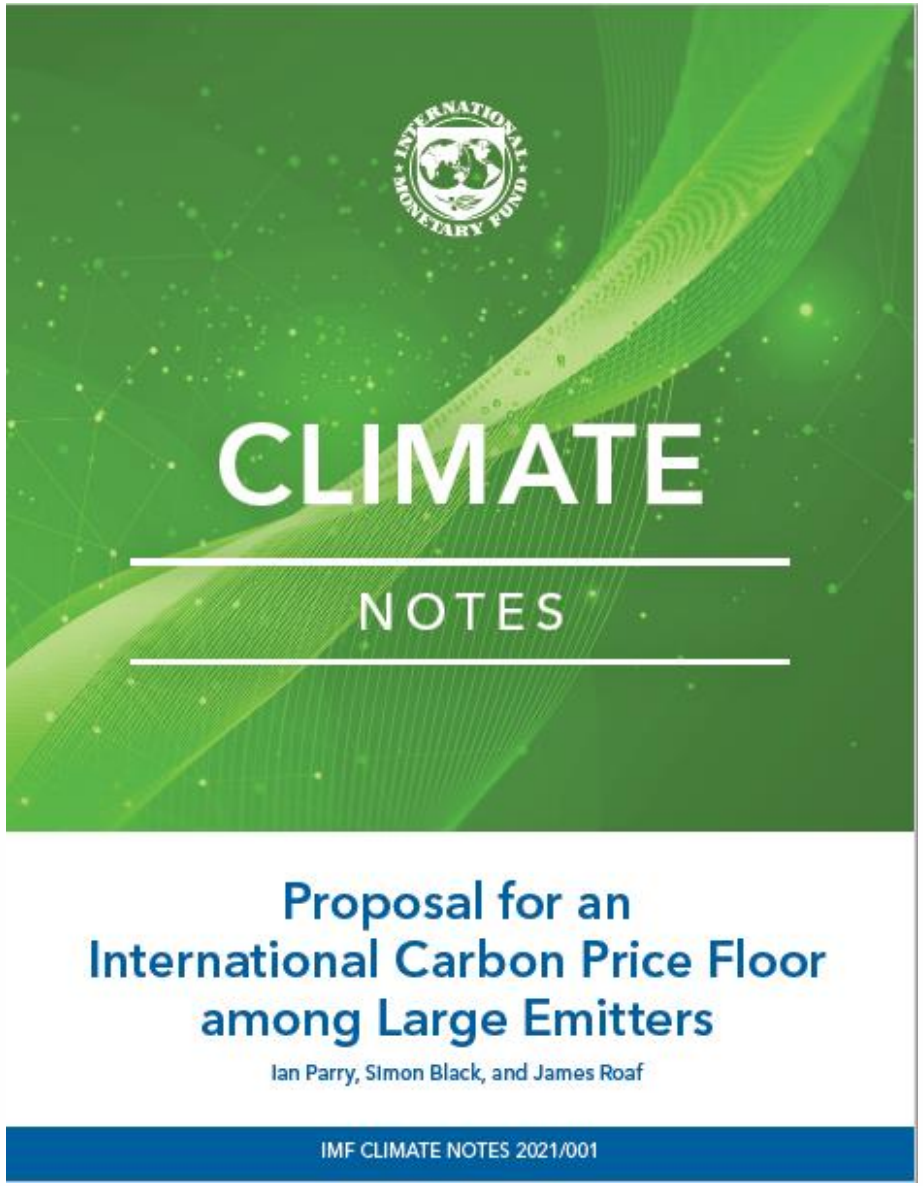
- BCAs may also encourage carbon pricing abroad

- **But international cooperation on carbon pricing is <u>superior to BCAs, notably in cutting global emissions</u>**

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

A Better Way? IMF Staff Proposal for an International Carbon Price Floor



- 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)

IMF Carbon Price Floor proposal – two key elements

1. Focus on key emitters

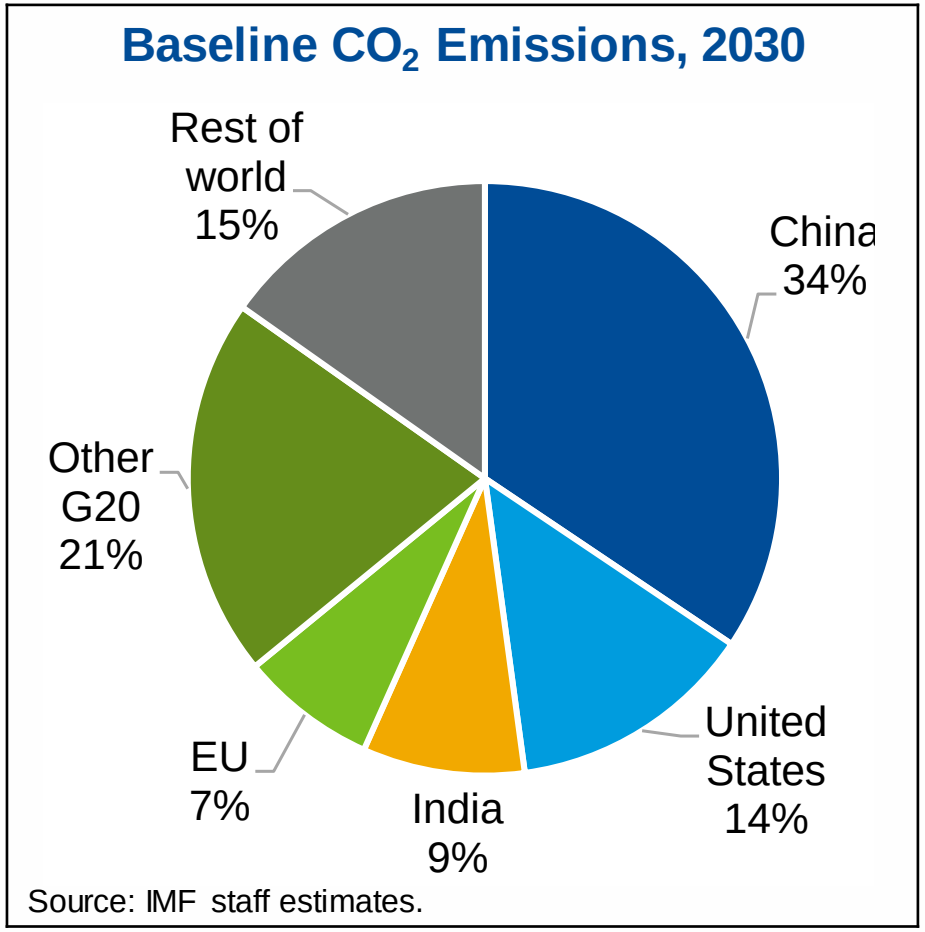
- e.g. China, US, India, EU, Canada, UK

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

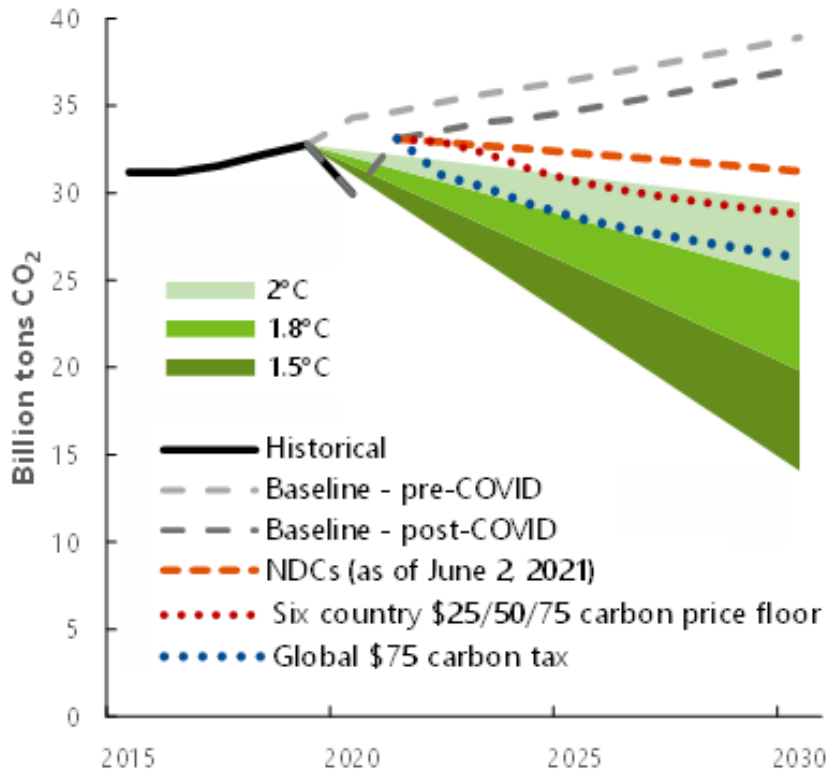
But pragmatic design needed

- *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

Global CO^2 Projections and Pathways for Warming Targets

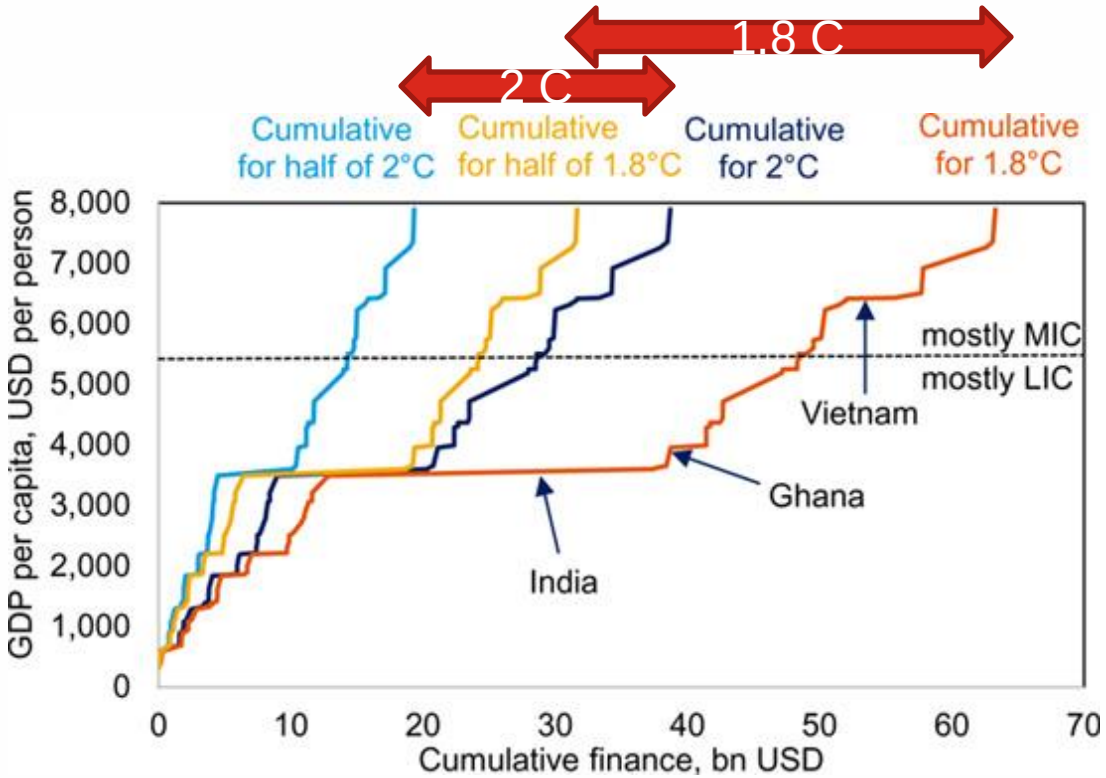


Source: IMF staff estimates using UNEP (2020) & IEA (2020).
Note: $25/50/75 carbon price floor is for China, US, India, EU, Canada, UK - conditional on achieving NDCs. Global $75 carbon tax starts at $15/ton, rising steadily from 2022 to 2030. Pathways assume energy-related national CO_2 emissions are reduced in proportion to total greenhouse gas emissions. COVID = coronavirus; NDCs = nationally determined contributions.

Climate Finance Needed to Compensate MICs and LICs for abatement efforts

Finance needs under equity scenarios

(in $bn)



Sources: IMF staff using CPAT model.

Conclusion

Key messages

- Urgent need to mitigate climate, but **ambition and implementation gaps persist**
  - Options exist to close the gap equitably through e.g. an **international carbon price floor**

- At the global level, abatement costs are equitably distributed and when **including co-benefits costs become negative**
  - Net benefits from climate mitigation especially in developing countries

- Raising climate finance could further ensure that accelerating a global **low-carbon transition is equitable**

Annex

Explicit carbon pricing

Explicit Carbon Pricing Policies, G20 Countries

	Instrument/coverage (April 2022, 2030 prices, US $/ton)[a]
Argentina	Carbon tax for all emissions (5,5)
Canada	Carbon tax/ETS for power, industry, transport, buildings (40, 140)[b]
China	ETS for electricity to be expanded to industry (9, 9)[c]
France	EU ETS for power/industry (87,140), domestic tax for industry/buildings/transport (49,
Germany	EU ETS for power/industry (87,140), domestic ETS for buildings/transport (33,55)
Italy	EU ETS for power/industry(87,140)
Japan	Carbon tax for all emissions (2,2), Subnational ETS schemes
Mexico	Carbon tax for all emissions (0.42-4,0.42-4), [d]ETS for power/industry (4,4), Subnational
South Africa	Carbon tax for all emissions (10, 10)
South Korea	ETS for power/industry/buildings (19, 19)
UK	ETS for power/industry (99,130), domestic tax for power (24,24)
US	Subnational ETS schemes

Sources: WBG (2022), IMF staff, and national sources.

Notes. [a]Where prices, or caps in ETSs, are not specified in legislation for 2030 they are based on 2022 prices or, as in Germany, the last available year where a price is specified. For the EU ETS, the 2030 price is an estimate based on CPAT. [b]For some provinces and territories industry is covered by a tradable emission rate standard rather than carbon pricing. [c]China's ETS takes the form of a tradable emission rate standard. [d]Mexico's carbon price on additional CO2 emission content compared to natural gas.

Power sector policies & targets

Sector-Specific Targets and Policies for Power, G20 Countries

	Renewables							Coal	
	Generation shares, %		Regulatory and fiscal policies					Generation shares, %	
	2021	Future target (year)	Feed in tariff	Renewable portfolio standard	Tradable renewable energy credits	Net-metering	Investment or production tax credits	2021	Future target (year)
Argentina	27	20 (2025)[a]	●	●		●	●	1	
Australia	20	68 (2030)	○	●	●	○		51	
Brazil	83	[b]				●	●	5	
Canada	68	90 (2030)	○	○	●	○	●	4	0 (2030)
China	28	80 (2060)	●	●			●	56	
France	22	40 (2030)[c]	●		●		●	1	0 (2022)
Germany	41	80 (2030)	●		●		●	17	0 (2030)
India	22	50 (2030)	○	●	●	○	●	64	
Indonesia	17	48 (2030)	●	●			●	51	30 (2025)[f]
Italy	41	55 (2030)	●			●	●	5	0 (2025)
Japan	21	36-38 (2030)	●		●			36	19 (2030)
Mexico	18	35 (2024)				●	●	5	
Russia	18	20 (2020)	●					9	
Saudi Arabia	0	50(2030)				●		0	
South Africa	6	41(2030)		●				87	
South Korea	5	30 (2030)		●	●	●	●	30	0 (2050)
Turkey	44	60(2030)[d]	●			●		19	
UK	39	100 (2035)	○	●	●			2	0 (2024)
US	19	28(2030)[d]	○	○	○	○	●,○	12	

Sources: REN21(2021); Government websites; and IMF staff estimates.

Notes: [a]Argentina's target excludes large hydro, which is included in its generation share. [b]Brazil's latest NDC no longer includes a renewable target. [c]EU wide target. [d]Inferred from numeric targets. ●= national. ○=subnational.

Sector-Specific Targets and Policies for Transport, G20 Countries

Transport policies & targets

	CO2/km		% EVs in vehicle sales		
	2020	Target (year)	2021	Target (year)	Additional incentives in registration fees (in US$)
Argentina					
Australia			1	30 (2030)	EV luxury car tax threshold at $56,800 compared with ICE threshold of $49,370.
Brazil	125	119 (2022)	<1		
Canada	123	100 (2026)	4	100 (2035)	Feebate: $4,000 subsidy for EVs, taxes on ICEVs rising to $3,200.
China	116	72 (2030)	6	100 (2035)	Feebate: $4,000 subsidy for EVs, taxes on ICEVs risng to 40% of base prices. 10% sales tax exemption for EVs.
France	100	61 (2030)	11	100 (2030)[a]	Feebate: $7,000 subsidy for EVs, taxes on ICEs rising to $12,000.
Germany	100	61 (2030)	14	100 (2030)[a]	Feebate: $7,000 subsidy for EVs, taxes on ICEVs rising to $5,000.
India	114	112 (2022)	<1	30 (2030)[b]	Subsidy up to $137/kWh for EVs <$20,455, general sales tax reduced 28% to 5%.
Indonesia			<1	numeric (2025)[c]	EV luxury tax exemption.
Italy	100	61 (2030)	4	100 (2030)[a]	Feebate: $4,600 subsidy for EVs, taxes on ICEs rising to $3,000.
Japan	106	92 (2030)	<1	100(2035)	Feebate: $7,000 subsidy for EVs, rising environmental performance tax on ICEVs.
Mexico	114	85 (2025)	<1	n/a[e]	
Russia				production (2030)[f]	5% purchase price subsidy on Russian-made EV up to maximum of $8,570.
Saudi Arabia				30 (2030)	
South Africa	138	n/a	<1		
South Korea	98	84 (2030)	3	numeric (2025)[d]	EV subsidy up to $17,000; excise tax reduction up to $2,700; acquisition tax reduction up to $1,200.
Turkey				numeric (2030)[g]	Special consumption tax reduced from 45%-160% to 10%- 60% for ZEVs.
UK	100	61 (2030)	11	100 (2030)	Feebate: $2,000 EV subsidy, taxes on ICEs rising to $3,870.
US	123	100 (2026)	2	50 (2030)	$7,500 producer subsidy for EVs (for first 20,000 vehicles sold).

Sources: IEA (2021b); ICCT (2017); Government websites

Notes: [a]EU wide target. [b]Target is for private cars. Target for commercial vehicles=70%, buses=40%, two and three-wheeler sales=80%. [c]Target of 2 million EVs in the passenger vehicle stock by 2025. [d]Target of 1.13 million EVs in the passenger vehicle stock by 2025. [e]No federal target but Jalisco, Mexico committed to 100(2030). [f]Annual EV production target of 220,000 units by 2030. [g]Target of 1 million EVs in the vehicle stock by 2030.

Sector-Specific Targets and Policies for Buildings, G20 Countries

Buildings policies & targets

	Targets	Policies					
	Target	Building Energy Codes for all Building Types	Retrofitting Incentives	Building Certification	Clean fuel requirements	Performance standards for household appliances	Appliance Labelling Scheme
Argentina				●[v]		●	●
Australia		●		●[m,v]		●	●
Brazil				●[v]		●	●
Canada	All new buildings net zero emissions by 2030.	●	●	●[v]		●	●
China	Green buildings to account for 50% of new urban buildings.	●	●	●[m,v]		●	●
France	Reduce building sector emissions 44% below 2020 emisisons by 2030; EU legislation requires all new buildings to be nearly zero energy.	●	●	●[m,v]	●	●	●
Germany	Reduce building sector emissions 43% below 2020 emisisons by 2030; EU legislation requires all new buildings to be nearly zero energy.	●	●	●[m,v]	●	●	●
India	Reduce energy use for new commercial buildings 50% by 2030.			●[v]		●	●
Indonesia	Reduce energy intensity ≥ 1% per year till 2025.*			●[v]		●	●
Italy	Reduce building sector emissions 25% below 2020 emisisons by 2030; EU legislation requires all new buildings to be nearly zero energy.	●	●	●[m,v]	●	●	●
Japan	Reduce building sector CO_2 emissions 66% below 2013 levels by 2030. All new houses net zero emissions by 2030.	●		●[m,v]		●	●
Korea	All new buildings net zero emissions by 2030.	●	●	●[v]		●	●
Mexico	Reduce energy consumption for all buildings 3.7% a year 2031-2050.	●	●	●[v]		●	●*
Russia		●	●	●[m,v]			●
Saudi Arabia		●	●	●[v]		●	●
South Africa	All new buildings net zero emissions by 2030.	●	●	●[m,v]		●	●
South Korea	All new buildings net zero emissions by 2030.	●	●	●[v]		●	●
Turkey		●	●	●[v]		●	●
UK	Reduce CO2 emisisons for all new buildings 75-80% by 2030.	●	●	●[m,v]	●	●	●
US	All new buildings net zero emissions by 2030.	●		●[m,v]		●	●

Sources: Climate Transparency (2021); IEA (2020); Government Websites

Notes: ●= national policy.●[v]=widely voluntary. ●[m,v]= Partially mandatory, widely voluntary.

Industrial policies & targets

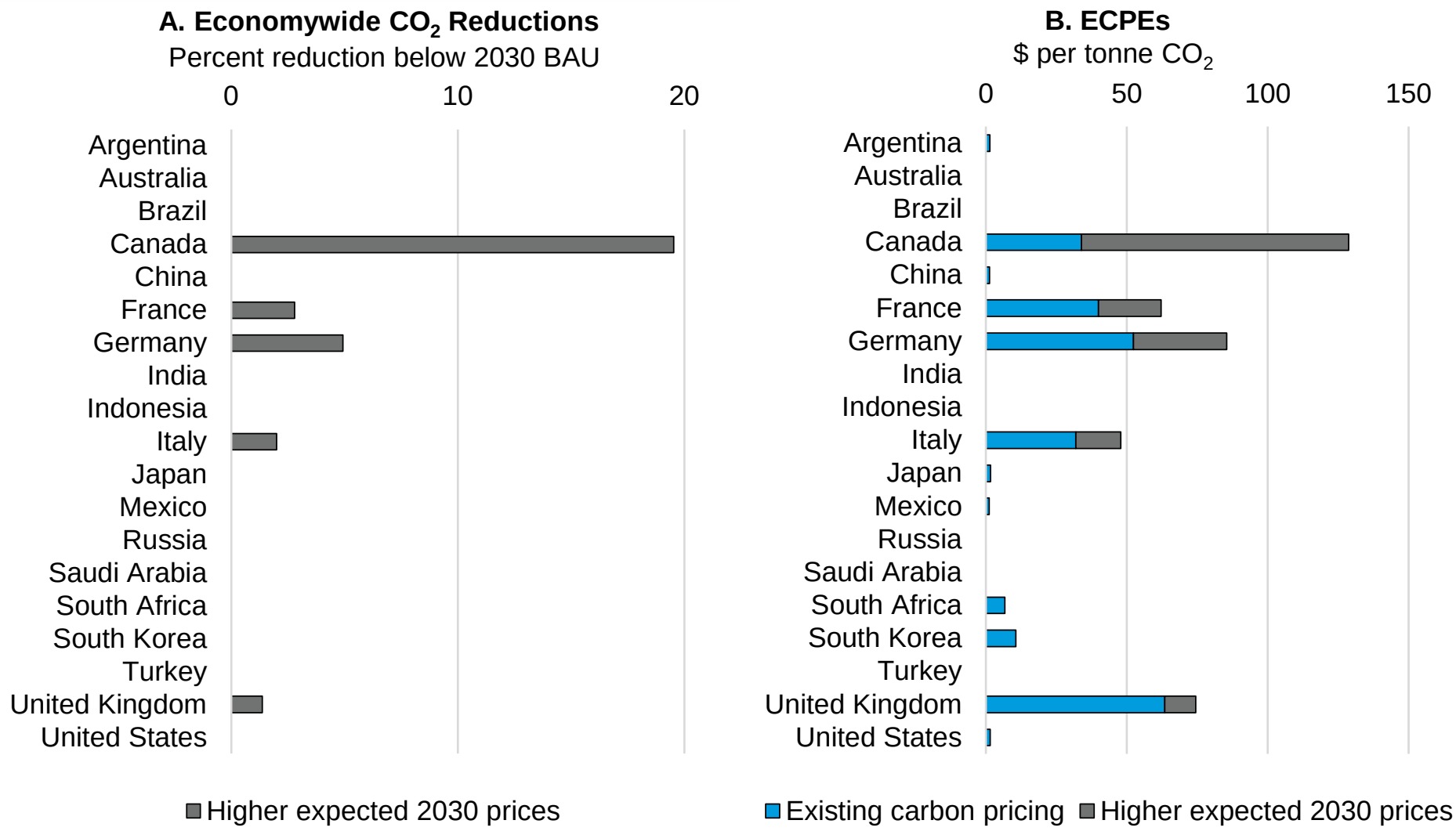
Sector-Specific Targets and Policies for Industrial Sectors, G20 Countries

	Target
Australia	Reduce the energy intensity of industry 30 percent between 2015 and 2030.
China	Peak aluminium and steel CO_2 emissions by 2025, and reduce them 40 and 30 percent, respectively from that peak by 2040.
France	Reduce (all GHG) emissions from industry 37 percent by 2030 relative to 2019.
Germany	Reduce CO_2 emissions 49-51 percent below 1990 levels by 2030
Japan	Reduce CO_2 emissions 38% below 2013 levels by 2030
South Africa	Reduce energy consumption of manufacturing 16 percent below 2015 levels by 2030.
Turkey	Reduce energy intensity by at least 10 percent in each sub-sector by 2023 (2011 baseline)
UK	Reduce CO_2 emisisons 67 percent below 2018 levels by 2035.

Sources: Climate Transparency; Climate Action Tracker: IEA; Government Websites.

Results – Explicit Carbon Pricing

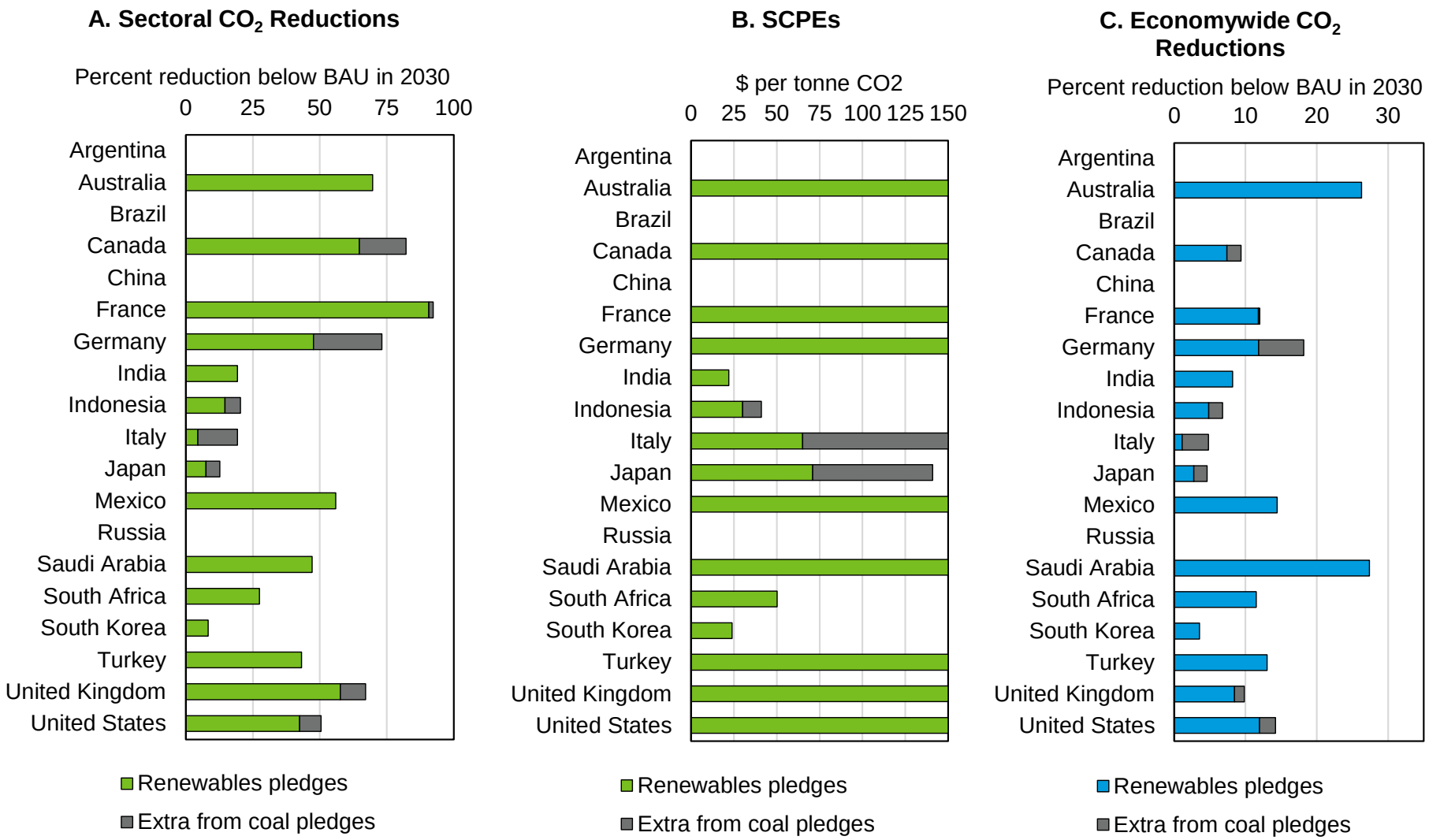
CO2 Reductions and Carbon Price Equivalence of Explicit Carbon Pricing, 2030



Source: IMF staff using CPAT

Results – Power Sector

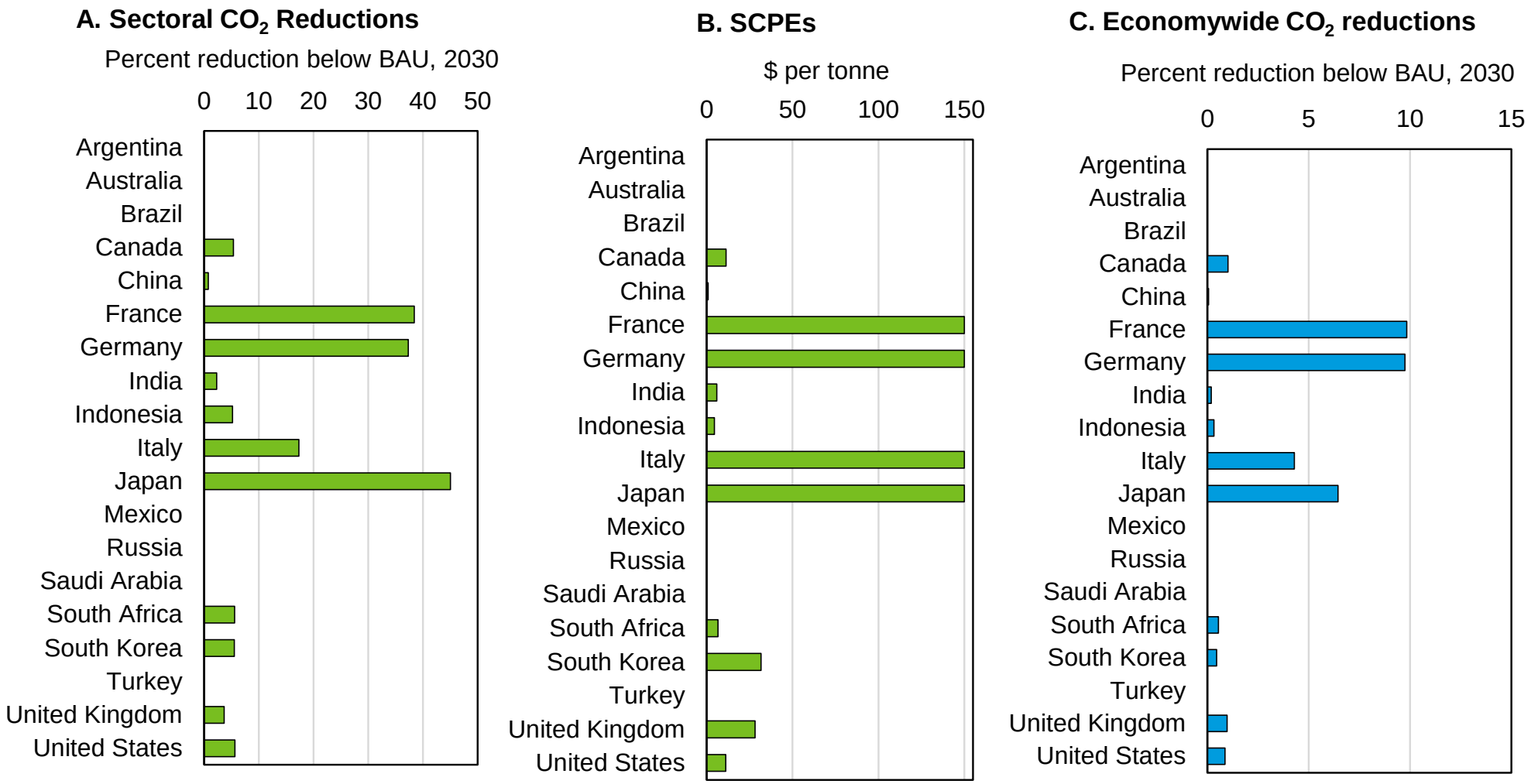
CO2 Reductions and Carbon Price Equivalence of Power Sector Targets, 2030



Source: IMF staff using CPAT

Results – Buildings Sector

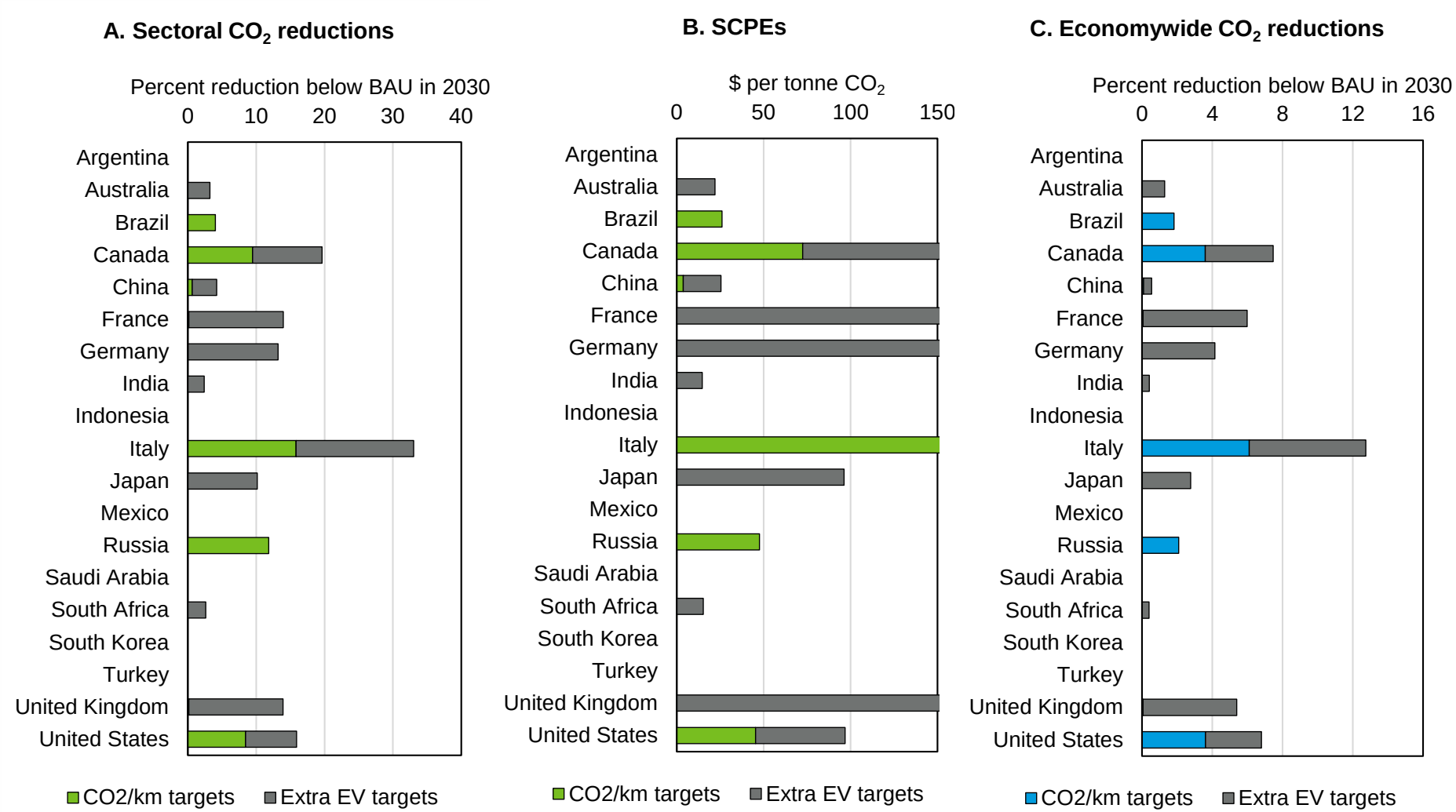
CO2 Reductions and Carbon Price Equivalence of Buildings Sector Targets, 2030



Source: IMF staff using CPAT

Results – Transport Sector Targets

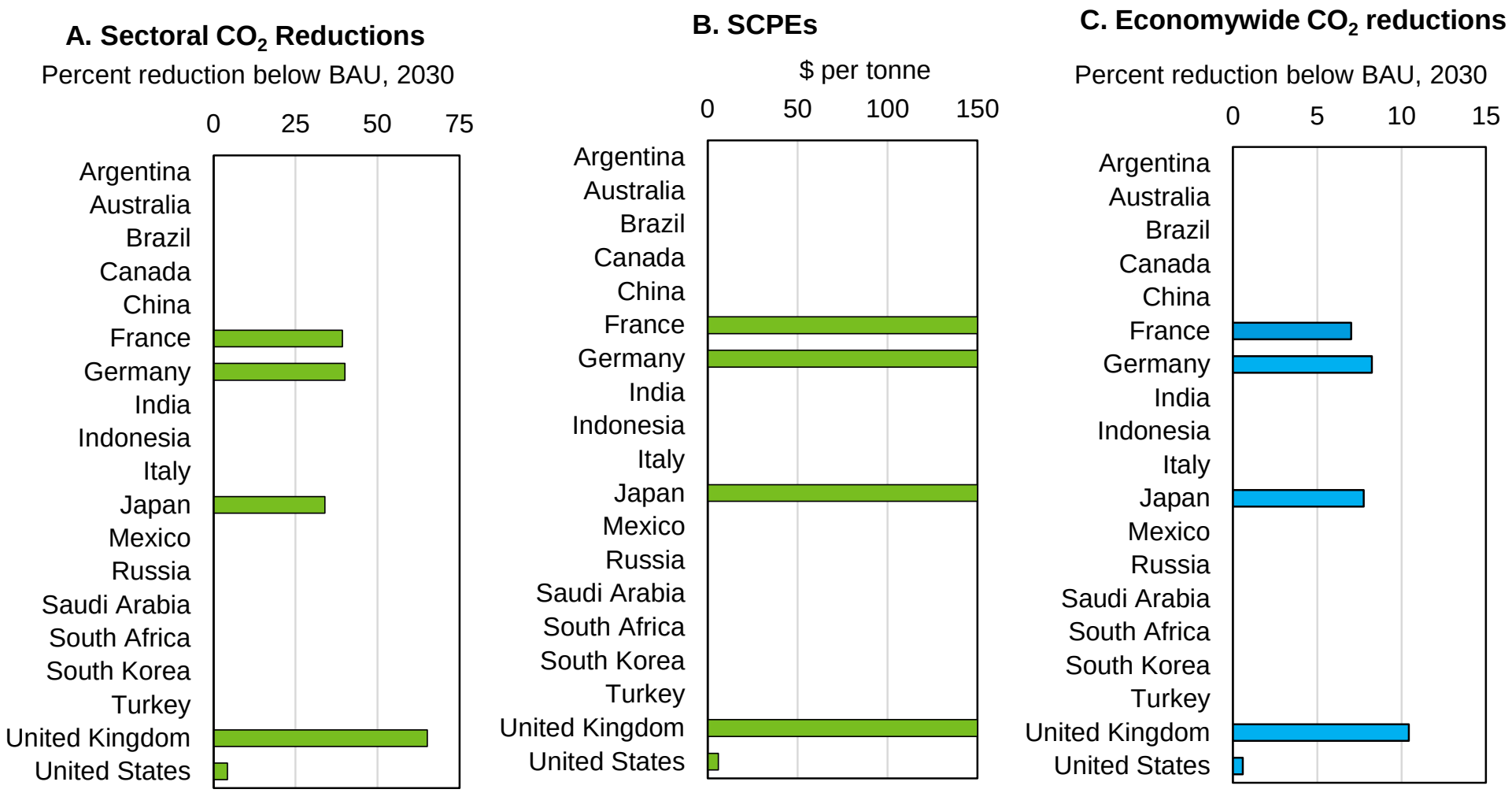
CO2 Reductions and Carbon Price Equivalence of Transport Sector Targets, 2030



Source: IMF staff using CPAT

Results – Industry

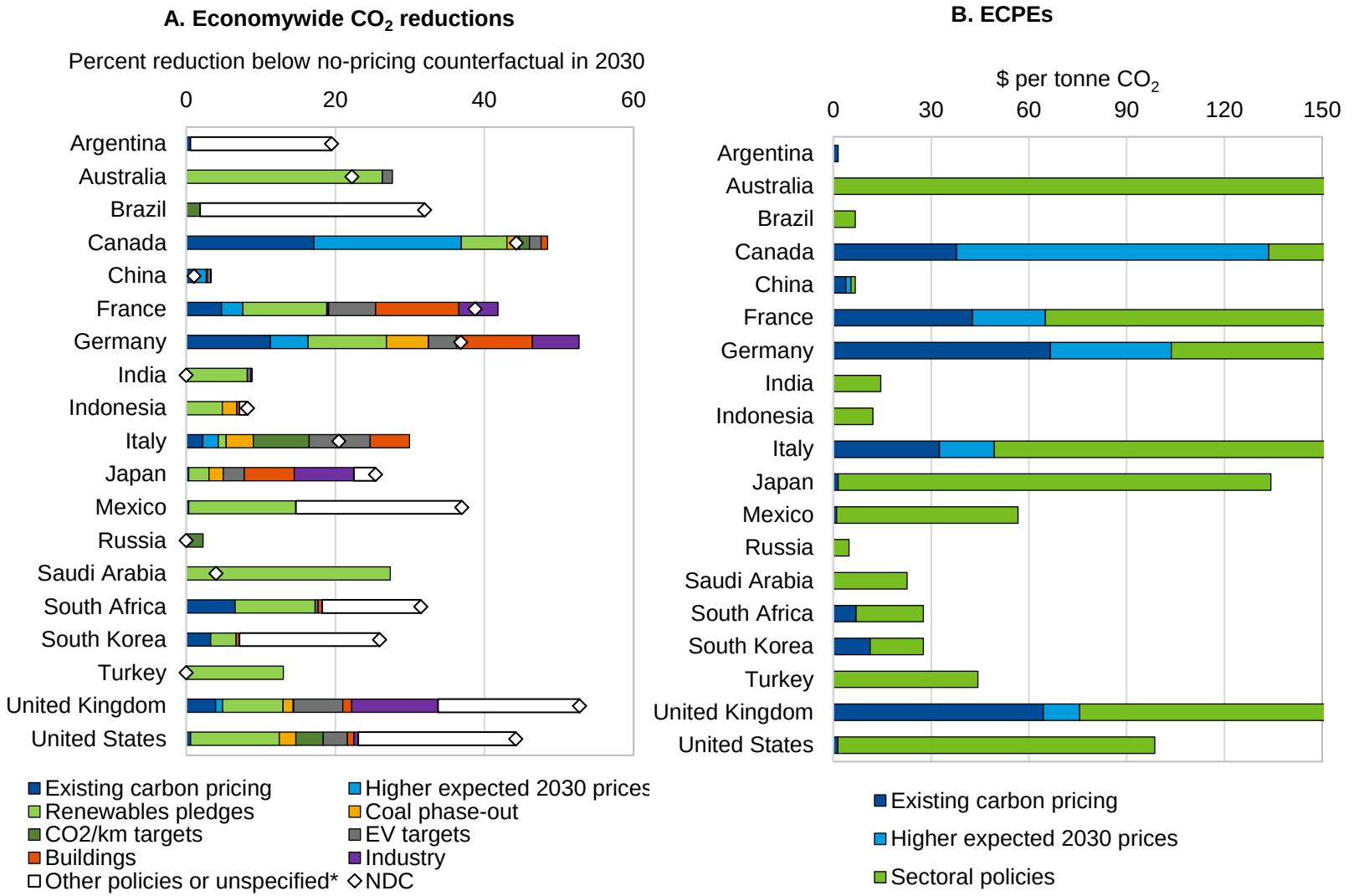
CO2 Reductions and Carbon Price Equivalence of Industrial Sector Targets, 2030



Source: IMF staff using CPAT

Key Results – Combined Quantifiable Effects of Multiple Policies/Targets in Multiple Sectors in G20

CO2 Reductions and Economywide Carbon Price Equivalence of All Sectoral Policies/Targets Targets, 2030



Source: IMF staff using CPAT

What about existing excise and energy taxes?

Excise Taxes by Fuel and Sector in 2020, G20 Countries

(expressed in dollars per ton CO_2)[a]

	power			industry			transportation[b]		buildings[c]	
	coal	natural gas	oil	coal	natural gas	oil	gasoline	diesel	natural gas	oil
Argentina	0	-31	19	5	0	33	105	45	-41	1
Australia	0	0	79	6	24	96	157	99	-54	68
Brazil	5	106	20	42	106	23	149	42	203	65
Canada	5	-34	14	5	-45	90	157	83	-9	97
China	3	70	6	4	70	35	168	65	-24	49
France	-7	113	79	29	111	192	377	262	93	208
Germany	14	-22	31	-3	-18	167	364	218	-60	213
India	4	-99	101	4	-99	50	232	130	0	-2
Indonesia	0	33	-7	0	11	-10	38	-11	-65	-93
Italy	-11	-51	7	16	-3	191	396	278	-120	201
Japan	0	-25	21	3	80	98	270	148	218	178
Korea	0	39	12	24	78	92	296	175	-43	108
Mexico	0	-16	8	1	0	44	112	103	-71	18
Russia	0	-34	2	0	-33	2	49	5	-158	-25
S. Arabia	0	-68	-13	0	-68	-26	-46	-159	0	-88
S. Africa	0	79	90	0	79	107	204	101	0	75
Turkey	0	20	0	5	14	43	219	74	-133	111
UK	20	-35	53	37	73	176	341	285	-103	93
US	0	0	10	0	0	39	71	46	-19	33
weighted average[d]	**2**	**19**	**20**	**5**	**25**	**47**	**158**	**74**	**-18**	**44**

Source: IMF staff using CPAT

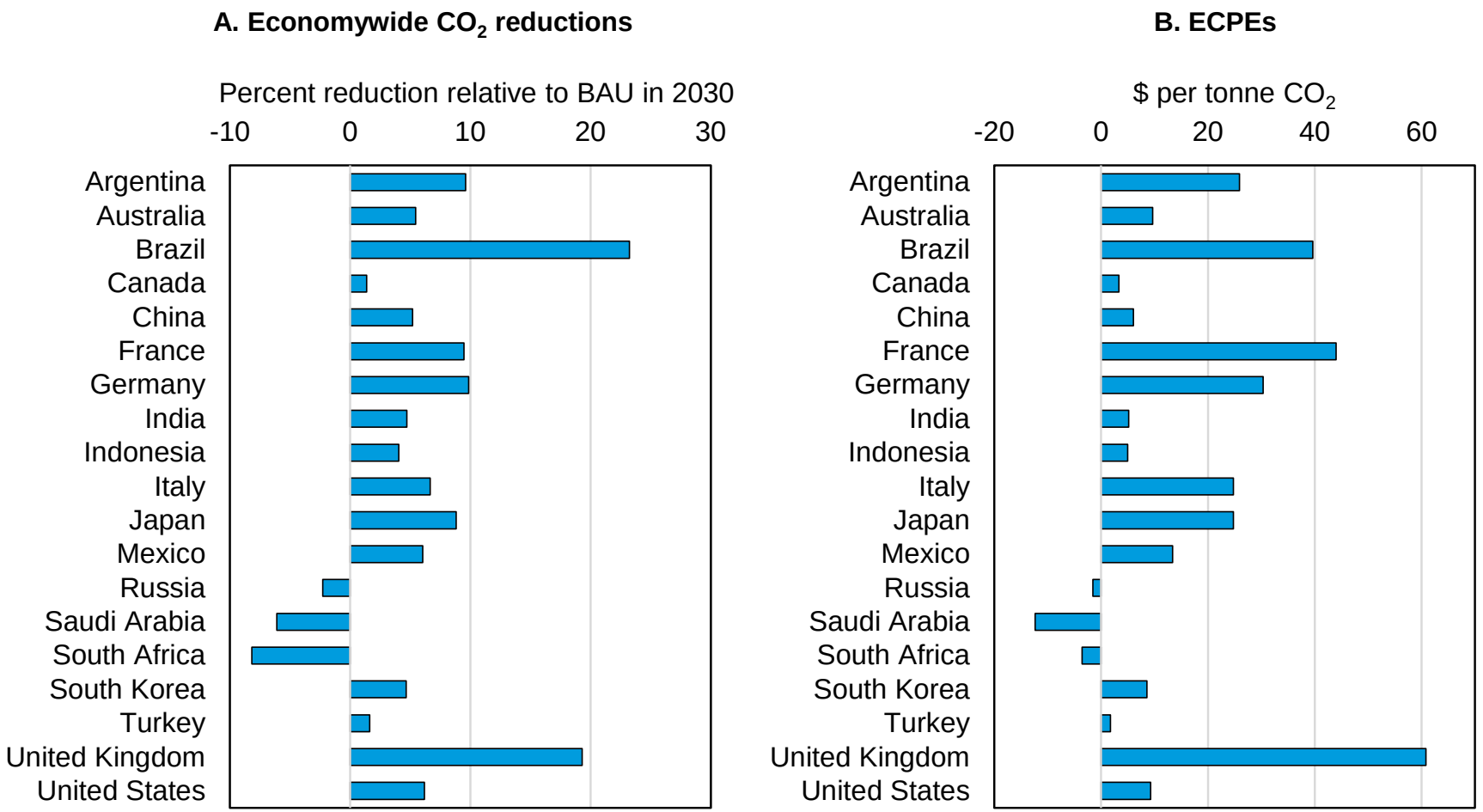
Existing excise and energy taxes

CO_2 Reductions and Economywide Carbon Price Equivalence of Existing Energy Taxes and Subsidies

Q. But do these 'count'?

A. Debatable:

- *Existing fuel taxes and subsidies in place for non-climate reasons*
- *There are multiple non-climate externalities that warrant internalizing e.g. road accidents, congestion*



Source: IMF staff using CPAT