

Climate-related policies and commitments

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Climate macroeconomics & finance 2024/25 - Lecture 4

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Outline of today's lecture

- What are current societal objectives?
 - The Paris Agreement and the NDCs
 - The net-zero race
- Rationale for environmental policy
 - Market failures and externalities
 - Pigouvian taxation
- Market-based policies
 - Carbon pricing: taxes and ETS
 - State of carbon pricing initiatives
 - Potential issues and remedies
 - Environmental subsidies
 - Fossil subsidy phase-out
 - Policy acceptability and uncertainty
- Focus on EU
 - European policy strategy
 - EU ETS

Climate-related policy objectives

UNFCCC and COPs

- The United Nations Framework Convention on Climate Change ([UNFCCC](#))
 - Signed in 1992, effective from 1994
 - Aim: ‘achieve stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system’
- Annual Conference of the Parties (COP)
 - The pioneer: Kyoto Protocol ([COP3](#), 1997)
 - The disappointment: Copenhagen conference ([COP15](#), 2009)
 - The comeback: Paris Agreement ([COP21](#), 2015)
 - Latest: Dubai, UAE ([COP28](#): December 2023)
 - Next: Baku, Azerbaijan ([COP29](#): November 2024)

Paris Agreement (COP21)

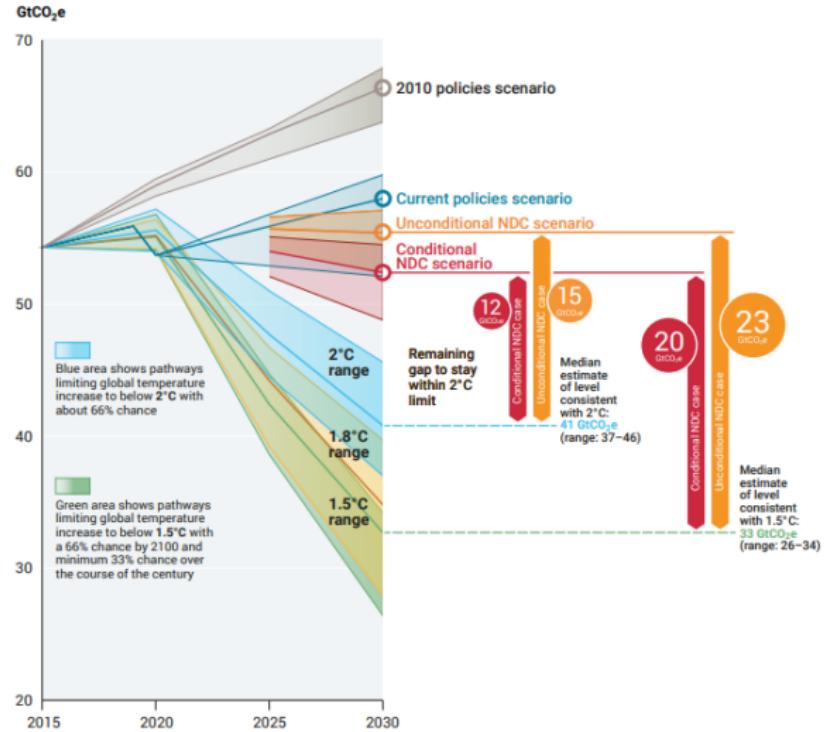
- Paris Agreement ([text](#)) objectives set in art.2:
 - Hold increase in global average temperature to well below 2°C above pre-industrial levels; pursue efforts to limit temperature increase to 1.5°C
 - Increase ability to adapt to adverse impacts of climate change; foster climate resilience and low GHG emissions development, without threatening food production
 - Make finance flows consistent with a pathway towards low GHG emissions and climate-resilient development



Nationally Determined Contributions

- Decentralised approach
 - No global agreement (eg. Kyoto Protocol)
 - Each country sets its own objectives: Nationally Determined Contributions (NDCs) by 2020 ([NDC registry](#); [NDC Explorer](#))
 - Collective progress assessed through a Global Stocktake ([1st Stocktake](#) just conducted: [see outcomes](#))
 - Every 5 years: report on actions → more ambitious NDCs
 - Conditional vs unconditional NDCs (e.g. access to financial resources)
- Current NDC objectives:
 - [EU](#): -55% GHG emissions by 2030 w.r.t. 1990
 - [China](#): -65% CO₂ per unit of GDP by 2030 w.r.t. 2005
 - [India](#): -45% emission intensity by 2030 w.r.t 2005
 - [US](#): -50/52% GHG emissions by 2030 w.r.t 2005

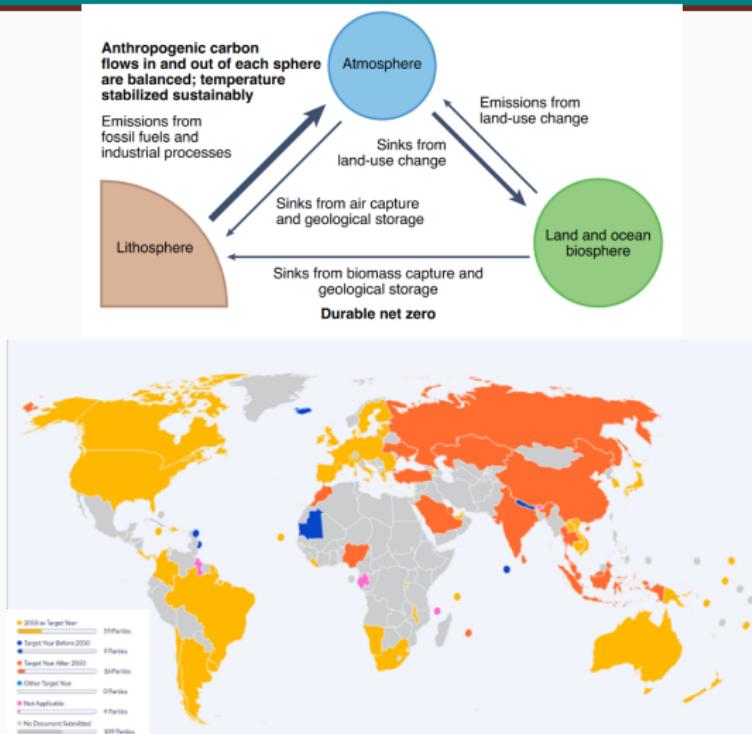
Are NDCs enough? No.



The emission gap. Source: UNEP 2022

Net zero targets

- Net-zero concept
 - Emissions less sequestration
- Recent explosion of net-zero target/pledges
 - In law, policy doc, pledges
 - Countries, regions, cities, companies..



Above: the net-zero balance ([Fankhauser et al. 2022](#)).
Below: net-zero pledges by target year ([Climate Watch](#))

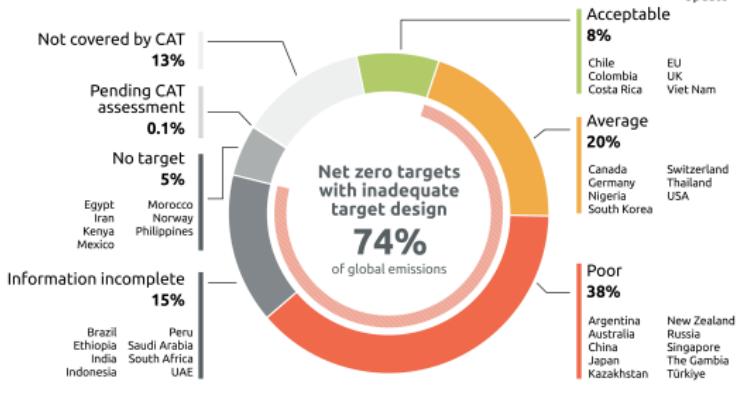
How credible are net-zero targets?

Good practice for ten key elements of national net zero target setting				
Scope	Target year	Emissions coverage	International aviation and shipping	Reductions or removals outside of own borders
	Checkmark All sectors and gases covered	Checkmark The net zero target fully covers emissions from international aviation and shipping	Checkmark Reaching net zero within own borders	
Architecture	Legal status	Separate reduction & removal targets	Review process	
	Checkmark Legally binding target	Checkmark Separate targets for emission reductions and removals	Checkmark Legally binding review of target and progress against it at regular intervals	
Transparency	Carbon dioxide removal	Comprehensive planning	Clarity on Fairness of target	
	Checkmark Transparent & scientifically robust assumptions on LULUCF and carbon removals & storage	Checkmark Transparent and scientifically robust assumptions on LULUCF and carbon removals & storage	Checkmark Clear statement on why the target is fair	

Net zero target design - mostly inadequate to date

Quality of net zero targets by percentage of global emissions evaluated using the CAT's design blueprint for transparent, comprehensive and robust national net zero targets

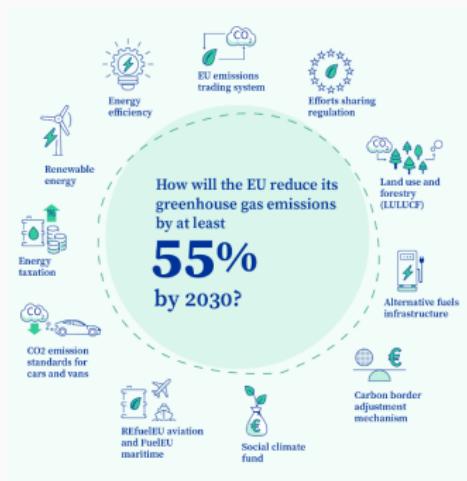
Climate Action Tracker
Nov 2022 Update



Source: Climate Action Tracker

The European objectives

- Overarching strategy: the European Green Deal
 - Broad strategy outlined in 2019 ([text](#))
- European Climate Law (2021)
 - Legally binding targets ([text](#))
 - Climate neutrality by 2050
 - 55% reduction of net GHG emissions by 2030, as compared to 1990
- Fit-for-55 strategy includes
 - 32%→42.5% [renewable energy](#) in electricity by 2030
 - 100% CO₂ reduction for new cars and vans by 2035 ([text](#))



The Fit for 55 proposals. Source: European Council

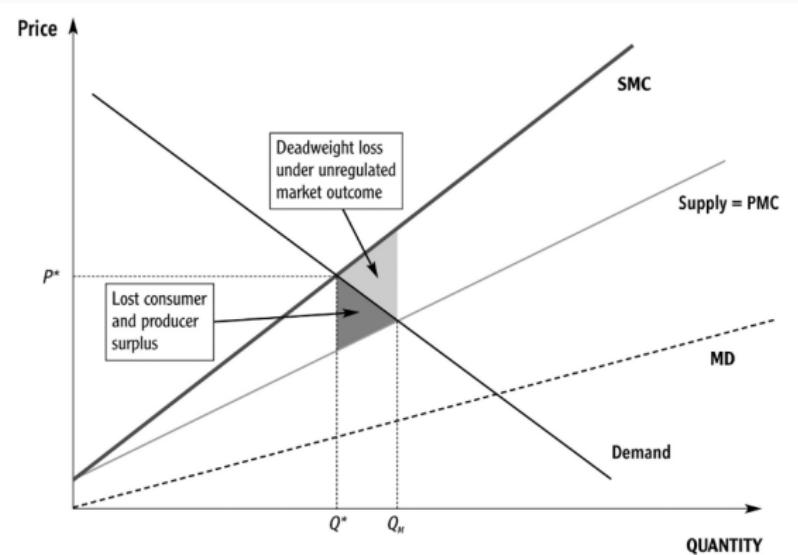
Environmental policy-making

Market failures

- Concept of 'market failure'
 - A situation in which market dynamics does not lead to efficient outcome → policies required
 - Climate change as 'the greatest and widest-ranging market failure ever seen' (N. Stern)
- Market failures can be created by:
 - Externalities: (uncompensated) cost created by an agent and affecting another agent (e.g. smoke, noise, pollution, etc.)
 - Public goods: private provision of public goods inefficiently low
 - Open-access resources: tragedy of the commons

Externalities lead to inefficiencies

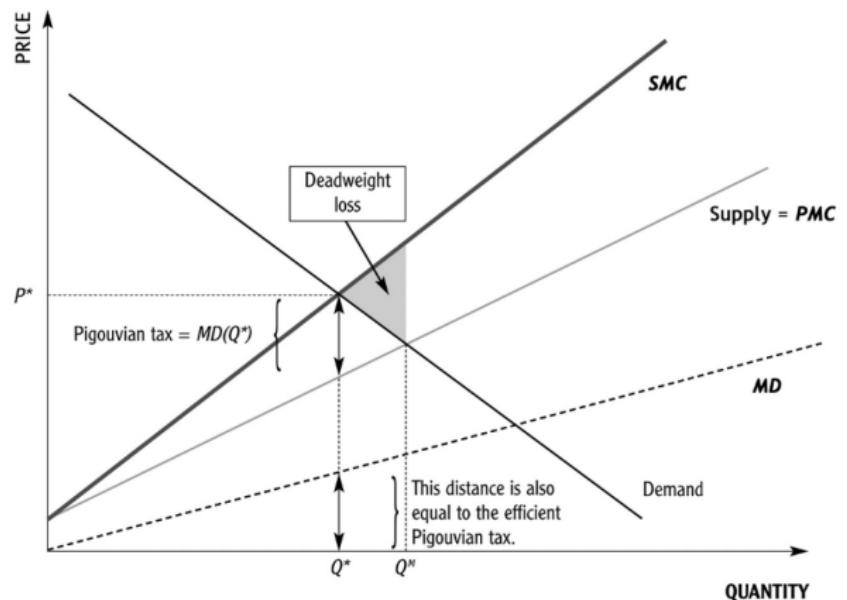
- Equilibrium where demand=supply (= private marginal cost)
- Negative externalities lead to overpollution



Market with a negative externality (assuming pollution=production). Source:
Keohane and Olmstead (2016)

The economist solution: put a price in!

- Internalise the externality setting a price = marginal damage in equilibrium



The efficient (Pigouvian) tax. Source: Keohane and Olmstead (2016)

Overview of market-based climate policies

- General idea:
 - Individuals and firms respond to prices
 - → Use price incentives to modify (not force) behaviour
- Three main policy strategies
 - Introduce a price on the carbon content of goods and services
 - Introduce a subsidy to support production/consumption of clean goods
 - Remove subsidies for fossil fuels

Why carbon pricing?

- Shifts incentives away from carbon-intensive goods
 - Internalises externalities for all emission sources at once (multiple sectors)
 - Captures both production and consumption
- Static and dynamic efficiency
 - Efficient allocation of abatement efforts: doesn't matter if emitters are heterogeneous (different MACs)
 - Incentivise R&D and adoption of low-carbon and carbon-saving technologies
- Administrative costs
 - Government doesn't need detailed information reducing monitoring and compliance costs
- Co-benefits
 - Health: reduced local air pollution
 - Fiscal: additional public revenues

Two main strategies to price carbon

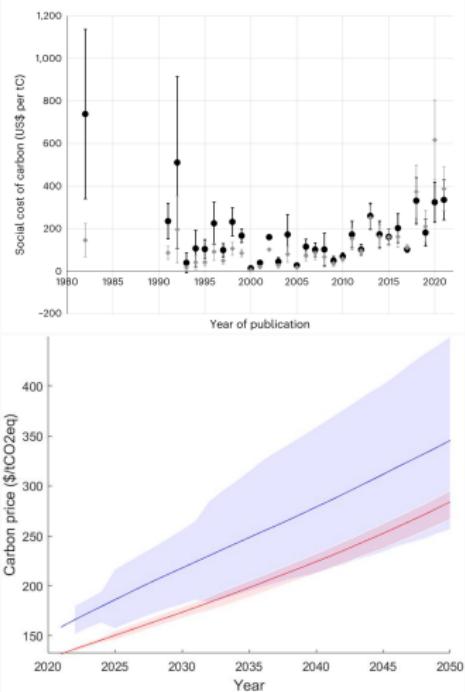
- Carbon tax
 - Fix tax base and tax rate
 - → set prices, uncertain emissions
- Emission trading schemes (ETS)
 - Cap-and-trade: create (shrinking) amount of allowances
 - Allowances can be auctioned or distributed for free
 - End of year: companies surrender allowances proportional to emissions. No surrender → fine
 - If they emit more → buy on market; if less → sell
- + Indirect carbon pricing
 - Instruments that introduce prices not proportional to GHG emissions e.g. fuel excise

Tax vs ETS

- Long debate in environmental econ (see Weitzman 1974)
 - If appropriately designed, they should be roughly similar
- Carbon tax
 - Price certainty: allows firms to plan ahead
 - Uncertainty about actual abatement choices
 - Doesn't require new legal infrastructure; tax collection and monitoring is already in place
 - Imposed upstream; known and constant emission factors
 - But.. people don't like taxes
- Emission trading schemes (ETS)
 - Subject to price volatility (but ways to mitigate it)
 - More certainty on emission reductions
 - More isolated from political influence
 - Loss of public revenues if permits are allocated for free
 - Needs to be set up and harder to administer

What is the ‘right’ carbon price?

- Pigouvian theory
 - Optimal tax should be set at marginal damage level
 - Social Cost of Carbon (SCC) → See Lecture 6
 - Large range of values, but increasing in recent years
 - Alternatively: set constraint (eg. 2C) and find cost-efficient path → shadow price of carbon
 - Usually increasing in time
- 2017 High-Level Commission on Carbon Prices ([report](#))
 - \$40-80/tCO₂ by 2020
 - \$50-100/tCO₂ by 2030



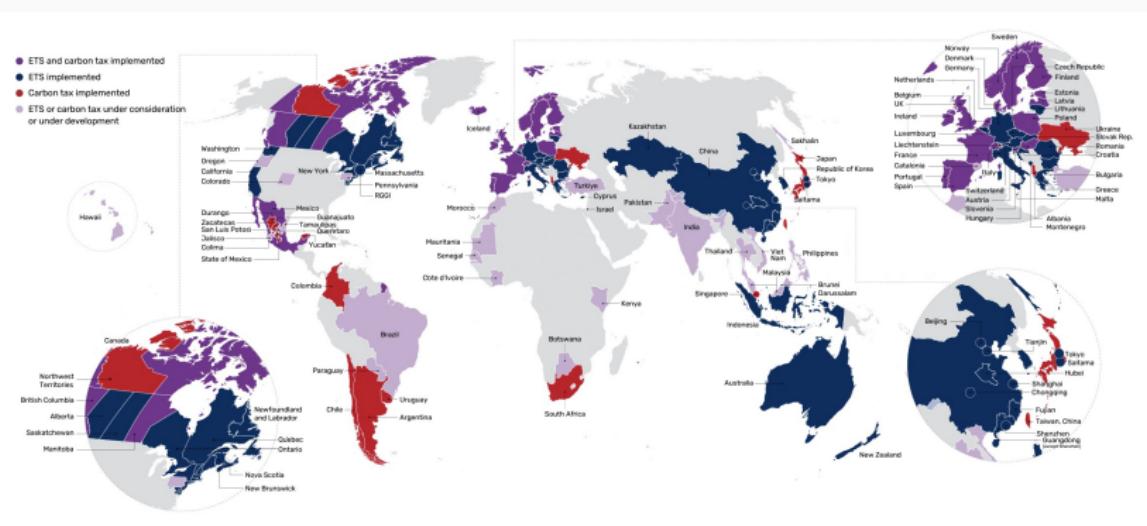
Sources: [Tol \(2023\)](#); [Campiglio et al. \(2023\)](#)

How to use carbon price revenues?

- Reduce other taxes
 - Literature on double dividend hypothesis
 - Mitigate fiscal distortions introduced by income/capital/VAT taxes
- Lump sum transfers
 - Per capita or per household cash payments
- Allocate to other uses
 - General budget expenditure
 - Allocate to social purposes
 - Further climate mitigation (e.g subsidise green technologies)
 - Productive uses (e.g. subsidise specific industries)

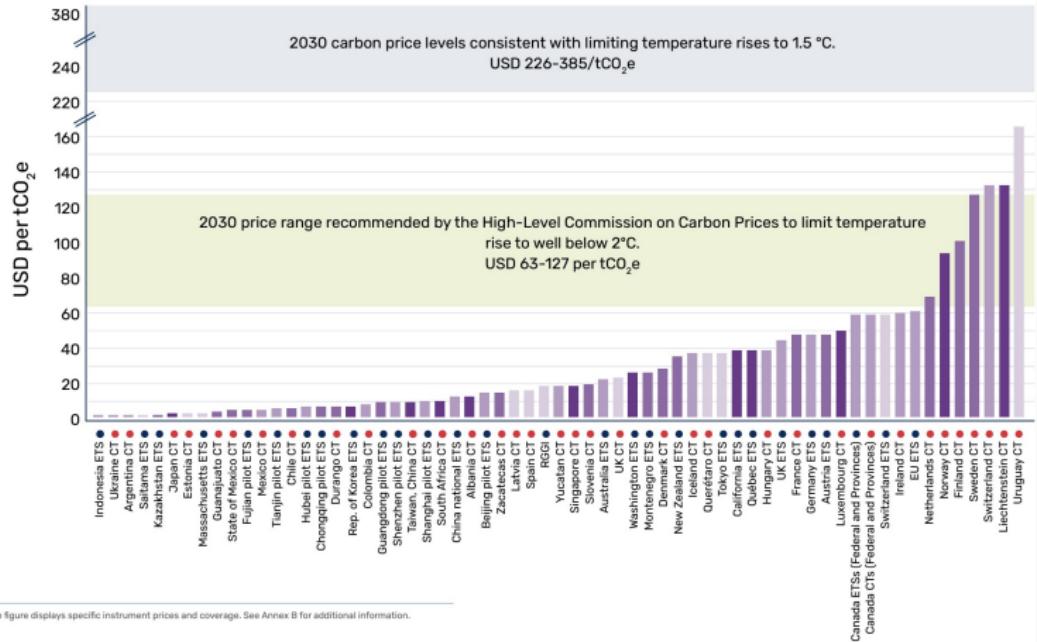
Current carbon pricing initiatives

- 75 CPIs covering 24% global GHG emissions



State of carbon pricing initiatives. Source: [World Bank \(2024\)](#). See also [Carbon pricing dashboard](#).

Carbon prices and emission coverage



Prices and coverage across ETSs (blue) and taxes (red). Stronger shades represent larger emission coverage. Source: [World Bank \(2024\)](#). Carbon price corridor adjusted for inflation. See also [Carbon pricing dashboard](#).

Possible carbon pricing issues (i)

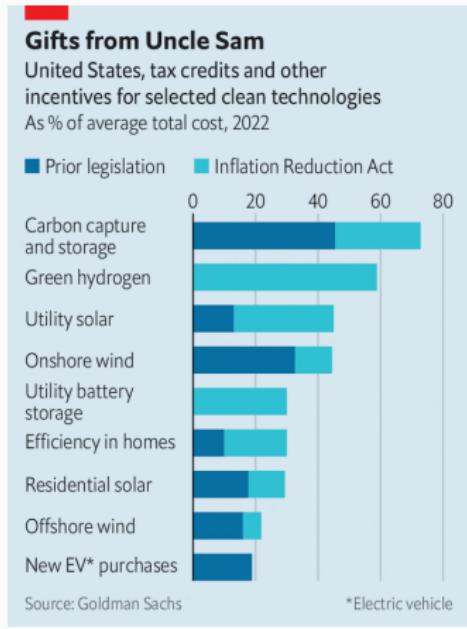
- Not effective at reducing emissions
 - However, plenty of evidence that it does, and it also stimulates innovation
- Macroeconomic and sectoral negative impacts
 - It depends on how revenues are redistributed
 - Cutting other taxes creates lower costs, then lump-sum transfer
 - Weak evidence on aggregate employment effects, but strong potential skill-specific effects (see Marin and Vona 2019)
 - No significant evidence of impact of carbon taxes in Europe on GDP or employment ([Metcalf and Stock \(2023\)](#))

Possible carbon pricing issues (ii)

- Distributional effects
 - Carbon prices might be regressive, as lower-income households spend proportionally more in energy.
 - True but regressivity can be addressed by revenue recycling
 - Lump-sum transfers most redistributive policies
- Competitiveness and leakage
 - Competitiveness of key industries affected
 - Carbon leakage: polluting industries might shift their production elsewhere
 - Solution 1: exempt industries from carbon price
 - Solution 2: apply trade tariffs to imports from countries subject to laxer regulation (carbon border taxes)
 - Solution 3: group of countries with similar carbon prices introduce trade sanctions on others (climate clubs; see Nordhaus)

Environmental subsidies

- Environmental subsidies
 - Grants and low-interest loans; preferential tax treatment (e.g. rebates, tax credits); protection from imports; etc.
 - → Boom of European renewable energy investments pre-2011
 - More recently: Inflation Reduction Act (USA, 2022)
- Carrots rather than sticks, so more popular
 - But: they're costly, someone has to pay for them.
 - international distortions and trade tensions



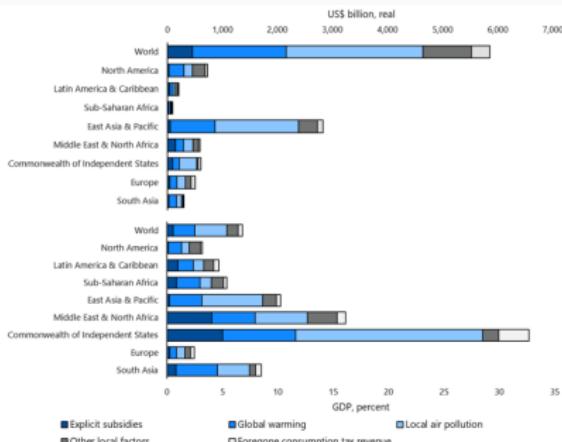
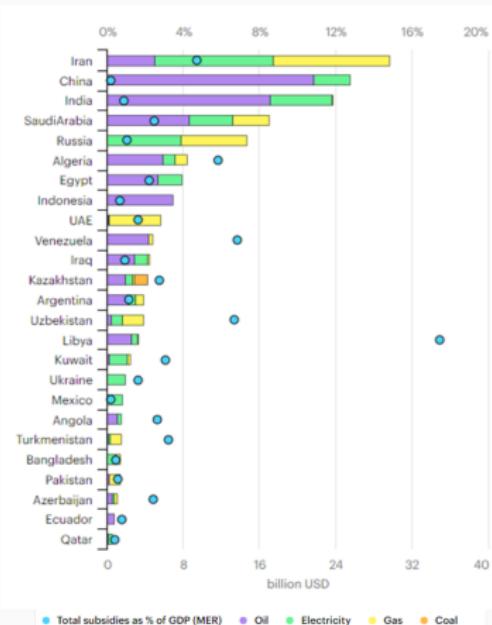
The Economist

Source: [The Economist \(2022\)](#)

Fossil fuel subsidies

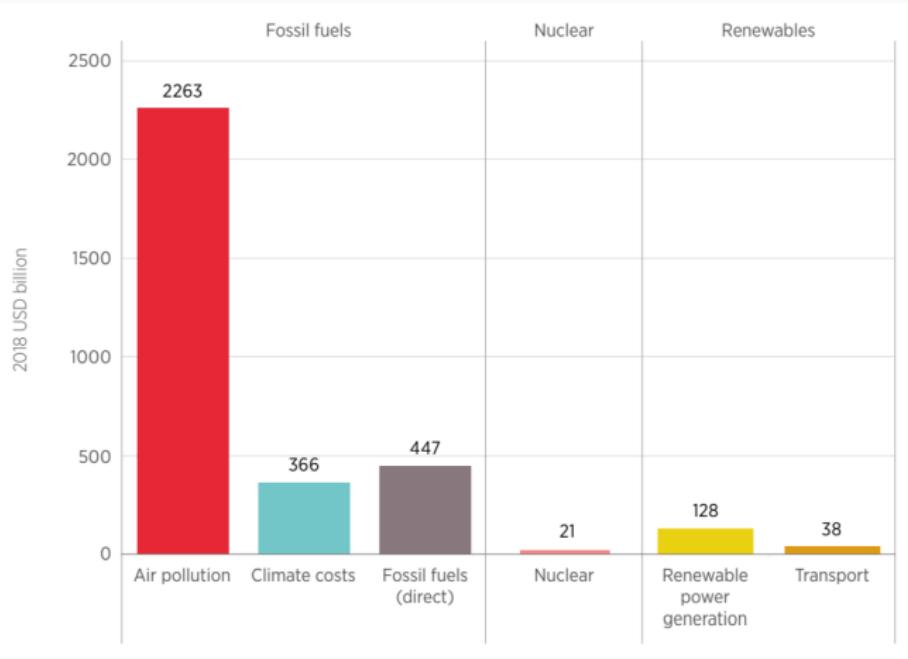
- Two main forms
 - Production subsidies to reduce cost of producing fossil fuels
 - Consumption subsidies to reduce consumer cost of using fuels
 - [Fossil fuel subsidy tracker; OECD database](#)
- Several motivations
 - Sustain national industries
 - Support lower-income households (e.g. heating)
 - Spread the wealth in resource-rich countries
- Hard to get rid of them
 - Powerful fossil lobbies
 - Social/economic/distributional impacts → protests
 - Social programmes needed (e.g. cash transfers)

Fossil subsidy estimates



Left: 2020 fossil fuel subsidies by fuel in the top 25 countries ([IEA 2022](#)). Right: 2020 fossil fuel subsidies including implicit costs ([IMF 2022](#))

Comparison with environment friendly subsidies



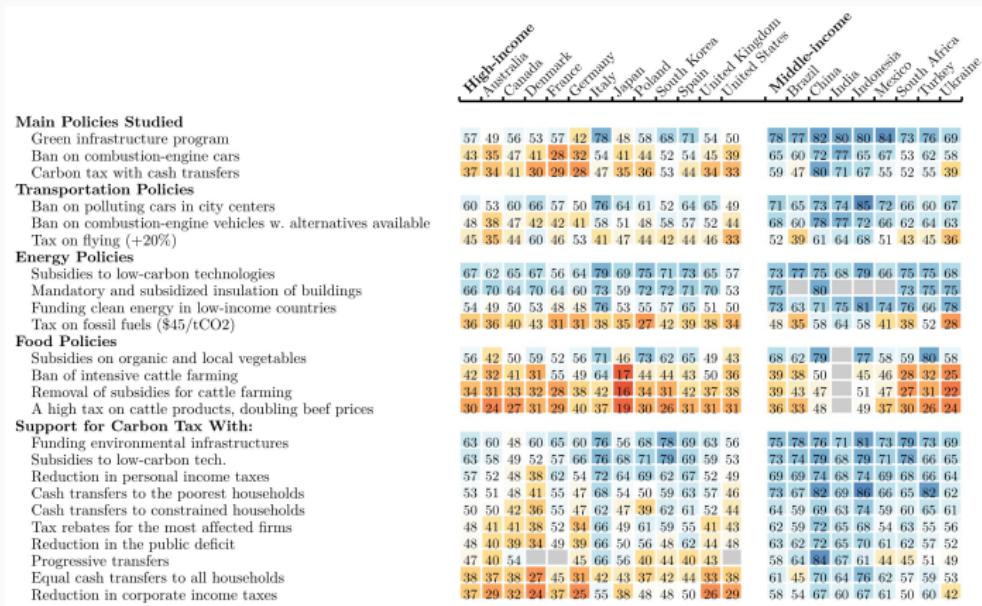
Total energy sector subsidies by fuel/source and the climate and health costs in 2017.
Source: [IRENA 2020](#))

Alternatives to market-based policies

- Command and control regulation
 - Technology standards: use a specific technology
 - Performance standards: respect specific parameters (e.g. max NOx/km from vehicles → 2015 Volkswagen Dieselgate)
 - Often uniform across firms → inefficiencies
- Information-based policies
 - Compulsory disclosure; labelling and certification programs (e.g. energy classes for homes); nudging
- Public spending/lending
 - Government investment and consumption; public development banks; official development assistance (ODA)
 - → Lecture 5

Policy acceptability

- Main concerns: effectiveness; personal costs; economic costs; regressivity..



Share of respondents supporting the policy. Source: [Dechezleprêtre et al. \(2022\)](#)

Climate policy uncertainty

- Low acceptability of policies might lead to social unrest
- Revision/withdrawal of announced plans (latest example: UK renegotiation of net-zero goals)
- This in turn disrupts future credibility



Gilets Jaunes movement in France (2018); Kazakhstan protests after LPG price cap lift (2022)

Focus on Europe

- Fit-for-55 policy package
 - 13 legislative proposals (8 revisions + 5 new proposals)
 - Status of implementation (Commission)
 - Implementation timeline (Council)
- Overview of initiatives
 - Reform of the EU Emission Trading Scheme
 - Carbon Border Adjustment Mechanism (CBAM)
 - Social Climate Fund
 - ETS2 for buildings and road transport
 - Directives on energy efficiency; renewable energy; energy taxation
 - Regulations on maritime and aviation fuels
 - ..and more

EU Emission Trading Scheme (EU ETS) (i)

- Participating countries:
 - 27 EU states + Iceland, Liechtenstein and Norway
 - Since 2020: link with Swiss ETS
 - UK → UK ETS ([see differences](#))
- Compliance entities:
 - ≈ 10,000 stationary installations (e.g. power/industrial plants)
 - ≈ 350 aircraft operators
 - Both compliance and non-compliance entities can buy/sell
- GHG emission coverage:
 - carbon dioxide (CO₂) from electricity/heat generation, energy-intensive industries, commercial aviation within EEA
 - N₂O from glyoxal and nitric/adipic/glyoxylic acids
 - Perfluorocarbons (PFCs) from production of aluminium
 - ≈ 40% emissions covered
 - From 2024-26: expansion to maritime transport
 - From 2027: separate ETS2 on building and road transport

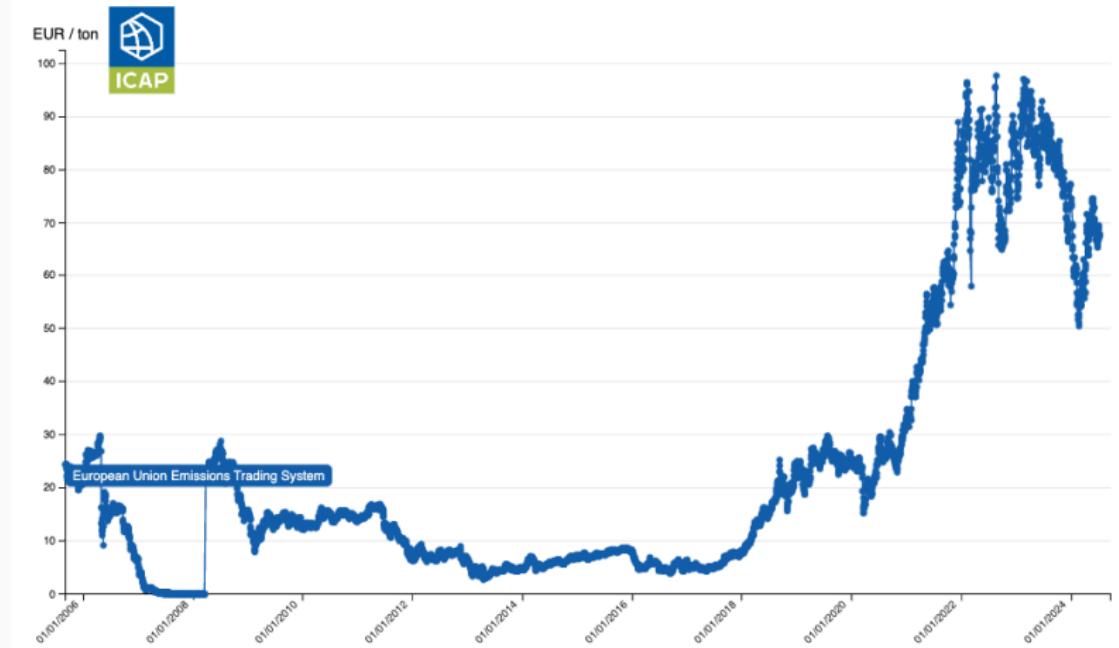
EU Emission Trading Scheme (EU ETS) (ii)

- History
 - Three phases so far (2005-07; 2008-12; 2013-20)
 - Now in the Fourth phase: 2021-2030 (linked to EU new climate objectives). See [2021 EC Report](#)
- Cap-and-trade system
 - 2021 cap: 1,597 MtCO₂e (1,572 from stationary installations + 24.5 from aviation)
 - Annual redemption at the end of March (EUR100 fine per tCO₂ not surrendered)
 - Linear cap reduction factor of 2.2% per year (4.3% from 2024)
 - [ETS transaction log](#); [EEA EU-ETS data viewer](#)
- Distribution of allowances
 - ≈ 57% of EUAs are [auctioned](#), the rest [distributed for free](#)
 - Partly free EUAs to aviation, industry, modernising energy, sectors under threat of carbon leakage (free allocation to be phased out by 2034)

EU Emission Trading Scheme (EU ETS) (iii)

- Carbon revenues
 - At least 50% to climate and energy-related purposes
 - → Innovation Fund for breakthrough technologies e.g. low-carbon hydrogen, CCUS, renewable energy
 - → Modernisation Fund: modernisation energy systems and just transition in lower-income member states
 - 2022 carbon revenues: EUR38 billion in 2021
- Market Stability Reserve
 - Issue: demand volatility vs fixed supply reduction → possible oversupply of permits → low carbon price
 - Solution: Market Stability Reserve (MSR). Move EUAs from market to MSR in times of oversupply, from MSR to market in over-demand, according to pre-defined rules
 - 2021: reduced auction volumes by $\approx 40\%$
 - Review of the EU ETS market stability reserve

EU ETS allowance price dynamics



EUA spot price. Source: [ICAP Allowance Price Explorer](#)

Conclusions

Conclusions

- We have set ourselves several longer-term objectives
 - Paris Agreement (1.5-2C) and NDCs
 - Net-zero commitments
- How do we achieve these goals? → Policies
 - Justified by econ theory: Internalise externalities
- Several option available
 - Carbon pricing (taxes, ETS)
 - Environmental subsidies
 - Fossil subsidy phaseout
 - Non-market-based policies
- Next lecture
 - The double role of finance in the low-carbon transition