Environmental and Climate Economics

Choosing the Right Climate Policy Mix

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Emissions and ambitions across the world

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India's target is conditional on $1 trillion of funding from developed countries.

Climate policy in practice

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- Intensity-based Emissions Trading System.
  - For now, covers the power sector, with mostly free allowances, and low price ($10/$tCO_2$).

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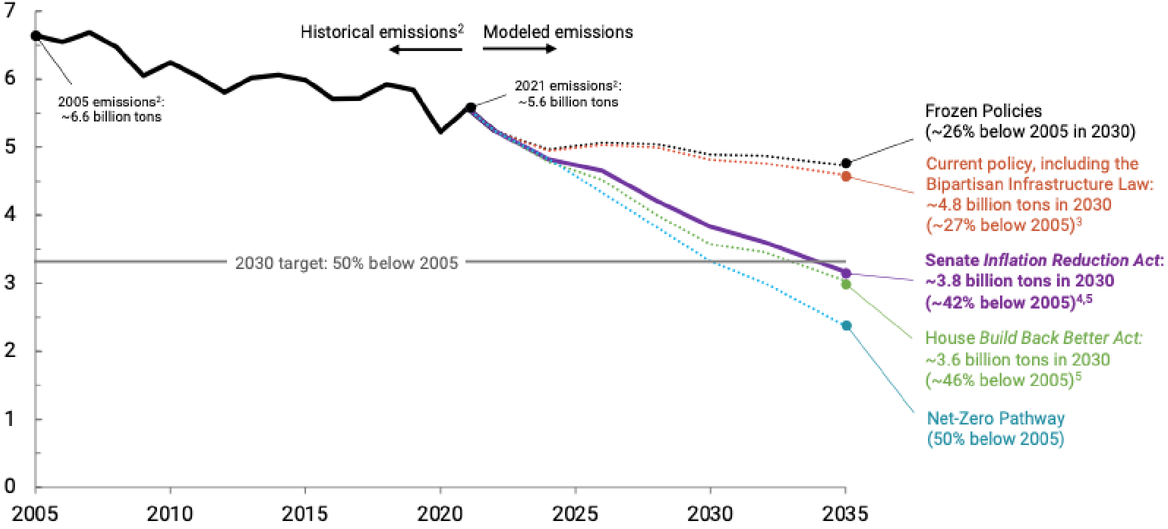

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- Scales up and extends tax credits created in 2005 until power mix is 75% low-carbon.

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Both standards allow firms to comply by purchasing credits from overperforming firms.

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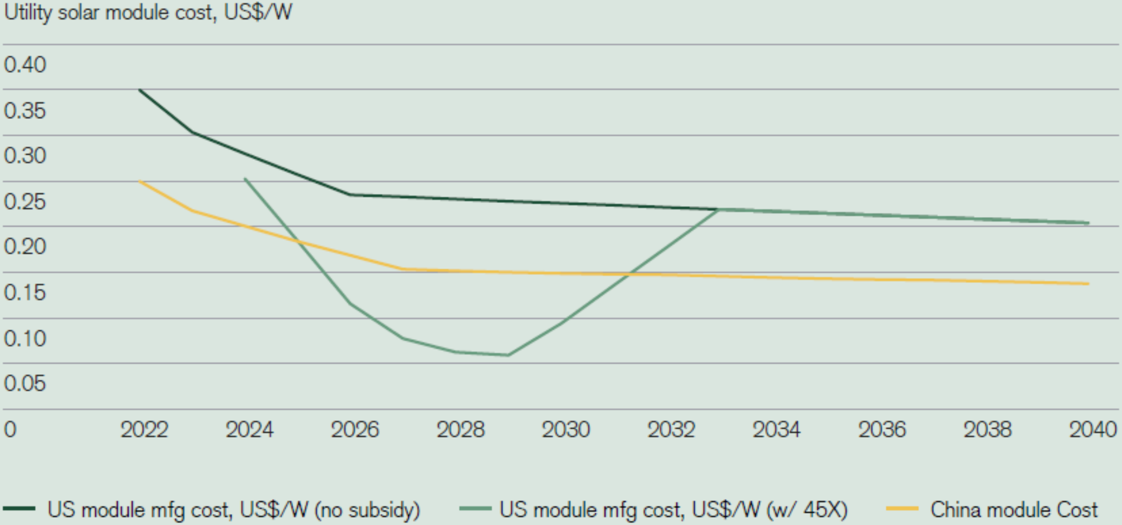
Climate policy of the United States

Figure 21: US Solar module <50% cheaper than China modules with tax credits



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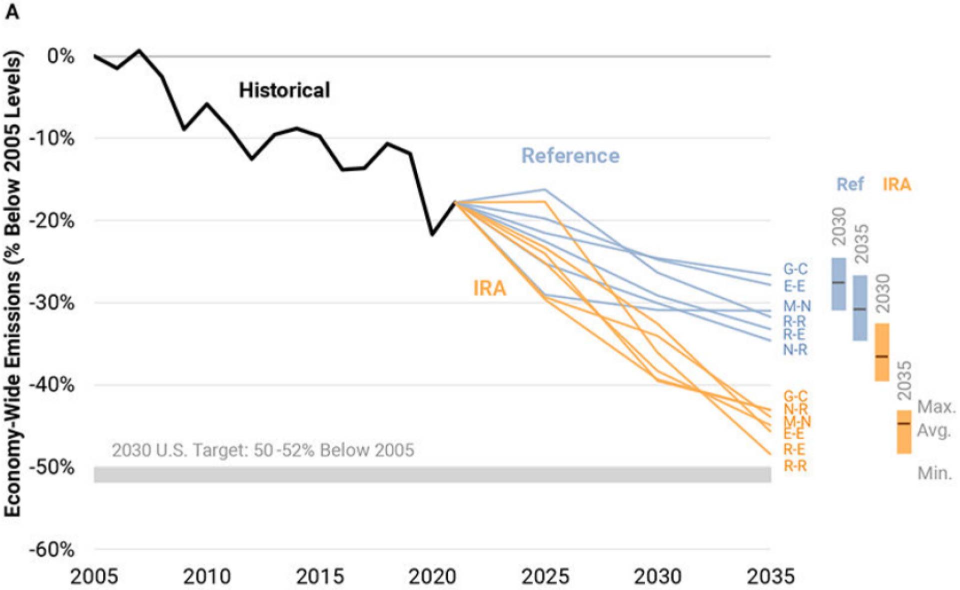

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Figure 10. Average Household Benefits and Costs (2030)

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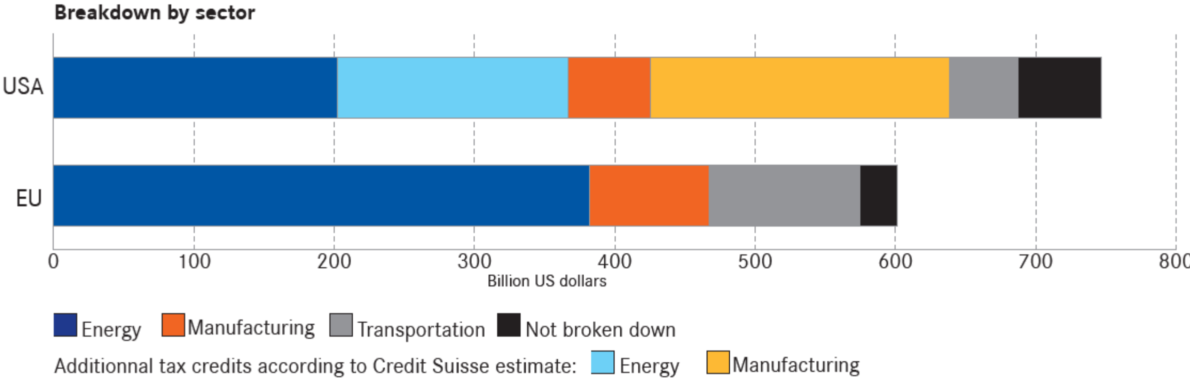
EU investments are comparable to U.S. ones: $\approx 0.3\%$ of GDP for 10 years.



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A Conservative + Far right alliance risks overturning it ⇒ upcoming EU elections are key.

Climate policy mix in China, U.S., EU.

	China	U.S.	EU
Carbon pricing	✓		✓
Subsidies to households	?	✓	✓
Subsidies to industry, investments	✓	✓	✓
Credit controls/incentives	✓	≈	≈
Production/shutdown decisions	✓	≈	≈
Renewable energy auctions	✓	✓	✓
CO_2 car emissions standards		✓	✓
Other norms or standards	✓	?	✓
Bans	?		≈
Strong policy on food/agriculture	?		

Climate policy in theory

Rationale and limitations of carbon pricing

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Figure 1: Households' annual expenditures in energy per c.u. (left) and as a share of their disposable income (right) in 2016, by income decile

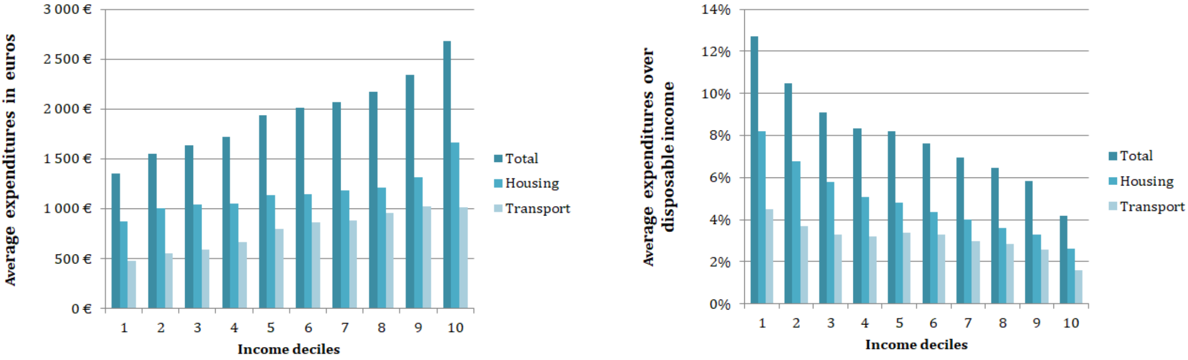
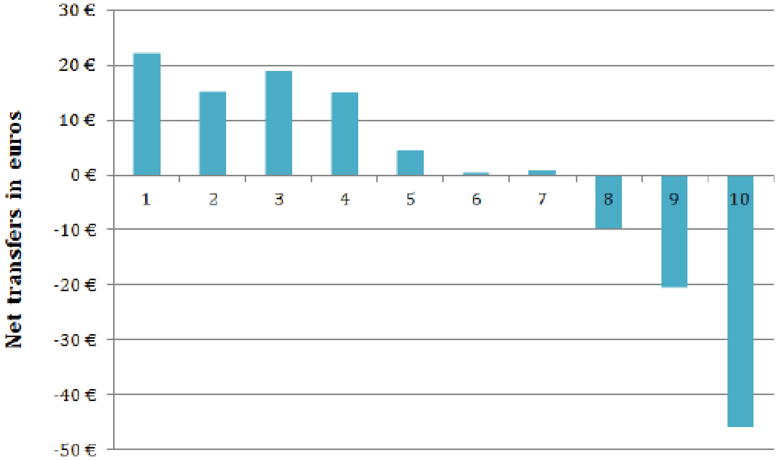


Figure 5: Average net transfers per c.u. after flat-recycling, by income decile



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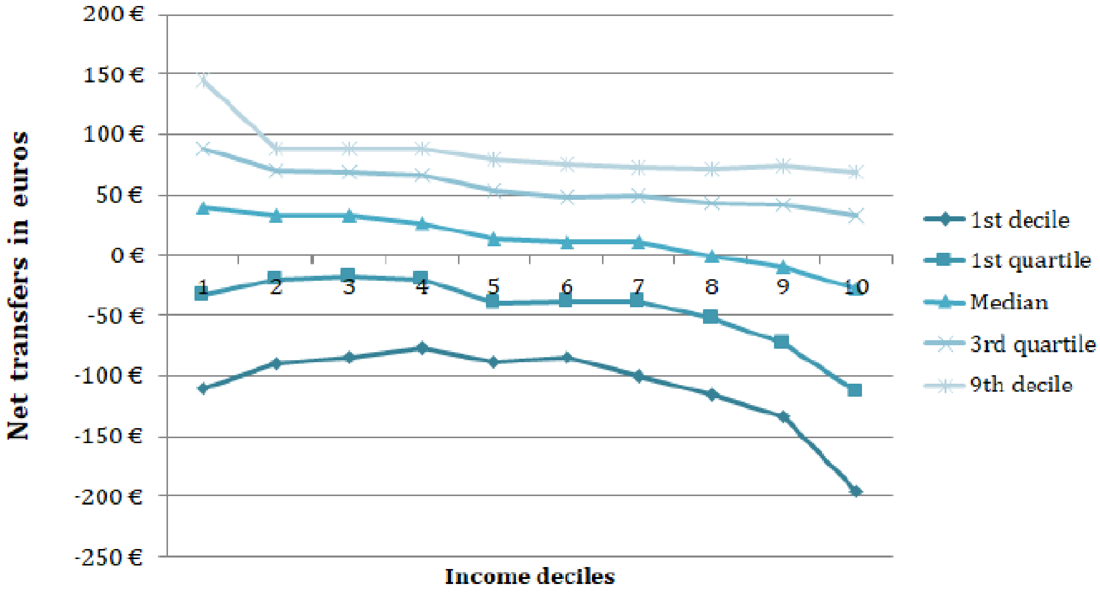

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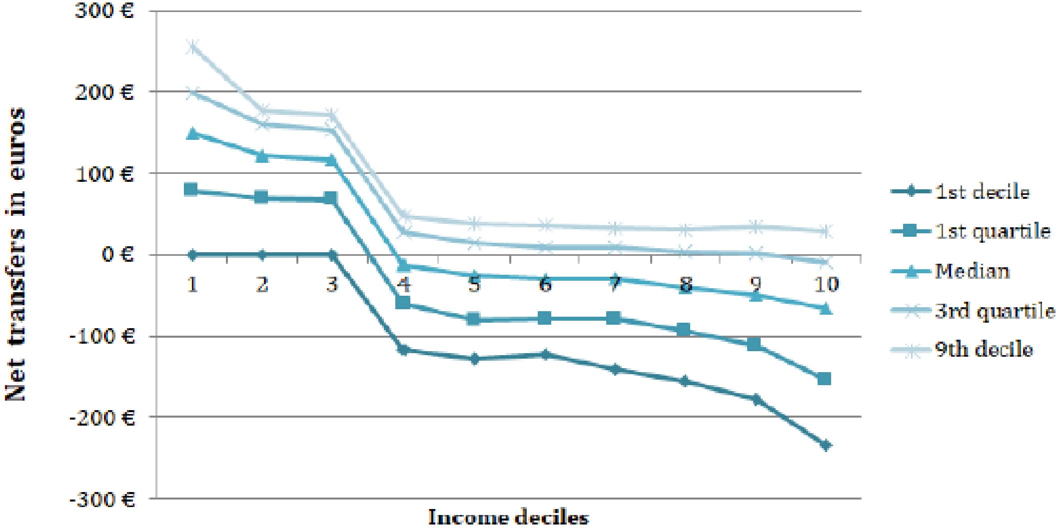

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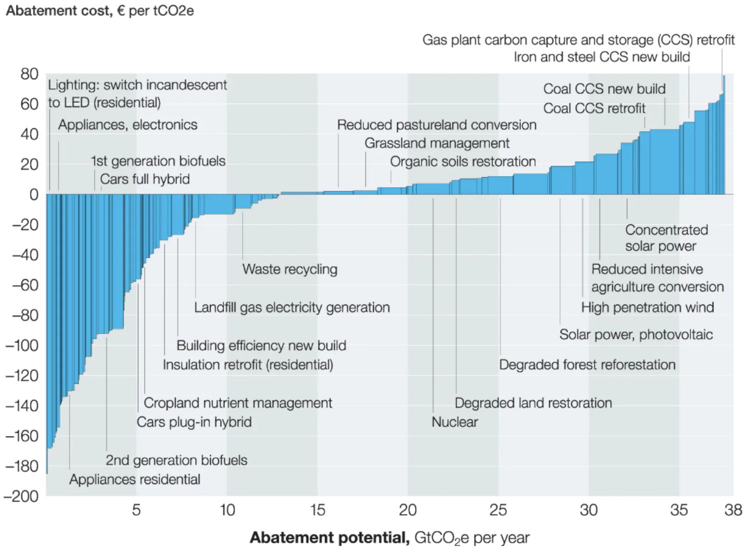
Marginal Abatement Cost Curve (McKinsey, 2017).



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Cost-efficiency: first set the climate goal, then find the least cost carbon price trajectory satisfying the goal.

Only needs the MACC.

Determining the optimal carbon price

Two approaches to set the value of the carbon price:

Cost-benefit analysis: intertemporal welfare maximization, e.g. utilitarianism: $\max \sum_t \frac{1}{(1+\rho)^t} u(C_t)$. It uses an Integrated Assessment Model, based on four elements:

1. Ethical assumptions: weights given to different generations, countries, inequality, riskiness, population size.
2. Climate and economic dynamics, e.g. temperature proportional to cumulative emissions.
3. Damage function: the cost of additional emissions or temperature, e.g. $C_t = \left(1 - e^{-d \cdot T_t}\right) Y_t$.
4. The Marginal Abatement Cost Curve (MACC): the price needed to achieve a given abatement target.

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  Setting a carbon budget, the carbon price grows at the rate of interest r, as the (present) value of an abatement is the same if it occurs now or later.

Pros and Cons of pricing

Pros

Cost-effective and efficient, as long as all emissions are priced (ensuring no leakage).

Cons

Pros and Cons of pricing

A carbon tax would be less costly than the IRA.

	IRA	Carbon Tax
Generation Share (Change in pp from 2021 to 2035)		
Coal	-14	-18
Natural Gas	-21	-5
Coal CCS	+3	+0
Wind & Solar	+28	+19
Other	+7	+4
CO2 (% Drop from 2005)	68%	68%
Abatement Cost ($/t-CO2)	$83	$15

Pros and Cons of pricing

Introducing a carbon price and repealing IRA's most costly provisions (7-FeeIRAp) would achieve U.S. climate targets.

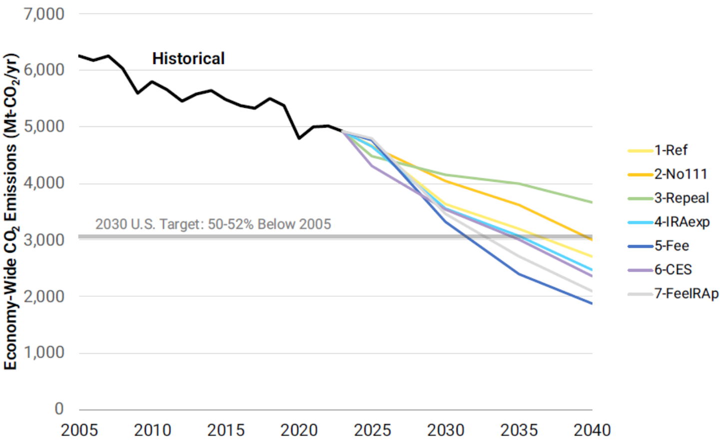

Figure 4: Historical and projected economy-wide CO_2 emissions by scenario. Emissions include gross energy and industrial process CO_2 emissions but do not include negative emissions from the land sink or non-CO_2 GHG emissions. Historical emissions come from the U.S. Environmental

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Pros | **Cons**

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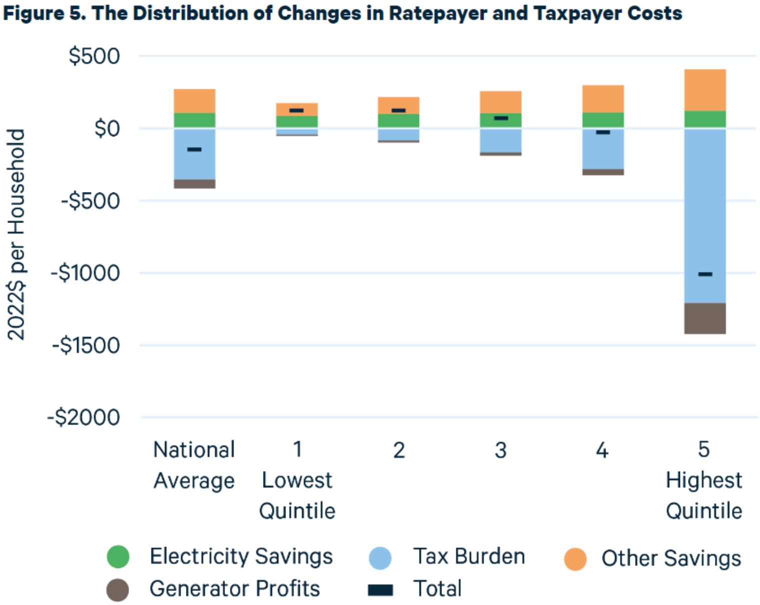

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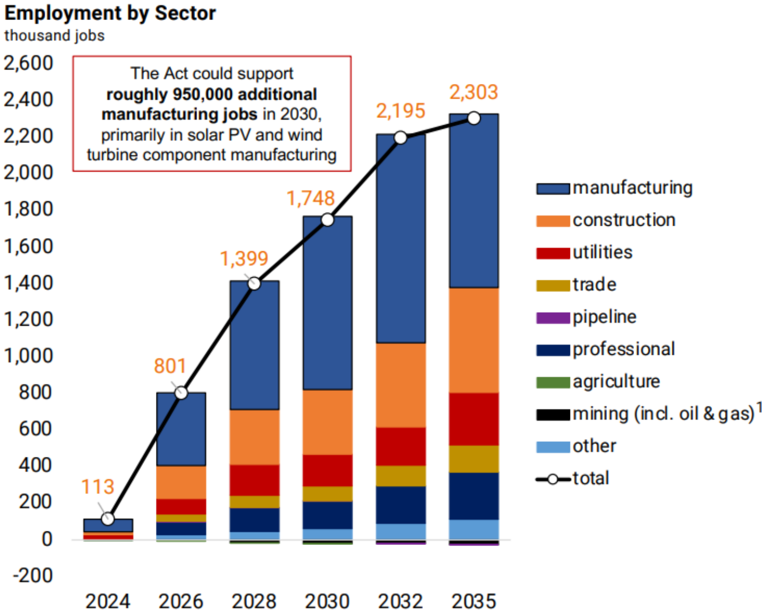

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Pros and Cons of central planning

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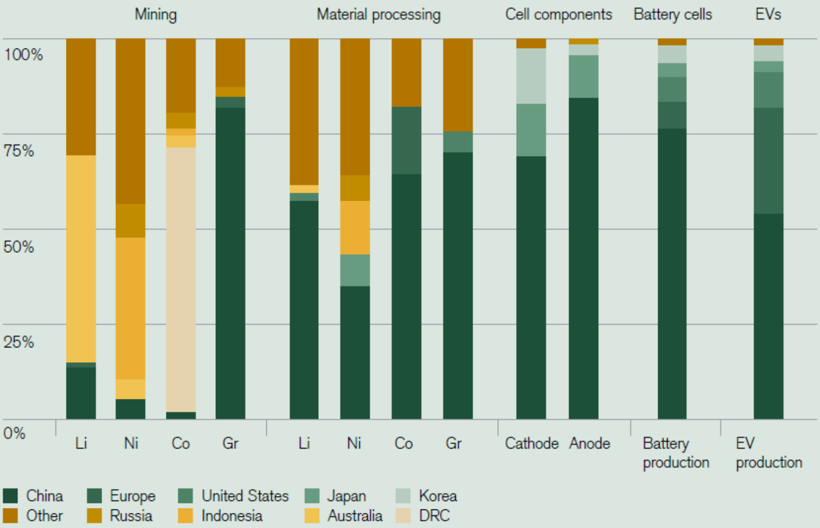
Figure 24: Geographical distribution of the global EV battery supply chain: China dominates cell and material components



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⇒ Inadapted to operational decisions (e.g. how much steel to produce today).

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