

GREEN TECHNOLOGIES

Decarbonizing Development in
East Asia and Pacific

Francesca de Nicola, Aaditya Mattoo, and Trang Thu Tran



 WORLD BANK GROUP

EAST ASIA AND PACIFIC
DEVELOPMENT STUDIES

Green Technologies

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Structure of the presentation

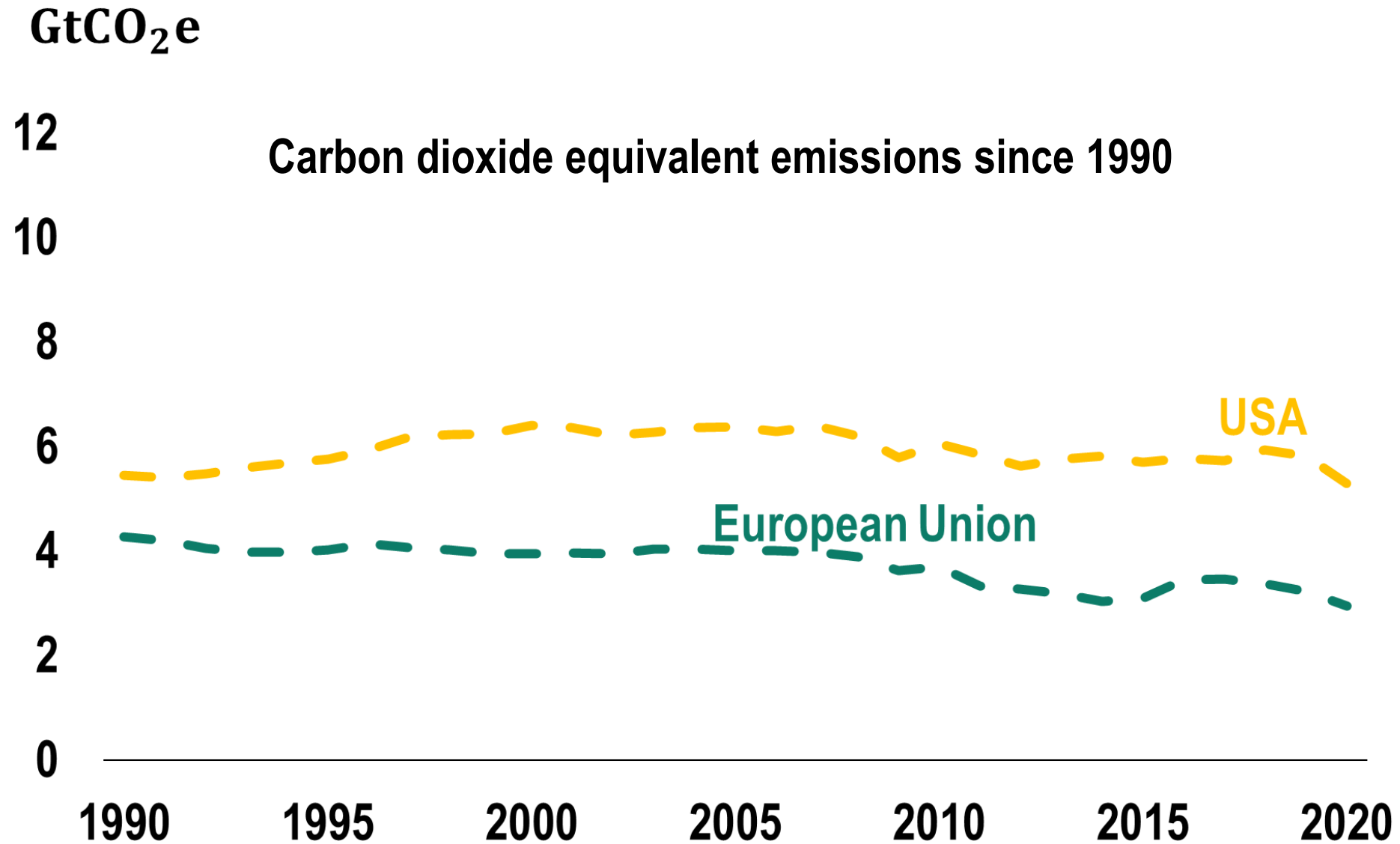
1. Why does developing East Asia's decarbonization matter?

2. Which green technologies are viable?

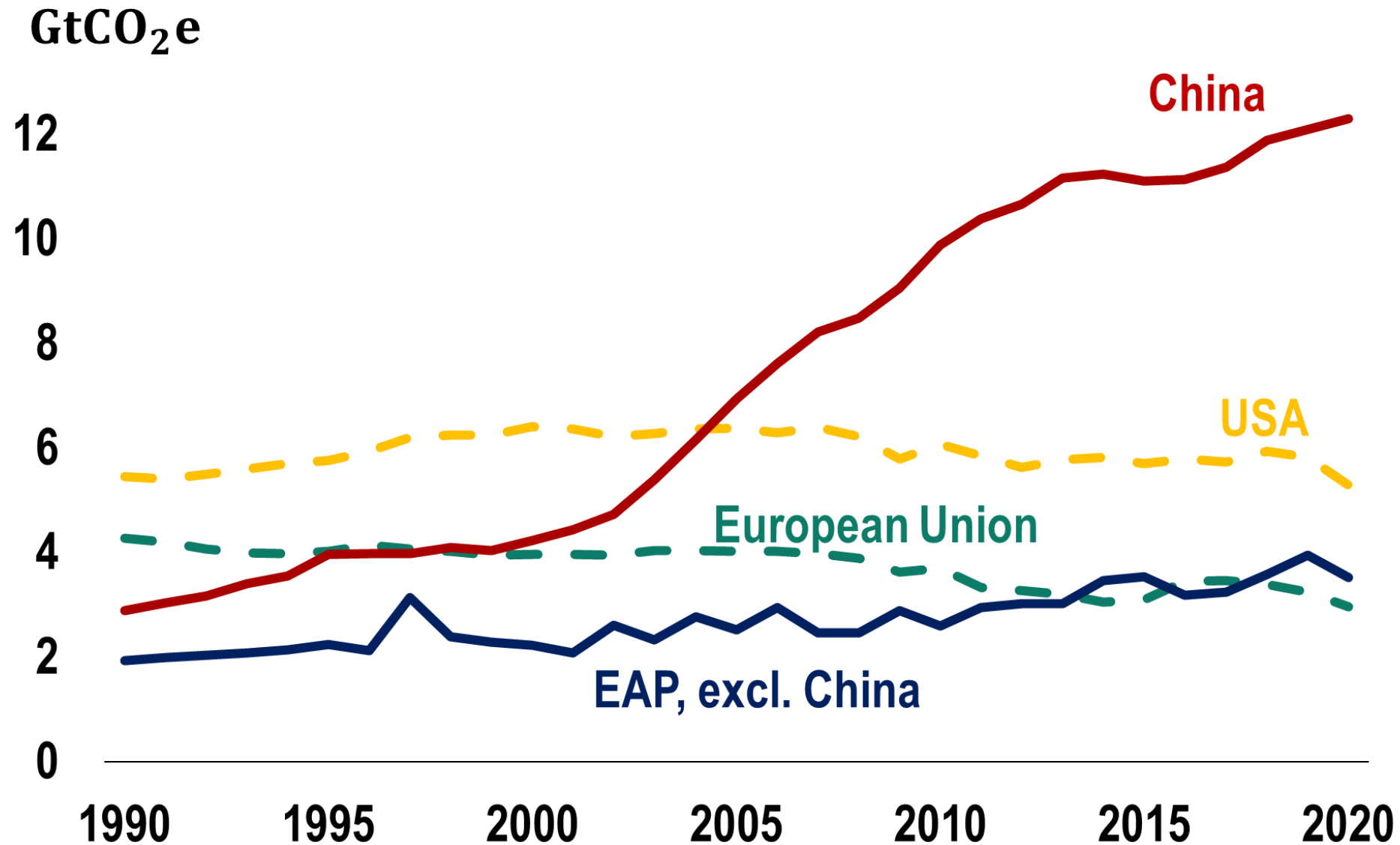
3. How is developing East Asia contributing?

4. What needs to be done?

Developing East Asia's decarbonization matters



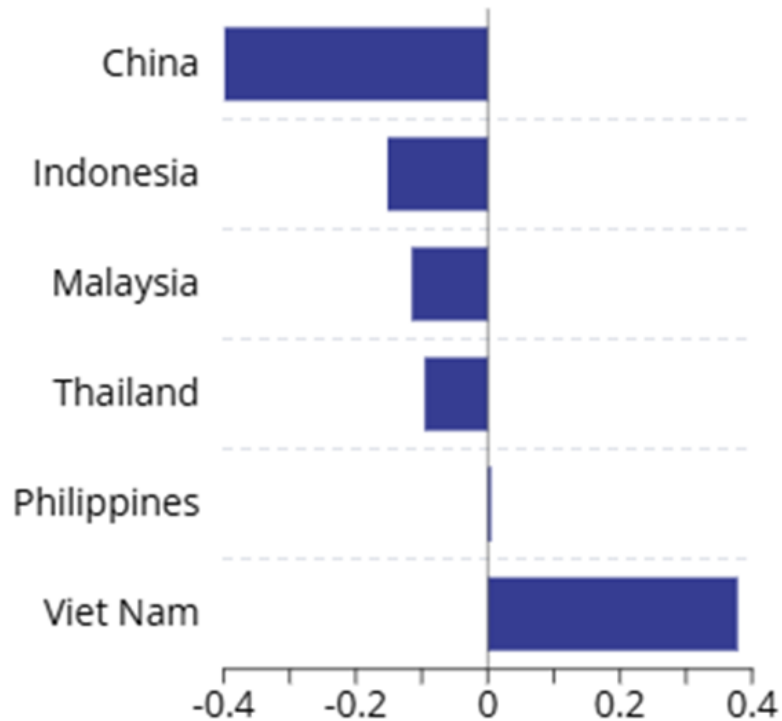
Developing East Asia's decarbonization matters



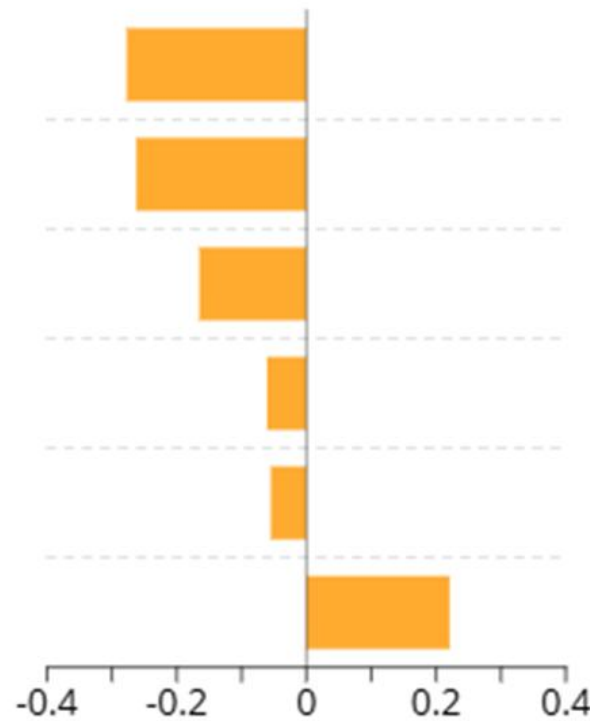
But progress on decarbonization has been uneven across developing East Asia

Log change, 2010-2020

Emission intensity of GDP



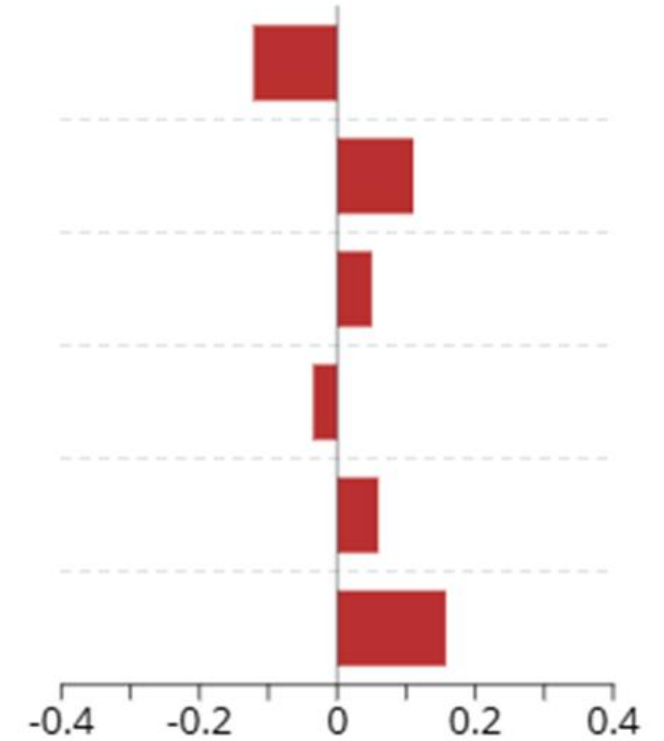
Energy intensity of GDP



=

+

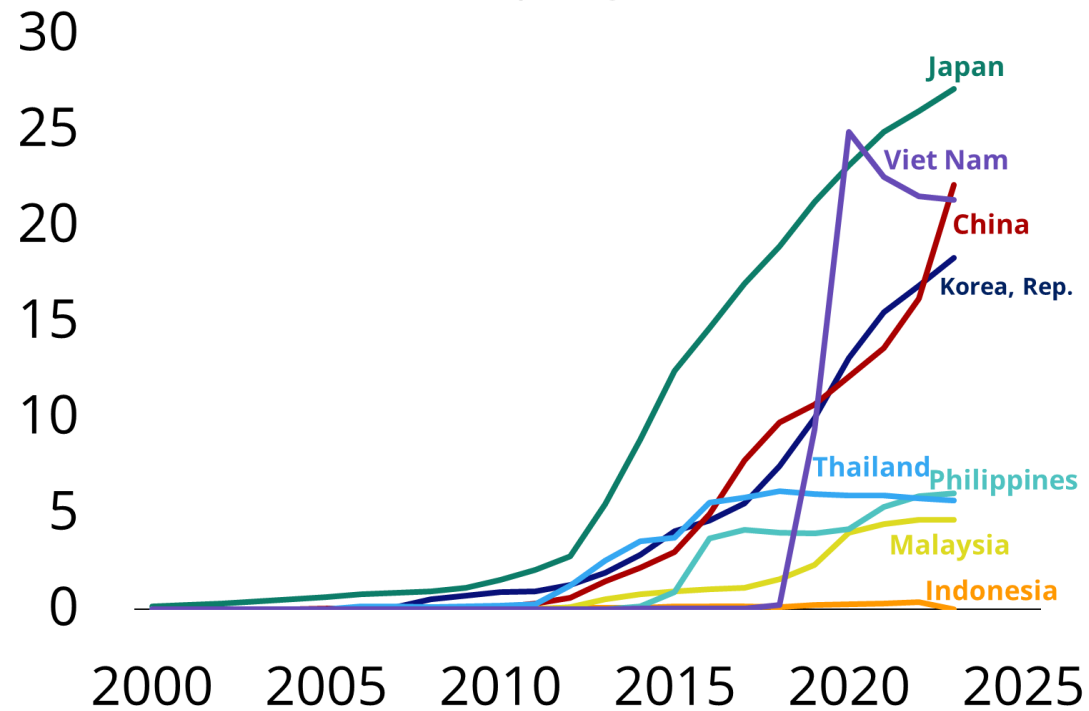
Emission factor of energy



The adoption of green technologies has been uneven

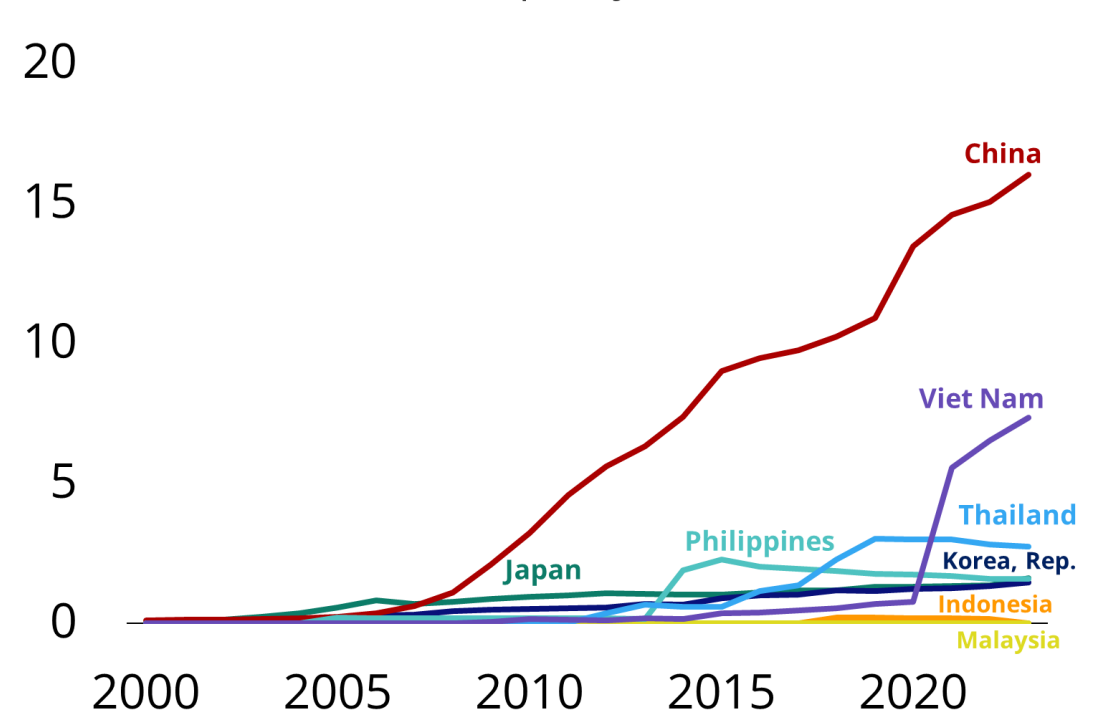
Solar

Share of total installed capacity (%)



Wind

Share of total installed capacity (%)



**2. Which green technologies
are viable?**

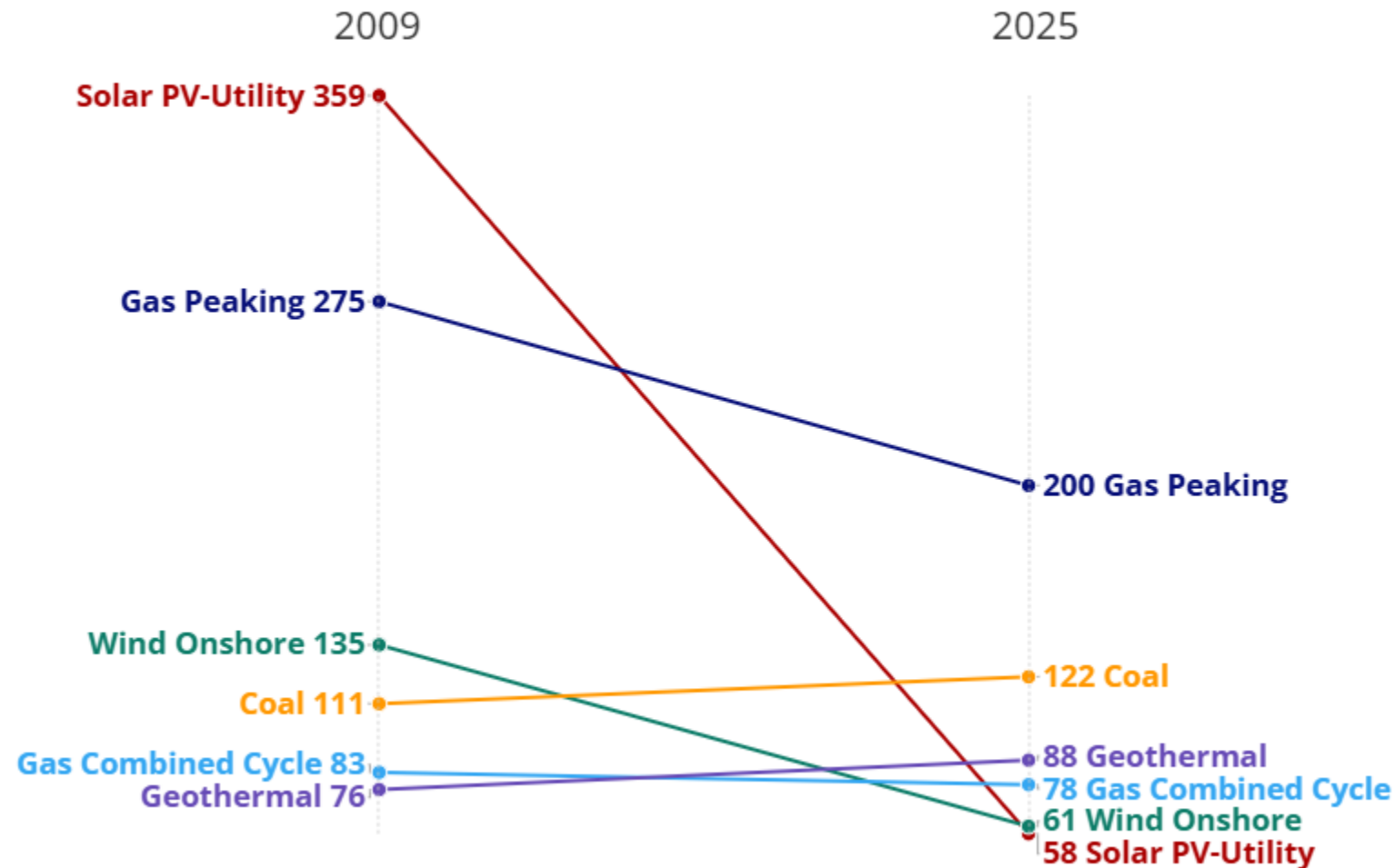
Relatively few green technologies are cost competitive today

Colors denote different maturity stages:
 mass market,
 niche/mass market,
 niche market (early adoption stage), and
 solutions development (concept,
 prototype, or demonstration stage).

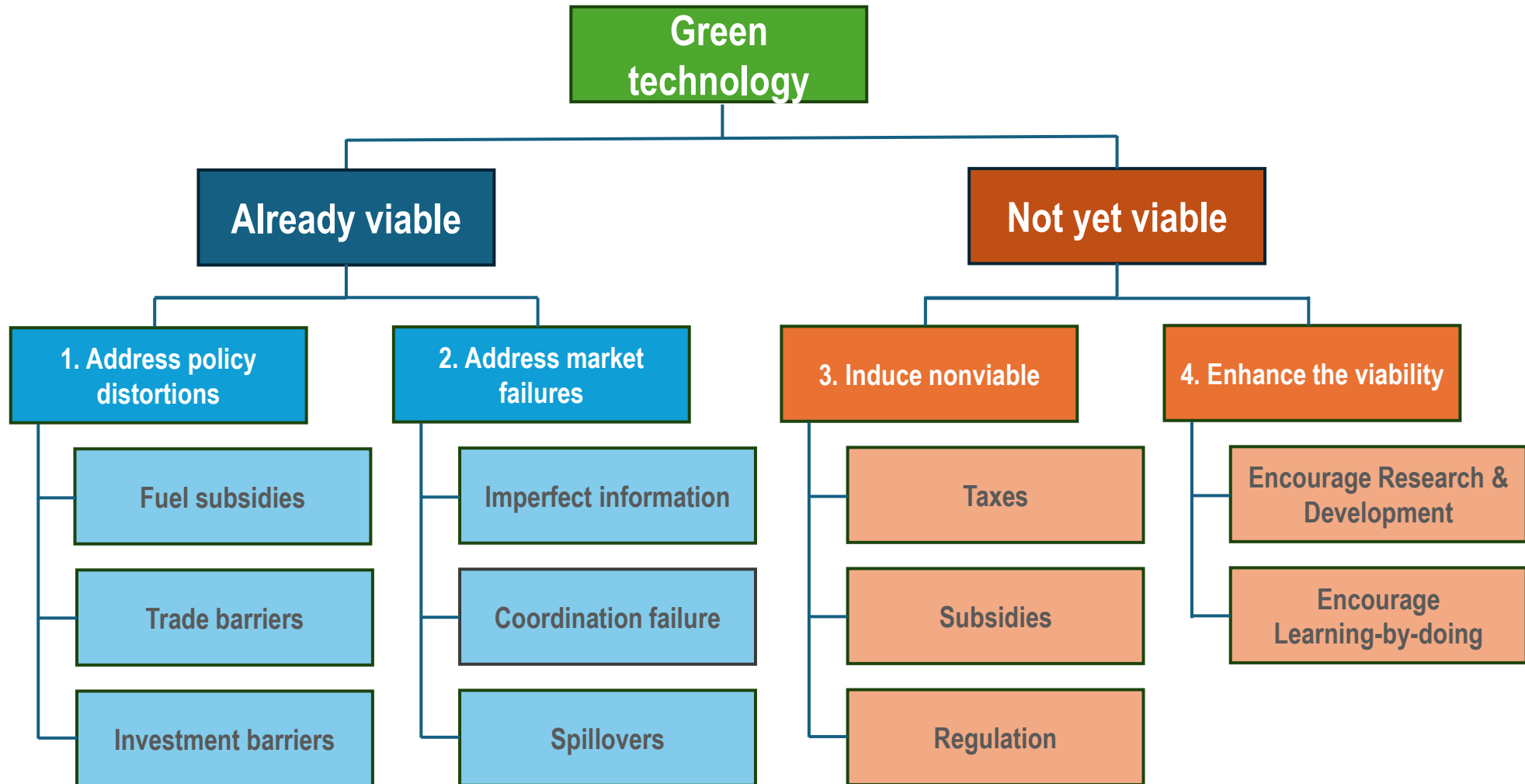
Sub-sector	Examples of technology options			Share of global emission (%)
Electricity and Heating	Solar	Wind	Energy storage	32
Transportation	Battery Electric Vehicles (BEVs)	Battery Electric Trucks (BETs)	Power-to-Liquid Fuels	15.3
Agriculture and Land-Use Change and Forestry	Precision Farming	Alternative Protein	Valuing Nature-based solutions (NBS)	15.2
Building	Heat pumps (residential retrofits)			6.3
Industry	Green Hydrogen-based Direct Reduction of Iron (DRI)	Green Ammonia		13.1
Industrial Processes	Carbon Capture Usage & Storage (CCUS)	Green cement from non-carbonate calcium sources		6.6
Waste	Pyrolysis treatment for chemically recycling plastics			

But the costs of green tech decline with deployment – while costs of brown tech are flat

Levelized cost of energy, \$/MWh



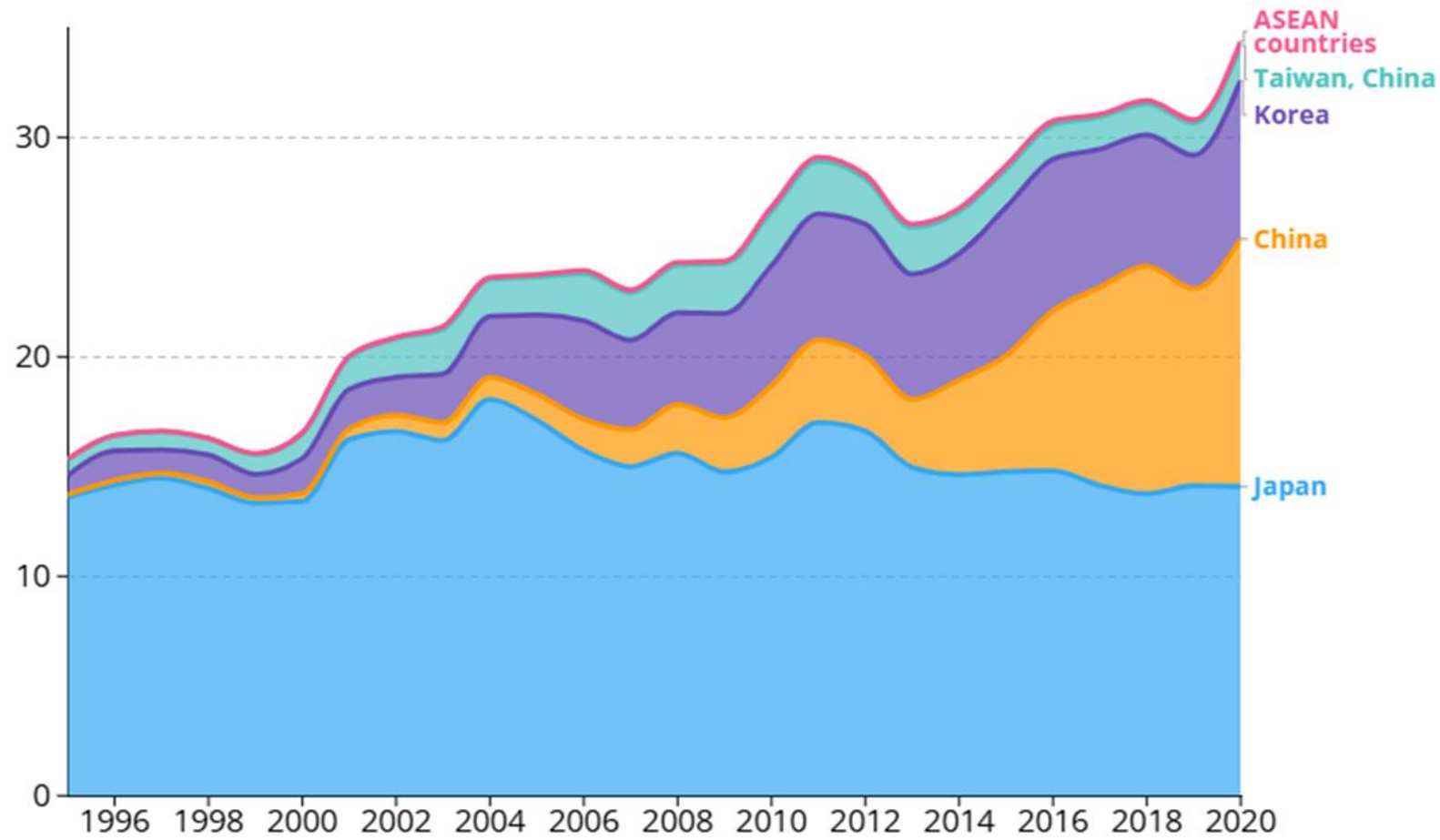
What impedes the adoption of green tech and what are the policy options?



3. How is developing East Asia contributing?

A growing share of green patents originate in the region

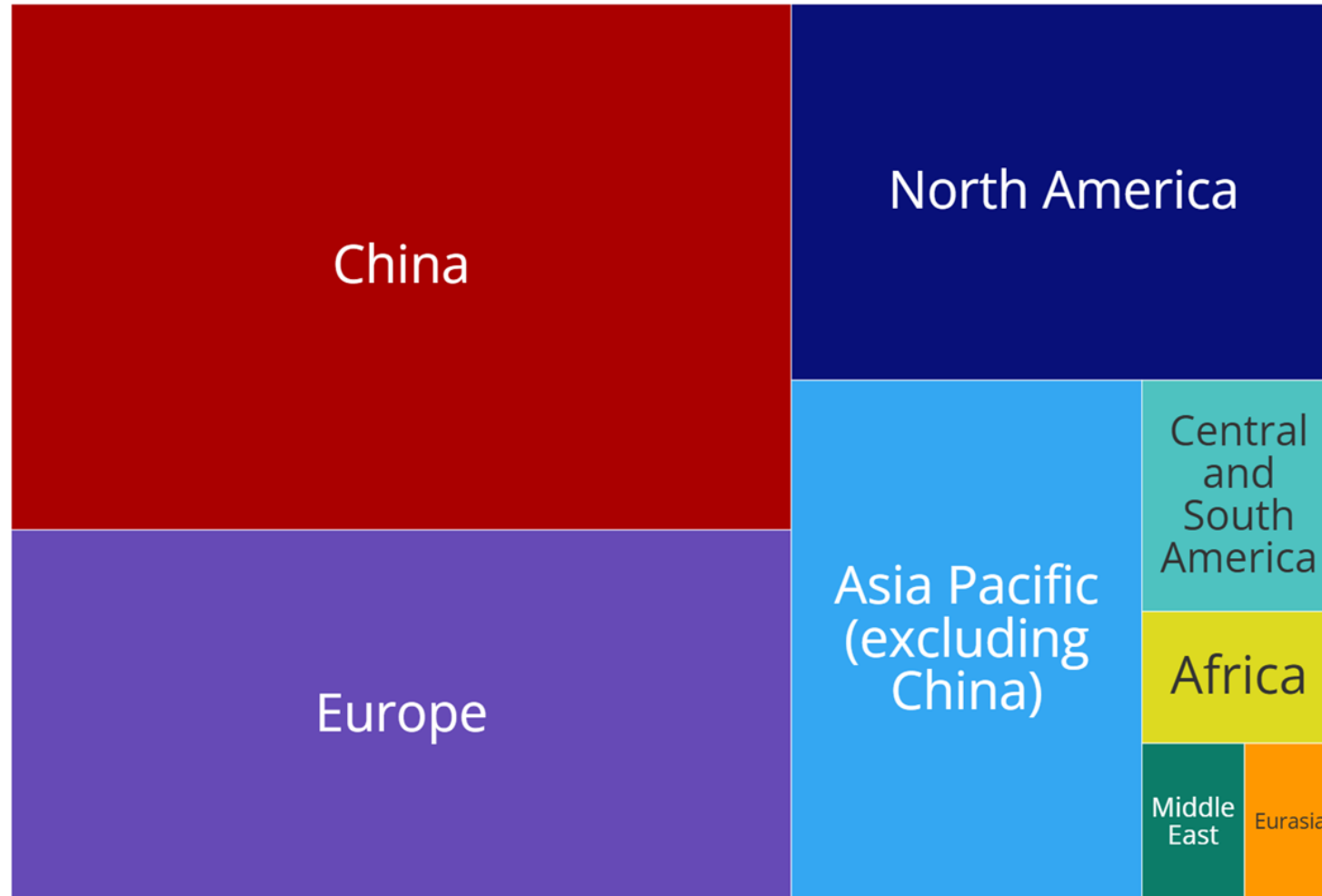
Global share of triadic green patents (%)



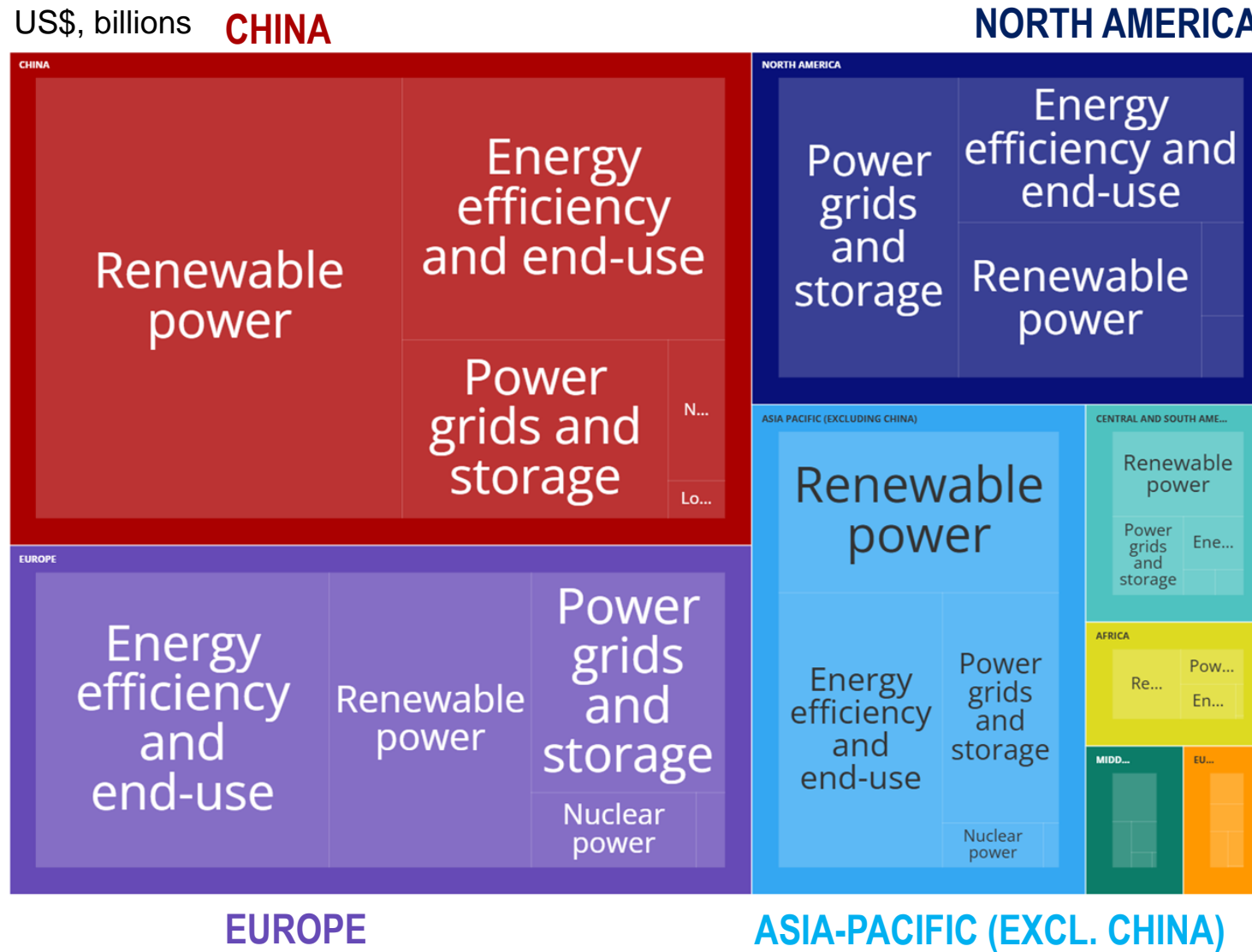
Source: Data from the World Intellectual Property Organization (<https://www.wipo.int/en/web/patentscope>). • Triadic patents are patents applied for with the European, US, and world patent offices. ASEAN-5 Countries include Indonesia, Malaysia, the Philippines, Singapore, and Thailand.

Developing East Asian countries account for a large share of global investment in clean energy...

US\$, billions

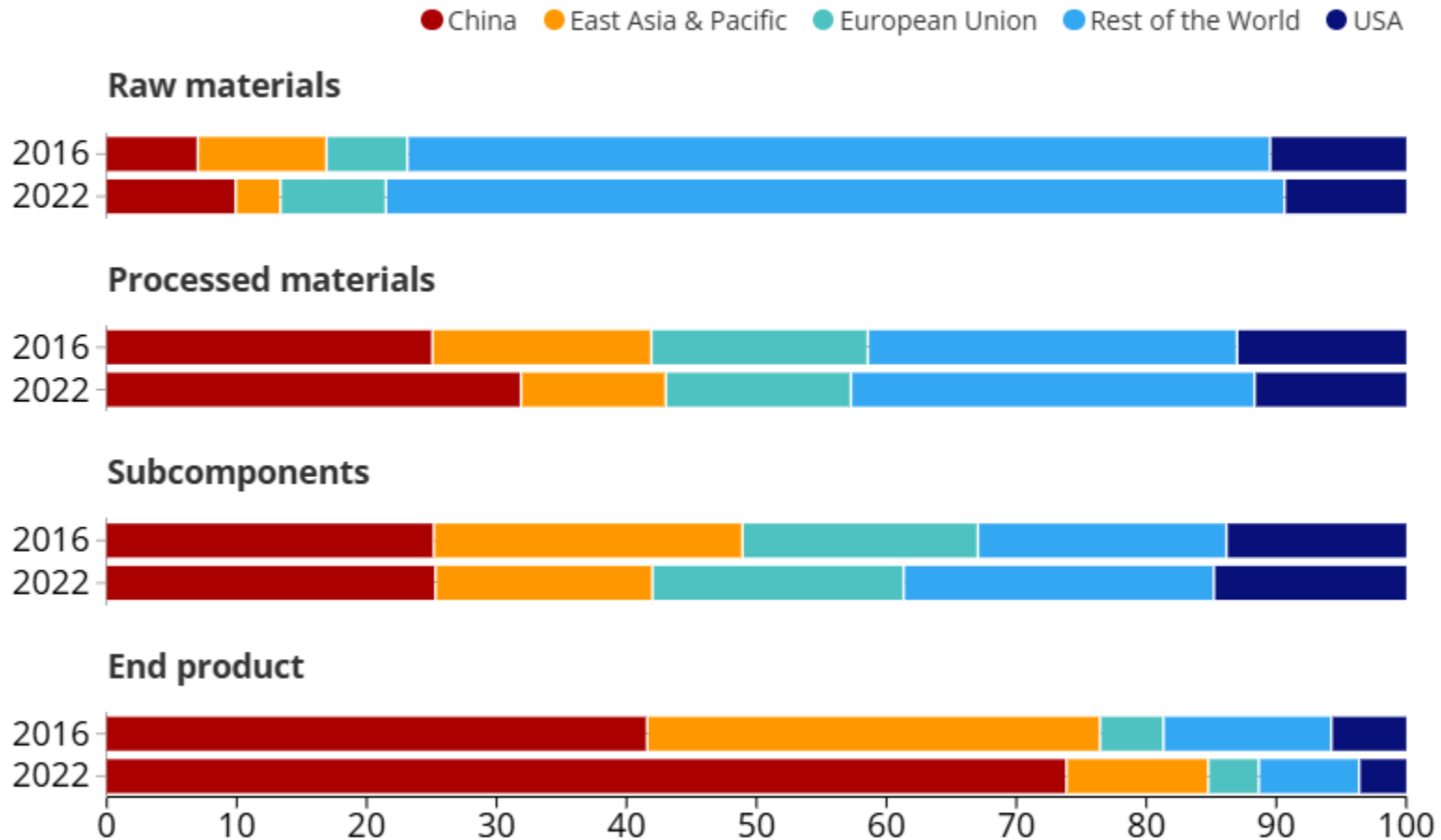


...with higher investments in renewable power than the rest of the world



Developing East Asian countries play an important role in clean energy supply chains, especially downstream

Share of exports of solar Photovoltaics (PV) by stage of value chain

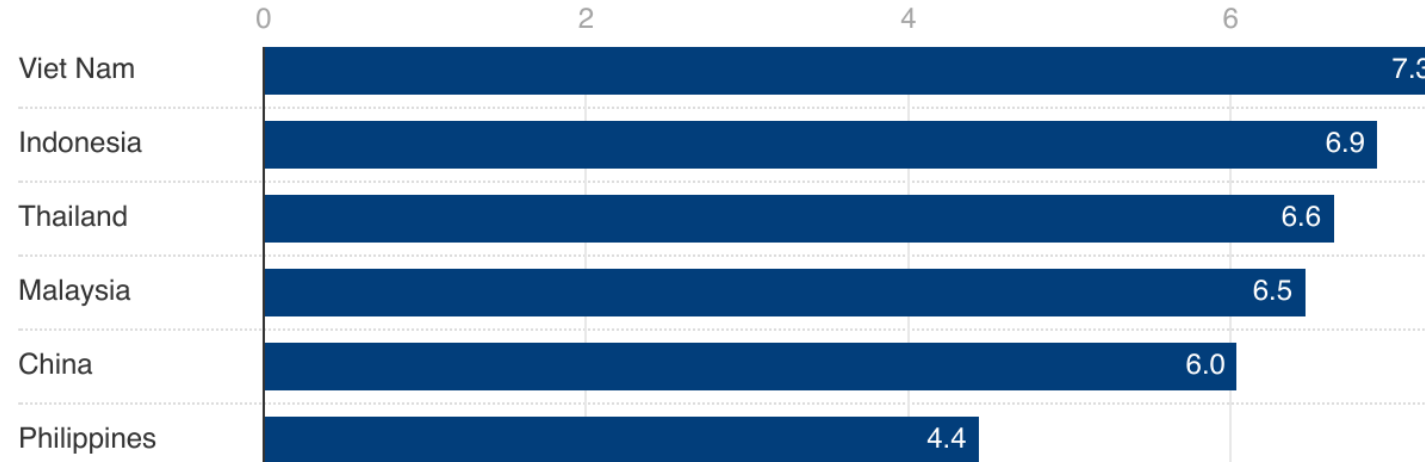


Policy distortions

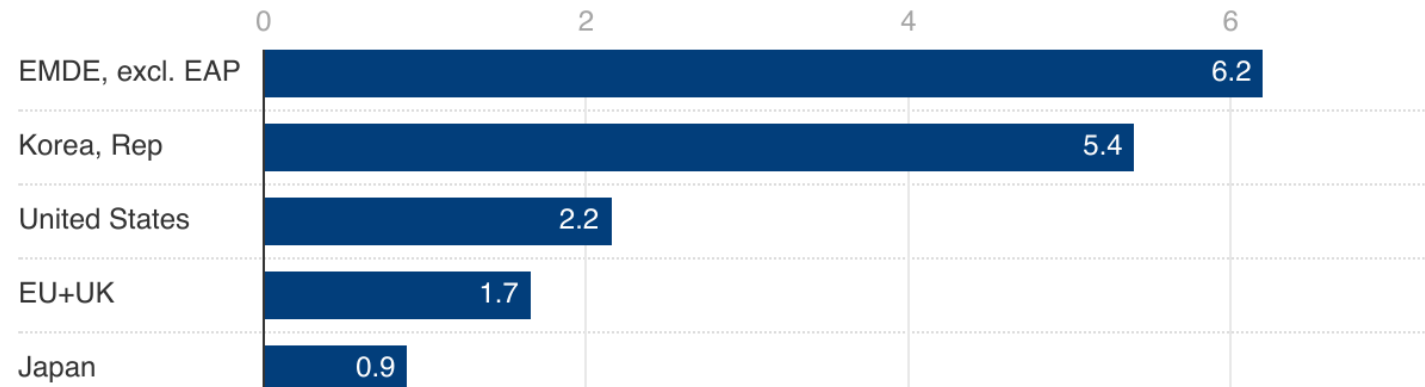
But many developing EAP countries restrict trade in green products

Average applied tariffs on green goods (%), selected countries, 2021

Developing EAP countries



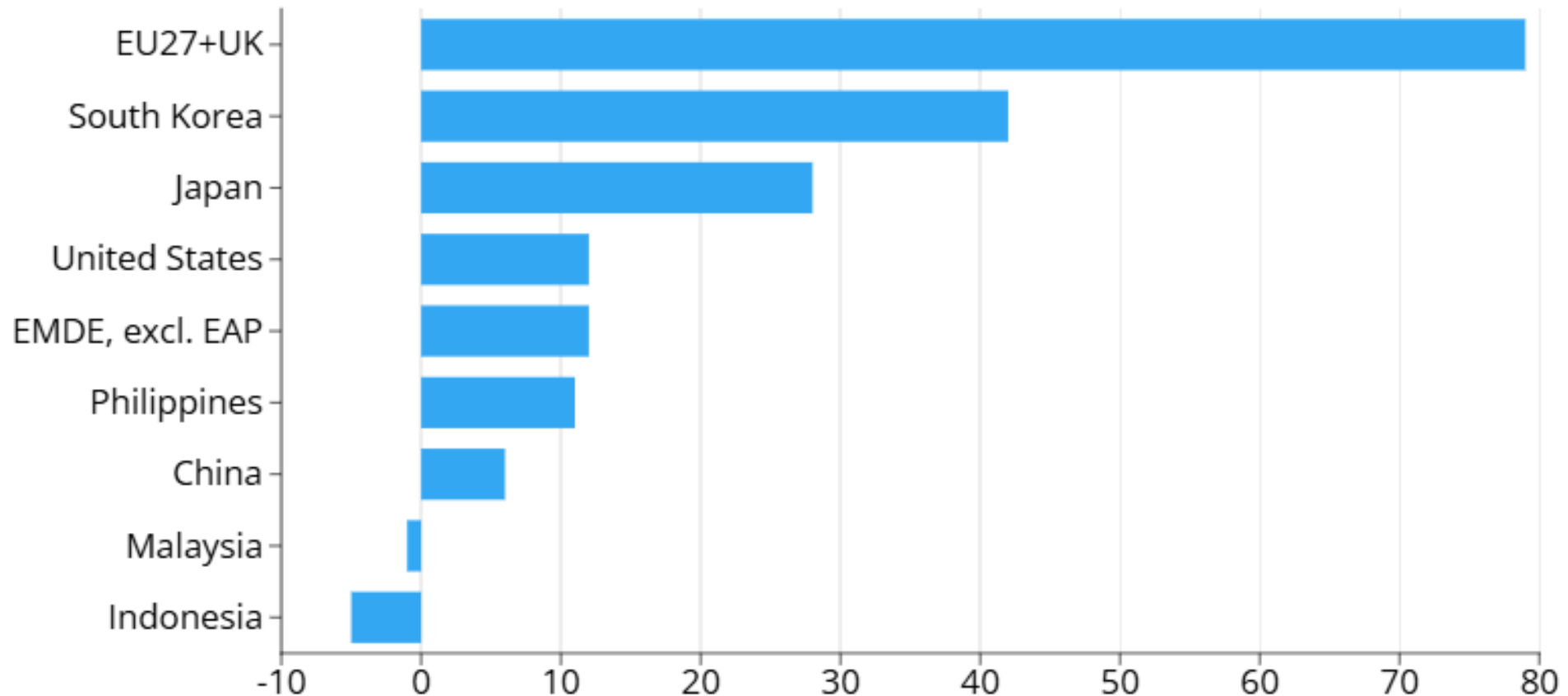
Other countries or regions



Policy distortions

And maintain policies that inhibit the domestic deployment of cleaner technologies

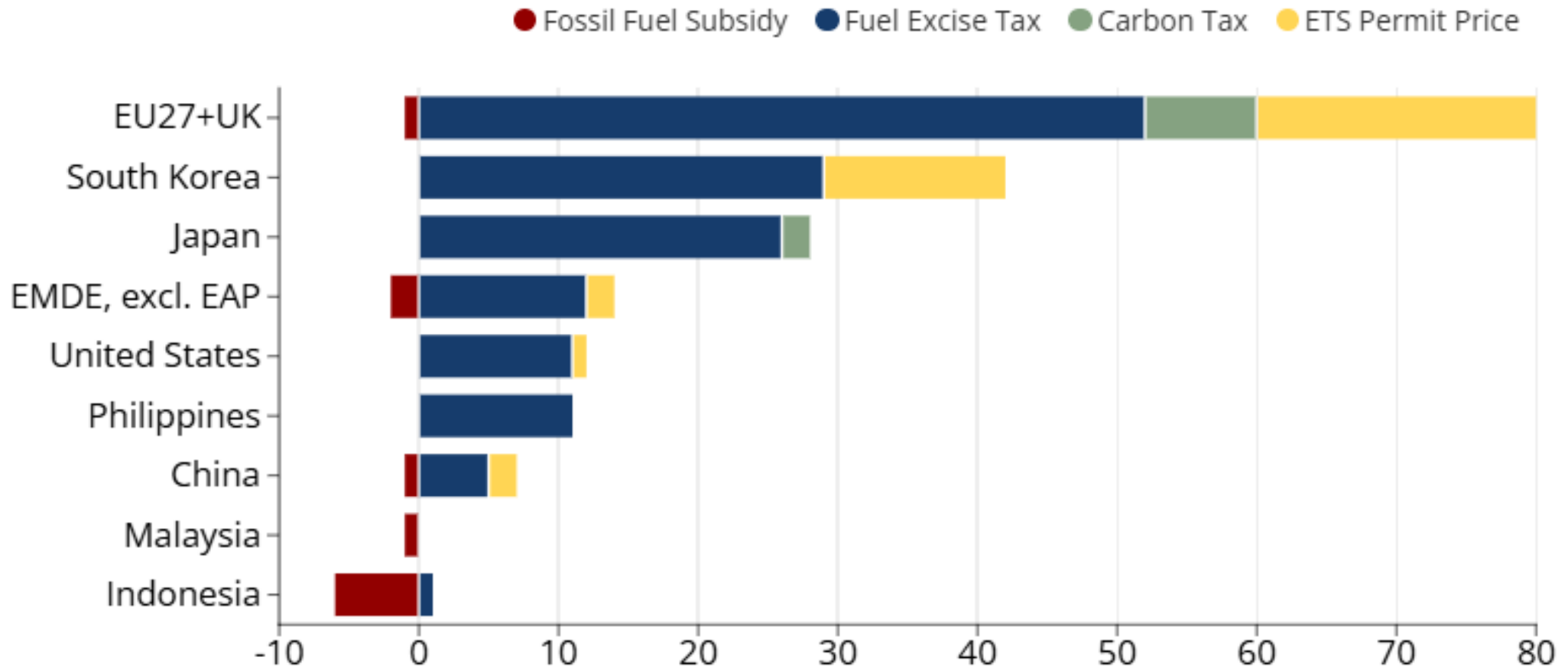
Net effect carbon rate (€ per tCO₂e)



Policy distortions

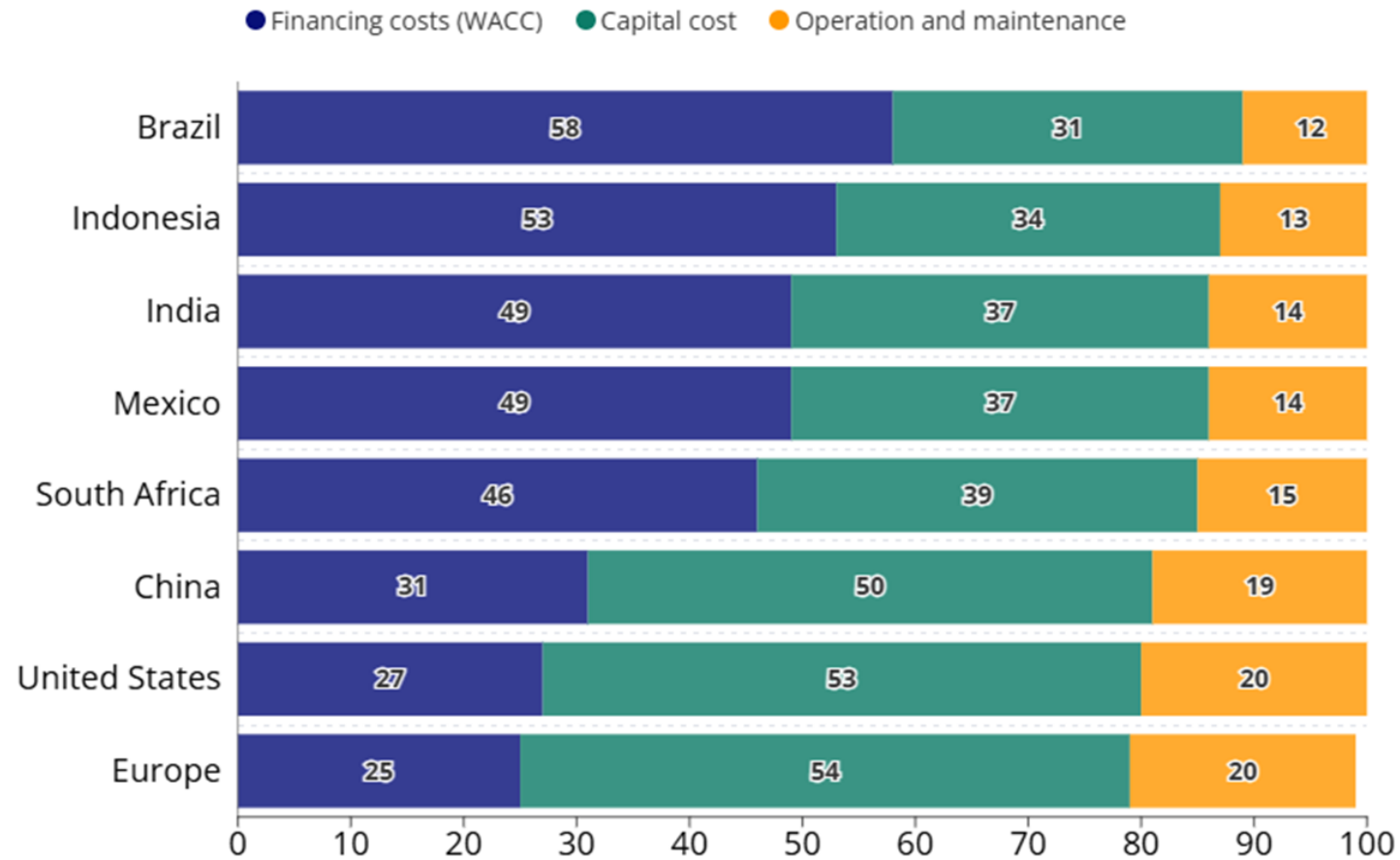
...especially fossil fuel subsidies in several countries

Effective carbon rate (€ per tCO₂e)



Developing countries face relatively high financing costs for renewables

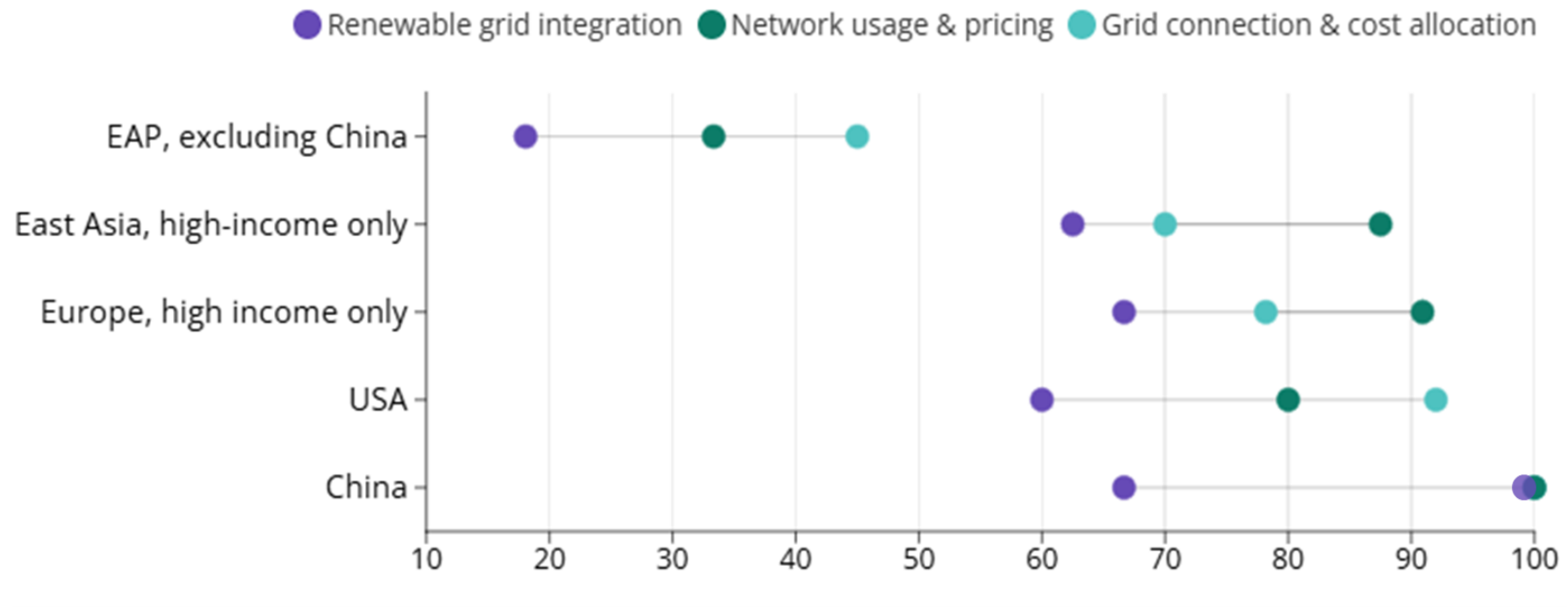
Share of levelized cost of electricity (%), 2021



Market failures

Limited progress has been made to improve access to green public infrastructure and address coordination problems

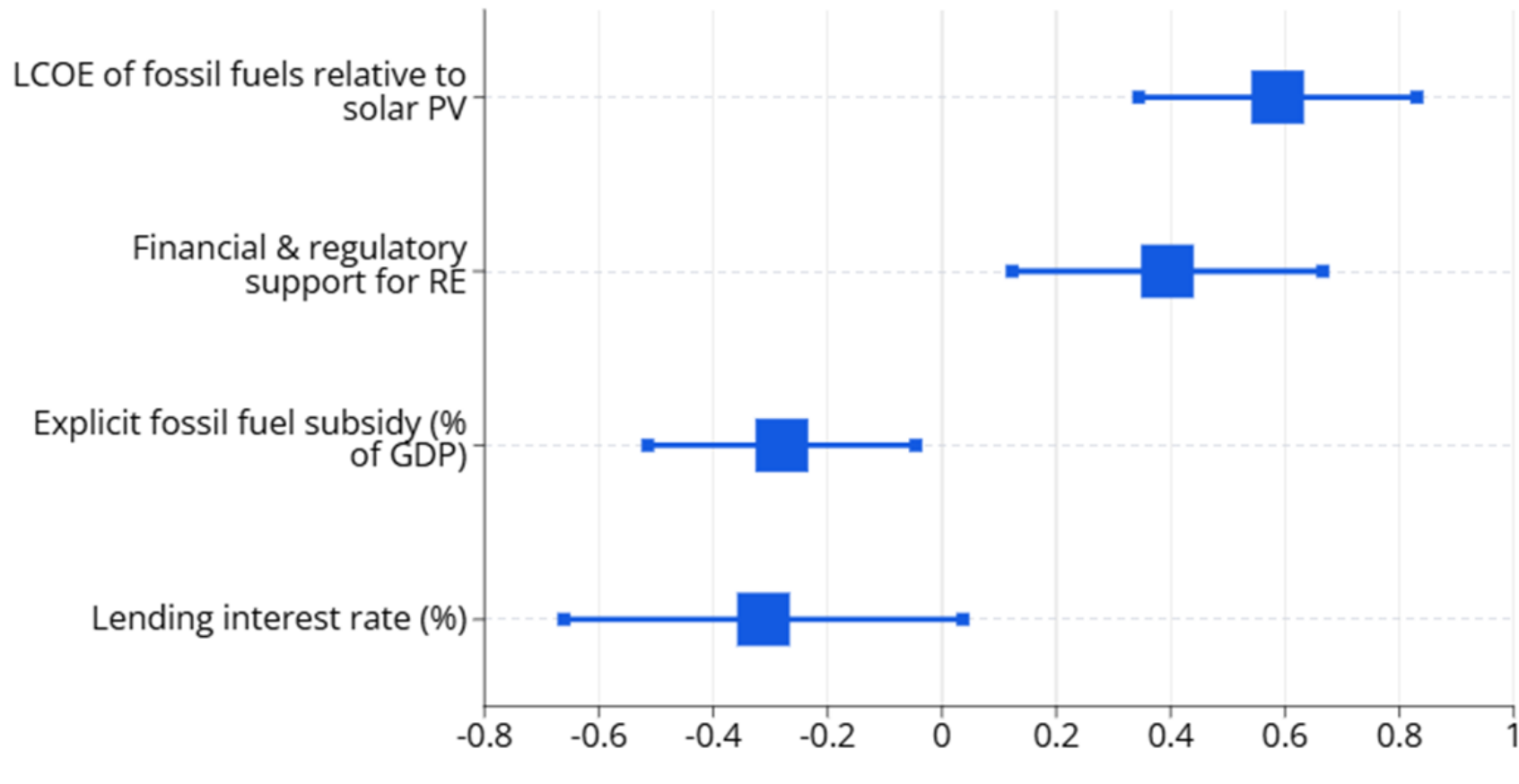
Regulatory score for renewable energy integration planning and incentives, 2021
Benchmarking score, 100 = best practice



4. What needs to be done?

Adoption is influenced by viability of technologies, as well as policy support and distortions

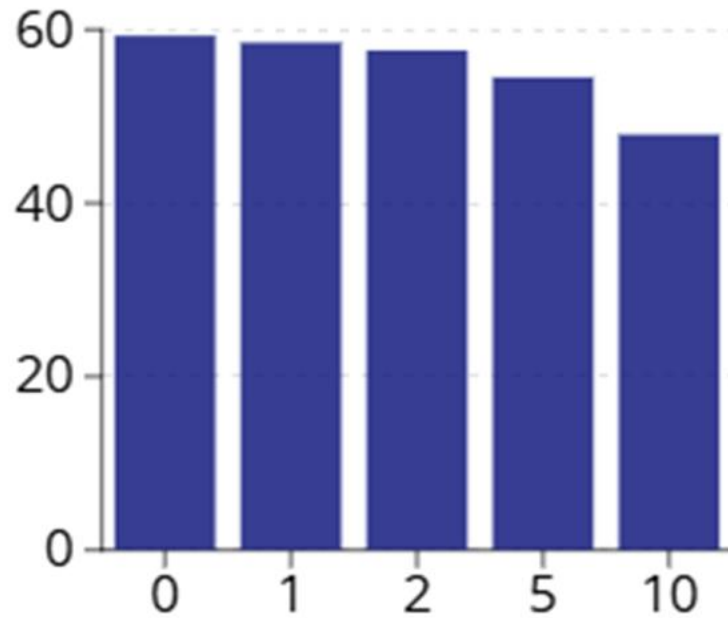
Marginal effect of 1 SD change on solar PV penetration (% of total electricity generation)



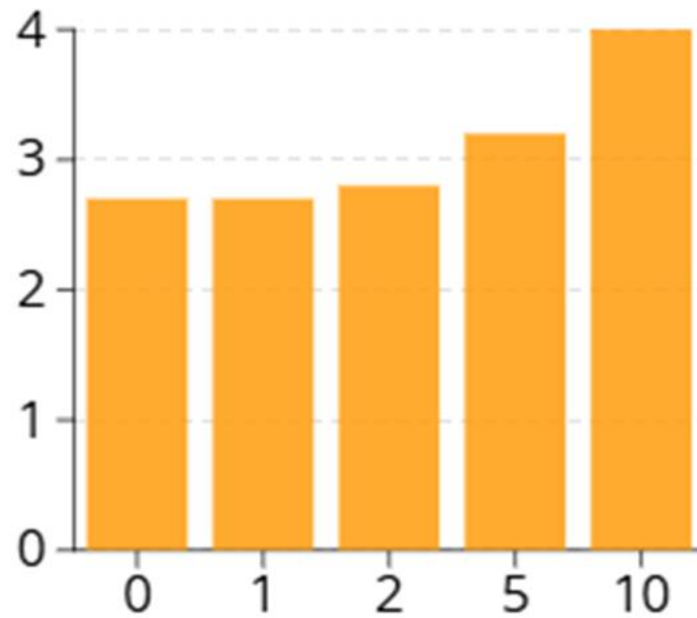
The first step is eliminating policy biases favoring fossil fuels

Effect of shortening coal plants' lifetime in Indonesia

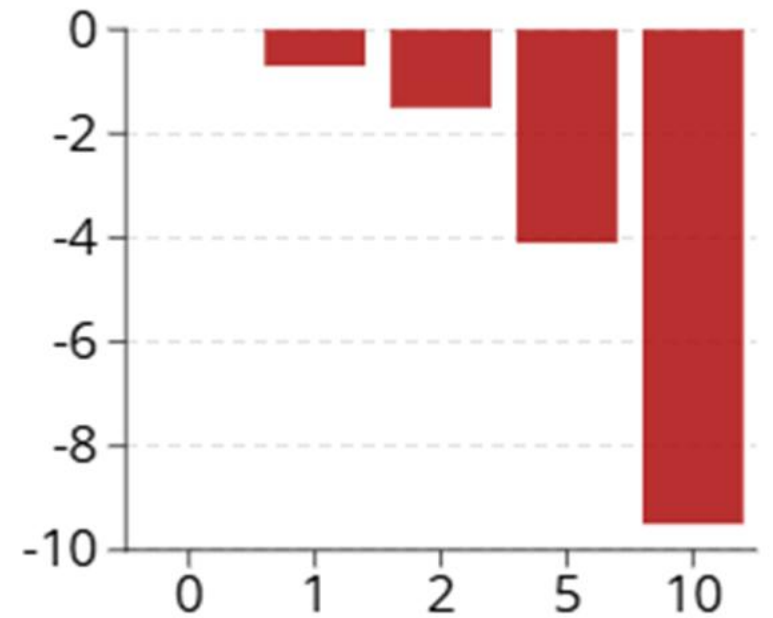
Coal share in 2050 (%)



Solar Share in 2050 (%)

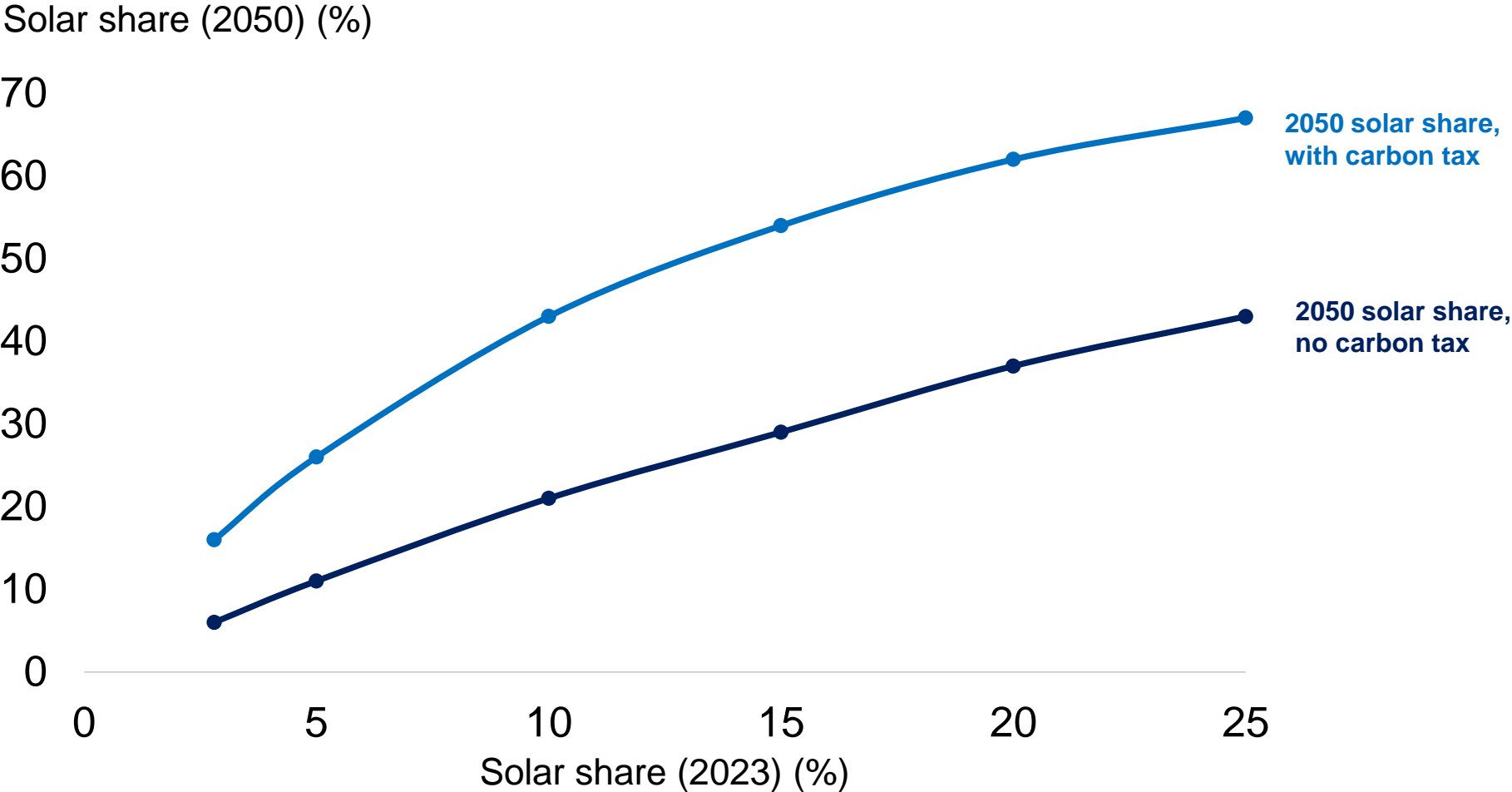


CO2 Reduction in 2050 (% from Baseline)



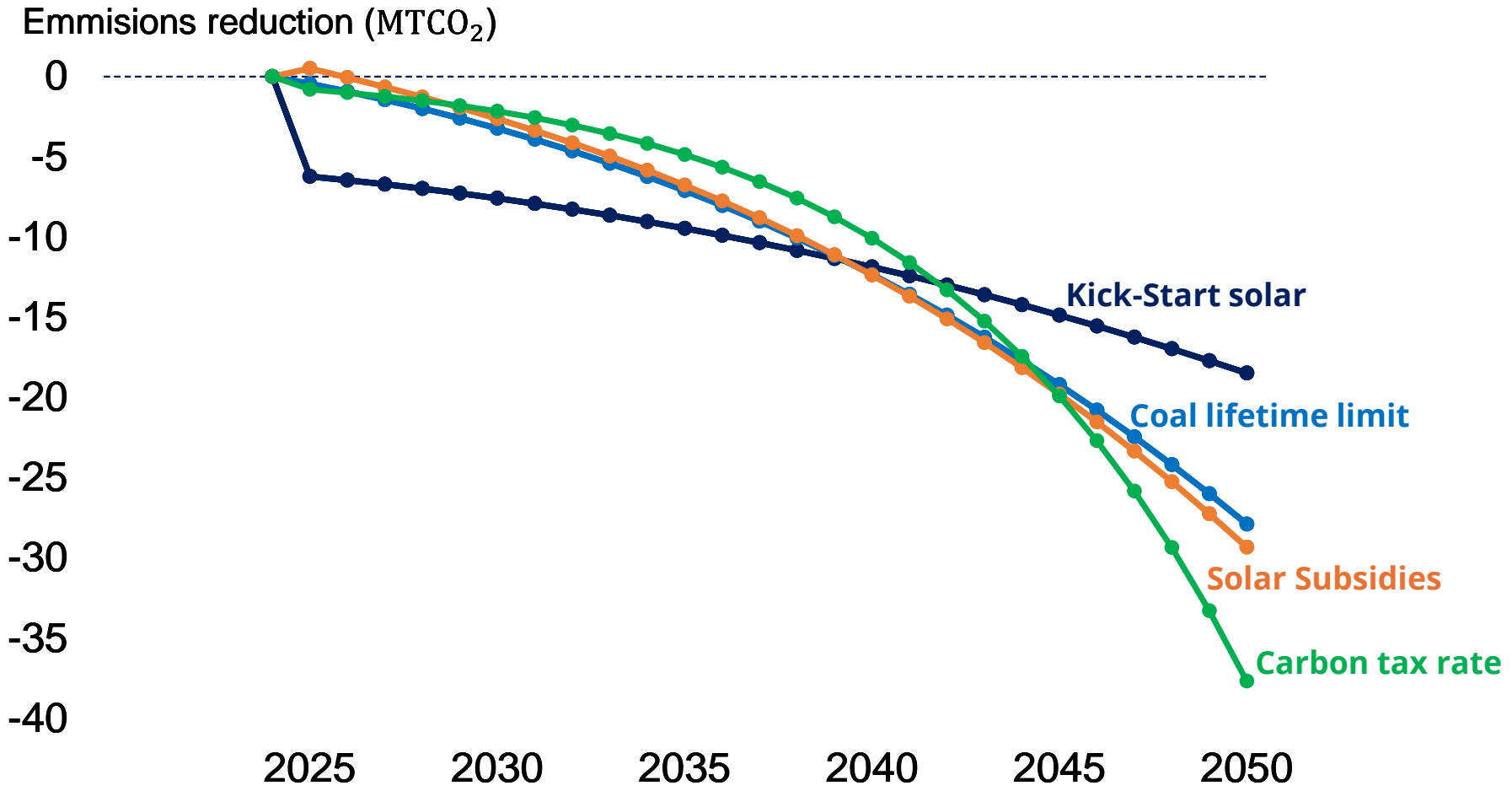
Action to remedy market failures – e.g. in creating green grids – will increase the efficacy of fiscal instruments

Effect of a carbon tax with different starting solar shares in Thailand



Other policy instruments can generate the same level of aggregate emission reductions, with different time paths

Emission paths from a solar mandate, coal plant lifetime limit, solar subsidies, and carbon tax in Vietnam



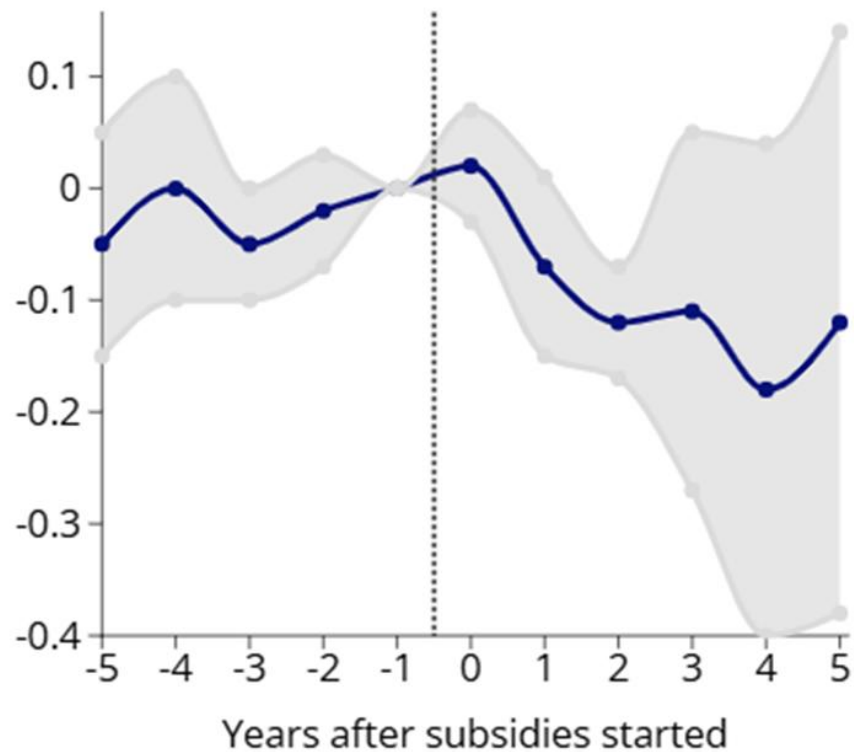
But the burden across stakeholders differs, affecting domestic political feasibility

Policy	Brown producers	Green producers	Consumers	Government budget
Carbon tax	-	+	-	+
Solar subsidies	-	+	+	-
Green standards	-	+/-	+/	-
Coal early retirement	-	+	-	+/-

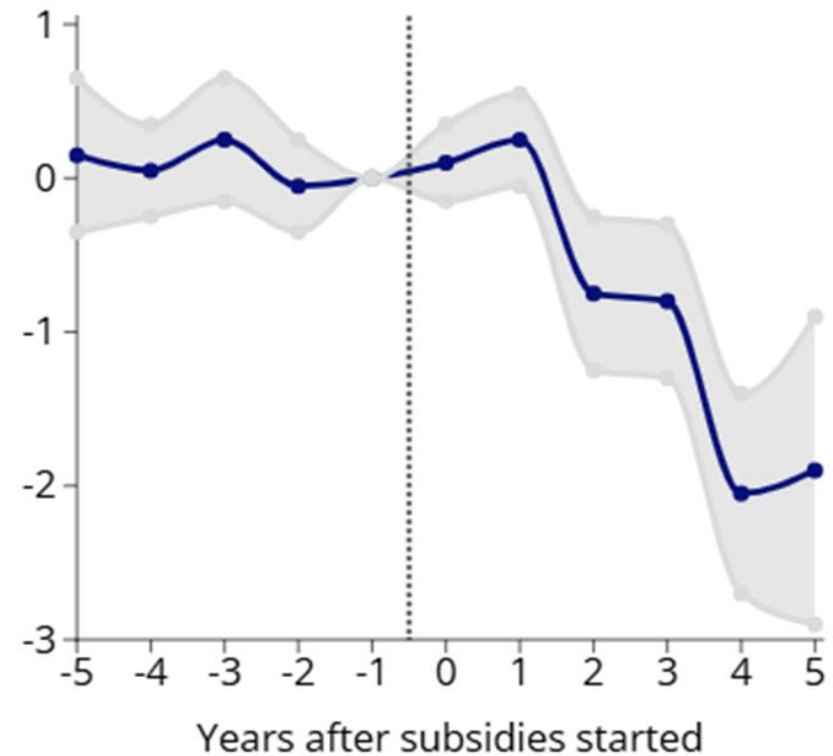
While global green industrial subsidies are helping to reduce the prices of green goods...

Effect of subsidies on unit cost of imported green goods

China



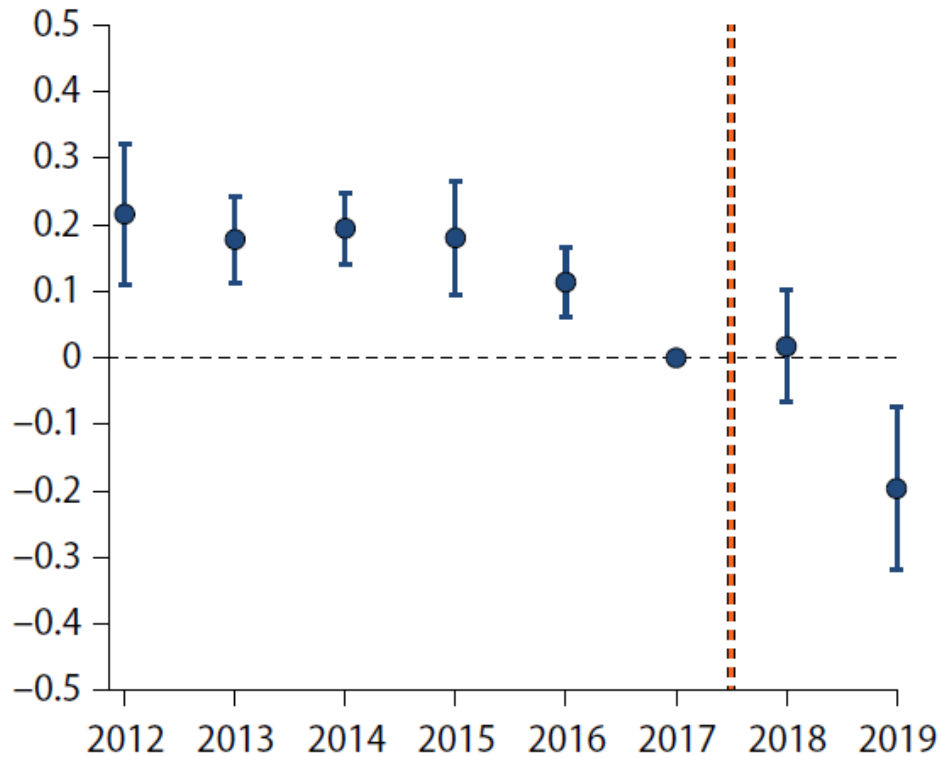
Global subsidies



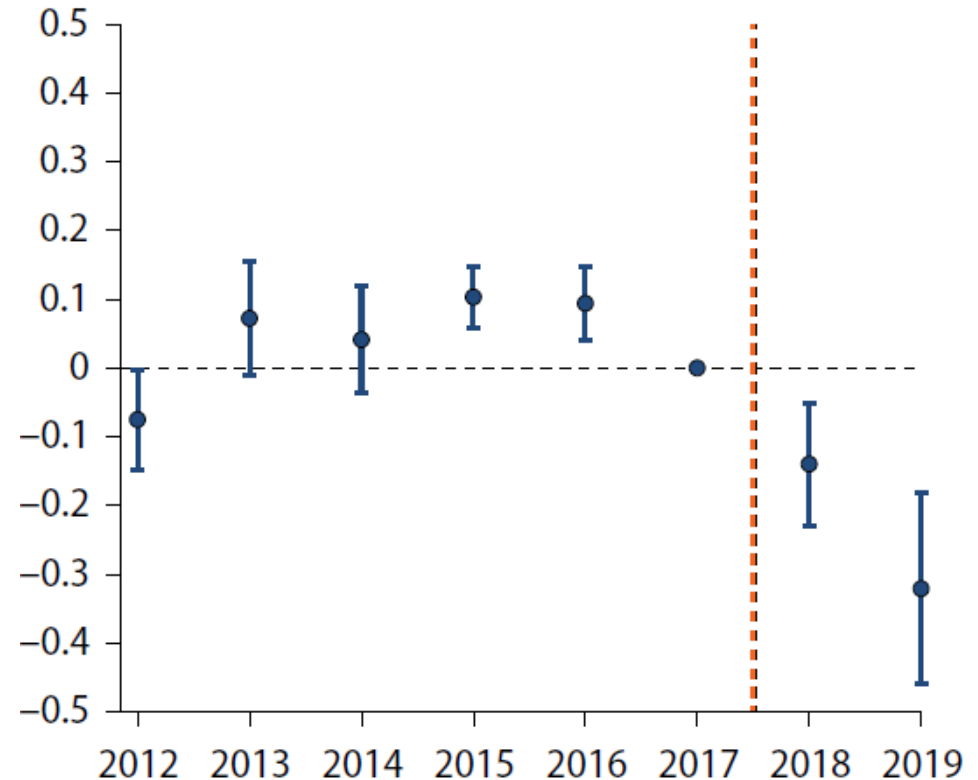
... the resulting tensions can provoke innovation-inhibiting policy restrictions

Predicted differences in high tech patents

Chinese firms



US firms



Three policy actions in order of priority

- Do no harm: *eliminate distortionary policies*
- Start doing good: *address domestic market failures*
- Conditional on action by the rest of the world:
 - *Induce the adoption of non-viable technologies*
 - *Enhance the viability of green technologies*

Thank you for joining us

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