



Powering Up the Global South

The cleantech path to growth

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Executive Summary

Global South countries are deploying cleantech rapidly, and will continue to do so as their path to growth.

The Global South needs energy. Across Africa, Latin America, South Asia and Southeast Asia, energy demand per person is only 32 GJ per year, a fifth of the amount in the Global North, and 41% of people live in countries where electricity demand per person is below the global energy minimum of 1 MWh/y.

The Global South lacks fossil fuels. With 60% of the global population, the Global South has only 20% of fossil fuel production and reserves, and oil and gas production are in decline. As a result, it is already a net importer of fossil fuels, with India for example spending 5% of GDP on over \$150 billion of imports.

But is rich in renewables. The Global South has 70% of global renewable potential, and 50% of cleantech minerals. Their renewable resource is nearly 400 times larger than their current fossil fuel production.

Three quarters of the Global South is in the sweet spot. 73% of the Global South (by energy demand) falls under four criteria that encourage cleantech adoption: middle income or above; low energy demand per capita; fossil fuel importing or self-sufficient; and vast renewable potential.

The revolution has begun. In 2024, 87% of Global South capex on electricity generation will flow into clean energy, and the IEA expects new solar and wind capacity to increase by 60% to 77 GW. Solar and wind generation has been growing at 23% per year for the past 5 years, supplies 9% of electricity generation, and is only 5 years behind the Global North. Electrification is already at 75% of Global North levels, and growing faster.

Leaders are outpacing the Global North. One fifth of the Global South, from Brazil to Morocco, from Bangladesh to Egypt and Vietnam, has already overtaken the Global North in terms of the share of solar and wind in electricity generation, or the share of final energy from electricity.

Capex parity opens the door. The halving of solar and battery costs in 2023 means that the up-front cost of solar has fallen to the same level as fossil generation, and the purchase cost of electric vehicles is falling to below that of petrol vehicles. This encourages cleantech solutions over fossil in spite of the higher cost of capital.

Chinese supply makes change easier. China has already announced enough cleantech capacity to supply all of the demand of the Global South, and since 2023 has invested over [\\$100 billion](#) into cleantech around the world.

The revolution will continue. By 2030 the Global South is likely to increase its electricity generation from solar and wind by over four times, to above 2,000 TWh per year.

The cheapest route to growth in history. The rapid growth of renewables provides the foundation for higher levels of electricity supply, which in turn will drive growth. By 2040, total electricity supply could be up to 40% higher than business as usual.

Peak fossil fuel demand. Fossil fuel demand for electricity will peak by 2030 in the Global South, and the remaining areas of demand growth are limited as the result of ongoing electrification and efficiency. The Global South will not serve to prop up declining fossil fuel demand elsewhere.

We need to do more. Two key areas of the Global South are not yet adopting cleantech – low income countries (6% of energy demand) and fossil fuel exporters (21% of demand). But even here we see signs of change, for example in Ethiopia and Colombia.

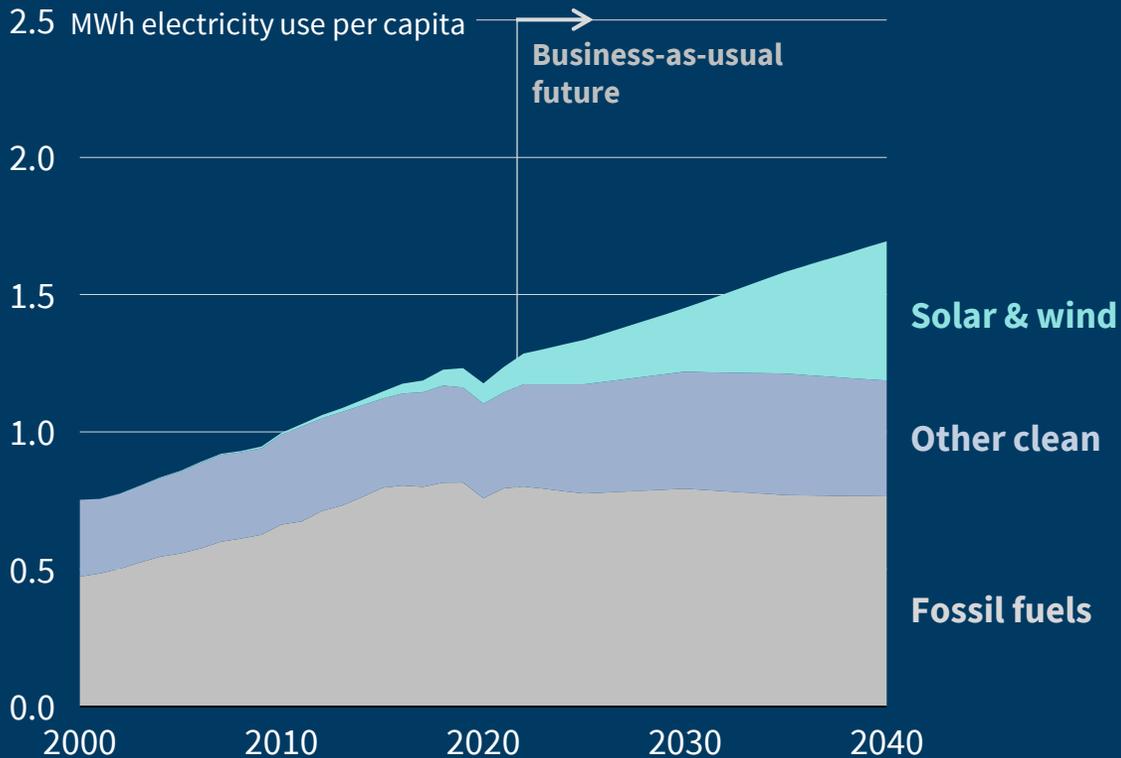
How to speed up change. Many solutions exist to speed up change including domestic policy to encourage the adoption of cleantech and attract investment, MDB reform, catalytic and concessional finance directed especially to poor and vulnerable countries, and technology transfer. As COP29 approaches, now is the time for NDCs to reflect the new economic reality of cleantech.

There are two visions of the Global South energy future

1. Business as usual

A future that looks like the **past: imported fossil fuels** bringing gradual energy supply growth and slower development

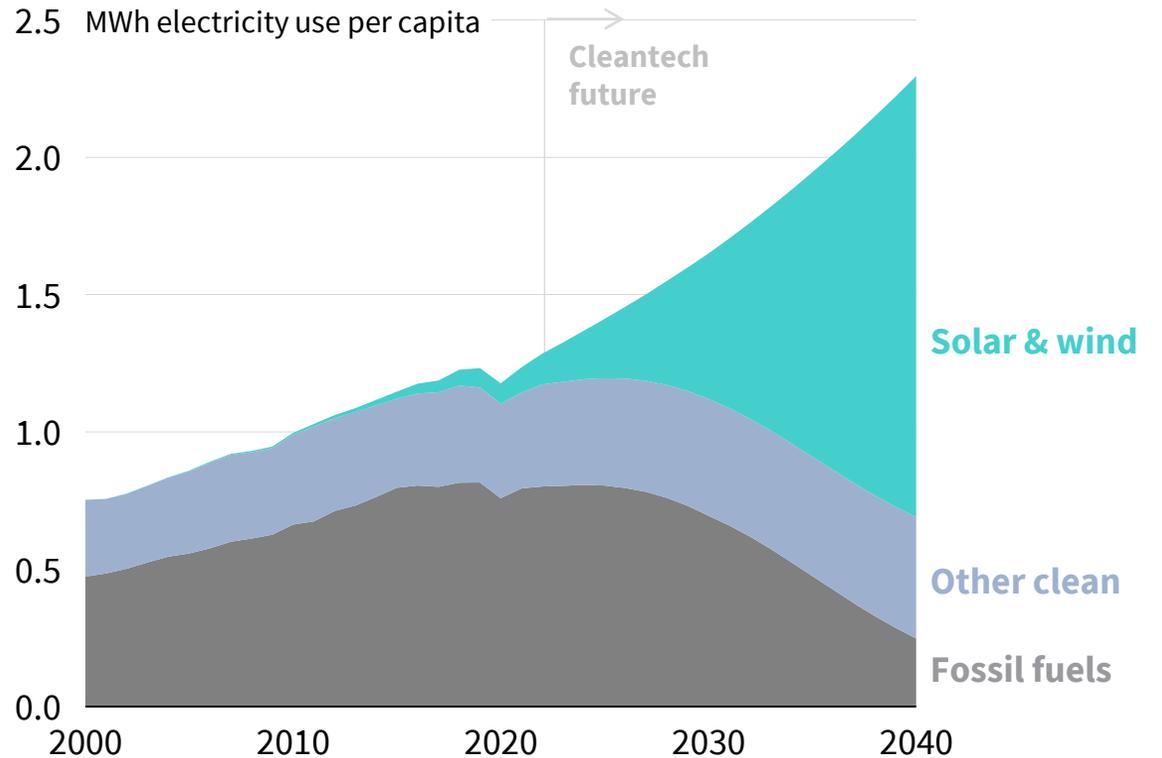
The old guard view



2. The Cleantech Revolution

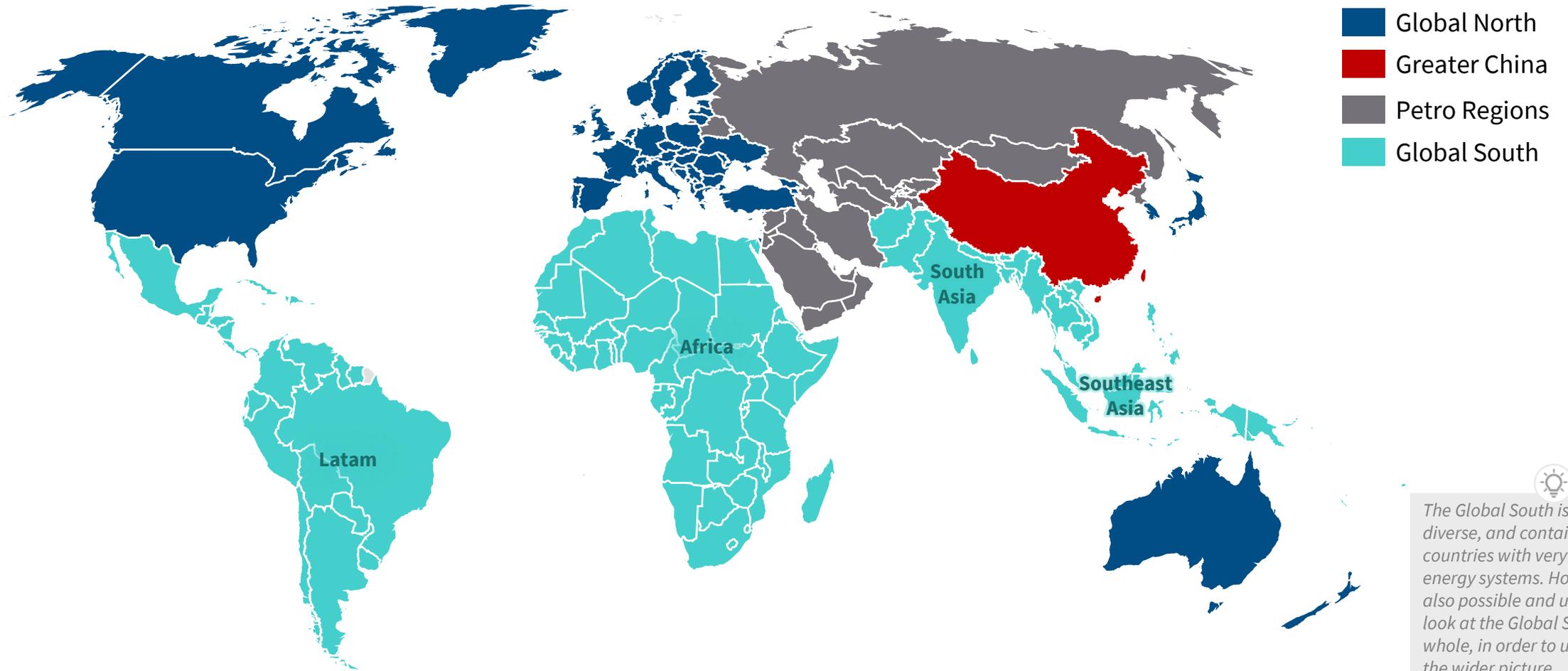
A future that embraces the most consequential energy innovation since the Industrial Revolution, to gain energy **faster, cheaper, and more securely**.

The new technology insurgent energy outlook



The Energy World in Four Parts

We split regions with high energy demand per person out of the Global South†

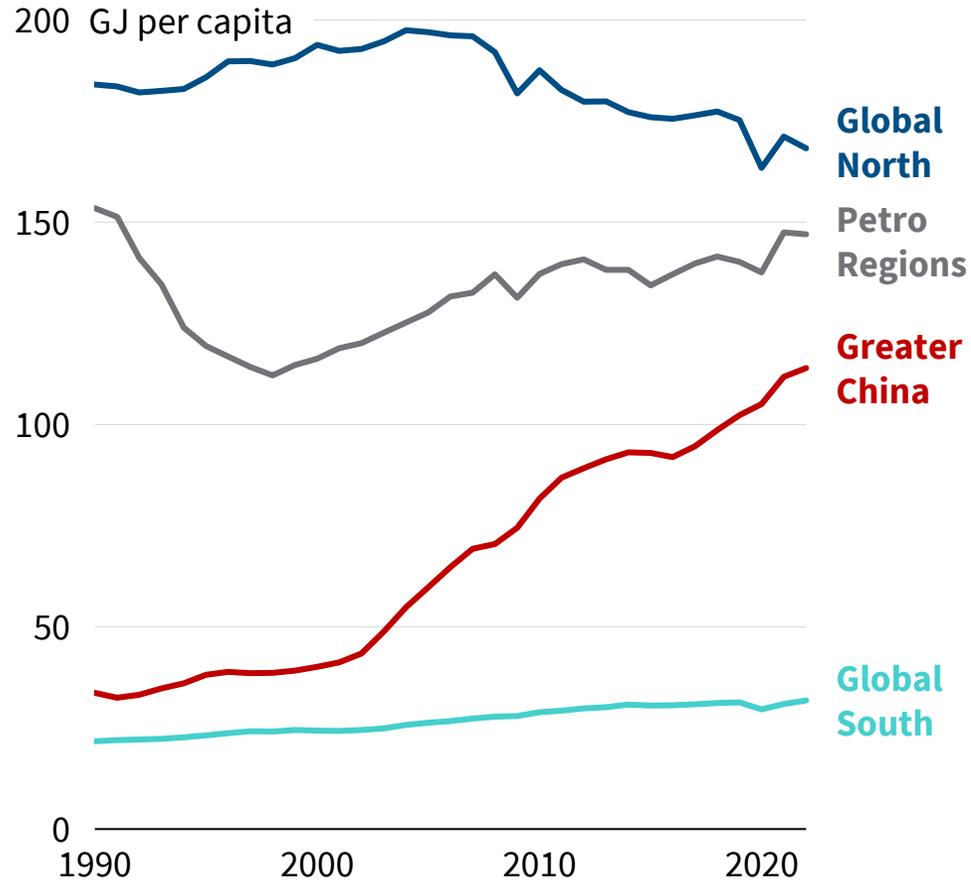


 The Global South is extremely diverse, and contains countries with very different energy systems. However, it is also possible and useful to look at the Global South as a whole, in order to understand the wider picture.

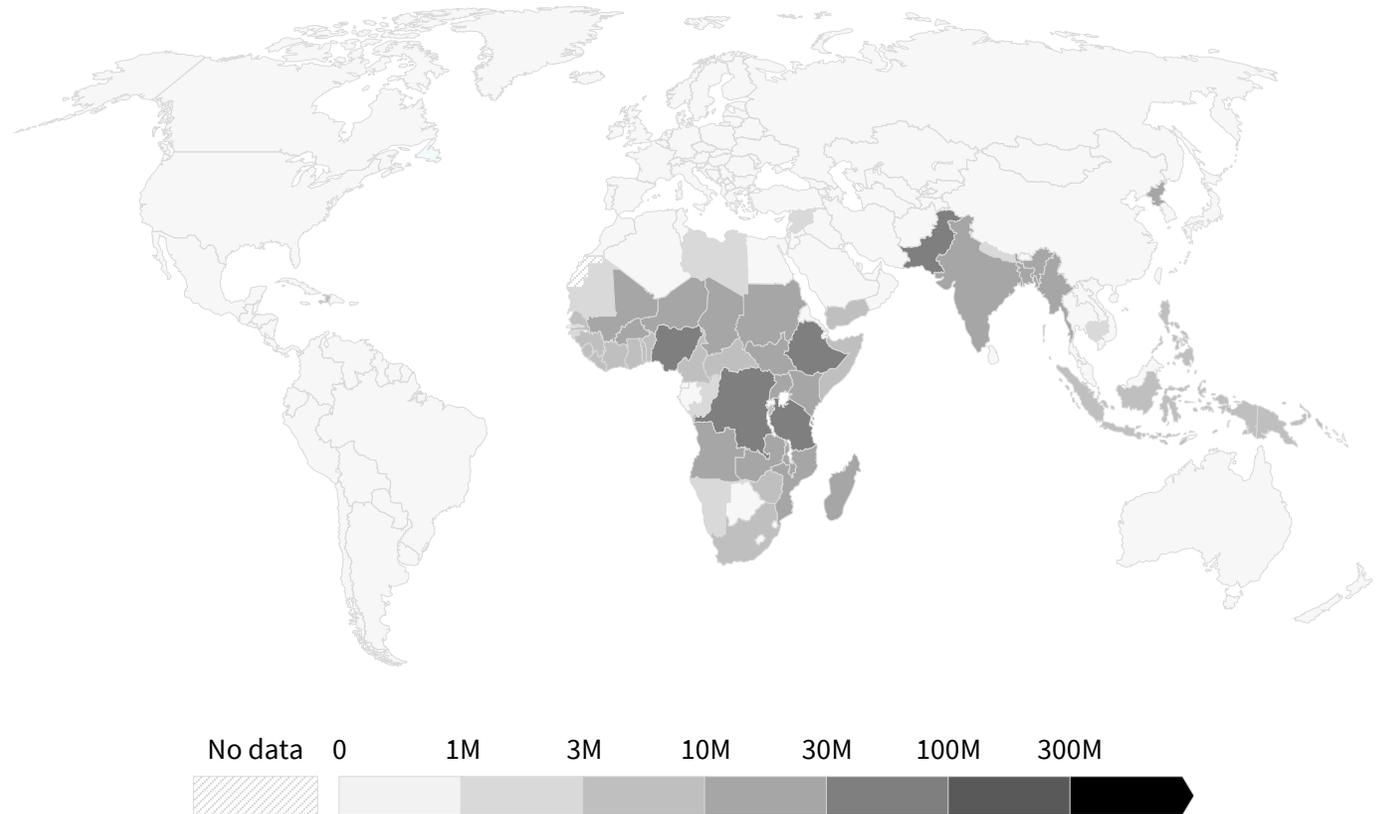
The Global South needs energy – lots of it, and fast

Energy demand per person is a fifth of the level in the Global North, and 685 million have no electricity[†]

Primary energy demand per capita



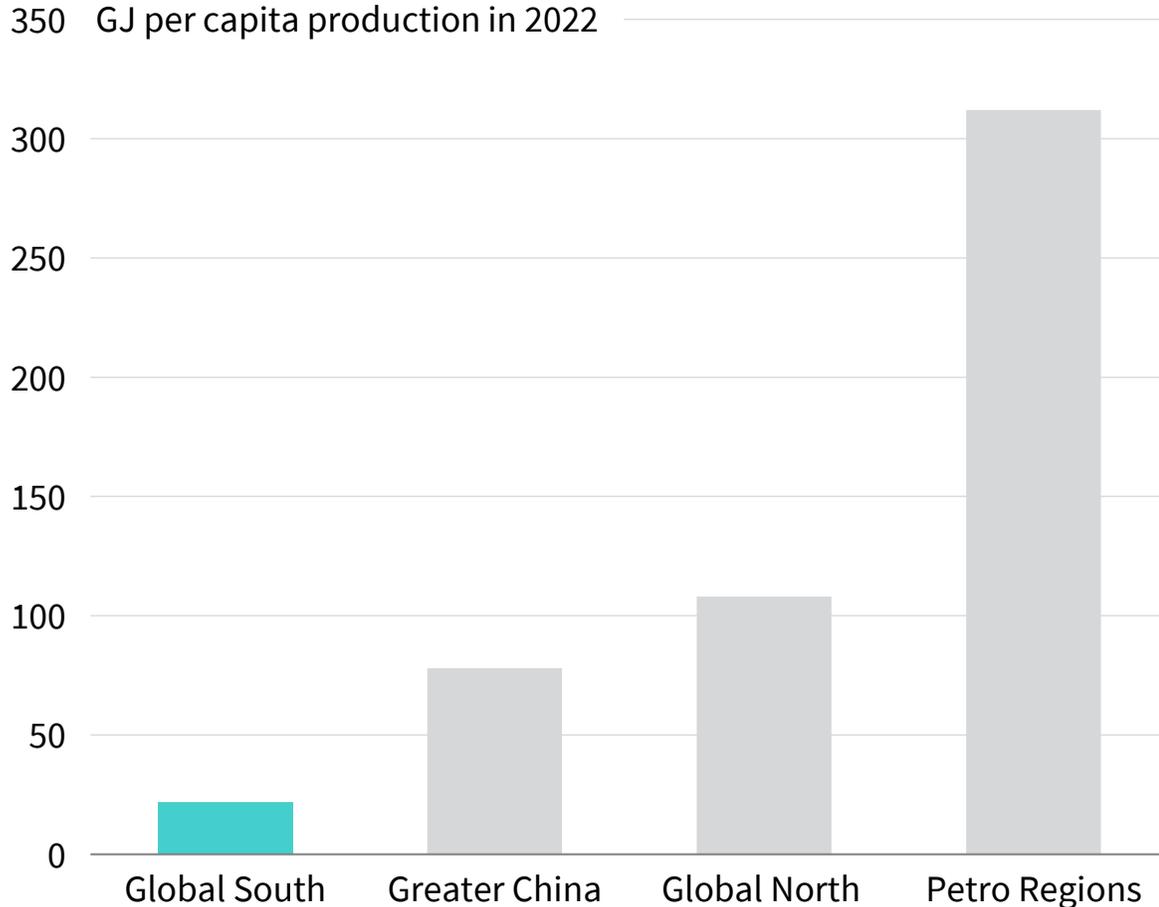
Number of people with no electricity access



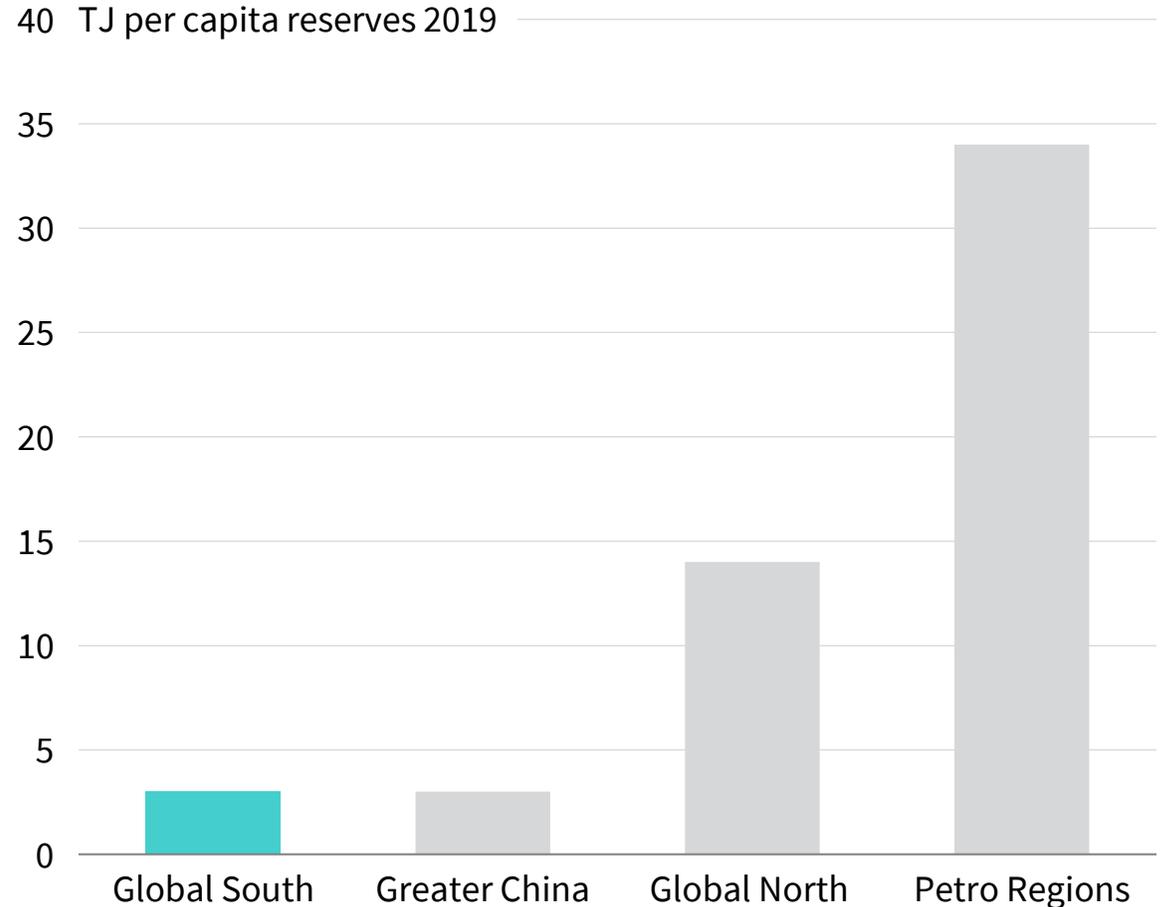
However, the Global South lacks fossil fuels

They have the lowest fossil reserves and production per person

Fossil fuel production per person



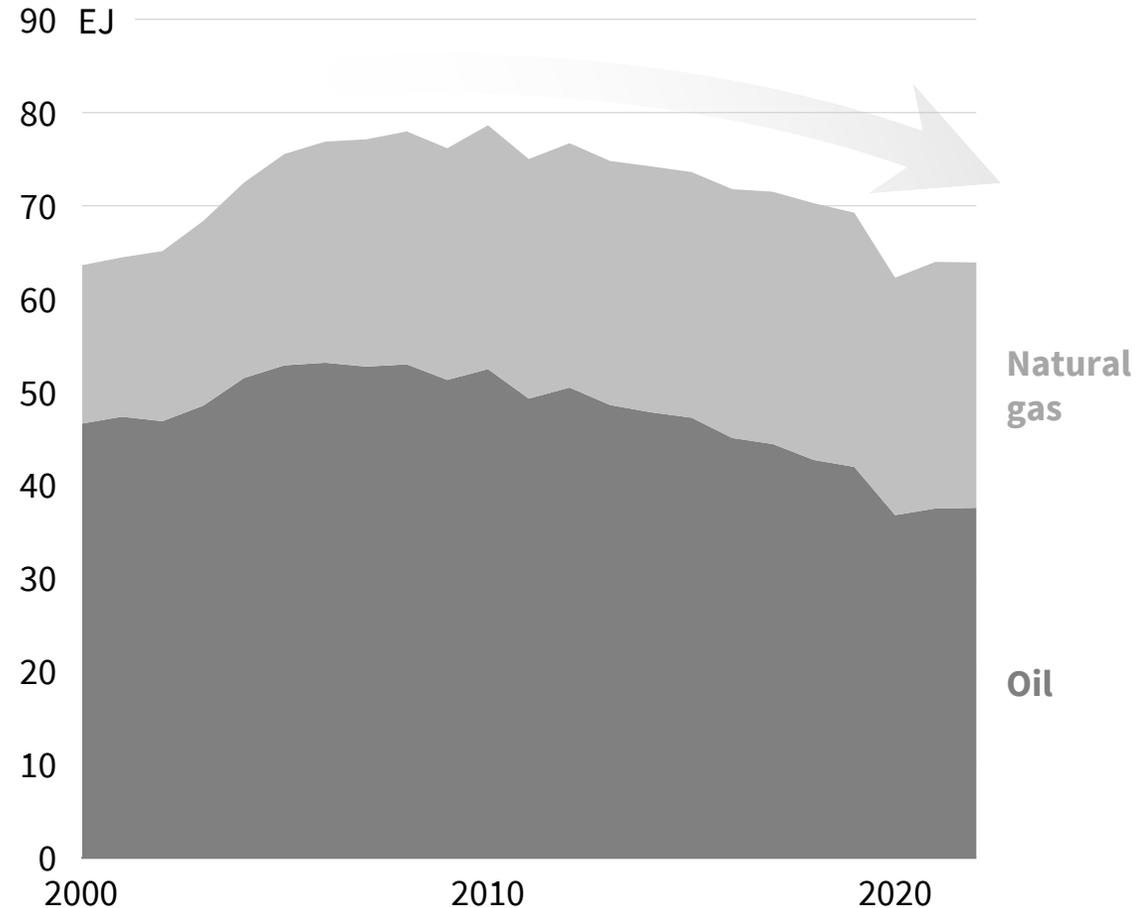
Fossil fuel reserves per person



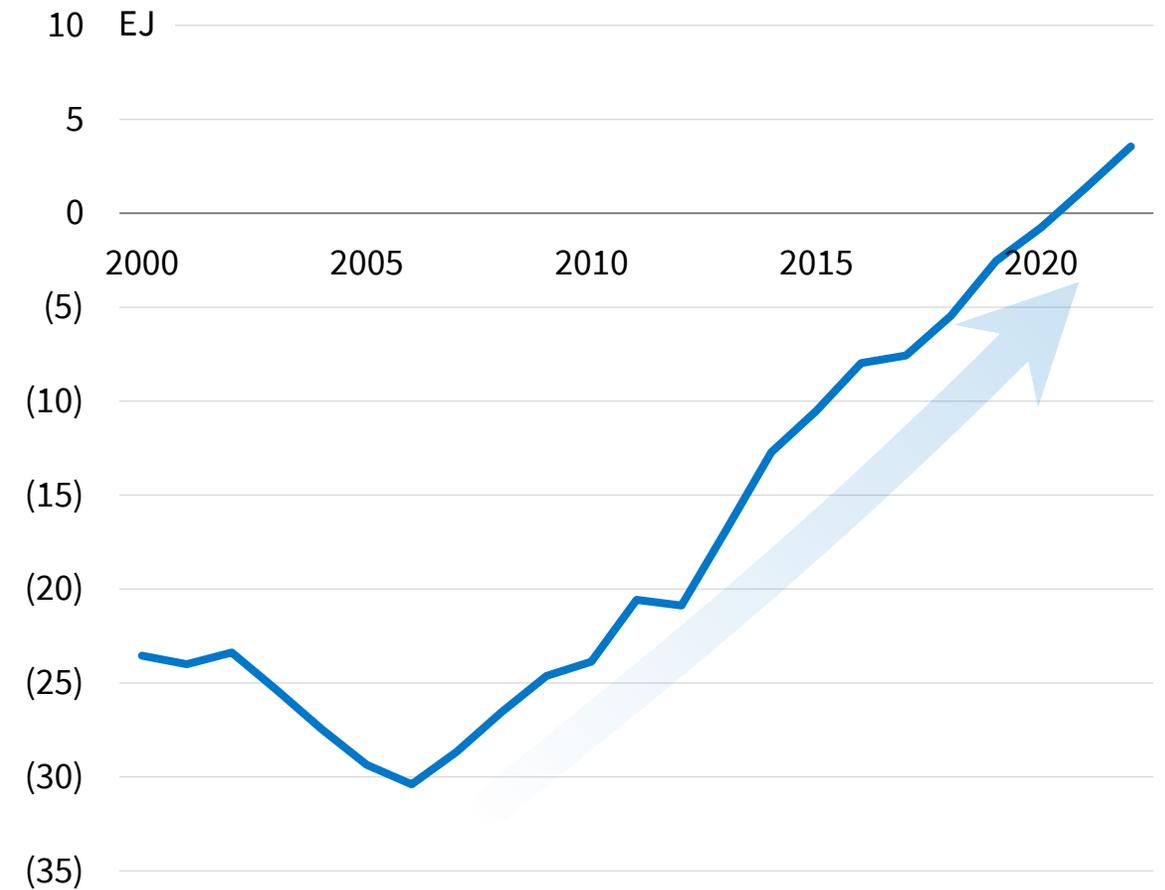
As a result, it has *already* become a net fossil fuel importer

Oil and gas production is falling, and fossil fuel imports are a rising economic burden

Global South oil and gas domestic production



Global South net fossil fuel imports (exports)

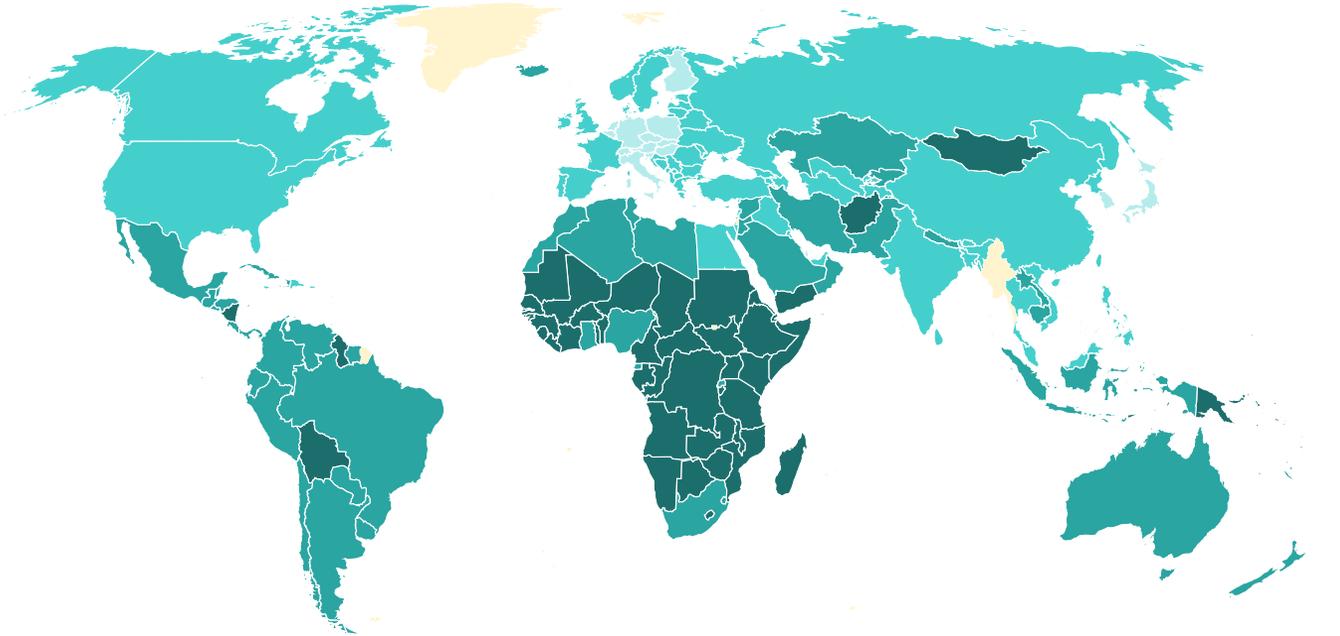


But the Global South can be a renewable superpower

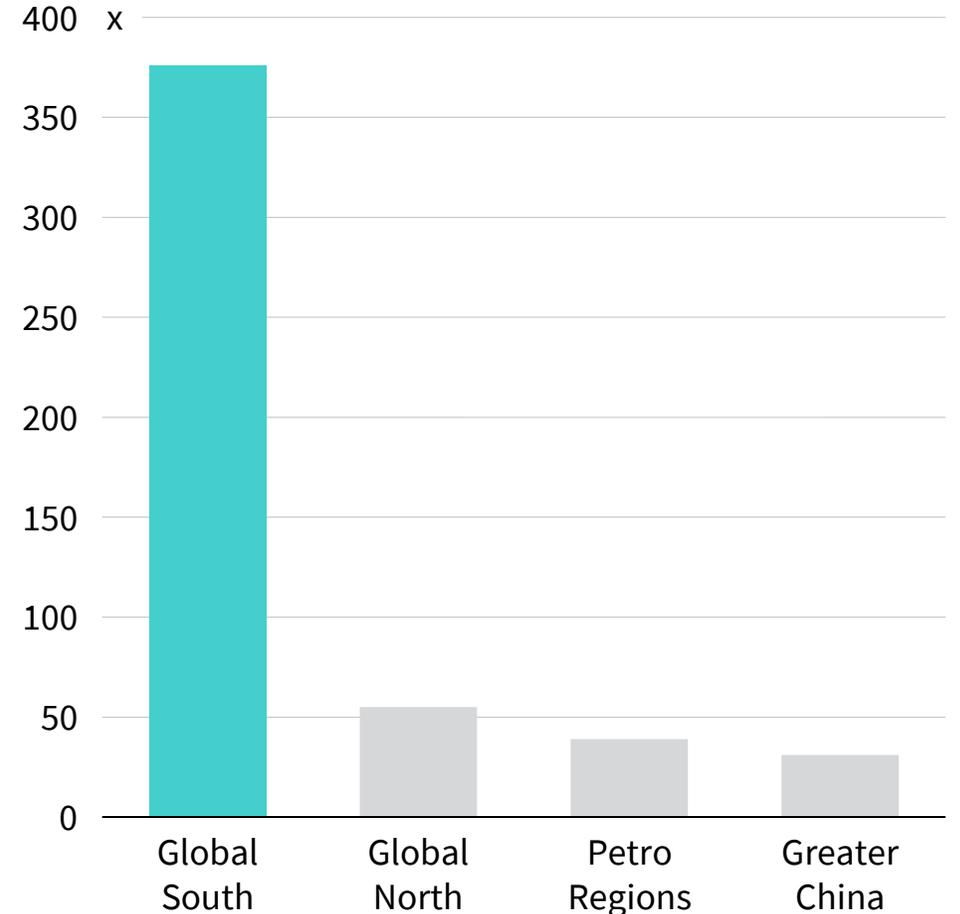
The Global South controls 70% of global solar and wind resources and 50% of critical minerals

Solar and wind potential as a multiple of current energy demand

Superabundant: >1,000x Abundant: >100x Replete: >10x Stretched: <10x No data



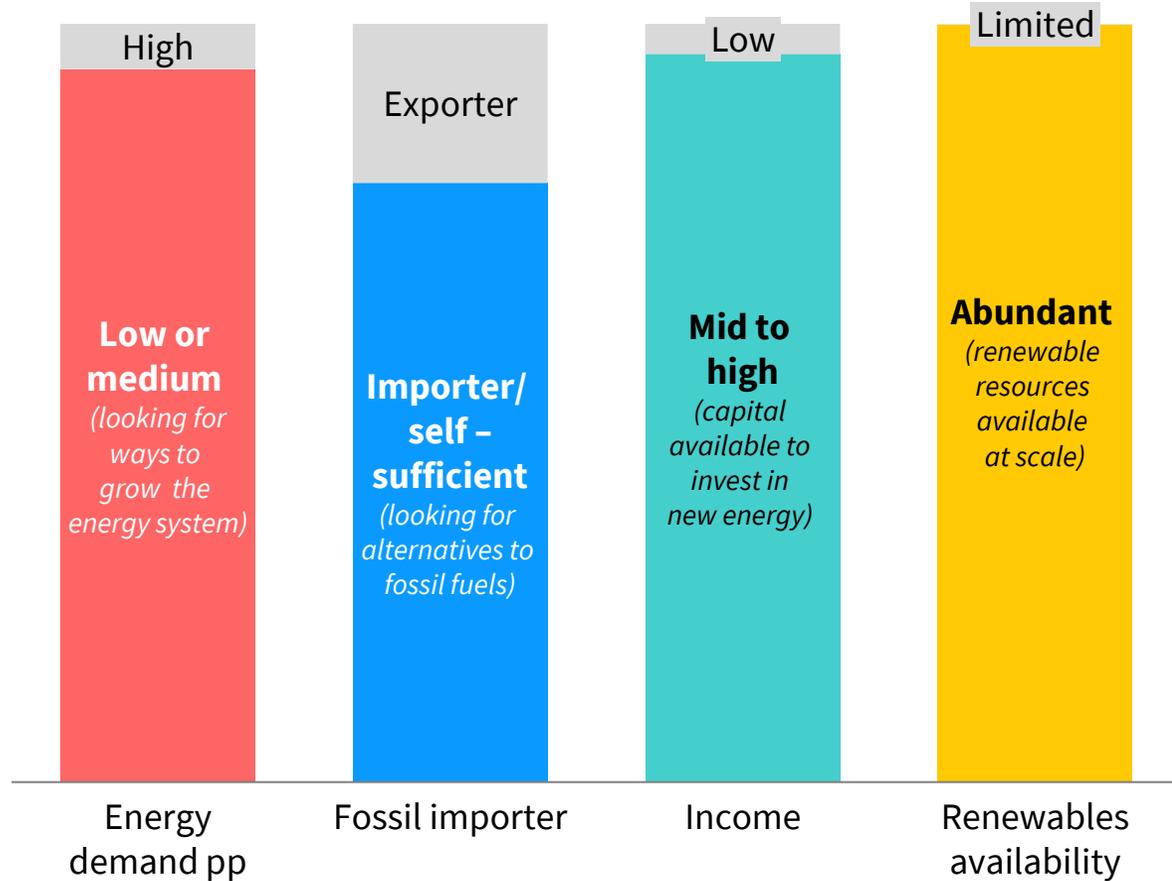
Solar and wind potential multiple of fossil production



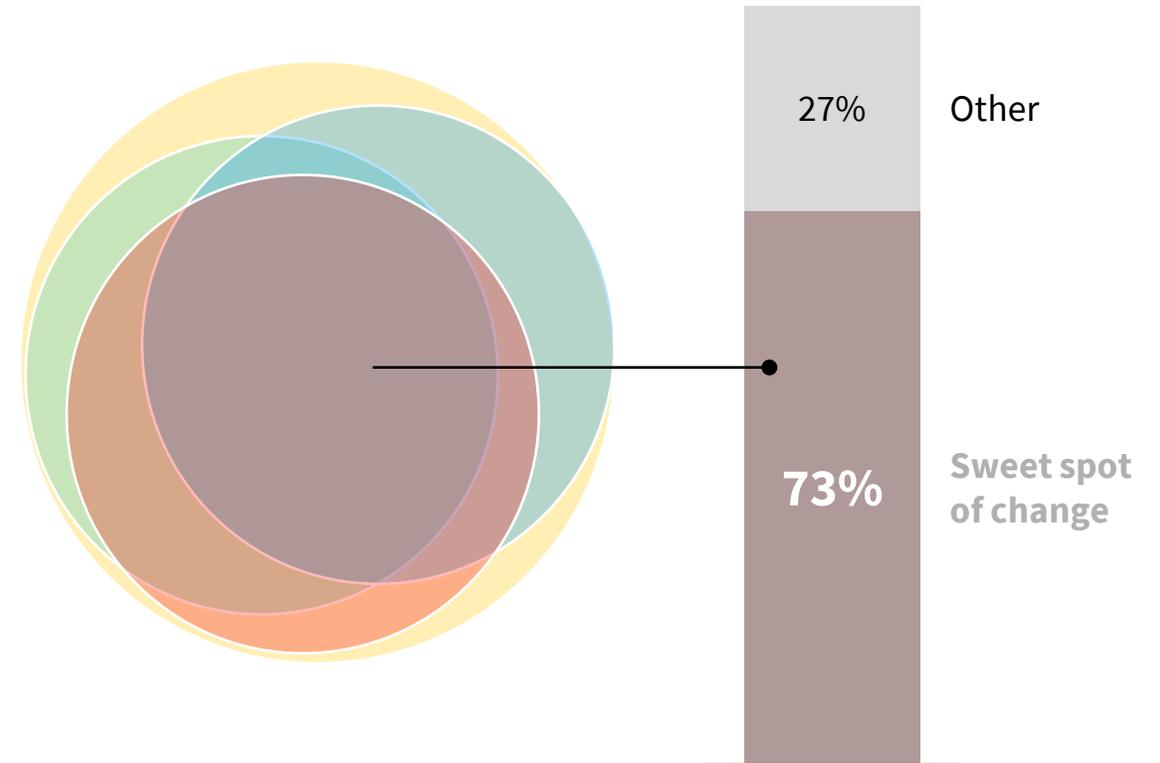
Three quarters of Global South countries are in the sweet spot of change

Low or medium energy demand pp, limited fossil fuels, middle income or higher, and abundant renewables

Share of Global South energy demand cut four ways, %EJ



The sweet spot of change, %EJ

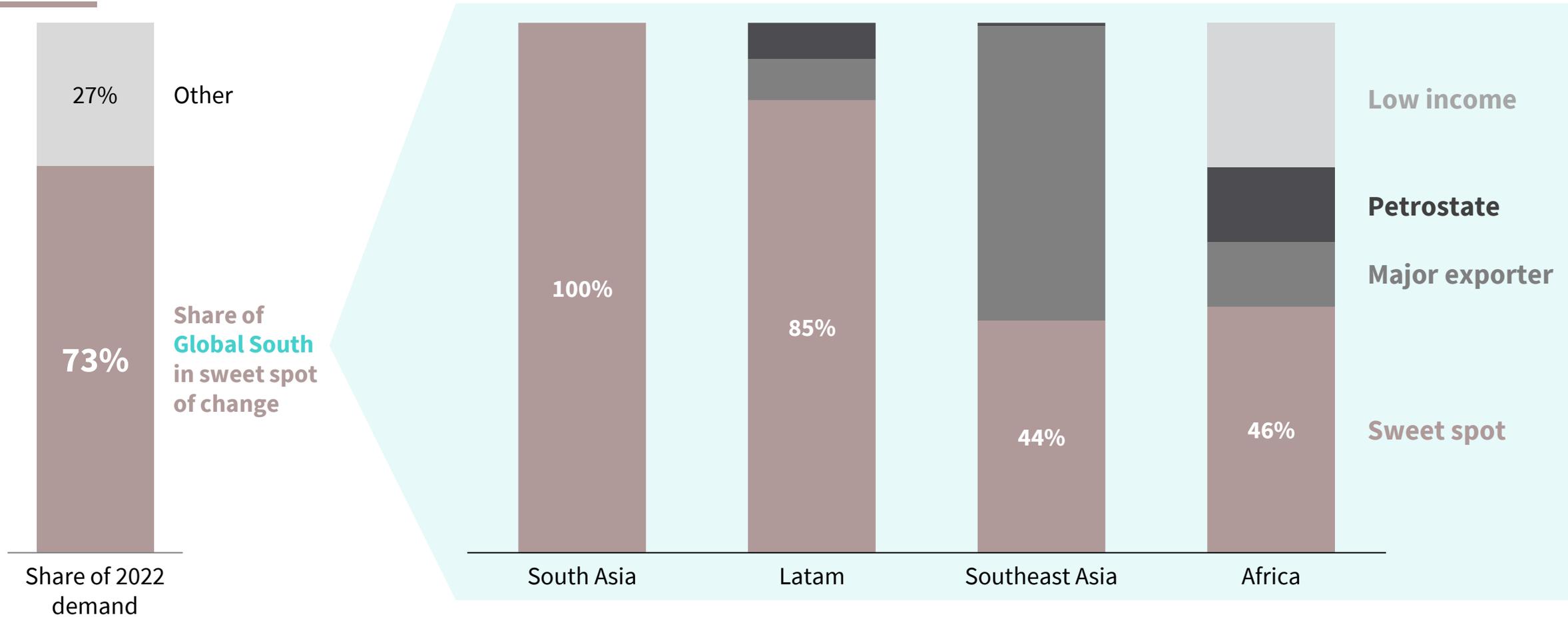


Sweet spot of change means: lower middle income or higher (most low-income countries are not yet embracing renewables); self-sufficient in fossil fuels or an importer (most major exporters and petrostates are not yet embracing renewables); low energy demand per person (which implies the need for higher growth); and abundant renewable availability.

Including most of South Asia and Latin America

Along with half of Africa and Southeast Asia

Sweet spot of change by sub-region, %EJ

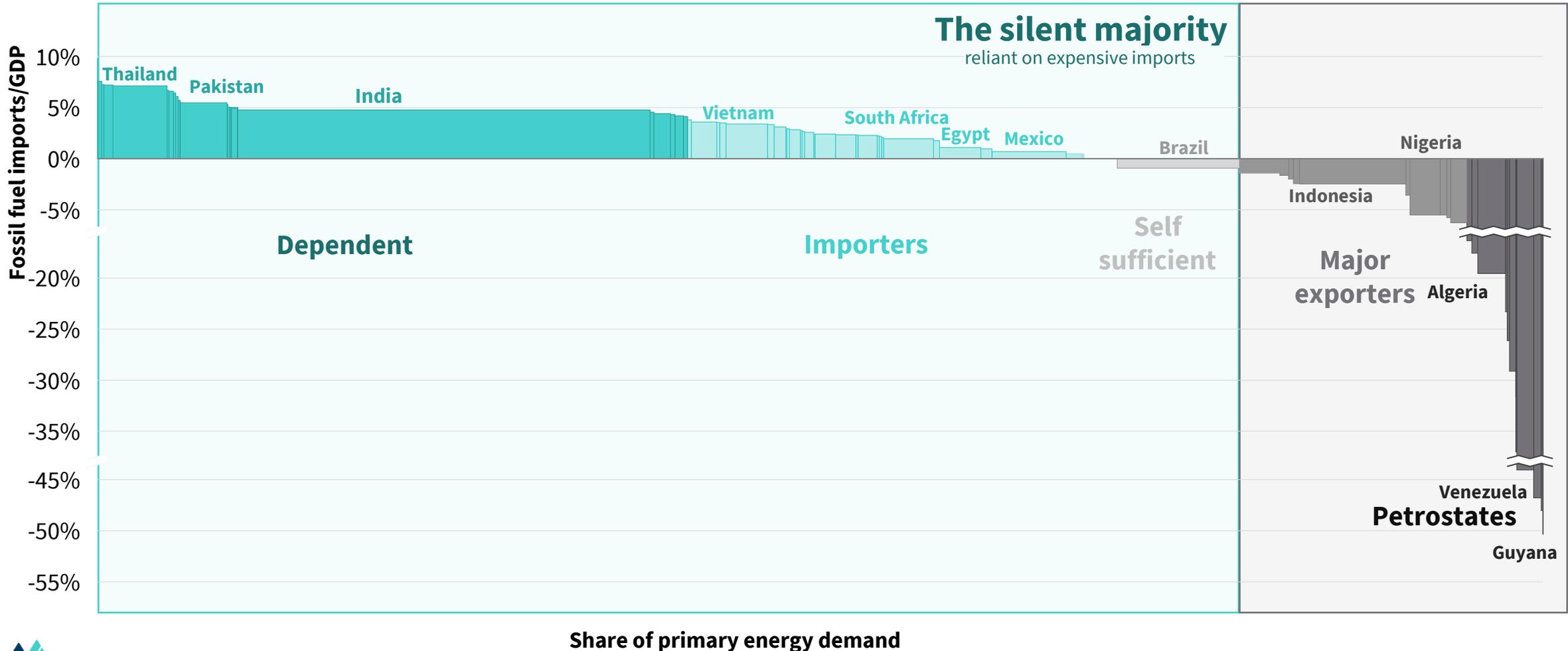


Definitions: Low income as defined by the World Bank. Petrostate is a country with fossil fuel exports over 10% of GDP. Major exporters are countries with fossil fuel exports from 1% to 10% of GDP. Sweet spot of change means: Middle income or higher; self-sufficient in fossil fuels or an importer; energy demand per person below 100 GJ; and plentiful renewable availability.

Although the debate skews to a small number of vocal petrostates

Petrostates account for only 5% of Global South primary energy demand

Indicative fossil fuel imports (exports)/GDP compared to energy demand

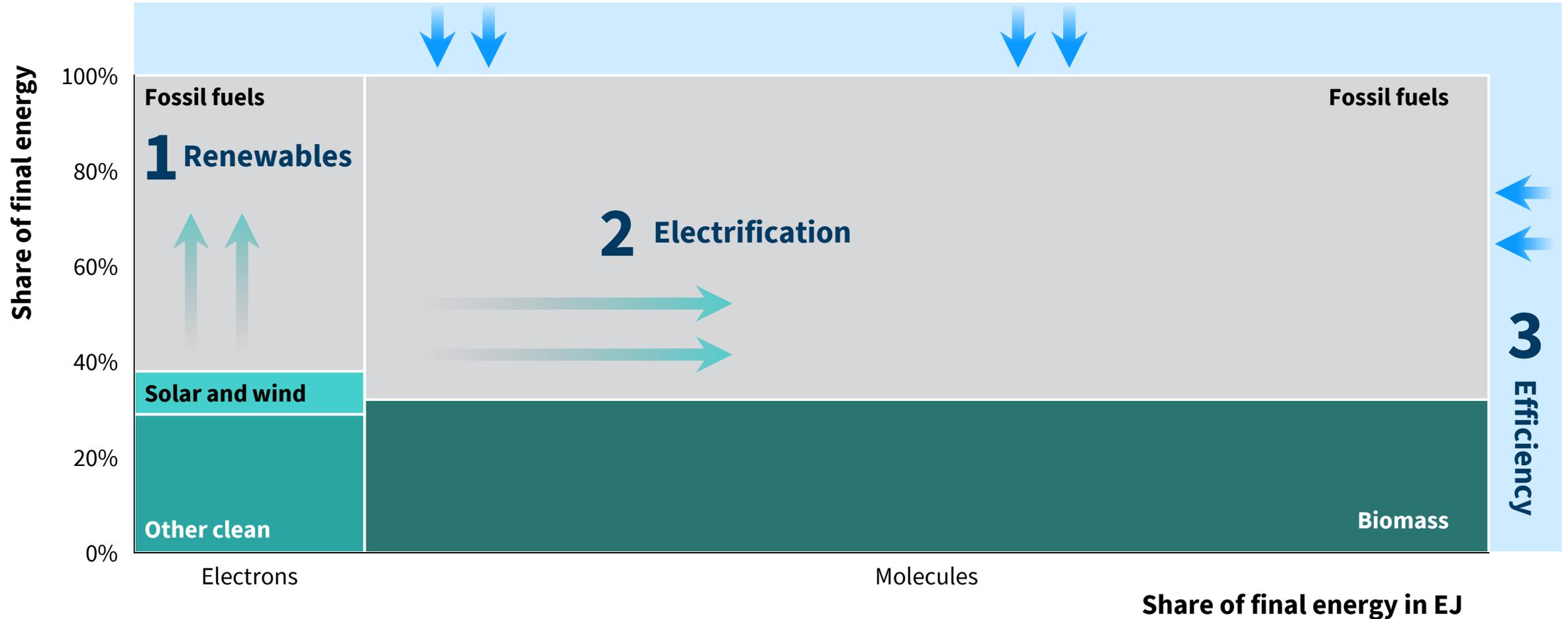


Source: World Bank GDP, IEA fossil fuel imports and exports in EJ 2022, global fossil fuel average prices in 2023 from IEA. 2023 fossil fuel prices selected as more representative than those of 2022.

There are three big levers of change

Renewables, electrification, and efficiency are rapidly transforming the energy system

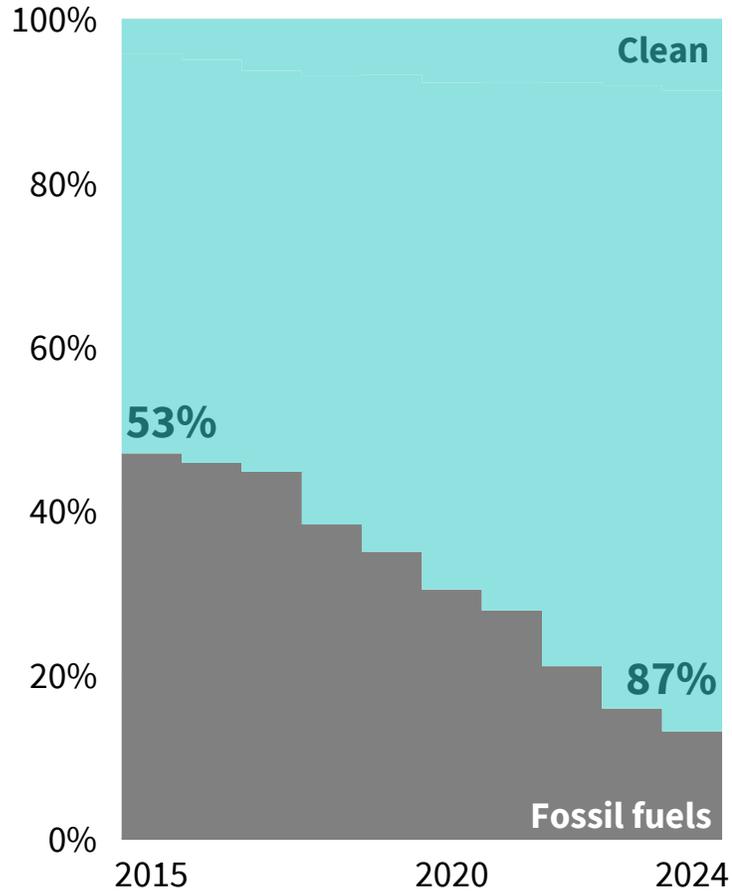
Global South energy demand in 2022



The Global South has pivoted capex to clean energy

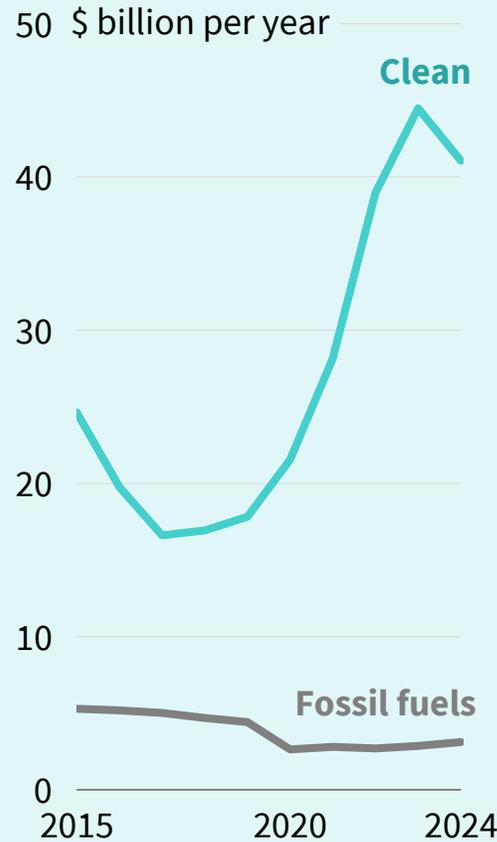
87% of Global South generation capex is already into clean energy: 93% in Latam, 84% in Asia, and 86% in Africa

Generation capex in the Global South



Sub-region detail

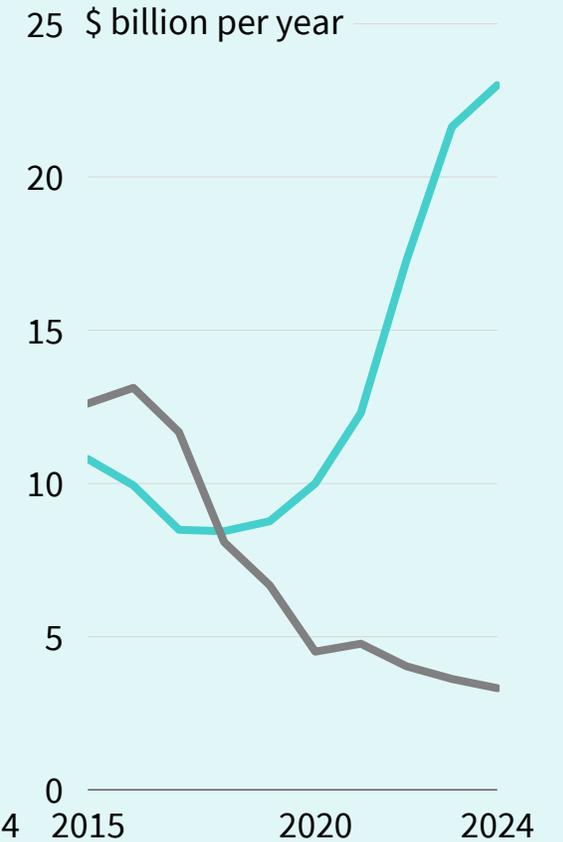
Latin America



South Asia & Southeast Asia



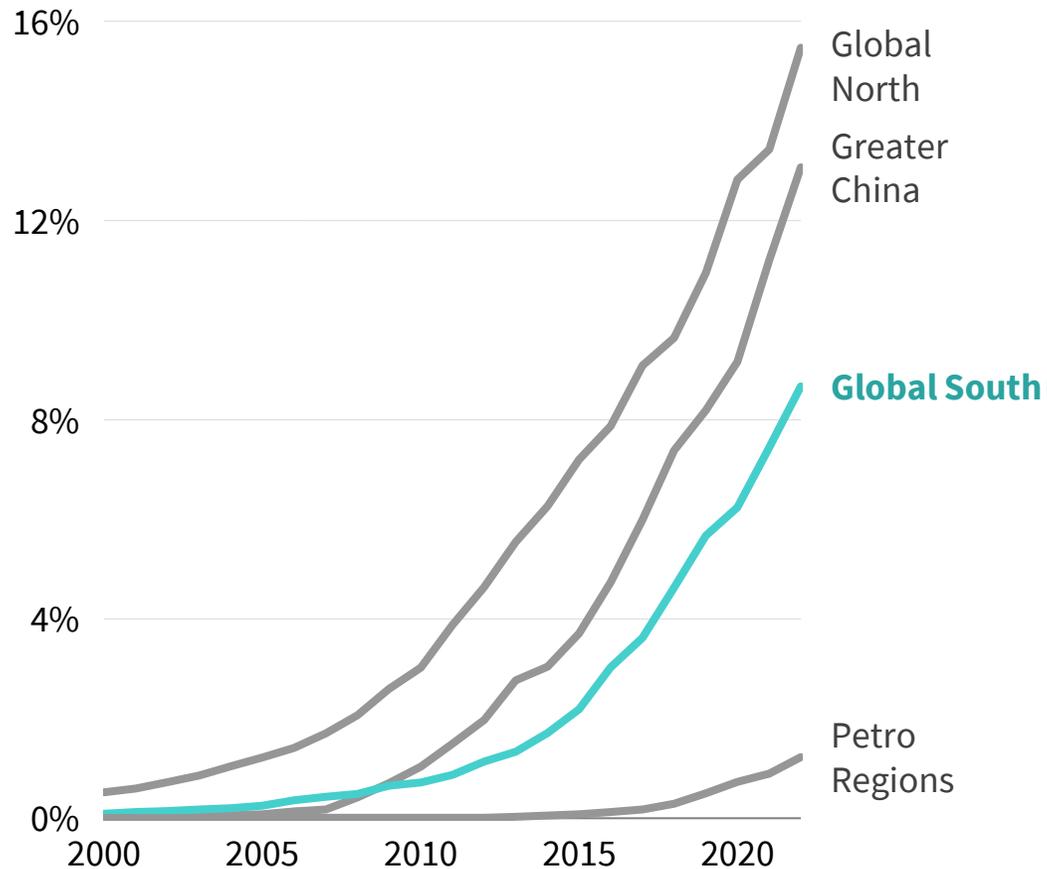
Africa



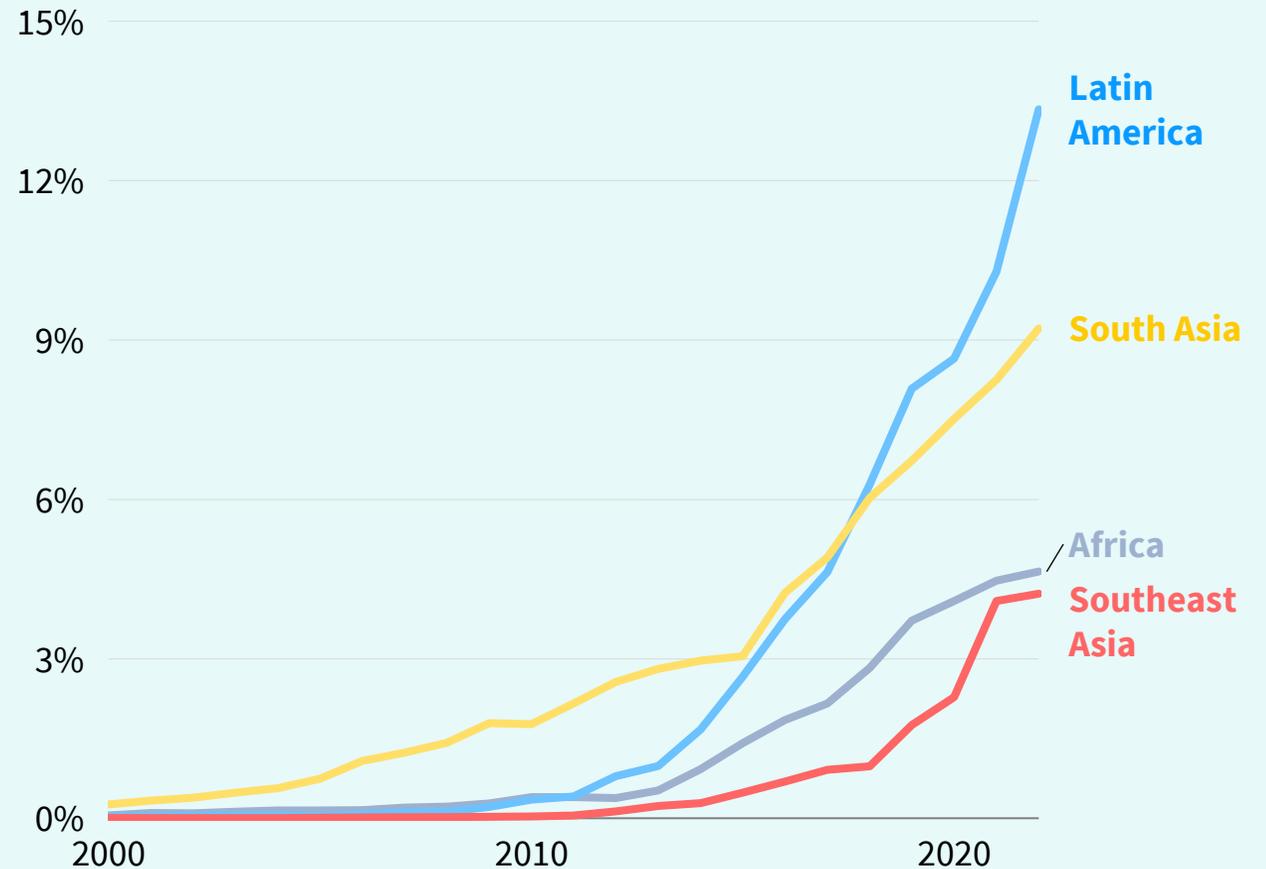
Renewables are also following an S-curve in the Global South

Solar and wind generation are growing rapidly, just like in the Global North and China

Solar & wind share of generation by region



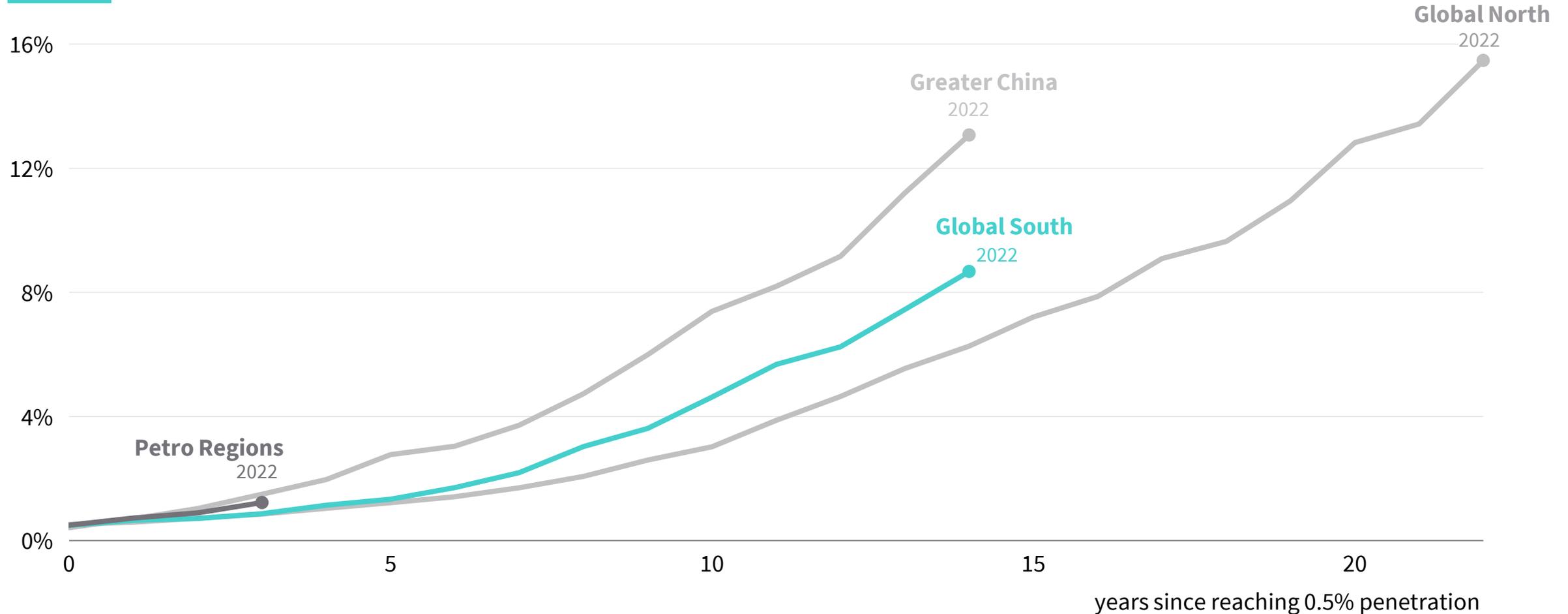
Solar & wind share of generation by Global South sub-region



Growth in the Global South is faster than the Global North

Change started later, but the Global South is a fast follower

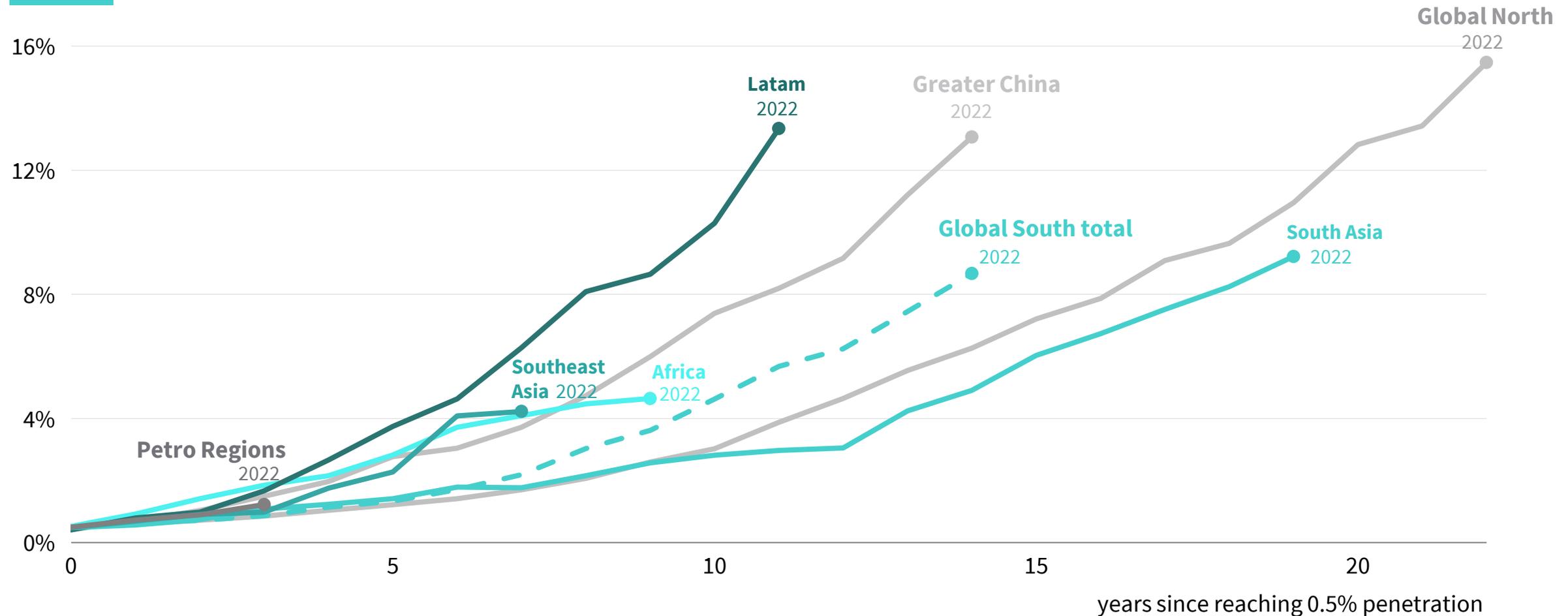
Solar & wind share of electricity generation by region



Some regions in the Global South even outpace China

Latam, for example, reached the same solar and wind penetration as China, but got there four years faster

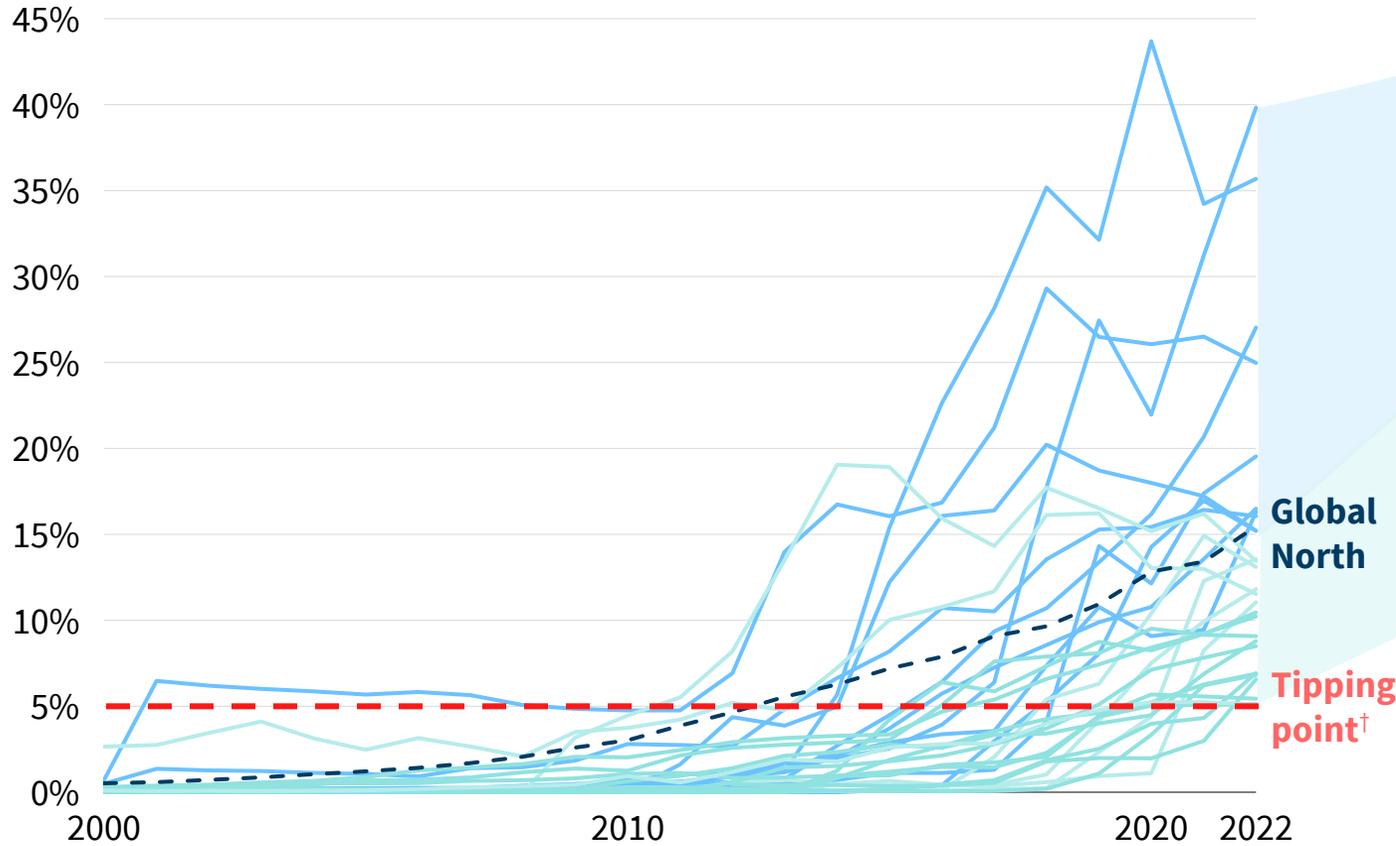
Solar & wind share of electricity generation by region and sub-region



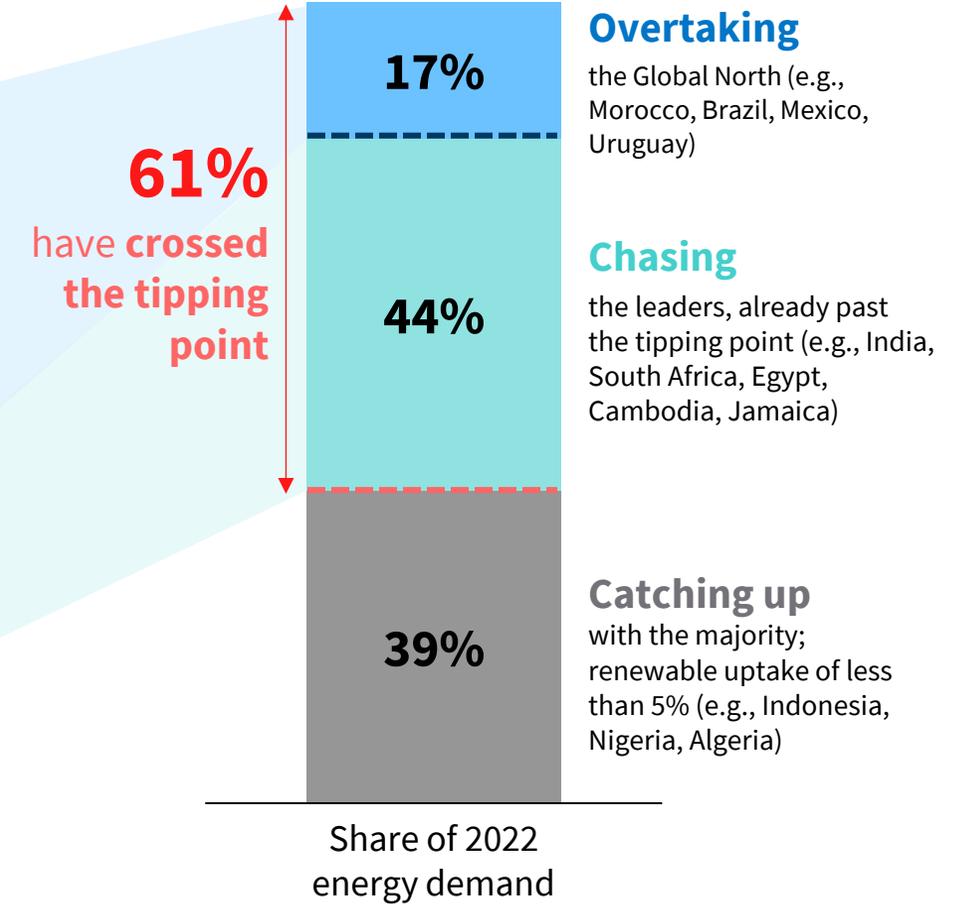
61% of the Global South has passed the renewables tipping point

And 17% have overtaken the Global North

Solar & wind's share of electricity generation



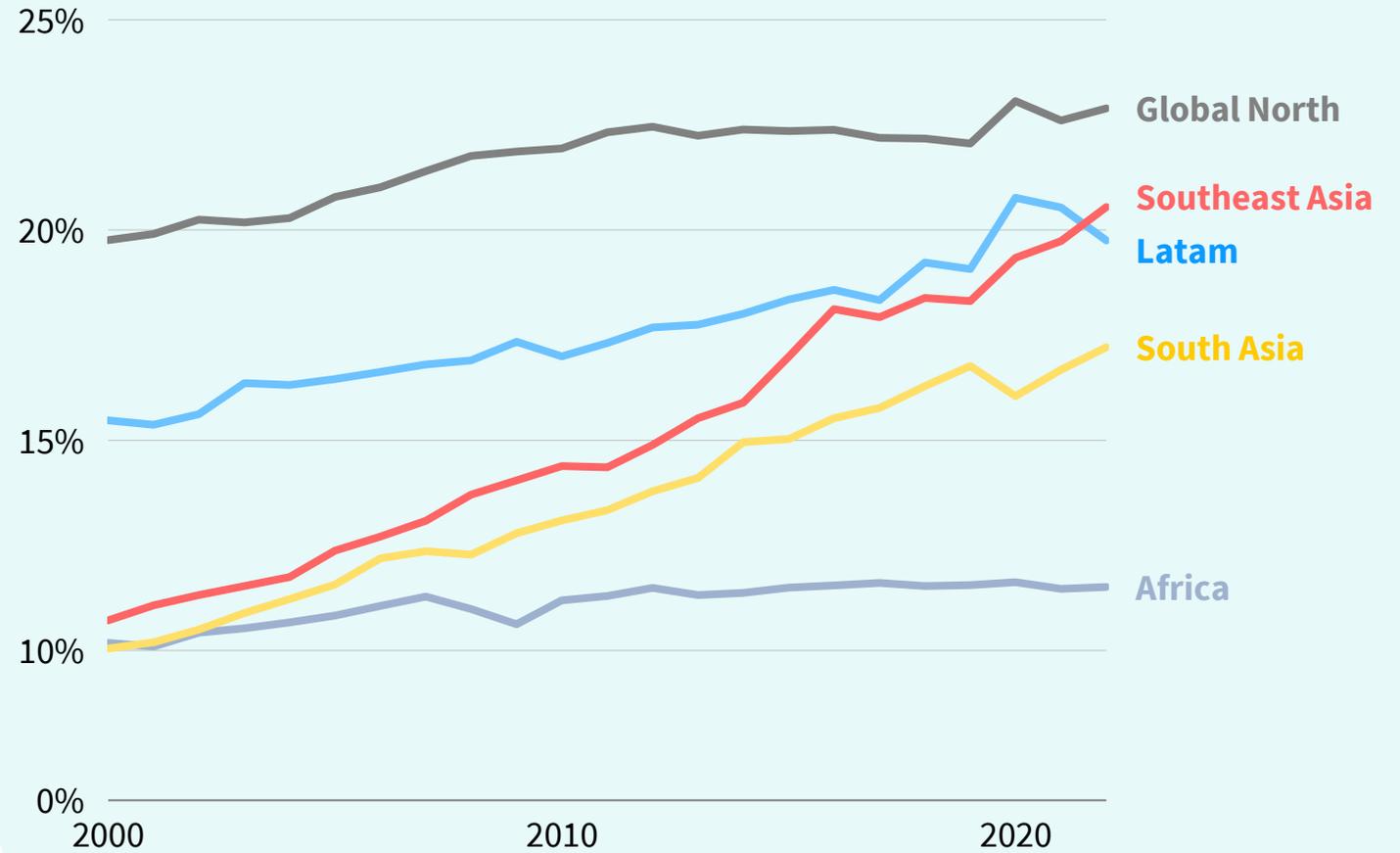
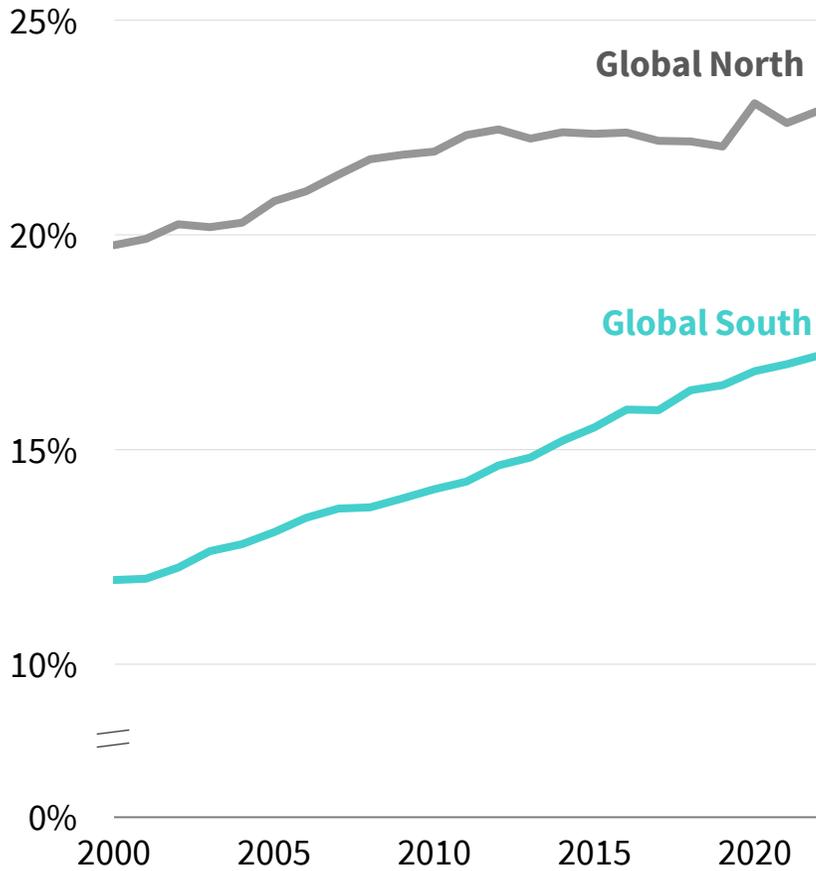
Who is where



Electric catch-up

The Global South is quickly catching up to Global North levels of electrification

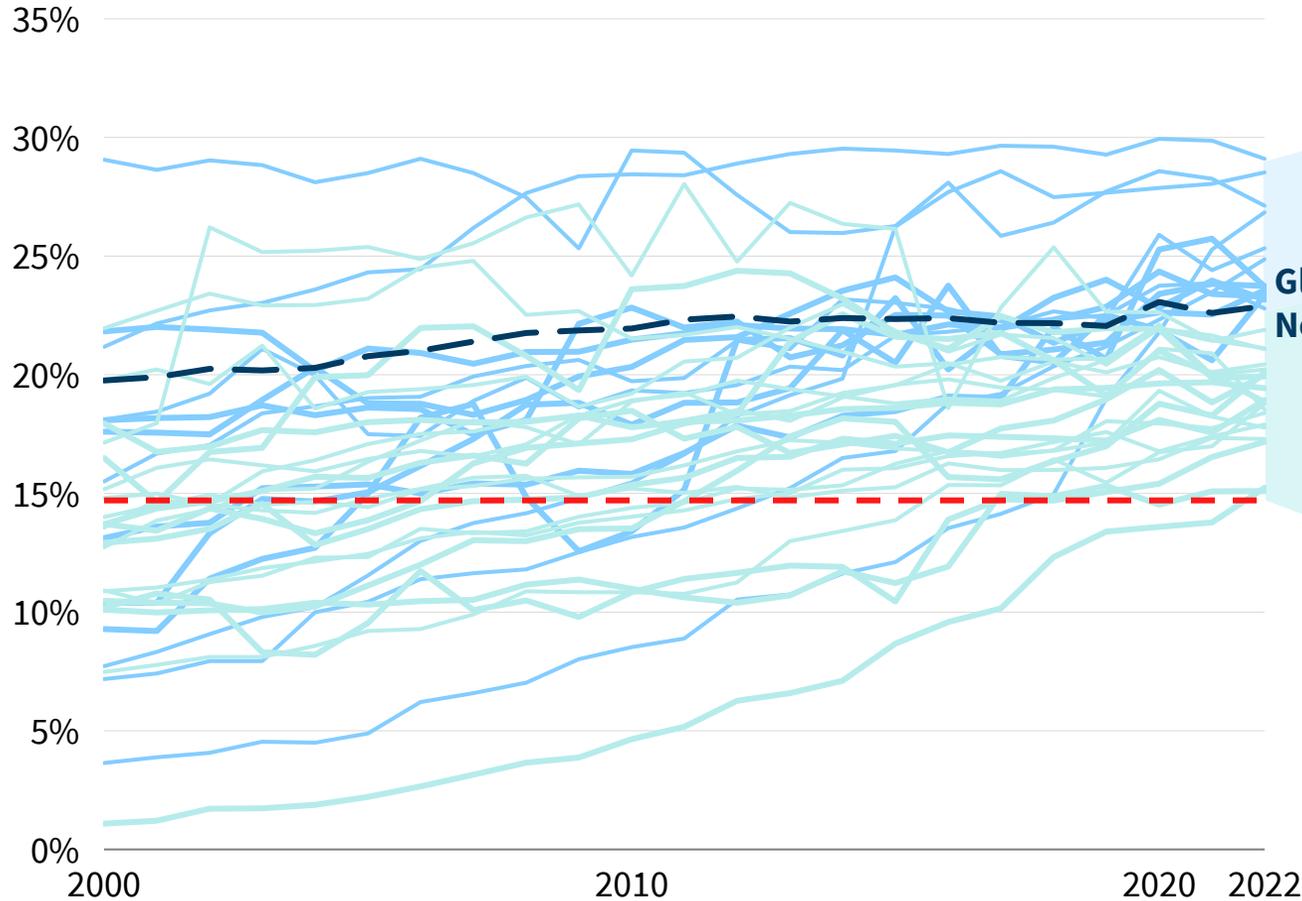
Electricity as a share of final energy consumption



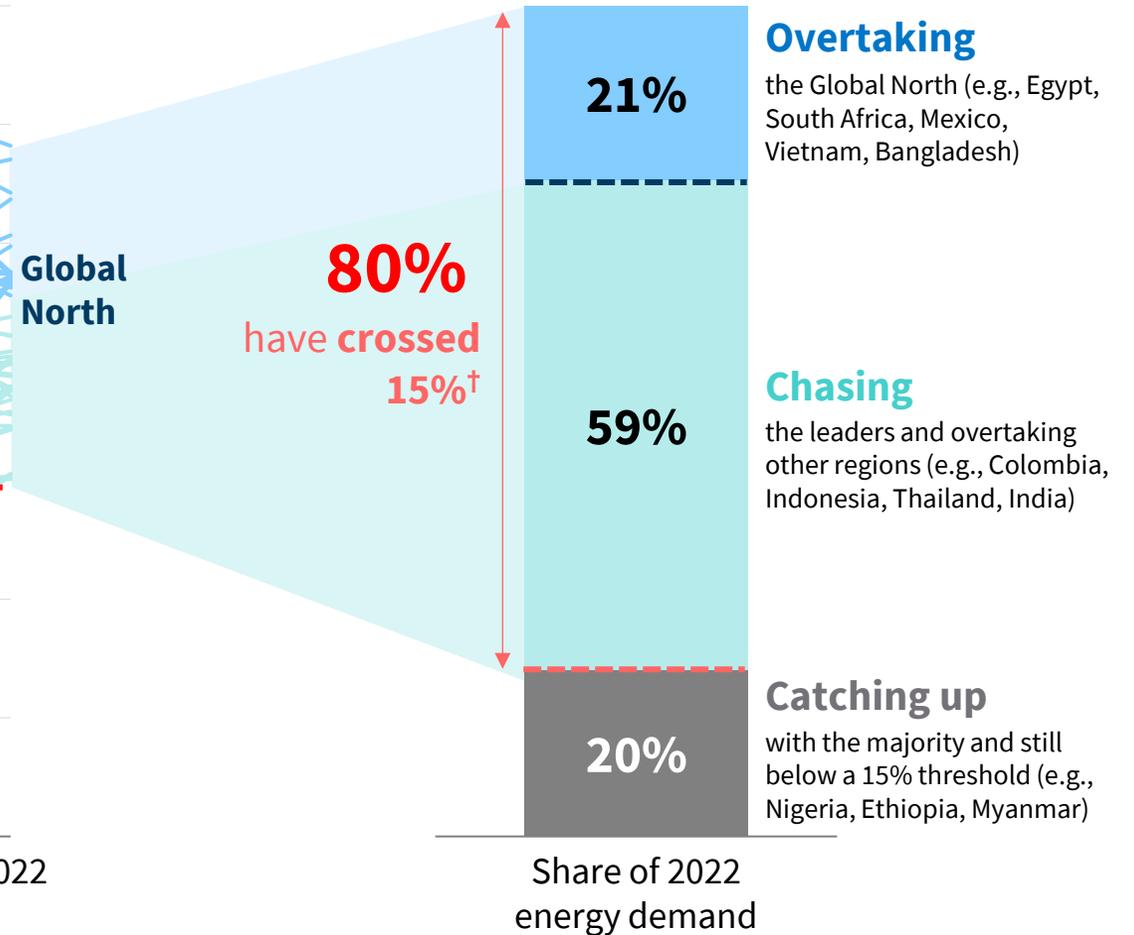
Electric South

21% of the Global South has already overtaken Global North electrification levels

Electricity as a share of final energy consumption



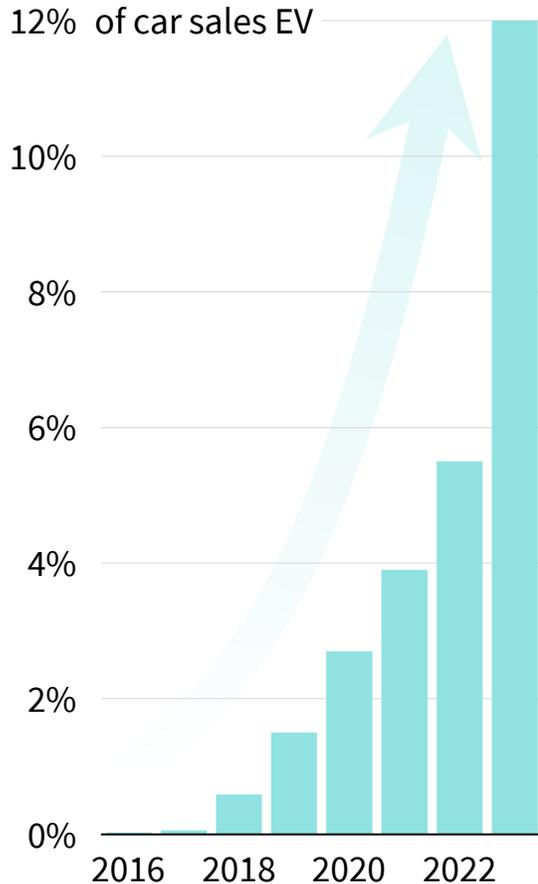
Who is where



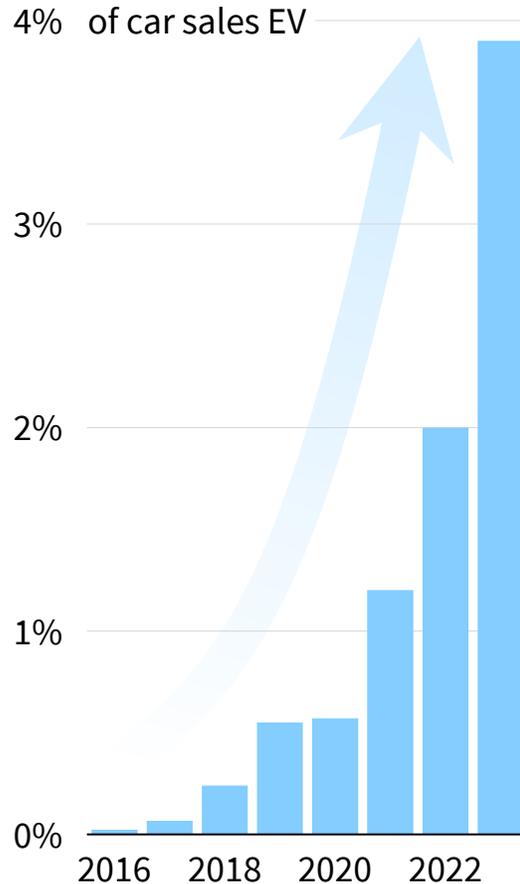
Electric vehicle sales are taking off

Electrification will be boosted by the exponential growth of EVs

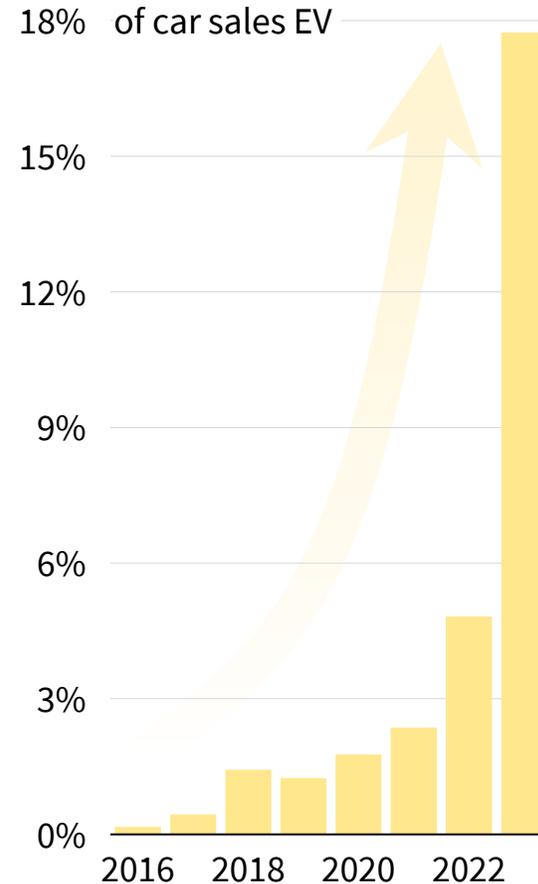
Costa Rica



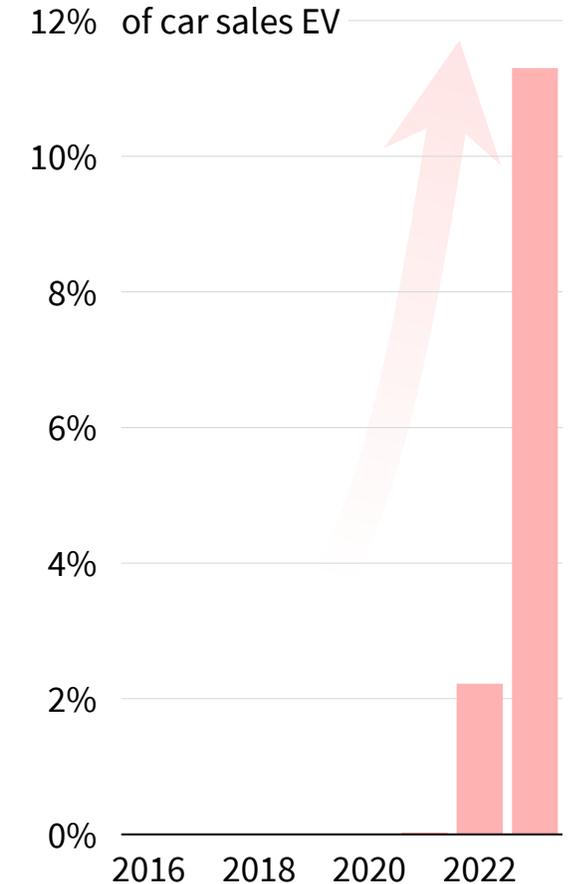
Colombia



Thailand



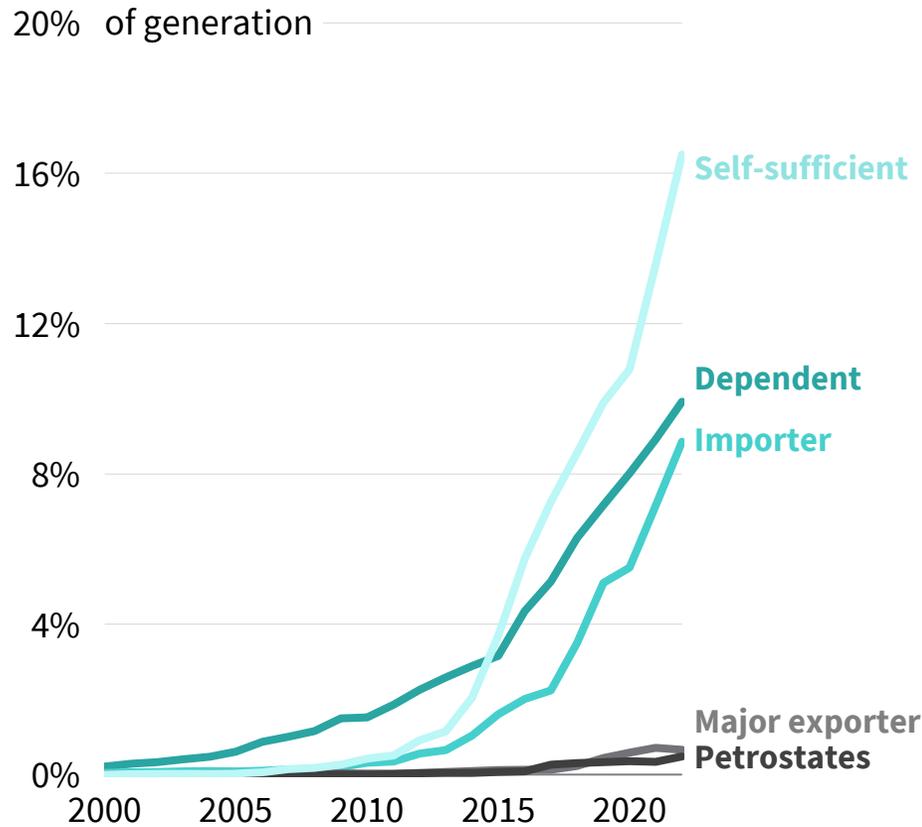
Vietnam



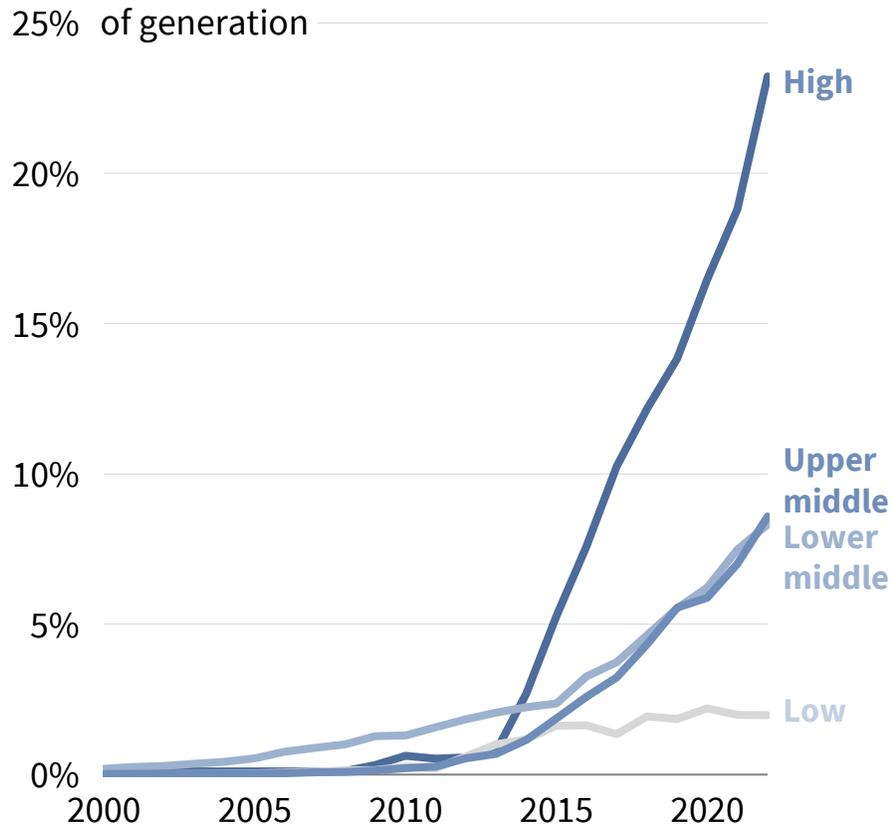
Fossil exporters and low-income nations are not yet changing

These groups make up a quarter of energy demand in the Global South. Each group requires very different solutions

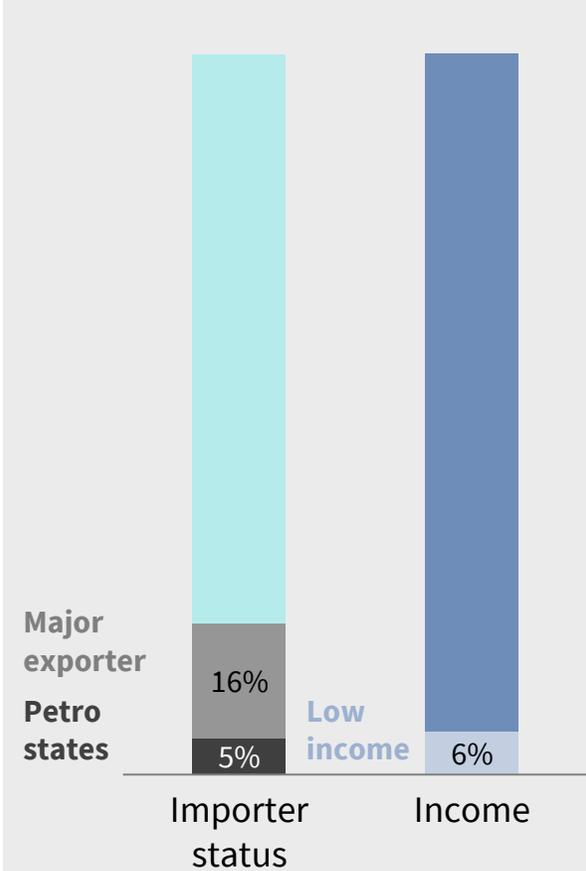
Solar & wind share, by importer/exporter group



Solar & wind share, by income level



Share of demand, %EJ



Note: Income groups as defined by the World Bank. There is no formal definition for petrostates, but we use a threshold of fossil fuel exports of greater than 10% of GDP. Major exporters are countries where fossil fuels exports are between 1% and 10% of GDP. Self-sufficient are countries where fossil fuel exports are below 1% of GDP. Importer countries are where fossil fuel imports are up to 4% of GDP. Dependent is where fossil fuel imports are over 4% of GDP. Source: World Bank, IEA, RMI framing.

Why the Global South will continue to adopt cleantech

As with the Global North, the barriers are many, but the solutions are more.



01

Falling costs

Falling cleantech costs are breaking through **capex parity**, unleashing even faster change.



02

Plentiful supply

Plentiful **Chinese cleantech** will find a way to the Global South and spark a **race with the West** for deployment.



03

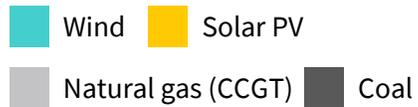
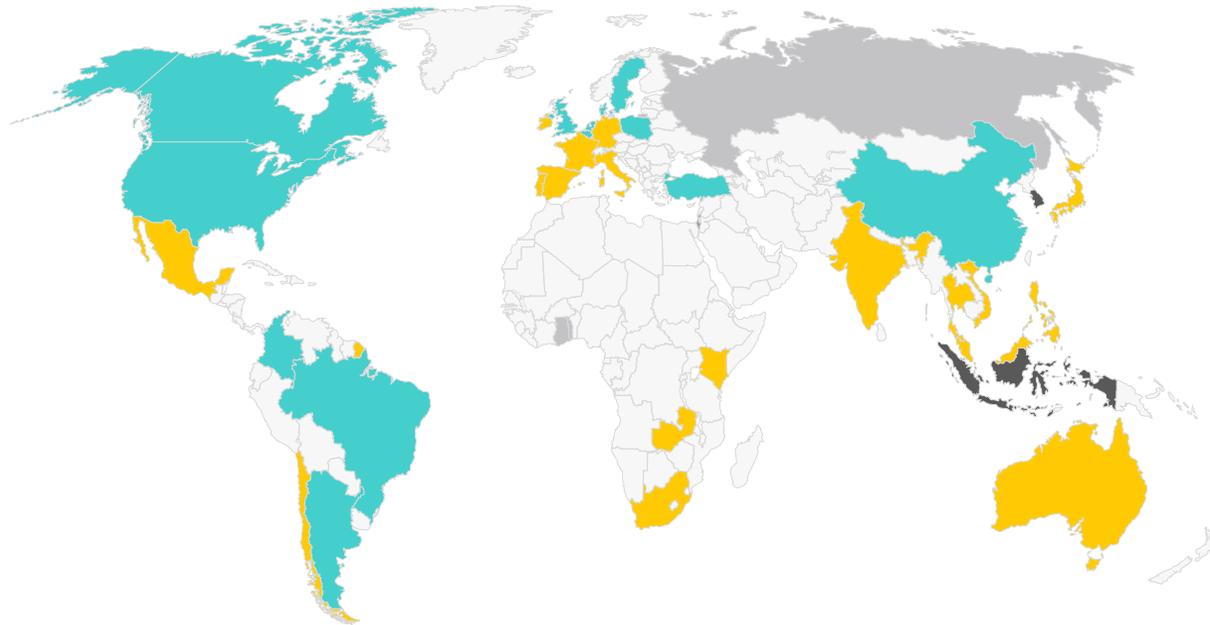
Rising domestic policy & international support

As the economic benefits of the cleantech revolution become more and more evident, **policy ambitions** and **development capital** can rise.

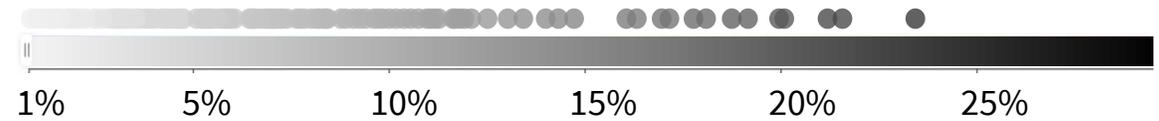
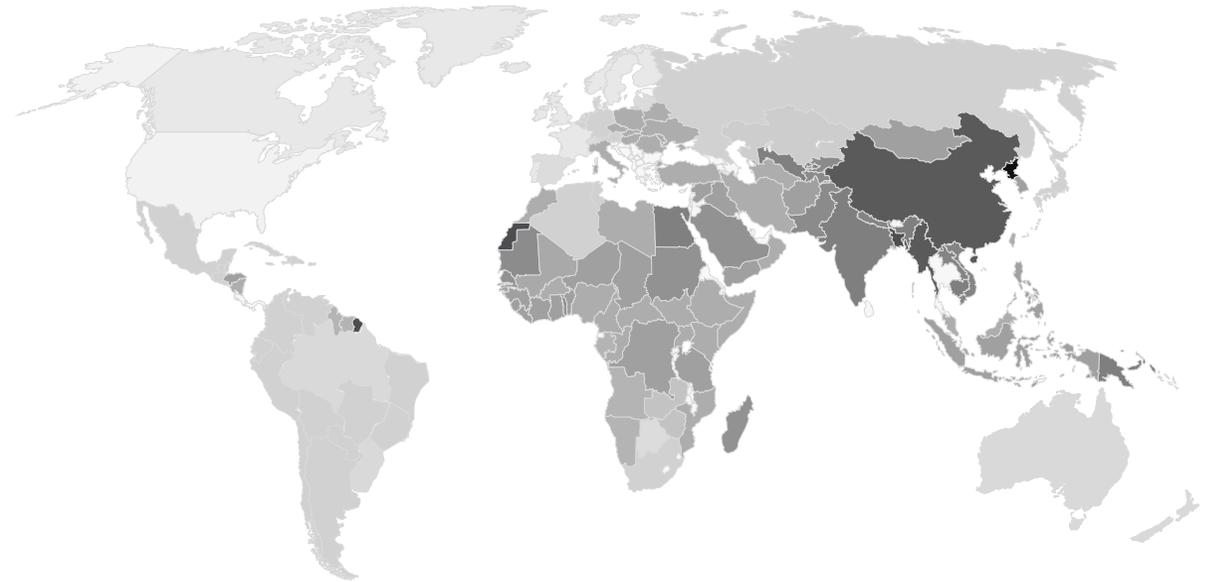
Cleantech saves lives and money

Renewables are already the cheapest electricity source. Air pollution kills over 5 million people a year in the Global South.

Cheapest source of new electricity, 2023, LCOE



Share of total deaths from air pollution, 2021



Capex parity opens the door for the Global South

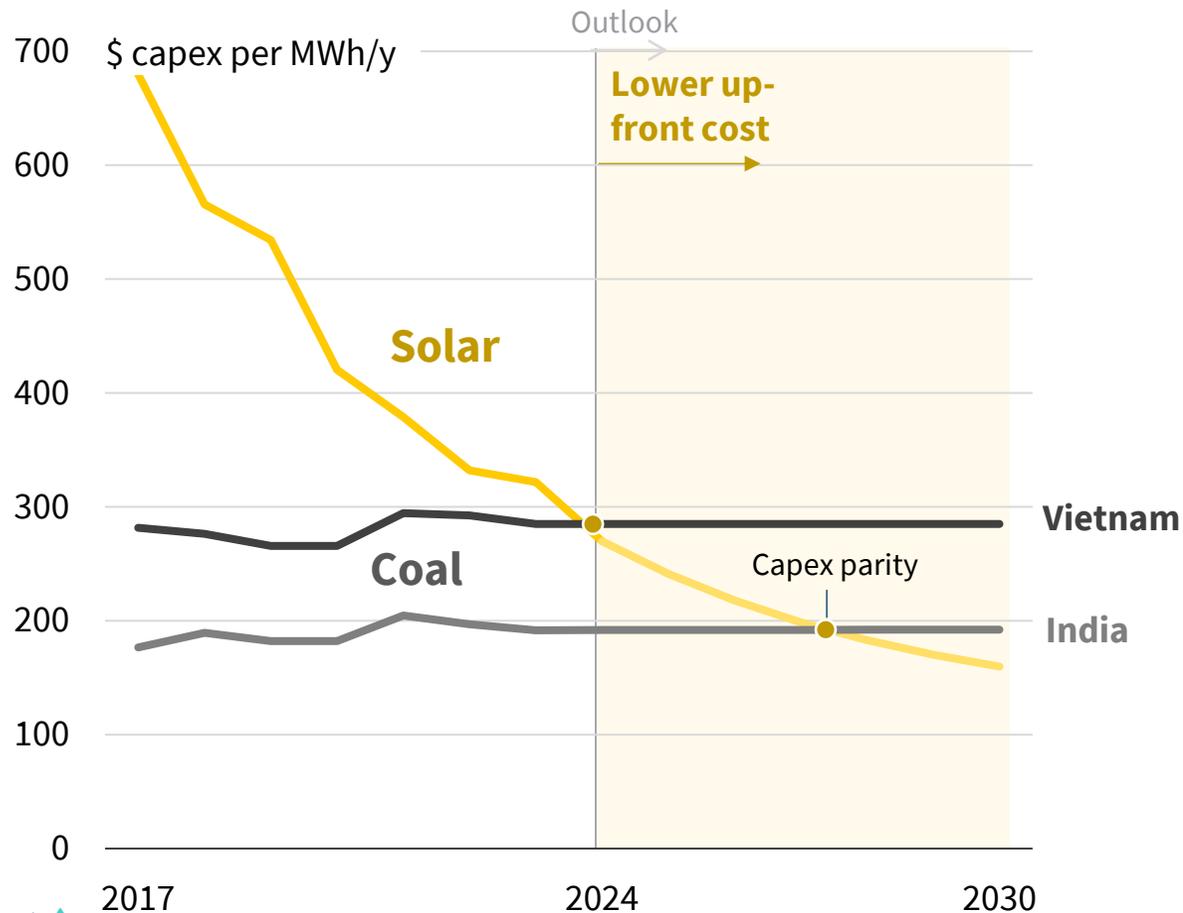
We are at the tipping point where the up-front cost of cleantech beats fossil tech



Capex parity may be even more important than total cost of ownership parity in the Global South, as cost of capital is high and access to capital limited.

Renewables

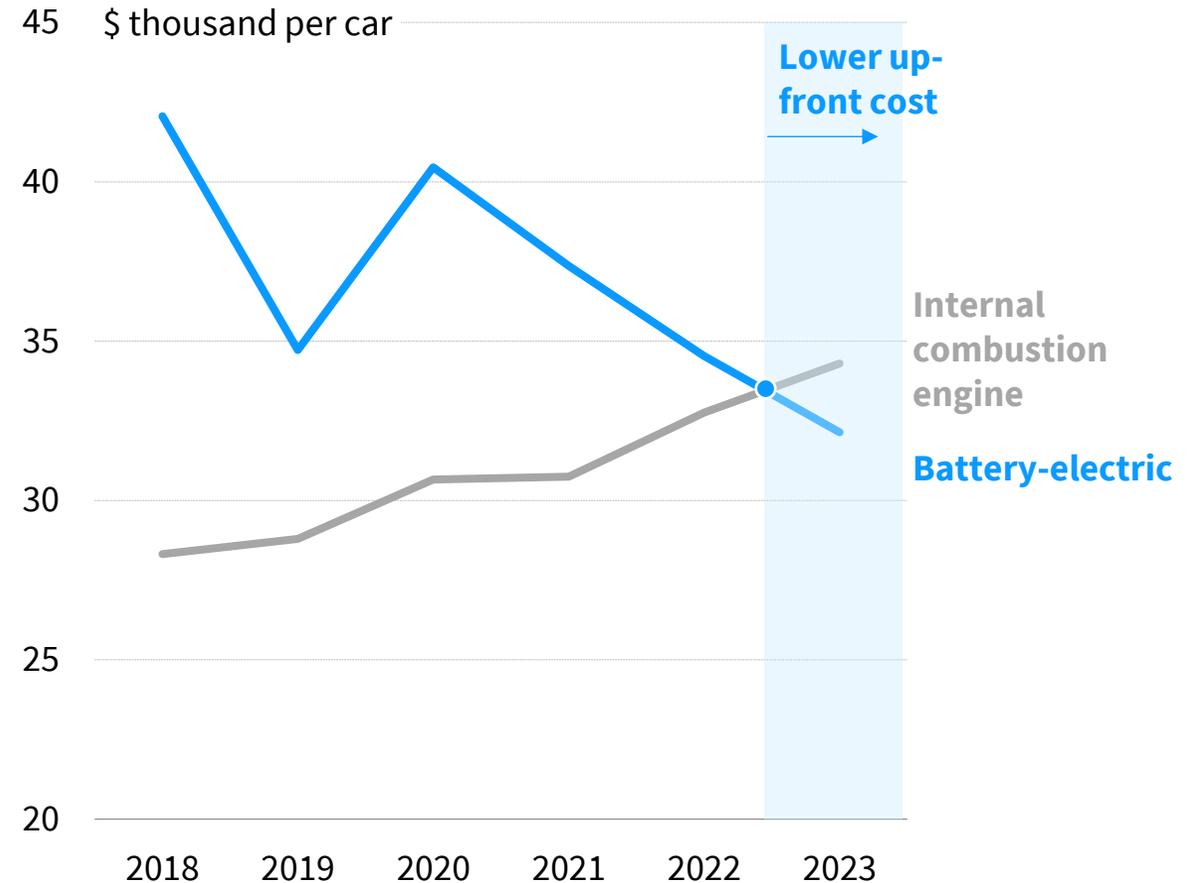
Solar versus coal capital cost per unit of effective capacity



Note: Capital cost per MWh/y is the capital cost per MW divided by the average number of hours that the resource is used in one year. Source: BNEF inputs for coal and solar history, RMI solar future, RMI calculations.

Transport

China average vehicle purchase price by drivetrain

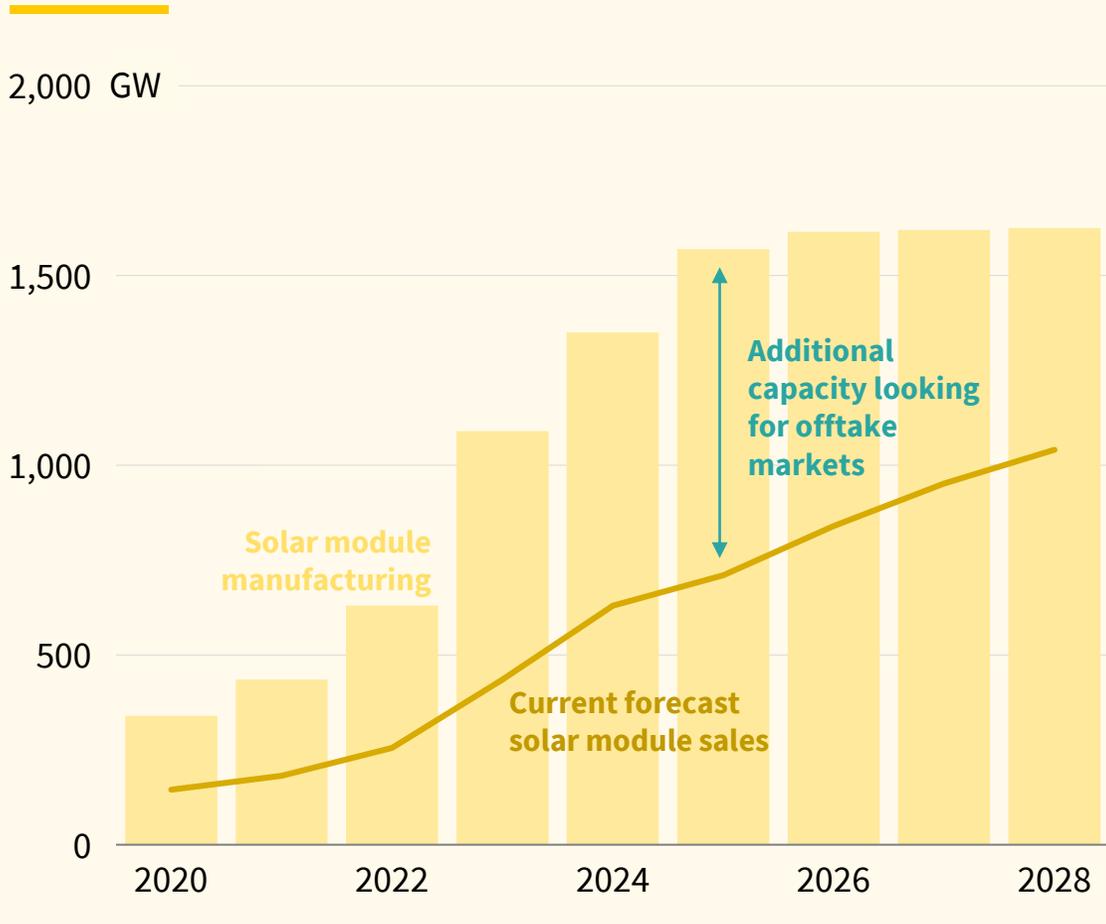


Note: Battery-electric vehicles exclude minicars. Source: BNEF, China Automotive Technology and Research Center.

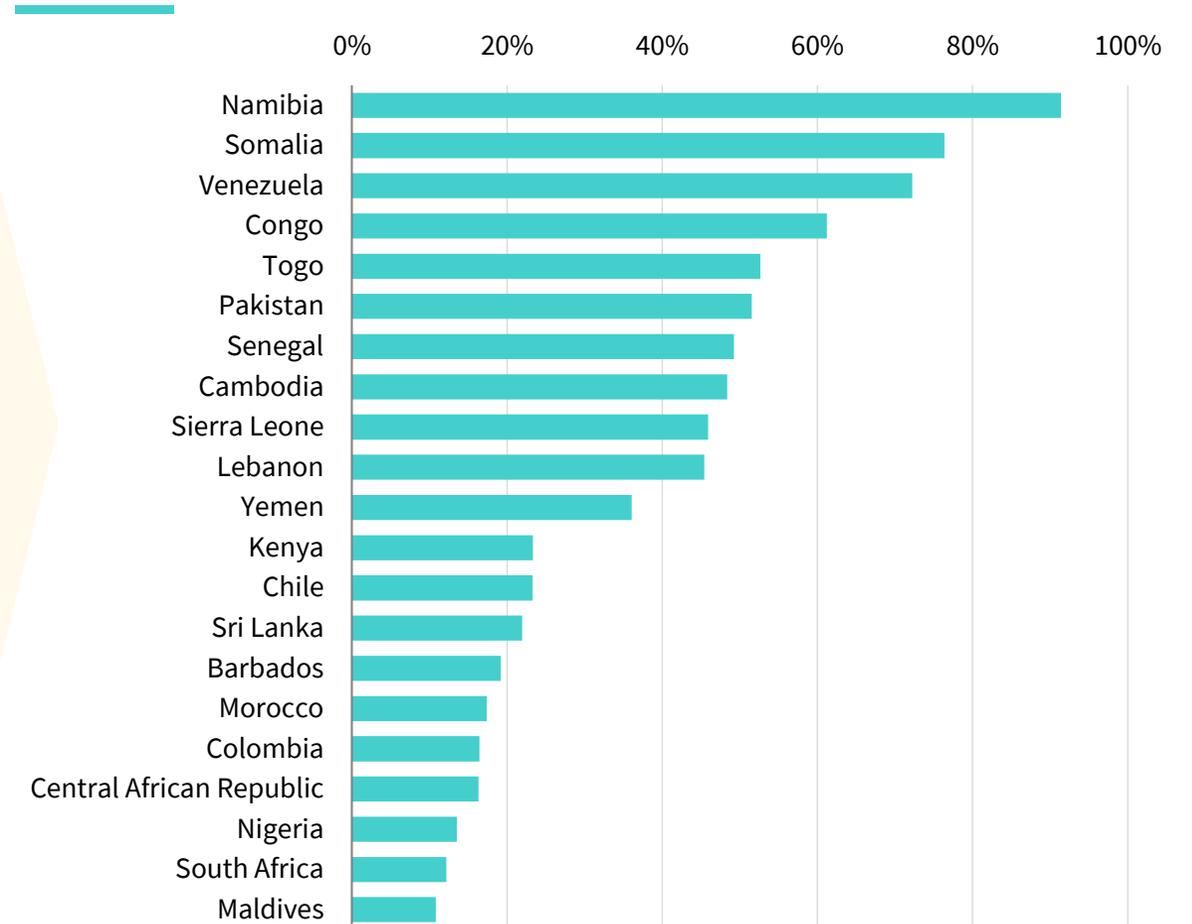
China can supply the cleantech to the Global South

Hundreds of factories in China stand at the ready to supply new markets

Solar module manufacturing capacity versus sales



Solar imports from China, GW, 2022–2024 vs. total generation capacity 2022



Note: Solar imports are Chinese solar imports only as calculated by Ember.

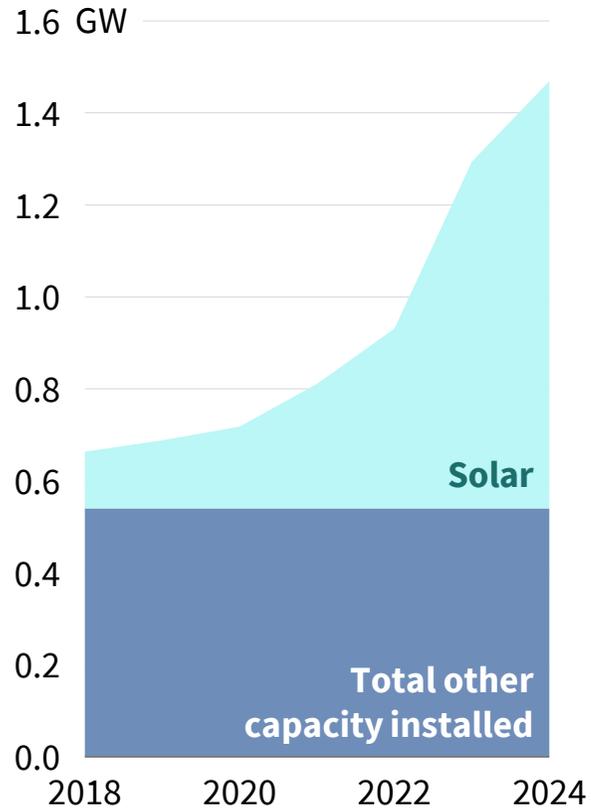
Source: IEA, Ember, BNEF, RMI fast growth forecast as published in the Cleantech Revolution (2024). See also [Green Capital Tsunami](#) by Climate Energy Finance.

Witness the explosive growth in solar

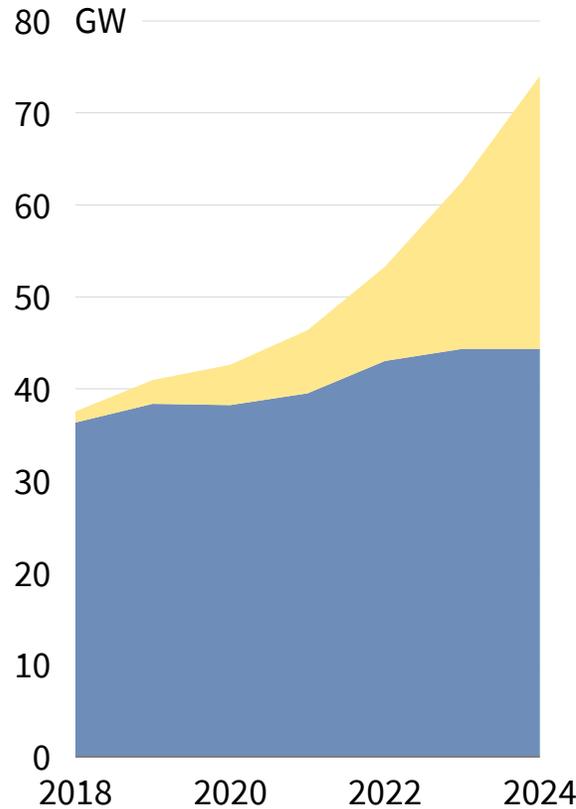
Solar is supplying in years what took old energy decades

Solar panel imports from China versus the total size of the electricity system

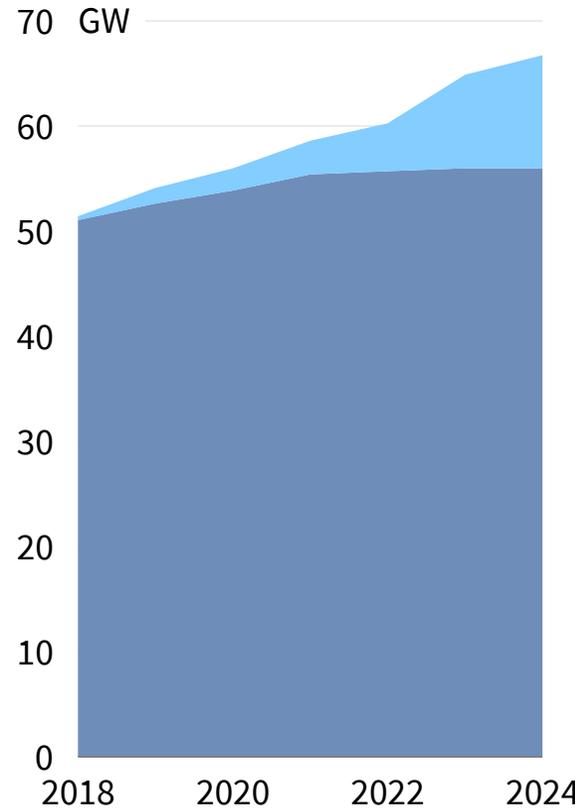
Namibia



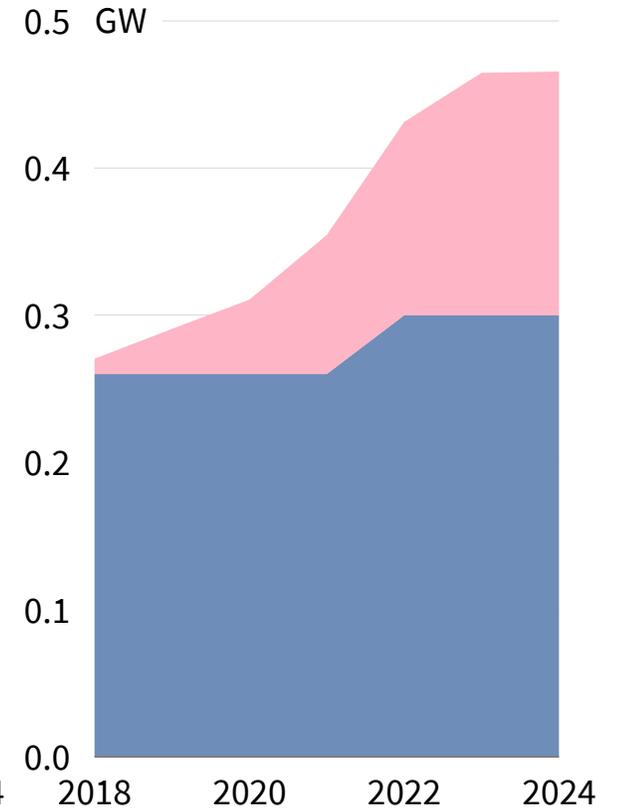
Pakistan



South Africa



Barbados



Cleantech is the logical choice for policymakers driving growth

As it brings...



Economic growth

Driving GDP growth with the technologies of the future



Jobs

Bringing millions of manufacturing and cleantech deployment jobs



Health

Avoiding millions of deaths and illnesses caused by fossil pollution



Security

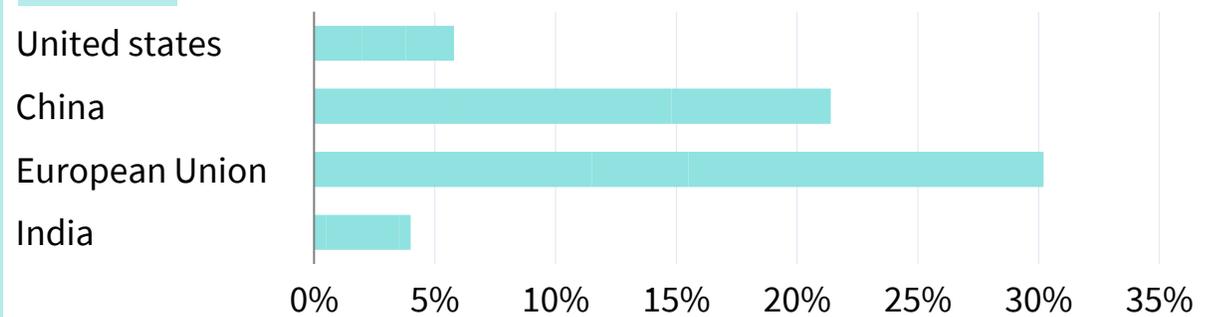
Regaining energy independence



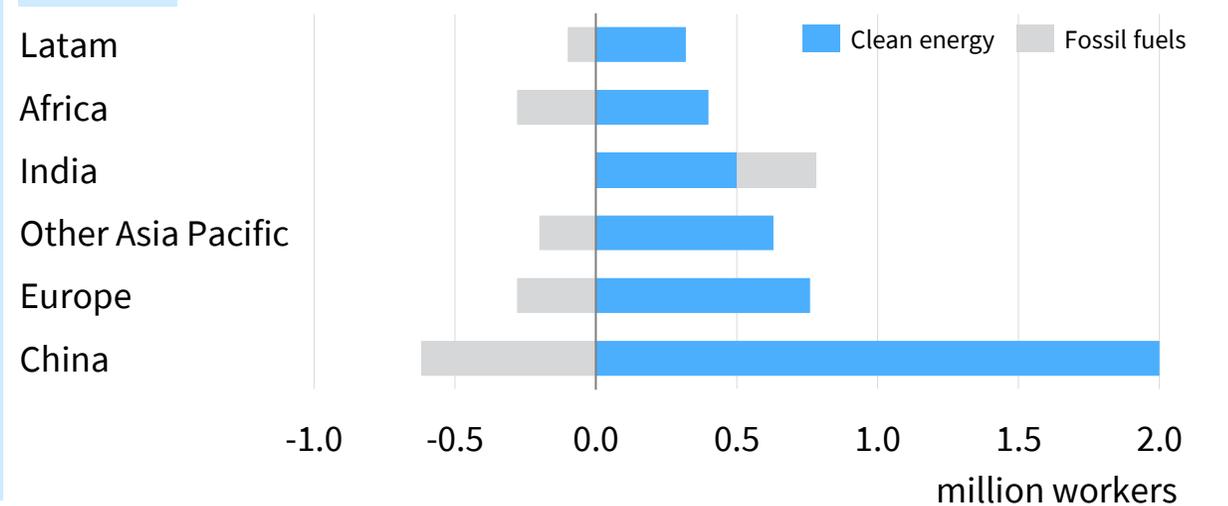
Speed

All of the above, at greater speed than fossil fuels can provide (see next page)

Contribution of cleantech to GDP growth, 2023



Change in energy employment by sector and region, 2019–2022



Renewables allow for faster energy growth than fossil fuels

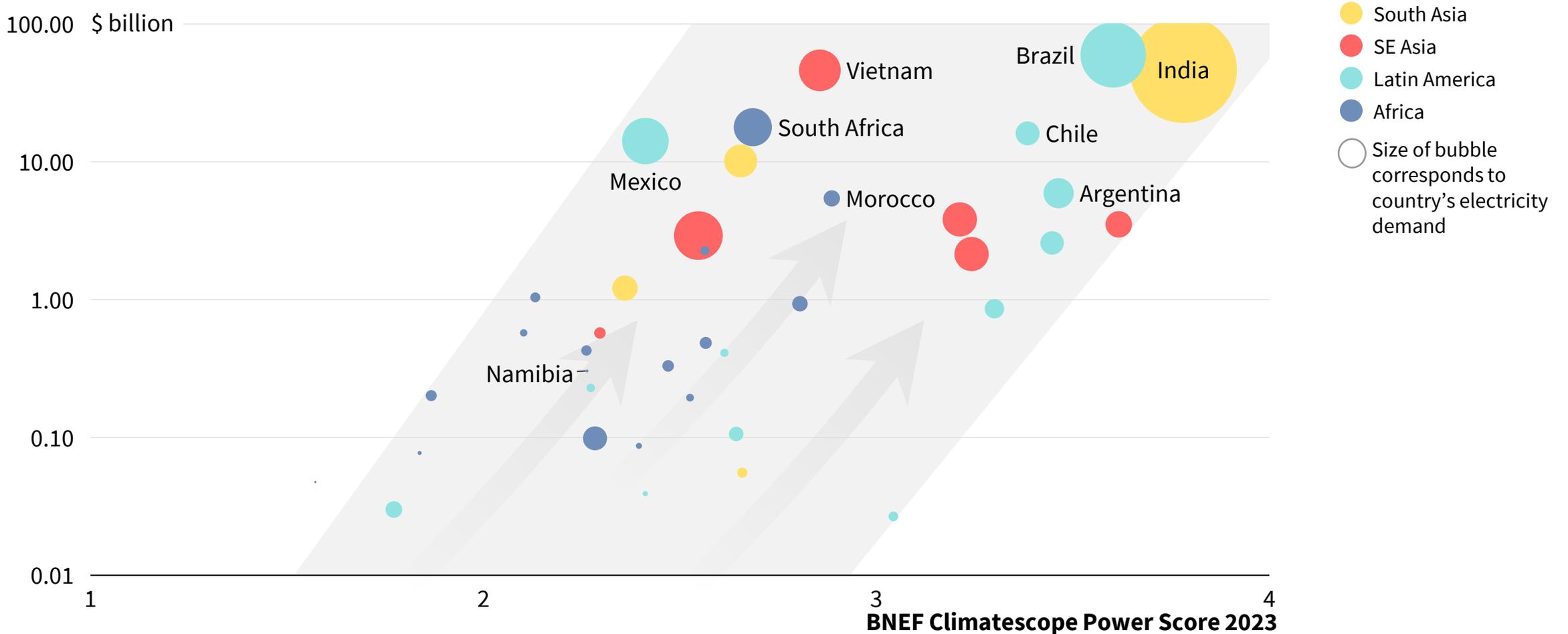
Deployment is simpler, scaling more modular and rapid, and resulting dependency lower

	Steps to deploy new energy					Construction time	Minimum size of investment		Dependency after deployment
Natural gas import case						5-10 years 	1-5 GW 	~\$3-10 billion 	Dependent on gas supplier and exposed to volatile gas market
	Secure LNG offtake agreement and open new shipping route	Build new LNG terminal in harbor	Build new gas pipelines	Build a new gas power plant	Build out centralized network to deliver power				
Solar + battery power case						<0.5 year 	1-10 kW 	~\$2-3 thousand 	Fully independent until solar panel and battery are at end of life in 20-25 years
	Import solar panels and battery packs through existing harbor	Deploy solar + battery locally	Build a localized grid to deliver power						

Good policy attracts capital

As policy environments across the Global South improve, more investment is unlocked

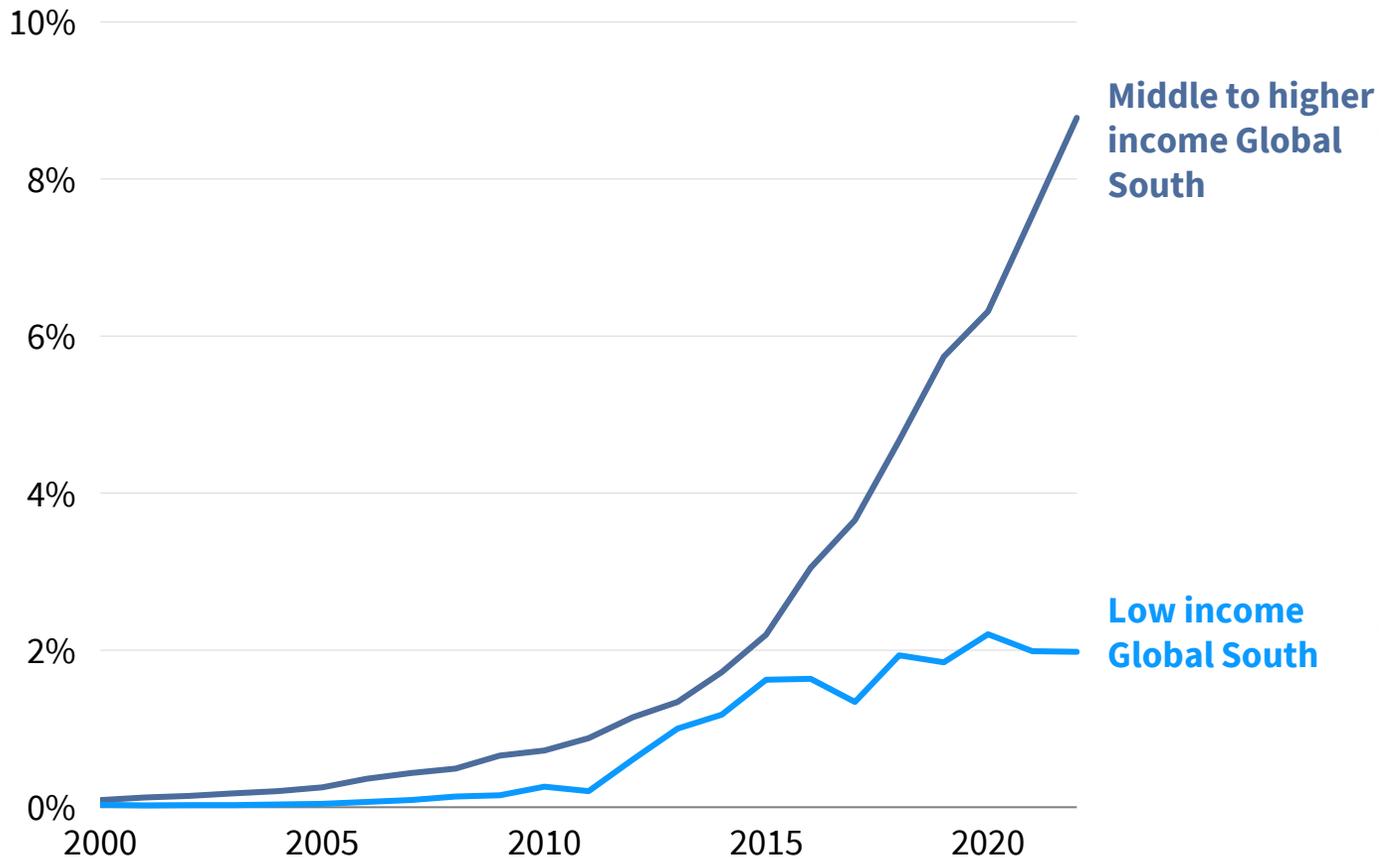
Investment in renewables (2018–22) versus strength of clean power policies



We need to accelerate innovative solutions

To overcome barriers, unlock affordable capital and support the most vulnerable nations

Solar & wind share of generation, by income level



Change is happening fast, but it can go faster

Many middle to higher income countries are already deploying renewables exponentially, but can accelerate progress through **strong domestic policies** and helped by **international efforts to unlock greater capital flows**. Domestic policies include ambitious targets, auction design, and mandates. International efforts include increasing inward capital flows, reducing the cost of capital, and promoting knowledge transfer.

Change is not happening and needs a holistic strategy of support

Low-income countries, concentrated in sub-Saharan Africa, account for 6% of Global South demand and 13% of the population. They face challenges more profound than those that pertain specifically to clean energy. These countries require **strong international support** including capacity building, technology transfer, MDB reform, and deploying catalytic and concessional finance more effectively and in greater volumes.

It is time to revisit old assumptions

In many ways the Global South is better positioned than the Global North for the Cleantech Revolution

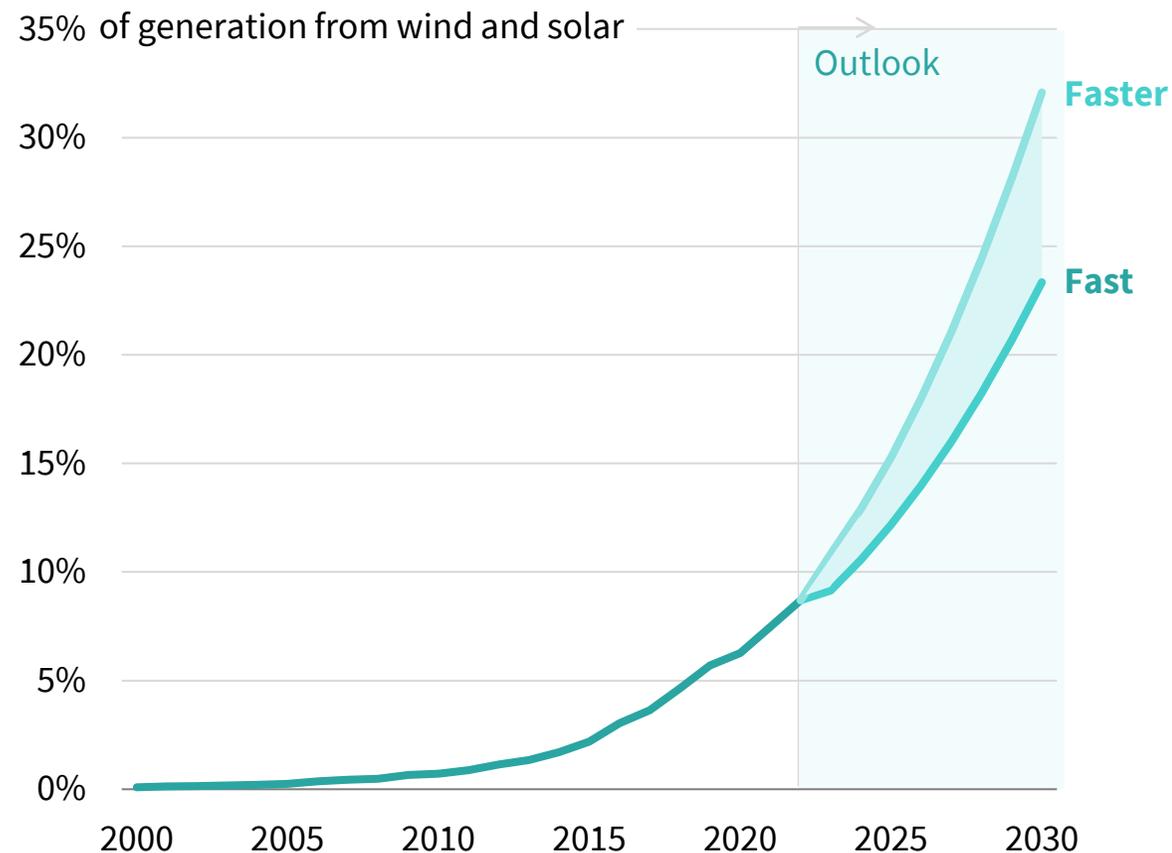
Who has the advantage

Area	Global North	Global South
Timing	First mover but it was expensive	Can be a fast follower at lower cost
Barriers	Needs to solve all the barriers at the cutting edge	Can learn from others
Location	Cold and far from the equator	Closer to equator means better solar
Legacy infrastructure	Giant legacy fossil fuel infrastructure	Smaller fossil infrastructure
Fossil fuel lobby	Powerful fossil fuel lobby	Smaller fossil lobby
Renewable potential	50x the size of fossil fuel production	400x the size of fossil fuel production
Energy growth	No growth in primary energy demand	Fast growth so easier to deploy the new
Cost of capital	Lower	Higher
Capital availability	Considerable	Lower
Relations with China	Mixed	Open to the cheapest tech

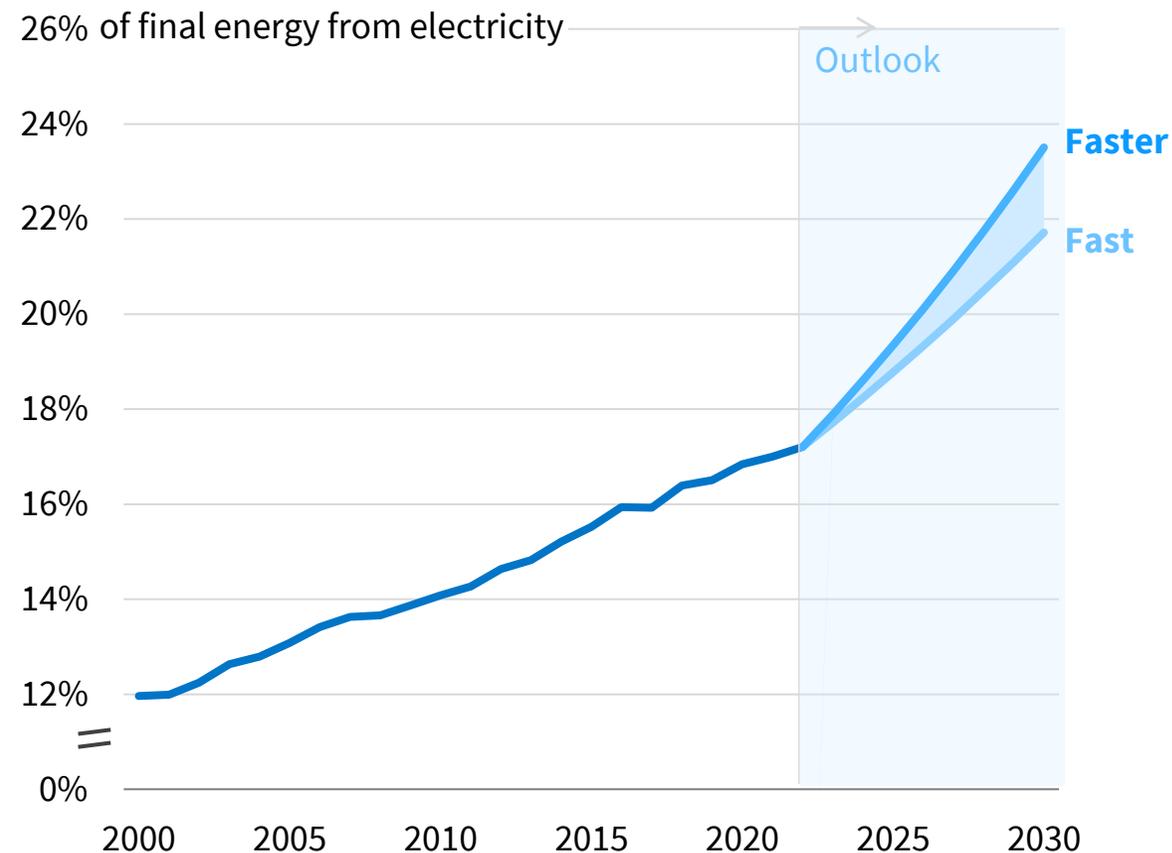
The cleantech revolution will continue

This is how it looks if the Global South follows the standard S-curve of technology deployment

Solar & wind generation



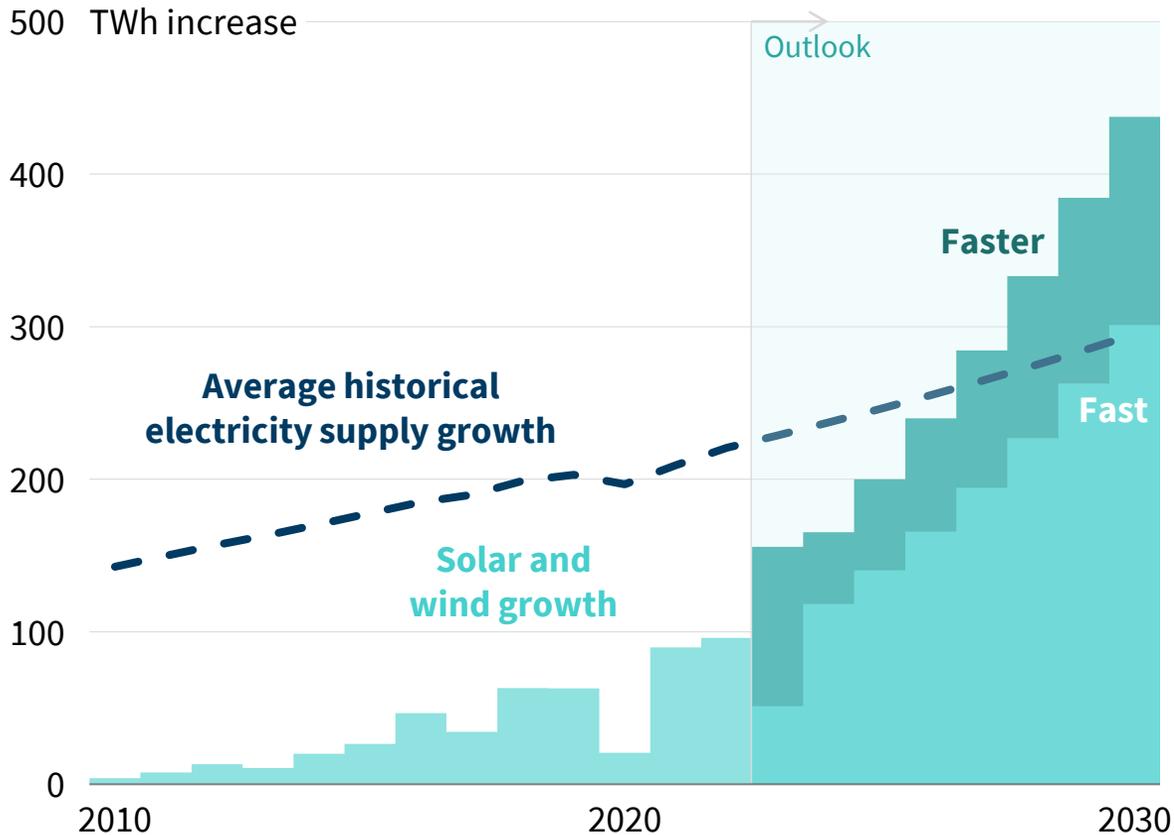
Electrification



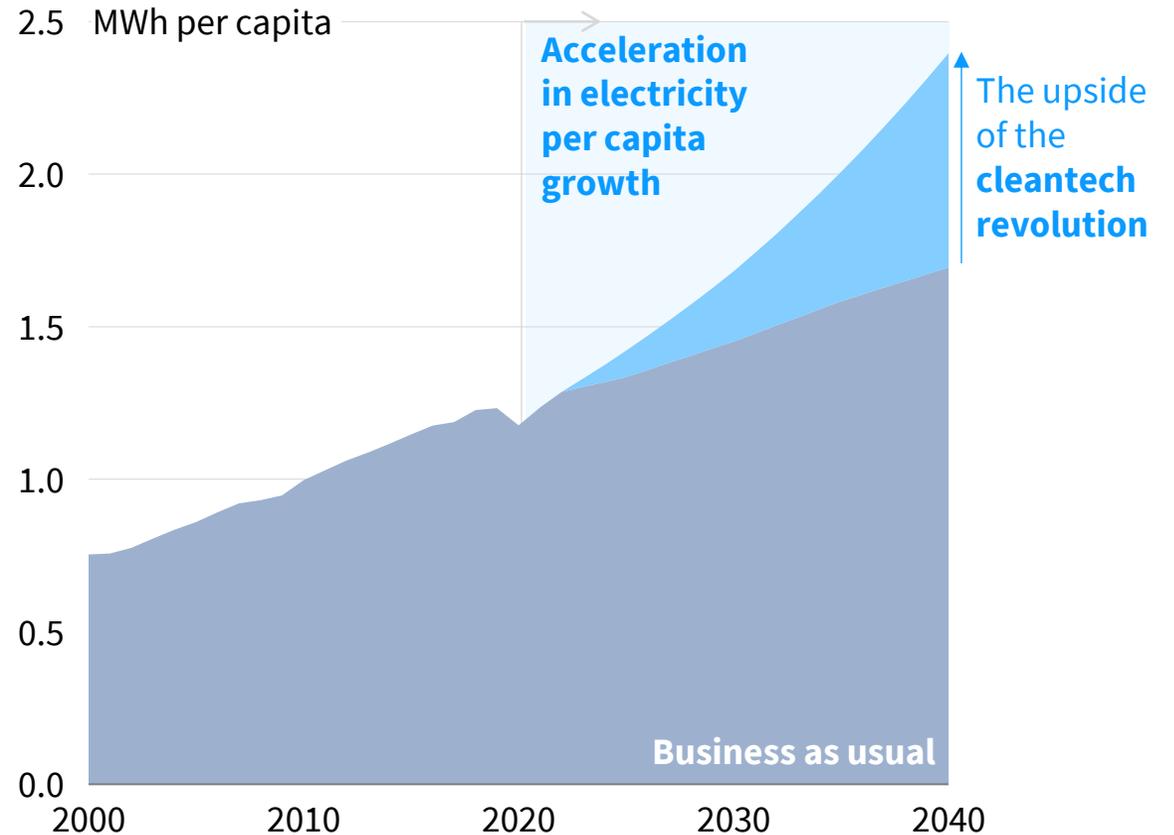
More energy for the Global South

Solar and wind growth will soon exceed historic electricity growth, bringing more energy to the Global South

Electricity versus solar and wind growth



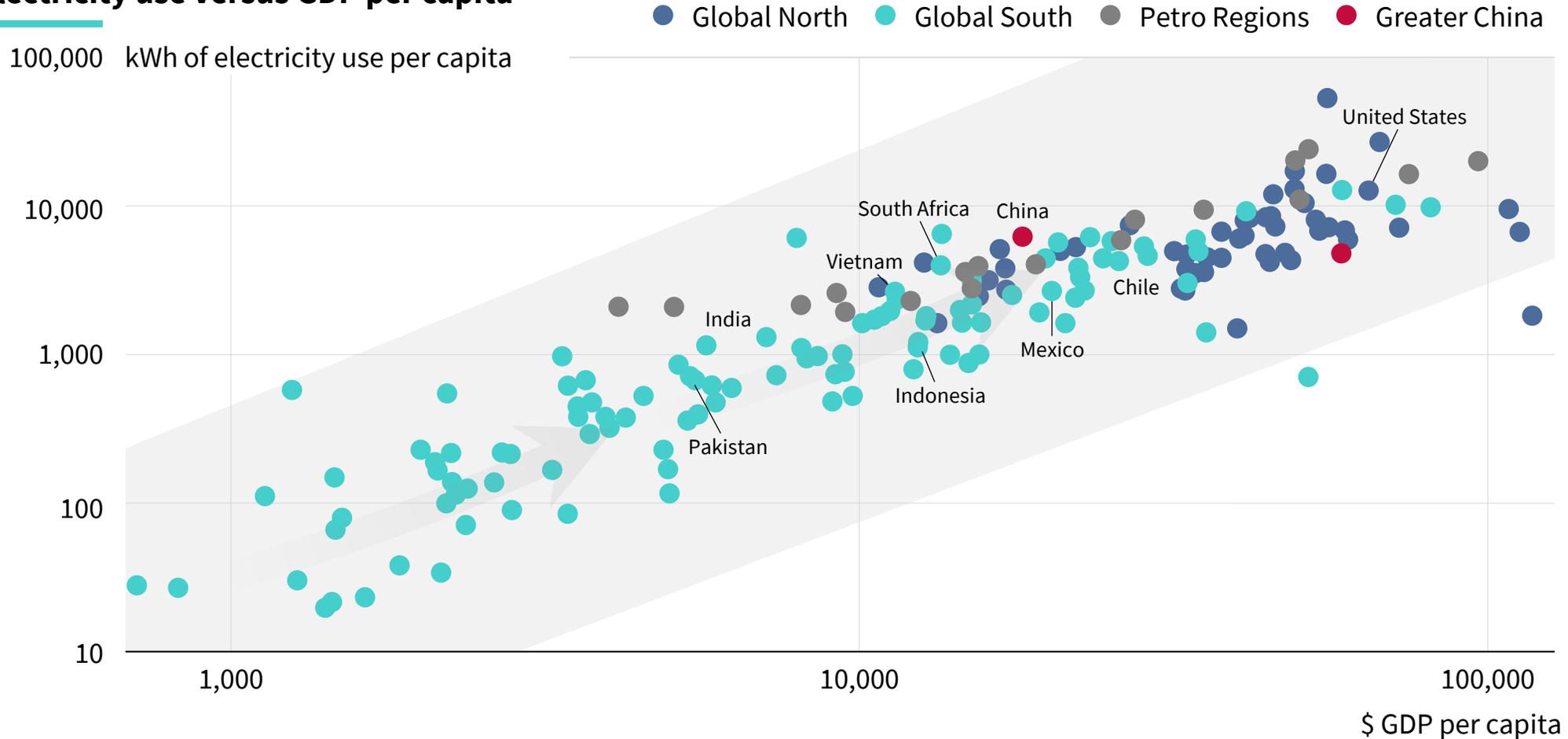
Electricity supply



More electricity means faster growth

Electricity is the driver of economic growth in the 21st century

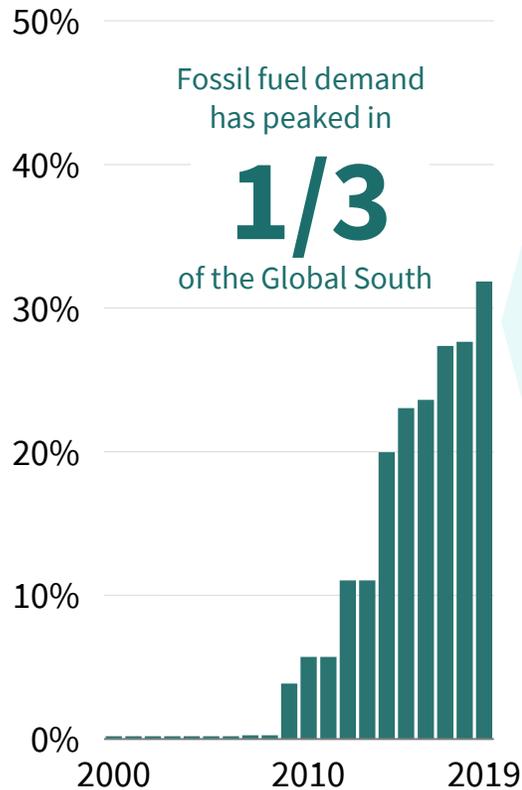
Electricity use versus GDP per capita



Fossil fuel demand has peaked in one-third of the Global South

Fossil fuel demand has already peaked in Latin America, South Africa, Thailand, and many others

Share of Global South past peak fossil fuels



Fossil fuel demand

Latin America



South Africa



Thailand



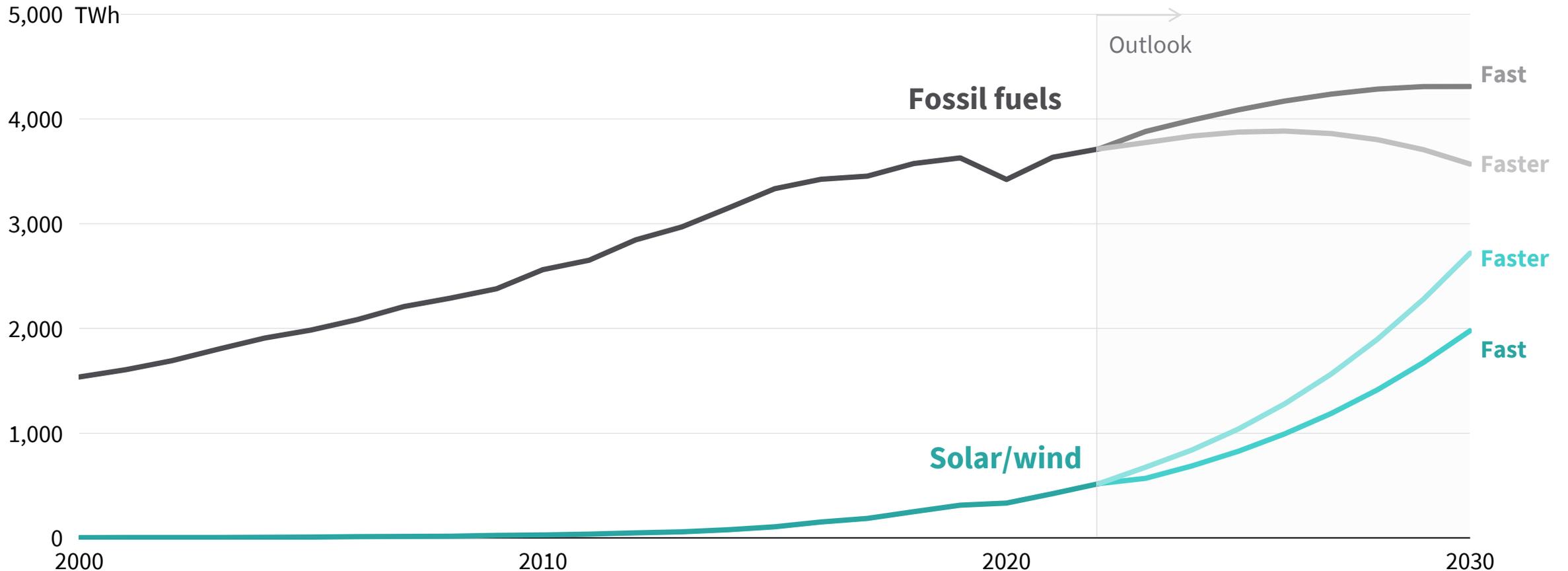
Jamaica



Fossil fuel demand for electricity will soon peak

At current growth rates of solar and wind, there is very little room for fossil growth in the Global South

Generation from fossils and solar/wind in the Global South

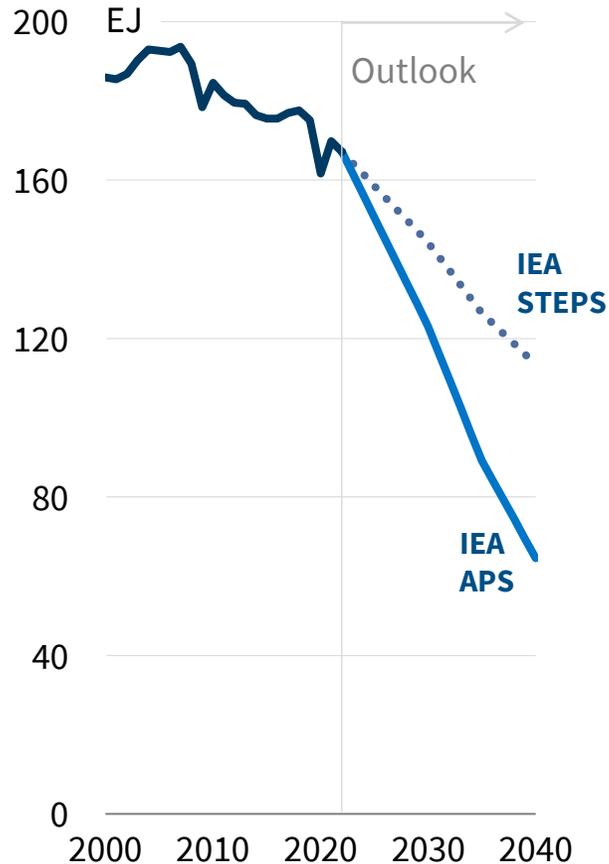


The Global South won't save global fossil fuel demand

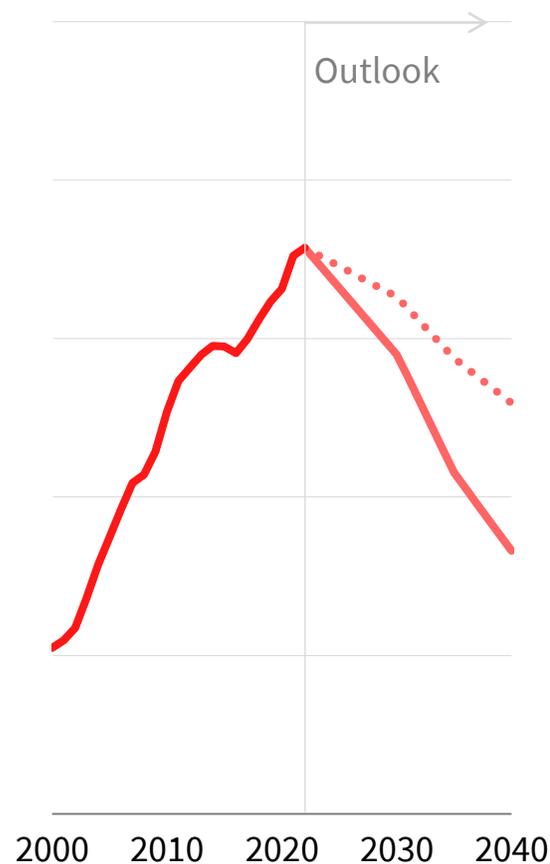
The Global South is not large enough to offset fossil decline in the Global North and China

Fossil fuel demand by region

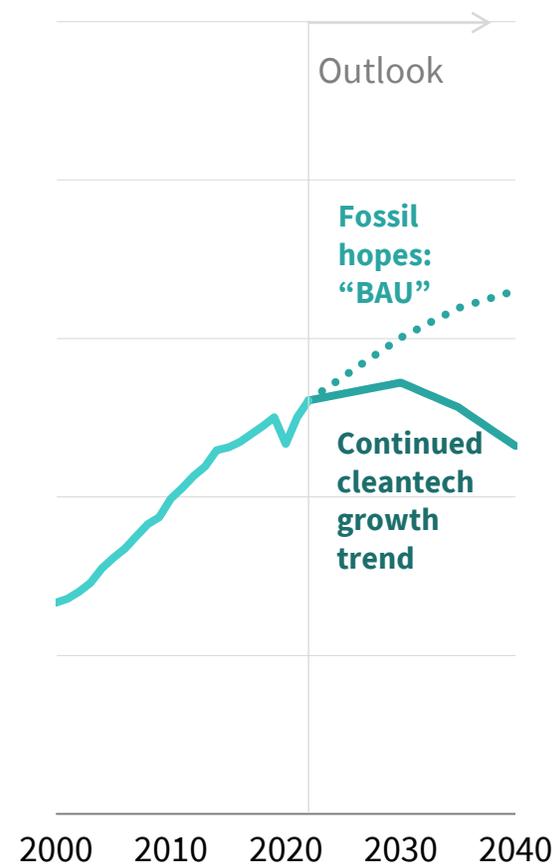
Global North



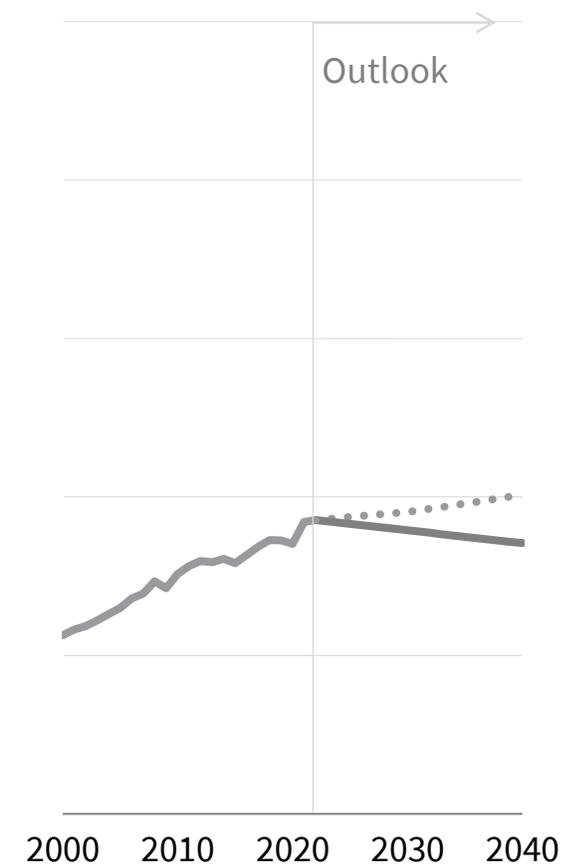
Greater China



Global South



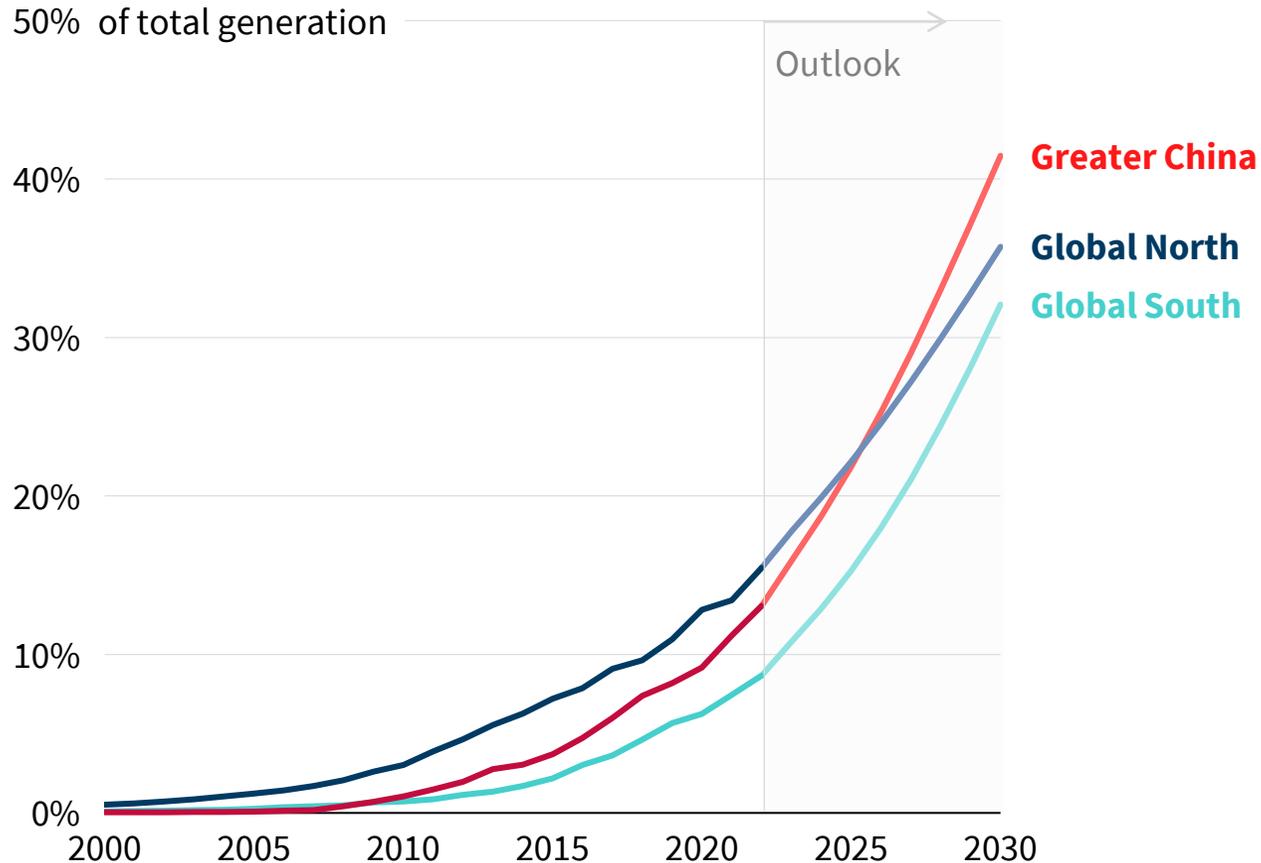
Petro Regions



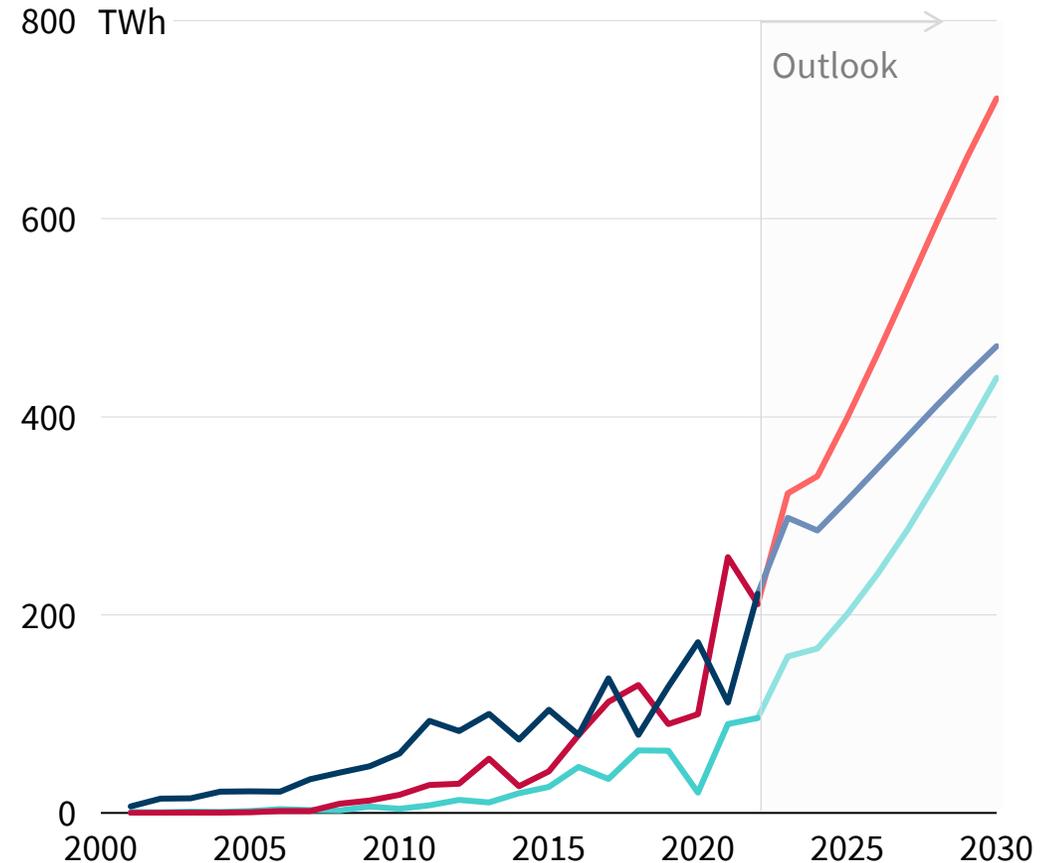
The Global South will be a driver of the cleantech revolution

By 2030, the Global South could be adding as much renewable capacity as the Global North

Solar & wind generation



Annual increase in solar and wind generation



About RMI

RMI is an independent nonprofit, founded in 1982 as Rocky Mountain Institute, that transforms global energy systems through market-driven solutions to align with a 1.5°C future and secure a clean, prosperous, zero-carbon future for all. We work in the world's most critical geographies and engage businesses, policymakers, communities, and NGOs to identify and scale energy system interventions that will cut climate pollution at least 50 percent by 2030. RMI has offices in Basalt and Boulder, Colorado; New York City; Oakland, California; Washington, D.C.; Abuja, Nigeria; and Beijing.

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