



Zero Carbon Prosperity for Climate Adaptivity

A New Narrative for Climate Actions

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Centre for Global Climate Strategies
18 August, 2026



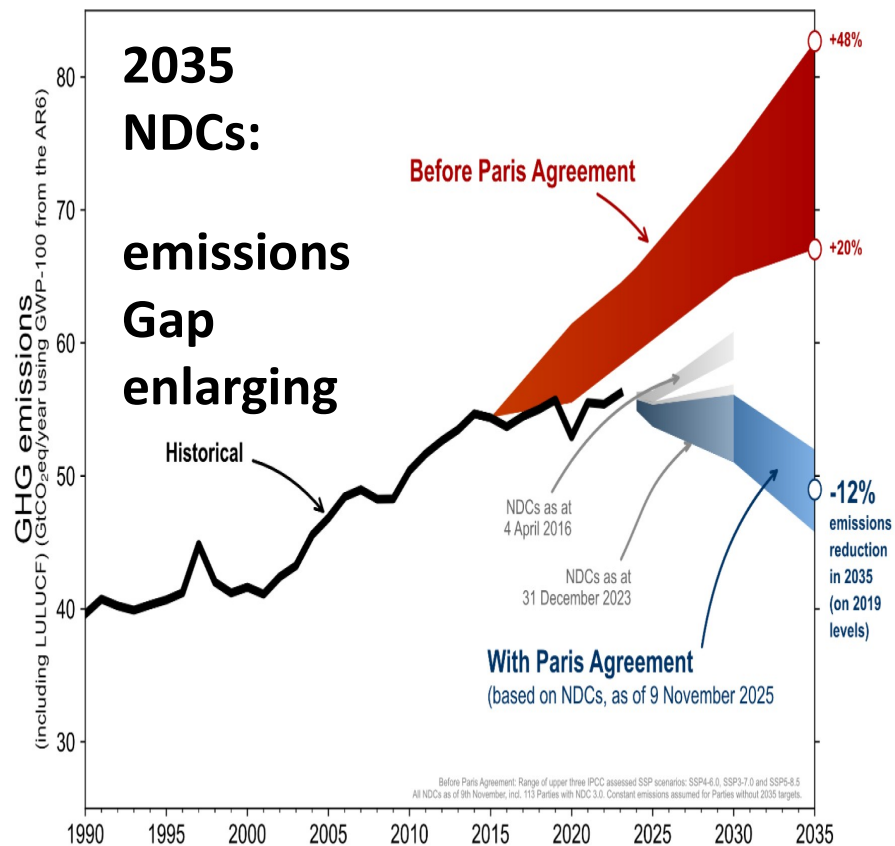
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TECHNOLOGY (GUANGZHOU)

Mitigation or Adaptation?

An Ethical Paradox for Climate Finance

Carbon budget constraints for 1.5°C

Zero Sum Game for Limited Emissions Space



Simon Stiell: MESSAGE TO PARTIES AND OBSERVERS
Nationally Determined Contributions Synthesis Report – Update, 10 November 2025



- By end of 2025, remaining carbon budget to limit global warming to 1.5°C: **170 GtCO₂**;
- In 2025, total global fossil CO₂ emissions to **38.1GtCO₂**
- At the annual rate of emissions, **4 years** to use up
- Land use emissions **5.03 GtCO₂/a** over the years between 2015 - 2025

Global Carbon Budget 2025

Paradoxical climate ethics: climate security or carbon equity?

Climate actions should reject misleading narratives and misperceptions of carbon ethics

- **Climate Finance: a paradoxical choice.**

Under a give budget constraint, more on losses & damages, less on zero carbon transition. In the longer run, more losses & damages.

- **Carbon Equity: a paradoxical ethical doctrine.** the poor for equal emission rights, the rich cut emissions. Then, more emissions, less chance for 1.5° C. More losses & damages.

- **Externality dilemma:** spacial and temporal mismatches of cost & benefits.

Deadlocked: fighting for carbon equity, no way out, and no climate security!

Carbon Equity: total vs. per capita; current vs. future

		unit	2024	2035	2050	2050/2024
US	population(m)	m	340	357	374	110.0
	total emissions	MtCO ₂	4521	4447	4127	91.3
	per capita emissions	tCO ₂ /c	13.3	12.5	11.0	83.0
EU	population(m)	m	448	438	420	93.8
	total emissions	MtCO ₂	2385	1643	995	41.7
	per capita emissions	tCO ₂ /c	5.3	3.8	2.4	44.5
Africa	population(m)	m	1494	1884	2434	162.9
	total emissions	MtCO ₂	1460	1658	2244	153.7
	per capita emissions	tCO ₂ /c	1.0	0.9	0.9	94.3
China	population(m)	m	1415	1369	1256	88.8
	total emissions	MtCO ₂	12660	11997	9256	73.1
	per capita emissions	tCO ₂ /c	8.9	8.8	7.4	82.4
India	population(m)	m	1441	1568	1669	115.8
	total emissions	MtCO ₂	3113	3883	4995	160.5
	per capita emissions	tCO ₂ /c	2.2	2.5	3.0	138.5

a Includes industrial process and flaring emissions.
b. projections under current policies
Source: IEA, World Energy Outlook 2025. p. 444 & P.449



Global Mutirão:

Uniting humanity in a global mobilization against climate change. 2025-11-21

From COP 30 to COP 31
Anything actionable for mitigation or adaptation?

Climate Finance: By 2035, \$1.3 trillion/a, public and private; \$300billion/a, public finance. Ambitious targets, yet merely pie in the sky. Mere words will not fill a bushel. What is more, such empty pledges are being retracted.

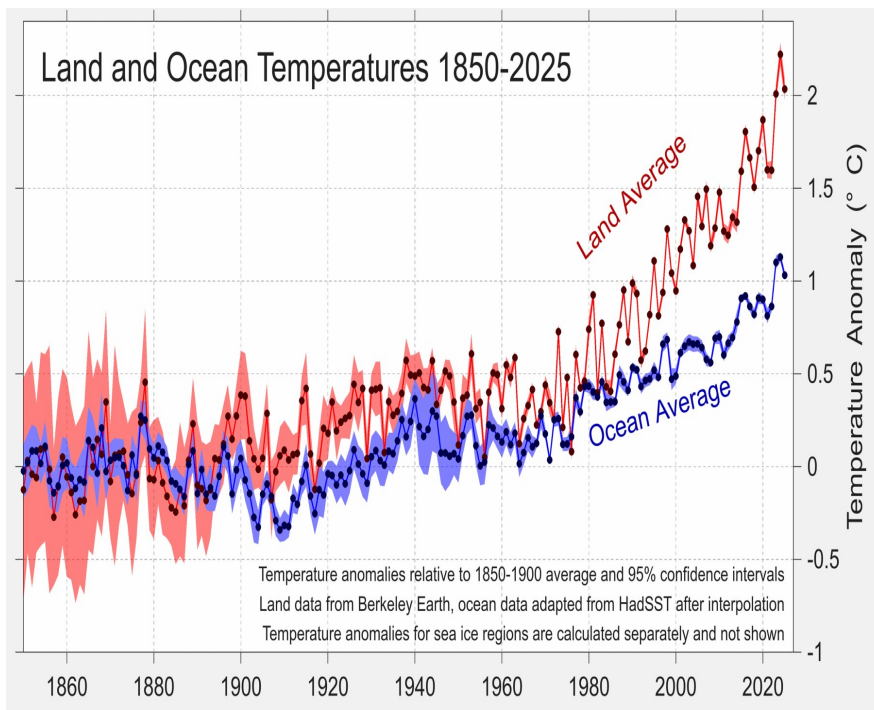
Belém Adaptation Indicators: By 2035, triple adaptation finance; Global Goal for Adaptation (GGA): A system of 59 indicators agreed, covering finance, technology transfer, capacity building, gender, etc. MRV technically difficult for actions

Mitigation Pathways: COP 28 Transition Away from Fossil Fuels (TAFF) not included; Belém Mission to 1.5, no concrete pathways; Global Implementation Accelerator, no target.

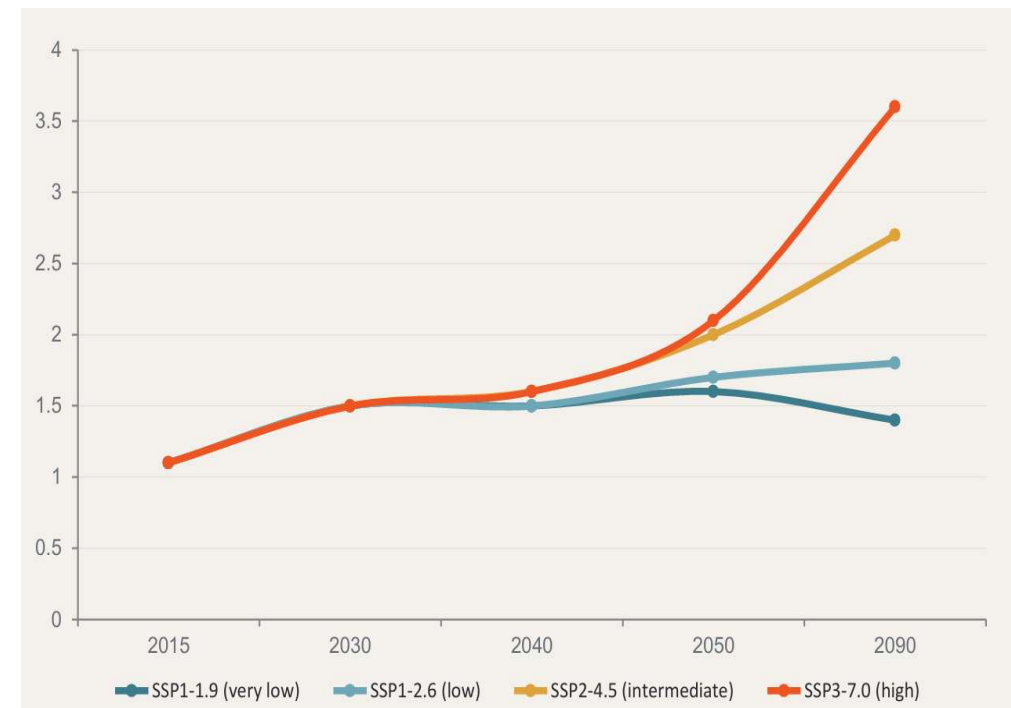
Just Transition Work Programme (JTWP): Just Transition Mechanism established. No TAFF, Just for what?

Mitigation still decides everything in the longer term

The gap that opens after ~2050 depends on our actions now. Today's energy choices decide whether late-century warming is $\sim 1.4^{\circ}\text{C}$ or $\sim 3.6^{\circ}\text{C}$.



Land and ocean temperature rise since the pre-industrial 1850-1900 period. Figure from Berkeley Earth.



Assessed best estimates, IPCC AR6 WG1, Table SPM.1.

Antigua and Barbuda	Australia	Austria	Bahamas	Barbados	Belgium	Belize	Brazil	Cabo Verde	Chile
Colombia	Cook Islands	Costa Rica	Croatia	Cyprus	Denmark	Dominica	Dominican Republic	Estonia	
Fiji	Finland	France	Georgia	Germany	Greece	Grenada	Guatemala	Guyana	Honduras
Iceland									
Ireland	Jamaica	Kenya	Latvia	Liechtenstein	Lithuania	Luxembourg	Maldives	Malta	
Marshall Islands	Mauritius	Mexico	Micronesia	Monaco	Mongolia	Nauru	Netherlands	Niue	Norway
Palau	Panama	Papua New Guinea	Peru	Portugal	Romania	Samoa	São Tomé and Príncipe	Slovakia	
Slovenia	South Korea	Spain	St. Kitts and Nevis	St. Lucia	St. Vincent and the Grenadines	Suriname	Sweden		
Switzerland	Tonga	Trinidad and Tobago	UK	Vanuatu					

Both 'supporter' and 'opposer'

Bahrain	Bulgaria	Comoros	Cuba	Czech Republic	Guinea-Bissau	Haiti	Hungary	Kiribati	Nepal
Sierra Leone	Solomon Islands	Timor-Leste	Tuvalu						

'Opposers'

Algeria	Angola	Argentina	Armenia	Bangladesh	Benin	Bolivia	Brunei	Burkina Faso	Burundi
Cambodia	Central African Republic	Chad	China	Democratic Republic of the Congo	Djibouti	Ecuador	Egypt		
El Salvador	Eritrea	Ethiopia	Gambia	Guinea	India	Indonesia	Iran	Iraq	Jordan
Kuwait	Laos								
Lebanon	Lesotho	Liberia	Libya	Madagascar	Malawi	Malaysia	Mali	Mauritania	Moldova
Morocco	Mozambique	Nicaragua	Niger	Nigeria	Oman	Pakistan	Palestine	Paraguay	Philippines
Qatar	Russia	Rwanda	Saudi Arabia	Senegal	Somalia	South Sudan	Sri Lanka	Sudan	Syria
Tanzania	Togo	Tunisia	Turkey	Uganda	United Arab Emirates	Venezuela	Vietnam	Yemen	Zambia

A RoadMap for Transition Away From Fossil Fuels

Supporters vs Opposers and the reasons behind, mitigation or adaptation?

Supporters: Mainly OECD economies, with high level of climate resilience and per capita emissions

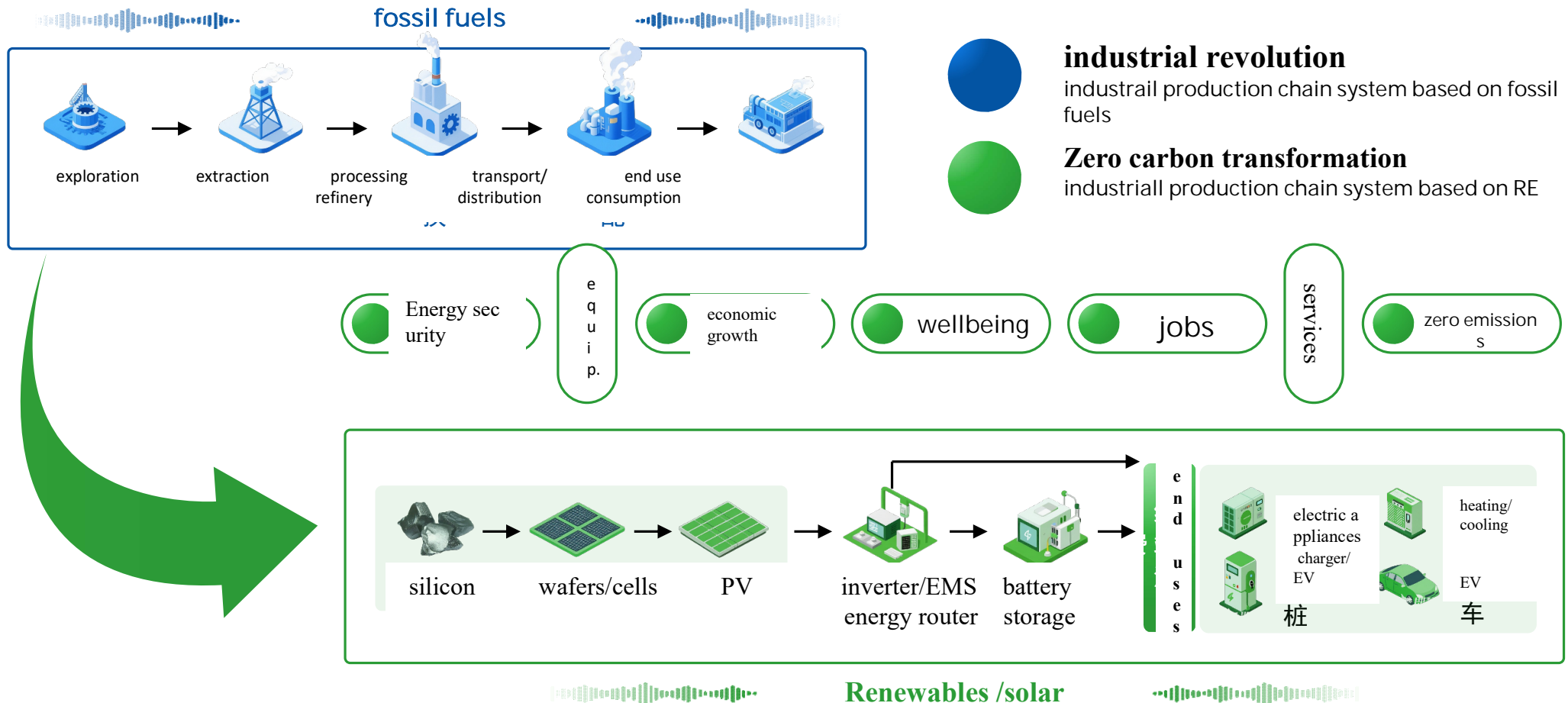
Opposers: Mainly OPEC and many economies countries, some per capita emissions high, most are highly vulnerable to climate risks.

Blocking the Roadmaps in the final "mutirao" (<https://carbonbrief.org/cop30takeaways/>)

Decarbonize Fossil Fuels or Zero carbon Renewables?

What does Just Transition Mean for Climate Adaptivity?

Fossil fuels, capital intensive and expensive, for the rich;
zero carbon renewables, climate and poor friendly



Zero carbon Renewables: Distributed, small in size, affordable and manageable, as compared with fossil fuels

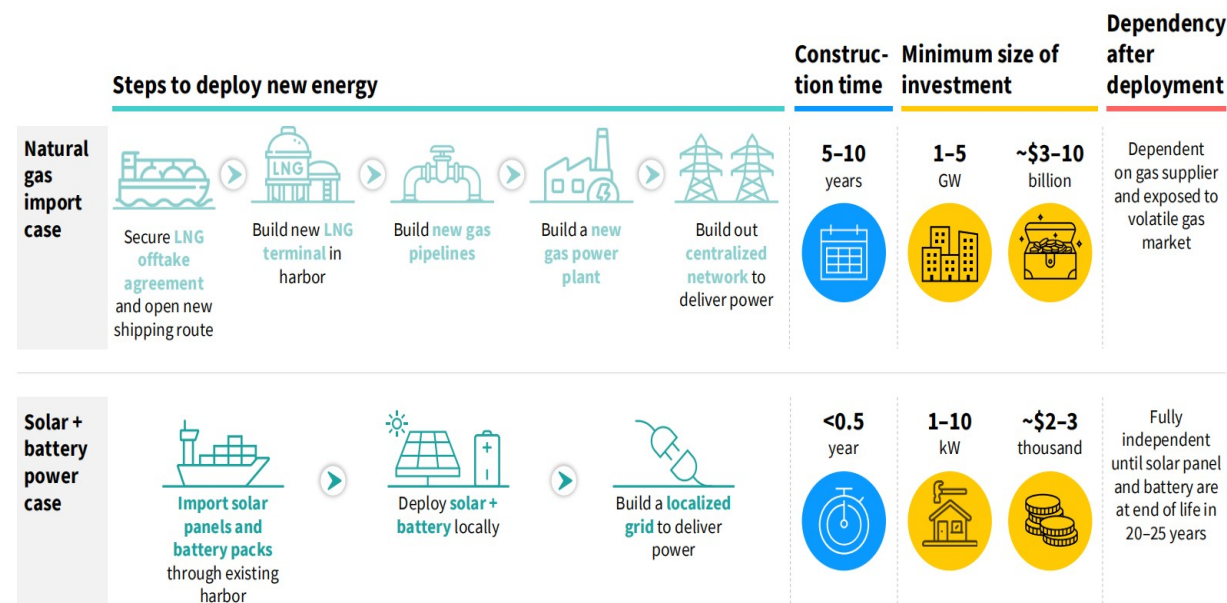
Solar Power

- By end of 2025, total installed capacity: 1,202GW
- New additions of installation:
 - 2024: 280GW
 - 2025: 315GW
- Net annual increase in solar power generation:
 - 2024: 250.8TWh
 - 2025: 339.2TWh

As a comparison: The Three Gorges Hydro Power: 18 yrs (1992-2012) to construct; total investment: 200 billion RMB; total installation: 22.5GW; annual electricity generation: 80-100TWh

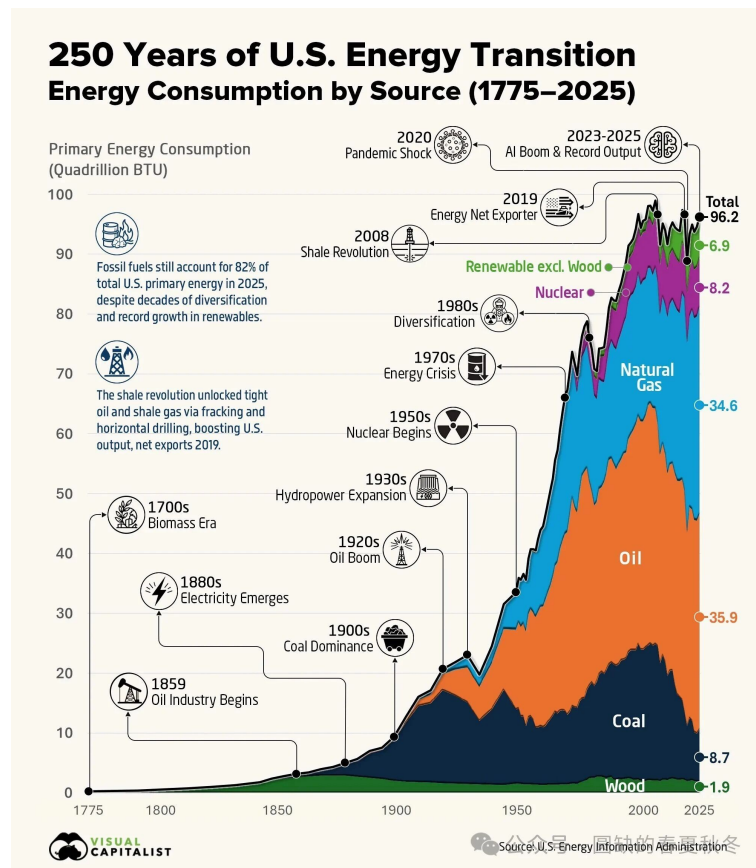
Renewables allow for faster energy growth than fossil fuels

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

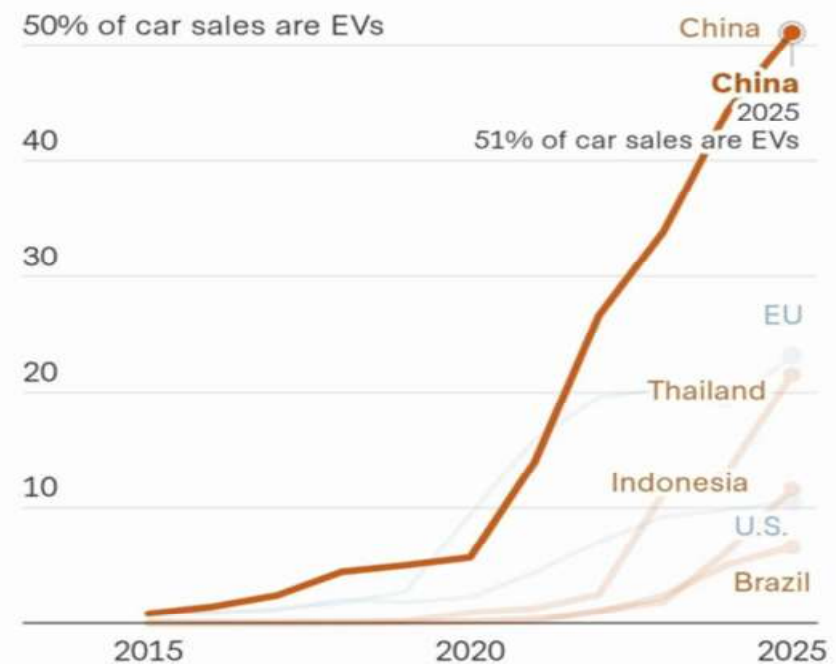


What is just?

Is the global south taking the lead, doing more and better than the global North?
Zero Carbon Renewables: North and South redefined?



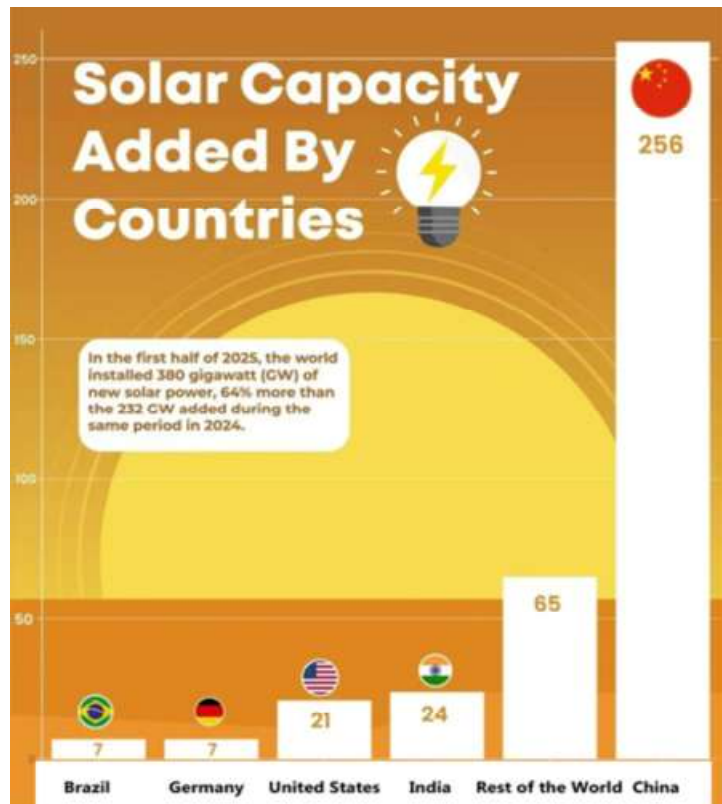
50% of car sales are EVs



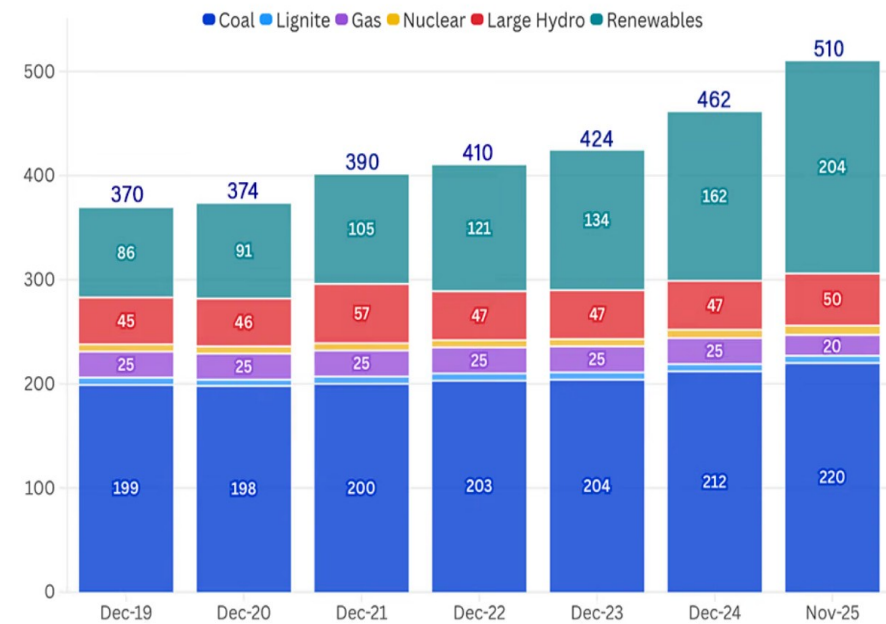
Source: EV Volumes • Chart: iLab

CSIS
CHARTS

Zero Carbon Renewables: North and South redefined? China & India go renewables faster and more determined



INDIA'S TOTAL INSTALLED POWER GENERATION CAPACITY (IN GW)



Source - Central Electricity Authority(CEA), India

*Renewables include solar, wind, small hydro and bio-power

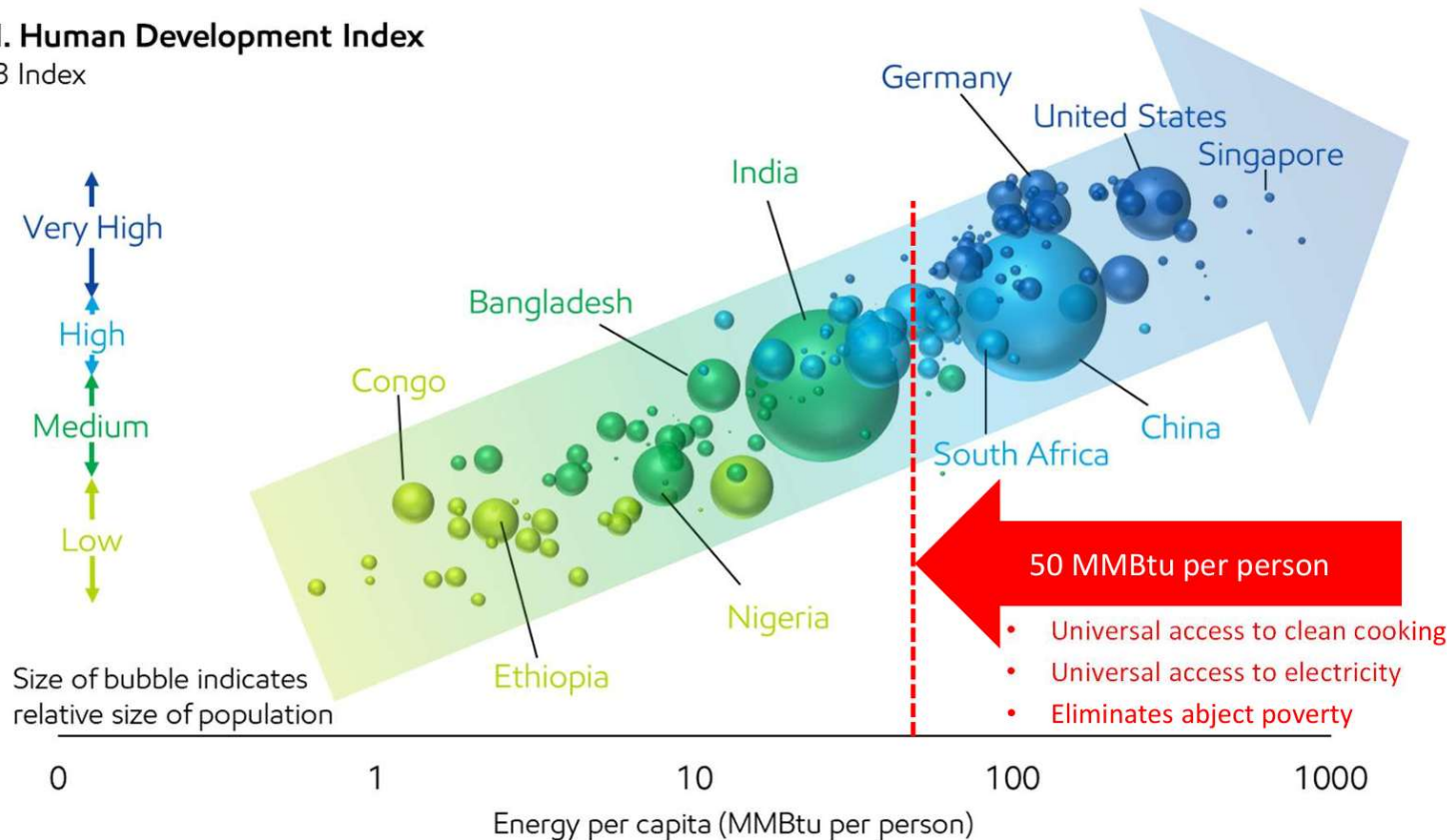
Graphics: Sonali Dub/ThePrint

Capacity Building for Climate Adaptivity

Proactive Expansion or Passive Defensiveness

Energy is essential for human development. More than 4 billion people live below modern standards for life expectancy, education, and income

U.N. Human Development Index
2023 Index



Sources: U.N. Human Development Reports, EIA, ExxonMobil analysis

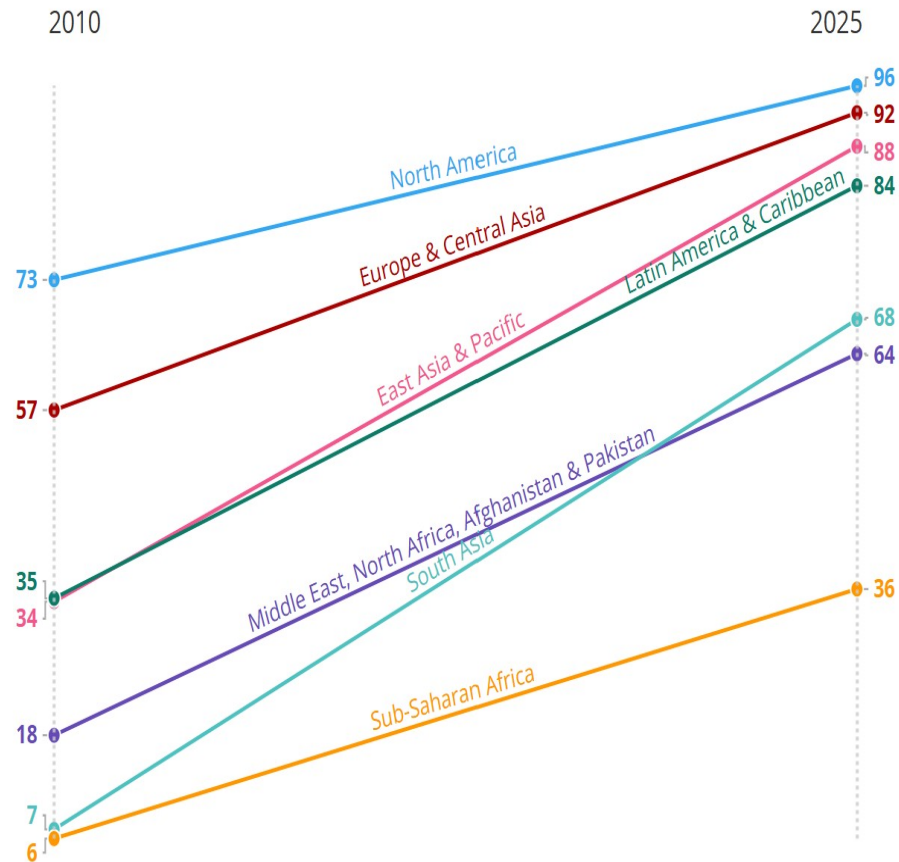
50 MMBtu
=1.80 tce
=14653.55kWh

1.80 tce can generate
5861.5kWh

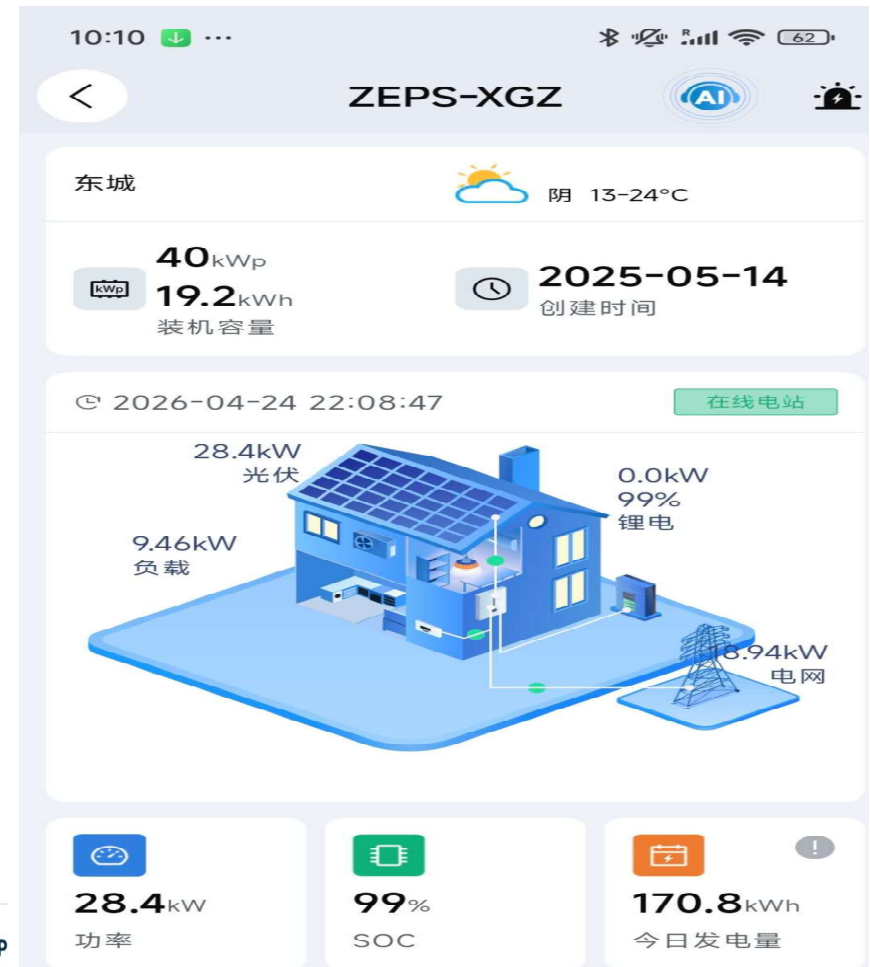
60 M², 12 kW
solar PV capacity
\$4,500 cost
Power Battery
capacity 20kWh
plus inverter
\$6,000
Annual power
generation:
15600kWh

Percentage of the Population Using the Internet

Solar panels on top of roof, 100% for internet connection?



Source: World Bank Group Scorecard, International Telecommunications Union



Climate Risks at Their Extremes: outward or inward climate migration/ climate mobility

Hotspots of internal climate migration will intensify in rural, urban, and coastal systems

People will migrate due to slow-onset climate change impacts—those included in the model are:



Water scarcity



Lower crop productivity



Sea level rise and storm surge

Some places may become less livable—factors examined include:



Heat stress



Extreme events



Land loss

People in the Middle East and Small Island Developing States (SIDS) will also be affected by climate-driven migration

TAKING ACTION ON INTERNAL CLIMATE MIGRATION

- Cut global greenhouse gases now to reduce the climate pressures that drive internal climate migration
- INTEGRATE CLIMATE MIGRATION into far-sighted green, resilient and inclusive development planning
- PLAN FOR EACH PHASE of migration — before, during and after — to ensure positive adaptation and development outcomes
- INVEST IN UNDERSTANDING THE DRIVERS of climate migration through evidence-based research, models, and consultations, to inform policy response



Gobi Desert in Western China, Solar panels installed (4GW), area covered 76.76km², power generated (6.90TWh), evaporation reduced, job position created.

塔克拉玛干沙漠, 2025; 占地76km², 装机容量400万千瓦, 年发电量69亿度。

“Clement, Viviane; Rigaud, Kanta Kumari; de Sherbinin, Alex; Jones, Bryan; Adamo, Susana; Schewe, Jacob; Sadiq, Nian; Shabhat, Elham. 2021. Groundswell Part 2: Acting on Internal Climate Migration. © World Bank. <http://hdl.handle.net/10986/36248> License: CC BY 3.0 IGO.”



Climate Extreme: record-low river levels force atomic power plants to reduce output in Hungary and Romania

Hungary and Romania have been forced to shut down nuclear reactors cooled by the Danube for the first time, as record-low water levels deepen fears of an energy crisis across the region.

The drought forced the shutdown of a reactor at Romania's only nuclear plant at Cernavodă.

Lorenzo Tondo and agencies, 3 Aug. 2026, The Guardian Photograph: Andreea Alexandru/AP



Solar Energy: Climate safe and secure at the edge of Himalayas, Sichuan Province, Altitude 4,200 above sea level. Solar panel installed (1GW), electricity generated 3.9TWh/yr

四川甘孜，4200米；2025；装机容量200万kW 年发电量~39亿度



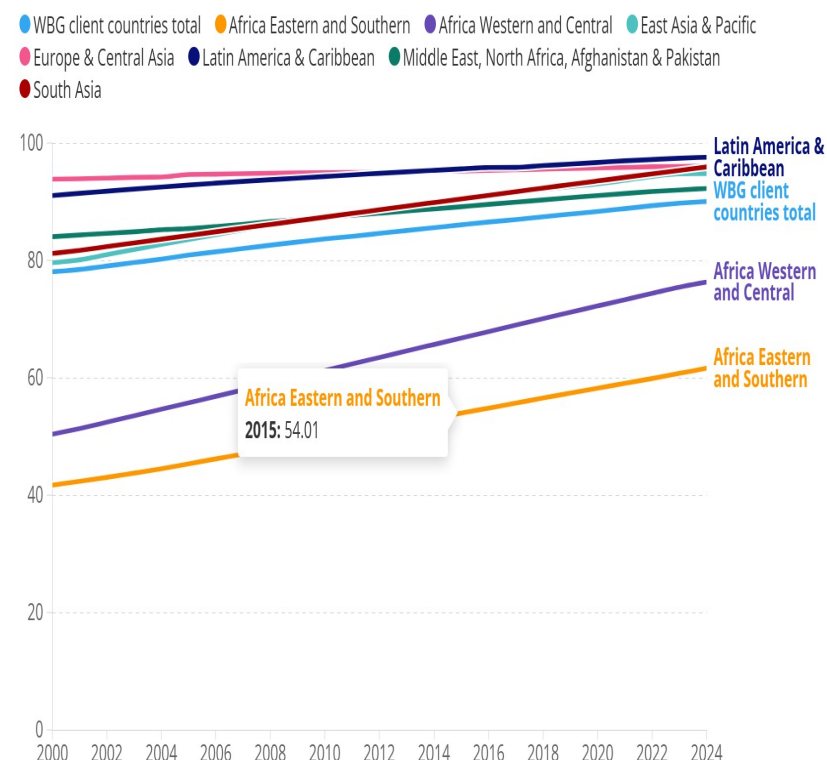
With Renewables, water can be pumped, purified and supplied

At the outlet of Yellow River in Dongying, Shandong Province, 12.3 km² used for solar panel installation; 1.2GW; 1.78TWh/yr.

山东东营黄河入海口渤海，2025. 装机容量100万kW 年发电量17.8多亿度

People Using At Least Basic Drinking Water Services (% of population)

by region (WBG client countries)



Source: World Bank Group Scorecard, WHO/UNICEF JMP for Water Supply, Sanitation and Hygiene, World Development Indicators



Cash in on human misery, or cash
in on renewables?

Economic losses from climate extremes vs. Oil companies cashing in on geopolitical conflicts



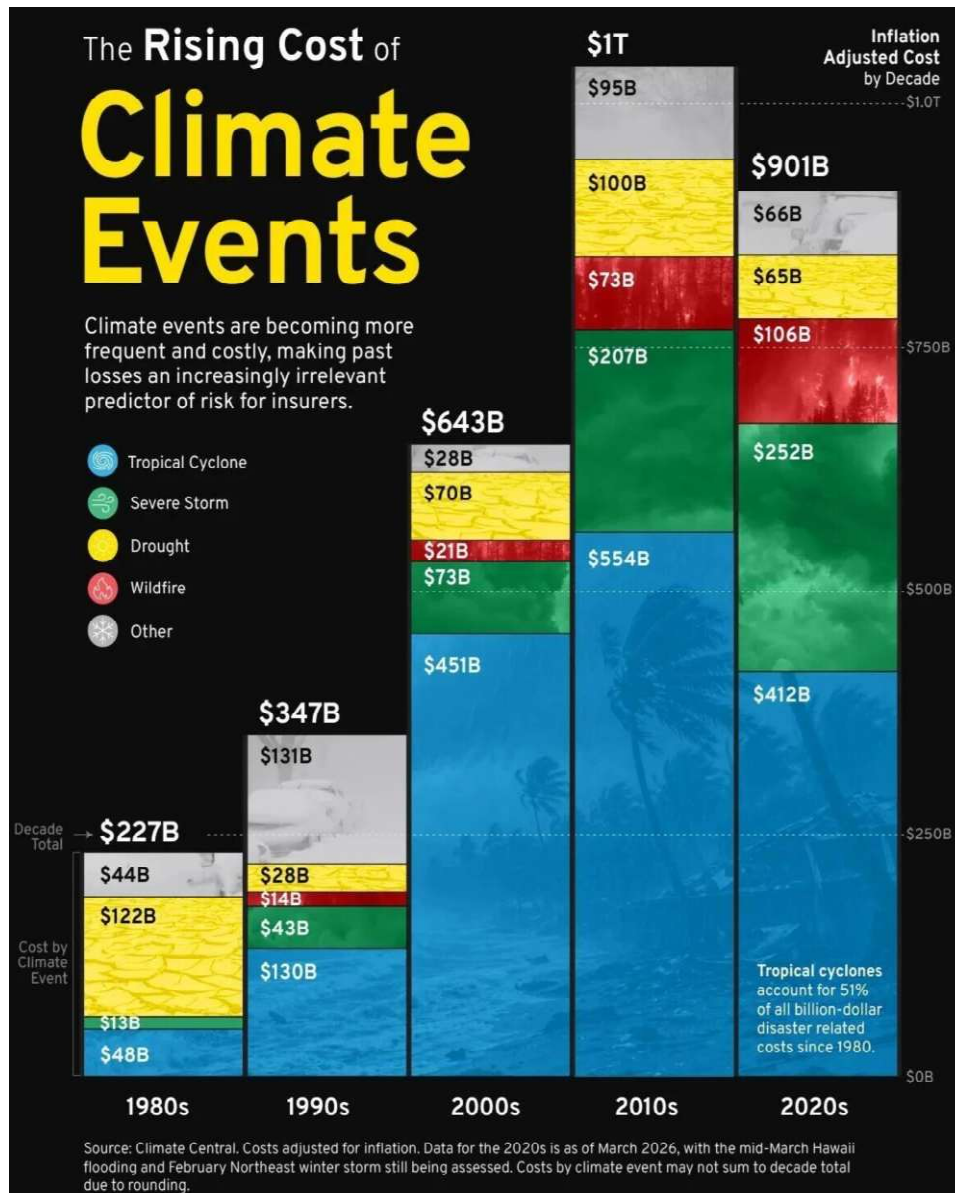
Up to end July, over 2000km² burned in Spain, and over 420km² in France, 220,000 people evacuated.

€3bn: The “economic toll” of European wildfires so far this year, according to an estimate by the [Financial Times](#). 2026-0806 (Carbon Brief, 20260807)

\$93bn: eight listed oil producers made in **the three months to the end of June – the first full financial quarter** after the US-Israeli war on Iran Guardian 2026-0804



Strait of Hormuz Crisis 2026. triggered a surge in global oil prices to highs above \$126 a barrel.



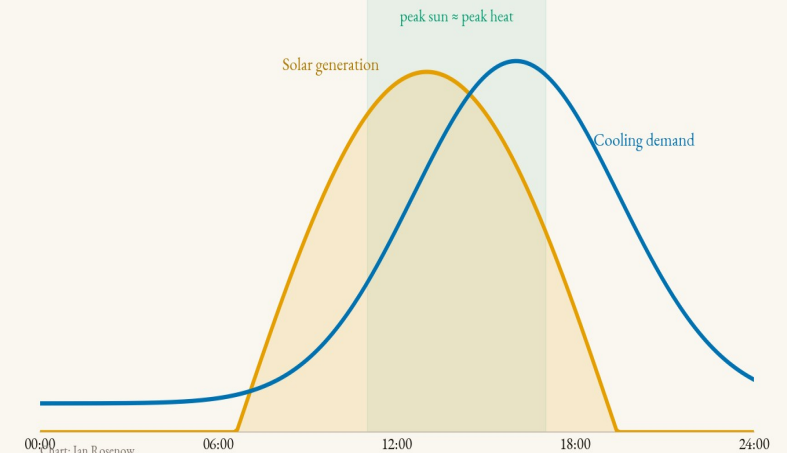
Rising Damages from Extreme Climate Events

- An opportunity for insurers to cash in
- higher cost for individual households

Adaptive Capacity Built Through Harvesting Solar Power for Air Conditioning and Irrigation

Solar peaks just when the cooling has to run

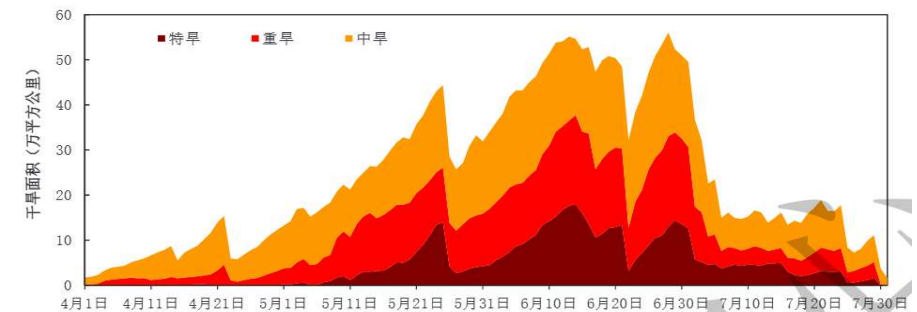
Shape of solar output vs. air-conditioning demand on a typical summer day



Sunshine to push heat waves, but for solar power



no rain but solar power for irrigation



京津冀晋鲁豫皖苏8省(市)

Oil companies cashing in on geopolitical conflicts through oil market manipulation



Vehicles queue for fuel in Peshawar, Pakistan on 3 April 2026. [Credit: ZUMA Press / Alamy Stock Photo](#)

Adaptive capacity building through cash in on renewables



In 2024, Pakistan imported 16 GW PV panels, nearly 1/3 of the country's total installed power generation capacity, of which **96.1% was distributed solar PV**.

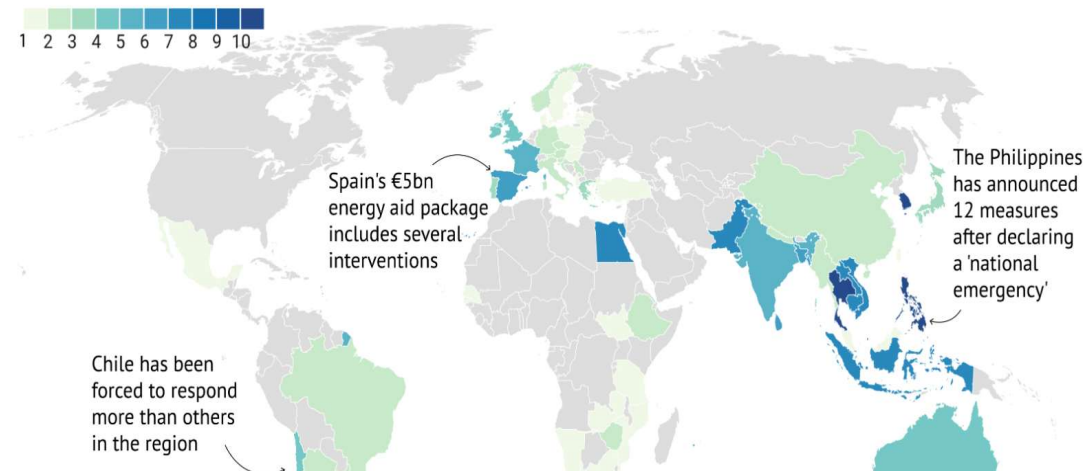
Farmers in Pakistan now have access to electricity: **95% of farmland in the Lahore area** has switched to solar-powered water storage, with an average installed capacity of **5–10 kW** per household, sufficient to cover an irrigated area of **2–5 hectares**

李响，南方国家“获得电”的中国途径——以巴基斯坦为样本。《文化纵横》2025年第5期

Renewables Based Solutions for Climate Resilience

At least 60 economies have already introduced some kind of emergency measures to deal with the energy crisis

Number of measures introduced by governments in response to the energy crisis



Geopolitical conflicts
leading to oil dependent energy crises,
But with virtually no impact on renewables
Climate adaptivity requires secure energy supply

[ps://www.carbonbrief.org/iran-war-analysis-how-60-nations-have-responded-to-the-global-energy-crisis/?utm_source=cbnewsletter&utm_medium=email&utm_term=2026-04-11&utm_campaign=DeBriefed+Worst+energy+crisis+ever+India+withdraws+COP33+bid+Drag+artists+and+climate+change](https://www.carbonbrief.org/iran-war-analysis-how-60-nations-have-responded-to-the-global-energy-crisis/?utm_source=cbnewsletter&utm_medium=email&utm_term=2026-04-11&utm_campaign=DeBriefed+Worst+energy+crisis+ever+India+withdraws+COP33+bid+Drag+artists+and+climate+change)

- Indonesia, Japan, South Korea and India are already spending **billions of dollars on fuel subsidies** to protect people from rising costs.
- The **Philippines** has declared a “**state of national emergency**”, which includes limiting air conditioning in public buildings and subsidising public transport.
- Bangladesh asking the public and businesses to avoid unnecessary lighting,
- **Pakistan** reducing speed limit on highways
- **Laos** encouraging people to work from home.
- **Spain** announced a €5bn aid package, with at least six measures to support consumers.
- Many **African** economies, while also less reliant on direct fossil-fuel supplies via the Strait of Hormuz than Asia, are still facing the strain of higher import bills.
- Ethiopia, Kenya and Zambia, are also facing severe fuel shortages.

Zero Carbon Renewable Energy Industrialization & urbanization in developing economies

Non fossil fuels, Zero carbon renewable energy driven



Solar panels powering homes, businesses, and agriprocessing in Anini community, Niger state, **Nigeria.**



Talus Ag's green fertilizer plant in Kenya.

Empowering Africa: Clean energy opportunities for economic growth, workforce development, and regional leadership As world leaders gather in Brazil for COP30, RMI shares our vision for sub-Saharan Africa. November 15, 2025 By [Ije Ikoku Okeke](#)

Solar Run's "Candle Killer" solar lamps in the least developed economies

Over 2 million "Candle Killer" units deployed in impoverished households across Africa, replacing **kerosene lamps**.

Cost of **solar lamps** for residents is just \$1/a, comparable to the expense they previously spent on kerosene and candles.

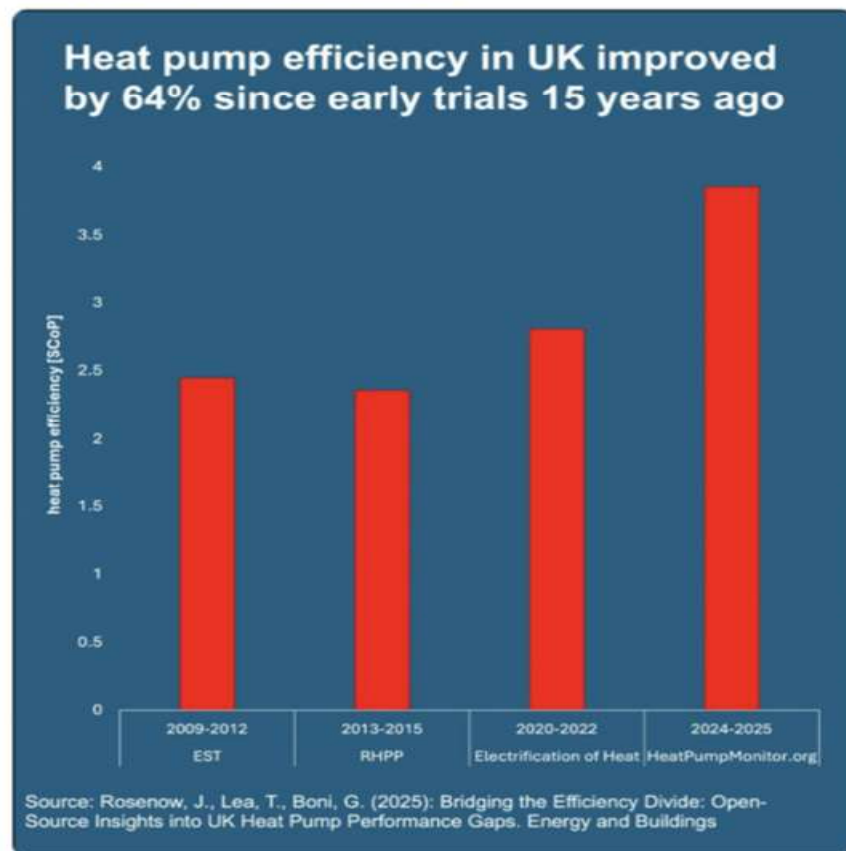
Solar Media's off-grid photovoltaic (PV) systems operate independently of the grid, integrating **solar home lighting with multimedia educational devices**. The video content covers vocational skills training, agricultural education, and more, and the preloaded content is tailored to the needs of different regions.



Solar street lights in Baro Village, Guinea.
Image credit: Mike Goldwater / Alamy

Zero carbon renewables compatible end use equipment more energy efficient and cost saving

[www.sciencedirect.com/science/arti...](https://www.sciencedirect.com/science/article/pii/S0360591225000000)

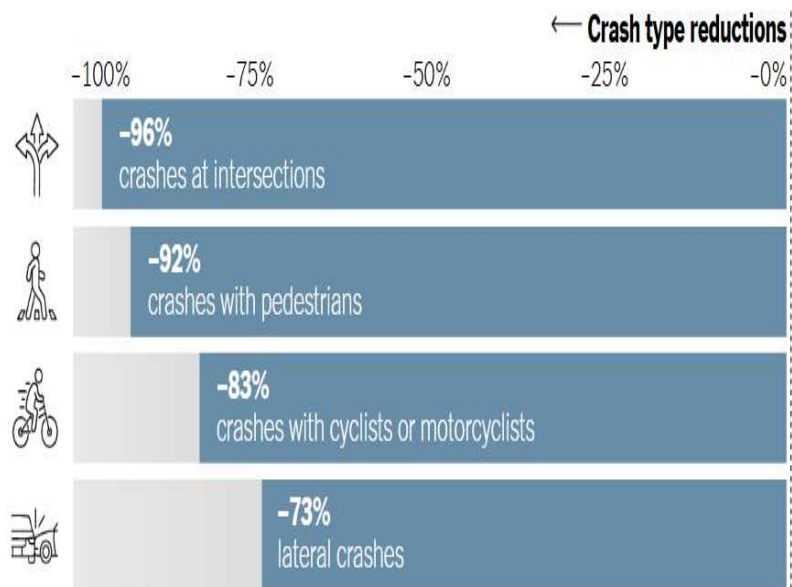


Heat pumps:

- **SCoP of 2.8 2020:** Electrification of heat trial data to use an efficiency
- **SCoP of 3.9 2024:** Detailed, real-time data on hundreds of heat pump systems around the UK the average efficiency
- **64% efficiency increase** in 4 years
- a typical household could cut its annual energy bills by **nearly £200** with a heat pump – even on a standard electricity tariff – if the system has a SCoP of 3.9

AI empowered Mobility: EV, safer, and cheaper

Compared to an average human driver over an equal distance, Waymo vehicles had...



Source: Waymo

<https://www.nytimes.com/2026/03/05/learning/what-s-going-on-in-this-graph-march-11-2026.htm>

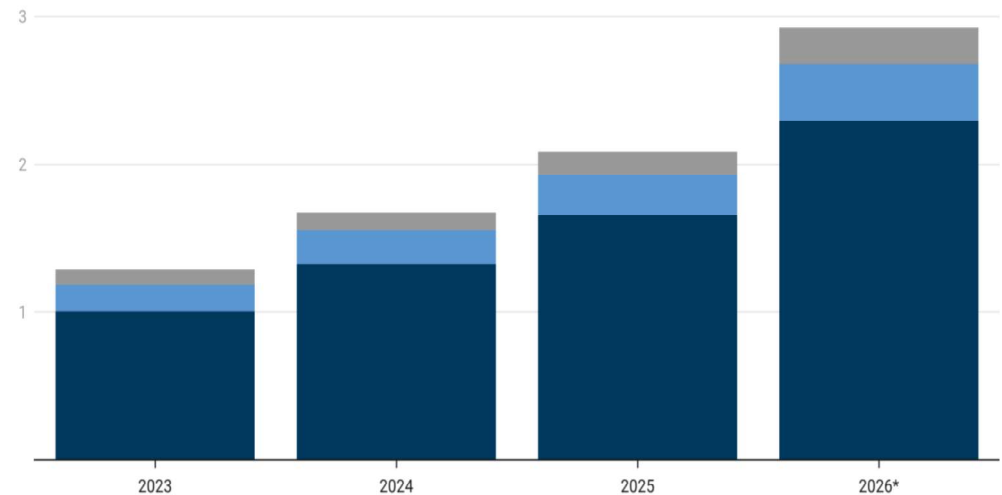


A Waymo driverless car in San Francisco. Credit: Andri Tambunan for The New York Times

UK's EV drivers are now saving £1,100 a year – and £3bn in total

Annual fuel cost savings, £bn

BEVs PHEVs Electric vans



Source: Carbon Brief analysis

CarbonBrief
CLEAR ON CLIMATE

Total annual fuel cost savings from the UK's fleet of battery EVs, plug-in hybrids and electric vans, £bn. Figures for 2026 based on EVs on the road as of May 2026 and the latest road fuel prices. Analysis based on 80% home charging at cheap overnight rates and 20% public charging. Savings can reach £1,400 a year with exclusive home charging. Source: Carbon Brief analysis.

Abundant clean energy and higher agricultural productivity in Australia:

Solar Sharer program and higher gross revenue under the solar farm

Three hours free electricity

Starting from July 1, 2026, from 11 AM to 2 PM in New South Wales and southeast Queensland and 12 to 3 PM in South Australia.

Many homes fill up their battery for free during the three Solar Sharer hours and then use it to power the rest of the day

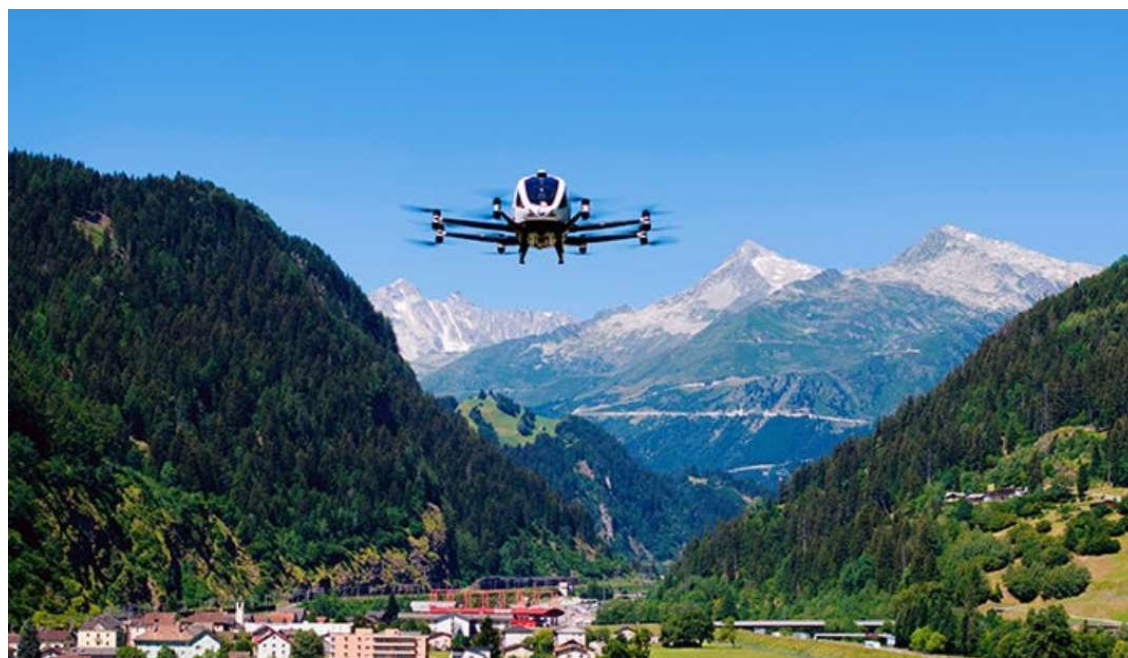
<https://www.energy.gov.au/rebates/solar-sharer-offer>

15 percent increase in the gross revenue coming from the sheep running under the solar farm



'Solar sheep' help Australia go green, one panel at a time. February 22, 2022. <https://kuwaittimes.com/article/40159/business/solar-sheep-help-australia-go-green-one-panel>

Drones powered by distributed renewables: Fascinating climate resilience work!



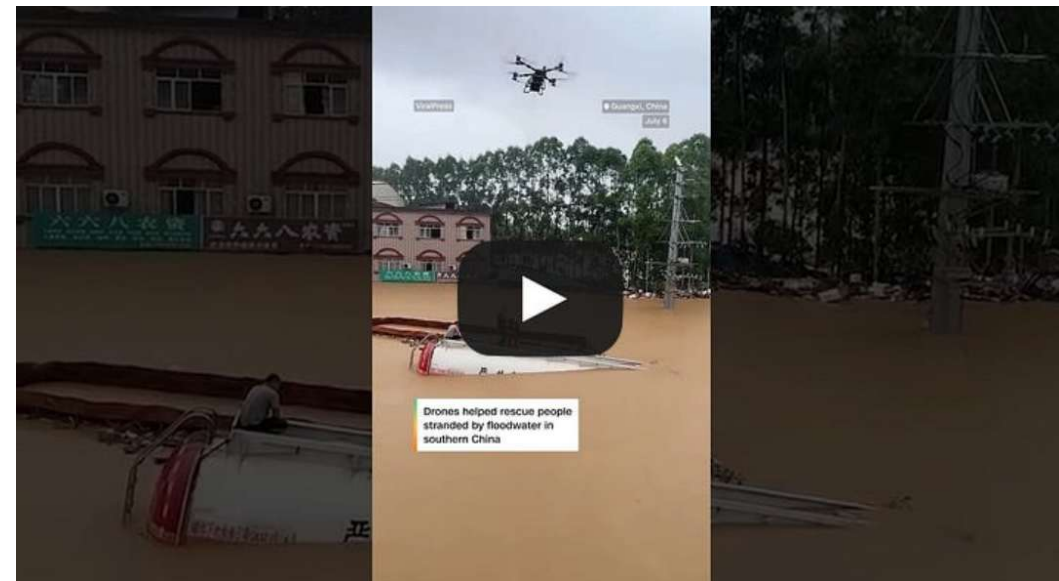
a test flight of the electric flying cars being built by Chinese manufacturer EHang

<https://www.ehang.com/news/1180.html>, January 16, 2025

Torrential rains from Tropical Storm Maysak caused devastating flooding in the Guangxi of southern China in July 2026.

Drones

- air-dropped supply packages to villages cut off by floodwaters,
- functioned as airborne hubs providing Internet connection, and
- physically lifted some people to safety





Thank you!

For further information: jiahuapan@hkust-gz.edu.cn