LES ATELIERS
DU FUTUR

ADF
Quarterly Climate Review #3

Executive Summary

June 2025

AGENDA

I | Call for actions

II | Climate

- II.1 | Recent Developments
- II.2 | Outlook

III | GHG Emissions

- III.1 | Recent Developments
- III.2 | Outlook

IV | Green Techs

- IV.1 | Recent Developments
- IV.2 | Outlook
- IV.3 | Synthesis

V | Public Policies

- V.1 | Recent Developments & Outlook

VI | Finance

- VI.1 | Recent Developments & Outlook

LES ATELIERS DU FUTUR

ADF QCR #3

Our Call for action to global leaders

OUR CALL FOR ACTION TO GLOBAL LEADERS

ENHANCING THE WILL
Closer Cooperation, Higher ambitions

1. **NDCs of world top 10 emitters** should be issued as soon as possible, with more ambitious targets to reduce emissions by 43% by 2030 and by 60% by 2035 compared to 2019 levels. NDCs should include the definition of policy mix (standards and regulation, subsidies and incentives, pricing and taxations) associated with carbon pricing.
2. As part of more ambitious new NDCs, **mandatory transition plans, aligned with Paris agreement targets**, should be prescribed to corporations worldwide, over and above EU initial CS3D applicability thresholds. Governments should notably prioritize **adequate power infrastructure investments, and strong support to BEV adoption and critical material extraction and processing**.
3. In the absence of such audited transition plan, **corporates dividend distribution and share buy-back** should be capped e.g. to 20% of net income. The most critical sectors, such as energy production, should be targeted first. Transition plans should include adequate internal carbon pricing.
4. **COP 28 methane pledge** from global energy industry should be closely monitored with additional investment needed to reduce the industry methane emissions by 75% by 2030.
5. **Global Climate Governance System:** Quaterly inter-COP meetings of the world leaders (G7, G20) should focus on climate-related issues to accelerate decision making process and improve monitoring.

ENHANCING THE MEANS
Easier financing of green projects worldwide

6. Central banks to be prescribed to issue **0% or very low interest rates for green energy projects**, including power infrastructure, as long as necessary to align developed and developing nations with the Net Zero scenario.
7. Raise conditions to develop **private and multilateral banks financing in developing nations (**including through global risk insurance) as well as secure local regulations.

ENHANCING THE SKILLS
Know-hows and capabilities to be developed

8. Increase R&D to develop **solutions to reach 2050 targets** (e.g. batteries, hydrogen, SAF, CCUS) by requiring large corporations of high emission sectors to invest a minimum of 10% of net cash flows.
9. Increase subsidies to step up efforts in **geothermal, thermal storage and biogas**. O&G companies should be prescribed **growing targets for biogas production as a % of fossil gas sales.**
10. **Increase investment in data, climate modelling, to better understand climate dynamics**. In response to U.S. budget cuts, Europe and other Parties should step up funding and resources sharing.

Climate:

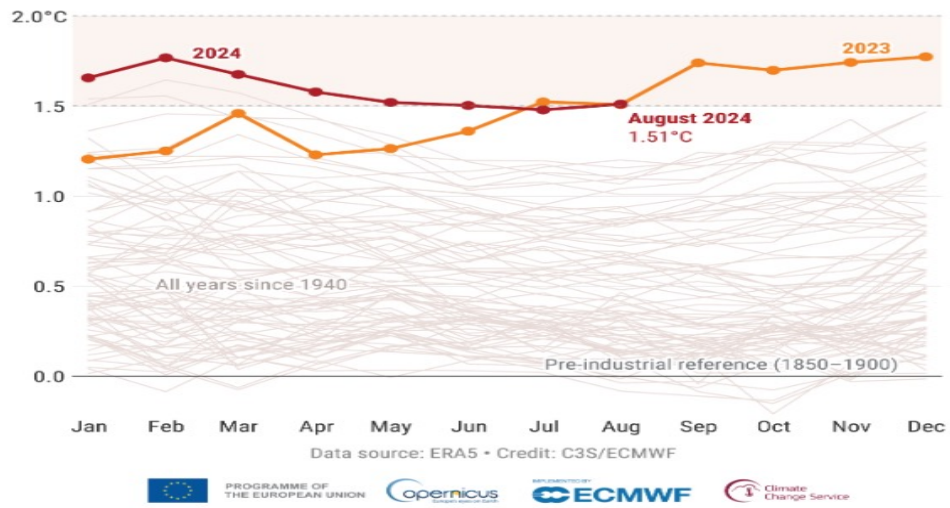
Recent Developments

2023 HAD ALREADY MARKED NEW RECORDS ON GLOBAL TEMPERATURES

Global warming in 2023 is 1.43 [1.32 to 1.53]°C above the preindustrial levels, partly due climate variability (strong El Nino). (Source : Copernicus)

Every month in 2023 was at least **1.2 °C** (2.2 °F) **warmer** than the corresponding 1850 to 1900 monthly average. S1 2024 follows the same pattern

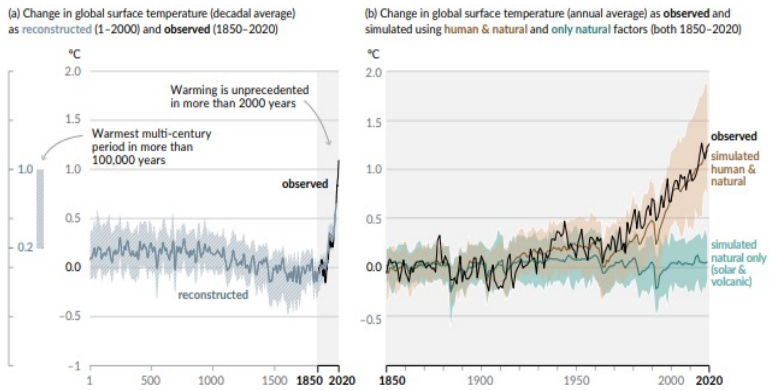
Global surface air temperature anomalies [1850s-2024]



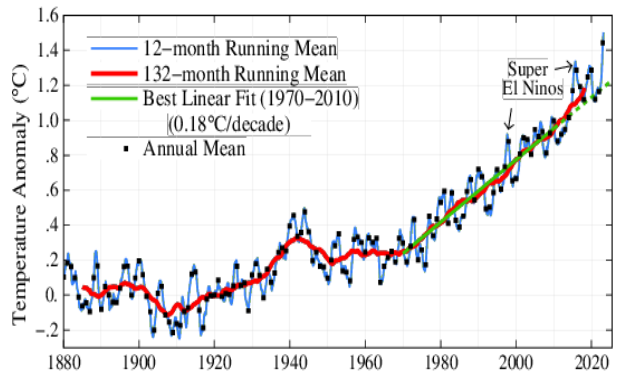
According to IPCC AR6 , human influence has warmed the climate at an unprecedented rate in at least the last 2000 years

Since the 1960s, **each decade has been warmer than the previous one**. 2011-2020 was the warmest decade on record

Changes in global surface temperature relative to 1850-1900



Mean temperature [1880-2023]



Source : Columbia University

2024 - A SECOND RECORD-BREAKING YEAR, FOLLOWING THE EXCEPTIONAL 2023

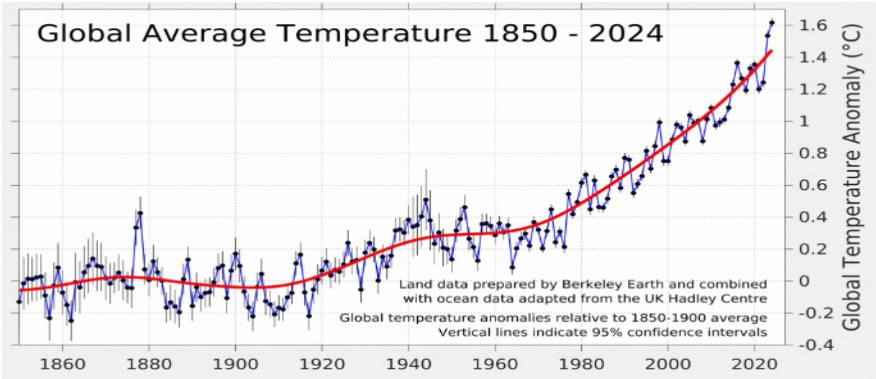
Combined average temperature anomaly for 2023 and 2024 is ~ +1.50°C above pre-industrial levels

2024 observed record in global surface temperature **(1.52°C best estimate**) is well above the best estimate of human-caused warming (1.36°C). However, the 2024 observed warming can still be regarded as a typical year, considering the human induced warming level and the state of internal variability associated with the phase of El Niño and Atlantic variability
El Niño phenomenon seemed to cease in July (El Niño adds 0.1–0.2 °C to global temperatures), paving the way for La Niña to develop between August and September, with its first effects expected to be visible in 2025.

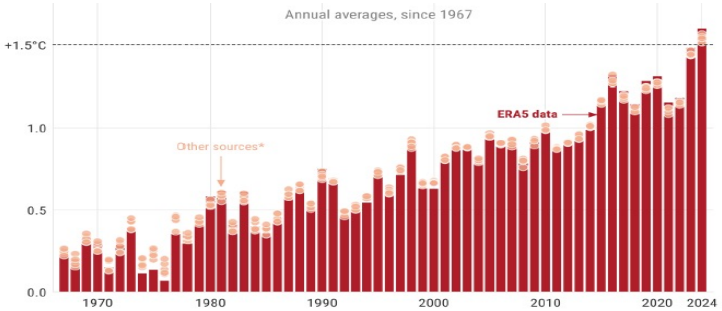
A **global average temperature of 15.10°C**; 0.12°C higher than the previous highest annual value in 2023

2024 was 0.72°C warmer than the 1991–2020 average, and 1.52°C warmer than the pre-industrial level, making it the first calendar year to exceed 1.5°C above that level. Each month from January to June 2024 was warmer than the corresponding month in any previous year. August 2024 equaled the record warmth of August 2023 and from July to December each month was the second warmest after 2023

In 2024, as in 2023, the **tropics and the northern mid-latitudes** contributed the most to the record global temperature anomalies
Earth is warming at a current rate of more **than 0.2°C per decade.** The last ten years have been the warmest ten years on record



Global surface temperature: increase above pre-industrial [°C ; 1850-2024]



Key temperature statistics [2024]

Region	Anomaly (vs 1991–2020)	Actual temperature	Rank (out of 85 years)
Globe	**+0.72°C** (+1.60°C vs pre-industrial)	15.10°C	**1st highest** 2nd - 2023
Europe	**+1.47°C**	10.69°C	**1st highest** 2nd - 2020
Arctic	**+1.34°C**	-11.37°C	**4th highest** 1st - 2016
Extra-polar ocean	**+0.51°C**	20.87°C	**1st highest** 2nd - 2023

Source: Berkeley, ERA5, Opernicus, Climate Change Service

2023 AND 2024 : SEA TEMPERATURES AND LEVEL ARE DANGEROUSLY RISING

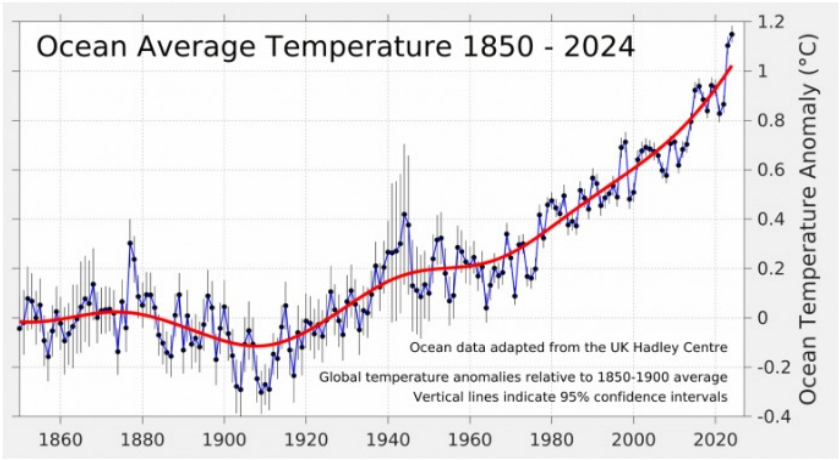
Rising warming anomaly observed in 2023 and 2024:

The annual average sea surface temperature over the extra-polar ocean reached a record high of **20.87°C in 2024**, after the precedent record of 20.81°C. in 2023

According to Berkeley, on the ocean's surface, 2024 was also the warmest observed year reaching an anomaly of **+1.15 °C**, after the previous record of +1.10°C set on 2023 (Baseline : 1850-1900) – Anomaly of +0.6°C on average for 2023 and 2024 but on 1991-2020 baseline according to Copernicus

Global mean sea surface temperature is warming at a rate of 0.13 ± 0.01 °C per decade over the period 1982–2023

The **Arctic continues to warm faster** than the globe overall : In September 2024, the extent of sea ice, which has a profound influence on the Arctic environment, was the sixth-lowest in the 45-year satellite record



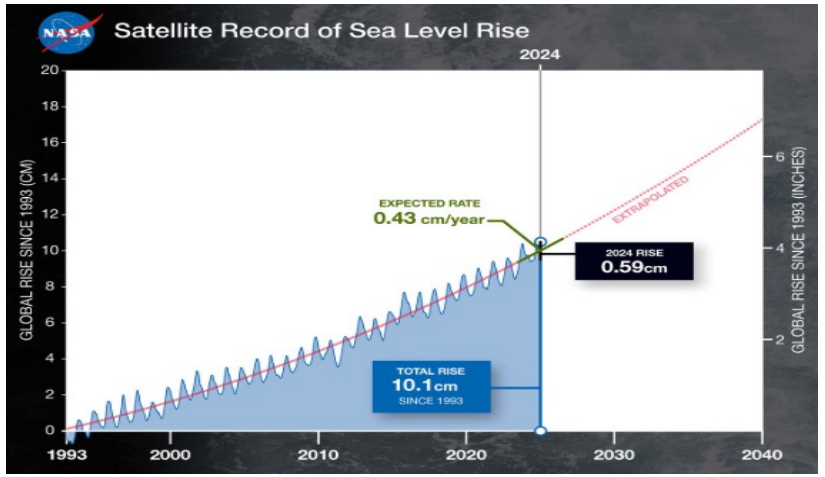
Source: Berkeley

NASA Analysis Shows Unexpected Amount of Sea Level Rise in 2024:

Global sea level rose faster than expected in 2024, mostly because of ocean water expanding as it warms. According to a NASA-led analysis, last year's rate of rise was **0.59 centimeters compared to the expected rate of 0.43 centimeters.** The 2023–2024 El Niño event caused a temporary global sea level rise of several centimetres, primarily due to ocean thermal expansion and shifts in wind-driven circulation

Since the satellite record of ocean height began in 1993, **the rate of annual sea level rise has more than doubled**. In total, global sea level has gone up by 10 centimeters since 1993.

In recent years, about two-thirds of sea level rise was from the addition of water from land into the ocean by melting ice sheets and glaciers. About a third came from thermal expansion of seawater. But in 2024, those contributions flipped, **with two-thirds of sea level rise coming from thermal expansion**.

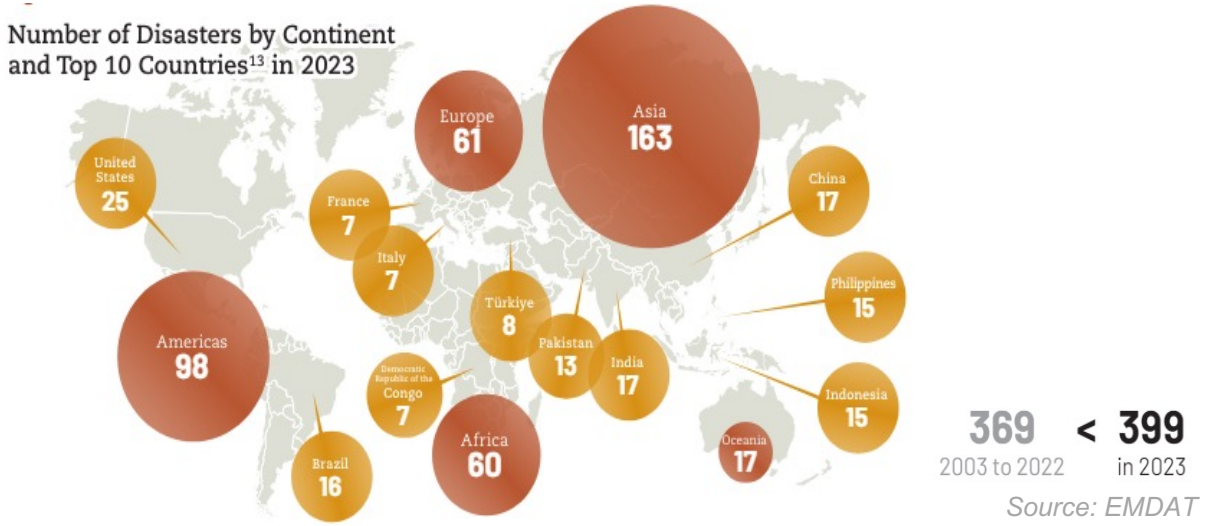


Source: NASA

2023, A RECORD YEAR FOR NATURAL CATASTROPHES EXCEEDING $108 BILLION OF INSURED LOSSES

In 2023, **a large number of extreme events were recorded across the globe**, including heatwaves, floods, droughts and wildfires :

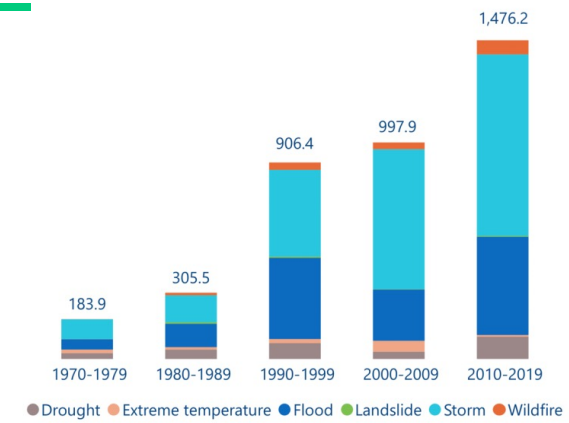
- Strong tropical cyclones (e.g. Cyclone Freddy, the longest-lasting tropical cyclone on record, causing over 1,400 deaths, primarily in Malawi and Mozambique.
- Heavy floods and storms in Libya and Italia
- Heat waves in North America
- Severe droughts affected the US, South America and Europe



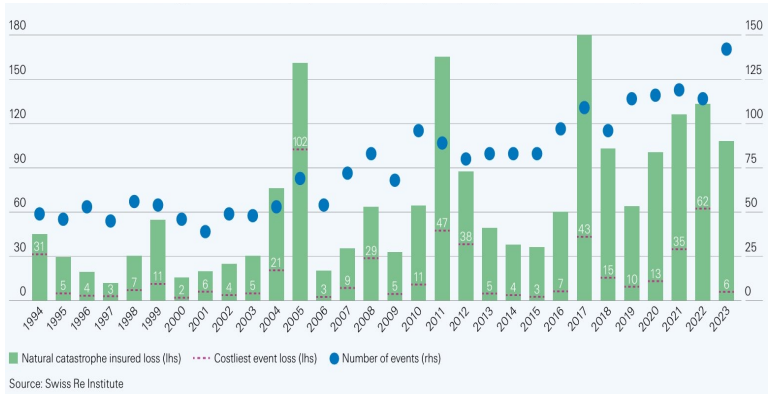
According to Swiss Re, the cost of natural catastrophes covered by insurance reached an estimated **USD 108 billion in 2023**

Annual insured losses of more than USD 100 billion have become the norm and is expected a trend of a **5–7% increase in insured losses**

Reported economic losses
[US$ bn decade ; Inflation adjusted]



Total annual insured losses 1994-2023
[US$ bn-2023 prices ; total number of event/year]



IN 2024, INSURED LOSSES CAUSED BY NATURAL DISASTERS RISED SIGNIFICANTLY TO US$ 140BN

Worldwide, natural disasters caused losses of **US$ 320bn in 2024** (2023, adjusted for inflation: US$ 268bn)

A loss-heavy year for the insurance market: **US$ 140bn in insured losses according to Munich Re and US$ 135bn according to Swiss Re** – since 1980, only two years have been more expensive

Insured losses rose by **16%** compared to the previous year

Many extreme events that took place in the beginning of 2024 were influenced by El Niño. However, most of studies found that climate change played a bigger role than El Niño in fueling these events (Source : World weather Attribution)

Weather catastrophes dominant : powerful hurricanes, severe thunderstorms and floods driving the losses

Regional events : North America with a higher proportion of losses than usual (Hurricane Helene resulted in the largest overall losses from natural disasters in 2024 at US 56bn) and extreme flooding in Europe

Natural disasters [2024]

	The figures of the year 2024	The figures of the year 2023 (adjusted for inflation)	Average of the last 5 years (2019 – 2023) (adjusted for inflation)	Average of the last 10 years (2014 – 2023) (adjusted for inflation)	Average of the last 30 years (1994 – 2023) (adjusted for inflation)
Overall losses in US$ bn	320	268	261	236	181
Insured losses in US$ bn	140	106	106	94	61
Fatalities (approx.)	11,000	77,600	23,000	17,500	42,000

Examples

Flash floods in the Valencia region:
A study found that climate change made an event with this rainfall intensity twice as likely to occur in today's climate, then it would have been in the cooler preindustrial climate without human-caused warming (World Weather Attribution)

Hurricanes Helene and Milton:
Studies have shown that both hurricanes were significantly more severe and brought much more extreme rainfall than in a hypothetical world without climate change (World Weather Attribution)

NATURAL CATASTROPHES CAUSED OVERALL LOSSES OF US$ 320BN WORLDWILDE

Nat cat lost events [2024]

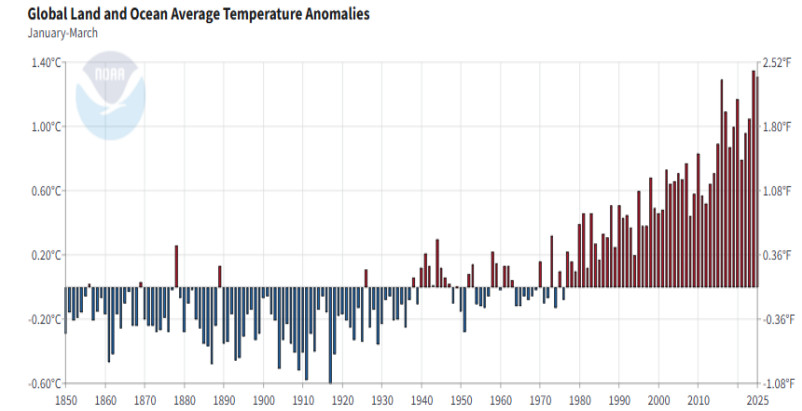
Source: Munich Re, NatCatSERVICE, 2025

Climate: Outlook

DURING THE FIRST QUARTER OF 2025, TEMPERATURES CONTINUED TO BREAK RECORDS AND A SERIES OF SEVERE NATURAL DISASTERS OCCURRED

Despite cooling La Nina, the **January–March** global surface temperature ranked second warmest in the 176-year record at **1.31°C above the 1901-2000 average** of 12.3°C according to NOAA (January : +1.33°C ; February : 1.26°C; March : 1.31°C)

The **annual average for the latest 12-month period** (April 2024 to March 2025) was: **0.71°C above the 1991-2020 average**, and **1.59°C above the estimated 1850-1900 average** used to define the pre-industrial level according to Copernicus

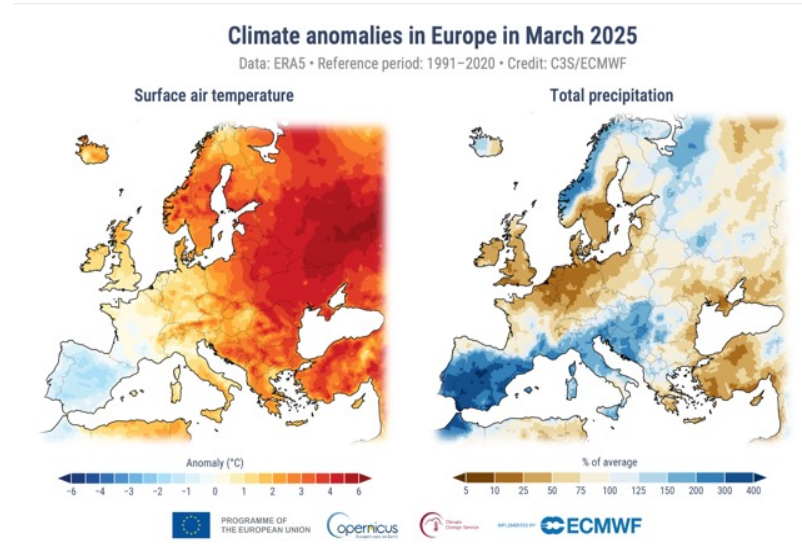


Source: NOAA

Record warmth were observed across many regions, including the Western Arctic, Australia, South and Central America, Asia, and Europe:

Europe, in particular, experienced exceptional warmth in March, with the average temperature reaching **2.41°C** above the 1991–2020 March average, making it the **warmest March ever recorded on the continent**

During the first quarter of 2025, **Europe** also experienced **significant precipitation anomalies**, marked by regional contrasts



Southern California (Los Angeles) experienced **unprecedented wildfires** in January due to drought conditions (estimated economic losses between $250 billion and $275 billion, making them among the most expensive natural disasters in U.S. history)

The tropical **cyclone Dikeledi** caused unprecedented rainfall and strong winds across **Mayotte** and **Northern Mozambique**, triggering floods and disruptions

Prolonged heavy rainfall led to **catastrophic flooding** across **Brazil** (January) and **Bolivia** (March)

ANTICIPATED OVERSHOOT OF THE +1.5°C LIMIT CALLS FOR HIGHER INVESTMENTS IN DECARBONIZATION…

The Met Office outlook for 2025 suggests that it is likely to be one of the three warmest years for global average temperature, falling just behind 2024 and 2023 : The average global temperature for 2025 is forecast to be between 1.29°C and 1.53°C (central estimate of 1.41°C) above the average for the pre-industrial period (1850-1900)

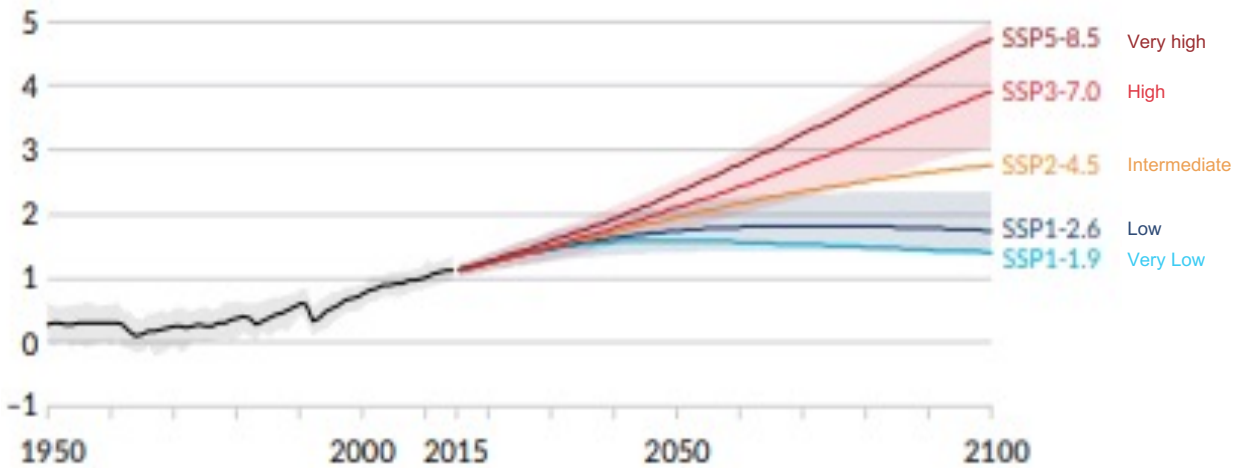
According to **WMO** (Decadal Climate Update 2024/28), there is an **80% likelihood** of at least **one year** exceeding **1.5°C between 2024-2028**

Global warming will continue to increase in the near term (2021–2040) mainly due to increased cumulative CO2 emissions in nearly all considered scenarios and modelled pathways.

In the near term, global warming is more likely than not to reach 1.5°C even under the very low GHG emission scenario (SSP1-1.9) and **likely or very likely to exceed 1.5°C** under higher emissions scenarios

Temperature anomalies will cause significant changes in extremes events. For high temperature anomaly, IPCC predicts the intensification of heavy precipitations and the worsening of droughts.

Global surface temperature change relative [°C ; 1850-1900]



Source: IPCC

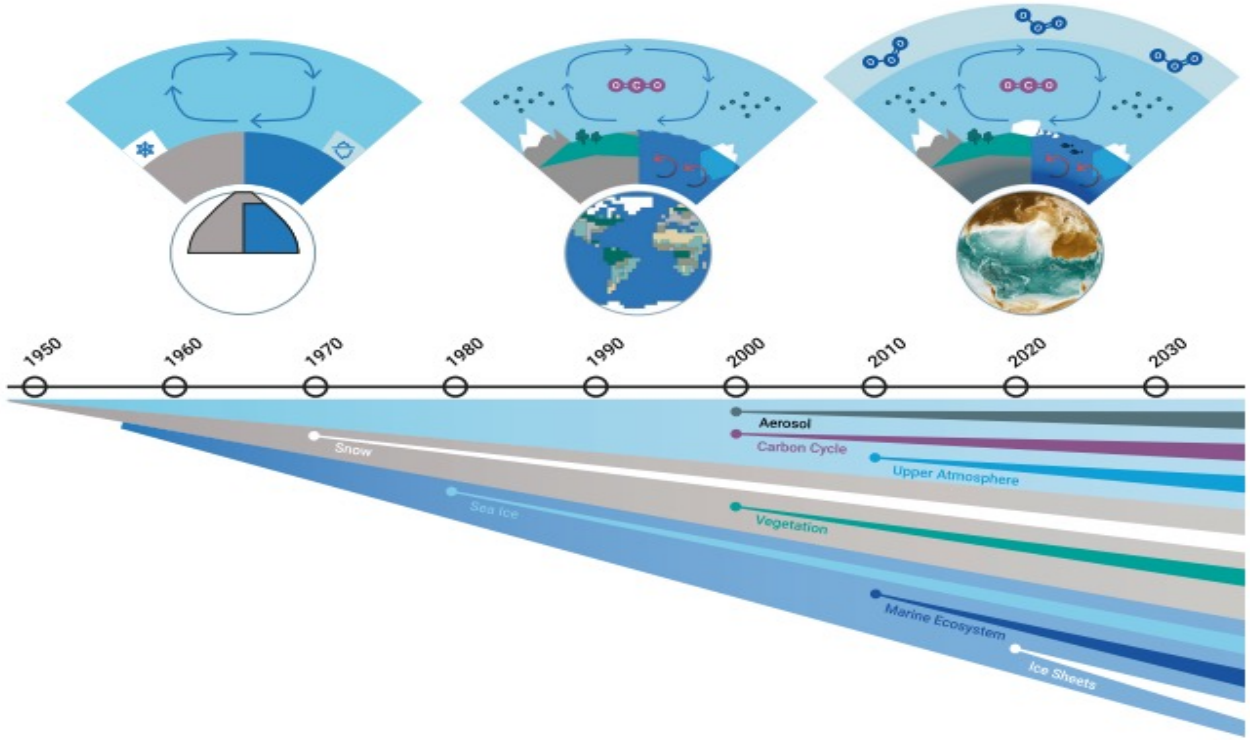
… AND IN CLIMATE MODELING

Climate models are very sensitive to **aerosol–cloud interactions**. Clouds reflect sunlight and trap heat, while aerosols scatter light and cool the Earth. However, their interactions remain uncertain. EarthCare and PACE satellites (launched in 2024) aim to clarify how clouds and aerosols reflect solar radiation. Better understanding of **ocean and ice** dynamics is also needed. The AMOC, a key Atlantic current system, is crucial for regulating climate, especially in the Northern Hemisphere.

Climate NGOs worldwide are deeply concerned by the **drastic budget** cuts applied by the **US administration**, regarding **scientific climate institutions**. A striking example is the National Oceanic and Atmospheric Administration (NOAA), which faces a **$1.3 billion cut** — representing 27% of its funding — including a 74% reduction for its Oceanic and Atmospheric Research division. These cuts jeopardize NOAA's global climate modeling, which relies on billions of data points and benefits countries worldwide.

This calls for continuous investment in earth system data capture, sharing and climate modelling

Timeline of climate model complexity [1950-2030E]



Source: Nature

GHG Emissions:

Recent Developments

ANTHROPIC CO2 EMISSIONS UP 2% IN 2024, WITH AN 8% RISE FROM AVIATION & SHIPPING

The global **atmospheric CO2 concentration** is forecast to average 422,5 parts per million in 2024, up 52% versus 1750 and +2,8% in 2024.

Global CO2 emissions projected to reach 41,6 GtCO2 in 2024, **+2% above 2023** level of 40,6 GtCO2:

Fossil CO2 projection for 2024: 37.4 GtCO2, **+0,8% versus 2023**, after +1,4% 2023/2022 ow coal 15,5 (+0,2%), oil 12,4 (+0,9%) ow IAS +8%, gas 8,1 (+2,4%), cement 1,5 (-2,8%),

Most developed countries have managed to decrease their fossil CO2 emissions, but at a relatively low pace compared to Net Zero trajectory:

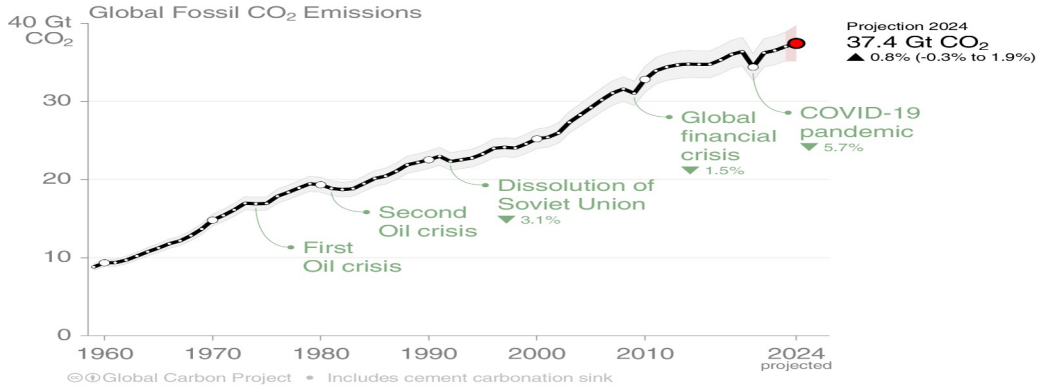
- EU: -3,8%, USA -0,6%

22 countries representing 23% of global fossil CO2 emissions managed to decrease them during the past decade, while their economy grew.

China and India development driving steady increases in CO2 emissions, despite at a much lower pace for China.

Land use change projection for 2024: 4.2 GtCO2, +0,5 GtCO2 vs 2023, exacerbated by drought El Nino conditions in South America. Permanent deforestation still represents 3,7 GtCO2.

Brazil, Indonesia and Congo represent 60% of global LUC emissions.



Projected change in fossil CO2 emissions by fuel type [mtCO2-2024/2023]

Country	Total	Coal	Oil	Natural Gas	Cement
World	+399 *(+0.8%)*	+66 (+0.2%)	+143 (+0.9%)	+214 (+2.4%)	-40 (-2.8%)
China	+55 *(+0.2%)*	+51 (+0.3%)	-8 (-0.8%)	+68 (+8%)	-56 (-8.1%)
USA	-16 (-0.6%)	-25 (-3.5%)	-10 (-0.7%)	+22 (+1%)	-2 (-5.8%)
India	+149 (+4.6%)	+98 (+4.5%)	+27 (+3.6%)	+16 (+11,8%)	+8 (+4%)
EU27	-89 (-3.8%)	-85 (-15.8%)	+5 (+0.2%)	-7 (-1,3%)	-2 (-3.5%)
RoW	+197 (+1.1%)	+28 (+0.5%)	+38 (+0.5%)	+115 (+2.2%)	+13 (+2%)
IAS	+90 (+7.8%)		+90 (+7.8%)		

Source: Global Carbon Project

METHANE ANTHROPIC EMISSIONS: ENERGY SECTOR EMISSIONS STILL NEAR RECORD HIGH

Atmospheric CH4 concentrations rose faster over the last decade than in the 2000s.

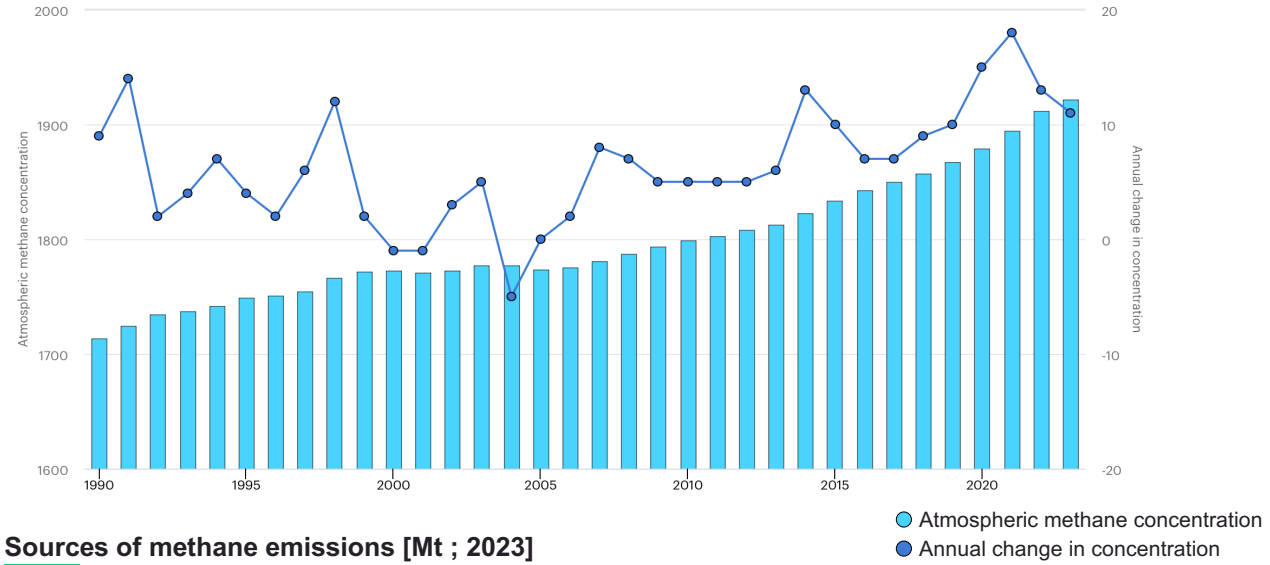
Since 2013, the trend in atmospheric methane concentrations is closer to the most greenhouse-gas-intensive scenarios of IPCC AR5 than scenarios integrating mitigation policies.

Anthropogenic sources are responsible for all or most of the recent rapid rise in global CH4 concentrations, equally from agriculture and fossil fuels sources.

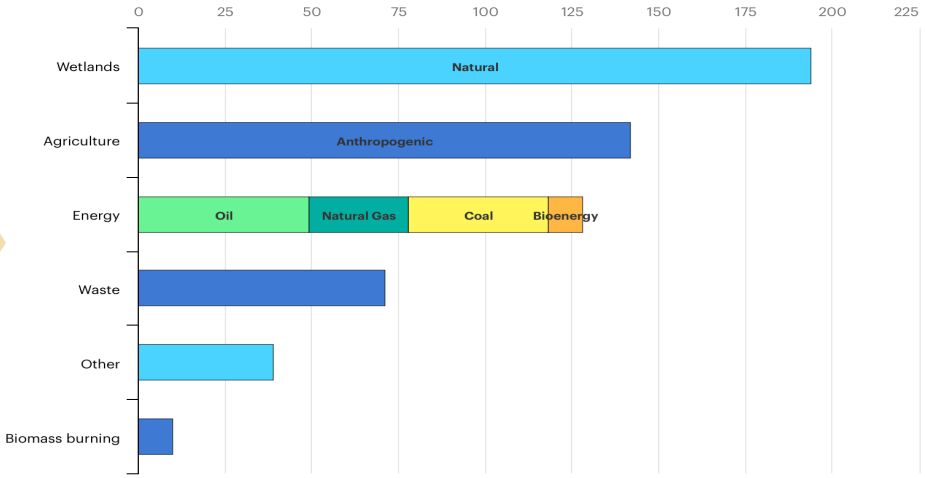
Methane emissions from the energy industry remained near record high in 2023

Emissions from coal and natural gas continued to rise in 2023, with oil fugitive emissions rebounding

Changes in atmospheric methane concentrations [1990-2023]



Sources of methane emissions [Mt ; 2023]



GHG Emissions:

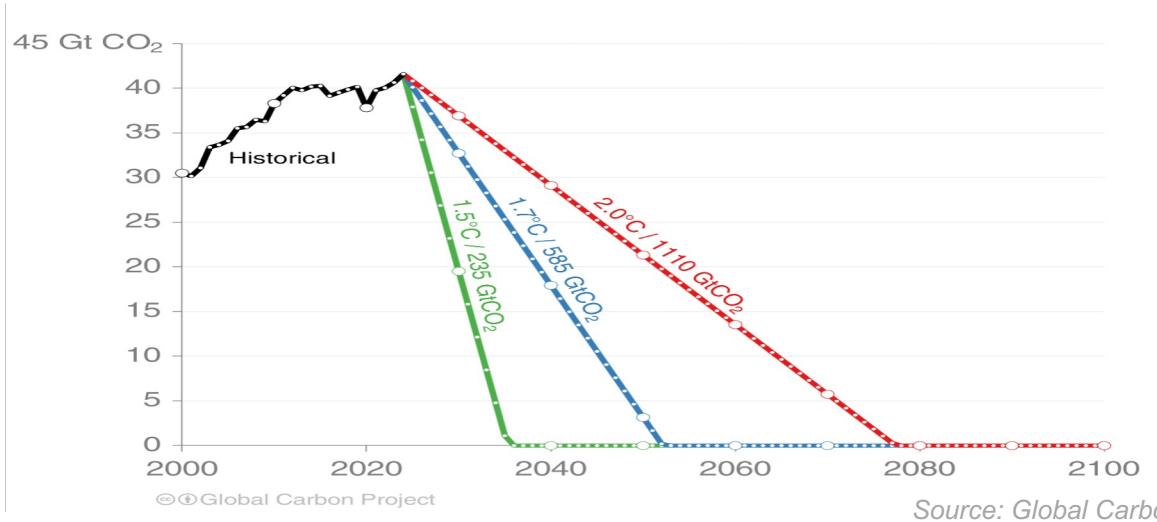
Outlook

PUTTING CO2 EMISSIONS UNDER CONTROL REQUIRES AMBITIOUS TRANSITION PLANS, INVESTMENTS

The remaining CO2 carbon budget to limit global warming to 1.5°C , 1.7°C and 2°C (with 50% probability) is **235 GtCO2**, **585 GtCO2**, and **1110 GtCO2** resp. (equivalent to 6, 14 and 27 years from 2025)

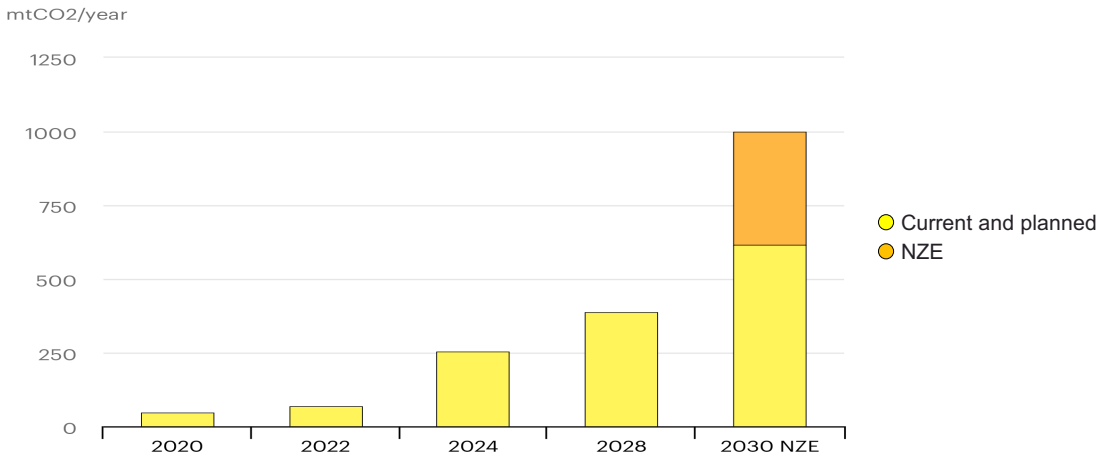
According to IEA, planned CDR (Carbon Dioxyde Removal) infrastructure is insufficient against the Net Zero scenario

Global CO2 pathways using PICC AR6 Remaining Carbon Budgets



Source: Global Carbon Project

Annual CO2 storage capacity, current and planned vs Net Zero Scenario [2020-2030]



Source : IEA (2024), CCUS Projects Database

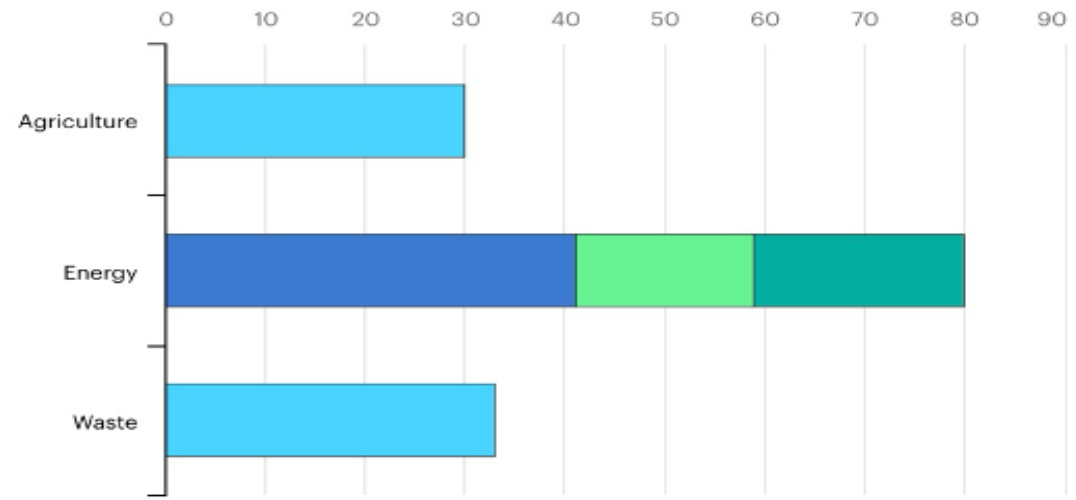
Source: IEA (2024), CCUS Projects Database

METHANE EMISSIONS: CUTTING FOSSIL FUEL EMISSIONS BY 75% & BY 2030 IS VITAL TO 1,5°C TARGET

Methane mitigation offers rapid climate benefits and economic, health and agricultural co-benefits that are highly complementary to CO2 mitigation

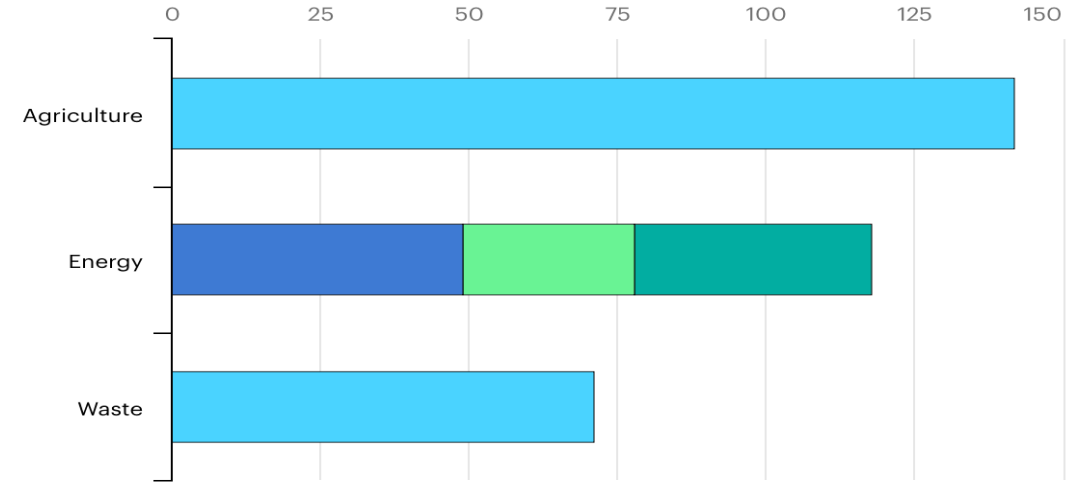
Cutting methane emissions from fossil fuels by 75% by 2030 is critical to limit global warming to 1.5 °C in 2100

Methane abatement potential to 2030 [Mt]



Source: IEA

Main sources of methane emissions [Mt]



Source: IEA

97% RISK TO EXCEED 2°C WARMING UNDER CURRENT CLIMATE POLICIES

GLOBAL CARBON project

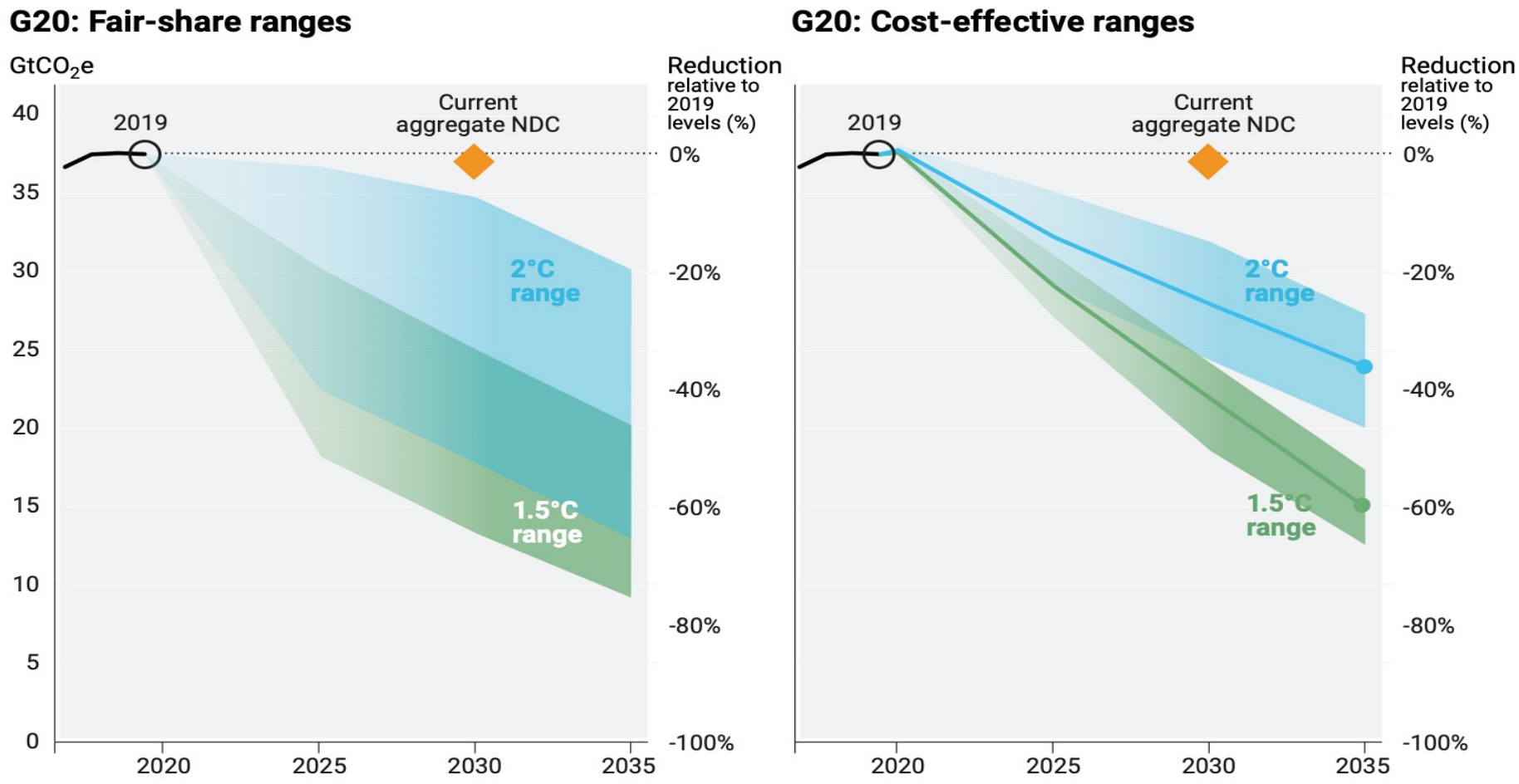
Scenarios	1.5°C	2°C	3°C
Current policies continuing	100% (85–100%)	97% (28–100%)	37% (1–80%)
Unconditional NDCs continuing	100% (86–100%)	94% (28–100%)	22% (1–75%)
Conditional NDCs continuing	100% (77–100%)	79% (19–100%)	10% (0–69%)
Conditional NDCs + all net-zero pledges	77% (64–97%)	20% (64–97%)	0% (0–6%)

Source: UNEP Emissions Gap Report 2024

G20 HAS A KEY RESPONSIBILITY TO TURN AROUND THE OUTLOOK

GLOBAL CARBON project

Fait-share and cost-effective mitigation ranges consistent with different limits for the G20 collectively [excluding African Union & LULUCF]



LES ATELIERS DU FUTUR

Source: UNEP Emissions Gap Report 2024

Green Techs:

Recent Developments and Outlook

GREEN TECHNOLOGY DEPLOYMENT MOMENTUM FACING HEADWINDS TO MEET REQUIRED PACE OF DECARBONIZATION

Many risks are surging concerning almost all green technologies, and their mitigation is more complicated in the present **geopolitical instability**, not only in **developed countries** but also in **developing countries.**

Renewable energies

If the development of ***solar power is in line with the NZE trajectory***, the ***wind power market is struggling*** more except in China, both for on-shore wind (penalized by the complexity and length of authorization procedures) and for offshore wind (increase in costs of materials, labor and interest rates, new US administration's "Zero-wind" policy…). And a new risk appears for renewable energy projects: if the ***necessary investments in transmission grids*** (expansion and modernization) are not made at the right pace, this could lead to a ***bottleneck*** in the development of renewable energies.

Stationary storage:

Despite a rather dynamic development of projects, **the bar to jump is so high** that it is imperative to deploy alternative solutions to batteries because Lithium resources are not infinite. Without waiting for new battery technologies, mature solutions exist, in particular by accelerating on switchable renewable energies (geothermal energy, biogas, biomass, etc.) and on the storage of heat and cold (geothermal energy with active recharge, thermal storage wells, etc.).

Biogas and biomethane:

Being both a green fuel for heavy vehicles and a mature, switchable and interesting renewable energy for heavy industry decarbonization, **we must strongly accelerate (x3.7)**, especially since it is also a solution for waste treatment issue and a source of income for the agricultural sector. **The EU objective is ambitious but not binding**. We should increase support for this sector to develop "*Biomethane Purchase Agreements*".

Electric vehicles

While the market is still expanding, a combination of rising costs, reduced governmental support, infrastructure challenges, and technological uncertainties pose ***real risks to continued rapid growth***. Overcoming these hurdles will require coordinated efforts across industries and governments, focused on continuity in policies, improving affordability, building charging infrastructure, and advancing battery technology.

Low carbon hydrogen:

Europe is clearly lagging behind and risks missing out on this new market whose development is essential to achieve the NZE (storable green energy, solution to decarbonize part of heavy industry, green fuel for heavy vehicles, aviation fuel after recombination with biogenic CO2, etc.). Clarification and simplification of European support policy to hydrogen projects is essential.

Critical materials:

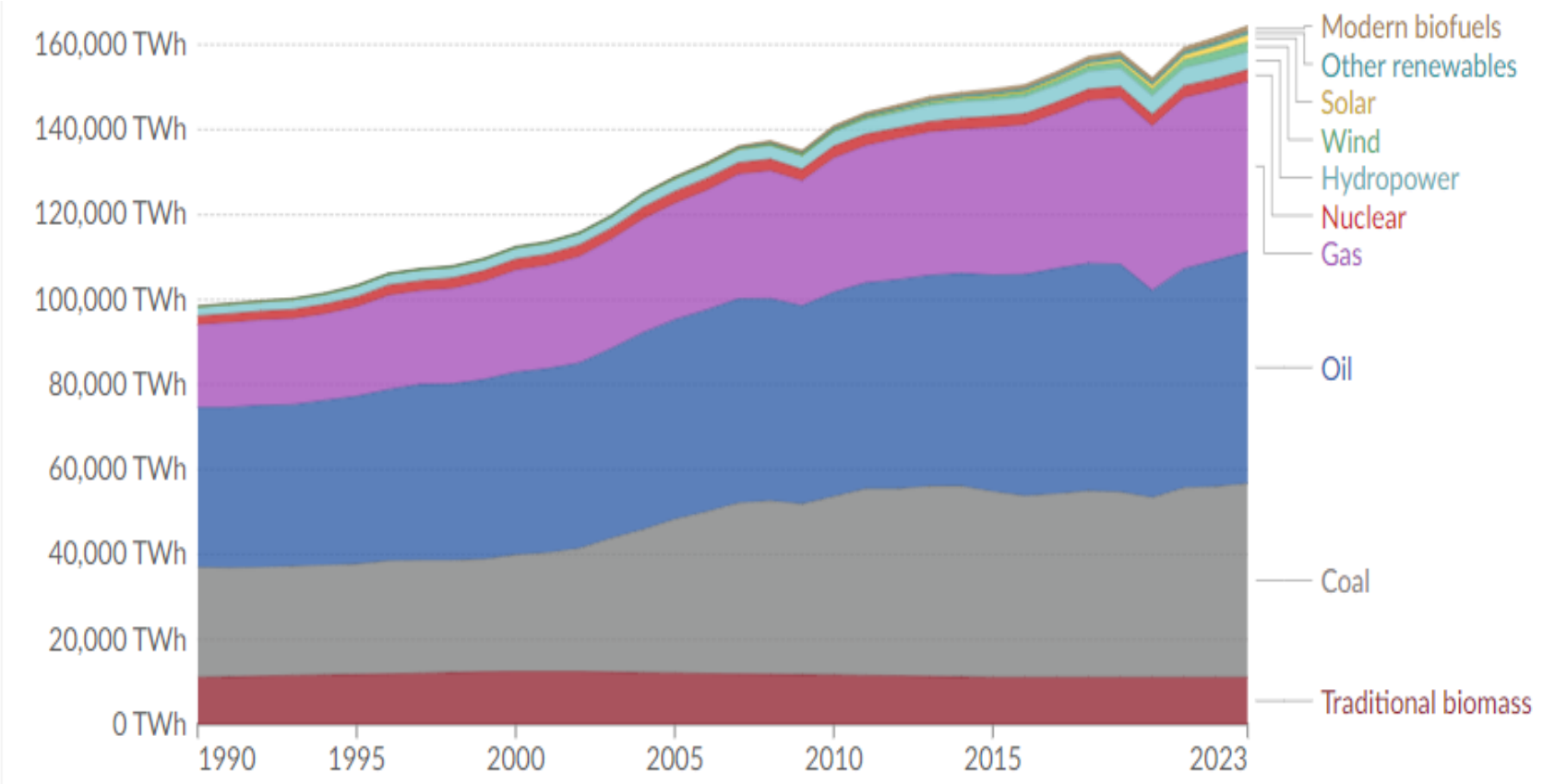
To avoid developing new dependencies on a very small number of countries, we must accelerate on 3 levers: the **search for new mining resources**, particularly in developed countries, to **diversify the supply sources**; strongly encourage the recycling of critical materials; **develop alternative technologies** that consume less critical metals.

R&D and Innovation:

According to the IEA, **35% of the emissions reductions expected in 2050 will come from technologies not yet commercialized**. It is therefore appropriate to continue R&D at a high rate in all developed countries, both to achieve the NZE objective, but also to avoid developing new technological dependencies on a small number of countries.

GLOBAL PRIMARY ENERGY CONSUMPTION STILL 80% FOSSIL – THE RENEWABLE CAPACITY ADDITIONS DOUBLED DURING THE LAST 3 YEARS, COVERING THE INCREASE OF ENERGY CONSUMPTIONS

Global direct primary energy consumption [TWh*)



The share of carbon-free energies in the global mix **has doubled in ten years**, but they only represent **less than 20% of primary energies consumed**

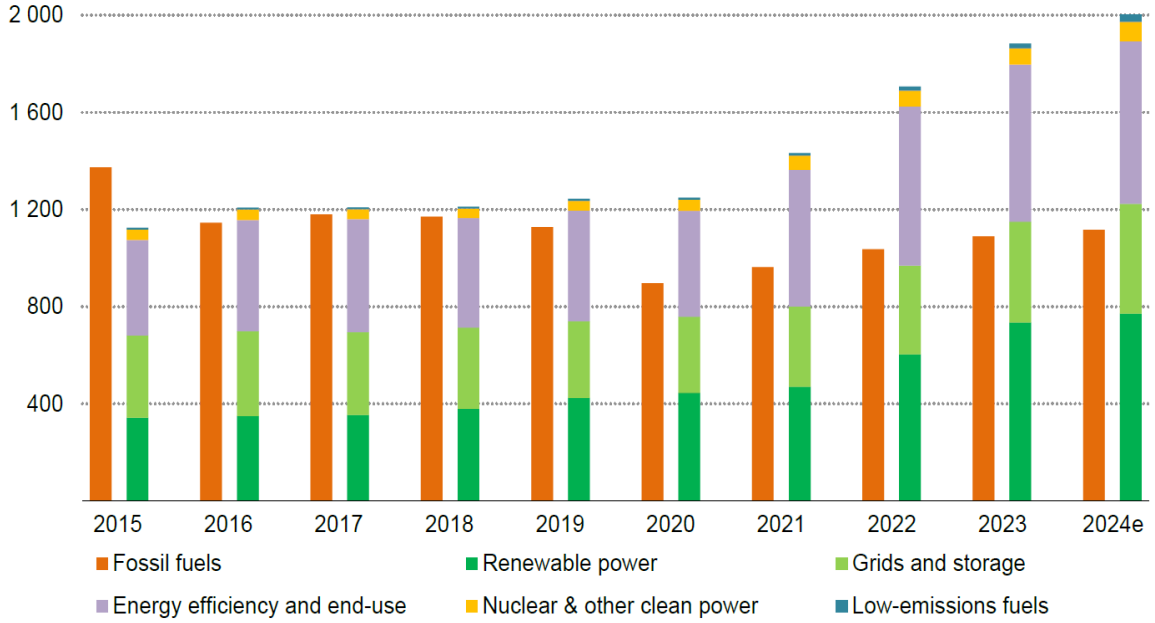
On a brighter note, **clean energy technology adoption surged at an unprecedented pace over the last three years**. **Total renewable capacity additions increased by a factor of 2 between 2022 and 2024!**

**: Energy consumption is measured in terawatt-hours, in terms of direct primary energy.*
This means that fossil fuels include the energy lost due to inefficiencies in energy production

Source: OUR WORLD IN DATA

THE WORLD INVESTS ALMOST TWICE AS MUCH IN CLEAN ENERGIES AS IT DOES IN FOSSIL FUELS, & INVESTMENT IN SOLAR PV NOW SURPASSES ALL OTHER GENERATION TECHNOLOGIES COMBINED

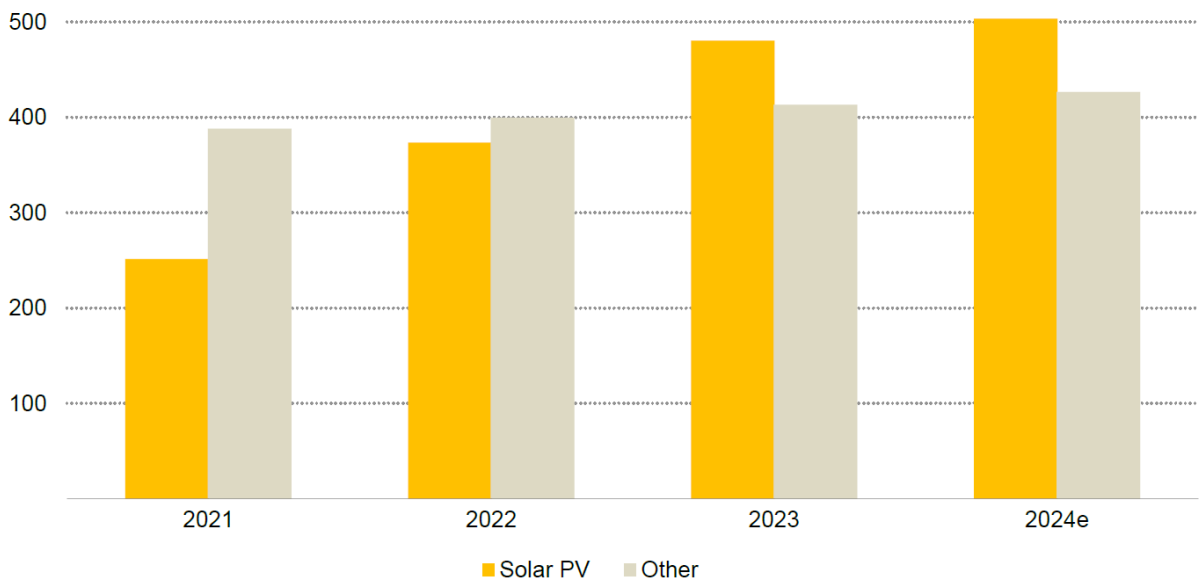
Global investment in clean energy and fossil fuels [US$ bn ; 2015-2024E]



Note: Other clean power = fossil fuel power with CCUS, hydrogen, ammonia, and large-scale heat pumps.
Low-emissions fuels = modern bioenergy, low-emissions H2 based fuels, and CCUS associated with fossil fuels and also includes direct air capture.
2024e = estimated values for 2024

Source: IEA

Global annual investment in solar PV & other generation technologies [US$ bn ; 2015-2024E]

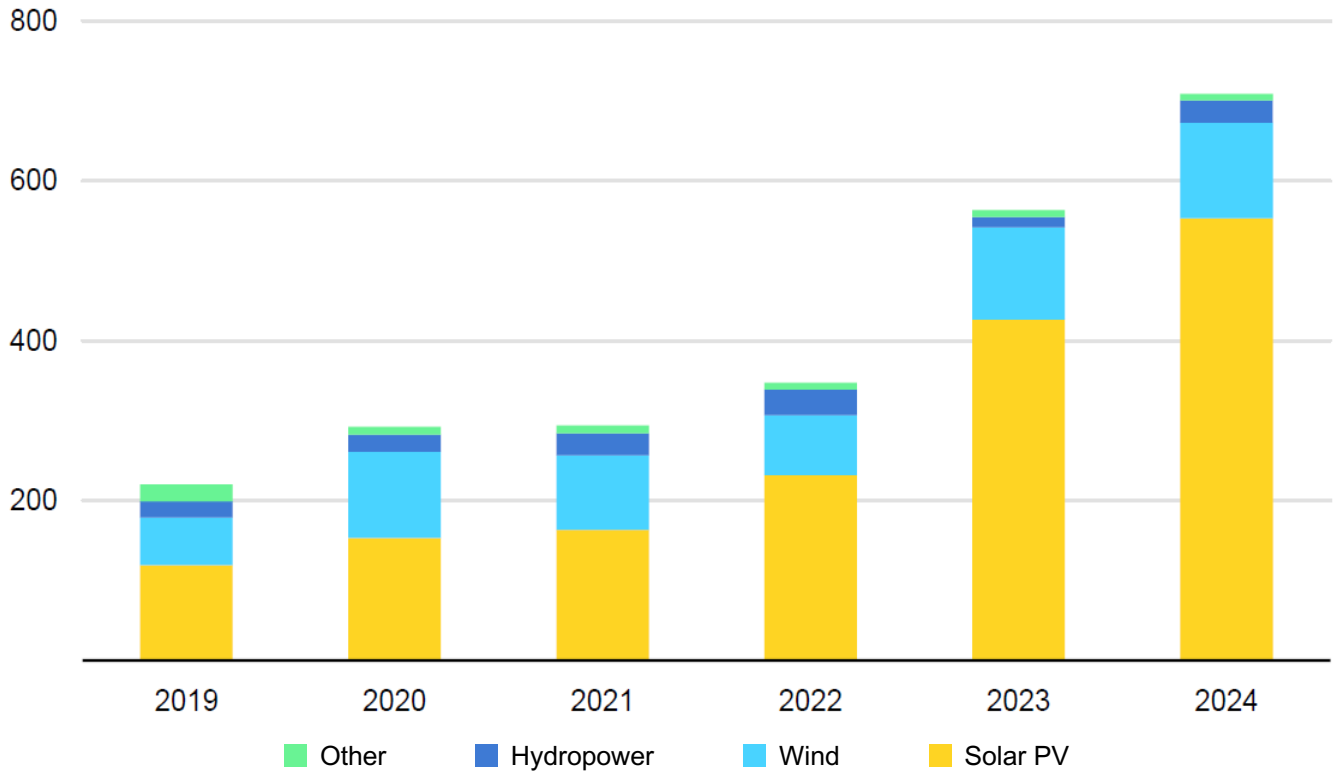


Note: 2024e = estimated values for 2024. Other = electricity generation from all other technologies including coal, oil, natural gas, wind, hydro and nuclear

Source: IEA

IN 2024, GLOBAL ANNUAL RENEWABLE CAPACITY ADDITIONS SURGED BY 25% TO AROUND 700 GW, WHICH IS IN LINE WITH THE COP28 GOAL OF TRIPLING 2022 CAPACITY

Total renewable capacity additions by technology [GW ; 2019-2024]



Note: 2024 values are based on both actual and estimated additions

Source: IEA

In 2024, global annual renewable capacity additions surged by an estimated 25% to around 700 GW – marking the 22nd consecutive year that renewables have set new records for expansion.

Solar PV accounted over 75% of renewable capacity additions, followed by wind (17%) and hydropower (4%), with bioenergy, geothermal, concentrating solar power and marine making up the remainder.

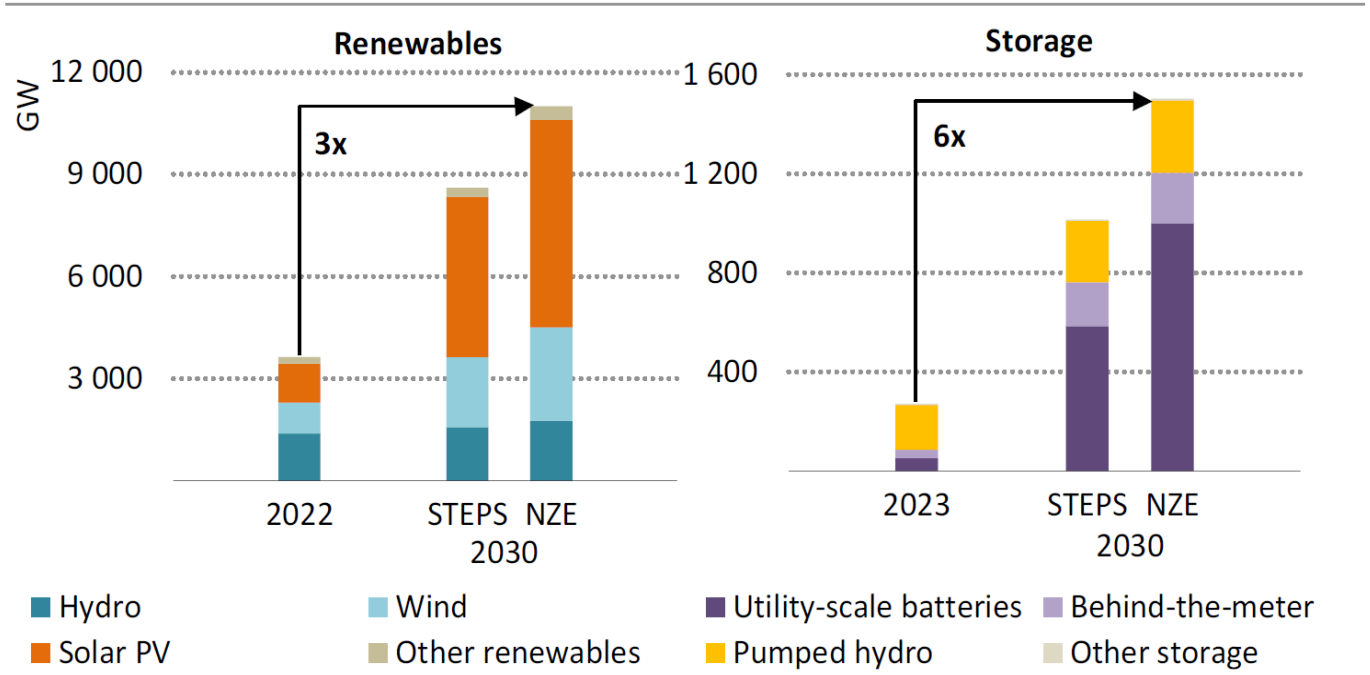
Solar PV additions in 2024 rose by almost 30% year-over-year, totaling about 550 GW. With this growth, installed solar PV capacity worldwide reached an estimated 2.2 terawatts (TW).

Annual wind additions remained stable at around 120 GW. **The wind power market is struggling except in China**, both for on-shore wind (penalized by the complexity and length of authorization procedures) and for offshore wind (increase in costs of materials, labor and interest rates). The **Trump administration's "Zero-wind" policy** might seriously affect the development of the US wind market in the next months.

Hydropower installations more than doubled to over 25 GW thanks to large projects commissioned in China, Africa and Southeast Asia.

MUCH HIGHER ELECTRICITY-STORAGE CAPACITIES ARE NECESSARY TO AVOID PRICE VOLATILITY

The x3 target for renewables decided at COP28 needs x6 for grid-scale storages

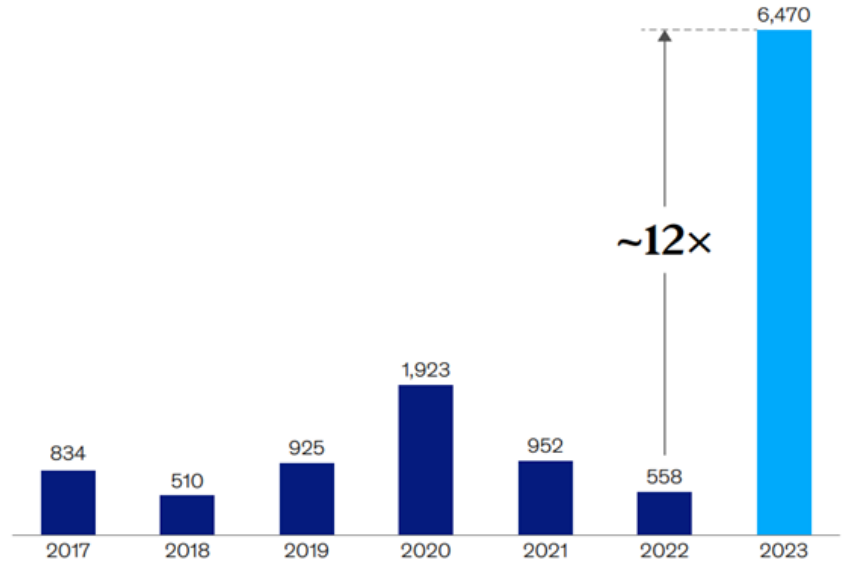


Note: Energy storage capacity, led by battery storage increases sixfold by 2030 in the NZE scenario and supports the tripling of renewables capacity goal

Source: IEA

The example of Europe, where the lack of interconnectivity leads to strong volatility of electricity prices

Yearly occurrences[1] of day-ahead negative electricity prices in the EU[2]



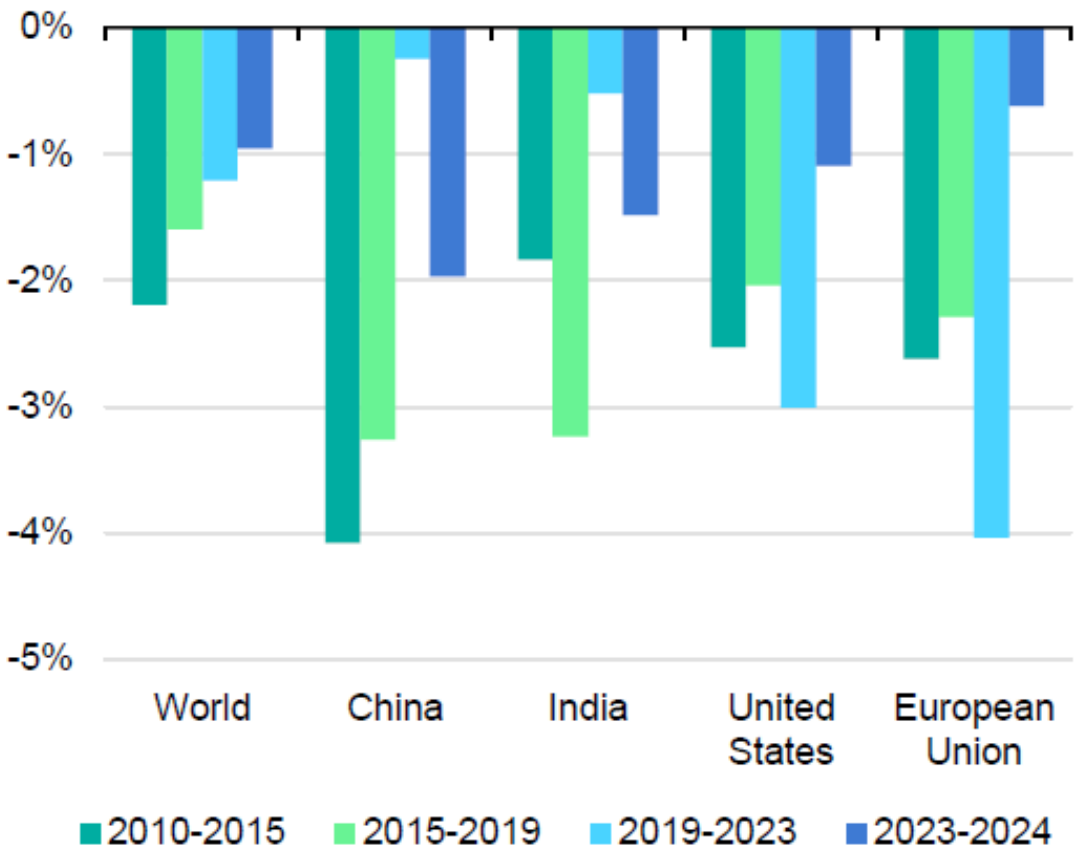
(1): One occurrence corresponds to one hour during which prices are negative

(2): EU + Norway + Switzerland

Source: EU Agency for the Cooperation of Energy Regulators

ENERGY INTENSITY IMPROVEMENTS CONTINUED TO SLOW IN 2024

Average annual rate of energy intensity improvement [selected regions ; 2010-2024]



After improving at an average rate of around 2% annually between 2010 and 2019, energy intensity improvements slowed to 1.2% per year between 2019 and 2023 and **only 1% in 2024**

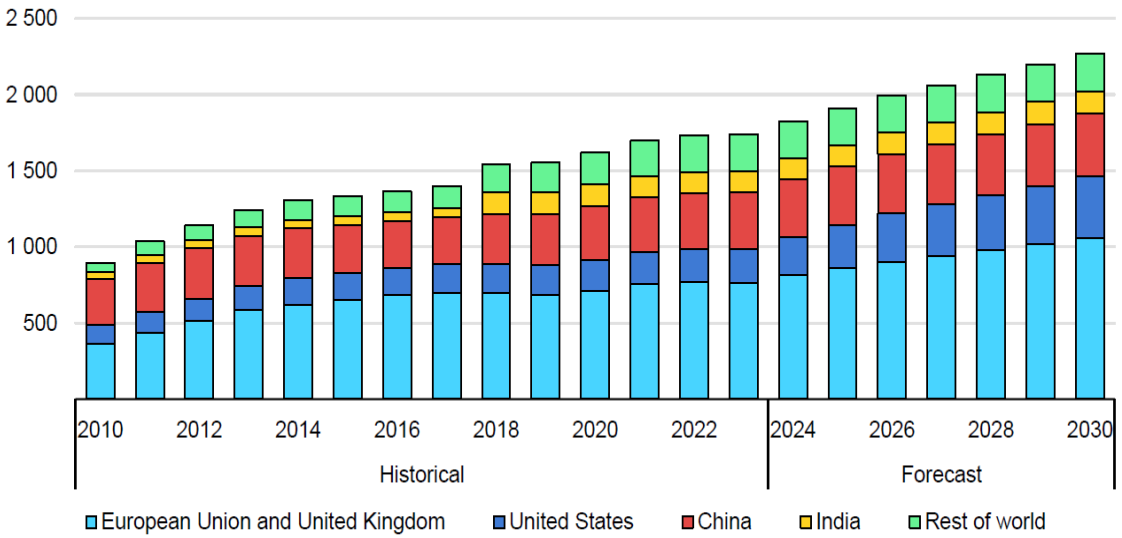
Key reasons for this recent slowdown include:

- investment and manufacturing-intensive post-Covid growth in major emerging and developing economies such as China and India;
- Higher energy demand due to extreme temperatures;
- and a trend of poor growth in hydropower output that was only partially reversed in 2024, leading to more consumption of less efficient fuels in some regions

BIOGASES DEVELOPMENT LED BY EUROPE AND NOT IN LINE WITH THE NZE SCENARIO

Biogas and Biomethane

Global historical and forecast demand for biogass [PJ/y ; 2010-2030F]



Source: IEA 2024 CC by 4.0

Biogas is a mature technology. It is a viable energy source for clean cooking, and for heavy vehicles. It can be used as a dispatchable source of low-carbon electricity generation, which will be increasingly important with the deployment of volatile renewables such as wind and solar

Combined global biogas and biomethane production reached more than 1.7 EJ in 2023 – a 17% increase from 2017

Almost half of the production is based in Europe, with Germany alone representing almost 20% of global consumption. Another 21% is produced in China, followed by the United States (12%) and India (9%)

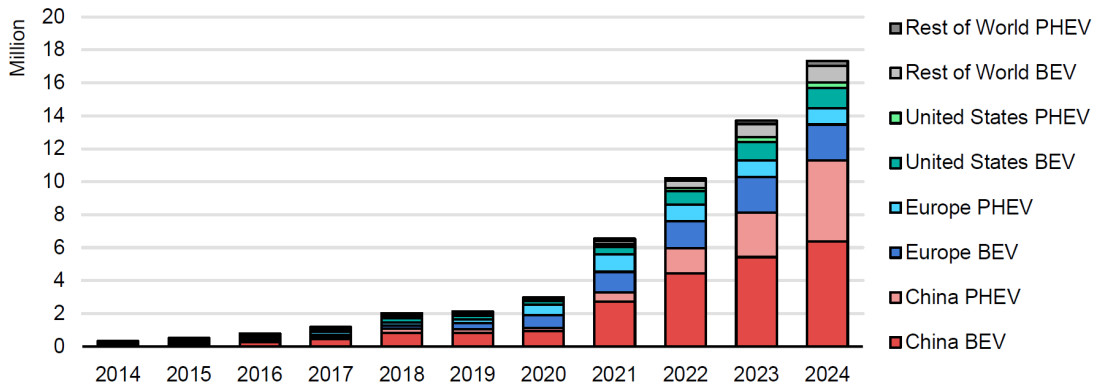
This current global production expansion is not in line with the IEA Net Zero by 2050 Scenario, which requires the production of biogases to **grow 3.7-fold by 2030**

Growth will primarily come from Europe and North America, owing partially to established infrastructure and experience, and driven by previous policies that make rapid deployment in a five-year term possible. Many other regions with strong biogas potential, such as Latin America and Southeast Asia, could make significant contributions to global growth if their countries introduce new policies to support the biogas sector

GREEN MOBILITY STILL ON TRACK FOR THE NZE SCENARIO BUT SOME STRONG WARNING SIGNALS ARE EMERGING, AND HEAT PUMPS SALES ARE DECLINING

Electric Vehicles

Global electric car sales [2014-2024]



Source: IAE

Electric car sales exceeded 17 million globally in 2024, reaching a sales share of more than 20%.

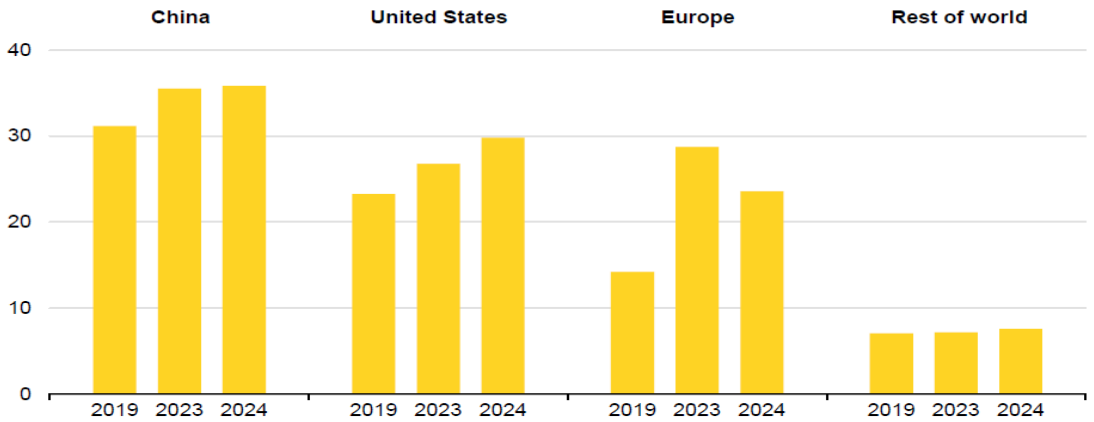
China maintained its lead, with electric cars accounting for almost half of all car sales in 2024, while emerging market and developing economies outside China witnessed a significant 80% annual increase in EV sales.

EV sales in US grew in 2024 by over 10%, thanks to the release of new EV models and availability of EV tax credits, which provided financial aid to consumers.

Electric car sales stagnated in the European Union, in large part due to Germany, where purchase subsidies were removed at the end of 2023. In contrast, EV sales in the United Kingdom surged, driven by the Zero-Emission Vehicle (ZEV) mandate.

Heat pumps

Heat pumps sales for selected regions [GW ; 2019-2024]



Source: IAE analysis based on the European Heat Pump Association (EHPA); the Air-Conditionning, Heating and Refrigeration Institute (AHRI); the Japan Refrigeration and Air Conditioning industry (JRAIA) and ChinaIOL

Global heat pump sales fell by 1% in 2024, recovering most of the decline recorded in the first half of the year

Some markets, notably Japan and the United States, showed a strong recovery in demand in the second half of the year, but it was not enough to offset the sharp annual decline in Europe and stagnation in China

Cost remains the major problem

**BEV Battery electric vehicle*

**PHEV : Hybrid/Plugging Battery electric vehicle*

CRITICAL MINERALS: LITHIUM REMAINS THE HIGHEST RISK FOR OUR 2030 MILESTONES

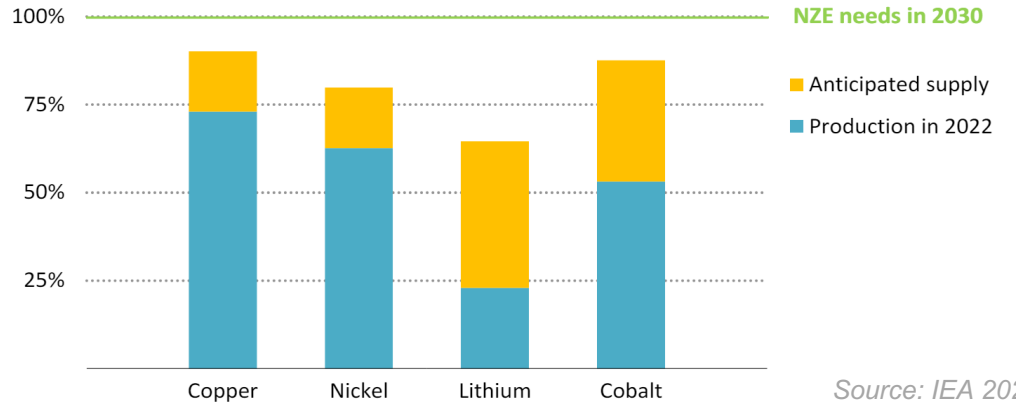
Despite the collapse in lithium, cobalt, and nickel prices due to oversupply, the **International Energy Agency (IEA) is sounding the alarm**. In its report on critical transition metals, published in May 2025, it warns its members of **future shortages of lithium and copper.**

IEA is also concerned about the **growing concentration** of metal production in a handful of countries, or even just one, most often in China. **Diversification is the solution** for ensuring energy security, but the critical metals world has **moved in the opposite direction**: according to IEA, the average market share of the top three countries for refining transition metals increased from around 82% in 2020 to 86% in 2024. The same is true for crude ore extraction, although the phenomenon is somewhat less pronounced. The top three producers accounted for an average of 73% of supply in 2020 and 77% in 2024.

In the present context of high geopolitical tensions, **critical minerals have become a key issue in ensuring global energy and economic security**. Too much concentration increases the risk of a supply shock, which can result in a price increase of 40 to 50% for consumers or a loss of competitiveness for manufacturers (*source : IEA*). The risk is all the greater given that 55% of strategic metals traded worldwide are subject to export restrictions.

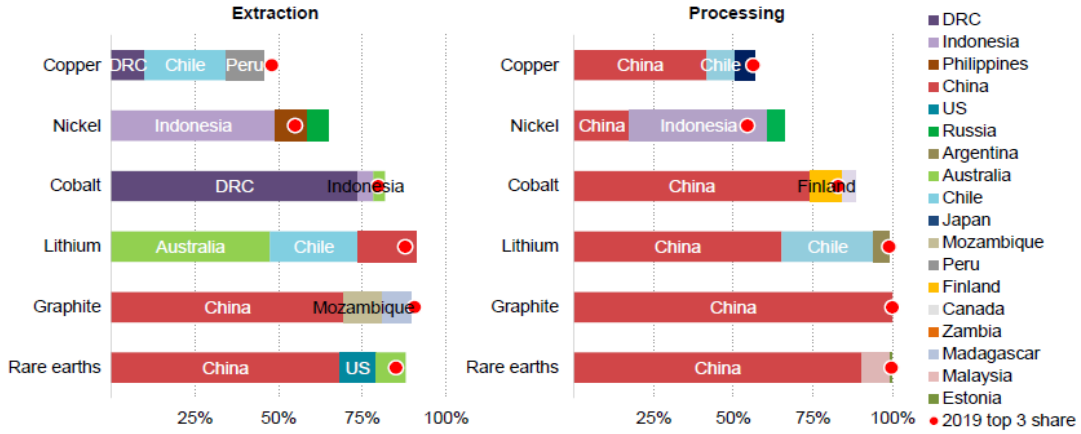
In addition to geographic diversification and recycling, **technological innovation** is another way to reduce tensions over critical metals. But despite policy efforts in the United States and Europe, **progress toward more diversified supply chains is expected to be slow** according to IEA.

Anticipated supply from the current pipeline of announced projects for key critical minerals would provide at least 65% of 2030's NZE Scenario requirements. Additional investments required.



Source: IEA 2022

Share of top 3 producing countries in total production for selected resources and mineral (2022)



Source: IEA 2022

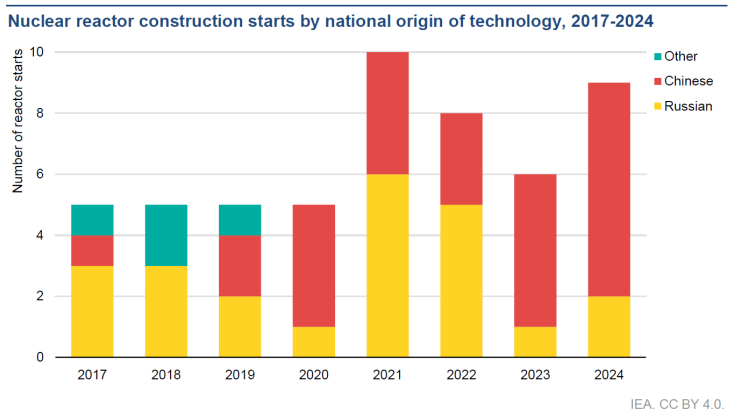
INVESTMENT IN OTHER LOW CARBON TECHNOLOGIES REQUIRED WITH EFFECTS AFTER 2030

Innovative & break-through technologies

According to the IEA, **35% of the emissions reductions expected in 2050 will come from technologies not yet commercialized**: new technologies of batteries, solid oxide electrolyzers, SAF, natural hydrogen extraction, advanced CCUS technologies, direct reduction of iron, small modular nuclear reactors…

Nuclear

In 2024, ***over 7 GW of nuclear power capacity was brought online***, ***33% more*** than in 2023. Electricity generation from nuclear in 2024 rose by 100 TWh.. Construction starts for nuclear power plants grew by 50% in 2024, ***exclusively using Chinese and Russian designs***.



Note: Capacity is reported in gross terms.
Source: IEA analysis based on IAEA PRIS database (Accessed 6 February 2025).

Hydrogen

Except in China, most regions have witnessed ***steady growth in electrolyzer deployment*** in 2023. Demand uncertainty and lack of regulatory clarity, coupled with inflation, fall in fossil fuel prices, and slow implementation of support mechanisms have hindered faster adoption.

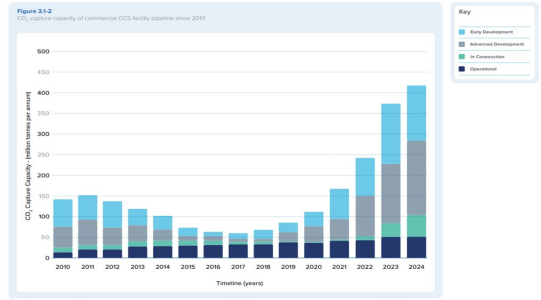
Globally, the pipeline of projects shows that more than **400 GW of electrolysis production capacity should run by 2030**. This could potentially meet the milestones of the APS IEA scenario if all planned projects go ahead, but cost inflation and supply chain bottlenecks could hamper progress.

LARGEST GREEN HYDROGEN PROJECT IN CHINA (150 MW) INSTALLED IN CHINESE CHEMICAL FACTORY OF NINGXIA BAOFENG GROUP

CCUS

Carbon capture and storage (CCS) is seen by many experts as a ***vital tool*** in combating climate change. CCS technologies are considered especially important ***for hard-to-abate industries*** that cannot be easily replaced by electrification, such as oil and gas, iron and steel, and cement and refining. However, CCS is still very much in its infancy, capturing just 0.1 percent of CO_2 emissions per year.

In July 2024, ***the total capacity of CCS projects in development worldwide was 416 million metric tons per annum*** of carbon dioxide (Mtpa CO_2). Those in advanced development had a capture capacity of 180 Mtpa CO_2.



Public Policies:

Recent Developments & Outlook

CHINA NOW LEADING THE WORLD DECARBONIZATION JOURNEY, AHEAD OF EU, WHILE THE USA ARE EXITING

China leading the world decarbonization journey:

- CO2 emissions fell by 1.6% in the first quarter of 2025, mainly due to growth in renewable energy.
- Renewable energy growth has outweighed electricity demand growth, leading to a 2% reduction in emissions from the energy sector.
- Emissions from non-energy sectors increased, particularly in metal and chemical industries due to higher production.

China's clean-energy sectors have been "developing rapidly", China's tax bureau said, with the sectors' sales revenue growing 13.6% year-on-year – "11.5 percentage points higher than the national average".

If the reduction in emissions from the power sector continues, it could signal a structural decline in overall emissions. However, future policies and economic factors, such as the U.S.-China trade tensions, will heavily influence this path.

Chinese president Xi Jinping confirmed that the country's 2035 "nationally determined contribution" (NDC) will cover the "entire scope of the economy, including all greenhouse gases" and be published before COP30.

EU getting late in implementing its green transition:
In December 2024, EU council and parliament reached an agreement to postpone by one-year EUDR regulation which imposes due diligence to prevent deforestation.

A growing need to reinforce its defense investments squeezing EU budgets, gradually diverting resources from the green transition. As an example, reduced government incentives have sapped customer interest electric cars.

Automotive industry lobby has resulted in EU postponing implementation of levies on car makers based on sold vehicles emissions by 3 years.

EU is late in delivering its NDC. But in its 02/2024 competitive Compass, Europe reiterated: « **Europe has set out an ambitious framework to become a decarbonized economy by 2050**. It will stay the course, including through the intermediate 2040 target of 90% »

USA now reversing its climate strategy. The new administration removed the US from the Paris Agreement, ordered the rewrite of fuel-economy rules, froze wind projects and stopped foreign aid.
Key actions include

- The **Energy Department** resumed permitting LNG export projects,
- The **EPA** took widespread actions to undermine its own environmental protections,
- International cooperation by NASA scientists, UN diplomats and more has been forbidden.

The US' withdrawal from the Paris Agreement directly impact domestic investment in transition plans. It also impacts finance for developing countries.
Finally, it represents a negative signal to other countries formerly pulled by US traction.

NEW NDCS OFFICIALLY SUBMITTED IN 2025: SWITZERLAND, BRASIL, UAE, UK

Switzerland's updated and enhanced first NDC is in line with latest findings by the IPCC1 to reduce global CO2 emissions by about 45 per cent from 2010 levels by 2030 and to achieve net zero greenhouse gas emissions by 2050 in order to limit warming to 1.5 degrees Celsius.

Brazil is setting an economy-wide target of reducing its net greenhouse gas emissions by 59 to 67 percent below 2005 levels by 2035, which is consistent, in absolute terms, with an emission level of 1.05 to 0.85 GtCO2e, according to the most recent inventory data

The UAE is committed to achieving a 47% reduction in GHG emissions by 2035, compared to the 2019 levels of 196.3 MtCO2e, thereby reducing the anticipated emissions to 103.5 MtCO2e. This target has been established in line with a 1.5 pathway in an effort to showcase the UAE's best efforts, effectively contributing to global mitigation efforts to deliver deep, rapid and sustained reductions in greenhouse gas emissions by 2035.

United Kingdom of Great Britain and Northern Ireland's 2035 Nationally Determined Contribution (NDC) Halfway through this critical decade for tackling climate change, the world is off-track to limiting global warming to 1.5°C.

On 12 November 2024 at COP29, the Prime Minister announced the UK's ambitious and credible NDC target to reduce all greenhouse gas emissions by at least 81% by 2035, compared to 1990 levels (excluding international aviation and shipping emissions) – three months ahead of the 10 February deadline.

The target is in line with the advice from the Climate Change Committee who state that it is a credible contribution towards limiting warming to 1.5 °C and it sits within a range of Paris consistent equity metrics1.

In December 2024, The UK published the Clean Power 2030 Action Plan. The UK has lifted the onshore wind ban, consented large amounts of solar, delivered a record-breaking renewables auction, launched Britain's carbon capture industry and set out plans to increase the energy efficiency of rented homes to take a million households out of fuel poverty.

The UK also has launched Great British Energy with £8.3bn, as well as committing £3.4bn for Warm Homes and a further £1bn for public sector decarbonization over the next three years.

NEW NDCS OFFICIALLY SUBMITTED IN 2025: JAPAN, CANADA, NEW ZEALAND

Japan aims to reduce its greenhouse gas emissions by 60 percent in fiscal year (FY) 2035 and by 73 percent in FY 2040, respectively, from its FY 2013 levels, as ambitious targets aligned with the global 1.5°C goal and on a straight pathway towards the achievement of net zero by 20501.

The details of the action policy as well as targets and estimates by greenhouse gases and other classifications are described in the Plan for Global Warming Countermeasures, which is a comprehensive implementation plan for achieving Japan's NDCs2, and in its related materials.

Canada is committed and determined to achieve carbon neutrality by 2050 and to contribute to global efforts aimed at limiting the increase in global temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit it to 1.5°C.

Canada's 2035 Nationally Determined Contribution (NDC) involves reducing emissions by 45 to 50 percent from 2005 levels by 2035, building on the 2030 target, which is a 40 to 45 percent reduction from 2005 levels.

Canada's commitment to achieving carbon neutrality by 2050 is codified in law through the Canadian Net-Zero Emissions Accountability Act (the Act). The Act requires the Government of Canada to set national emissions reduction targets every five years, ten years in advance, to keep Canada on track to achieve carbon neutrality by 2050.

New Zealand plan is to reduce net greenhouse gas emissions to 51–55 per cent below gross 2005 levels by 2035.

Based on New Zealand’s Greenhouse Gas Inventory (1990–2022), this target provisionally equates to reducing emissions to between 38.98 and 42.44 Mt CO2-e by 2035.

New Zealand’s relatively small population, high rates of renewable electricity generation, and economic reliance on primary industries are key factors that are reflected in its unique emissions profile, with emissions significantly coming from the agriculture sector

Finance :

Recent developments and Outlook

GREEN TRANSITION FINANCING REQUIRES AN ARRAY OF PUBLIC AND PRIVATE, DOMESTIC AND INTERNATIONAL INSTRUMENTS

Public policies to support the transition in the private sector

		Companies	Households
Support to ensure affordability of green technologies	Regulations	ESG & climate risk disclosures, greenwashing, emissions reduction for firms, green labels	Green labels
	Financing tools	Tax reliefs, green bonds, Support related to energy bills	Tax reliefs, banks' initiatives, Support related to energy bills, subsidies, Cost-of-living support
	Others	Private sector mobilization, industry, export, technology adoption, employment	Private sector mobilization, just transition, buildings, farmers
Risk-transfer / -sharing tools		Insurance companies' programmes, banks, initiatives (guarantees & others), Other guarantees, guidance and support, de-risking tools	Insurance companies' programmes

Funding instruments for the transition

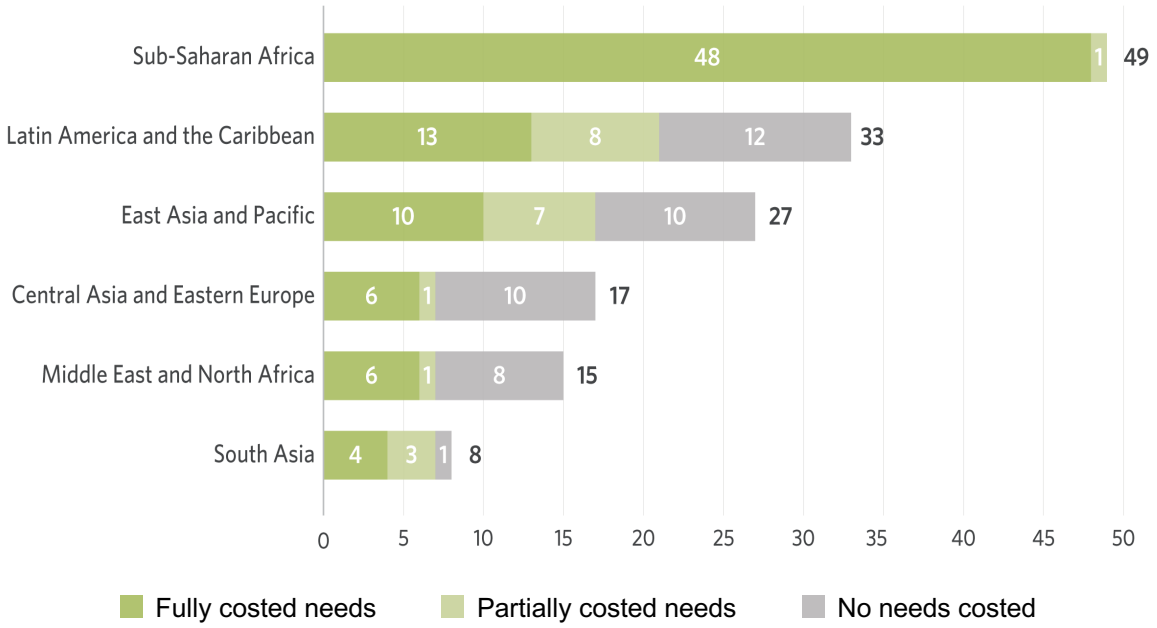
	Earmarking of fiscal revenues	Debt tools	Public development banks	International financing
Australia	○	◔	◑	○
France*	◕	◕	●	●
Rep. of Korea	◕	◔	◑	○
United Kingdom*	○	◕	●	○
United States of America	◔	◔	●	○
Bangladesh	○	◔	●	●
Brazil**	○	◕	●	●
Chile	○	◕	●	●
Rwanda**	◔	◔	◑	●
South Africa	◔	◔	●	●

■ Developed countries ■ Developing countries

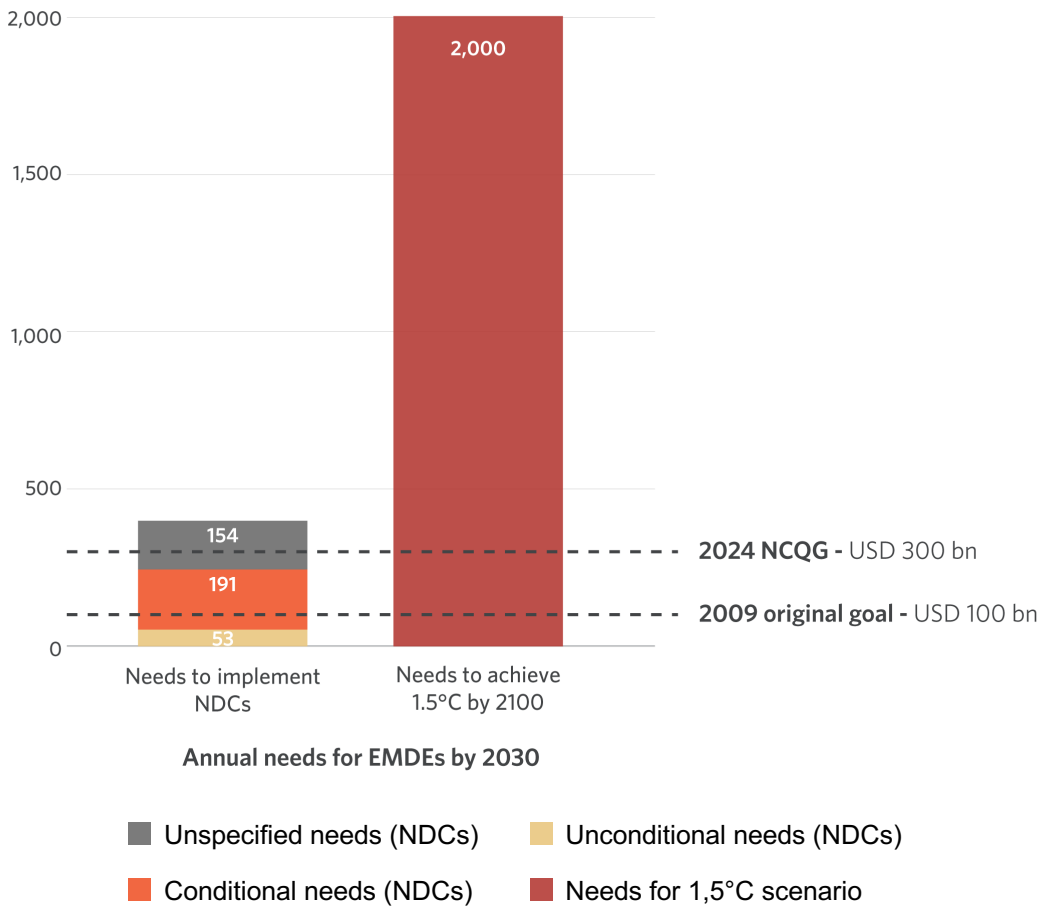
*Direct pricing includes carbon taxes and emissions trading schemes.
**No direct pricing exists.

ESTIMATES OF EMERGING COUNTRIES NEEDS FOR THEIR GREEN TRANSITION WOULD REQUIRE MORE DETAILED ASSESMENT

Coverage of NDC climate finance needs for EDMEs [Number of NDCs by region]

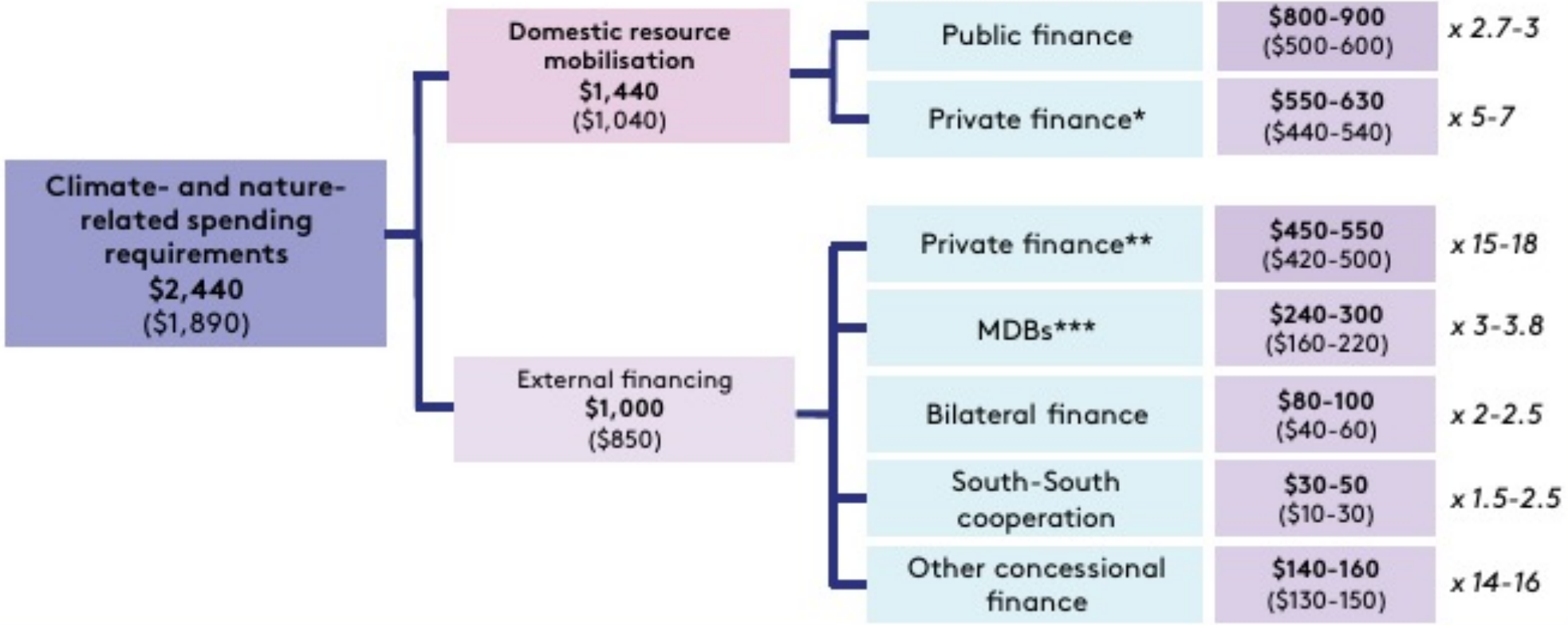


Ambition of the NCQG and NDCs compared to the global climate finance needs for a 1.5°C scenario for emerging and developing countries [US$ BN]



TO MEET EMDC4C NEEDS, MULTILALERAL DEVELOPMENT BANKS SHOULD TRIPLE LENDING CAPACITY BY 2030

Mobilizing the necessary financing for EMDCs other than China [US$ BN per year by 2030 ; increment from current in parentheses]



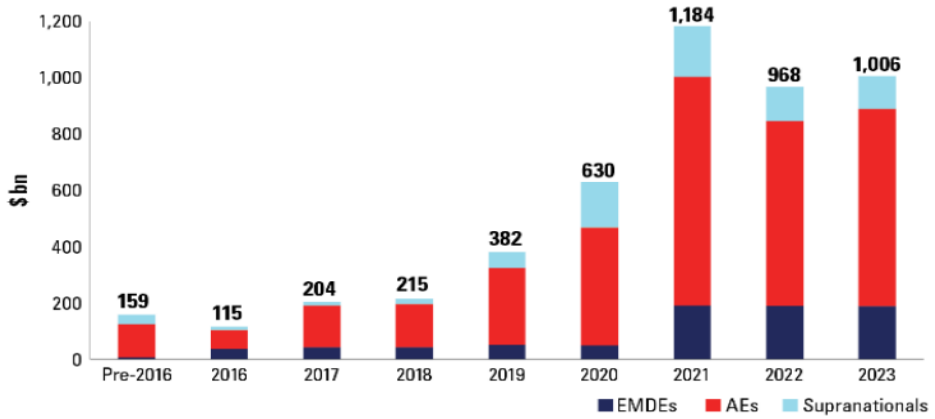
*Notes: *Includes household savings.*

***A significant proportion of this private finance would be directly and indirectly catalyzed by MDBs, other development finance institutions and bilateral finance.*

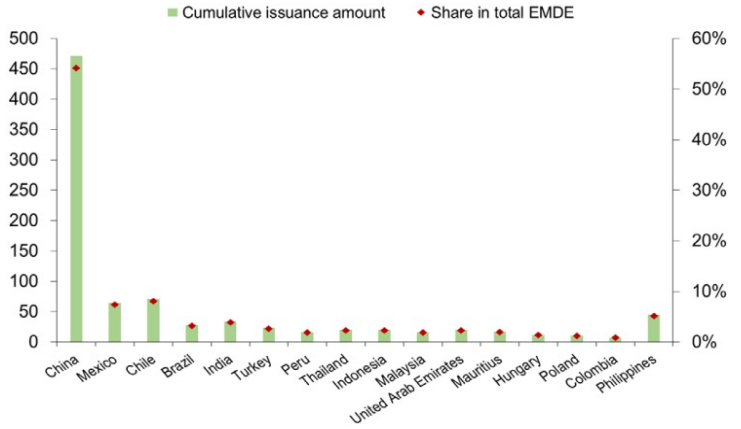
**** Includes multilateral climate funds.*

BANKS CONTRIBUTION TO EMDES CLIMATE FINANCE STILL LIMITED. 60% OF EMDE BANKS ALLOCATING LESS 5% OF THEIR LENDING TO CLIMATE FINANCE, WITH 28% NON ACTING.

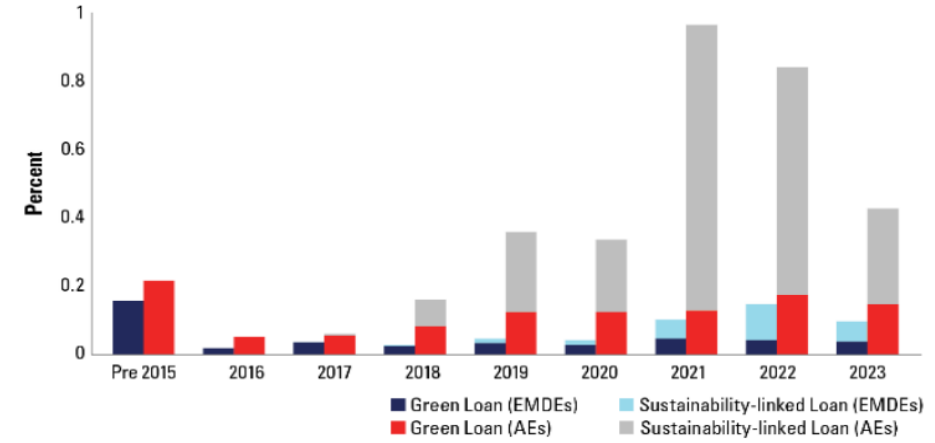
Total sustainable issuance by AE/EMDE [US$ BN ; pre2016-2023]



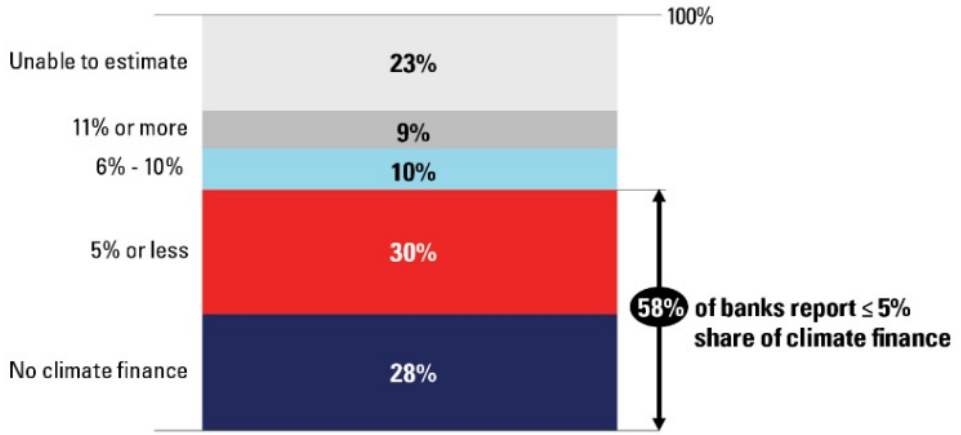
Cumulative sustainable bond issuance by country [US$ BN ; since 2015]



Breakdown of green loan and sustainability-linked loan issuance by EMDEs/AEs [GDP ; pre2015-2023]



Share of climate finance in surveyed EMDE banks' lending portfolios [% of total loans]



Source: World Bank Finance & Prosperity, Refinitiv, IMF

BAKU AGREEMENT, AIMED AT DELIVERING $300 BILLION IN ANNUAL CLIMATE AID TO DEVELOPING NATIONS, IS THREATENED

Germany intends to scale back development finance by almost $1 billion, while the Netherlands has unveiled €2.4 billion ($2.5 billion) of cuts.

Across Europe, governments including Finland, Sweden and Switzerland are releasing similar plans.

In the UK, Prime Minister Keir Starmer has announced plans to cut aid spending by £6 billion ($7.6 billion) to make room for increased military spending.

The US administration has began dismantling the US Agency for International Development. The agency managed $43 billion of foreign aid in 2023

Who we are

LES ATELIERS
DU FUTUR

ATELIERS DU FUTUR, AN NGO OF EXECUTIVES WHO ACT TO ENHANCE BUSINESS MOBILIZATION FOR THE CLIMATE

Our purpose

In response to the interconnected challenges of climate change and biodiversity loss, our **mission** is to **act for the Climate**

Who we are ?

A multidisciplinary group of business executives and senior managers
All volunteers, we are **experts in modeling** (trained in climatology), engineers focused on **energy** and **green technologies**, or **finance specialists**
Our experience facilitates their mastery of business climate strategies

Our strategy

A focus on the **Climate**
An international vocation, as key governance for the normative framework of businesses and citizens is at global and regional levels
An orientation towards corporations, as they alone meet the key conditions to successfully decarbonize our activities: Ability to do, know-how, and, to some extent, willingness to do

Our actions

Raising awareness - policy makers and governing bodies (public or private)
Challenging corporate strategies and public policies with a constructive, optimistic yet ambitious mindset.
Training future generations through Universities/Schools

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