2023 GLOBAL ENERGY TRENDS Edition

2022

A troubled, yet promising year for energy transition?

Enerdata
intelligence + consulting

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Chapter 1

2021 & 2022 DATA BENCHMARKS

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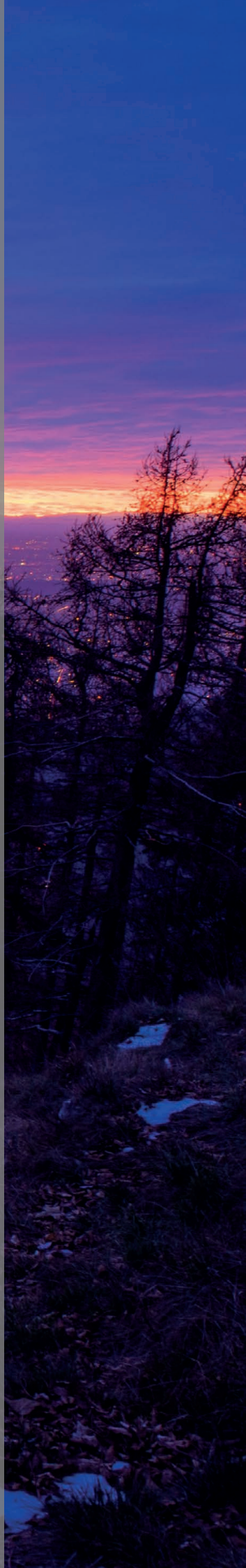
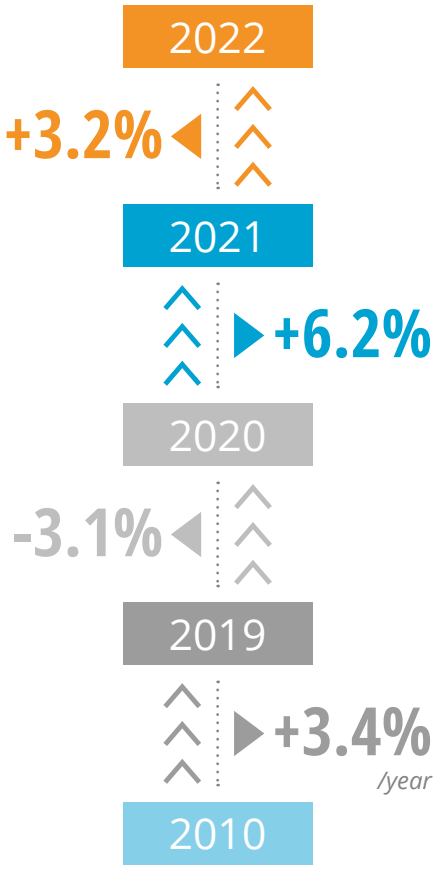
- Trends by energy for G20
- Summary



Key energy & climate figures for G20*

ECONOMIC GROWTH

returns to trend



Source: Enerdata – www.enerdata.net

***G20 countries** represent around **80% of global energy consumption.**

ENERGY CONSUMPTION

grows at historic pace

2022

+1.7%
11.8 Gtoe

2021

+5.1%

2020

-3%

2019

+1.9%
/year

2010

CO_2 EMISSIONS**

rise above 2019 levels

2022

+1.9%
28.3 $GtCO_2$

2021

+6.3%

2020

-4.9%

2019

+0.8%
/year

2010

*** CO_2 emissions from energy combustion (> 80% of CO_2 emissions)*

Source: Enerdata – www.enerdata.net

ECONOMIC GROWTH

A return to the normal pre-2020 trend

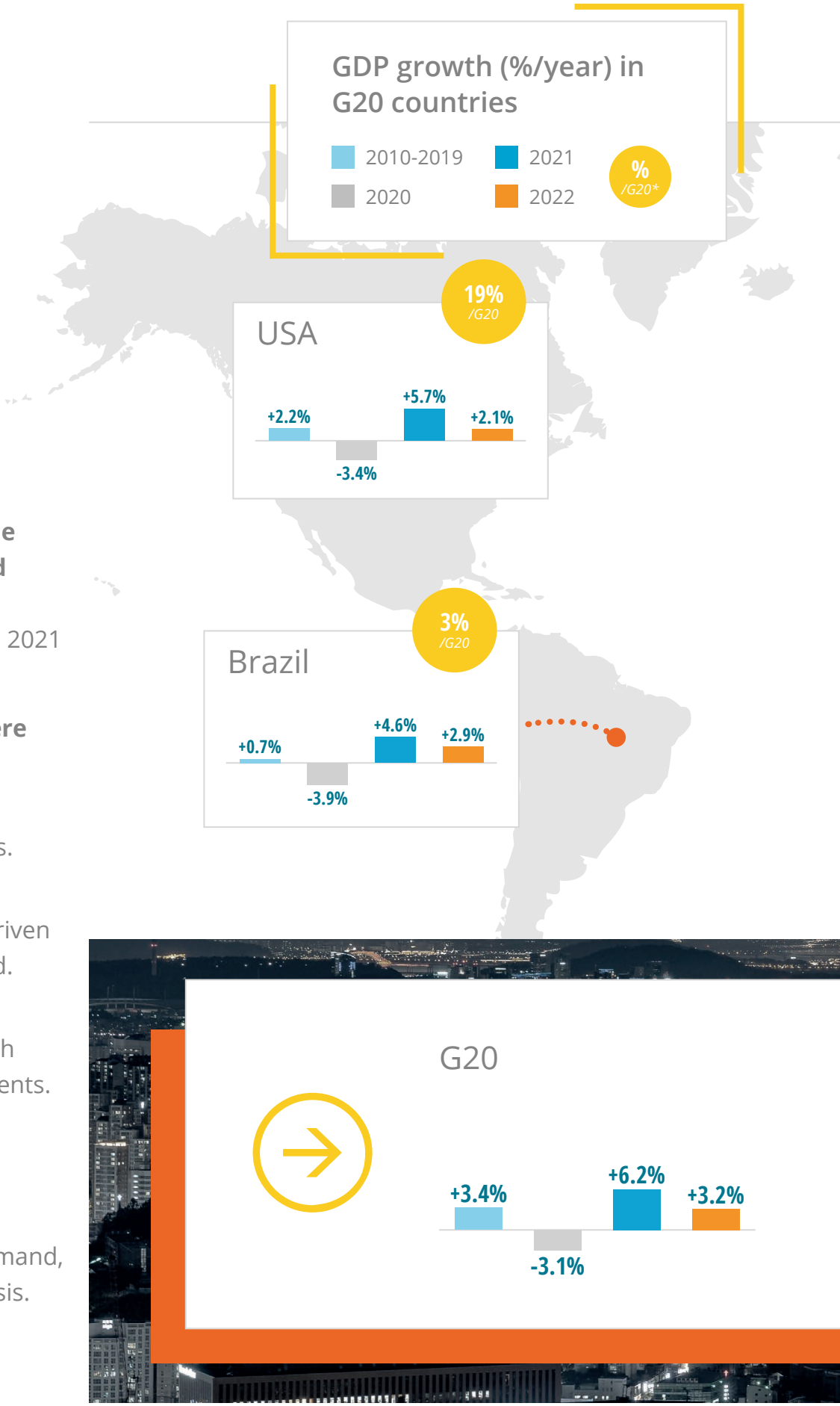
In 2022 **G20 economic growth returned to the normal pre-2020 trend** (+3.2%), with a sharp slowdown compared to 2021 (6.2%).

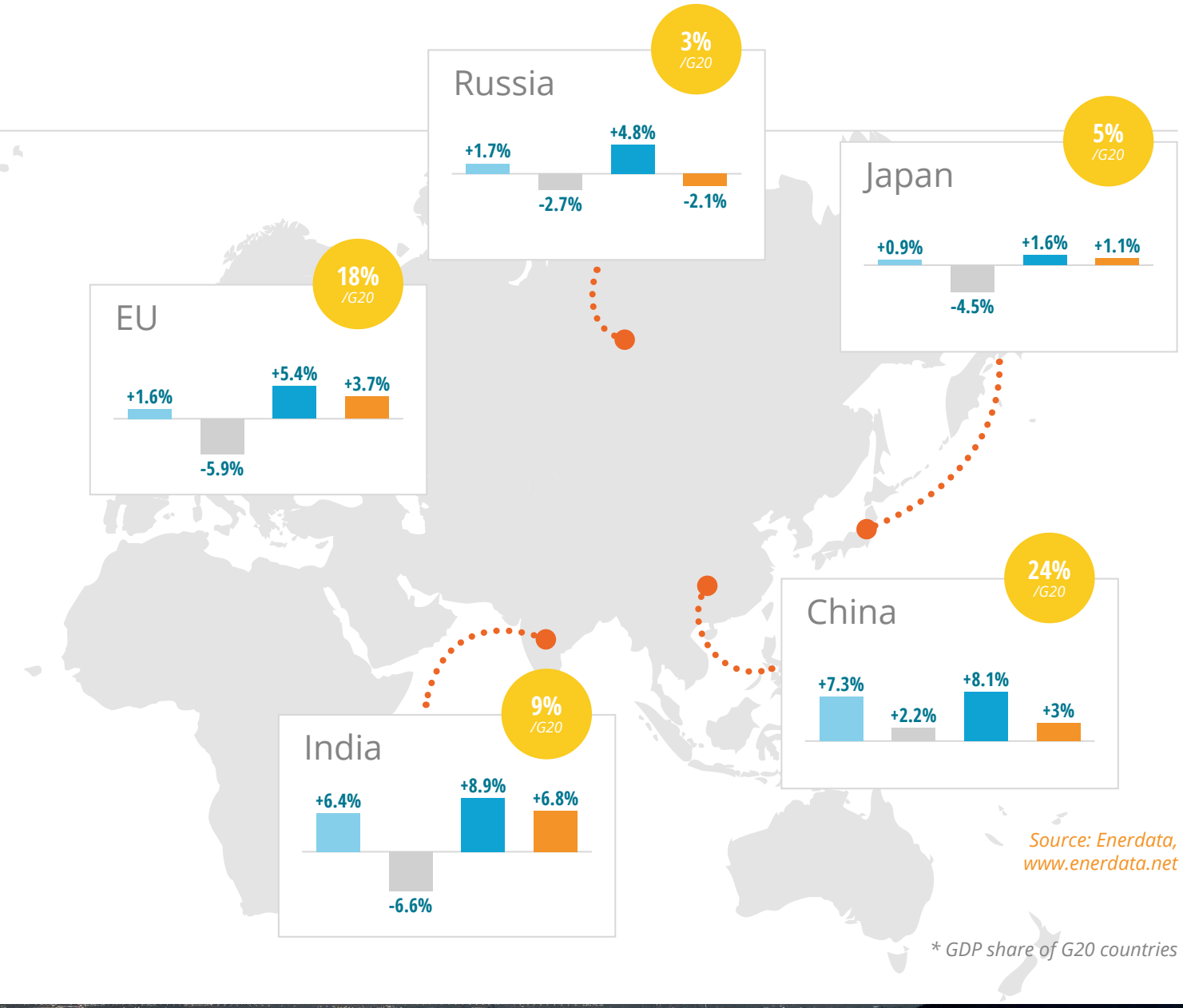
Country situations were diverse:

- In EU: strong growth despite uncertainties.
- In Japan, Korea, and Indonesia: growth driven by domestic demand.
- In Brazil and India: pre-election year with huge public investments.

The **biggest economic slowdowns** were:

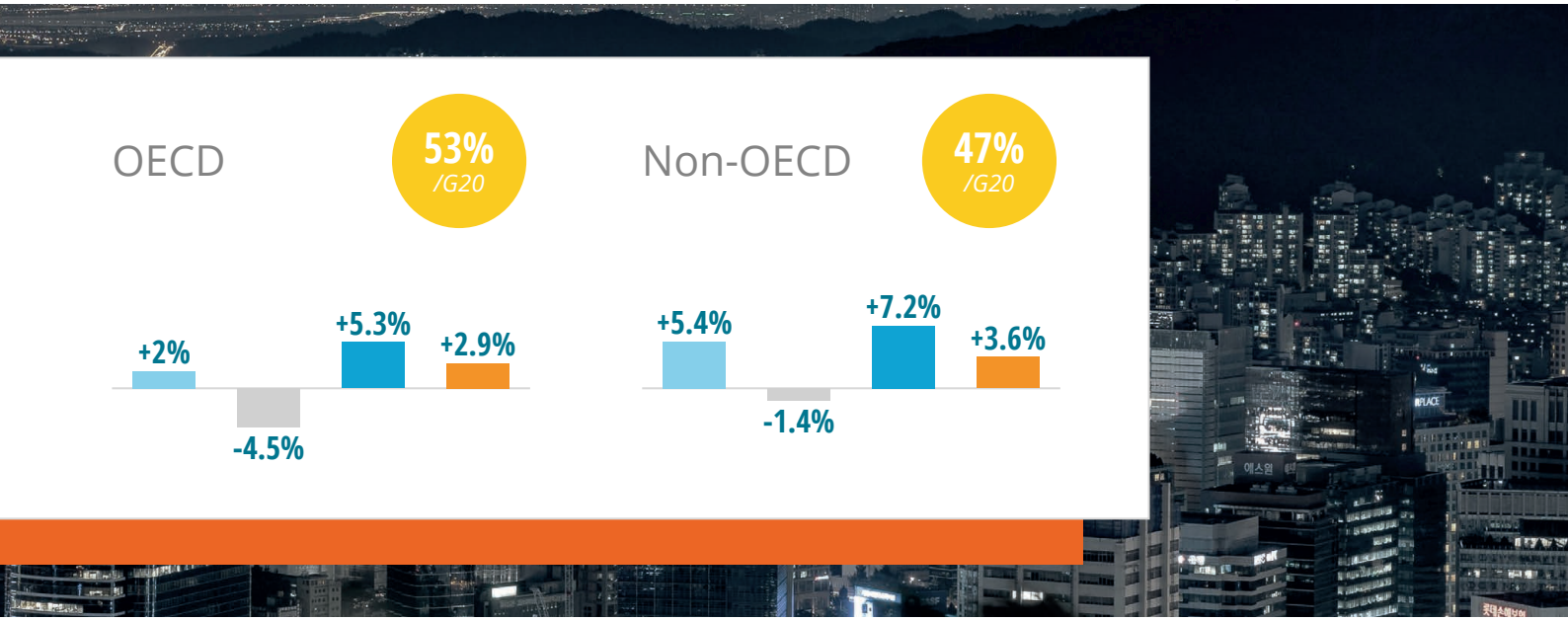
- In China: Zero-covid policy, a sluggish demand, and the property crisis.
- In Russia: Western sanctions.





Source: Enerdata, www.enerdata.net

** GDP share of G20 countries*



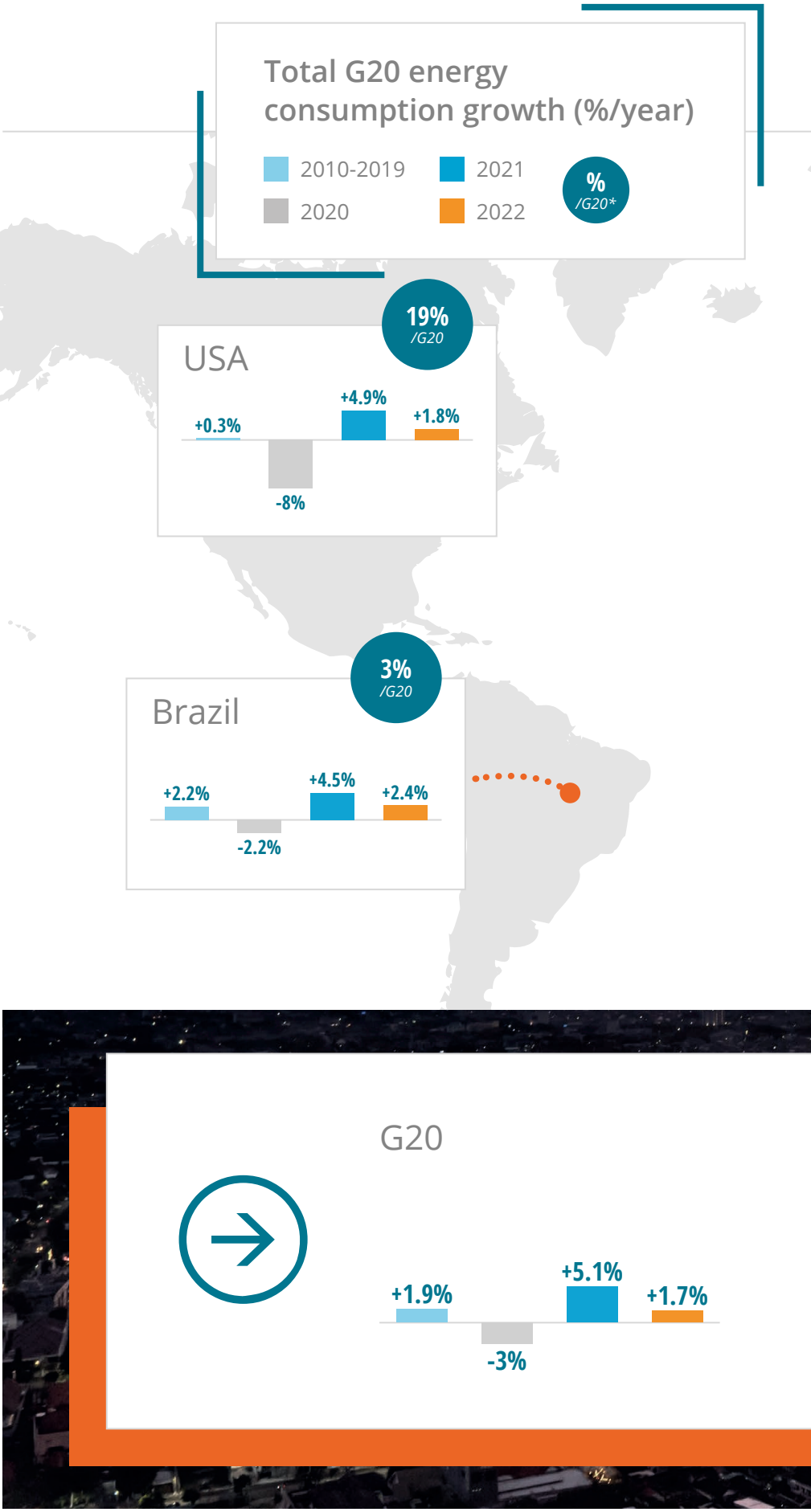
ENERGY CONSUMPTION

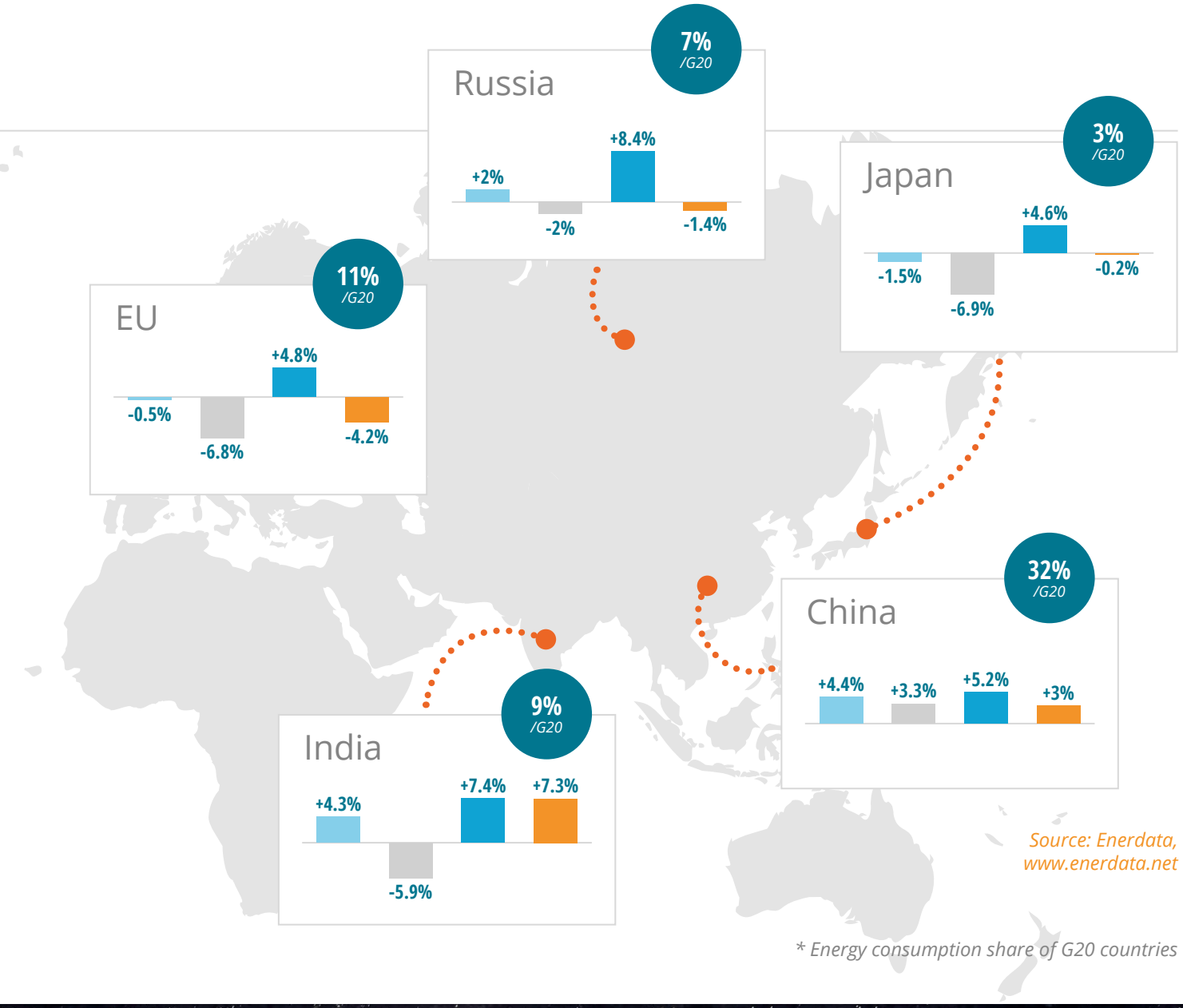
Energy consumption grew despite the impact of the war in Ukraine

The sharp fall in Europe was offset by a growth in energy consumption in the United States and Canada which are major energy producers, and were therefore not subject to soaring prices as Europe and Asia were.

The **slight decline** in Japan and the **moderate growth** in **Korea** were due to very **high gas and oil prices** on global markets, while energy consumption in China grew at the same rate as the GDP.

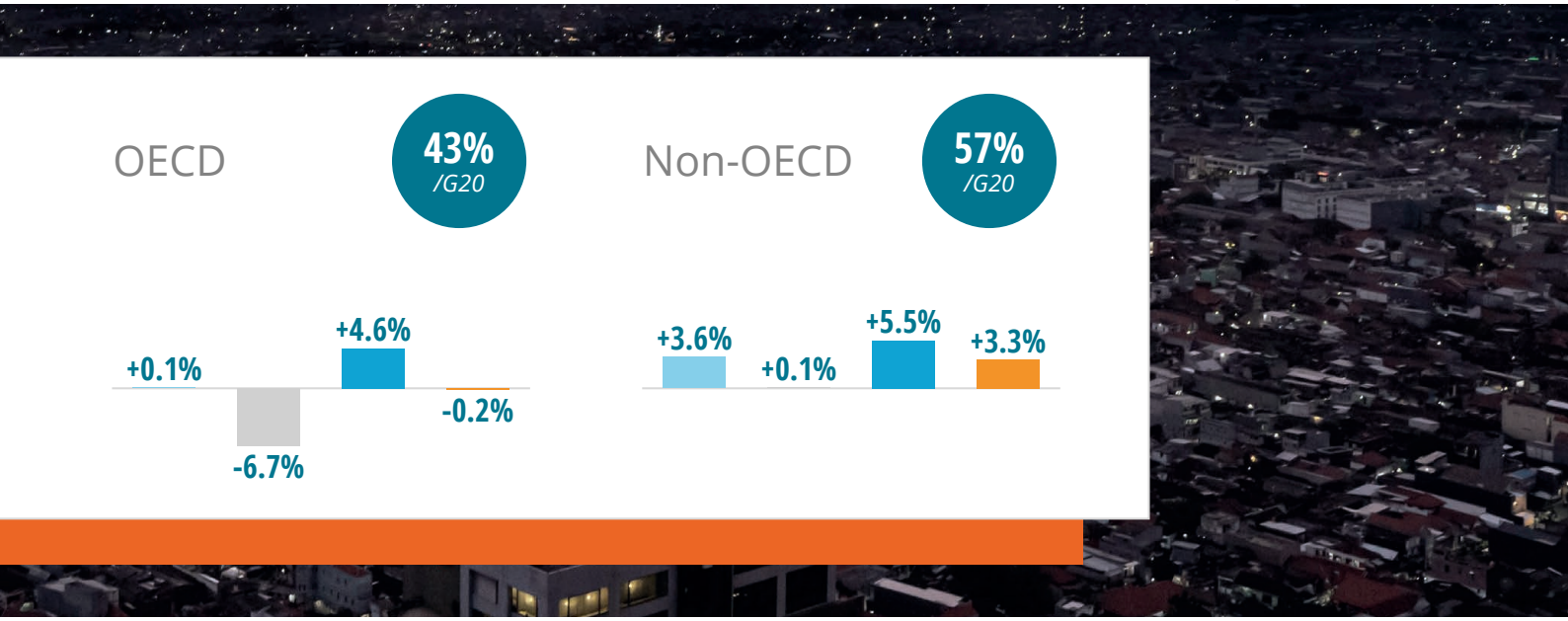
Energy consumption rose significantly **in coal-intensive India** and **Indonesia** and in **oil-intensive Saudi Arabia**, which all had a robust economic growth.





Source: Enerdata, www.enerdata.net

** Energy consumption share of G20 countries*

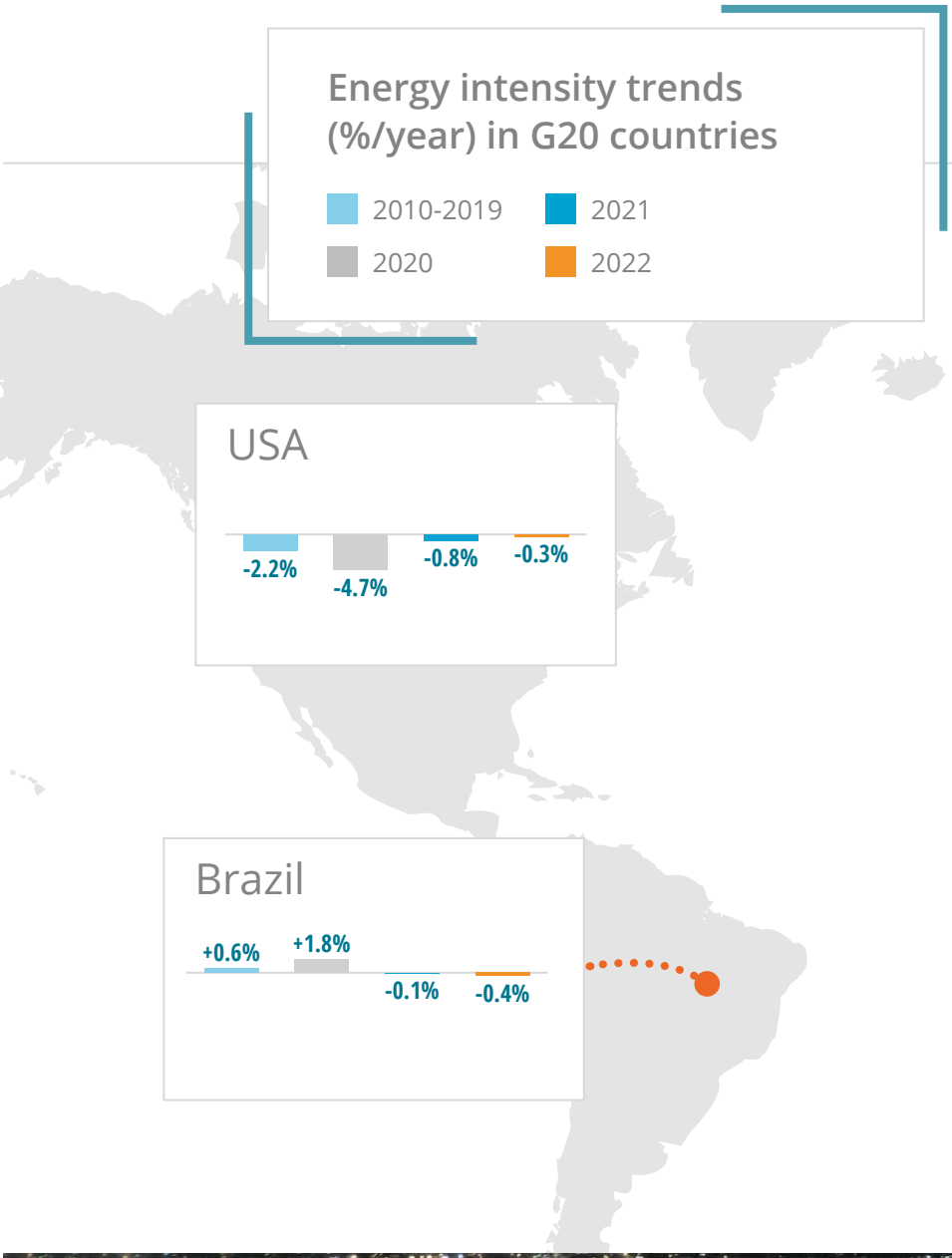


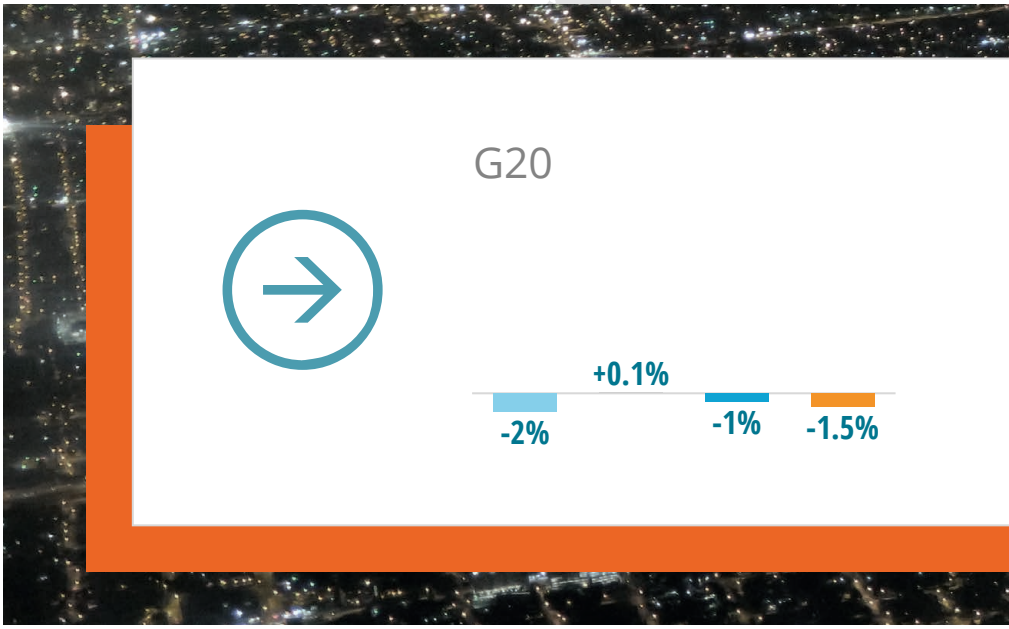
ENERGY INTENSITY*

A reduction in 2022 that is not sufficient to meet the 2°C objective

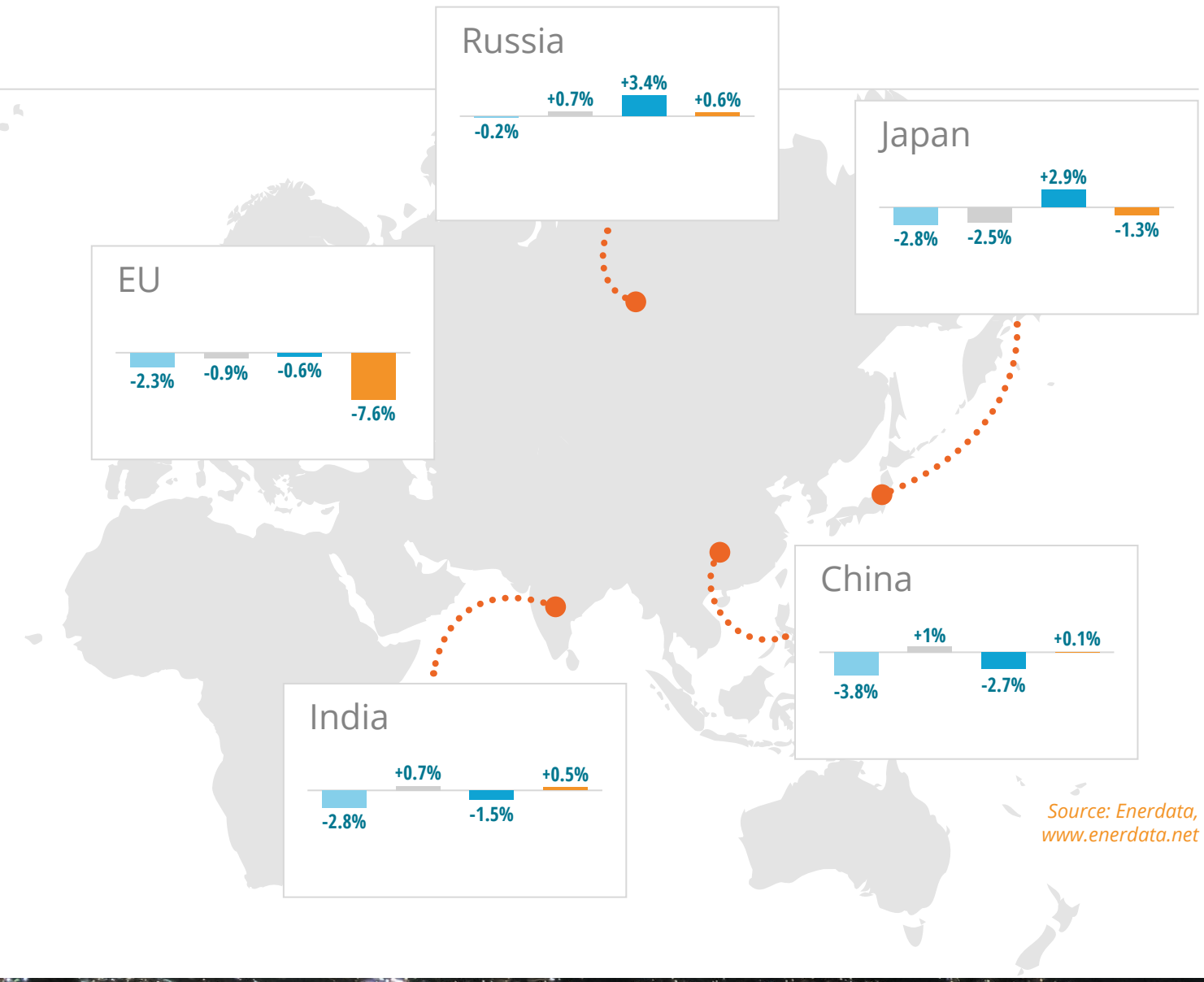
In **Europe**, the **sharp reduction** is due to the decline **in energy consumption** and the **growth in GDP**.

In **China energy consumption** and **GDP grew** at the same pace, resulting in a **stable energy intensity**.

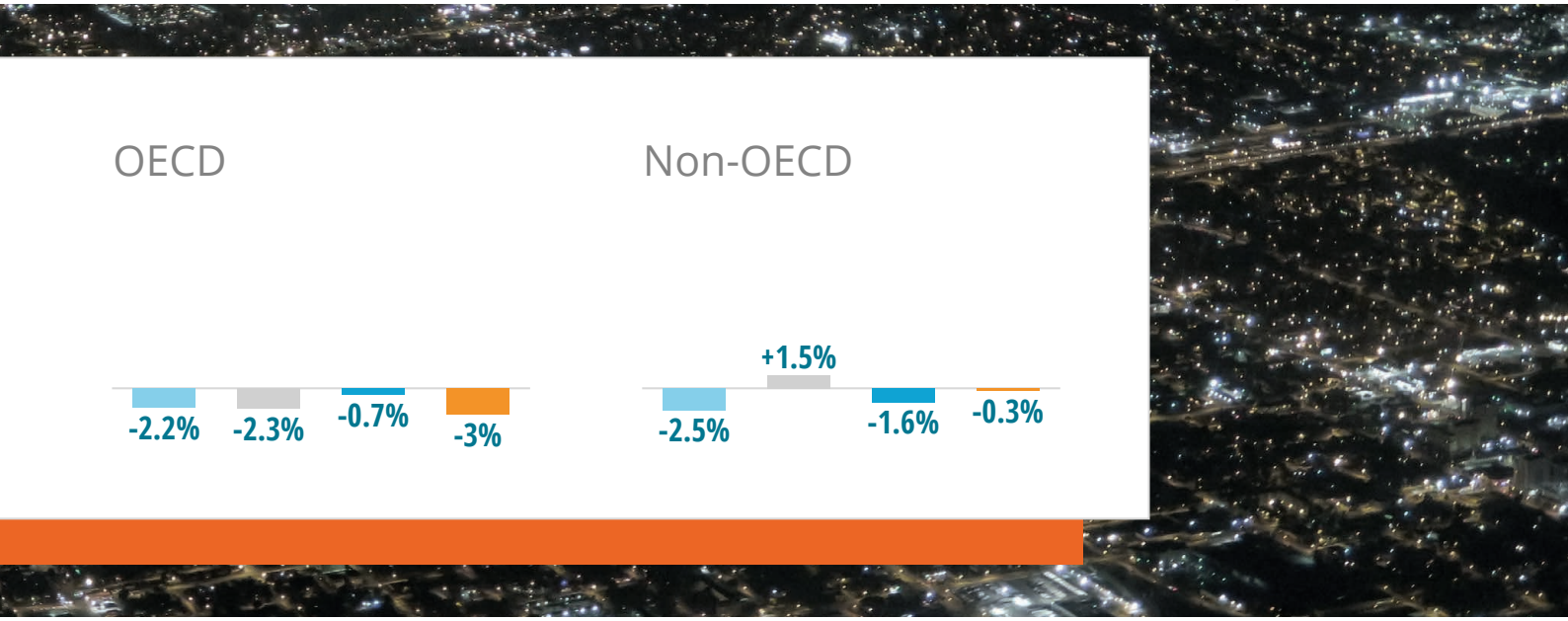




*"Energy intensity" = energy consumption / GDP



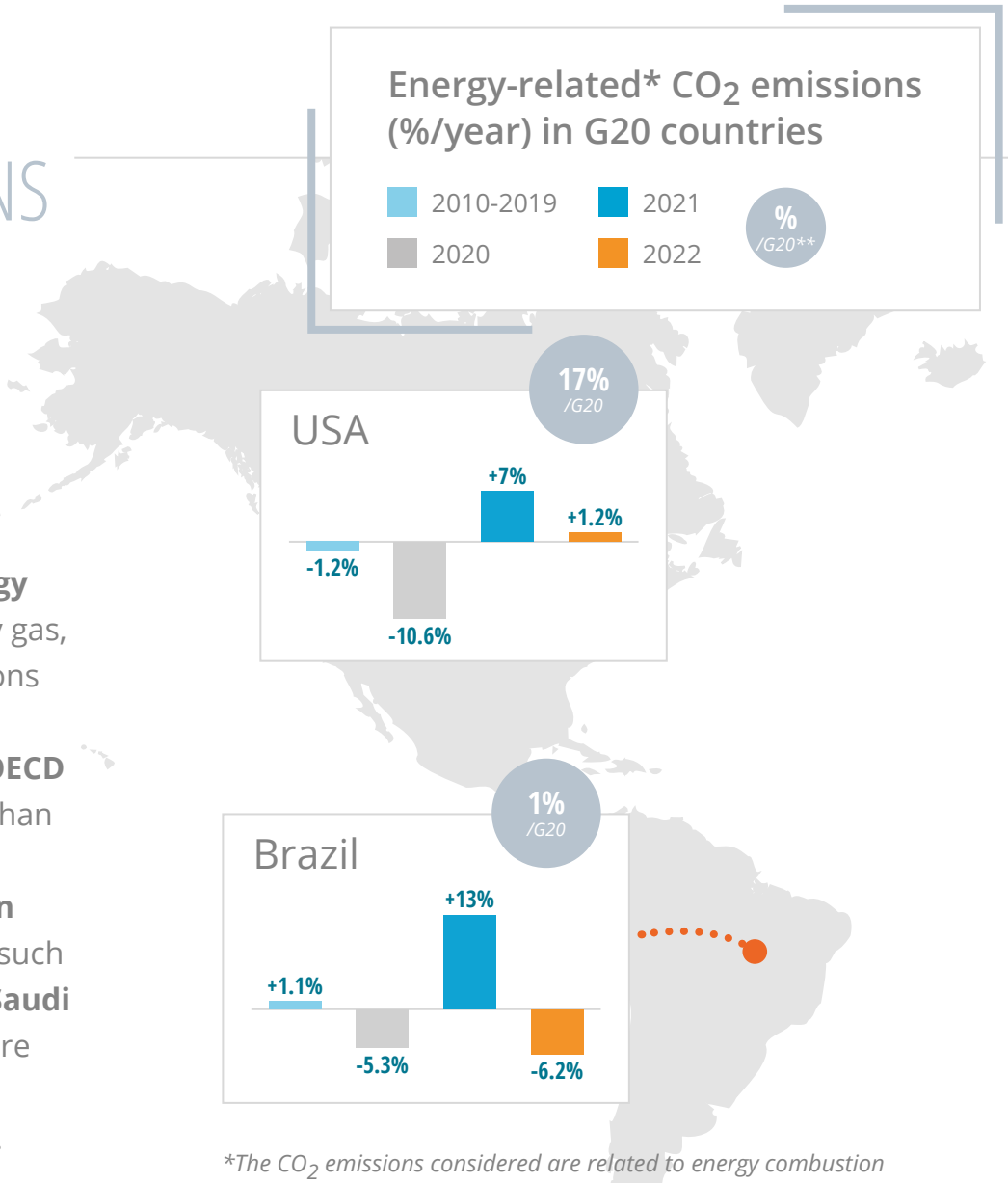
Source: Enerdata, www.enerdata.net



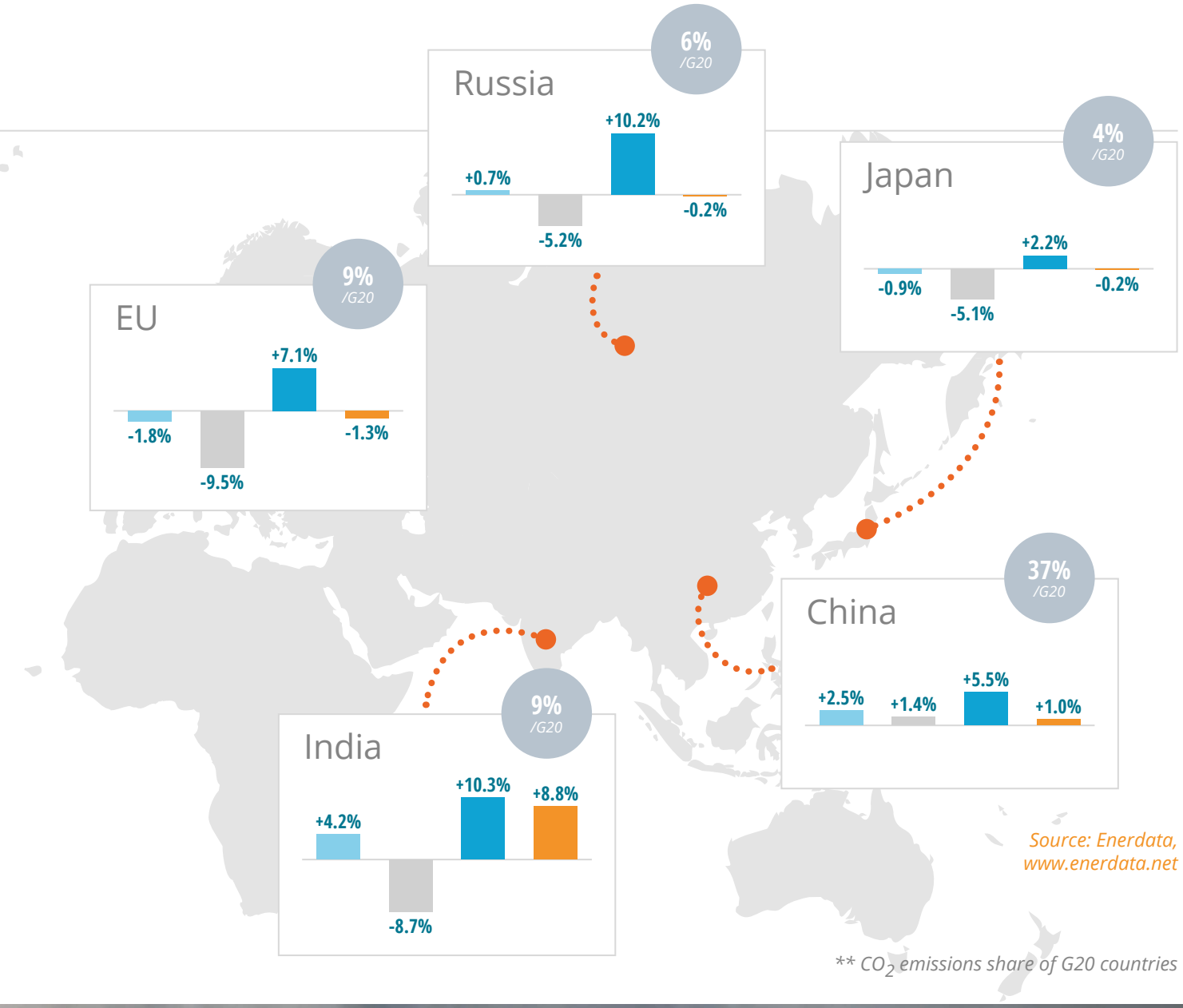
CO_2 EMISSIONS

Record levels in 2022, exceeding 2019

CO_2 emissions fell in the EU due to a drop in energy consumption, particularly gas, which made OECD emissions stable.
But the **increase in non-OECD countries is huge**: more than **4%, due to the increase in energy consumption in CO_2-intensive countries** such as **India**, **Indonesia**, and **Saudi Arabia**. Therefore, the more energy they consume, the more emissions they emit.

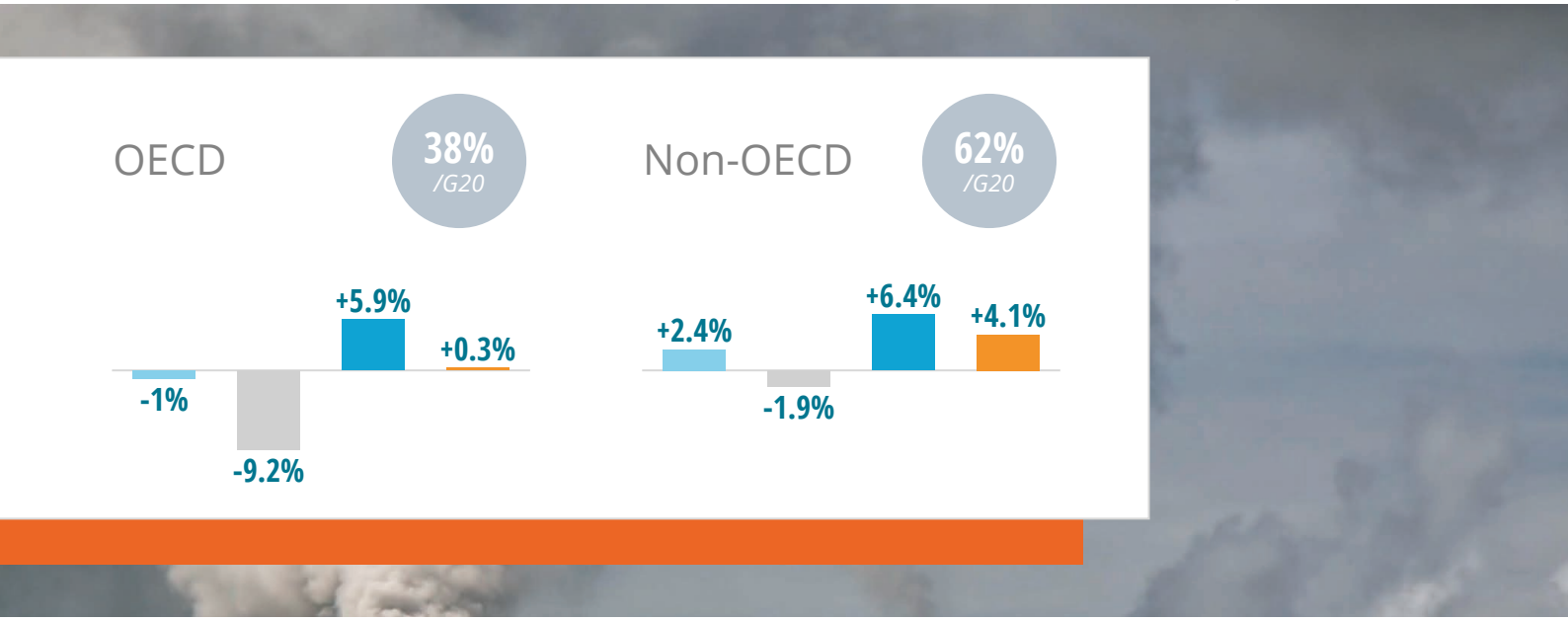


*The CO_2 emissions considered are related to energy combustion



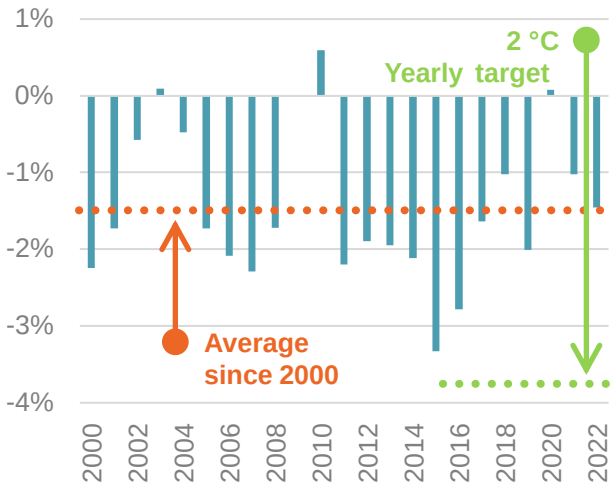
Source: Enerdata, www.enerdata.net

*** CO_2 emissions share of G20 countries*

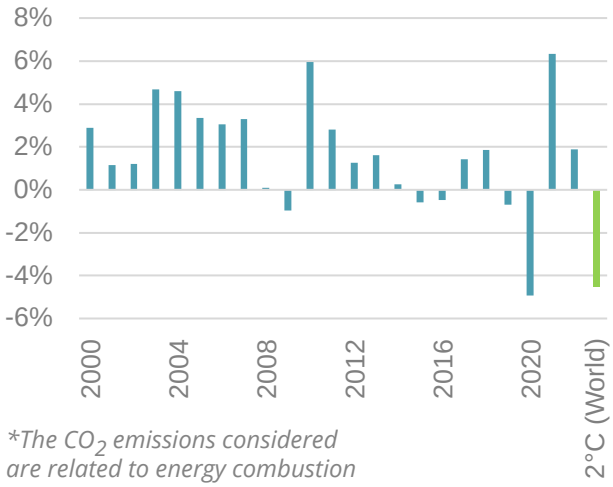


DECARBONISATION EVOLUTION

Energy intensity: G20

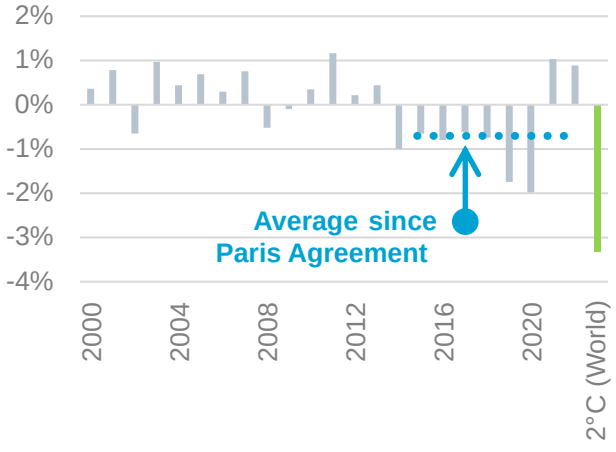


Energy-related* CO_2 emissions: G20

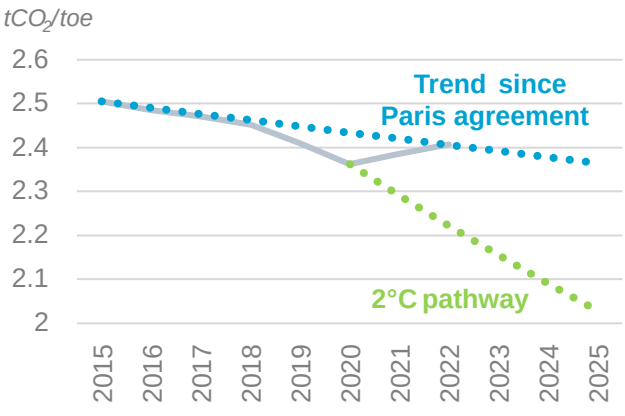


**The CO_2 emissions considered are related to energy combustion*

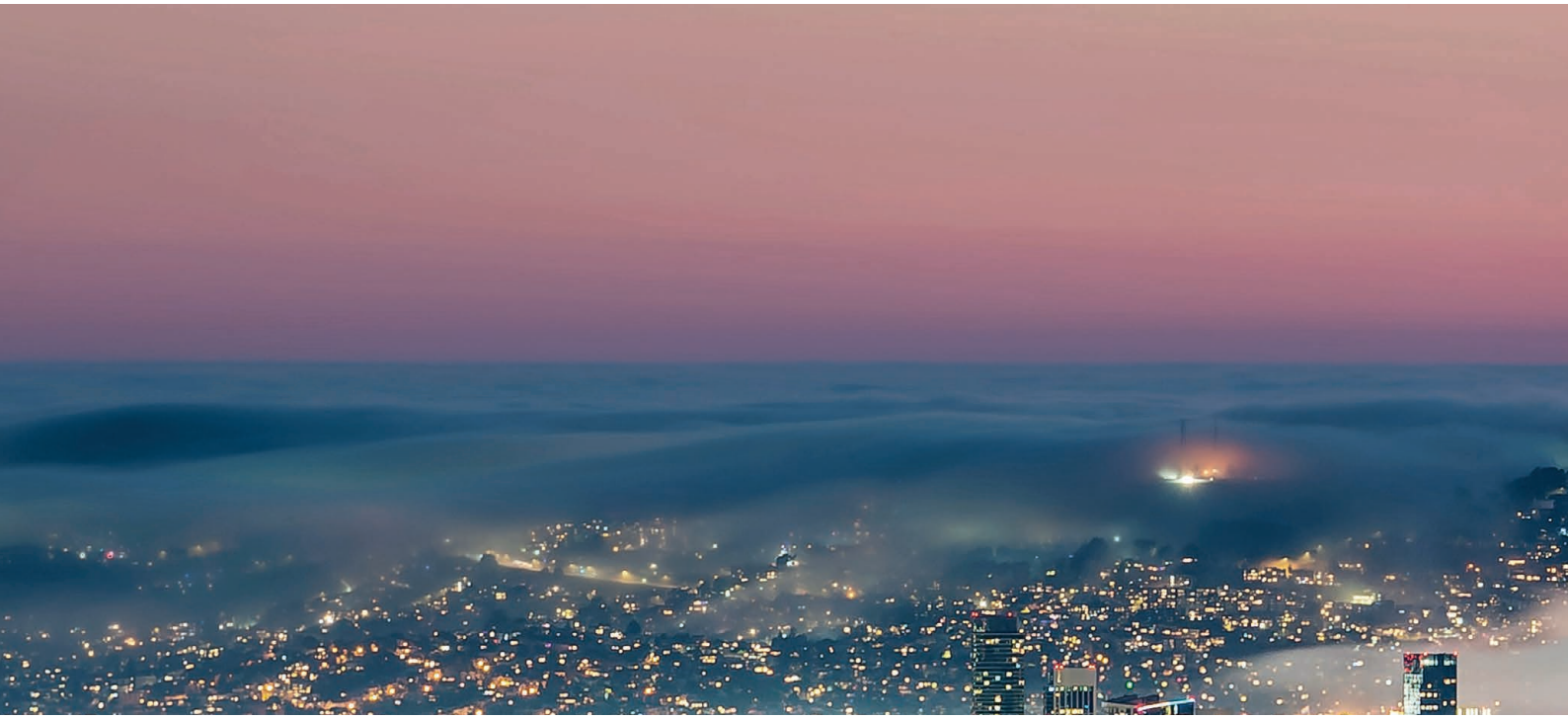
Carbon factor growth: G20



Carbon factor: G20



Source: Enerdata – www.enerdata.net



Latest decarbonisation indicators drift further away to the climate targets limiting a global temperature increase to under 2°C.

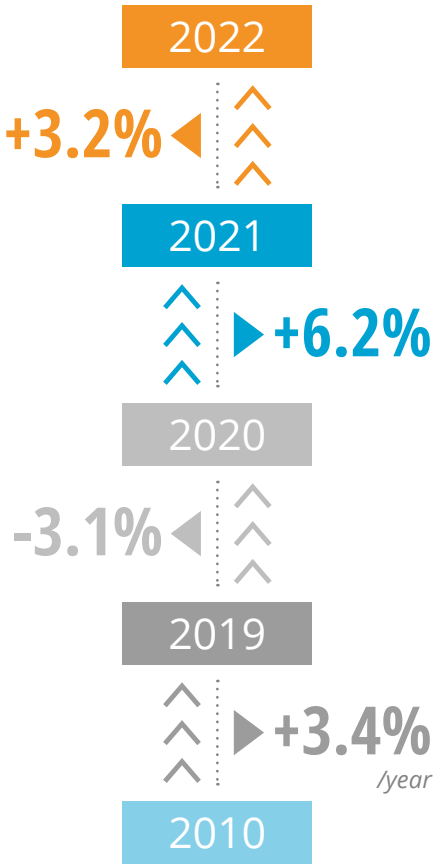
- Since 2000, although the **energy intensity in the G20 has fallen by an average of 1.5% per year, this is not enough to achieve the two-degree target**, which requires annual reductions of almost 4%. More effort needs to be made.
- **CO_2 emissions in the G20 are significantly above the level we would need to maintain to achieve the two-degree target**, since they would need to fall by more than 4% per year.
- **The average decline in the carbon factor since the Paris agreement is less than 1% per year, whereas we need nearly 3.5% per year to reach the two-degree target**. There was a decline until 2020, but the last two years have slowed this progress. This is because **power generation is still very carbon intensive**, using 60% for thermal power generation, and there has been a surge in coal consumption over the last two years.

More information in the Global Stocktake section.

Trends by energy for G20

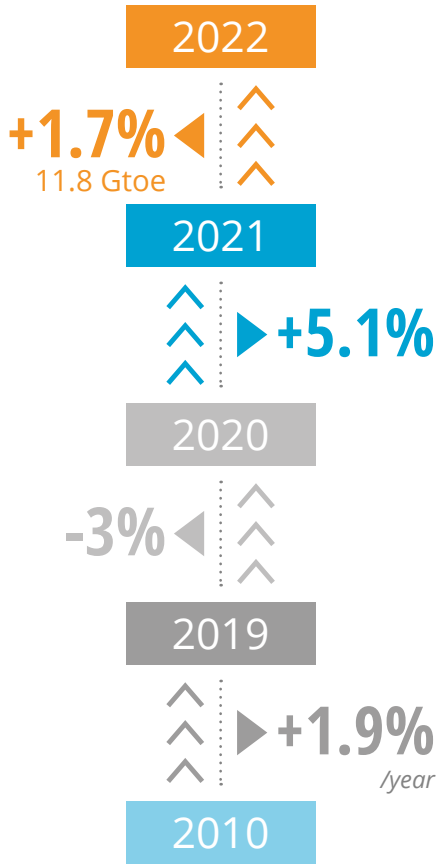
ECONOMIC GROWTH

returns to trend



ENERGY CONSUMPTION

grows at historic pace



Source: Enerdata – www.enerdata.net

COAL — 32%
Share of total

-3% | +3.7%
2019 — 2020 — 2021 — 2022
+6%

2010-19 ▶ +0.4% /year

OIL — 28%
Share of total

-6.7% | +1.9%
2019 — 2020 — 2021 — 2022
+4.9%

2010-19 ▶ +0.9% /year

GAS — 21%
Share of total

-1.1% | -1.4%
2019 — 2020 — 2021 — 2022
+4.8%

2010-19 ▶ +2.3% /year

Source: Enerdata
www.enerdata.net

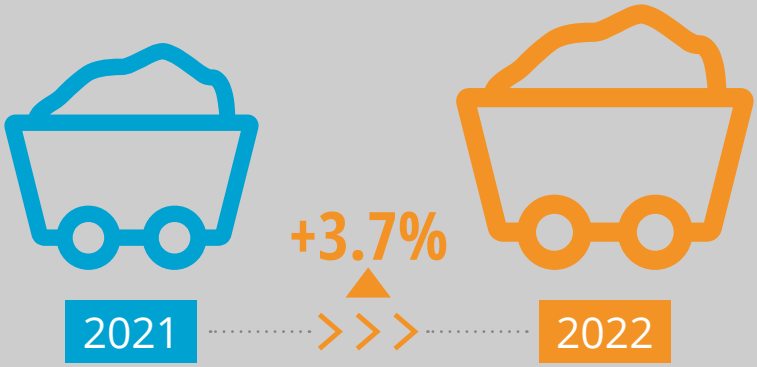
ELECTRICITY

-0.2% | +2.2%
2019 — 2020 — 2021 — 2022
+6%

2009-19 ▶ +2.7% /year

COAL

Steady growth in 2022



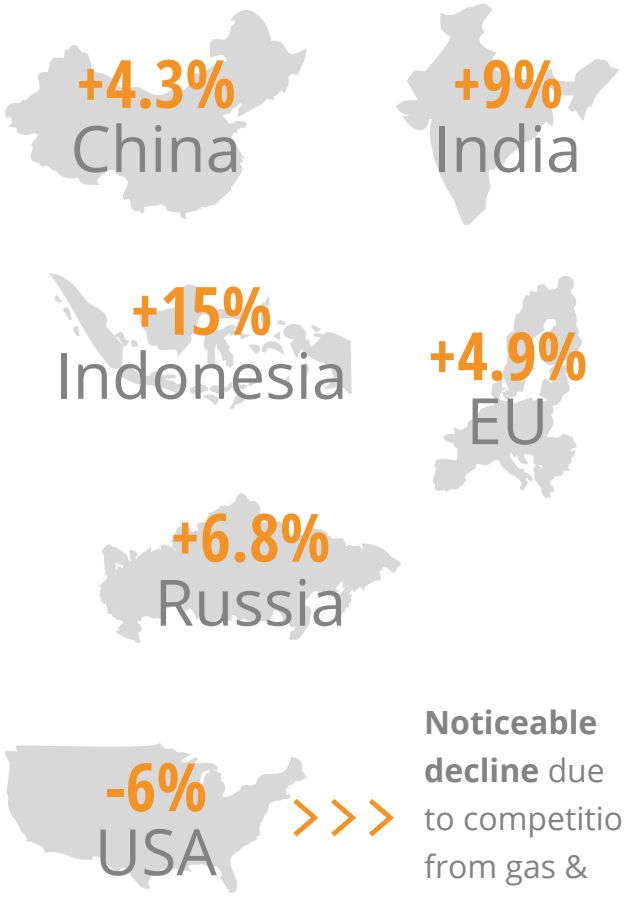
Coal consumption grew steadily, driven by Asian coal producers: China (over 60% of total G20 coal consumption), India and Indonesia.

Coal consumption also **increased in the EU** for the second year in a row **due to extremely high gas prices** throughout the year.

Competition from gas and renewables in the **US electricity sector reduced coal consumption** by **6%**.

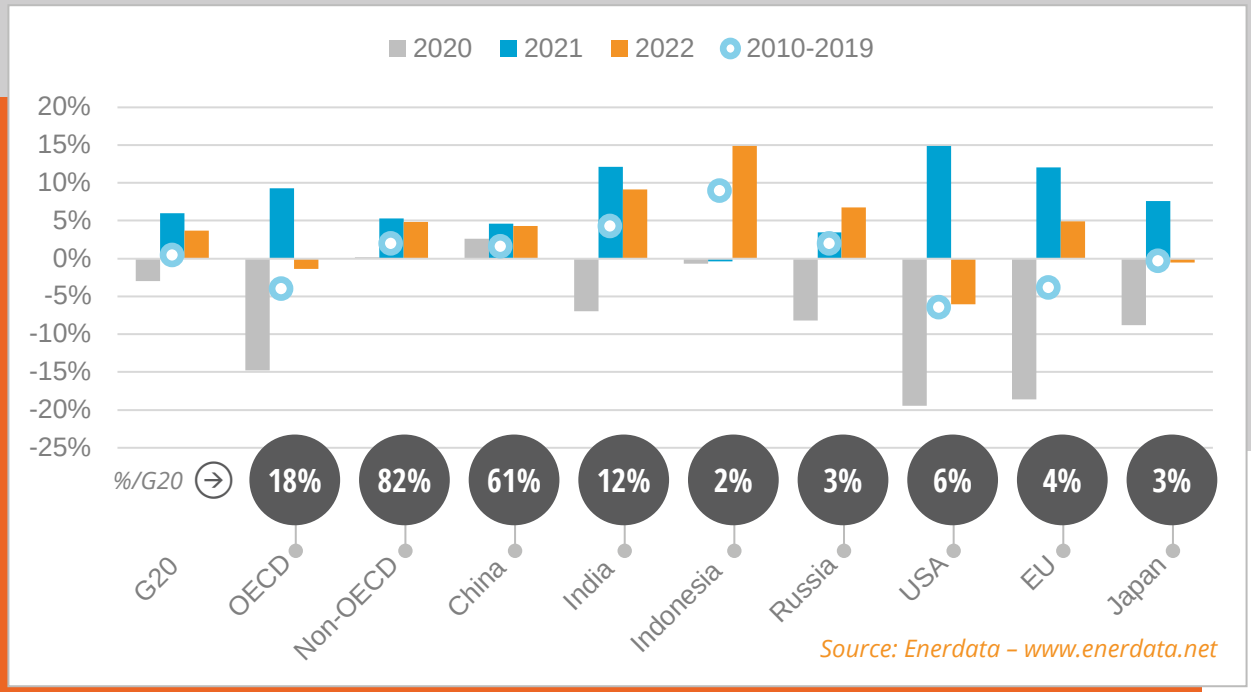
Although Australia is a major producer, its coal consumption declined due to extensive power plant maintenance (1/4 of the fleet offline in May-June 2022) that reduced coal-fired power generation; massive rains and flooding also had an impact on Australian coal production.

Key data

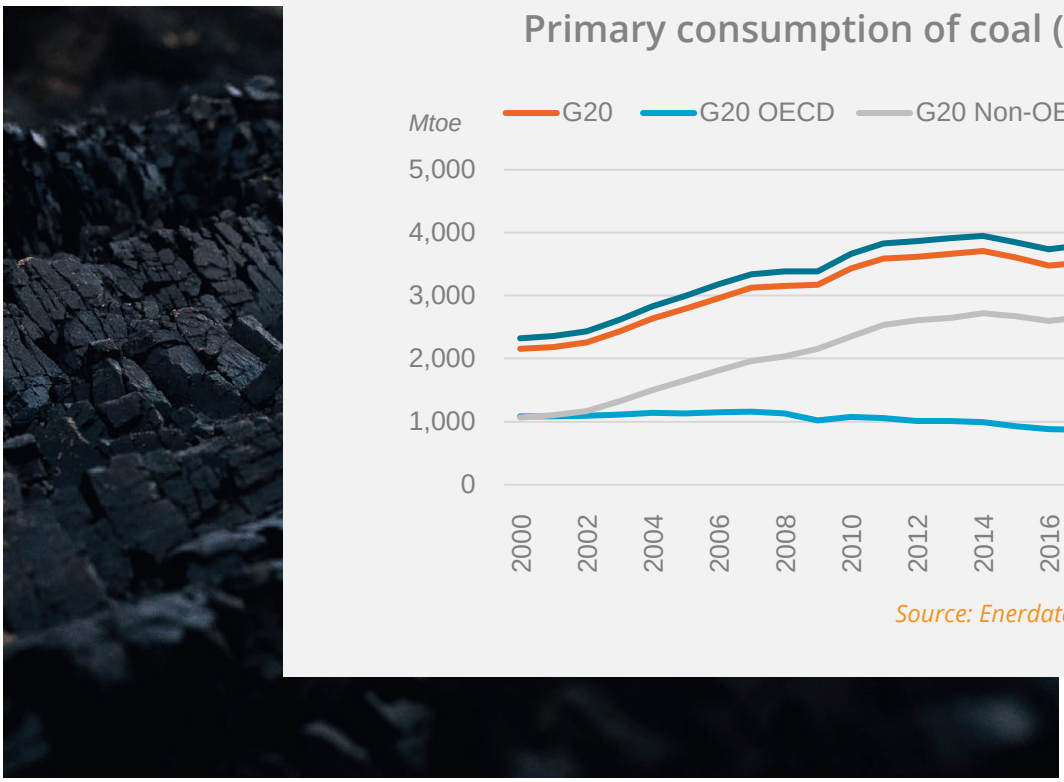


Noticeable decline due to competition from gas & renewables.

Trends in coal consumption in G20 countries (%/year)



Source: Enerdata – www.enerdata.net

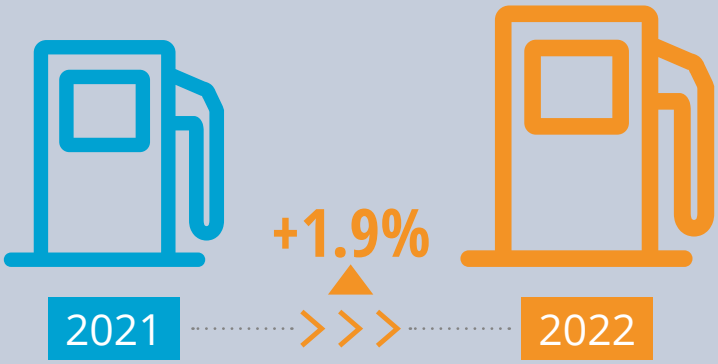


Primary consumption of coal (Mtoe)

Source: Enerdata – www.enerdata.net

OIL

Contrasting growth in oil consumption



Due to the economic slowdown and soaring oil prices, growth in oil consumption also slowed.

On the one hand, the **three main oil consumers of the G20 played a leading role in this trend**. Indeed, China's industrial demand decreased, and the US and EU consumption grew at a slower rate.

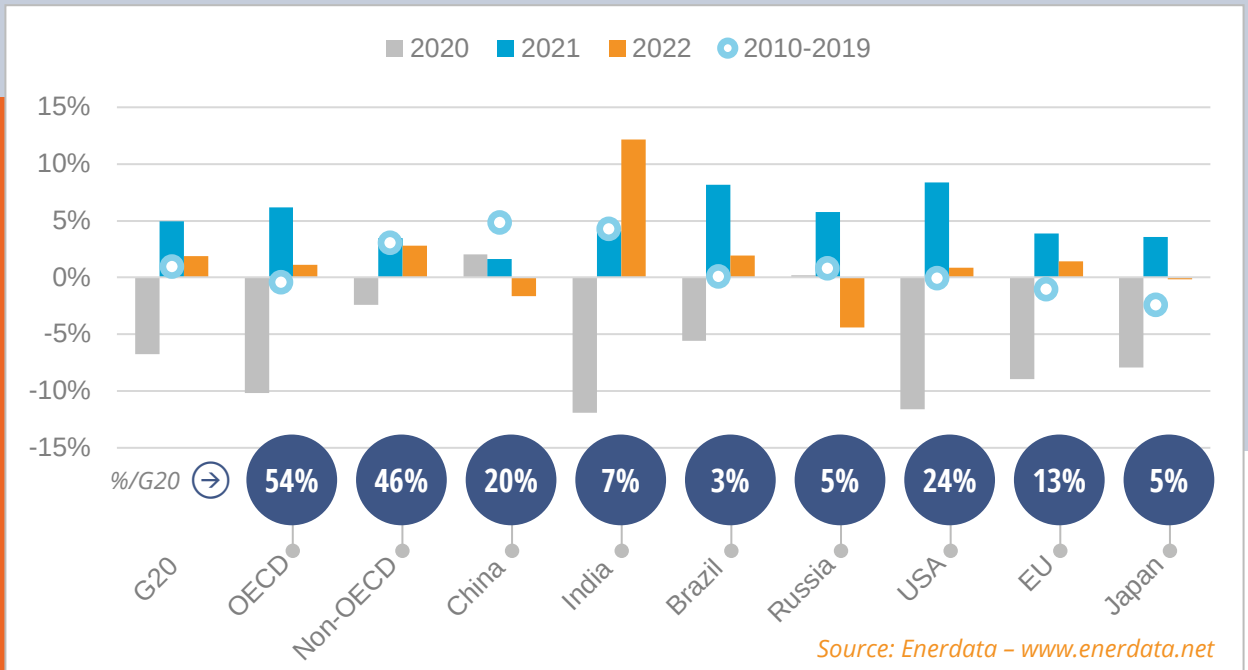
On the other hand, in some **countries with strong economic growth, energy demand has been sustained**, leading to high oil consumption in India, Indonesia and Saudi Arabia.

Key data

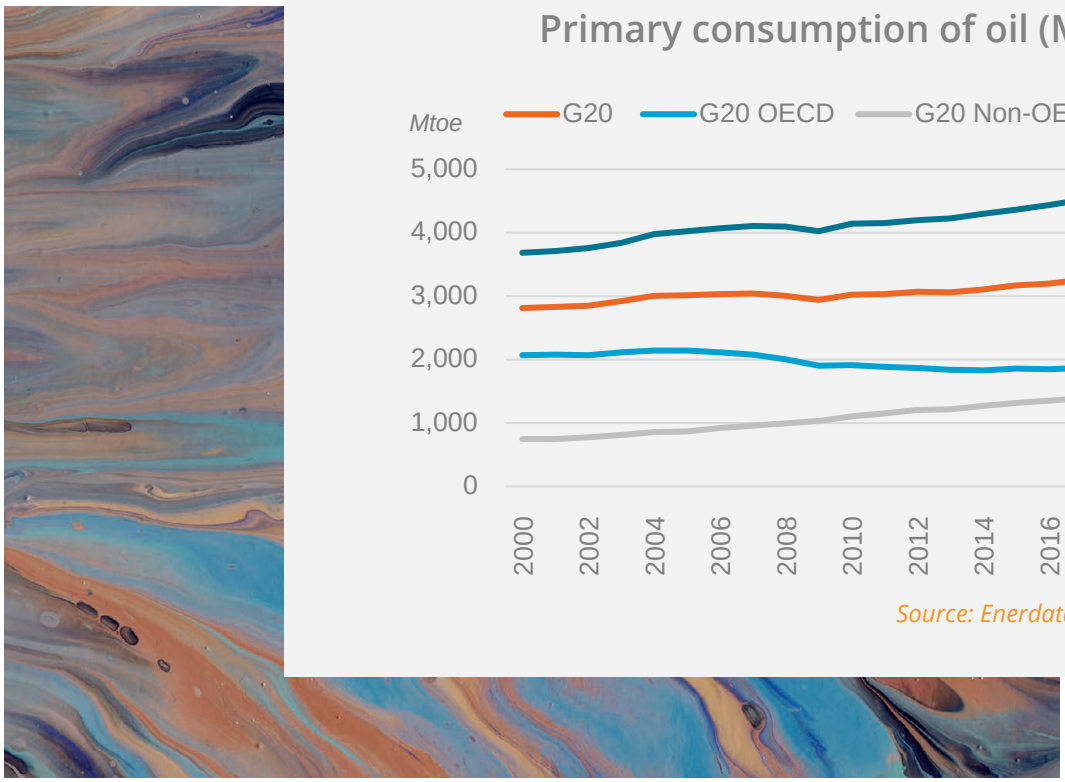
Slower growth for the main oil consumers of the G20.

Strong increase for some countries with strong economic growth.

Trends in oil consumption in G20 countries (%/year)



Source: Enerdata – www.enerdata.net

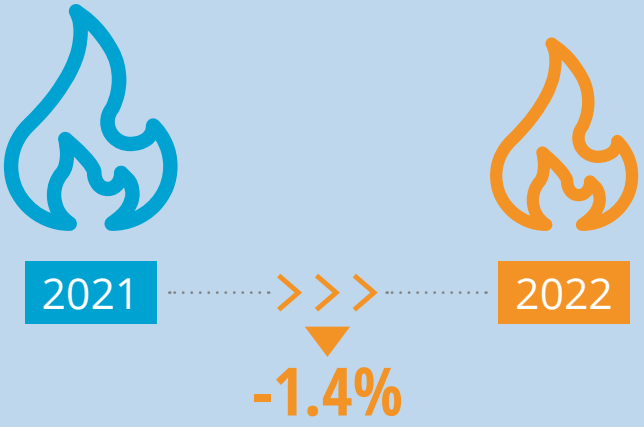


Primary consumption of oil (Mtoe)

Source: Enerdata – www.enerdata.net

GAS

The impact of the Ukrainian conflict



Two significant impacts.

Firstly, gas consumption in **Europe fell by 12% due to soaring prices and fears of supply disruption, forcing industry and end consumers to reduce gas use**. The mild winter and the introduction of energy-saving measures helped too. **High gas prices** and the **industrial slowdown** also **impacted China**, which saw its first drop in gas consumption in 30 years.

Secondly, **the invasion of Ukraine led to a 56% rise in European gas prices in two months**, and pressure to boost gas reserves contributed too. In addition, with European consumers turning to LNG imports on a massive scale, **LNG prices** on the **European** and **Asian markets** reached **record highs**. **US LNG prices increased at a slower pace**. Thus, LNG growth was substantial: +5.3% in the USA and +4.4% in Canada.

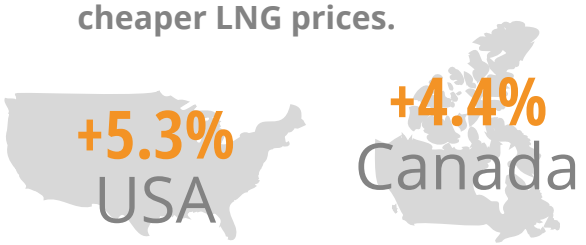
Key data

Decline due to the war in Ukraine.

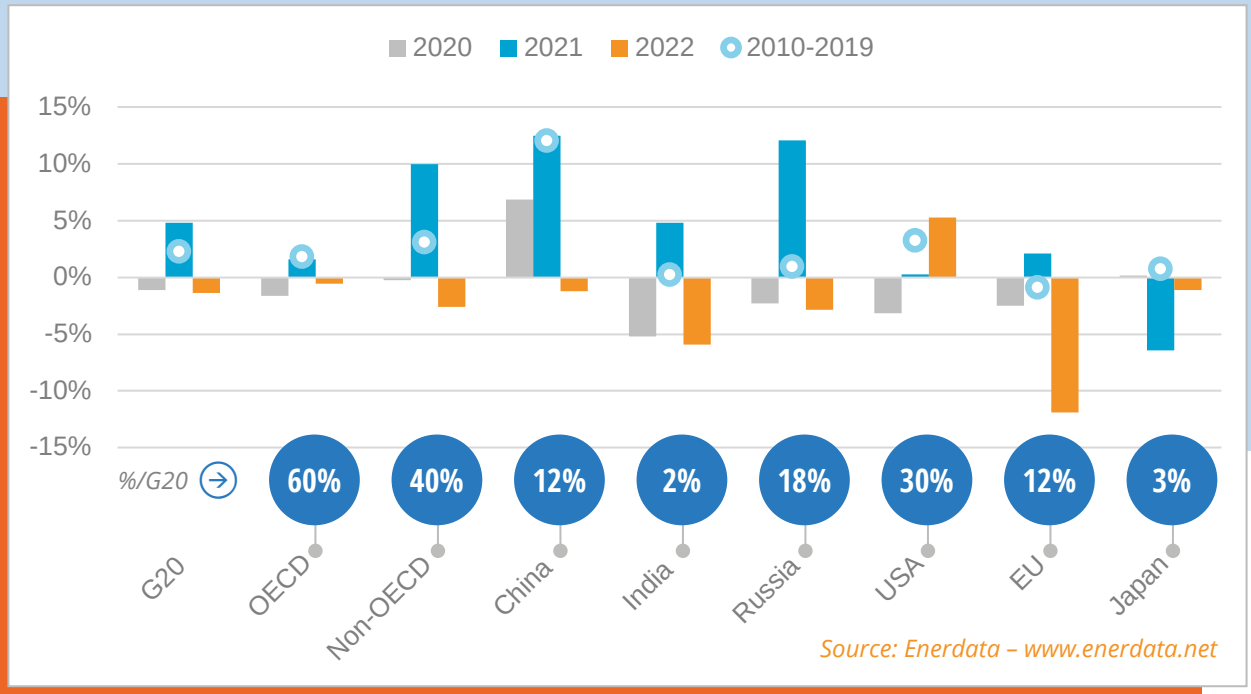
Rise in European gas prices between February & March 2022.

First drop in 30 years (industrial slowdown and high gas prices).

Substantial growth due to much cheaper LNG prices.



Trends in gas consumption in G20 countries (%/year)



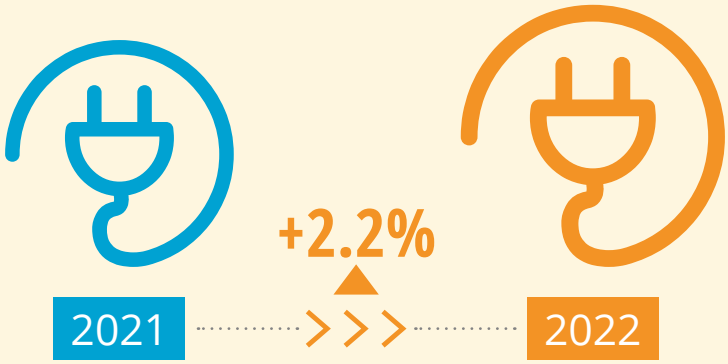
Source: Enerdata – www.enerdata.net

Consumption of natural gas (Mtoe)

Source: Enerdata – www.enerdata.net

ELECTRICITY

Slower growth in electricity demand



However, the share of electricity in final energy consumption continued to rise. 24% in 2022 which is +1.3 pp compared to 2019 level.

In the **EU, electricity prices were directly linked to the increase in gas prices**, which **led to energy-saving measures** and a **decrease in electricity consumption**.

The **share of electricity in final energy consumption** is clearly **rising** with a **sharp increase in China**.
24% of the final consumption is electricity, which is more than one percentage point higher than pre-crisis levels.

Key data

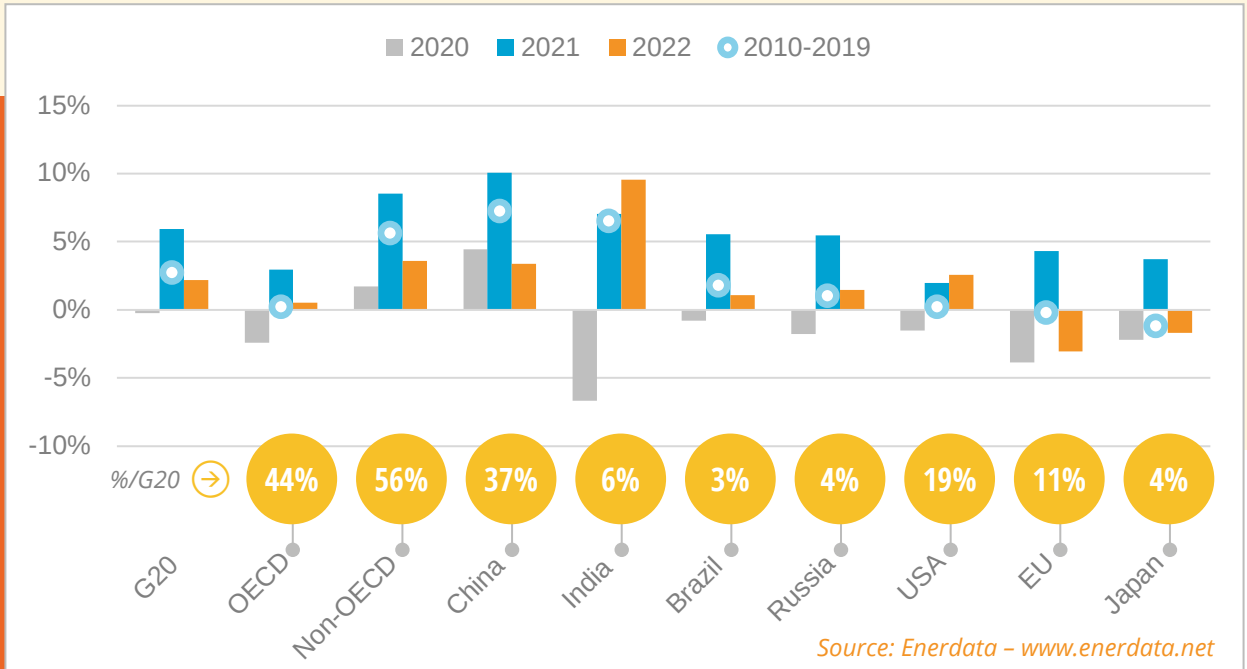
+0.5%
OECD

Growth is moderate due to a decline in the EU and Japan.

24%

Share of electricity in G20's final energy consumption, increase driven by China.

Trends in electricity consumption in G20 countries (%/year)



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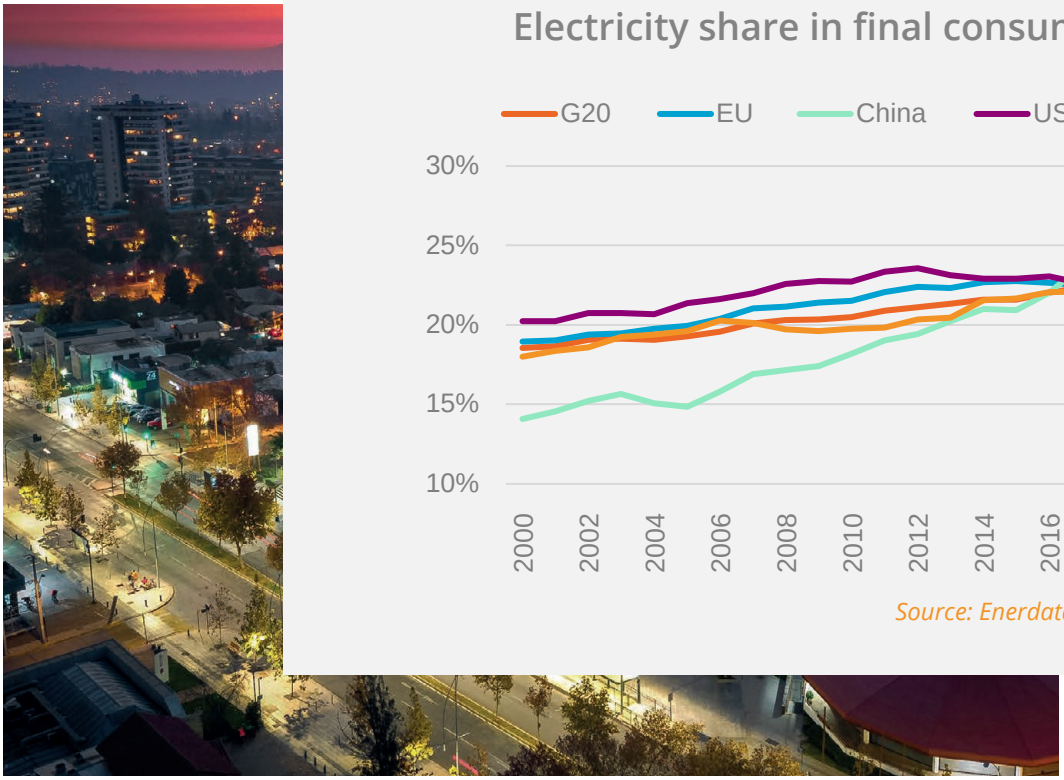
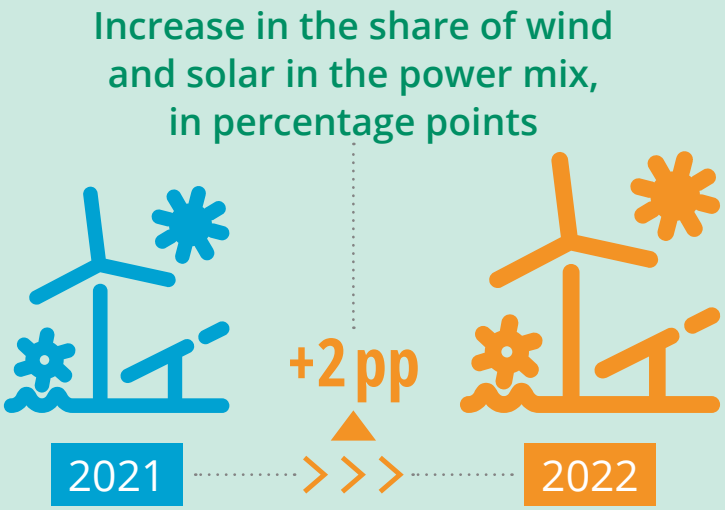


Electricity share in final consumption

Source: Enerdata – www.enerdata.net

POWER MIX

A less carbon-intensive power mix



Strong growth in solar and wind generation but the power mix remains dominated by thermal power.

Power generation is still rising with a sharp increase in solar (27%) and wind (13%) power generation.

Nuclear generation dropped by 4.9%, primarily in Europe with the closure of nuclear power plants in Germany, and with maintenance, strikes and drought in France. However, **thermal power generation remains broadly unchanged since 2020** and is still **dominant with 60% of the power mix**.

Key data

Sharp rise in solar & wind: **the share of solar in the G20 electricity mix has grown by 6 pp since 2010** (8% in 2022), and that of **wind by 5 pp** (5% in 2022).

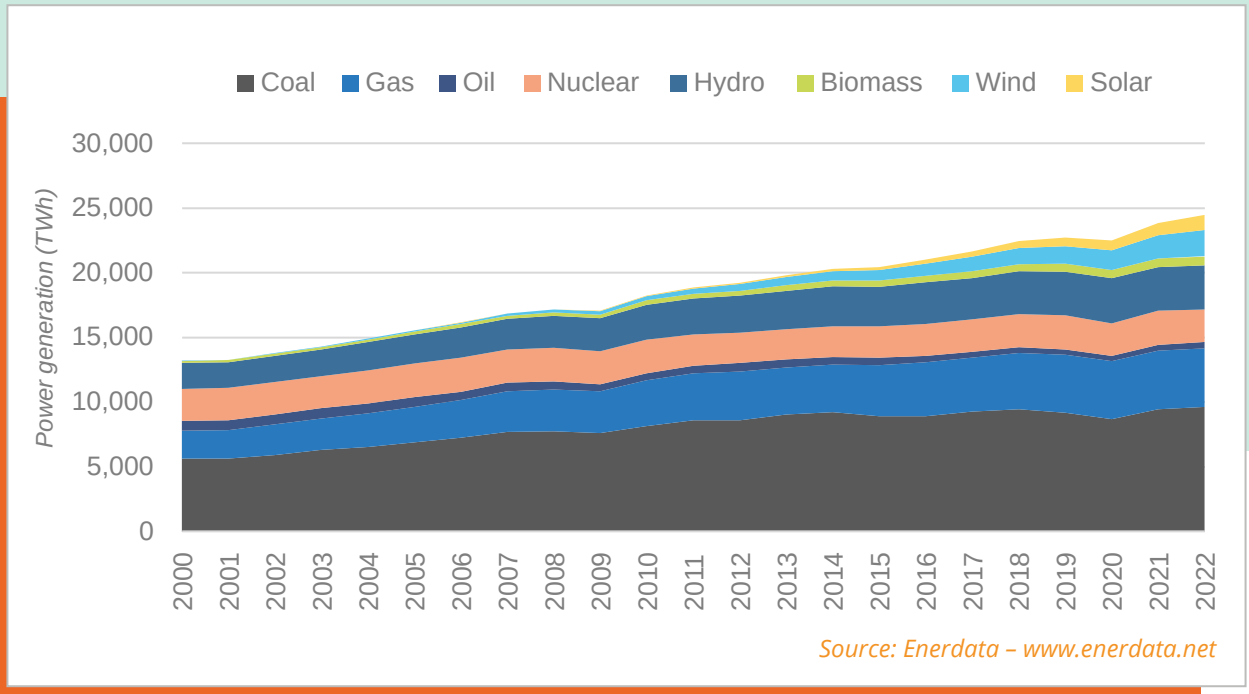
+27%
For Solar

+13%
For Wind

-4.9%
For Nuclear

Drop in nuclear generation (especially in Europe).

Evolution of power generation by source in G20 countries



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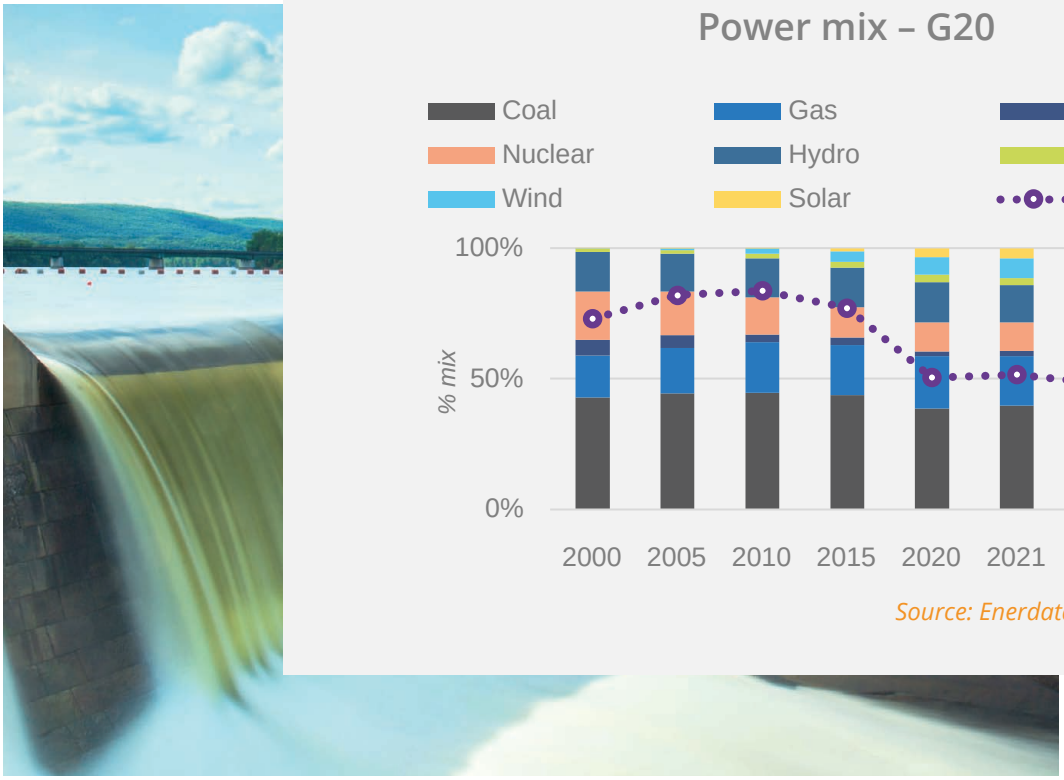
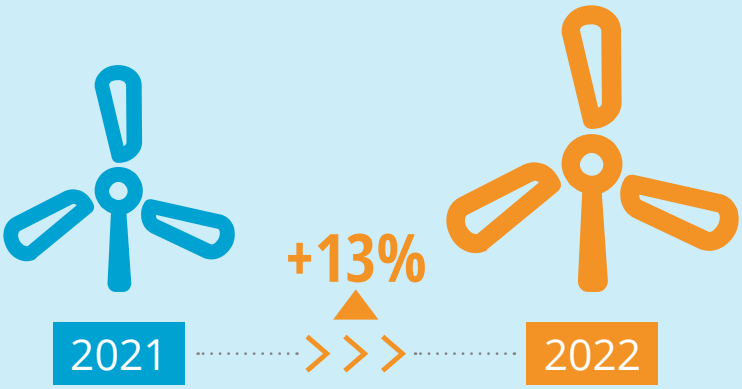


Source: Enerdata – www.enerdata.net

WIND

Strong growth for wind power generation, while capacity development slowed down



The increase in wind power capacity continued to slow down, to +75 GW.

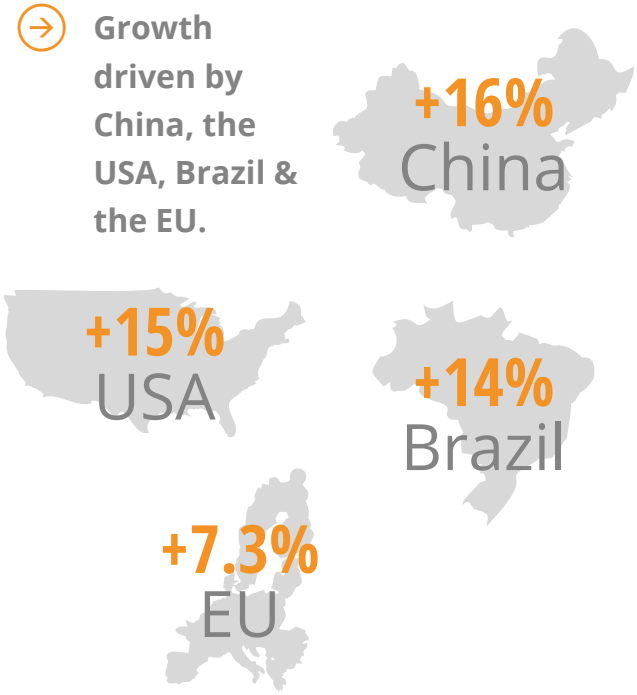
China accounted for half of the new capacity installed with 37 GW.
Wind power generation increased by 13%, particularly in China and the USA with more than 15% growth, and Brazil with +14%.

China dominated wind energy, producing almost twice as much as the EU and the USA.

The **EU** and the **USA** each **generated as much as the other G20 countries combined**.

Key data

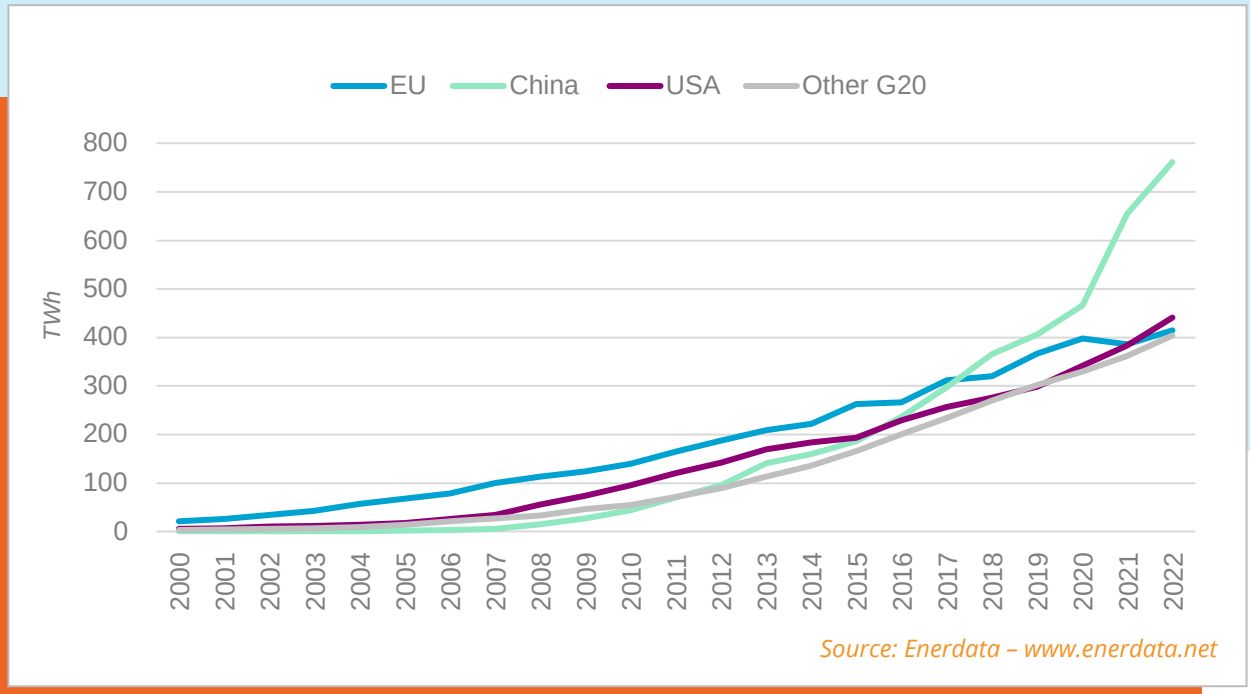
Growth driven by China, the USA, Brazil & the EU.



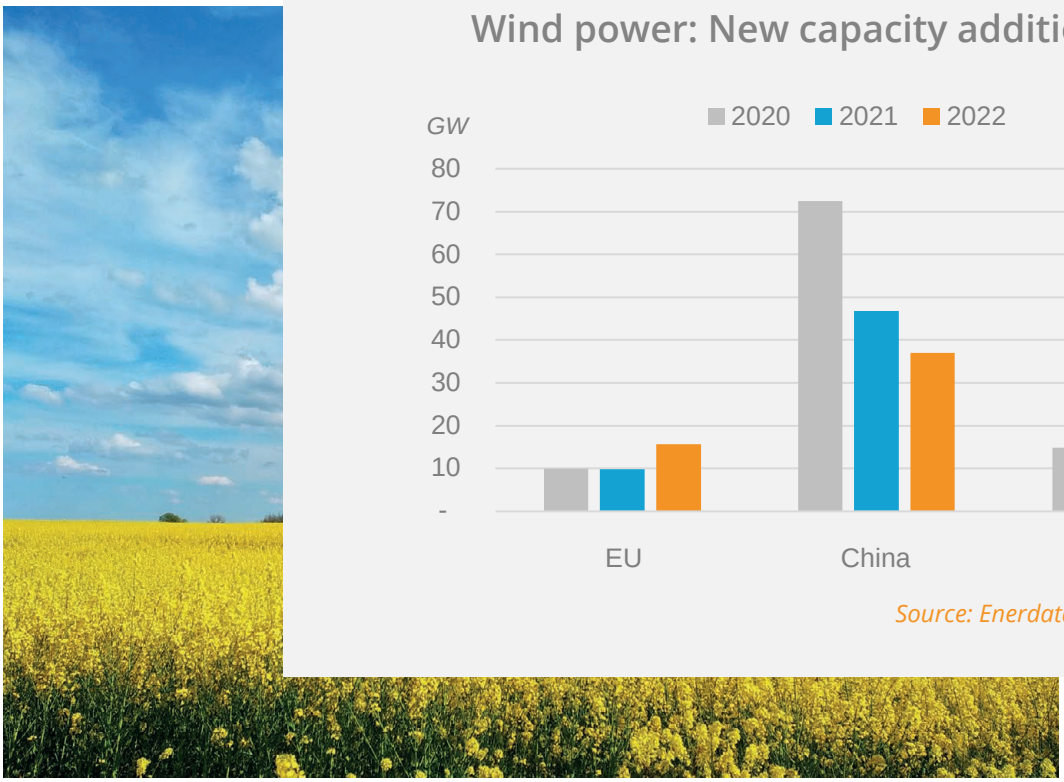
+75 GW
Of wind power capacity

Slowdown after +108 GW in 2020 and +83 GW in 2021.

Wind power generation in the main G20 countries (TWh)



Source: Enerdata – www.enerdata.net

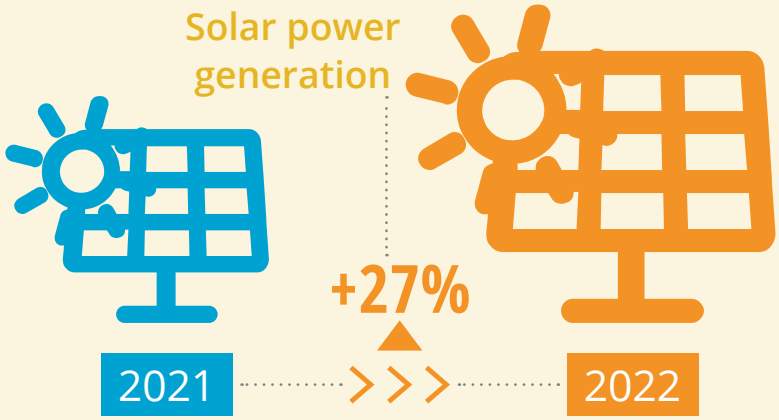


Wind power: New capacity additions (GW)

Source: Enerdata – www.enerdata.net

SOLAR

Solar development: a record-breaking year



Solar installations increased as production and installation costs decreased.

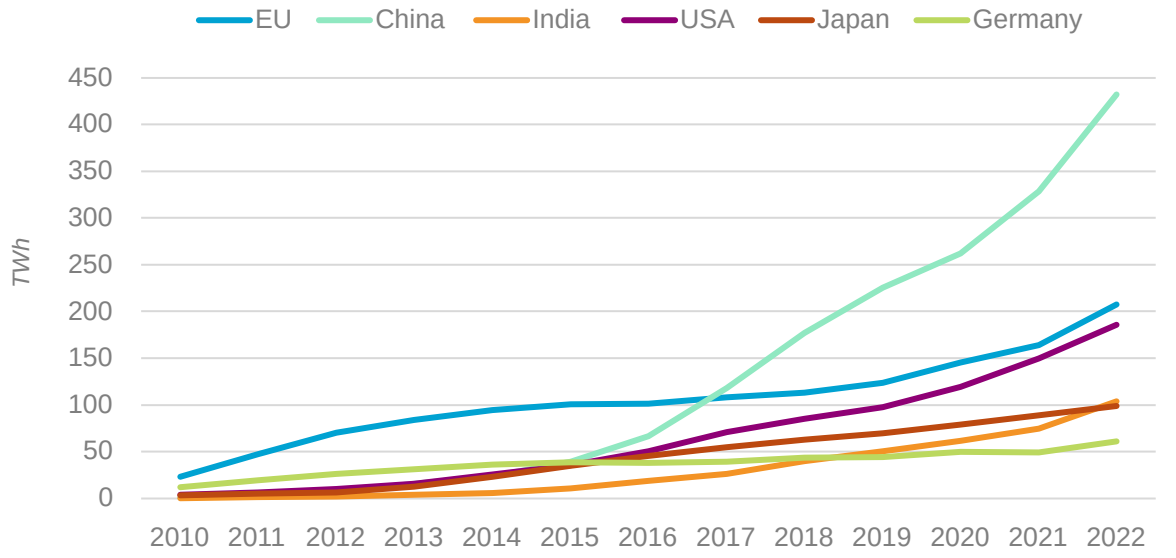
China installed 86 GW, representing 45% of the new solar capacity.
As a result, solar power generation surged in many countries: +32% in China, +27% in the EU, +24% in the USA, +39% in India, +64% in Brazil, and +11% in Japan.

Key data

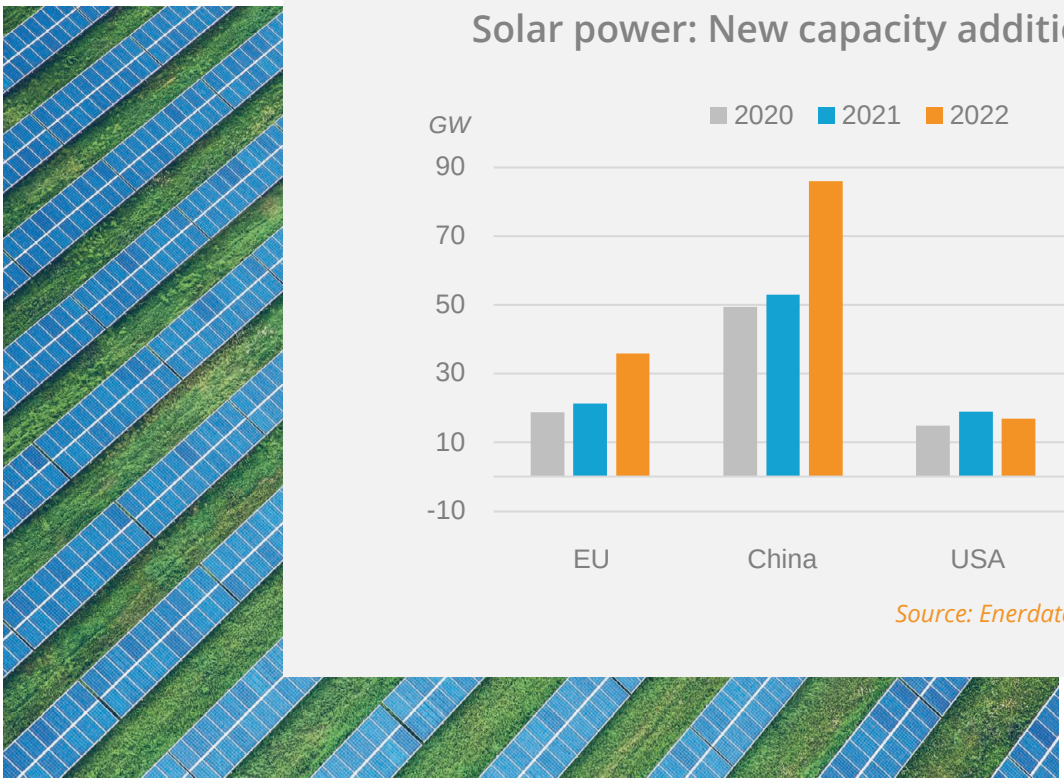
- **Acceleration in China, in the EU & in India.**

- **Slowdown in the United States.**

Solar power generation in the main G20 countries (TWh)



Source: Enerdata – www.enerdata.net



Solar power: New capacity additions (GW)

Source: Enerdata – www.enerdata.net

Summary

KEY TAKEAWAYS FROM 2022 FIGURES

Global economy and energy consumption are back to their trend growth

- On the economic front, the **slowdown in China and the impact of the war in Ukraine on Europe are particularly noteworthy**.
- Apart from the “forced energy sufficiency" in Europe, **energy consumption has closely followed economic trends**, with no acceleration in the decoupling of the economy from energy consumption – and with robust growth in India and Indonesia.
- Something to watch: **how consumption will rebound in Europe if supply tensions evolve**, in order to understand to what extent sufficiency initiatives are temporary or structural.

CO_2 emissions rise by around 2% again

- Aside from the impact of rising energy consumption, **the energy mix has not evolved favourably**.
- In **Europe**, the **unfavourable trend in the energy mix** almost **offset the fall in energy consumption**.
- Globally, **the share of fossil fuels is not decreasing**, with the rise in coal usage largely offsetting the fall in gas consumption.

Renewable power generation (wind, solar PV) continues to rise

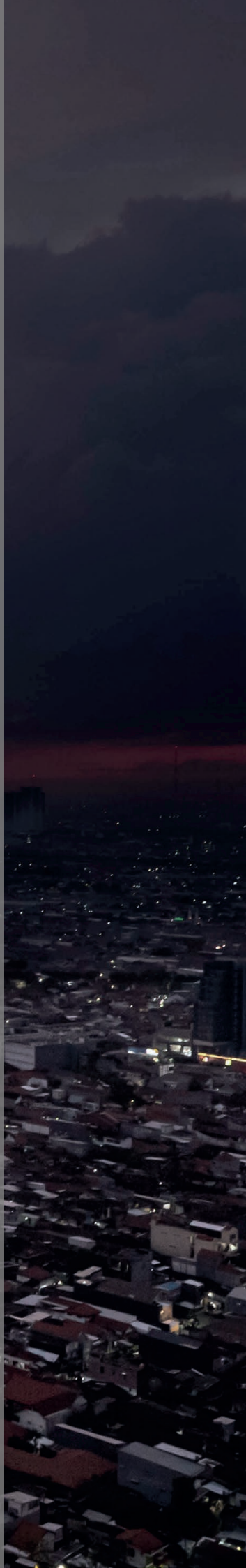
- **Renewable energy production is growing rapidly** (+27% for solar and +13% for wind) while new installations remain steady.
- **China** accounts for **50% of wind power installations** and **45% of solar power installations** in the G20.

Finally, in 2022 we see returns to pre-covid trends and new questions about the long-term impacts of the Russia-Ukraine conflict. These questions concern the evolution of energy consumption, the energy mix, and prices.

Chapter 2

GLOBAL STOCKTAKE

How have CO_2 emissions evolved since the Paris Agreement,and what were the main drivers behind this evolution?



About the Global Stocktake

The Global Stocktake is the part of the Paris Agreement which oversees the nationally determined contribution (NDCs).

It **provides**:

- Assessment of **implemented measures**
- Assessment of remaining **efforts required**
- **Policy recommendations**

Its **main limitations** are:

- Global approach: **does not allow** for a more **granular assessment**, on country or regional and sectoral level.
- **No benchmarking** against an ideal trajectory.

The Global Stocktake was launched in 2021 with an initial period of data collection by various parties. Last year, after a long period of data analysis, technical assessment reports were published. The **synthesis report is expected** by the end of **2023**, around the time of **COP 28** on November 30th. This process is planned to be **reproduced every five years**.

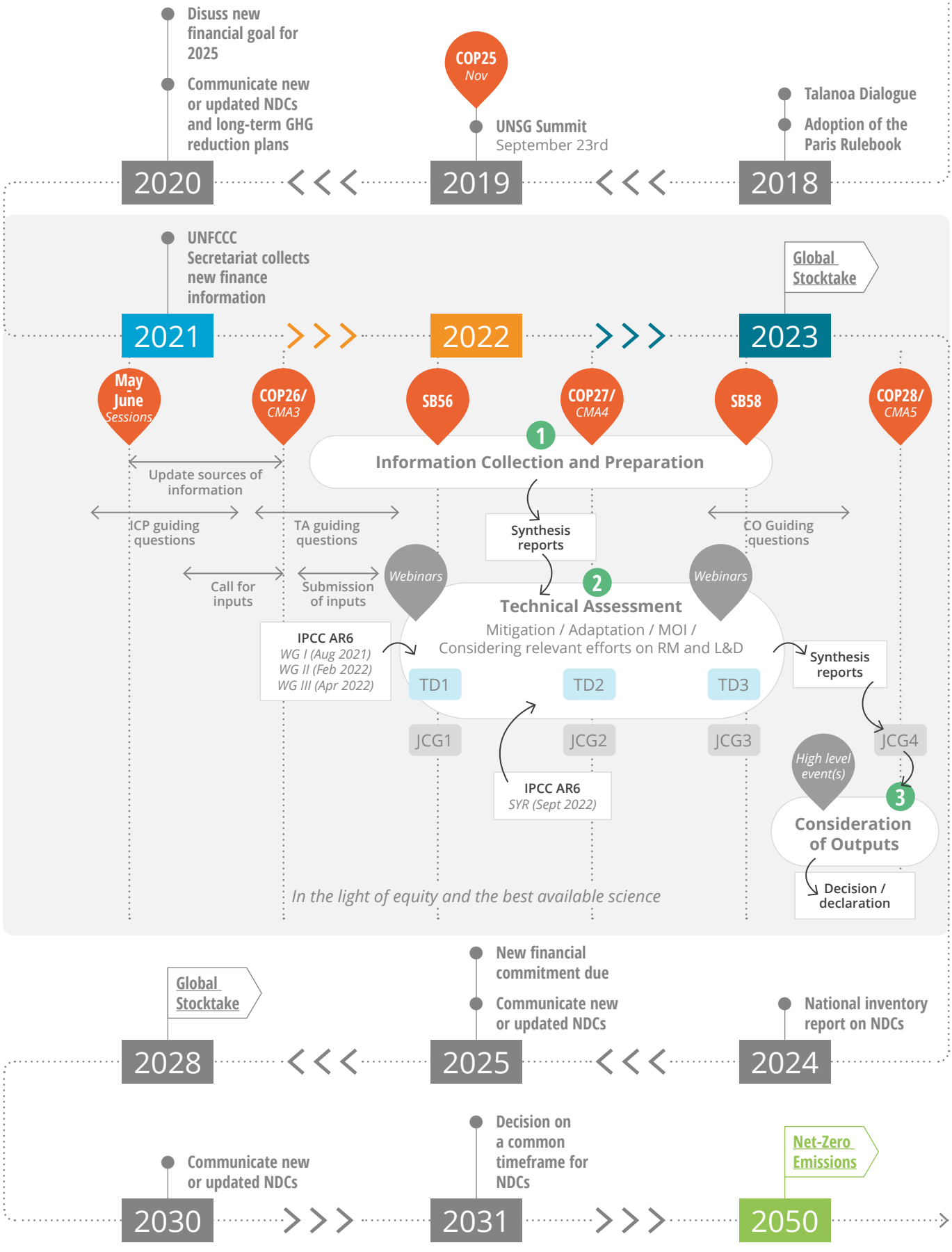
Enerdata contributes in a very modest way, trying to bring our vision **to complement the official process** and to **overcome the perceived limitations**. Notably we are working on comparing past trends with reference scenarios. Our goal is to provide a regional and sectoral assessment.

We derive two scenarios from an internal model called **POLES**:

- EnerBlue: scenario based on the achievement of updated NDCs.
- EnerGreen: scenario based on a temperature rise of less than 2°C.

These two scenarios allow us to **consider the difference between the NDCs and an actual ideal trajectory**. This is what we commonly refer to as the e**missions gap**. This exercise is **updated every year by our services** and will lead to further publications.

UN climate agenda – timeline and deliverables



Sources: UNFCCC, SWP, Enerdata

Emissions kept growing since 2021

CO_2 EMISSIONS DECOMPOSITION METHODOLOGY

In this section we provide insights and trends on global emissions since the Paris Agreement. Before diving into the heart of the matter, let's take a quick look at our methodology.

In line with our intent to provide more granular features on emissions, we considered the Kaya identity, which is derived as follows:

KAYA IDENTITY MODEL

$$CO_2 \text{ emissions} = \text{Population} \times \underbrace{\frac{\text{GDP}}{\text{Population}}}_{\text{GDP/ capita}} \times \underbrace{\frac{\text{Energy consumption}}{\text{GDP}}}_{\text{Energy intensity}} \times \underbrace{\frac{CO_2 \text{ emissions}}{\text{Energy consumption}}}_{\text{Carbon factor}}$$

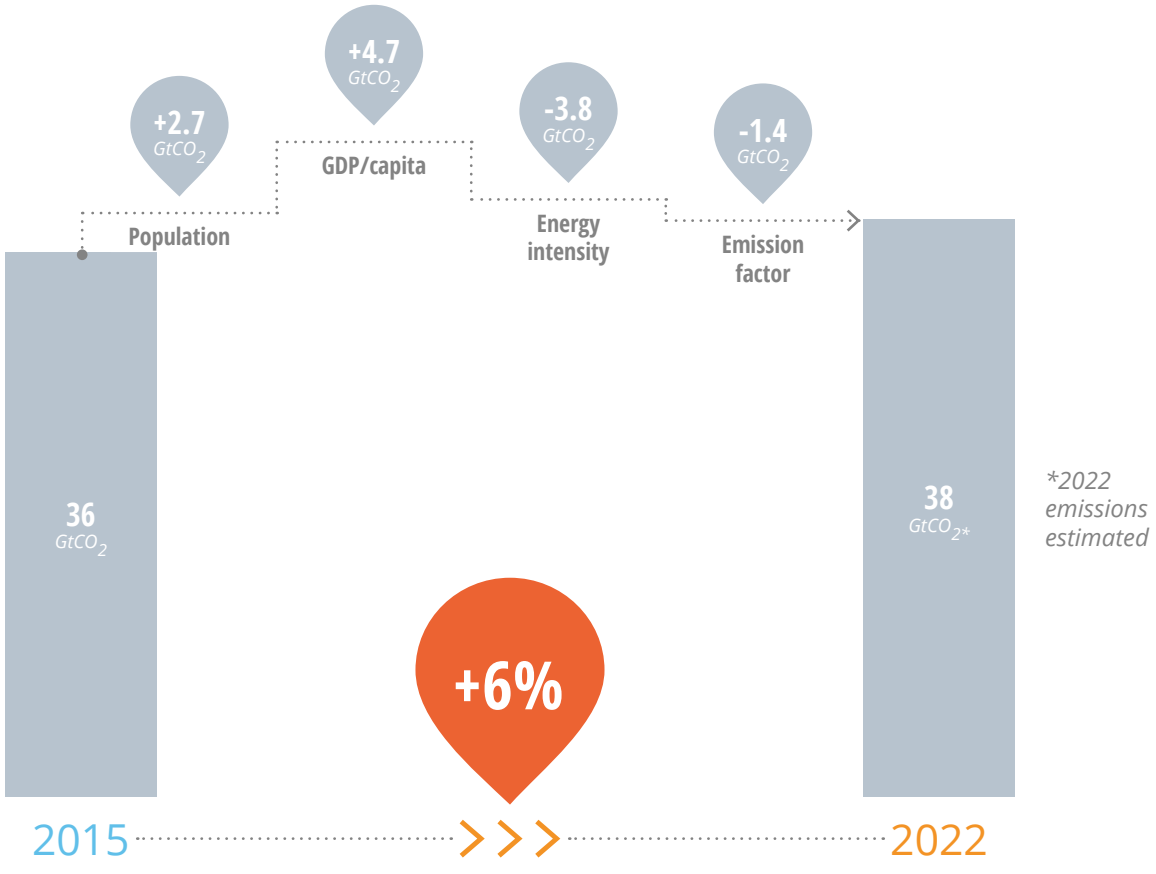
The **Kaya identity** provides a simplistic but easily replicable initial breakdown of emissions by driver for each country. In order to **break this down into a sectoral analysis**, we integrate **more specific drivers**, such as **industrial production by branch**, and **passenger** and **freight traffic for transport**.

MAIN DRIVERS OF CO_2 EMISSIONS

Compared with 2015, global CO_2 emissions increased by 6% in 2022 (+2 Gt).

Lower-than-expected cumulated **economic growth** since 2015 has **mitigated the increase of emissions** (approx. 3.3 Gt). However, **compared with a 2°C scenario**, **energy intensity gains and decarbonisation are 50% lower than expected**. There is still no decoupling of GDP / CO_2 emissions, and the evolution of the global energy mix is very slow.

Global CO_2 emissions (2015-2022)



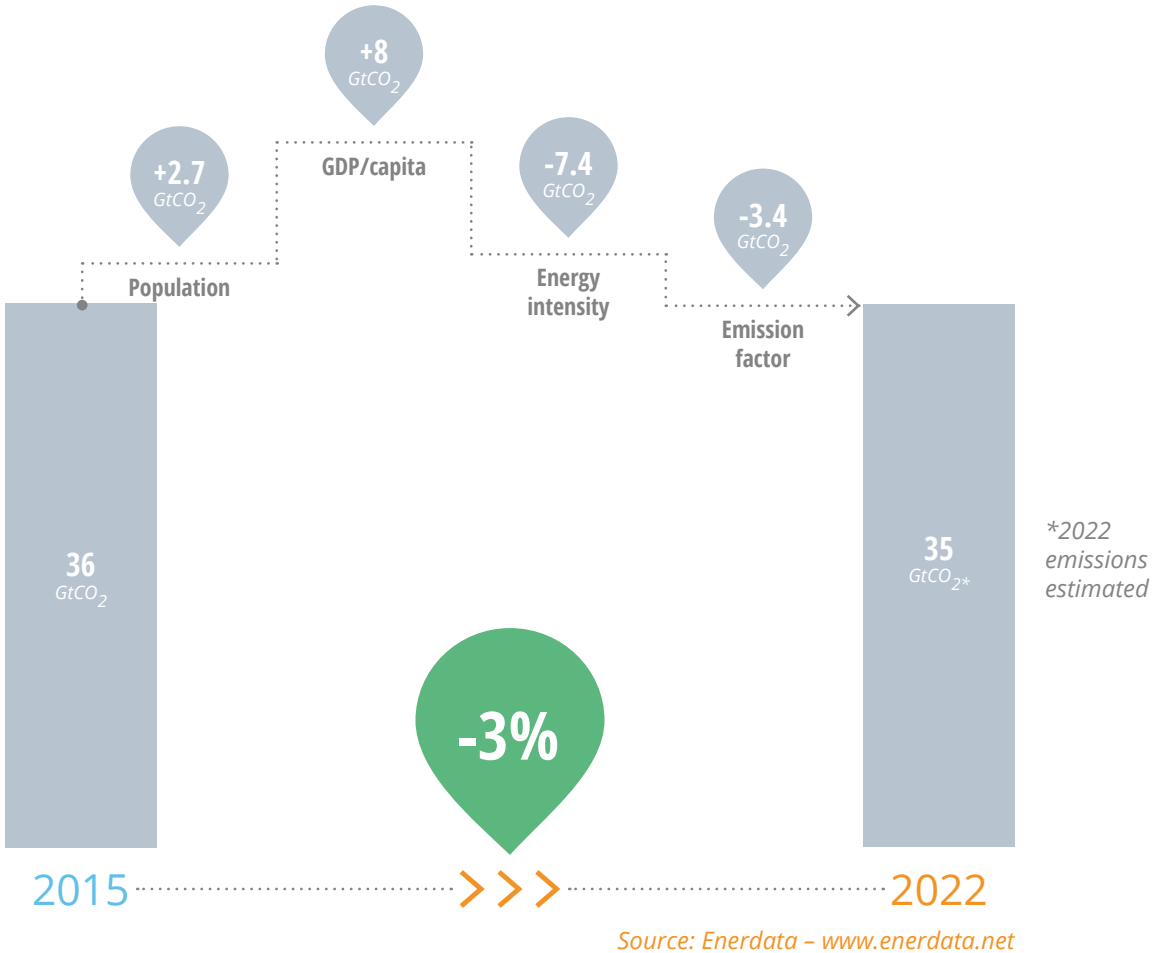
Source: Enerdata – www.enerdata.net

All other things being equal, **the break down yields:**

- The **population effect** accounts for nearly **2.7 Gt** of **CO_2 emissions growth**.
- **GDP per capita** accounts for the **largest share of the increase**, at **4.7 Gt**.
- A **reduction** of the **energy intensity factor** by almost **4 Gt**.
- A **modest improvement** of the **carbon factor**, helping to **reduce emissions** by **1.4 Gt**.

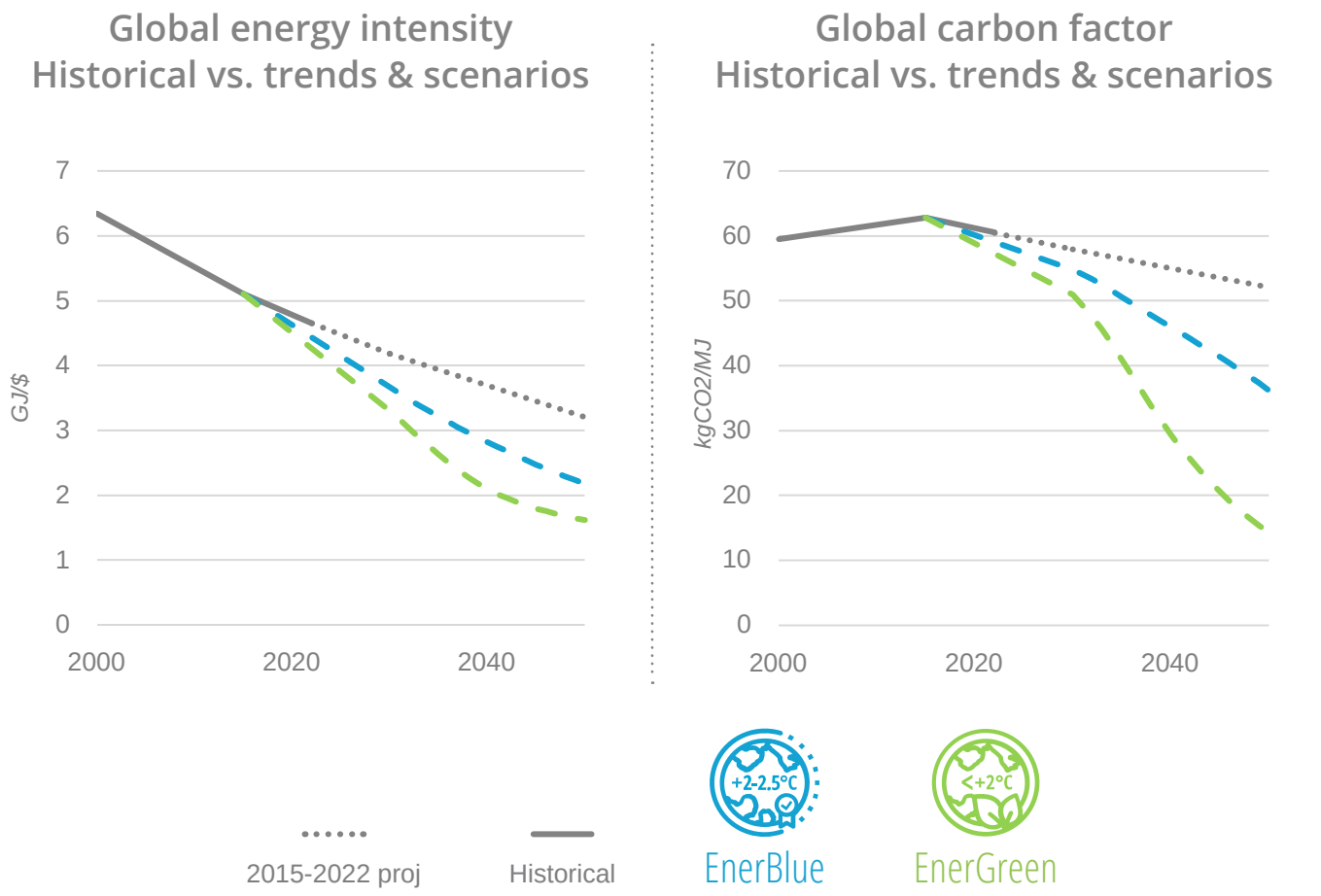
Comparing the actual evolution and what we expected back in 2015 reveals insufficient efforts. It is counterintuitive to have recorded **growing emissions** at a time when global **economic activity was far below** the expectations of the **Paris Agreement**. It depicts how **insufficient** the **intensity** and **efficiency gains** have been for the **last seven years**. This edifying statement shows that we were not able to activate the mitigation commitments yet.

Projected emissions as per 2015



Source: Enerdata – www.enerdata.net

STILL FAR FROM THE TARGETS



Source: Enerdata – www.enerdata.net

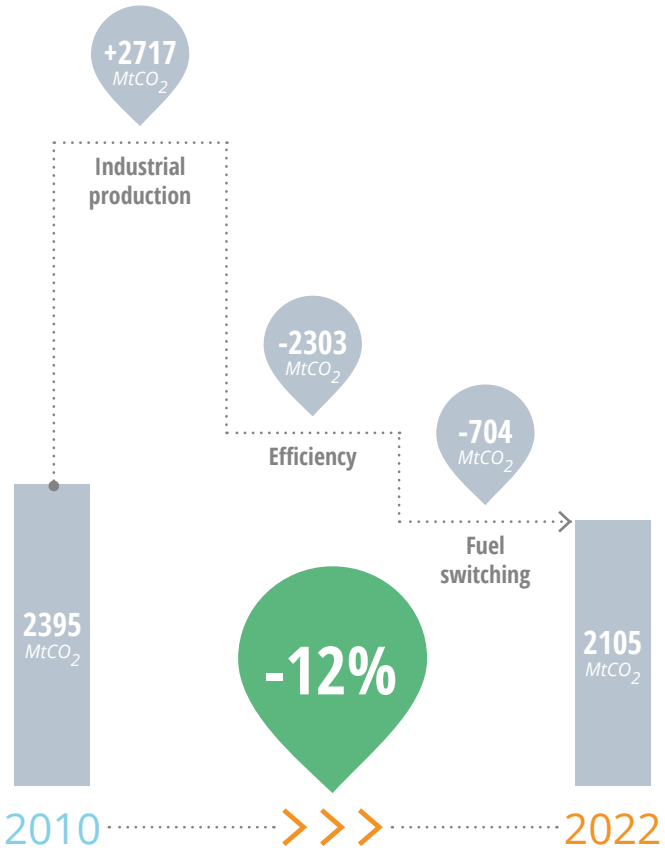
Our EnerBlue and EnerGreen scenarios illustrated above clearly **confirm that we are not doing enough to cut CO_2 emissions**. Even though the targets for 2030 were not very ambitious, they are far from being met. The year 2022 is no exception, despite slight improvements.

Sectoral breakdown for EU, China and the US

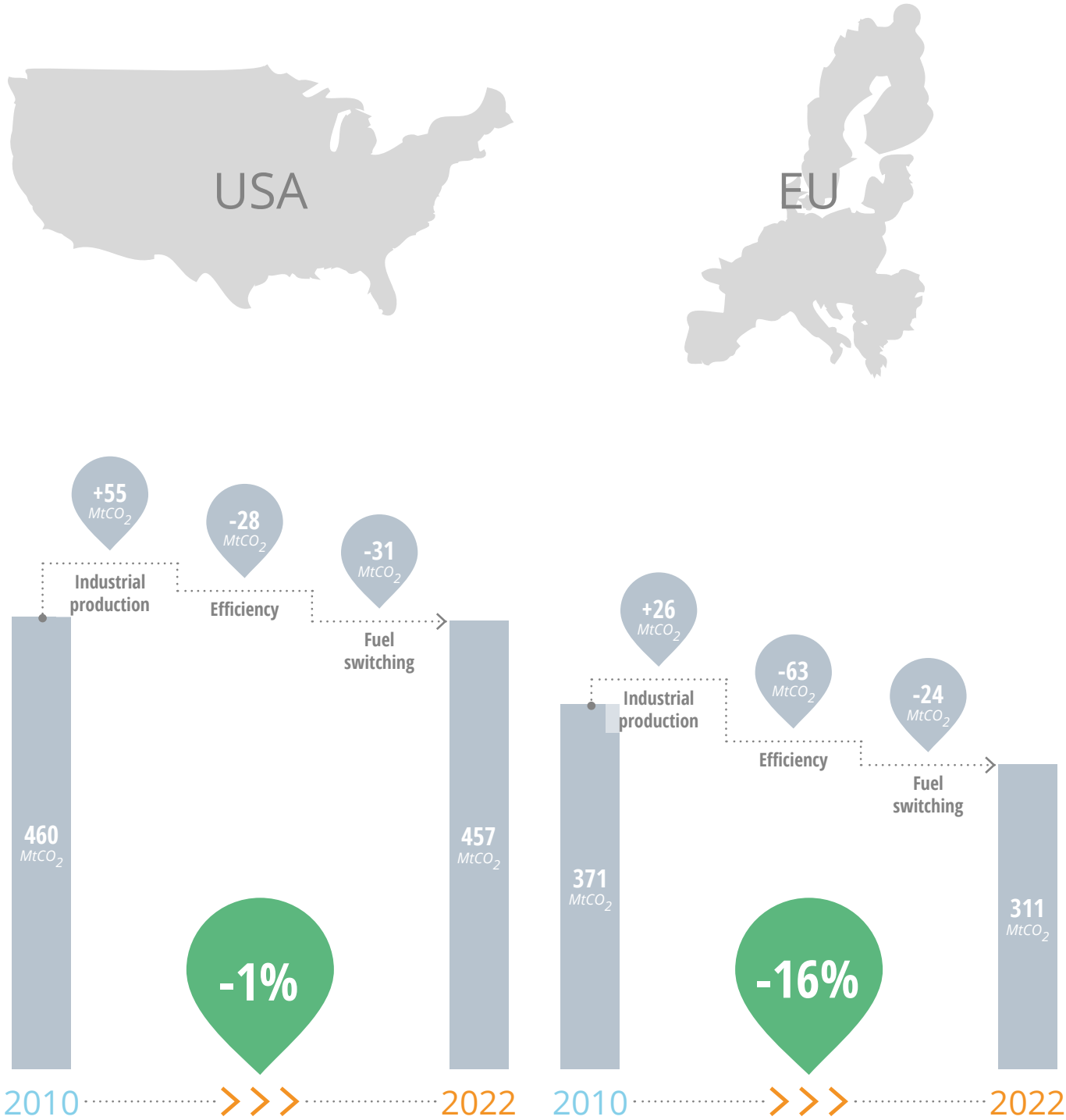
MANUFACTURING INDUSTRY

Industrial activity rising, alongside energy efficiency gains.

- **Emissions declined slightly** in China, the EU and the US.
- **Large intensity gains** in **China** offset the rising output in industries.
- **Moderate gains in efficiency in the EU cut emissions** by approximately **15%**. Small gains in the US barely compensated for the increased production.
- **Fuel switching** was **significant** in **China**, while it appeared in much **smaller proportions** in the **EU** and the **US** (quite intuitive considering the larger initial fossil fuel share in China).



Source: Enerdata – www.enerdata.net

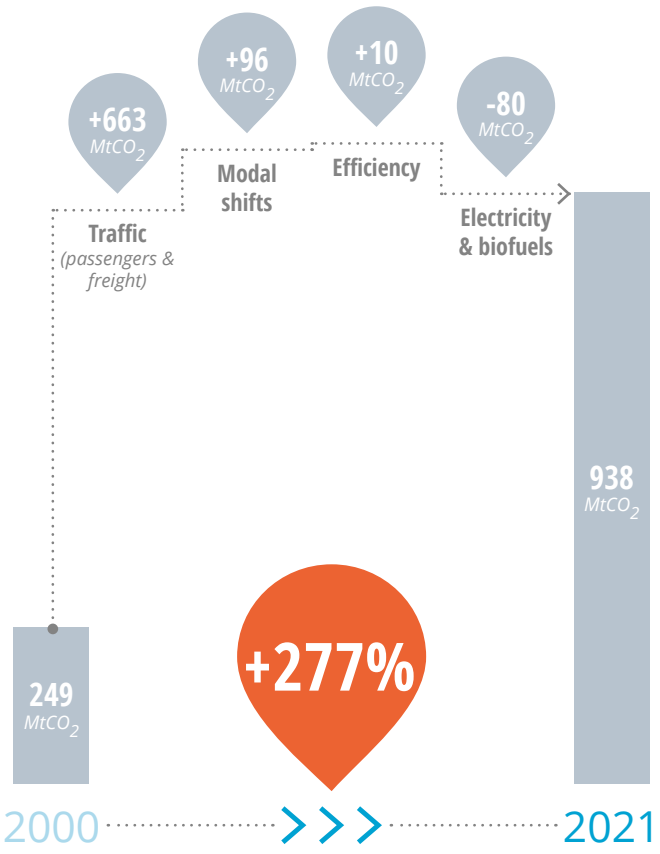


Source: Enerdata – www.enerdata.net

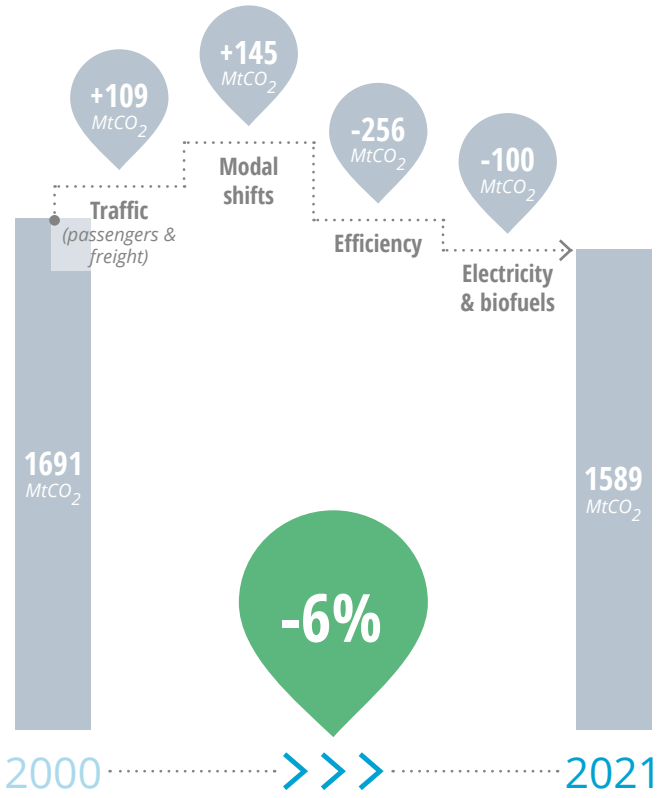
TRANSPORT

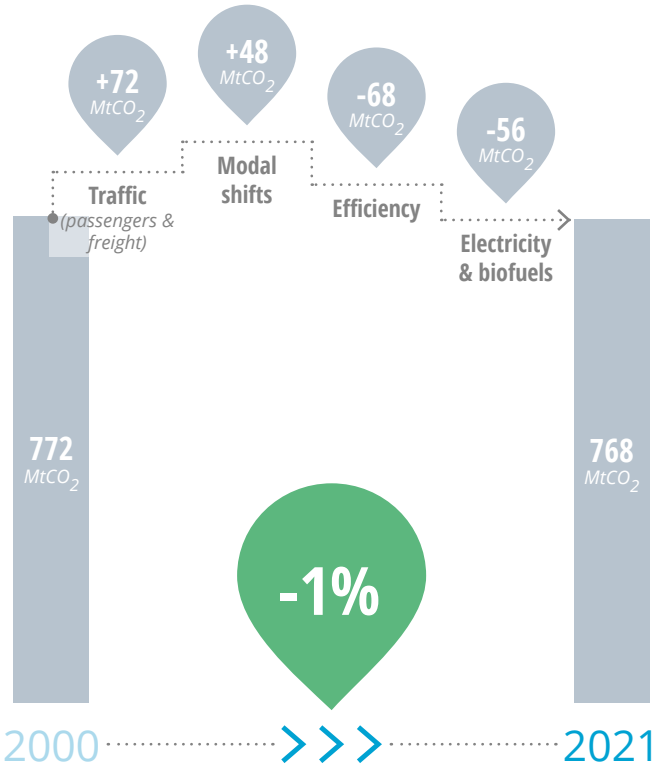
Transport sector decarbonisation barely started.

- In **China**, **emissions** have **risen significantly** with increased passenger and freight traffic, little decarbonisation and no efficiency gains.
- In **Europe** and the **USA**, **emissions** are **steady** with poor gains in efficiency and electricity & biofuels use.
- **Modal shift** (for instance switching from individual cars to public transport) has actually gone the **opposite** way from what we **expected**, contributing to a **rise in emissions** in the three regions.
- **Electrification** has yet to have a **substantial impact** but is a **major** potential **game changer** in the **coming years**, along with an overall reduction in demand.



Source: Enerdata – www.enerdata.net



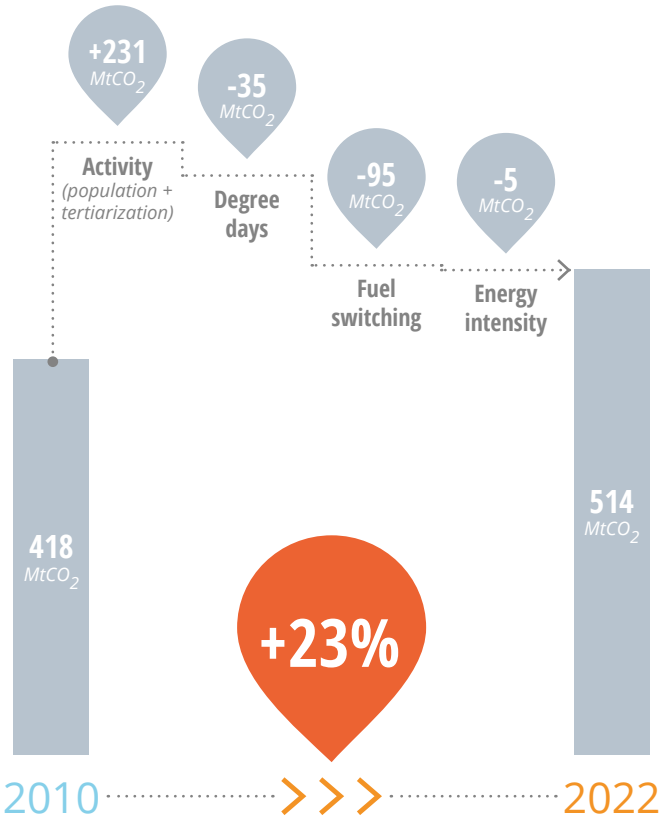


Source: Enerdata – www.enerdata.net

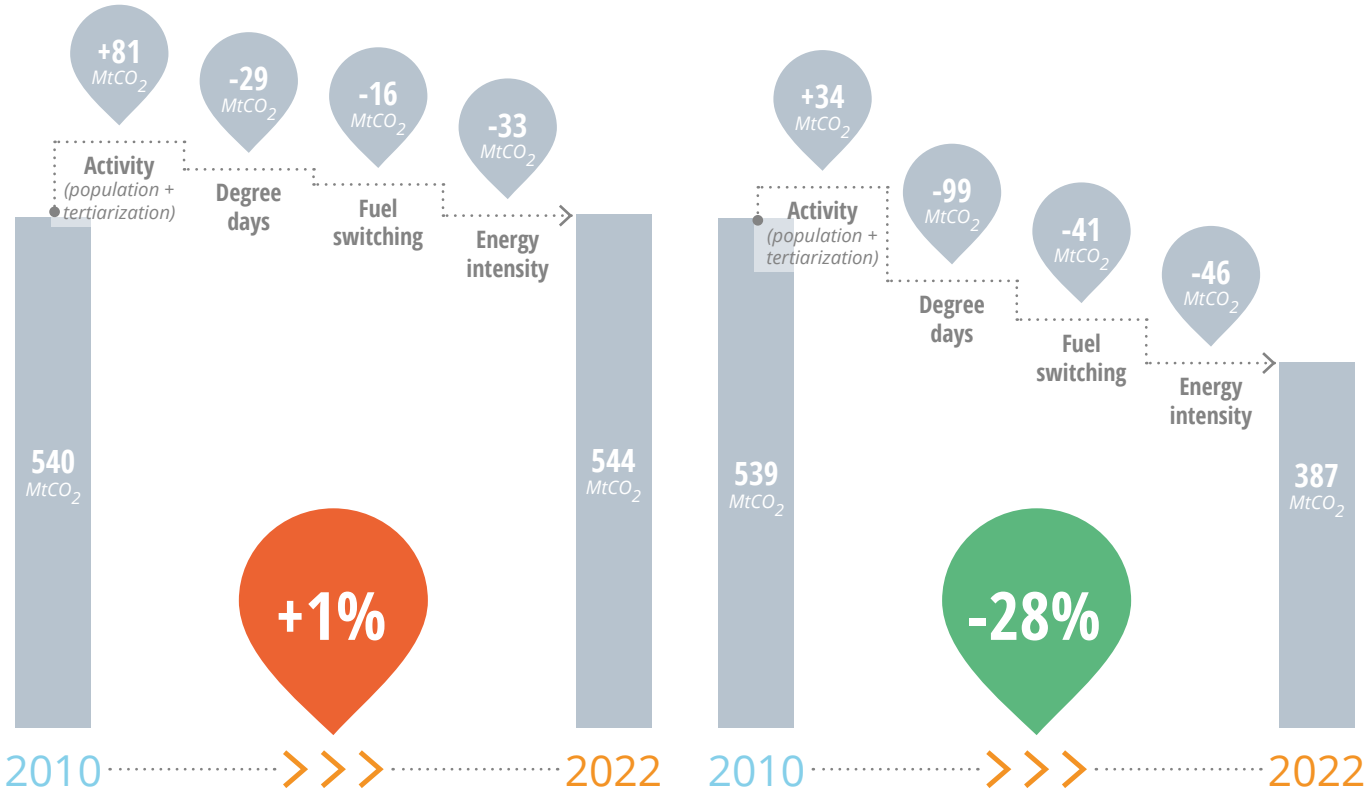
RESIDENTIAL AND SERVICES

Different dynamics according to world regions.

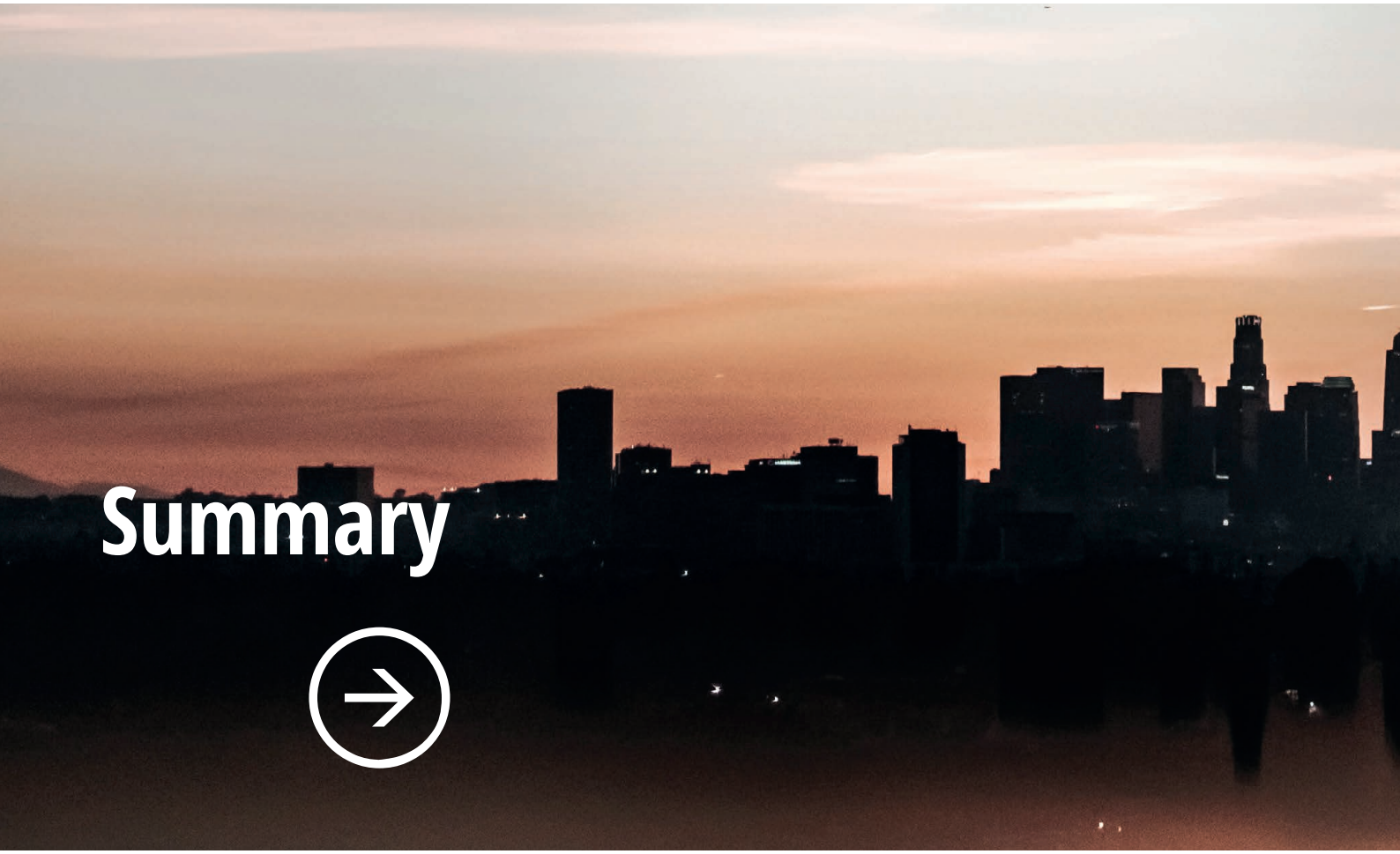
- There has been a **significant decrease** in **emissions from buildings** in the **EU compared to 2010**. This is **attributable** to a **mild 2022 winter** (depicted by degree days being the difference between ambient temperatures and indoor temperatures of dwellings and offices) and **progress** in **decarbonisation** and **energy intensity**.
- In **China**, **demographic** and economic **growth drove emissions upwards**, while **energy intensity barely changed**. Improvements in fuel switching were insufficient to compensate.
- The **US** saw almost **no change** in **emissions**, and **growth** was **offset by** very **small gains**.



Source: Enerdata – www.enerdata.net



Source: Enerdata – www.enerdata.net



Summary

KEY TAKEAWAYS

Global emissions

- **CO_2 emissions** continued to **increase despite a lower-than-expected economic growth**.
- **Efforts** to reduce energy intensity and the carbon factor **are insufficient to meet** a trajectory compatible with **Paris Agreement**.

Regional and sectoral dynamics

- **Notable efficiency gains** in **China** remain **insufficient to offset the rise in activity** (industrial output, population, etc).
- **Off-target trend** in **Europe** and the **US** where activity increased much less **without** a **significant drop** in emissions.

Levers to be activated

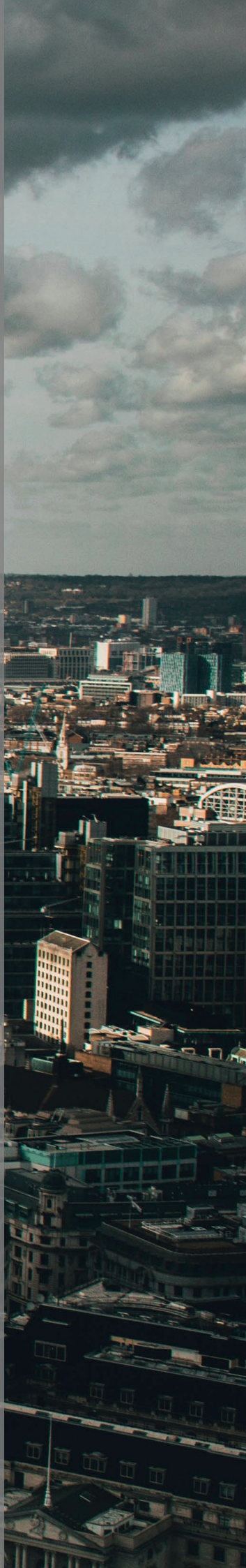
- **Electrifying**, **heating** and **transportation** with a double **benefit of lowering direct emissions** and creating substantial efficiency gains.
- **Pace of renovating buildings should increase** significantly in developed economies.
- **Demand patterns are becoming essential**: energy sufficiency, circular economy, etc.

Chapter 3

NATURAL GAS CRISIS IN EUROPE

What measures were implemented to adapt to the new geopolitical situation regarding natural gas supply in the EU?

- Pre-conflict situation
- Eu's natural gas demand decreased in all sectors in 2022
- Diversification of the supply
- Summary



This section presents an analysis of natural gas prices, focusing on the stakes and adaptation strategies in Europe following the invasion of Ukraine in February 2022. The reference year used is 2019 in order to exclude any bias in the comparisons, as 2021 was still marked by the pandemic and a major economic rebound, and gas consumption was not representative of pre-war trends.

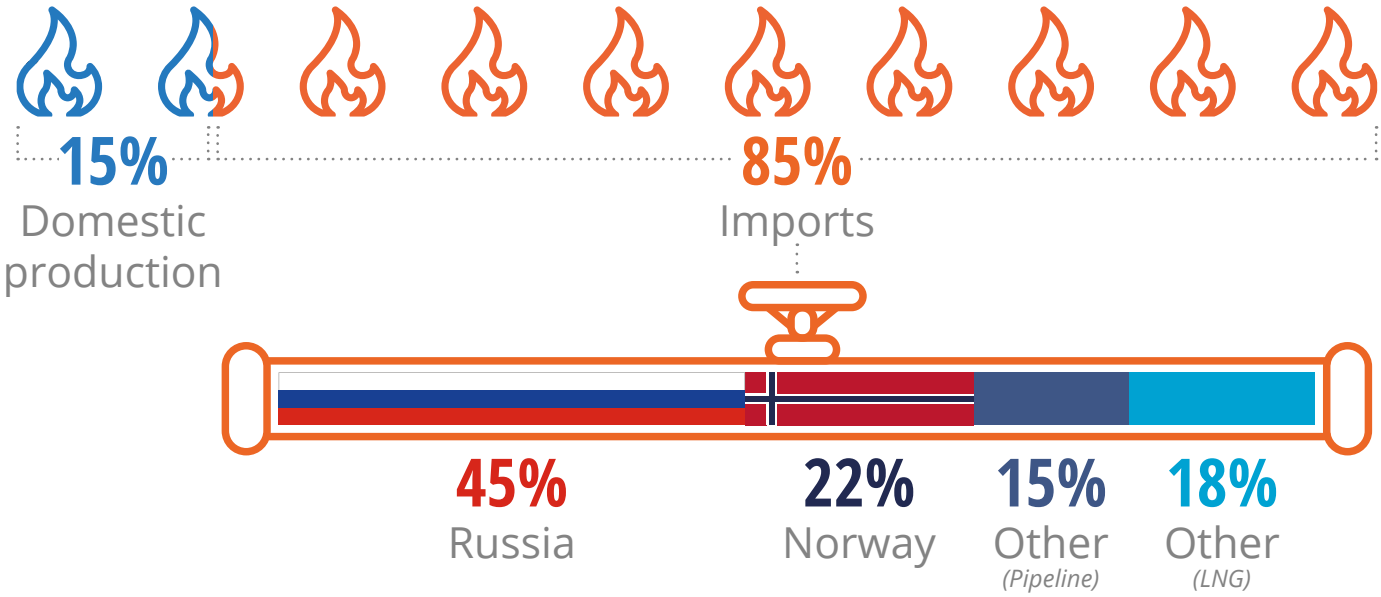
Pre-conflict situation

EU'S DEPENDENCE ON RUSSIAN GAS

The European Union has always been highly dependent on natural gas imports.

As of 2019, domestic production only provided 15% of total needs. **Natural gas is a strategic source of energy for European countries** since it accounts for a significant share of final energy demand in all sectors (except transport) as well as in power generation. In 2019, imports from Russia (182 bcm) accounted for 45% of natural gas imports in the EU, making it by far the largest supplier.

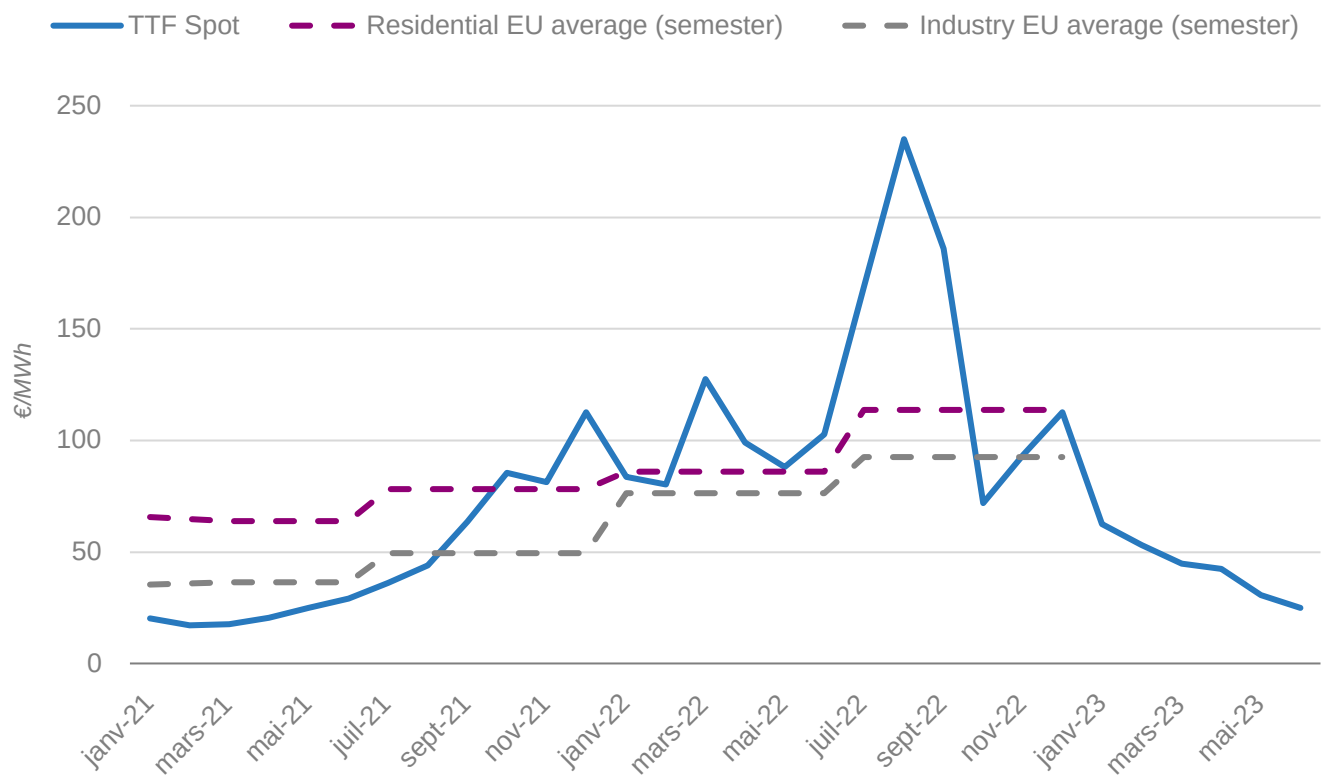
Gross natural gas consumption in the EU by source (2019)



Sources: Eurostat, Cedigaz

NATURAL GAS PRICES WERE ALREADY HIGH IN THE 2ND HALF OF 2021

Spot prices and end-user prices of natural gas in Europe (2021-2023)



Sources: EnergyMarketPrice, Eurostat

At the beginning of the conflict in Ukraine, gas prices skyrocketed as a result of Western sanctions against Russia.

These sanctions, combined with supply pressures due to pipeline cuts from Russia reinforced the pressure on natural gas prices. However, the upward trend in natural gas prices had already started in 2021, caused by an increase in consumption and strategic actions by Russia to push up prices before the invasion.

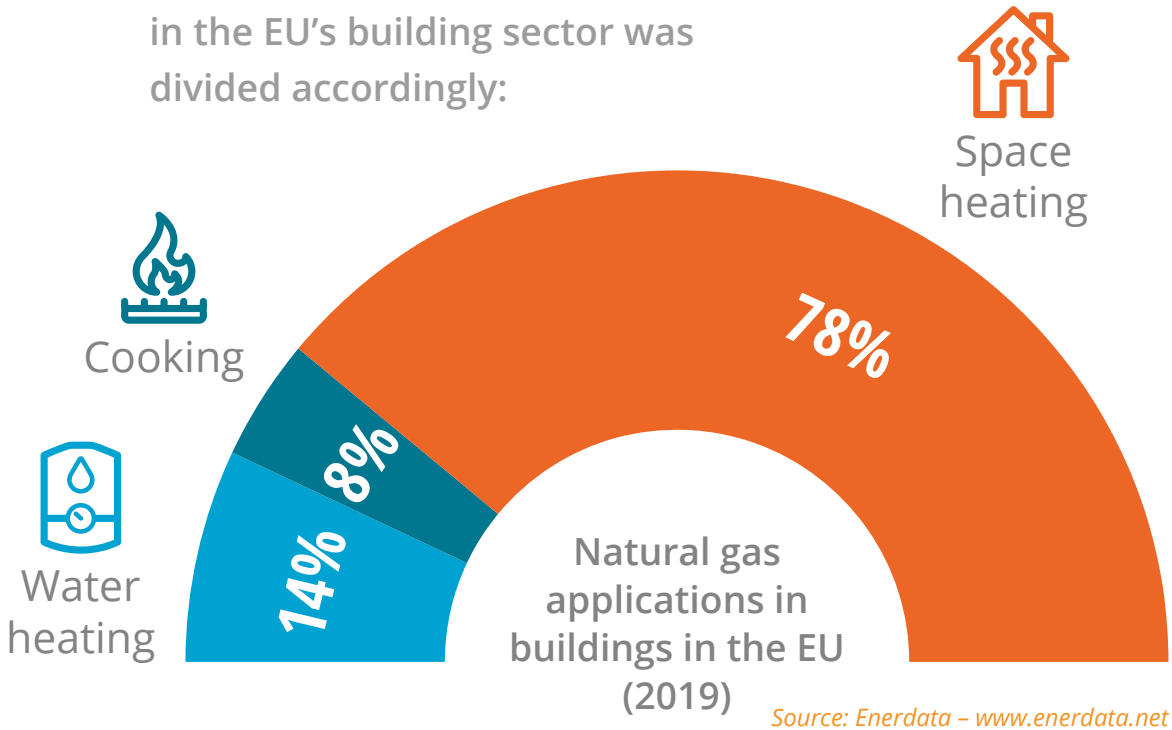
In brief:

- Wholesale **natural gas prices first increased in Europe in 2021**, amid a strong post-pandemic economic recovery, driving up natural gas demand, particularly in Asia.
- The **invasion of Ukraine** by the Russian army **caused prices to soar in 2022**.
- **End-user prices also increased substantially**, but didn't match price peaks observed in wholesale markets.

Eu's natural gas demand decreased in all sectors in 2022

ADAPTATION AND SUFFICIENCY IN THE BUILDING SECTOR

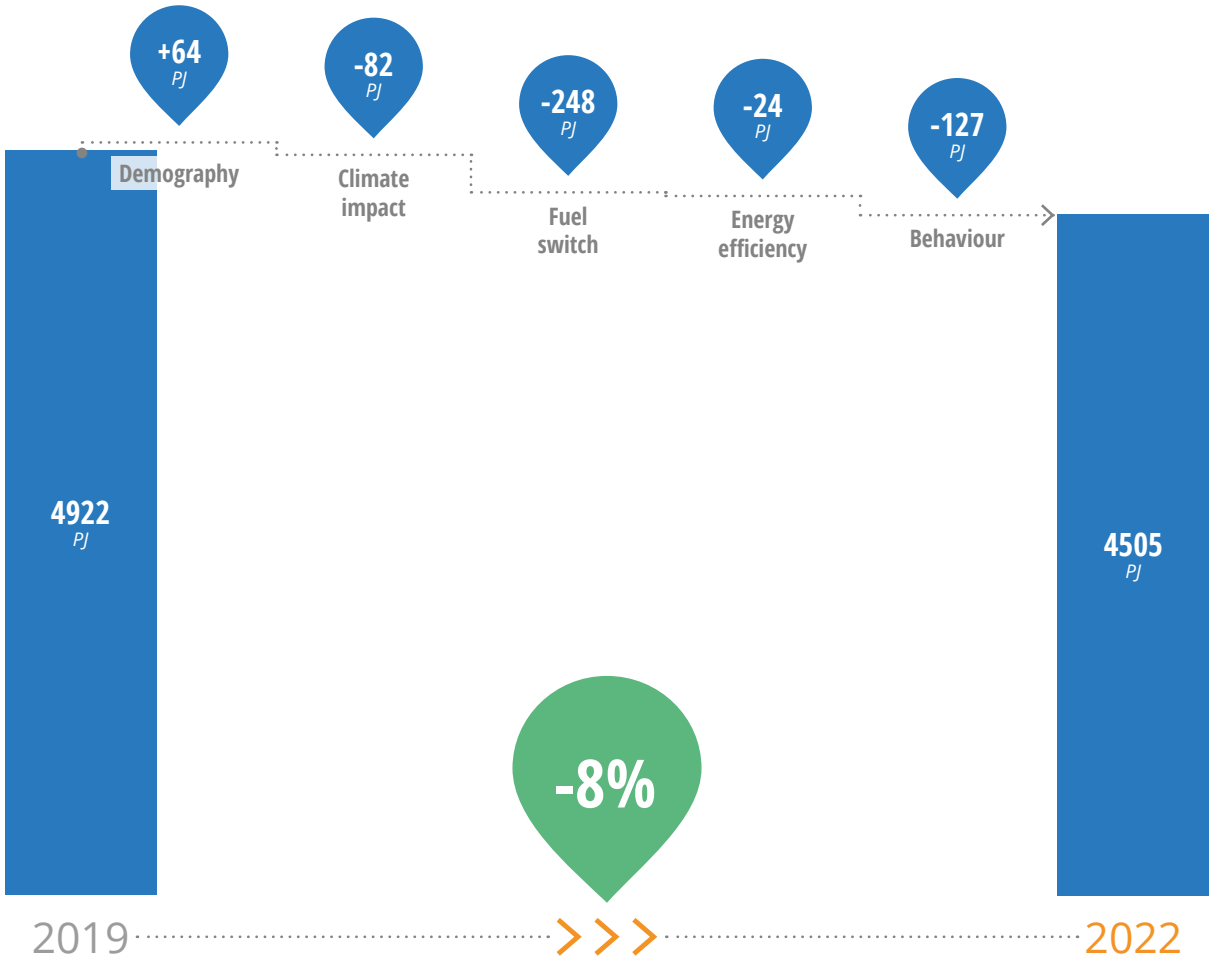
In 2019, natural gas consumption in the EU's building sector was divided accordingly:



Source: Enerdata – www.enerdata.net

Between 2019 and 2022, the use of natural gas for **heating decreased**, partly due to the **rise of heat pumps**.

Breaking down the decrease in EU natural gas consumption in the buildings sector between 2019 and 2022



Source: Enerdata – www.enerdata.net

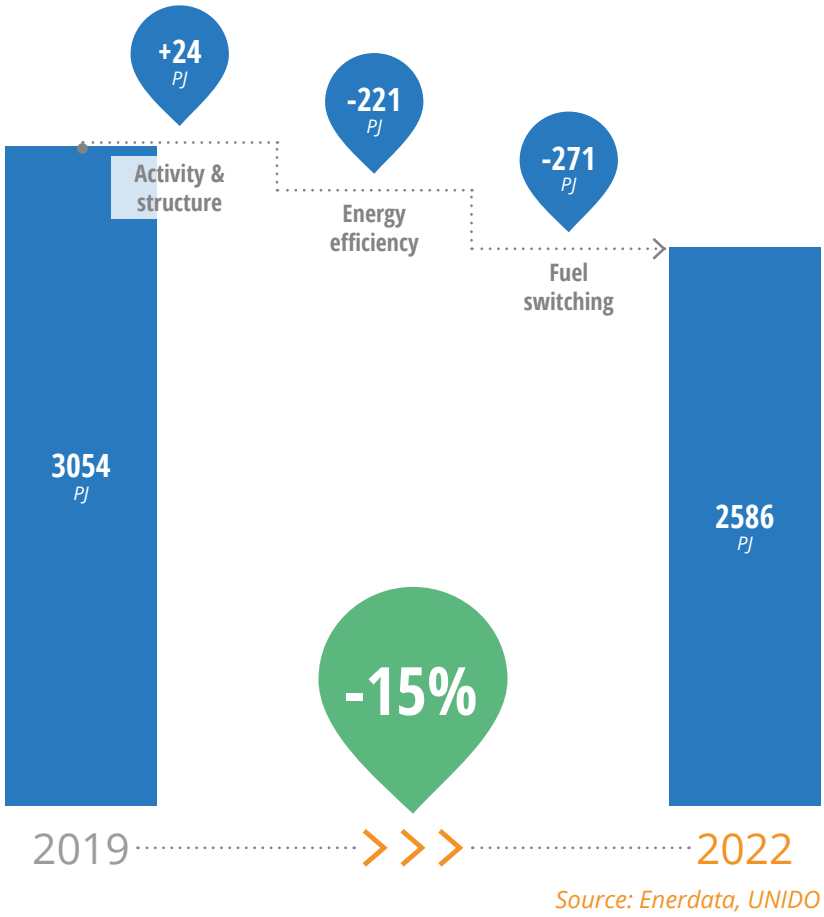
Natural gas consumption in the **building sector decreased by 8.4%** due to the following factors:

- **Fuel switching**, accounting for **more than half of the cut** (notably moving towards heat pumps, as mentioned before).
- **Price elasticity of demand** and **forced energy sufficiency** resulting from fear of a supply shortage (known as "behaviour") responsible for 30% of the decrease.
- **Milder weather**.

INDUSTRY SECTOR

Natural gas consumption in the manufacturing sector followed the same path as the building sector. However, the levers were not the same.

Breaking down the decrease in EU natural gas consumption in manufacturing industry between 2019 and 2022



Source: Enerdata, UNIDO

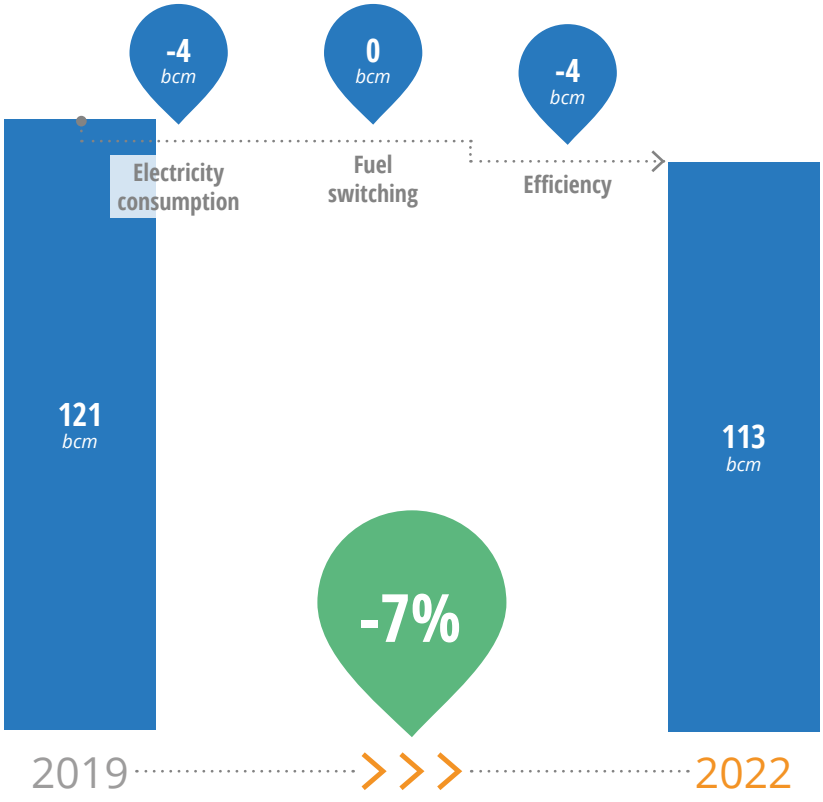
- **No sign of de-industrialisation**: stable activity despite a decline in the iron and steelmaking industries, and chemicals industries to a lesser extent.
- **Fuel switching** accounts for the **largest share** (58%).
- **Energy efficiency improvements** have been **implemented**.

POWER GENERATION SECTOR

Since 2019, the EU has not abandoned gas-fired power stations in favour of other power stations, because the effect of the order of merit has been neutralised.

Gas-fired power plants lost competitiveness due to soaring prices and should have been relegated to the end of the pecking order. However, the **very low availability of French nuclear power plants**, among other things, **increased the need for other means of production**, **including gas-fired power plants**, meaning the **power sector** had very **little flexibility**.

Breaking down the decrease in natural gas consumption in power generation between 2019 and 2022 in the EU



- **Slight reduction** in **overall electricity consumption**.
- **No fuel switching** despite the loss of competitiveness of gas-fired plants.
- Overall **efficiency improvements**.

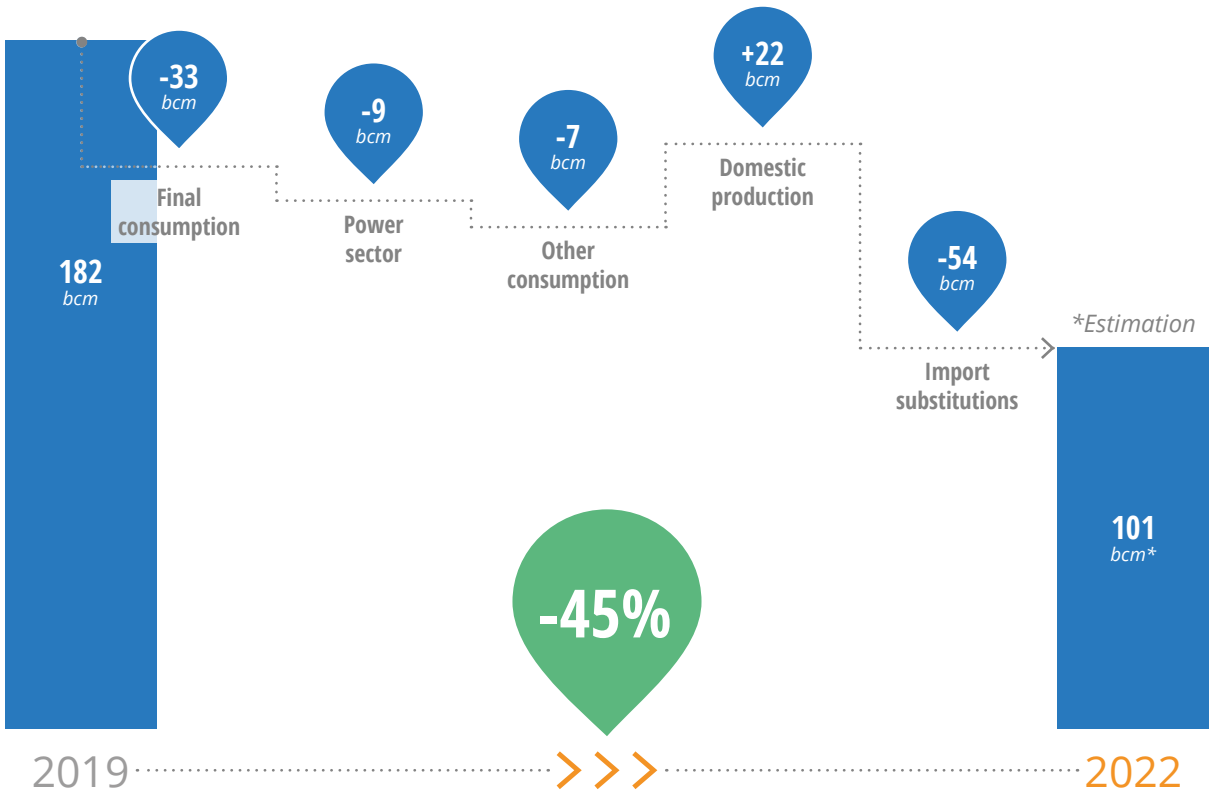
Source: Enerdata – www.enerdata.net

Diversification of the supply

SUBSTITUTING RUSSIAN GAS IMPORTS

Despite a drop in domestic production (positive in the waterfall chart since it led to increasing import needs), **imports from Russia fell by 45% in 2022 compared to 2019**. It is not easy to track **gas from Russia** accurately due to changes in the usual routes, though we estimate a volume of **101 bcm in 2022 compared with 182 bcm in 2019**. The **EU's natural gas supply was forced to diversify** to **reduce** the use of **Russian gas**.

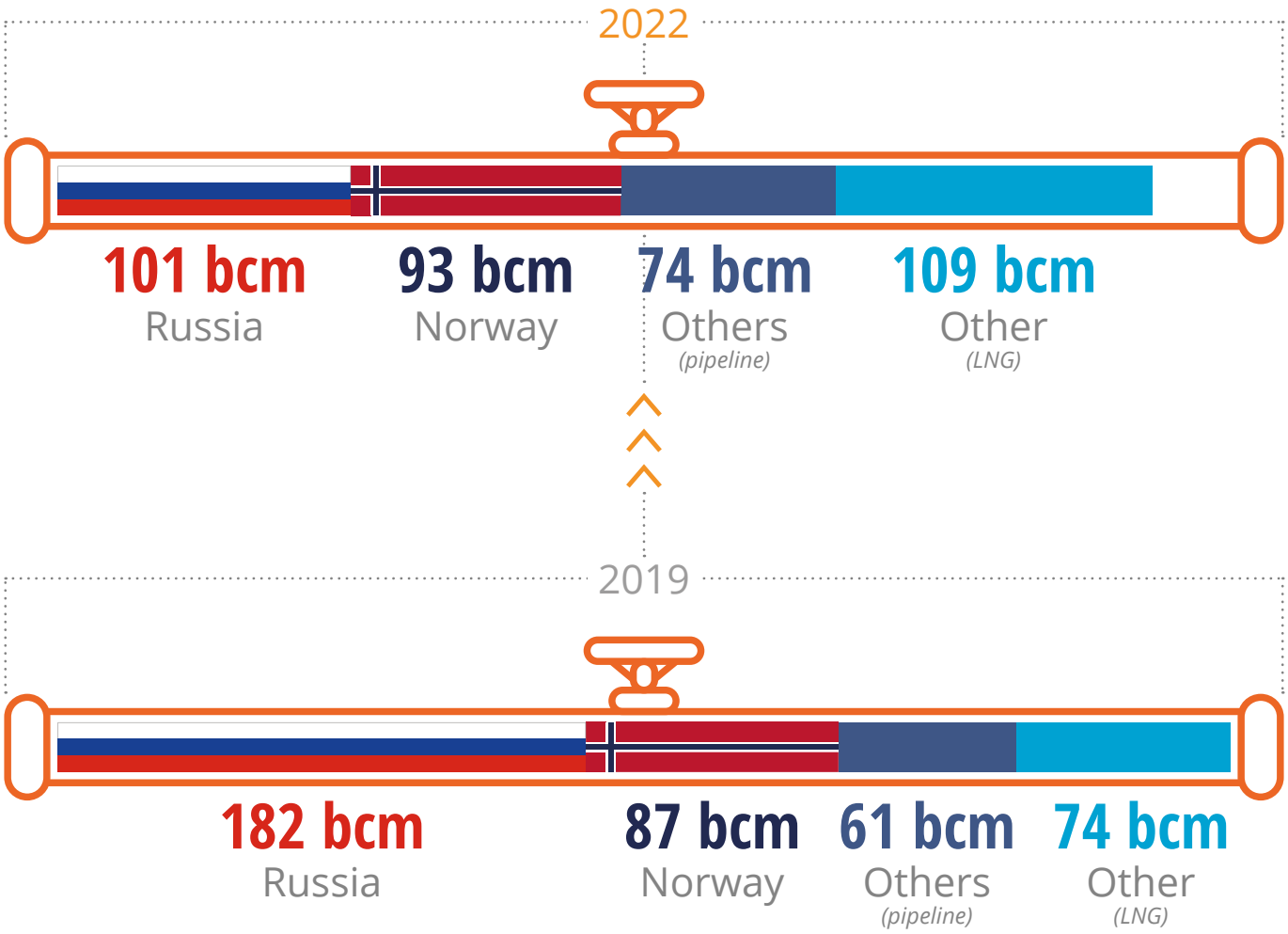
Main drivers behind the decrease of Russian gas imports in the EU between 2019 and 2022



Sources: Enerdata, Eurostat, Cedigaz

- **Lower final consumption** and **import substitutions** played the **main role** in the **decline** of **Russian gas imports**. They each accounted for a third of the drop.
- The **power sector's contribution** is **lower than expected** due to the mitigated merit order effect.

Gas imports in the EU by source in 2019 and 2022



Sources: Eurostat, Cedigaz

- **LNG imports increased massively by 47%** to **compensate** for the drop in **Russian supplies**. **LNG** now represents the **largest share of total gas supply in the EU**. It is a more flexible source which can be rerouted easier than pipelines.
- **Imports from Norway also increased** (+6 bcm), complementing LNG imports to **ensure sufficient supply**.

Summary

EUROPEAN GAS CRISIS SYNTHESIS

Overall, the invasion of Ukraine led to distortions in the natural gas market with surging prices in the EU. However, there were ultimately no supply outages as initially feared, thanks to:

- Consumption adaptation.
- A diversification of natural gas supply chains.

Natural gas consumption fell by 12% compared with 2019 through:

- Improved efficiency and fuel-switching in the industry.
- Favourable weather, heat pumps emergence and energy sufficiency in buildings.
- A slight decrease of electricity consumption and small intensity gains in the power sector.

Russian imports, falling by 44%, were compensated for by:

- 48% rise of LNG imports (largest source of total supply).
- 7% increase of Norwegian imports.

Enerdata
intelligence + consulting

HELPING YOU SHAPE THE ENERGY TRANSITION

Enerdata is an independent research company that specialises in the analysis and forecasting of energy and climate issues, at a variety of different geographic and business / sector levels. The company is headquartered in Grenoble, France, where it was founded in 1991, and has a subsidiary in Singapore.

Leveraging its globally recognised databases, business intelligence processes, and prospective models, Enerdata assists clients – which include companies, investors, and public authorities around the world – in designing their policies, strategies, and business plans.

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