

Weekly Summary

Economics of Climate Change

November 22, 2024

Clean Energy, Key to 2023 Emissions Cut in Spain

The 2023 Air Emission Accounts for Spain highlight an annual decrease in GHG and CO2 emissions. This reduction has been largely driven by a transition to a “cleaner” energy mix, coupled with improvements in energy efficiency. These advancements represent a meaningful step forward on the path toward meeting the ambitious climate goals set.

In 2023, the Spanish economy released fewer greenhouse gases (GHG) and CO2 into the atmosphere compared to the previous year, with reductions of 5.5% and 5.7%, respectively, after two consecutive years of increases, according to the [Spanish Air Emission Accounts](#)¹ published by the National Statistical Institute (INE). This reduction can be attributed to the normalization of economic activity after the post-pandemic rebound and a shift toward a less carbon-intensive energy mix, driven by the increased penetration of renewables. Notably, **hydropower and solar PV production grew by 41% and 34% annually**, respectively, following a historic low in hydro output in 2022 -the lowest in three decades. Energy intensity, measured as the energy used per unit of GDP, declined further in 2023, accelerating its downward trend and also contributing to the overall reduction in emissions (see **Figure 1** and **Figure 6**).

Figure 1. **Spain. Economic activities, Households GHG Emissions and Emission intensity.** (Thousands of Tons, 2008=100)

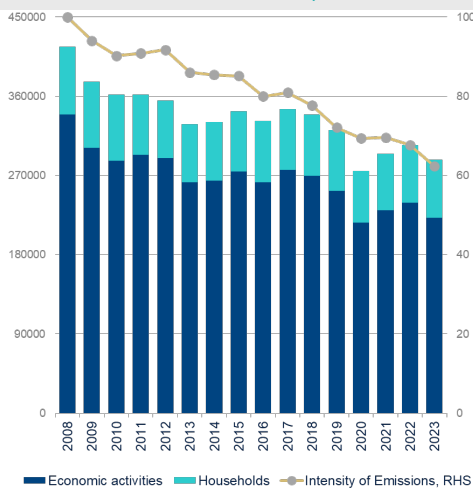
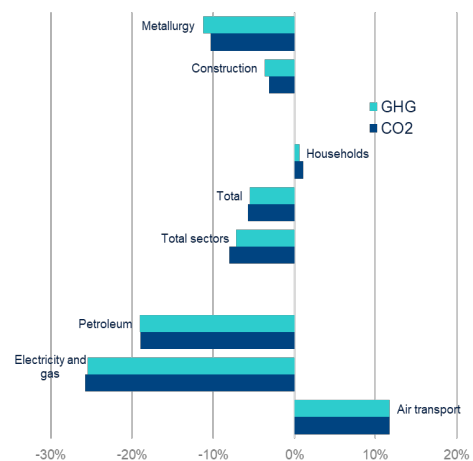


Figure 2. **Spain. Selected activity sectors and households. CO2 and GHG emissions.** 2023 vs 2022, %



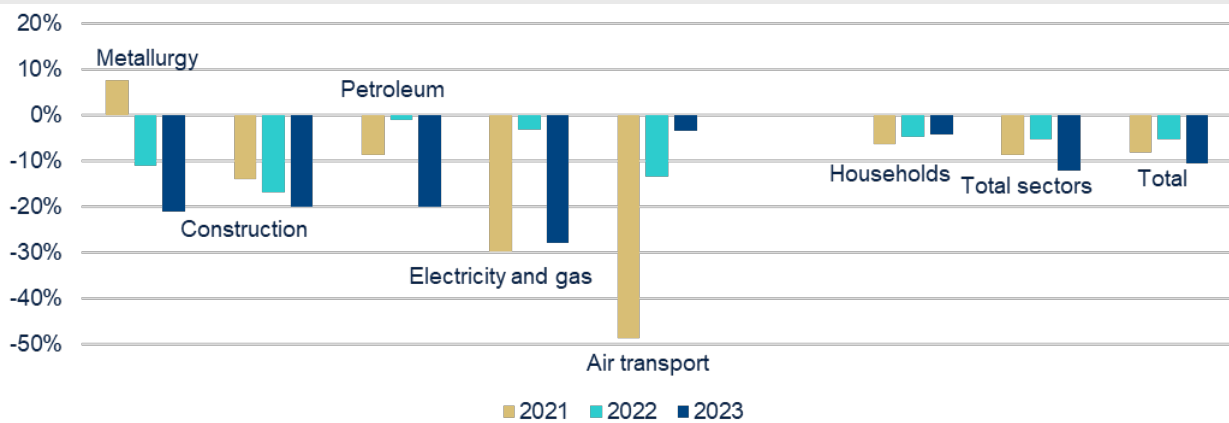
Source: BBVA Research from INE data.

The household emissions statistics published by INE only include direct emissions values. Direct household emissions are the GHG that are emitted when people drive their vehicles for personal use and use fossil fuels to heat their homes. Indirect household emissions are the greenhouse gasses that are emitted when industries produce the goods and services that people purchase for consumption.

1: The National Accounts system accounts for national economic activities (principle of residence) regardless of the geographical place where these emissions actually occur.

From the sector breakdown, a significant reduction in GHG emissions in 2023 is noteworthy for the electricity and gas, and petroleum sectors (see Figure 2), with annual declines of 25.5% and 19.1%, respectively, as well as for metallurgy (-11.3%) and construction (-3.7%). These reductions are mainly attributed to two factors: a slower pace of activity growth following the conclusion of the post-pandemic recovery process (GDP grew by 0.9% in 2023 compared to 6.2% the previous year), leading to reduced energy demand; and a less emission-intensive energy mix. Nonetheless, it is important to note that many of these sectors have not yet returned to pre-pandemic emission levels, and therefore, even assuming the existence of a technological improvement trend that favors lower emission intensity, their GHG emissions could rise again in the coming years. In that vein, the air traffic sector increased its emissions by approximately 11% compared to 2022, reaching levels slightly lower than those of 2019 (see Figure 3).

Figure 3. Spain. GHG emissions, selected activity sectors and households vs 2019 % variation

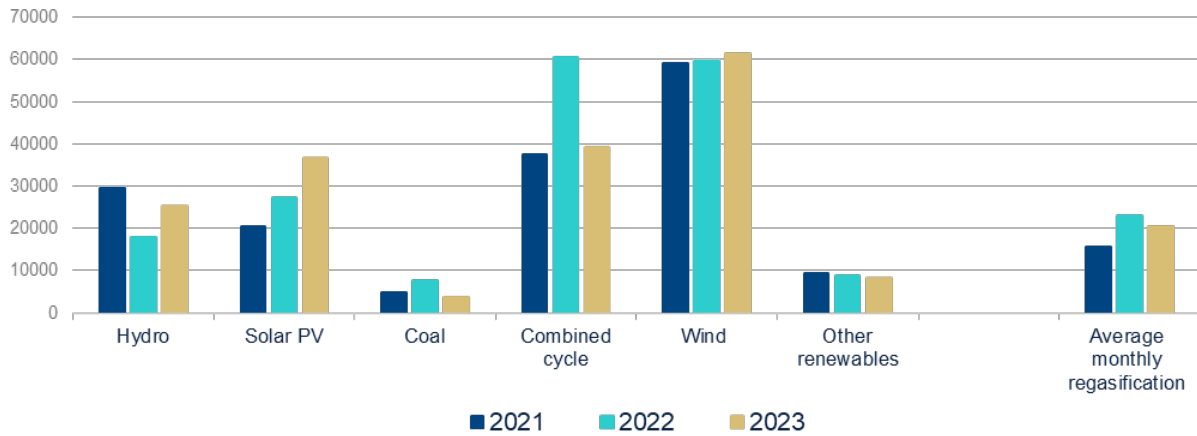


Source: BBVA Research from INE data.

The cleaner energy mix has played a pivotal role in reducing electricity sector emissions. The sharp decline in these emissions (see Figure 2) is largely due to a reduced reliance on carbon-intensive technologies, which was compensated by increased solar PV and hydropower generation, resulting in a cleaner electricity mix compared to the previous year. Additionally, regasification volumes fell by 12.2% in 2023, further contributing to the sector's emission reduction.² However, despite these improvements, the electricity and gas sector still emitted more greenhouse gasses than in 2021 (see Figure 3 and Figure 4).

2: LNG has a higher GHG footprint than pipeline gas due to the energy required for liquefaction and the potential for gas leaks and venting during transport.

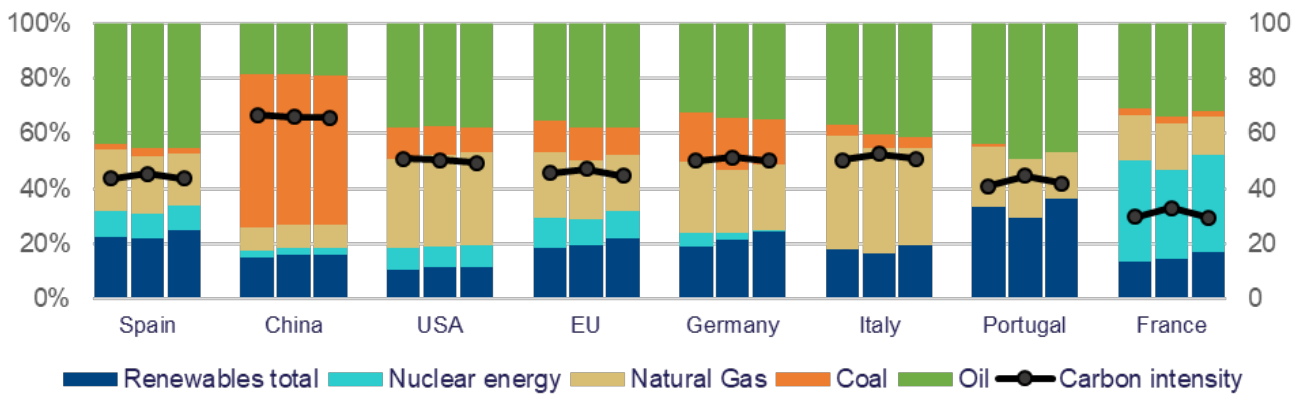
Figure 4. **Electricity generation by source and monthly regasification in Spain. (GWh)**



Source: BBVA Research from REData

The improvement in carbon intensity has extended to the overall energy sector, which recorded a 4.1% annual decline, recovering to 2021 levels after an extraordinary 2022 marked by **geopolitical** disruption and severe droughts.³ Similar trends have been observed in other European countries, including Portugal, Italy, France, and Germany, as well as in the US. In contrast, China's carbon intensity remains relatively stable and significantly higher than that of the EU and the US. Against this backdrop, **Spain continues to position itself as a global leader in renewable energy sources** (see Figure 5).

Figure 5. **Structure of energy consumption by source. 2021-2023 (first-third columns %). Carbon intensity of energy sector (*) (Mill tons of CO2 / Exajoules)**

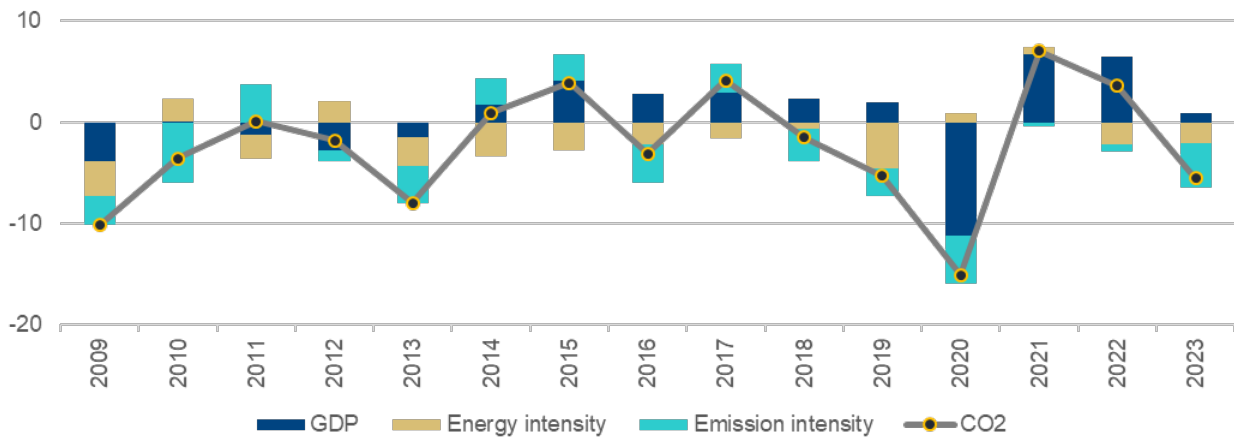


Source: BBVA Research from Energy Institute. (*) Carbon intensity is defined as the ratio between GHG emissions of the energy sector and total energy consumption.

3: A 1-in-500 year drought across Europe led to the lowest level of hydro generation since at least 2000, and there were widespread unexpected French nuclear outages just as German nuclear units were closing. Reference: [European Electricity Review 2023 | Ember](#).

Spain's 2023 emissions drop has been driven by efficiency gains and renewable energy penetration. In conclusion, the reduction in GHG and CO2 emissions in Spain in 2023 cannot be solely attributed to slower GDP growth. It has also been driven by improvements in carbon and energy intensities, reflecting greater efficiency, as highlighted by the Kaya identity analysis (see **Figure 6**). Spain remains a global leader in renewable energy, a strategic advantage that must be leveraged to advance energy sovereignty and meet its ambitious decarbonization targets.

Figure 6. **Kaya identity, Spain. CO2 emissions growth (2009-2023). % and pp**



Source: BBVA Research from INE data.

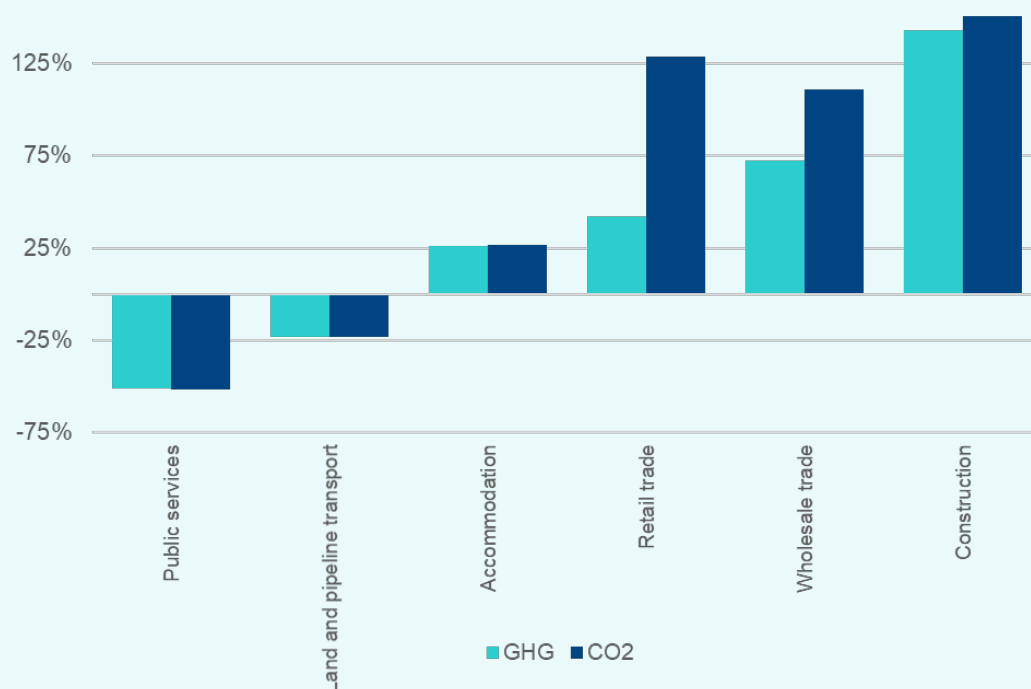
Box 1. Backward revisions of historical data

Environmental Accounts, in addition to early estimates for 2023, include a revision of historical data (Figure 7). Similarly to the previous update, **the changes are not especially relevant for the total emissions figures** (-0.18% average variation in GHG and -0.14% in CO2 for the period 2008-2022) but they imply **significant changes in the sectoral and household emission distribution**, altering sectoral analysis.

Household emissions have been revised downward by 4.3% for GHGs (4.4% for CO2), while those from some activity sectors have undergone significant changes, some upwards and others downwards, which explains the modest revision in emissions across all sectors (1% increase in GHG emissions and 1.3% in CO2 emissions).

Among the analyzed sectors,⁴ the largest downward revision in CO2 emissions has been observed in Public Service and land and pipeline transport, with average reductions of 52% and 23.5%, respectively. Conversely, **emissions from construction, wholesale trade and retail trade have been significantly revised upward**, in some years doubling or even tripling their previous levels. As a result, emission intensity ratios - commonly used as indicators of vulnerability to transition risks (calculated by dividing sectoral emissions by an activity metric such as added value or sectoral output)- will be impacted by these data revisions.

Figure 7. **Spain. Selected activity sectors. Revisions to average CO2 and GHG emissions over the period 2008-2022.**



Source: BBVA Research.

⁴ The analysis was limited to sectors with a share of equal total CO2 emissions of at least 0.5%.

Highlights of the Week

- **Global | [Unlocking Adaptation Finance in Emerging Market and Developing Economies](#)**. Mitigation efforts are insufficient to meet the 1.5°C goal, making adaptation crucial, especially for developing economies; scaling private sector finance is essential, requiring reframing adaptation as an investment opportunity, overcoming barriers, fostering public-private collaboration, and implementing policy reforms and financial incentives.
- **Global | [Mapped: How climate change affects extreme weather around the world - Carbon Brief](#)**. Attribution studies calculate whether, and by how much, climate change affected the intensity, frequency or impact of extremes.
- **Global | [Renewed momentum for emissions trading systems as tax-based carbon pricing stalls post energy crisis | OECD](#)**. Reduced energy excise tax rates in many countries in response to the recent energy crisis led to lower implicit carbon prices in 2023, but the development of new emissions trading schemes should lead to a greater share of emissions being priced in the next five years, according to a new OECD report.
- **China | [Analysis: China's emissions have now caused more global warming than EU - Carbon Brief](#)**. China's historical emissions within its borders have now caused more global warming than the 27 member states of the EU combined.
- **España | ["El Agua en España. Diagnóstico integral de un desafío urgente y compartido"](#)**. Documento que combina análisis, diagnóstico y recomendación de políticas sobre un asunto muy complejo, también por economía política.

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