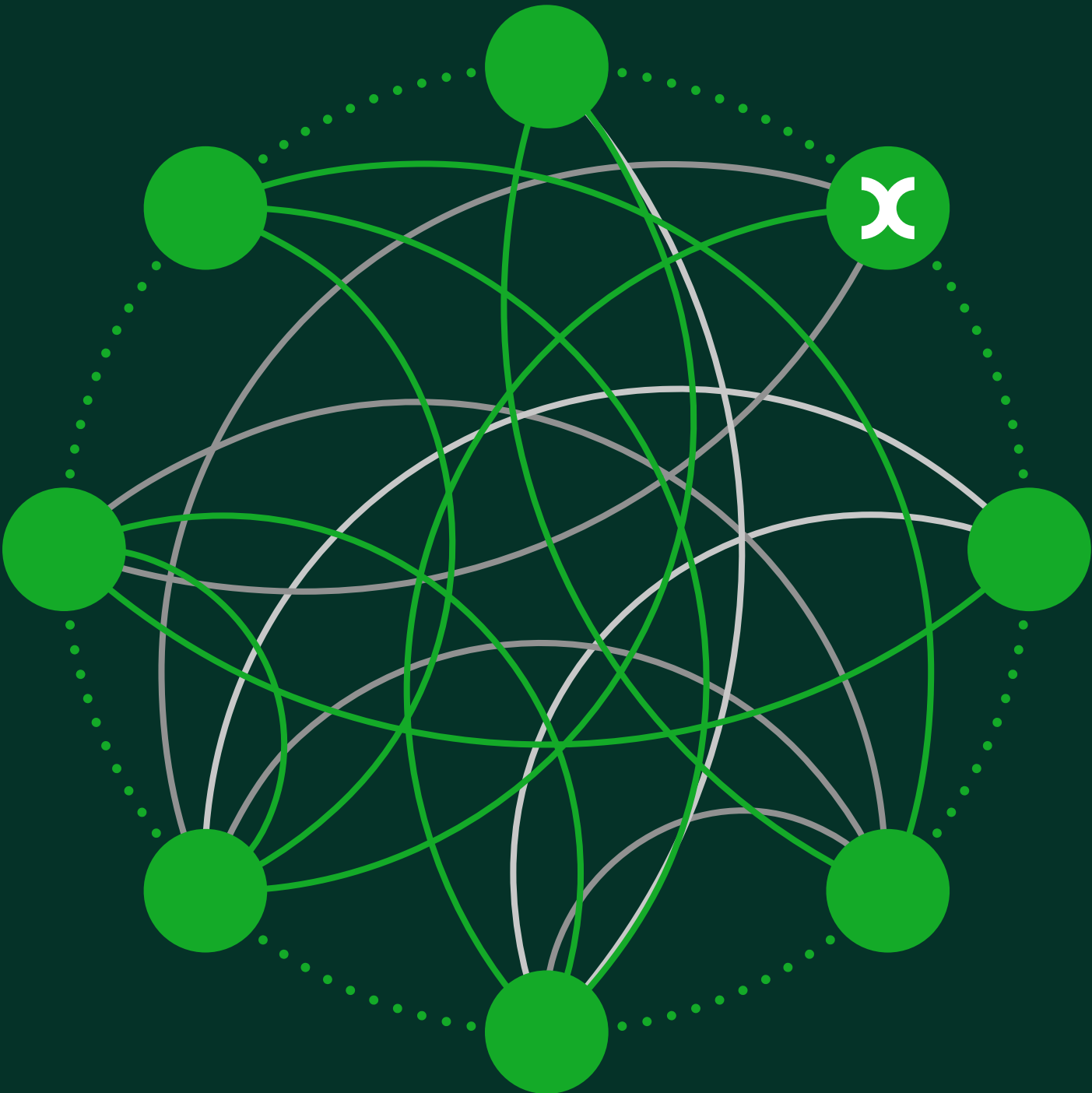


Prepared by Oxera
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Summary

As the UK pursues its net zero target, understanding the full impact of the emissions associated with domestic consumption is key to credible climate policy. The current UK national carbon accounting framework focuses on **territorial emissions**, capturing emissions released within the country's geographic boundaries. In doing so, it omits consideration of emissions associated with the relocation of production overseas—a process often referred to as **offshoring**—and those embedded in imports.

Policymakers should be mindful that **offshoring can not only fail to reduce global emissions but may, in some cases, increase them**—both due to the emissions generated by transporting goods to the UK (goods that were previously produced and consumed domestically but are now produced elsewhere and imported) and the potentially higher carbon intensity of production abroad.



Key finding

Our analysis shows that, in some sectors, the scale of offshored emissions is equivalent to **more than 40% of the reported territorial reductions**—meaning that part of the UK's apparent decarbonisation reflects relocation of production overseas rather than global cuts in emissions. For certain commodities, this share is even higher—up to **70–80%**.

We have analysed trade and production patterns to identify volumes and emissions related to the consumption of goods where production appears to have been offshored. This reveals the extent to which the UK's observed reduction in territorial greenhouse gas (GHG) emissions may, in part, reflect a relocation of emissions-intensive production overseas, rather than a decarbonisation of domestic demand. We find that:

- there is evidence of offshoring in a set of high-emission commodities between 2005 and 2022, particularly in **crude petroleum and natural gas, as well as ceramic and stone products, and refined petroleum products**, with total offshored volumes amounting to **64 million tonnes**;
- if these offshored commodities had been produced domestically under current UK production conditions, they would have generated **14.9 million tonnes of carbon dioxide equivalent (MtCO₂e)** in emissions;
- in some sectors, **offshored emissions represent a substantial share of the reported territorial reductions**, indicating that part of the UK's decarbonisation reflects relocation of production;
- Most offshoring of industrial commodities is concentrated in countries including the **USA, China, Qatar, and the Netherlands**—reflecting their strong trading relationships with the UK for goods in carbon-intensive industrial sectors.

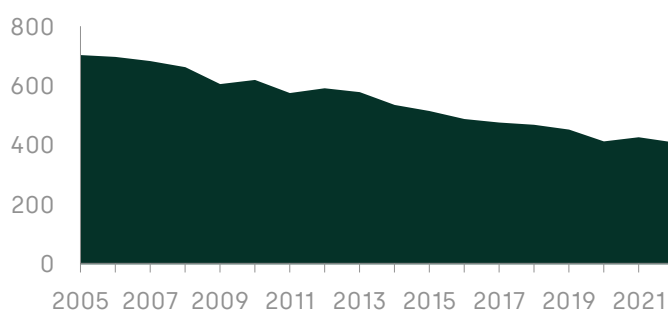
This analysis offers a high-level, consumption-based perspective on offshoring. While aggregate in nature, it suggests that part of the UK's reported reduction in overall territorial emissions is accounted for by the relocation of production outside the UK. While offshoring does not explain the majority of the decline in territorial emissions, for some commodities the extent of decarbonisation due to industrial offshoring appears significant.

Introduction

The UK has established itself as a global leader on climate action. It was the first major economy to legislate for net zero emissions by 2050 and has achieved substantial reductions in GHG emissions, according to the UK government.¹ These achievements are measured using the **UK's territorial carbon accounting framework**, which reflects emissions released within the UK's borders.

The UK has recorded a sustained decline in territorial GHG emissions since the early 2000s. As shown in Figure 1, emissions fell from 700 MtCO₂e in 2005 to 405 MtCO₂e in 2022—a **reduction of around 295 MtCO₂e, or 42%, over 17 years**.

Figure 1 UK Territorial GHG emissions by pollutant (MtCO₂e)



Source: Oxera analysis based on DESNZ (2025), 'Final UK territorial greenhouse gas emissions statistics by Standard Industrial Classification (SIC), 1990-2023', June.

However, this framework does **not capture emissions embedded in imported goods**. As a result, it may not fully reflect the UK's true carbon footprint, especially if domestic production is replaced by more emissions-intensive production overseas—a phenomenon known as **carbon offshoring**.

Our analysis **assesses patterns in trade and production between 2005 and 2022**, to estimate the emissions associated with these changes, and identify the key products and trading partners involved. This is a high-level, **consumption-based** analysis focused on proxying broad offshoring trends. While it does not track individual supply chains, it provides an indication of the scale and nature of offshored emissions.

What are the most intensively 'offshored' commodities?

We have examined trade and production trends between 2005 and 2022, focusing on commodities where:

¹ HM Government (2021), '[Net Zero Strategy: Build Back Greener](#)', October, pp. 14–35.

- UK consumption remained stable or increased;² and
- imports rose relative to domestic production.

These patterns indicate a likely offshoring of production.

Overall, we estimate that **64 million tonnes** of products were offshored between 2005 and 2022. Below, we list the commodities with the stronger evidence of offshoring, according to the above criteria.

- Crude petroleum and natural gas;
- Forestry, logging, and related products;
- Mining and quarrying products;
- Refined petroleum products;
- Coke oven products;
- Metal products.

Production and trade patterns suggest greater levels of offshoring in these sectors—they also tend to be among the most emissions-intensive with respect to production. Building on this, we have also assessed the GHG emissions associated with offshored volumes of these commodities, proxied by the change in their import volumes from 2005 to 2022.

Offshored commodity emissions

To estimate these emissions, we assume that the commodities would be produced in the UK under current conditions;³ this represents a counterfactual that allows direct comparison with reported UK territorial emissions and reveals the net effect of offshoring.

Figure 2 illustrates the estimated emissions linked to the offshoring of production between 2005 and 2022. For the commodities we identify offshoring, we estimate that associated offshore emissions amounted to approximately **14.9 MtCO₂e**. This is equivalent to the annual emissions of approximately 10 million UK cars or to 8.8 million return flights from London to New York.⁴

Figure 2 Estimated emissions associated with offshore production increases (2005–22)



Source: Oxera analysis based on DESNZ (2025), ‘Final UK territorial greenhouse gas emissions statistics by Standard Industrial Classification (SIC), 1990-2023’, June; HMRC (2025), ‘Overseas trade statistics’, accessed

10 July 2025 and ONS (2025), ‘UK input-output analytical tables: product by product’, February.

These offshored emissions are equivalent to a **significant portion (5%) of the decline in reported territorial emissions** over the same period. For UK industrial sectors, this share alone increases markedly (by around 20%), suggesting that a component of the observed reduction in UK emissions is attributable to the relocation of production abroad rather than to absolute reductions in global emissions. This is shown in Figure 3.

Figure 3 The relationship between offshoring and reported reductions in UK territorial emissions: all sectors compared with industry sectors

% of the observed reduction in territorial emissions that can be attributed to offshoring

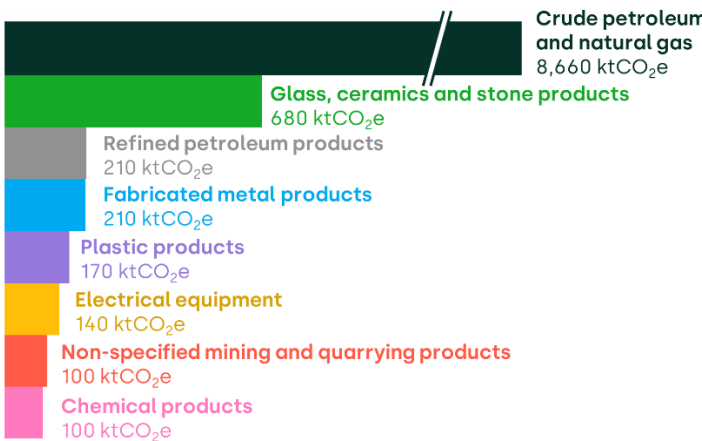


Source: Oxera analysis based on DESNZ (2025), ‘Final UK territorial greenhouse gas emissions statistics by Standard Industrial Classification (SIC), 1990-2023’, June; HMRC (2025), ‘Overseas trade statistics’, accessed 10 July 2025 and ONS (2025), ‘UK input-output analytical tables: product by product’, February.

What are the offshored commodities with the most emissions?

Figure 4 presents the estimated total emissions associated with the offshore production of key commodities between 2005 and 2022.

Figure 4 Estimated emissions associated to various offshored commodity groups (2005–22)

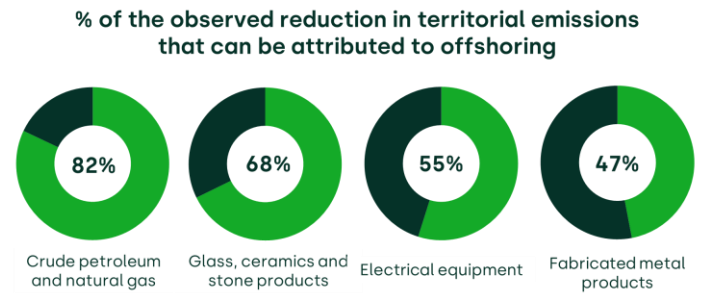


² Theoretically, we may also observe cases of offshoring where overall consumption declines slightly, but a growing share of that demand is met through imports. This scenario is accounted for in our methodology.
³ We therefore do not account for the possibility that a given commodity produced in a different country may be produced in a more or less emissions-intensive way.
⁴ DESNZ, ‘Greenhouse gas reporting: conversion factors 2025’, 10 June 2025. Department for Transport (2025), ‘Vehicle licensing statistics data tables’, August; and Department for Transport (2025), ‘Annual mileage of cars by ownership, fuel type and trip purpose: England, 2002 onwards’, August.

Note: Offshored emissions for each commodity are rounded to the nearest 10 kilo-tonnes of carbon dioxide equivalent (ktCO₂e).
Source: Oxera analysis based on DESNZ (2025), 'Final UK territorial greenhouse gas emissions statistics by Standard Industrial Classification (SIC), 1990-2023', June; HMRC (2025), 'Overseas trade statistics', accessed 10 July 2025 and ONS (2025), 'UK input-output analytical tables: product by product', February.

At the level of specific commodities, offshored emissions correspond to an even larger share of the reported decline in UK industrial territorial emissions over the same period. Indeed, for certain commodities, estimated **offshored emissions explain a large proportion—often over 40%—of the total territorial emissions reduction for the relevant commodity since 2005**. This is illustrated in the figure below.

Figure 5 The relationship between offshoring and observed reductions in UK territorial emissions for selected commodities



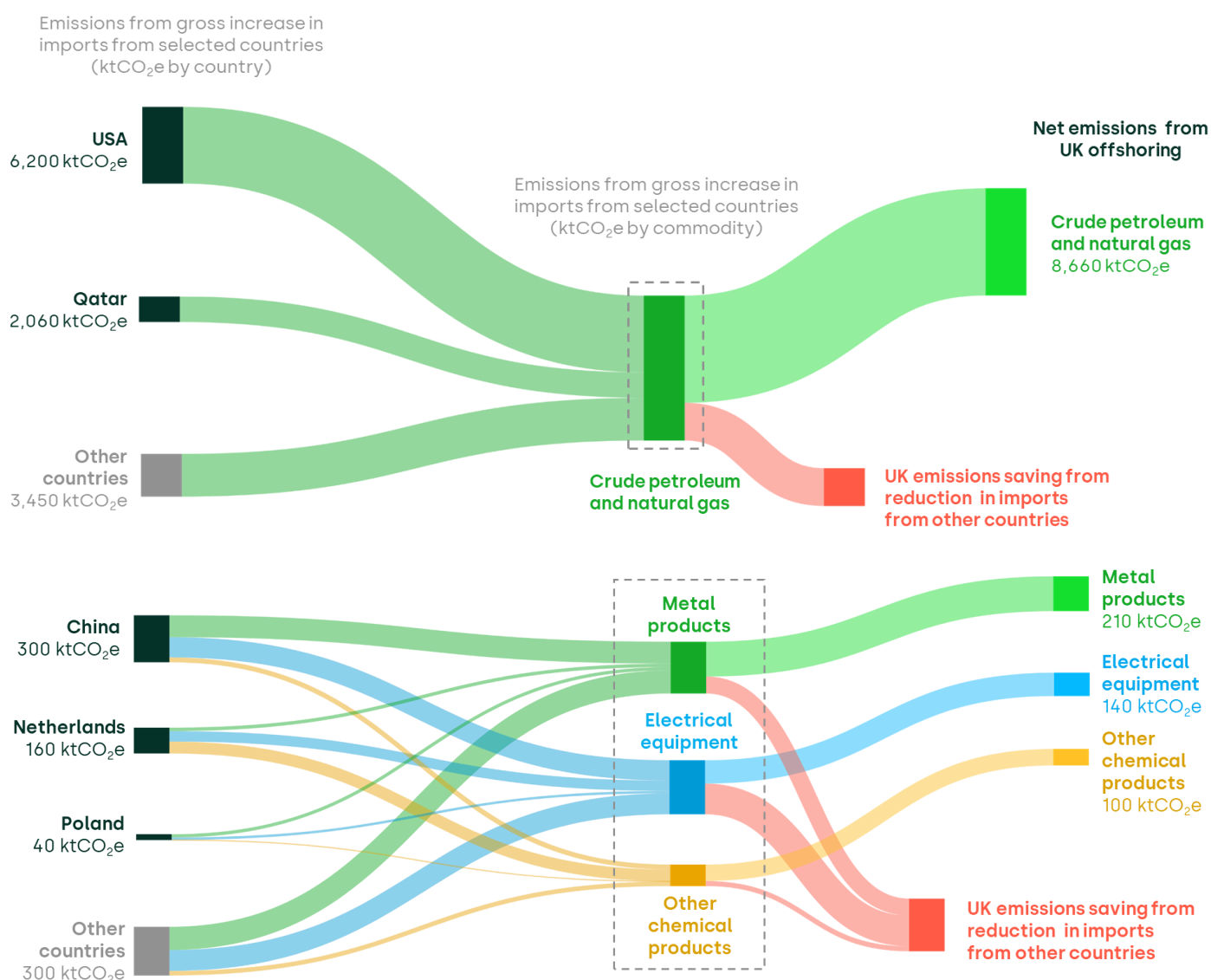
Note: Territorial emission reductions are rounded to the nearest 10 ktCO₂e.
Source: Oxera analysis based on DESNZ (2025), 'Final UK territorial greenhouse gas emissions statistics by Standard Industrial Classification (SIC), 1990-2023', June; HMRC (2025), 'Overseas trade statistics', accessed 10 July 2025, and ONS (2025), 'UK input-output analytical tables: product by product', February.

Where does the offshored production go?

Using trade data, we have mapped the origin countries for these offshored goods. This provides a sense of the proportion of emissions that can be attributed to each source country. Figure 6 illustrates the estimated flow of offshored emissions by country of origin, highlighting where the production of selected industrial commodities has (effectively) relocated to and where the associated emissions would now take place. The flows represent emissions from offshoring in a few countries, distributed across different commodities. On the right, the figure shows how these gross emissions translate into the net change in UK emissions from offshoring. Together, these flows highlight the countries that contribute most to emissions from UK offshoring, serving as the primary sources of some imported industrial commodities.

A large share of offshored emissions is concentrated in a few countries—particularly the USA, China and the Netherlands— reflecting strong trade ties between the UK and these countries in carbon-intensive industrial sectors.

Figure 6 Offshored emissions by country of origin for metal products, electrical equipment, other chemical products and crude petroleum and natural gas



Note: Offshored emissions for each commodity are rounded to the nearest 10 ktCO₂e. We focus on the emissions that would have been generated if these goods were produced within the UK under current production conditions. For each commodity, imports increased from some countries and decreased from others. To present net emissions from offshoring, the 'reduction in imports from other countries' reflects reductions in imports that offset part of the gross increase in offshored emissions.

Source: Oxera analysis based on DESNZ (2025), 'Final UK territorial greenhouse gas emissions statistics by Standard Industrial Classification (SIC), 1990-2023', June, HMRC (2025), 'Overseas trade statistics', accessed 10 July 2025, and ONS (2025), 'UK input-output analytical tables: product by product', February.